Equinor Canada Ltd.

Central Ridge Exploration Drilling Program

Abridged Environmental Impact Statement Summary

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List of Abbreviations

2D	Two-dimensional
3D	Three-dimensional
Accord Acts	*Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act*
ADW	Approval to Drill a Well
ASF	Atlantic Salmon Federation
AUV	Autonomous Underwater Vehicle
bbl	Barrels
BOP	Blowout Preventer
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
CEA Agency	Canadian Environmental Assessment Agency
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
DFO	Fisheries and Oceans Canada
DND	Department of National Defence
DP	Dynamic Positioning
EA	Environmental Assessment
EBSA	Ecologically and Biologically Significant Area
ECCC	Environment and Climate Change Canada
EEM	Environmental Effects Monitoring
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
EL	Exploration Licence
EPP	Environmental Protection Plan
Equinor Canada	Equinor Canada Ltd.
ESRF	Environmental Studies Research Fund
FCA	Fisheries Closure Area
Flemish Pass EIS	Flemish Pass Exploration Drilling Program Environmental Impact Statement
FFAW-Unifor	Fish, Food and Allied Workers-Unifor
FLO	Fisheries Liaison Officer
FSC	Food, Social, and Ceremonial

FTWT	Formation Testing While Tripping
IBA	Important Bird Area
IR	Information Request
IUCN	International Union for Conservation of Nature
km	Kilometre
L	Litre
LSA	Local Study Area
m	Metre
MARPOL	The International Convention for the Prevention of Pollution from Ships
MBCA	Migratory Birds Convention Act
MMO	Marine Mammal Observer
MPA	Marine Protected Area
NAFO	Northwest Atlantic Fisheries Organization
NB	New Brunswick
NL	Newfoundland and Labrador
NL ESA	Newfoundland and Labrador *Endangered Species Act*
NM	Nautical miles
NO_X	Nitrogen Oxide
NS	Nova Scotia
OA	Operations Authorization
OCI	Ocean Choice International
OCSG	Offshore Chemical Selection Guidelines
OWTG	Offshore Waste Treatment Guidelines
OSRP	Oil Spill Response Plan
PE	Prince Edward Island
QC	Quebec
ROV	Remotely operated vehicle
RSA	Regional Study Area
SAR	Species at Risk
SARA	*Species at Risk Act*
SBM	Synthetic-Based Mud
SDL	Significant Discovery Licence
SOCC	Species of Conservation Concern
SOCP	Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment
SPOC	Single point of contact

UNCBD	United Nations Convention on Biological Diversity
UNFAO	United Nations Food and Agriculture Organization
VC	Valued Component
VOC	Volatile Organic Compounds
VME	Vulnerable Marine Ecosystem
VSP	Vertical Seismic Profiling
WBM	Water-based Mud
ZOI	Zone of Influence

1.0 INTRODUCTION AND ENVIRONMENTAL ASSESSMENT CONTEXT

Equinor Canada Ltd. (Equinor Canada), on behalf of its partners, Husky Oil Operations Limited and Suncor Energy Offshore Exploration Partnership, is proposing to undertake an exploration drilling program on Exploration Licenses (ELs) 1159 and 1160 in the Central Ridge Area, located offshore Newfoundland and Labrador (NL) and approximately 375 km east of St. John's, NL.

The drilling, testing, and abandonment of offshore exploratory wells in the first drilling program in an area set out in one or more ELs issued in accordance with the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* is a designated project under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). This document has been prepared to address the information requirements pursuant to CEAA 2012 and its regulations, as well as the requirements under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Newfoundland and Labrador Act* (the Accord Acts). It is also intended to assist other regulatory agencies, Indigenous groups and the public to determine their interest and participation in the Environmental Assessment (EA) process.

Equinor Canada submitted an Environmental Impact Statement (EIS) for the Flemish Pass Exploration Drilling Program (the Flemish Pass EIS) in December 2017 and a Decision Statement was received from the CEAA 2012 assessment process, with conditions, in April 2019. ELs 1159 and 1160 are within the Project Area assessed in the Flemish Pass EIS and the Agency has determined that an Abridged EIS is required for exploration drilling to be conducted in these two ELs.

2.0 PROJECT OVERVIEW

The scope of the exploration drilling on ELs 1159 and 1160 includes the drilling, testing and decommissioning / abandonment of exploratory wells (including delineation wells) using one or more drilling installation, as well as associated exploration and supporting activities. Delineation and appraisal wells refer to the same activity. The appraisal phase follows a successful exploration drilling program and consists of drilling delineation wells to determine the size of the oil or gas field (Schlumberger 2019). The distance between individual exploration well varies as they are dependent on the results from initial wells and geophysical programs. Delineation / appraisal wells are typically completed within a radius of approximately 20 kilometres (km) from the initial exploration well.

In November 2018, Equinor Canada was awarded ELs 1159 and 1160 in the Central Ridge area of the Canada-NL Offshore Area.

The Flemish Pass EIS environmental effects analysis considered the drilling of up to 30 wells. Wells to be drilled on ELs 1159 and 1160 would be captured within this 30-well count. The effects assessment carried out within the Flemish Pass EIS is directly applicable to ELs 1159 and 1160, and the abridged EIS focussed on new information available since the filing of the Flemish Pass EIS. No additional wells would be drilled with the inclusion of ELs 1159 and 1160. Up to twelve wells could be drilled in total on EL 1159 and EL 1160, and the total number of wells for the Flemish Pass and Central Ridge ELs (i.e., ELs 1139, 1140, 1141, 1142, 1159, and 1160) would not exceed 24 as per the Flemish Pass EIS Decision Statement.

The purpose of exploration drilling is to determine the potential for oil and gas resources on Equinor Canada-held land holdings within the Project Area. Exploration / delineation drilling is required to determine the presence, nature and volume of potential oil and gas resources within the ELs. Exploration drilling activities on ELs 1159 and 1160 also enables the licence interest holders to meet the work expenditure commitments that must be fulfilled over the term of the licence.

Equinor Canada-held land holdings within the Project Area have the potential to contain important and commercially significant hydrocarbon resources. Exploration drilling is expected to result in economic, social and technological benefits at the regional level. This includes contributing to energy diversity and supply. Oil continues to play an important part in meeting energy demands and exploration is necessary to enable oil and gas companies to maintain production. In addition, revenues and economic benefits generated from oil production form a significant part of the Newfoundland and Labrador economic and provincial government revenues.

As an operator, Equinor Canada recognizes that oil and gas will be an important part of the energy mix for decades to come and that global energy systems must be transformed to become more sustainable. Sustainability management is an integral part of Equinor Canada's overall management system (Statoil 2016a). Equinor Canada also aims to be recognized as the most carbon-efficient oil and gas producer, committed to creating lasting value for communities (Statoil 2016a). Equinor Canada actively works to reduce climate emissions, including carbon dioxide (CO_2), nitrogen oxide (NO_X), sulphur oxide and non-methane volatile organic compounds (VOCs).

Equinor Canada's lease purchases represent the amount of money that Equinor Canada has committed to spending exploring hydrocarbons in the offshore, and on research and development, education and training, within the first six years of the EL term. This expenditure can benefit the provincial economy and communities through capital expenditures, wages, and supplies and services contracts with local providers. In addition to the Project-specific benefits for the provincial economy and communities, Equinor Canada has made investments in youth talent development and the local Newfoundland and Labrador society for more than 10 years.

2.1 Project Location

A project area is defined as the overall geographic area within which all components and activities will take place. As illustrated in Figure 2-1, the Project Area, as assessed in the Flemish Pass and Eastern Newfoundland EISs, includes Equinor Canada ELs 1159 and 1160 where exploration drilling activities may be carried out. The previously assessed Project Area also encompasses other existing Equinor Canada operated licences and partner operated licences. The Project Area includes a surrounding area to account for planned and potential ancillary and support activities at, or around, relevant well sites.

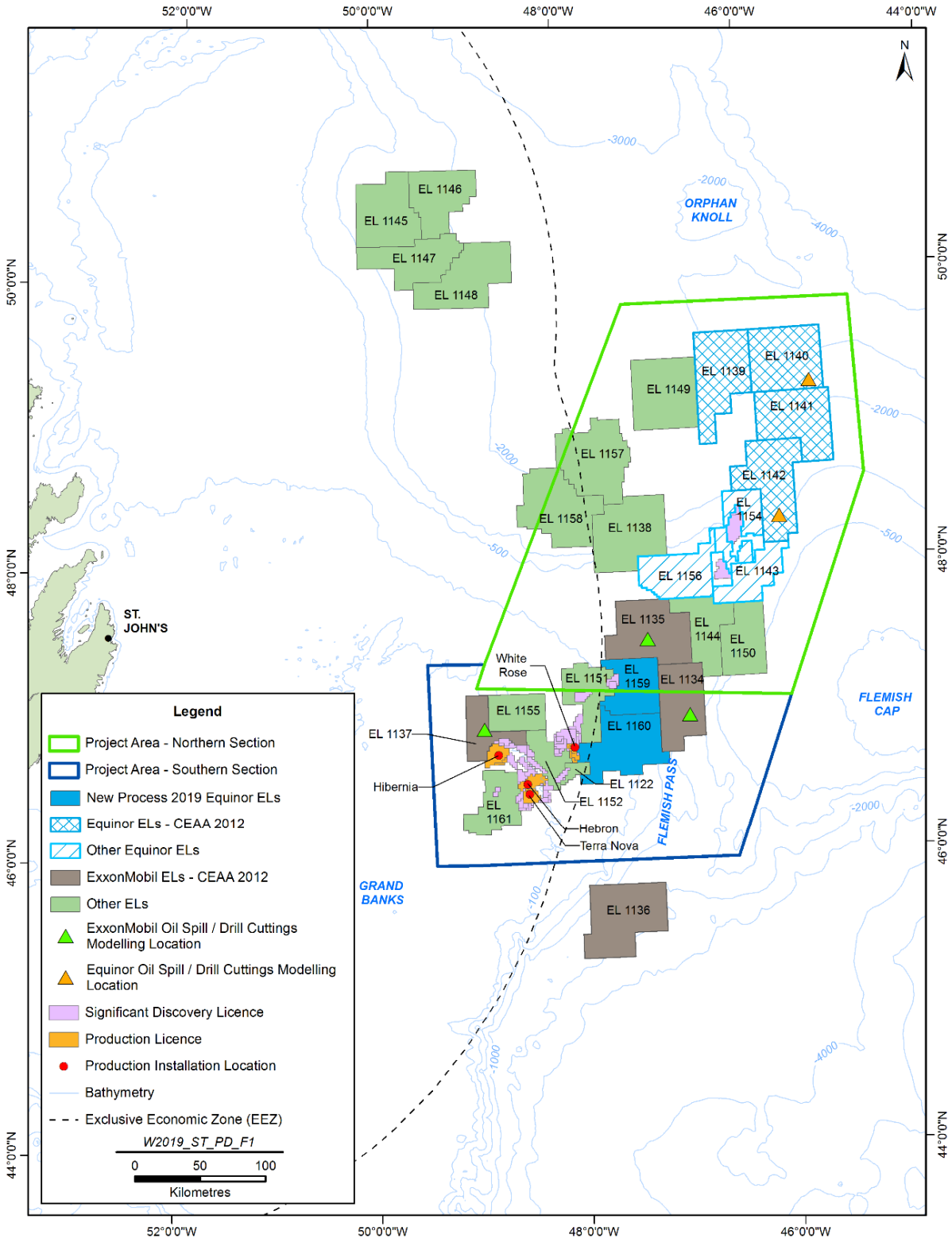


Figure 2-1 Project Area

As defined in the Flemish Pass and Eastern Newfoundland EISs, the Project Area, which has an area of approximately 100,800 km², is divided into the Northern Section and Southern Section. EL 1160 is located within the Project Area – Southern Section, while EL 1159 is located within both the Project Area – Northern Section and Project Area – Southern Section (Figure 2-1). For the purposes of this Abridged EIS for exploration drilling on ELs 1159 and 1160, the same Project Area is being used.

Safety zones around drilling installations are approximately 1 km² for a drill ship using dynamic positioning (DP) and 12 km² for a semi-submersible requiring anchors.

Water depths in EL 1159 range from approximately 90 metres (m) to 930 m, and EL 1160 ranges from approximately 40 m to 1,020 m. Average water depths in ELs 1159 and 1160 are approximately 350 m and 260 m, respectively. Specific drilling locations cannot be identified at this time as they will be based on the interpretation of seismic data, which is an ongoing activity, and the results for each drilled well within the Project Area

2.2 Planned Project Components and Activities

The scope, as identified in the EIS document, includes the mobilization and operation of drilling installations, drilling activities, supporting ancillary activities to drilling programs, and well decommissioning or suspension. The components and activities are summarized in the subsections below.

2.2.1 Drilling Installations and Activities

Exploration and delineation / appraisal wells are drilled to confirm the presence, or delineate the extent, of oil and gas resources at specific locations. Exploration wells are drilled to determine whether areas of interest identified from previous geophysical surveys and other information contain oil and gas resources. Depending on the results of these wells, an operator may then drill delineation / appraisal wells into different parts of the identified hydrocarbon accumulation to confirm its size and the characteristics of the hydrocarbons found.

Specific wellsite locations are not currently defined and will be selected as planning and design activities move forward. Detailed well design has likewise not yet been completed, and will depend on various factors including water depth, reservoir potential and its geological properties. Individual well designs will be developed and submitted for approval to the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) as required per the applicable authorization and approvals processes.

Wells may be drilled using a semi-submersible drilling installation or drillship (Figure 2-2). The type of installation chosen will be based primarily on the characteristics of the physical environment at the proposed drill site, particularly water depth, expected drilling depth, and expected weather and ice conditions and associated mobility requirements. Drilling installations and vessels selected will meet the operational and environmental capabilities needed for the associated exploration activities and will meet all regulatory requirements. For the purposes of environmental effects analysis, it is assumed that there may be up to two drilling installations actively engaged in drilling activities in the Project Area (i.e., any of the Flemish Pass ELs) at any one time. A drilling installation can either be moored in position over

the drilling site using mooring lines and anchors (generally in shallower water depths up to 500 m) or maintained on station by a DP system (generally in deeper water greater than 500 m).

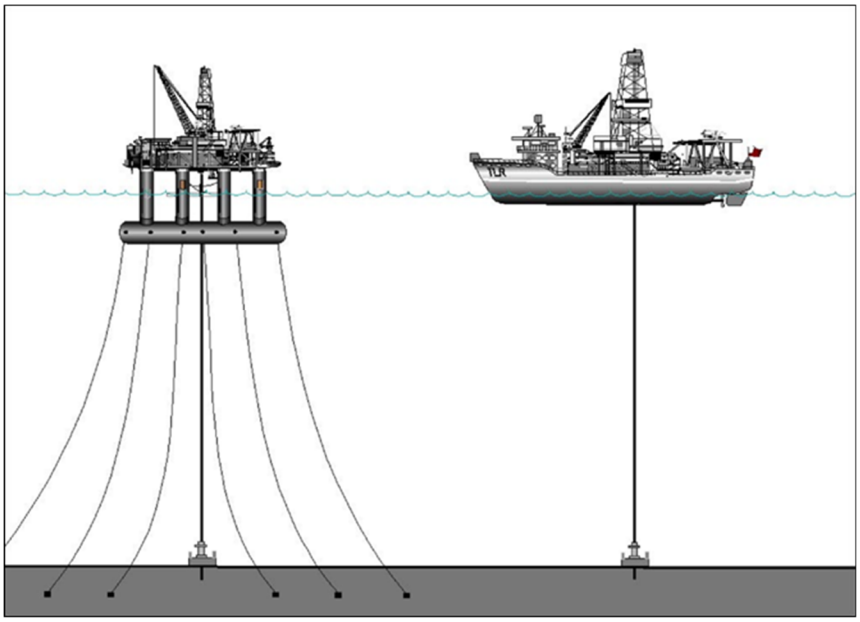


Figure 2-2 Typical Offshore Drilling Installations: Semisubmersible and Drill Ship

Once an appropriate wellsite has been identified and the permits and regulatory approvals have been granted for a drilling campaign, the drilling installation will be mobilized to the wellsite location, after which the drilling of a well will be implemented in a number of stages. A safety zone is established around the drilling installation for the protection of the drilling installation and other equipment and for the safety of other ocean users.

Once the drill site clearance has been completed and the drilling installation has been positioned or moored with anchors the drilling process commences, with a well being drilled in sections by gradually reducing the size of the wellbore (or hole). 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 pressure in the well. Drilling of the first section of the well, the top hole, usually involves a large diameter hole to install the surface casing and conductor. These initial sections of the well are drilled using seawater or a water-based mud (WBM) without a riser in place. The riser enables the return of the drilling fluids and cuttings back to the drilling installation. As the initial (conductor) portion of a well is drilled without a riser in place, the drilling muds and cuttings are discharged directly to the seabed as allowed by the Offshore Waste Treatment Guidelines (OWTG).

When top section drilling has been completed to the desired depth a steel casing is run and cemented in place to prevent the wall of the wellbore from caving in and to prevent muds and other fluids seeping out of the hole. At this stage, the wellhead is also installed on top of the casing and the riser and blowout preventer (BOP) are then installed onto the wellhead. The riser is a large diameter pipe that acts as a channel connecting the drilling installation 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. At intervals along the well, casing is cemented in place at set depths to reinforce the wellbore.

Once the riser has been installed, the remaining sections of the well are drilled to predefined depths using either WBM or synthetic-based mud (SBM) if the use of the former is technically impractical. Once the conductor hole is completed and when the riser and BOP are installed and in place, drilling muds and cuttings can be returned to the drilling installation for treatment and discharge, in the case of cuttings, and recovery and reuse of drilling muds.

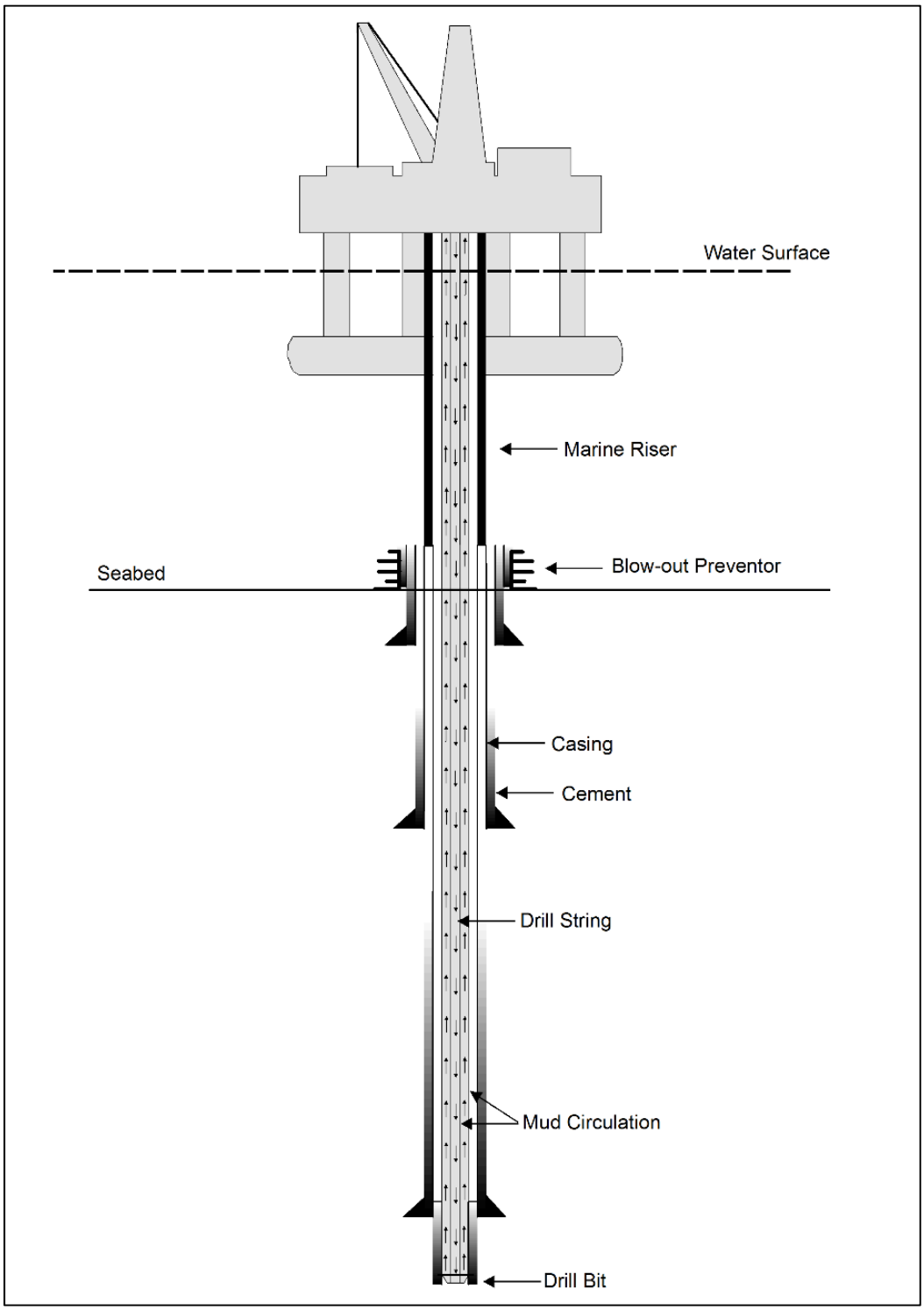
With the casing and associated equipment in place, the drill bit and riser are lowered into the conductor hole. Drilling begins at the bottom of the initial (conductor) hole and then continues on to the desired depth under the seabed. Drill pipe sections are added as drilling continues and progresses. As sections of well are completed, the drill string is pulled out of the well and the sections of the casing are joined together, lowered into the well, and cemented into place. The circulation equipment includes high pressure pumps, equipment to separate rock cuttings from the fluids, and storage facilities for the used fluids once retrieved.

Figure 2-3 provides a generalized schematic of a typical well and summarizes the typical drilling sequence for the upper section of a well and associated well head, BOP, casing and riser installation for wells such as those being proposed as part of this Project.

In addition to conventional drilling approaches, where a well is drilled from surface hole to final depth without moving the drilling installation, the Project may also include batch drilling, in which only the top hole sections for multiple wells are completed. Once all the top hole sections are finished, the drilling installation returns to a well to drill it to final depth before moving to the next wellsite.

Equinor Canada will complete coral and sponge surveys at each well location, as well as 50 m around each anchor pattern, where applicable, at least three months prior to drilling activities. Site-specific survey details will be outlined in the *Coral and Sponge Survey Plans*, which will be provided to the C-NLOPB and Fisheries and Oceans Canada (DFO) for their review and acceptance prior to commencing the survey. If corals and sponges are identified, then a risk assessment will be completed. After the survey is complete, Equinor Canada will prepare *Coral and Sponge Survey Results and Risk Assessment Reports*, which will be provided to the C-NLOPB and DFO for their review and acceptance at least 60 days prior to commencing drilling.

Once an appropriate wellsite has been identified and the permits and regulatory approvals have been granted for a drilling campaign, the drilling installation will be mobilized to the wellsite location, after which the drilling of a well will be implemented in a number of stages. A safety zone is established around the drilling installation for the protection of the drilling installation and other equipment and for the safety of other ocean users.



NOTE: For general illustration only, drilling installation and well components not to scale

Figure 2-3 Schematic of a Typical Offshore Well and Associated Drilling Sequence

2.2.2 Geophysical, Environmental and Geotechnical Surveys

Geophysical / Geohazard / Wellsite and Seabed Surveys: These surveys may be conducted prior to drilling to assess the potential for hazards (such as possible obstructions or seabed instability), which may include seismic sound sources, multibeam echo sounders, side scan sonar, sub-bottom profilers, and video equipment. A pre-drill coral survey will also be undertaken, using similar equipment listed above, to confirm the presence or absence of sensitive marine habitat (e.g., corals, sponges). Multiple streamer geophysical surveys including, but not limited to, conventional two-dimensional (2D) and three-dimensional (3D) seismic surveys, would not be included in the designated Project.

Vertical Seismic Profiling (VSP) survey is often undertaken following completion of drilling a well to correlate seismic data to well depth. A VSP survey is undertaken by placing a receiver (geophones) down the well at pre-determined depths, with a sound source (usually mid-sized air source arrays) suspended from the drilling installation. Walk-away VSP surveys may also be undertaken, which involve placing a sound source on a vessel, which then moves away while operating the sound source at pre-determined distances from the borehole receiver. Data is recorded at multiple intervals down the well, and the information assists in determining and confirming the depth of the drilled well and for reconciling drilling information with that obtained through geophysical survey work. VSP surveys are typically short-term activities (usually several days duration), with the sound source firing often limited to just a few hours. They also use sound sources that are considerably smaller than those used in regional geophysical surveys for oil and gas in the offshore.

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 temporal scope and at any time of the year, using dedicated vessels provided by marine geotechnical specialist suppliers.

Remotely Operated Vehicles (ROV) / Autonomous Underwater Vehicle (AUV) Surveys: They may be used to conduct visual inspections (camera equipped) of activities and components. ROV surveys may also be used during pre-drill surveys and before marine installations to determine presence / absence of physical objects on the seafloor, as described earlier. They may also be used during the surveys described above to support drilling operations. They will be conducted throughout the temporal scope and at any time of the year using vessels of opportunity.

Environmental Surveys: May also be conducted to collect samples to analyze the physical, chemical, and biological aspects of the selected drilling 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 the temporal scope and at any time of the year using vessels of opportunity, typically taking 5 to 20 days to complete.

2.2.3 Formation Flow Testing with Flaring

A formation flow test may be carried out on wells where hydrocarbons are discovered, and additional reservoir data is needed. During such testing, fluids from the reservoir are flowed back to the drilling installation, measured and if, required stored for future analysis. Produced hydrocarbons and some produced water from the reservoir are flared using high-efficiency burners. Flaring would be continuous and last between two to five days. If there is a larger amount of produced water than can be flared, it will be treated in accordance with the relevant regulatory requirements prior to ocean discharge or shipped onshore for disposal.

Equinor Canada will use third-party well testing contractors. Most suppliers for well testing equipment / services have their own burner technology that has been tested and quantified for liquid fallout (i.e., oil phase) and emissions (e.g., carbon monoxide [CO], CO_2, NO_X, hydrocarbons). Documented fallout and combustion efficiencies for burners on the market from major suppliers are typically 99.9%.

An alternative to formation flow testing with flaring exists and may be used on exploration wells to gather similar data. These types of tests, called Formation Testing While Tripping (FTWT), may be conducted without the need to flare. Formation flow testing would only be carried out on exploration wells where hydrocarbons are discovered and additional information on the specific characteristics of the find is therefore required. The specific nature and duration of formation flow testing is dependent upon various factors but is typically in the order of two to three days, although could be up to five days, depending on the characteristics of the hydrocarbons found and the analysis being undertaken.

2.2.4 Well Decommissioning or Suspension

Once drilling and formation flow testing (if required) is completed, the offshore wells drilled will be decommissioned or suspended. These activities typically involve the isolation of the wellbore by placing cement plugs and/or mechanical devices, at various depths, and in some cases, the casing is cut and removed just below the surface of the seafloor and equipment removed. In certain circumstances, the well may be suspended, in accordance with C-NLOPB requirements, for future re-entry. This is similar to the decommissioning process, but the wellhead is not removed, and a suspension cap is installed to protect the wellhead connector.

The approach undertaken will be based largely upon the water depths at the well site and associated technical considerations, as follows:

- In water depths less than 500 m, the wellhead will be removed by using the drilling installation to cut the wellhead below the seafloor and return it to the installation.
- In water depths between 500 m and 1,500 m, wellheads will be removed by cutting the wellhead externally, leaving a portion of the casing above the seafloor. A supply vessel or well intervention vessel using a ROV and an exterior diamond wire cutting saw will be used to cut and remove the wellheads above the sea floor. Cutting of the wellheads above the seafloor will be completed as close to the natural seabed as practicably and technically feasible. A pipe stub with a maximum height of approximately 0.85 m will remain above the seabed. While current technology has a limit of 0.85 m of casing remaining above the seafloor, cutting as close to the seafloor will be attempted.

- In water depths greater than 1,500 m, the wellhead will remain in place and will not be removed (maximum water depths in EL 1159 and EL 1160 are approximately 930 m and 1,020 m, respectively, therefore this wellhead abandonment option is not likely to be applicable).

Well decommissioning will be carried out as per Equinor Canada's standard internal procedures, as well as applicable industry practice and in compliance with relevant regulatory requirements. These activities will adhere to the requirements set out under the *Newfoundland Offshore Petroleum Drilling and Production Regulations*. Wells will be monitored (typically using an ROV to ensure the areas are free of equipment and obstructions) and inspected in accordance with applicable regulatory requirements at the time of their decommissioning.

2.2.5 Supply and Servicing

Supply vessels and helicopters will be used to transport personnel, equipment and materials to and from a drilling installation. Supply vessels will make regular trips to the drilling installation throughout the drilling program, and a dedicated stand-by vessel may also attend to the installation throughout the campaign. Personnel will be transported to and from the drilling installation by supply vessel or helicopter, according to work schedules and rotations, workforce numbers, distances and other factors.

It is expected that offshore supply vessel and aircraft (helicopter) services will be based in St. John's, NL. Existing facilities in eastern Newfoundland will be used, as well as for the supply and disposal of materials, such as drilling fluids, for fueling and other supply, support and logistical functions. Aircraft support will be based at the St. John's International Airport. The shore-based facilities are owned and operated by independent third-party service providers, service multiple operators and their activities, and were developed and operate in accordance with relevant regulatory requirements and approvals. They are also certified as compliant port facilities under the *Marine Transportation Security Act*. Third-party services and support will be procured through a competitive bid process in accordance with the requirements of the Accord Acts. Exploration drilling associated with ELs 1159 and 1160 will not require or result in upgrades or the development and use of new infrastructure at these established shore base facilities.

It is anticipated that an average of eight to ten vessel transits per month will occur in support of a drilling campaign using one drilling installation. Based on data from the St. John's Port authority (R. McCarthy pers. comm. 2016), eight to ten transits per month from a previous exploration drilling program in the Flemish Pass area accounted for approximately 8 percent of total vessel traffic in St. John's Harbour. Therefore, it is anticipated that the Project will not result in an increase in the number of vessel transits over previous levels. Vessels used in the Canada-NL Offshore Area are typically part of a pool of supply vessels supporting ongoing oil and gas activity. These are specialized vessels which operate under specific regulatory and training requirements.

2.3 Project Schedule

Exploration drilling activities associated with ELs 1159 and 1160, including well decommissioning, will be aligned with the EL period terms and will end once regulatory obligations and commitments have been met and the licence has either reverted to the Crown or is converted to a significant discovery

licence (SDL). The Project is scoped for a period of 10 years (i.e., 2020 to 2029), providing an adequate and conservative timeframe within which activities may occur. Exploration drilling campaigns may progress year-to-year and from well-to-well based on the results and evaluation of previously drilled wells, interpretation of geophysical data, and Equinor Canada's exploration requirements, with activities being carried out throughout the year.

2.4 Accidental Events

2.4.1 Spill Prevention and Response

Equinor Canada maintains a strong commitment to health, safety and environmental stewardship. Central to this commitment is a corporate Safety, Security, Health and Environment management system.

Prevention is the most effective way to avoid environmental effects from accidental spills. Standard operating procedures to reduce or eliminate the chance of a spill, even in the case of equipment failure, will be instituted for hydrocarbon handling operations. Routine maintenance and testing schedules will be established for the drilling program, with attention paid to well control, product storage and handling, and fuel transfer systems. Prior to exploration, practices for operating in poor weather, high sea state, or sea ice or iceberg conditions will be established. Good communications and sound marine practices for offshore supply vessels will also improve the ability to prevent spills.

Prior to initiation of the exploration drilling program, an operator must submit an application to the C-NLOPB for authorizations, such as an approval to drill a well (ADW) and an operations authorization (OA). Among other things, the applications include details on hazard identification and commitments for environmental protection, including spill prevention and response.

There are several control measures that are designed and implemented during drilling to maintain well control and reduce risk of a well blowout, including mechanical controls and barriers that are implemented as part of well design, and drilling and monitoring procedures. In the event that this primary barrier fails, secondary barriers such as the blowout preventer (BOP) system (safety equipment that houses 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) can be used to regain well control.

Prior to commencement of drilling operations, contingency plans will be developed that will serve as the guidelines for the company's response to an emergency. Contingency plans will be developed to address emergencies that will be identified in operations-specific hazard and risk analyses. The plans will outline the necessary procedures, personnel, equipment and logistics support required to respond to an emergency incident in a safe, prompt, coordinated manner. The plans will be distributed to designated personnel who will be responsible for emergency response actions. The content of the plans will contain sufficient detail to enable personnel to respond in a coordinated and effective manner. The following contingency plans will therefore be developed and implemented for the Project:

- Offshore Emergency Response Plan
- Collision Avoidance Plan
- Ice Management Plan

- Oil Spill Response Plan (OSRP)
- Well Containment Plan

Proper environmental operating practices will be assured through regular inspections and audits of the drilling installation and training, seminars, and safety meetings with offshore workers. A regular program of response exercises will also be conducted to encourage readiness of personnel. These exercises will contribute to continuing familiarization of personnel with emergency procedures, test preparedness of personnel, and provide a means of developing continued improvement to emergency procedures.

2.4.2 Potential Accidental Event Scenarios

While unlikely, accidental events due to natural hazards (e.g., icebergs, hurricanes, submarine landslides), vessel collision, dropped objects, loss of drilling installation stability or structural integrity and loss of well control leading to a blowout have the potential to occur. There are a number of preventative measures, barriers. and controls in place to prevent accidental events including the robust design of drilling installation / vessels, training of personnel, operational procedures and processes as detailed in the management system and oversight.

Spill trajectory modelling has been completed for 18 unmitigated scenarios within the Flemish Pass Project Area (which includes ELs 1159 and 1160). These scenarios occurred throughout the Project Area and a range of water depths and spill rates and include subsurface blowouts and instantaneous batch spills. Models are typically run to correspond to the time it takes to install a capping stack (average 30 days) or drill a relief well (average 120 days).

2.5 Spill Risk and Probabilities

Spill risk and probabilities were calculated based on number of wells (i.e., 30) and drilling duration (i.e., 35 to 65 days), the same well count and drilling duration as ELs 1159 and 1160. The results of the oil spill probability analyses show that the probability of a well blowout is extremely low (3×10^{-6}, or 1 in 333,333 chance of occurring) or other large release (more than 100 litres [L]) is very low (8.5×10^{-3}, or 1 in 118 chance of occurring); that is, blowouts and other large spills from offshore exploration wells are rare. The probability of an oil spill is inevitably greater for small spills (up to 100 L) as compared to larger spills, including batch and sub-surface releases. Based on world-wide statistics and C-NLOPB data for spill frequency type and volume, the annual frequency of a batch spill of any volume - from very small to the largest probable batch diesel spill volume of 126 barrels (bbl) is 0.045 per well for a 35-day drilling period, and 0.084 per well for a 65-day drilling period. The probability of a subsurface release for a single well is less than 0.000003. The probabilities increase with the number of wells. Overall, analysis indicated the probabilities of spillage are statistically low and if accidental release does occur, the spill volumes are likely to be small.

2.5.1 Spill Fate and Behaviour

A thorough overview of fate and behaviour of potential spills modelled is included in Chapter 15 of the Abridged EIS. In addition, a thorough overview of fate and behaviour of potential spills is included in Section 15.4 of the Flemish Pass and Eastern Newfoundland EISs, and Section 7.1 of the EL 1134

Addendum and is applicable and valid for ELs 1159 and 1160. Modelling was completed on 18 unmitigated scenarios involving various water depths, spill rates, locations, and durations (Table 2.1; Figure 1-1). Out of the 18 scenarios modelled, 15 of them are applicable to ELs 1159 and 1160 based on water depths and spill rates. In addition, all modelled unmitigated subsurface blowouts and batch spills resulted in the same predictions (i.e., surface oil would move eastward due to prevailing westerly winds), and therefore modelling for ELs 1159 and 1160 is not contemplated.

Table 2.1 Summary of Spill Trajectory Modelling

Exploration Licence	Water Depth	Product Type	Spill Rate	Duration	Total Volume
Subsurface Blowouts					
EL 1134*	1,175 m	Crude	6,010 m³/d	30 days	180,300 m³
EL 1134*	1,175 m	Crude	6,010 m³/d	113 days	679,130 m³
EL 1135*	362 m	Crude	24,802 m³/d	30 days	744,062 m³
EL 1135*	362 m	Crude	24,802 m³/d	113 days	2,802,633 m³
EL 1137*	89 m	Crude	4,165 m³/d	30 days	124,964 m³
EL 1137*	89 m	Crude	4,165 m³/d	113 days	470,603 m³
EL 1140	2,700 m	Crude	4,980 m³/d	36 days	179,280 m³
EL 1142*	1,100 m	Crude	15,000 m³/d	113 days	1,695,000 m³
Batch Spills					
EL 1134*	1,175 m	Diesel	N/A	Instantaneous	100 L
EL 1134*	1,175 m	Diesel	N/A	Instantaneous	1,000 L
EL 1135*	362 m	Diesel	N/A	Instantaneous	100 L
EL 1135*	362 m	Diesel	N/A	Instantaneous	1,000 L
EL 1137*	89 m	Diesel	N/A	Instantaneous	100 L
EL 1137*	89 m	Diesel	N/A	Instantaneous	1,000 L
EL 1140	2,700 m	Diesel	N/A	Instantaneous	100 L
EL 1140	2,700 m	Diesel	N/A	Instantaneous	1,000 L
EL 1142*	1,100 m	Diesel	N/A	Instantaneous	100 L
EL 1142*	1,100 m	Diesel	N/A	Instantaneous	1,000 L
Note: Scenarios marked with * can be applied to ELs 1159 and 1160 due to water depths and estimated spill rates.					

Spill trajectory models provide a predictive tool, are not carried out in real-time, and are not for a specific event. As drilling could occur anywhere on an EL, the selected location is representative of an entire EL, allowing proponents to conduct effects assessments for a broader Project Area. Spill trajectory modelling has been completed for 18 unmitigated scenarios within the Flemish Pass Project Area (which includes ELs 1159 and 1160) as part of the Flemish Pass and Eastern Newfoundland EISs. The Flemish Pass EIS and IR rounds stated and confirmed that the conclusions of effects for all these hypothetical scenarios may be considered representative of other potential releases in the Project Area.

2.5.1.1 Applicability of EL 1135 (shallow-water) and EL 1134 (deep-water) Modelling for Illustrative Purposes

Water depths in EL 1159 range from approximately 90 m to 930 m, and in EL 1160 range from approximately 40 m to 1,020 m. Average water depths in ELs 1159 and 1160 are approximately 350 m and 260 m, respectively. Given the range of depths that have been modelled within the Project Area (i.e., 89 m to 2,700 m), all depths within ELs 1159 and 1160 have been covered. While the full range of modelling that has occurred within the Project Area will inform the assessment of potential environmental effects of the Project and are available in the Flemish Pass EIS, for illustration purposes, modelling conducted for EL 1135 and El 1134 are included in the Abridged EIS are a representative shallow-water and deep-water release location, respectively. The water depths in ELs 1159 and 1160 correspond to modelled water depths at EL 1135 and EL 1134.

Regarding the applicability of previous modelling inputs for the Flemish Pass to ELs 1159 and 1160, the releases modelled in the Flemish Pass study are considered representative of other potential releases in the Project Area. The currents and winds that occur at the northern Flemish Pass location are similar to those found within the Project area. In general, the boundary set up by the Labrador Current and the Gulf Stream has the potential to result in dynamic currents, however general flow would be towards the east.

Estimated spill rates from EL 1135 are high, essentially representing a “worst-case” scenario. Spill rates from EL 1134 are also high. EL 1159 is immediately south of, and shares a boundary with, EL 1135, with the spill location on EL 1135 approximately 20 km north of the EL 1159 northern boundary. EL 1134 is adjacent to ELs 1159 and 1160 (east side).Given the general trend indicated by previous models for oil to move in a southward direction (i.e., thresholds are most likely to be exceeded to the east and south of the release sites) with the Labrador Current (until it meets Gulf Stream, which is south of the Project Area [and ELs 1159 and 1160]), a spill from EL 1159 or EL 1160 is expected to follow the same general trajectory (predominantly north to the Gulf Stream). Therefore, EL 1135 and EL 1134 provide model results to illustrate the trajectory of a potential oil spill from EL 1159 or EL 1160; however, there are numerous models that are applicable to ELs 1159 and 1160 and any drilling locations within them.

3.0 ALTERNATIVE MEANS OF CARRYING OUT THE PROJECT

Table 3.1 provides a summary of alternative options that are were carried forward in the Flemish Pass EIS and are applicable to exploration drilling on ELs 1159 and 1160.

Table 3.1 Summary of Alternative Means

Component	Alternatives Considered	Technically Feasible	Economically Feasible	Environmental Effects	Carried Forward in the Flemish Pass EIS
Choice of drilling fluid	WBM	NO Technically inferior at deeper sections of well	NO Potential economic increases if used at deeper sections of well	WBM acceptable for upper hole sections; SBM acceptable for lower well sections. For both options, it is assumed appropriate controls are implemented and OSCG is followed. Both options considered in assessment of potential environmental effects.	✓
	SBM	YES	YES		✓
Choice of drilling unit	Semi-submersible	YES	YES	Both options considered acceptable assuming appropriate controls are implemented.	✓
	Drill ship	YES	YES		✓
Management of drilling wastes – WBM	Disposal at sea	YES	YES	Localized effects on seafloor.	✓
	Disposal on shore	YES	NO	N/A	✗
	Offshore re-injection	YES	NO	N/A	✗
Management of drilling wastes – SBM	Disposal at sea	YES	YES	Localized effects on seafloor.	✓
	Disposal on shore	YES	YES Increased costs from increased transportation and operational delays	Increase in greenhouse gas emissions, larger environmental footprint.	✗
	Offshore re-injection	YES	NO	N/A	✗
Water management and location of final effluent discharge points	N/A – Discharge points on a drilling installation are fixed and cannot be changed or re-configured. A drilling installation has yet to be selected, and therefore alternative locations for effluent discharge points are not available.				

Table 3.1 Summary of Alternative Means

Component	Alternatives Considered	Technically Feasible	Economically Feasible	Environmental Effects	Carried Forward in the Flemish Pass EIS
Chemical Selection	Chemicals that have the potential to be discharged to the marine environment will be selected in accordance with the Offshore Chemical Selection Guidelines for Drilling & Production Activities on Frontier Land (NEB et al. 2009) to ensure they have a minimal effect on the receiving environment. This occurs prior to drilling; at that time alternatives may be assessed.				
Offshore drilling installation lighting	No or limited lighting	NO	NO	N/A	✗
	Standard lighting	YES	YES	Potential localized effects on migratory birds.	✓
	Spectral modified lighting	NO	NO	N/A	✗
Formation flow testing and nighttime flaring	No flaring	N/A – Not considered as an option due to regulatory and safety requirements			
	Reduced flaring (no flaring at night or during low-visibility weather)	YES However, potential to result in compromised data from formation flow tests; increased safety risk	YES However, increased cost and potential schedule extension	Reduced potential effects compared with standard flaring.	✗
	Flaring as required	YES	YES	Potential localized effects on migratory birds.	✓
	FTWT	YES	YES	No flaring required.	✓

4.0 PUBLIC PARTICIPATION AND ENGAGEMENT WITH INDIGENOUS GROUPS

Engagement is a key component of Equinor Canada's approach to the planning and implementation of its offshore programs. Engagement with government departments and agencies, Indigenous groups and stakeholders associated with exploration drilling activities commenced in 2016 are applicable to ELs 1159 and 1160.

4.1 Governmental, Agencies and Stakeholder Consultation Activities

Equinor Canada recognizes that a number of federal and provincial government departments and agencies have specific responsibilities or interests related to the Projects and their potential environmental effects, as a result of associated government policies, legislation, and regulations (including required regulatory decisions and/or compliance requirements), and other relevant issues,

mandates, programs, and services. As part of planning and development of the Flemish Pass EIS, Equinor Canada designed and implemented a governmental and stakeholder consultation program to provide various mechanisms and opportunities for individuals and organizations to receive and review information and to provide input related to the Project and potential Project-related environmental effects. Table 4.1 summarizes the organizations engaged, to-date, for the Project. A complete list of the stakeholder engagement initiatives is provided in Tables 3.1 to 3.12 of the EIS.

Table 4.1 Summary of Governmental and Stakeholder Organizations Consulted

Type	Organization
Government Departments and Agencies	Canadian Environmental Assessment Agency (CEA Agency) DFO C-NLOPB Environment and Climate Change Canada (ECCC) Transport Canada Health Canada
Fish Harvesters and Processors	One Ocean Food, Fish and Allied Workers-Unifor (FFAW-Unifor) Ocean Choice International (OCI) Groundfish Enterprise Allocation Council Association of Seafood Producers
Stakeholder Organizations	Nature NL

4.2 Engagement with Indigenous Groups

When engaging with Indigenous groups potentially impacted by the Projects, Equinor Canada respects the Aboriginal and Treaty Rights of Indigenous peoples in Canada and recognize there may be a potential impact of the Project on these rights. Equinor Canada also recognizes that the potential environmental effects of the Project may interact with resources used by Indigenous People in the exercise of their rights. When engaging Indigenous communities on the Project, Equinor Canada acknowledges the obligation of the Crown to consult with Indigenous communities where a potential Crown decision may impact potential or established Aboriginal and Treaty rights. Those obligations are reflected in the guidance provided to Equinor Canada in the EIS Guidelines (CEA Agency 2019).

The EIS Guidelines (Section 5.1) specify that Equinor Canada is required to notify various Indigenous groups about “key steps in the EIS development process and of opportunities to provide comments on key EA documents and/or information to be provided regarding their community”. These include groups in NL, Nova Scotia (NS), New Brunswick (NB), Prince Edward Island (PE), and Quebec (QC). The Indigenous groups by province are presented in Table 4.2.

In their engagement efforts with Indigenous groups during the Flemish Pass EIS (identified in Table 4.2), Equinor Canada provided timely information in plain language, while consistently following up to address questions and determine the need for more information. Engagement has been guided by the needs and/or requests of communities and has included a variety of methods, including personal meetings, phone calls, emails and reports. Engagement efforts have continued with Indigenous groups in relation to proposed activities on ELs 1159 and 1160 as noted in the Abridged EIS.

Table 4.2 Indigenous Groups by Province

Province	Group(s)
Newfoundland and Labrador	NunatuKavut Community Council
	Innu Nation
	Nunatsiavut Government
	Miapuwkek Mi'kamawey Mawi'omi
	Qalipu Mi'kmaq First Nation
Prince Edward Island	Abegweit First Nation
	Lennox Island First Nation
New Brunswick	Elsipogtog First Nation
	Buctouche First Nation
	Eel Ground First Nation
	Eel River Bar First Nation
	Esgenoôpetitj First Nation
	Fort Folly First Nation
	Indian Island First Nation
	Metepenagiag Mi'kmaq Nation
	Pabineau First Nation
	Kingsclear First Nation
	Madawaska Maliseet First Nation
	Oromocto First Nation
	St. Mary's First Nation
	Tobique First Nation
	Woodstock First Nation
	Passamaquoddy of New Brunswick
Nova Scotia	Acadia First Nation
	Annapolis Valley First Nation
	Bear River First Nation
	Eskasoni First Nation
	Glooscap First Nation
	Membertou First Nation
	Paq'tnkek Mi'kmaw Nation*
	Pictou Landing First Nation*
	Potlotek First Nation
	Wagmatcook First Nation*

Table 4.2 Indigenous Groups by Province

Province	Group(s)
Nova Scotia	We'koqma'q First Nation
	Millbrook First Nation
	Sipekne'katik First Nation
Quebec	Conseil des Montagnais de Natashquan
	Conseil des Innus de Ekuanitshit
	La Nation Micmac de Gespeg
	Listuguj Mi'gmaq Government
	Micmacs of Gesgapegiag

Equinor believes they have a good understanding of the concerns and interests expressed by Indigenous groups to date on similar projects (see Section 3.3 of the Abridged EIS) and that understanding continues to accumulate through ongoing discussions with Indigenous groups. As Equinor moves forward in the EA process for Central Ridge, they remain open and available to meet with interested Indigenous groups to discuss any additional concerns and/or interests, and how those may be addressed.

5.0 ENVIRONMENTAL ASSESSMENT SCOPE, APPROACH AND METHODS

The potential environmental effects of the Project on each VC are assessed, in consideration of existing baseline conditions, Project components, and application of mitigation measures. Residual adverse effects (effects remaining after the application of mitigation measures) on each VC and their significance are determined using pre-defined significance thresholds.

5.1 Scope of the Project and its Assessment

This EIS has been planned, prepared, and submitted in accordance with requirements of CEAA 2012, as well as the Project-specific *Guidelines for the Preparation of an Environmental Impact Statement pursuant to the Canadian Environmental Assessment Act, 2012 for the Central Ridge Exploration Drilling Project, Equinor Canada Ltd.* issued by the Canadian Environmental Assessment Agency (CEA Agency) in July 2019 and other generic EA guidance documents issued by the CEA Agency as cited herein.

The scope of the Project for the purposes of the EA includes each of the components and activities defined and described in Chapter 2 of the Abridged EIS and as specified in Section 3.1 of the EIS Guidelines, namely:

- The mobilization, operation, and demobilization of Mobile Offshore Drilling Units (*hereinafter referred to as drilling installations*) designed for year-round operations for the drilling, testing, and abandonment of up to 24 exploration wells within ELs operated by Equinor Canada, including consideration of any proposed safety zones. Drilling may occur in various water depths under consideration, with various types of drilling installations, and with multiple drilling installations operating simultaneously
- VSPs and in-water works (e.g., wellsite surveys) to support the specific exploration wells under consideration, but excluding surveys potentially required to support conduct of the EA (e.g., environmental baseline surveys) and surveys related to the broader delineation of resources
- The loading, refuelling, and operation of marine support vessels (i.e., for re-supply and transfer of materials, fuel, and equipment and on-site safety during drilling activities and transport between the supply base and drilling installation(s)) and helicopter support (i.e., for crew transport and delivery of light supplies and equipment) including transportation to the drilling installation

5.2 Identification and Selection of Valued Components

The Valued Components (VCs) were identified and selected based on several key considerations and inputs including the EIS Guidelines (CEA Agency 2019), regulatory guidance and Indigenous and stakeholder engagement.

As mentioned in Section 4, engagement related to Equinor Canada's exploration drilling activities is ongoing and commenced in 2016. No additional information has been brought forward from engagement that would suggest a change in VCs. In addition, the CEA Agency recently issued EIS Guidelines for various other exploration drilling programs in the NL offshore area, and the VCs identified are the same as those identified for ELs 1159 and 1160.

The VCs selected for ELs 1159 and 1160 and the rationale for the selection of these VCs is further described in Table 5.1.

Table 5.1 Identified VCs and the Rationale for their Selection

Valued Component	Rationale
Marine Fish and Fish Habitat	• Fish resources are an important consideration in the EA of the proposed activities that occur within, and that may affect, the marine environment. • This VC includes relevant fish species, as well as plankton, algae, marine plants, benthos, and relevant components of their habitats (such as water and sediment), given the clear interrelationships between these environmental components • The consideration of Marine Fish and Fish Habitat within a single VC is in keeping with current and standard practice, and provides for a more comprehensive, holistic approach while at the same time reducing unnecessary repetition • The VC (description of the existing environment and effects assessment) also gives specific consideration to any particular species that have been identified by regulatory agencies, stakeholder groups or Indigenous communities. • Specifically, Indigenous Groups identified Atlantic salmon, swordfish, cod, turbot, snow crab and American eel as fish species that are important and valued for commercial and/or traditional purposes. • Although the EIS Guidelines specify (in Section 6.3.2) “marine plants” as potential VC for the EIS, these have been considered as part of the overall Marine Fish and Fish Habitat VC, for the reasons outlined above
Marine and Migratory Birds	• A variety of avifauna species inhabit the marine environments off eastern Newfoundland at various times of the year • Birds are important from an ecological, social, and economic perspective, as they often function near the top of the food chain, and may be vulnerable to certain types of environmental disturbance • They are also an important resource for various recreational and tourism related pursuits. • Indigenous groups indicated that marine and migratory bird species and their eggs are used for traditional land and resource use activities
Marine Mammals and Sea Turtles	• Marine mammals (including whales, dolphins, and seals) have been and remain an important element of the environmental and socio-cultural settings of the province and elsewhere in Atlantic Canada • These species are important from an ecological perspective, with a number of marine mammal species having been designated as species at risk (SAR) under Canadian legislation • Some species are also important and valued due to current traditional / commercial (seal harvests) and recreational (whale watching) uses • The VC (description of the existing environment and effects assessment) also gives specific consideration to any particular species that have been identified by regulatory agencies, stakeholder groups or Indigenous communities. • Indigenous Groups identified species, such as beluga, Atlantic blue and North Atlantic right whales as being important for cultural reasons, as well as noting that seals were used for traditional land and resource use activities • Although sea turtles are generally uncommon in the region, they are also included as part of this VC given their rare and often protected status

Table 5.1 Identified VCs and the Rationale for their Selection

Valued Component	Rationale
Special Areas	• Several locations within the Canada-NL Offshore Area and beyond have been designated as special or sensitive areas due to their ecological characteristics and importance • Some of these areas are protected under provincial and/or federal legislation and others are protected under international maritime agreements
Indigenous Communities and Activities	• A number of Indigenous groups reside in Newfoundland and Labrador, and in parts of the Maritimes Provinces (NS, NB, PE) and QC • As illustrated in Chapter 7, the components and activities that comprise this Project will be located at some considerable distance from the communities, activities and other known interests associated with each of these groups. It may, however, potentially affect marine-associated species and other resources that are used by these groups, and which move through, and thus may interact with, the Project's anticipated environmental zone of influence • This VC is included in the EIS as specified in and required by the EIS Guidelines, and to address the requirements of Section 5(1)(c) of CEAA 2012
Commercial Fisheries and Other Ocean Users	• Marine commercial fisheries are key elements that have shaped the history and socioeconomic character of Newfoundland and Labrador and are important aspects of the current economic and socio-cultural fabrics of the province and other parts of Canada • Commercial fisheries in this region are extensive and diverse and involve a range of species and gear types at various times of the year. Fishing activities are undertaken in and around the Project Area by fishing interests from Newfoundland and Labrador (including several Indigenous organizations), Canadian and international fishing enterprises • Other activities take place in parts of the Project Area and adjacent areas on either a year-round or seasonal basis, including other oil and gas related activities, general vessel traffic, research, and military exercises

5.3 Overview of EA Approach and Methods

The EA structure and methods used are in keeping with current EA approaches and practice in Canada, including under CEAA 2012. As specified in Part 1, Section 4.3 of the EIS Guidelines, the EA approach and methodology used for the Abridged EIS addresses the following general items:

- Identifying the activities and components of the project
- Predicting potential changes to the environment
- Predicting and evaluating the likely effects on identified VCs
- Identifying technically and economically feasible mitigation measures for significant adverse environmental effects
- Determining residual environmental effects
- Considering cumulative effects of the project in combination with other physical activities that have been or will be carried out

- Determining the potential significance of residual environmental effects following the implementation of mitigation measures

The description of the existing environment as presented in Chapters 5 to 7 of the Abridged EIS forms the environmental baseline from which Project-related environmental changes and resulting effects on the VCs are assessed and evaluated, including the corresponding identification and development of technically and economically feasible mitigation to avoid or reduce potential adverse effects. The assessment of potential environmental effects is, therefore, based on the approach of identifying and describing whether, how and to what degree the "without Project" conditions for the identified VC may change as a result of the Project.

5.4 Spatial and Temporal Boundaries

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

Three types of spatial assessment boundaries are used in the EIS to reflect the various means by which the Project may interact with and potentially change the environment (Figure 5-1):

Project Area: This is the overall geographic area within which planned Project-related components and activities will take place, as described in the Project Description (Chapter 2. The Project Area is an overall polygon previously assessed in the Flemish Pass EIS and covers ELs 1159 and 1160 where exploration drilling activities may be carried out as part of the Project.

Local Study Area (LSA): The LSA is the same as the Project Area plus the transit route. Routine activities will occur within ELs 1159 and 1160 and the existing (previously assessed) Project Area provides the buffer for activities that occur at the very edge of ELs 1159 and 1160.

Regional Study Area (RSA): In addition to planned Project environment interactions, from an ecological and socioeconomic perspective, the environmental effects assessments also recognize and consider the characteristics, distributions, and movements of the individual VCs under consideration, including the larger regional areas within which they occur and function. The EA assesses potential effects to marine biota (individuals and populations) and human activities which are known or likely to occur in the LSA for the VC in question, but also considers the overall extent of affected individuals and populations during the time period at which they may be affected by planned Project components and activities. The EIS also considers and assesses the potential effects of accidental events or malfunctions that may be associated with the Project, including the potential nature and geographic extent of an oil spill. The EIS also considers and assesses the potential cumulative effects and potential effects of accidental events or malfunctions that may be associated with the Project, including the potential nature and geographic extent of an oil spill. The RSA is the same for all VC except for Indigenous Communities and Activities, which is larger to encompass the identified groups / communities

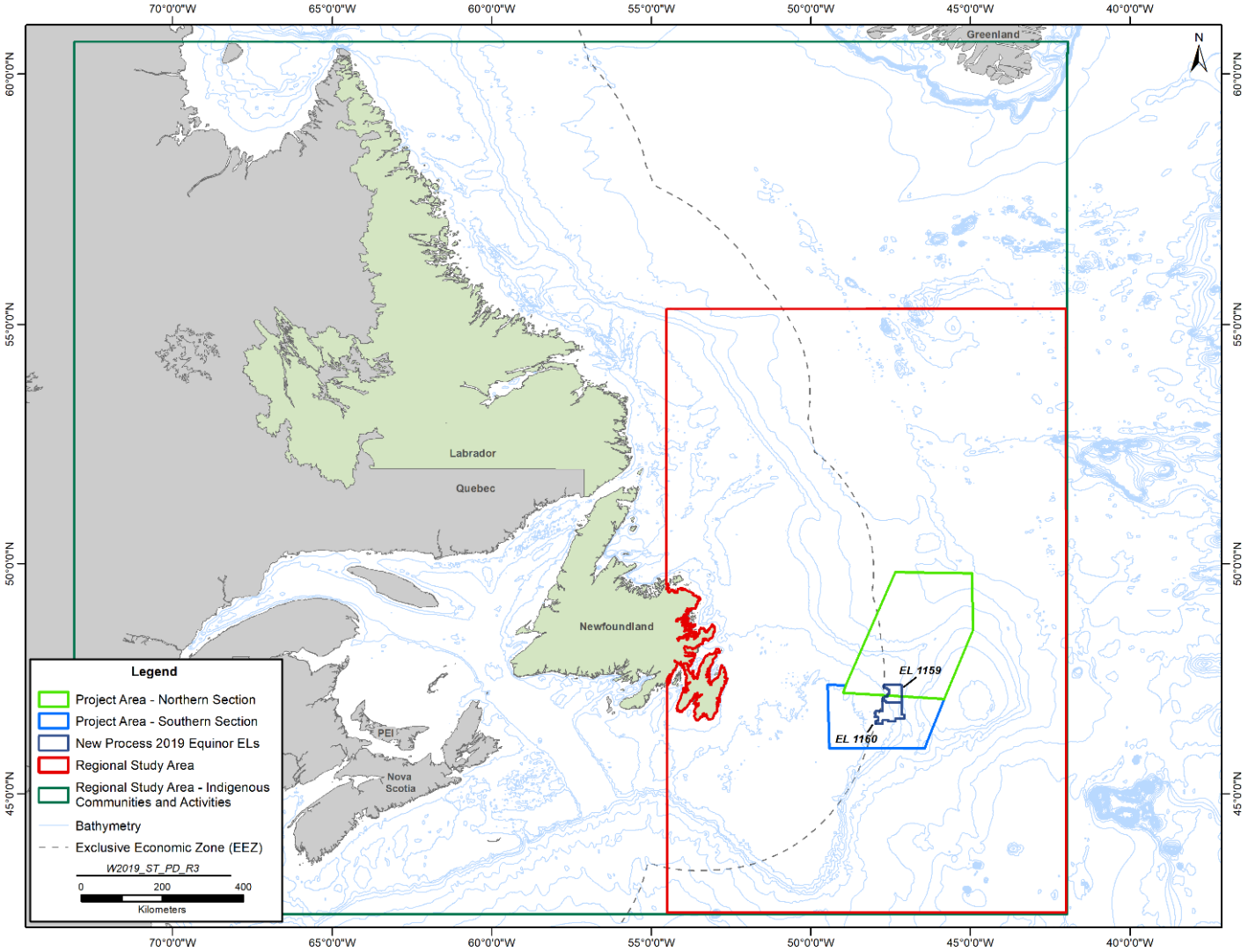


Figure 5-1 Environmental Assessment Study Areas

6.0 ENVIRONMENTAL EFFECTS ASSESSMENT

6.1 Marine Fish and Fish Habitat (including Species of Conservation Concern)

Marine fish and fish habitat, and the potential effects of the Project on this VC, are subject to the relevant provisions of the federal *Fisheries Act* and its associated Regulations, which provides protection to commercial, recreational, and Aboriginal fisheries by protecting the fish resources and habitats that support these activities. Certain fish species and their habitats may also be provided with legislative protection within Canadian (federal *Species at Risk Act*; SARA) and/or provincial (Newfoundland and Labrador *Endangered Species Act*; NL ESA) jurisdictions.

For the Abridged EIS, this VC included consideration of relevant fish species (both stable and at risk), as well as plankton, algae, marine plants, benthos, and relevant components of their habitats (such as water and sediment).

6.1.1 Description of the Baseline

The Project Area includes the shelf and slope regions of the Grand Banks, areas of the Flemish Cap, and parts of the Orphan Basin. Within the marine environment, habitats transition from the relatively shallow shelf zone, through the continental slope to very deep abyssal regions. These areas are used by fish and invertebrate species of commercial, cultural, and ecological value and support regionally important areas of biodiversity and marine productivity.

The Project Area is an area of relatively high fish species richness. The slope in this area contains relatively high densities of habitat forming sponges and corals, and the Northwest Atlantic Fisheries Organization (NAFO) has identified three Vulnerable Marine Ecosystems (VMEs) based on these features (see Section 6.4 Special Areas).

Seasonal phytoplankton blooms in the spring and fall coincide with presence in the pelagic areas of early life history stages of various fish and invertebrate species. Species abundance within the Project Area varies spatially and temporally, but common species include wolffish, grenadier, Atlantic cod, thorny skate, American plaice, capelin, and large migratory pelagics, such as sharks and tuna.

Patchy coral and sponge reef areas may occur within the Project Area; distributions within the Project Area vary spatially due to differences in environmental parameters, including temperature, salinity, currents and substrate type (Murillo et al. 2011; Murillo et al. 2016). Habitat forming sponges are associated with the relatively high abundance and species diversity of invertebrate taxa. Invertebrates, other than habitat-forming corals and sponges, that are commonly found in the Project Area include squid, polychaetes, bivalves, sand dollars, brittle stars, basket stars, pale sea urchins, soft corals, shrimp, Icelandic scallops, and snow crab.

Twenty-nine listed fish species are either known to occur, or likely to occur in the Project Area. Listed species include those listed under the NL ESA, Schedule 1 of SARA, have been identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Species of Conservation Concern (SOCC), or are listed by the International Union for Conservation of Nature (IUCN).

6.1.2 Anticipated Changes to the Environment

The key potential environmental interactions between planned offshore oil and gas activities and marine fish and their habitats include (adapted from AMEC 2014):

- Possible destruction, contamination or alteration of marine habitats and benthic organisms due to the discharge and deposition of drill cuttings and/or fluids, the deployment and use of other equipment, and possibly the introduction and spread of aquatic invasive species
- Potential contamination of fish / invertebrates and their habitats due to other environmental discharges during planned oil and gas exploration drilling and other associated survey and support activities
- Attraction of marine fish to the drilling installation and vessels, with increased potential for injury, mortality, contamination, or other interactions
- Possible temporary avoidance of areas by marine fish due to underwater noise or other disturbances, which may alter their presence and abundance as well as disturbing movements / migration, feeding, or other activities
- Possible changes in the availability, distribution, or quality of feed sources and/or habitats for fish and invertebrates as a result of planned activities and their associated environmental emissions
- Possible injury, mortality, or other disturbances to marine fish as a result of exposure to noise within the water column during wellsite surveys or VSP survey activity

As a result of these identified environmental interactions, issues identified in the EIS Guidelines, and concerns raised through consultation and engagement, the assessment of environmental effects on Marine Fish and Fish Habitat is focused on:

- Change in Habitat Availability and Quality
- Change in Fish Mortality, Injury, Health
- Change in Fish Presence and Abundance (Behavioural Effects)

6.1.3 Anticipated Effects (Planned Project Components and Activities)

6.1.3.1 Presence and Operation of Drilling Installation

The potential environmental effects of presence and operation of the drilling installation are primarily related to underwater noise and vibrations, light emissions and other environmental discharges, interactions with the benthic environment, and aquatic invasive species.

Continuous operation noises or DP may result in localized area avoidance; however, fish may remain in the area for relatively higher foraging opportunities. Safety zones around drilling operations may also afford localized, short-term protection to species that are otherwise exposed to overfishing. Direct contact with the seabed will occur if anchoring is used rather than DP; however, underwater surveys will be conducted prior to anchoring operations to confirm that anchors are not set in sensitive coral or sponge habitats. As the Project Area is within an area of low seabed complexity, the introduction of subsea infrastructure may provide opportunities for colonization and increased distribution of benthic species that have pelagic eggs or larvae and have a positive effect on fish abundance. This “reef effect”

would be temporary for the length of drill operations, but the combination of increased colonization opportunities and local enrichment may support faster recovery in an otherwise slow recovering environment. Lighting and other environmental discharges (including organic waste material) associated with the drilling installation may also result in the short-term and localized attraction of some individual fish. There is the potential for temporary positive effects from the creation of increased availability of shelter and food for juveniles around the drilling installation and decreased fishing pressure on adults within the safety zone. There is also a potential for short-term exposure and subsequent potential uptake of contaminants from waste discharge.

The interactions described above may result in changes to habitat availability and quality, fish mortality / injury risk and fish health, and fish presence and abundance. These changes are predicted to be adverse, low in magnitude, localized and certainly within the Project Area, short to medium term duration, occurs regularly and reversible with a high level of confidence.

6.1.3.2 Drilling and Associated Marine Discharges

The primary interactions from discharge of drill cuttings include cuttings deposition and potential seabed disturbance (smothering habitat), chemical toxicity, and bioaccumulation (uptake of contaminants by fish and the presence or perception of taint). Drilling waste discharges will adhere to the requirements for cuttings treatment and discharge guidelines in the OWTG (NEB et al. 2010). Discharge of drilling fluids and associated drilling cuttings may affect the benthic environment, with immobile or sessile bivalve and infaunal species being particularly sensitive to burial or drilling mud deposition. However, the high dispersal of the low toxicity and non-bioaccumulating drill cuttings has relatively low potential for adverse environmental effects.

Drill cuttings dispersion modelling was conducted for this Project at three locations in the Project Area – Northern Section and one location in the Project Area – Southern Section. In the Project Area – Northern Section, approximately 99 percent of WBM drill cuttings settle less than 2 km from the drill centre under all season scenarios. Treated SBM drill cuttings released under the water surface become well dispersed, with greater than 97 percent of SBM drill cuttings settling outside the 32 km model area. In the modelled Eastern Project Area, relatively lower currents result in settling of discharged cuttings within 5-31 km of the wellhead for three of four seasonal scenarios with the SBM drill cuttings drifting beyond the 32 km model in the June scenario. Due to the distance settled away from the well site, overall accumulation thicknesses are relatively low. In the Project Area – Southern Section, areas of accumulation for WBMs will occur within 2 km of the wellhead indicating that physical or chemical effects on fish habitat will be relatively localized. While SBMs are discharged at relatively shallower depths in comparison to other modelled areas, overall average thickness is minimal (0.4 mm or less). However, there are some areas of accumulation that may experience potential localized disturbances to fish habitat. The physical and chemical effects of this volume of WBM and SBM drill cuttings over this area are anticipated to have localized habitat disturbances, if any. Because overall sedimentation is low, there is low potential for smothering effects or creating of oxygen depletion conditions, which would reduce potential recovery and recolonization times.

The use and eventual release of seawater and WBMs are not predicted to result in adverse environmental effects related to toxicity or bioaccumulation. When SBM is used (i.e., drilling the lower portions of each well), fluids and cuttings will be returned to the drilling installation for treatment before

discharge below the water surface. It is not likely that the treated released SBM and SBM-associated drill cuttings will result in adverse effects associated with contamination of marine biota or habitats, as these materials have low toxicity, and localized biological effects (Deblois et al. 2014).

These interactions may result in potential changes to habitat availability and quality, fish mortality / injury risk and fish health, and fish presence, and abundance. These changes are predicted to be adverse, low in magnitude, localized and certainly within the Project Area, medium to long term in duration, occurring on a regular basis and reversible, with a high level of confidence.

6.1.3.3 Formation Flow Testing with Flaring

The predicted environmental effects of formation flow testing with flaring are primarily related to short-term light and atmospheric emissions and produced water discharge that may result in change in fish presence and abundance. Due to the low emission quantities, the temporary and short-term nature of air and light emissions, there will be limited potential interactions with fish or their habitat. These changes are predicted to be adverse, low in magnitude, localized, short term, occurring sporadically and reversible. These predictions have been made with a high level of confidence.

6.1.3.4 Wellhead Decommissioning

Wellhead decommissioning will be conducted by cutting off the wellhead, rather than blasting, for environmental and safety reasons. Wellhead cutting will be conducted by an ROV and result in short term, low-magnitude emissions of noise and light. Fish will likely temporarily avoid the area during activities. The remaining seabed infrastructure may add small quantities of habitat heterogeneity to the existing environment and potentially aid in recolonization of benthic species and overall recovery. These changes are predicted to be adverse, negligible to low in magnitude, localized, short-term, occurring sporadically, and reversible, with a high level of confidence.

6.1.3.5 Geophysical / Geohazard / Wellsite / Seabed Surveys and Vertical Seismic Profiling

The predicted environmental effects of geophysical, geohazard, wellsite, and VSP surveys are primarily related to seismic noise that may result in changes to fish mortality / injury risk, fish health, and fish presence and abundance. The possible effects from the use of seismic sound energy in the marine environment may be behavioural (avoidance, other changes in distribution or activities) or involve injury to or mortality of individual fish. However, operations will be short-term and localized, and have reversible, low-magnitude effects. Noise and seismic emissions from VSP activities are mainly directed downwards into the well, with limited horizontal range. Mobile fish and invertebrate species are predicted to temporarily avoid areas of survey operations, minimizing potential interactions.

There may be some short-term behavioural effects to individual fish in the immediate vicinity of the survey activity. However, it is unlikely that fish will be displaced from key habitats or disrupted during key activities over extended areas or periods, or be otherwise negatively affected. These changes are predicted to be adverse, low in magnitude, occurring within the Project Area, short-term, occurring sporadically and reversible, with a high level of confidence.

6.1.3.6 Geological, Geotechnical and Environmental Surveys

With the exception of sediment sampling, most survey activities will not result in physical contact with the seabed and will therefore not directly interact with benthic animals or their habitats. Sediment sampling equipment could potentially result in injury or mortality in fish, change habitat quantity or quality, and indirectly affect distribution and abundance. The resulting small footprint is not likely to cause effects on population scales. Underwater video surveys may have lighting and noise emissions, however the temporary nature of the activity limits potential effects on the environment. Fish may also migrate from the area while the short-term activity is ongoing. These changes are predicted to be adverse, negligible to low in magnitude, localized, short-term, occurring sporadically and reversible, with a high level of confidence.

6.1.3.7 Supply and Servicing

Helicopter use will have no direct interactions with fish and fish habitat. With respect to offshore supply vessels, exhaust emission levels will follow air quality regulations and guidelines. Similar to the drilling installation, offshore supply vessel wastewaters will be treated to reduce contaminant or hydrocarbon levels prior to discharge under The International Convention for the Prevention of Pollution from Ships (MARPOL). Due to the transitory nature of vessels, discharges are not likely to accumulate in one area and the low volumes would likely become dispersed in the marine environment. The continuous noise and lighting from vessels would also be relatively low and result in temporary avoidance by fish. As with other emissions, the temporary interaction with any one area limits potential noise and light interactions with fish. These changes are predicted to be adverse, low in magnitude, localized, short-term, occurring on a regular basis and reversible, with a high level of confidence.

With the implementation of mitigation measures, exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse environmental effects on Marine Fish and Fish Habitat.

6.1.4 Anticipated Effects (Accidental Events)

Potential accidental events may interact with and potentially affect fish and fish habitat in terms of habitat availability and quality, fish mortality, injury and health, and fish presence and abundance. Potential accidental effects that are considered involve varying degrees of hydrocarbon interaction and exposure with fish and fish habitat and include SBM spills, batch spills, and surface blowouts.

Taking into consideration the results of the spill modelling exercises completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, the predicted residual environmental effects from an accidental event scenario on Marine Fish and Fish Habitat is considered not significant. This determination of significance remains applicable and valid for ELs 1159 and 1160.

6.2 Marine and Migratory Birds (including Species of Conservation Concern)

Marine and migratory birds are found within the RSA year-round, using the area for breeding and foraging. Most are protected under the federal *Migratory Birds Convention Act* (MBCA) and its associated Regulations. Further, wildlife in Newfoundland and Labrador (including certain species not protected under the MBCA) are managed under the provincial *Wildlife Act* and *Regulations*. Avian

species at risk (SAR) and their habitats, including some species that are known or have potential to occur in the Project Area and surrounding marine environments, are protected by both federal (SARA) and provincial (NL ESA) legislation.

6.2.1 Description of the Baseline

The coastline of eastern and southern Newfoundland and Labrador, and the offshore waters, provide important breeding habitat and feeding areas for dozens of marine bird species. There are over 90 species of marine and migratory birds that may occur within the RSA including seabirds, waterfowl, and shorebirds.

The nutrient-rich waters of the Grand Banks and Flemish Pass are important to seabird species that feed on plankton, including storm-petrels, shearwaters, and dovekies. Offshore islands and mainland cliffs provide nesting grounds for tens of millions of seabirds, including some of the largest seabird colonies in eastern North America south of the Hudson Strait. While seabirds use the Project Area and RSA throughout the year, the overall abundance and distribution of species varies considerably. Some taxa (notably large gulls, kittiwakes, murres, guillemots, puffins, fulmars, and shearwaters) are abundant year-round, while others are absent or scarce in the winter months, such as the northern gannet, terns, cormorants, and phalaropes. Ivory gulls are most likely to be present during winter months, outside the breeding season. Waterfowl and landbird species may also occur within the RSA at certain times of the year (i.e., outside breeding season or during migration).

Several Special Areas relevant to marine and migratory birds have also been identified in eastern Newfoundland, which have been designated because they provide important habitat for nationally and/or globally significant numbers of birds, and/or because they support listed bird species. Listed species are those that are listed under the NL ESA, are listed under Schedule 1 of SARA, or have been identified by COSEWIC as SOCC. Important Bird Areas (IBAs) and breeding colonies are found in coastal and inland areas. The Flemish Pass is outside the reported foraging range of most species breeding at the major seabird colonies in coastal Newfoundland, although northern gannets and Leach's storm-petrels travel hundreds of kilometres from their breeding colonies over multi-day foraging trips.

6.2.2 Anticipated Changes to the Environment

The key potential environmental interactions between planned offshore oil and gas activities and Marine and Migratory Birds, include (adapted from AMEC 2014):

- Potential attraction of birds to offshore drilling installations and vessels, including their lights, flares or other light emissions, and waste discharges, resulting in possible injury or mortality (strikes, strandings, incineration, disorientation, increased energy expenditure)
- Possible injury of avifauna (particularly diving birds) due to exposure to noise within the water column during VSP or wellsite surveys using seismic sound sources or disruptions to and changes in their distributions and behaviours
- Changes in the presence, abundance, distribution, and/or health of birds (individuals and populations) resulting from direct exposure to waste discharges from installations or vessels (physical exposure, ingestion)

- Possible indirect effects due to changes in the availability, distribution, and/or quality of food sources or habitats for marine and migratory birds due to disturbances (noise, light) and/or waste discharges (such as drilling fluids, other liquid and solid waste materials).

As a result of these identified environmental interactions, issues identified in the EIS Guidelines, and concerns raised through consultations and engagement, the assessment of environmental effects on Marine and Migratory Birds (including SAR and SOCC) is focused on:

- Change in Mortality / Injury Levels and Bird Health (Individuals or Populations)
- Change in Avifauna Presence and Abundance (Behavioural Effects)
- Change in Habitat Availability and Quality
- Change in Food Availability or Quality

6.2.3 Anticipated Effects (Planned Project Components and Activities)

6.2.3.1 Presence and Operation of Drilling Installation

The predicted environmental effects associated with the presence and operation of the drilling installation are primarily related to lighting and emissions that may result in changes in mortality / injury levels, presence and abundance of avifauna, and food and habitat availability and quality. This includes the possible attraction of birds due to lighting, avoidance of the drilling installation due to sensory disturbance, and the creation of new foraging opportunities for predator species (e.g., through prey attraction due to organic waste disposal, creation of new “artificial reef” habitat). There may also be an increase in mortality / injury levels due to collisions, disorientation, and potential predation; however, the mortality rate is anticipated to be low as most stranded birds encountered on platforms and vessels are released successfully. It is recognized that the Leach’s storm-petrel is particularly attracted to anthropogenic light sources, and it is further recognized that the species is particularly vulnerable to effects of light attraction due to the Project, during the breeding season due to their long foraging trips. However, the short-term nature (in any one location) of the Project, relative to a production facility, means that the effects will consequently be short-term and transient in nature.

Some localized and short-term behavioural effects (change in presence and abundance) are also likely to occur from the operation of the drilling installation; however, these effects will be localized, transient, and short-term in nature. Changes in habitat and food availability and quantity, if any, will also be on a localized scale and for a short-term duration. These changes are predicted to be adverse, low in magnitude, localized and within the Project Area, short to medium term, regular in frequency, and reversible, with a moderate level of confidence.

6.2.3.2 Drilling and Associated Marine Discharges

The predicted environmental effects of drilling and associated marine discharges are primarily related to release of organic wastes, which may result in changes in mortality / injury levels, presence and abundance of avifauna, and food availability and quality. Organic waste will be reduced prior to discharge in accordance with the OWTG. Discharge of organic wastes (sewage and food scraps) may result in enhancement of the local food supply and attraction of birds to vessels and platforms. However, this potentially positive effect may be offset by increased exposure to risk of collision / strandings or

predation, as well as energetic costs due to deviation from normal movement / migration patterns. Proper waste management will reduce such effects of discharges of organic waste on birds. These potential effects are predicted to be adverse, low in magnitude, localized, short-term, sporadic in frequency, and reversible, with a moderate level of confidence.

6.2.3.3 Formation Flow Testing with Flaring

The predicted environmental effects of formation flow testing with flaring are primarily related to attraction of birds to flares, which may result in changes in mortality / injury levels, and in presence and abundance of avifauna. Although there is some potential for the attraction of migratory landbirds, it is unlikely that large numbers of landbirds will be affected. Any flaring events conducted will occur several hundred kilometres offshore, far away from coastal breeding sites and IBAs and well beyond the foraging range of almost all species that nest in Newfoundland. Therefore, breeding birds are unlikely to be affected by this activity, with the potential exception of the Leach's storm-petrel, which may forage thousands of kilometres from the nest site during the breeding season (Pollet et al. 2014).

While accurate assessment of mortality at offshore facilities may be difficult, no mass mortality events have ever been reported at offshore oil and gas operations in offshore Newfoundland. While the rarity of such events makes determination of trends difficult, these incidents tend to occur at night during migration season (April-May and September-October). Flares may provide misleading navigational cues to migrating birds, causing them to become disoriented and circle or fly into the light source, particularly in the absence of other visual cues (e.g., moonlight and stars) (Montevecchi 2006).

If hydrocarbons are discovered, formation flow testing with flaring may be required for a total of two wells for this Project. FTWT is an alternative to formation flow testing with flaring; however, it is unknown at this time if this testing will be required. Formation flow testing with flaring may require up to three days of flaring, however, if an extended flow test is required then flaring would last up to five days. From a worst-case scenario perspective, it is assumed that both wells will require formation flow testing with flaring, therefore the total potential days of flaring is estimated to be between 6 and 10 days over a 10-year period. Water curtains are sometimes deployed during flaring operations to protect the drilling installation from the generated heat. Equinor Canada is not currently aware of literature that suggests that water curtains are effective in preventing attraction of birds. Routine site monitoring will be conducted to maintain records of bird mortality noted on site, to enable identification of potential issues related to flares and other lighted structures.

Effects are predicted to be adverse, low in magnitude, localized and within the Project Area, short-term, sporadic in frequency, and reversible, with a moderate level of confidence.

6.2.3.4 Wellhead Decommissioning

No effects on Marine and Migratory Birds as a result of wellhead decommissioning are anticipated. Wellhead decommissioning is conducted underwater, at depth, and in adherence to the requirements set out under the *Newfoundland Offshore Petroleum Drilling and Production Regulations*. Decommissioning activities will be conducted well below diving depths for even the deepest-diving seabirds.

6.2.3.5 Project-Related Surveys

The predicted environmental effects of survey activities are primarily related to noise exposure from geophysical testing, which may result in changes in presence and abundance of avifauna, and potentially short-term injury. Deep-diving birds, such as alcids (including murres, dovekies, and puffins), as well as other bird species that forage underwater, may be at somewhat higher risk of injury or disruption due to exposure to underwater noise, such as that generated by seismic sound sources. VSP and geophysical, geohazard, wellsite and/or seabed surveys using 2D seismic arrays or other equipment will be conducted as required. However, these surveys will be short-term and localized in nature, and Marine and Migratory Birds are unlikely to be affected by the underwater sound energy that is associated with these activities. These changes are predicted to be adverse, negligible in magnitude, localized and within the Project Area, short-term, sporadic in frequency, and reversible, with a high level of confidence.

6.2.3.6 Supply and Servicing

The primary environmental effects of supply and servicing activities are related to potential disturbance due to vessel movements, release of organic wastes leading to increased food availability, and attraction / disorientation of birds due to lighting. The various bird species that occupy the Project Area and potential vessel and aircraft traffic routes will not likely be disturbed by vessel activity or associated aircraft use due to its short-term transitory nature, and because it will generally be in keeping with the overall marine traffic that has occurred throughout the region for years. The release of organic wastes by offshore vessels and activities can attract birds, which may increase the potential for interactions including risk of predation, collision and exposure to contaminants. However, this will be reduced with proper waste management practices and adherence to associated MARPOL requirements (e.g., food and sewage waste will not be discharged within 5.5 km (3 nautical miles [NM]) of the coast). Potential effects due to lighting on supply vessels, will be highly transient in nature. Overall, the presence of these vessels in the RSA would result in a negligible addition of night lighting in this region. These changes are predicted to be adverse, low in magnitude, localized in extent, short-term, regular in frequency, and reversible, with a high level of confidence.

6.2.4 Anticipated Effects (Accidental Events)

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

Taking into consideration the results of the spill modelling exercises (including EL 1135) completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, a precautionary conclusion was drawn and residual environmental effects from a subsurface blowout on Marine and Migratory Birds was predicted to be significant, but dependent on the specific occurrence, nature and degree of the event, and extremely unlikely to occur. This determination of significance remains applicable and valid for ELs 1159 and 1160.

6.3 Marine Mammals and Sea Turtles (including Species of Conservation Concern)

The Project Area and surrounding marine environments are known to be used by marine mammals and sea turtles. Marine mammals and sea turtles and their habitats are protected under the federal *Fisheries Act* and SARA. The *Fisheries Act* includes provisions that prohibit serious harm to fish (i.e., the death of fish or any permanent alteration to, or destruction of, fish habitat) that are part of a commercial, recreational, or Aboriginal fishery. Marine mammals and sea turtles as “marine animals” are considered “fish” for the purposes of the Act. SARA includes provisions to protect species listed on Schedule 1 of the Act, as well as their critical habitat, which is defined as “habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species’ critical habitat in a recovery strategy or action plan for the species” (Section 2(1)).

For the purposes of the Abridged EIS, marine mammals include baleen whales (mysticetes), toothed whales (odontocetes), and seals (phocids). Due to similarities in habitat use and the nature of potential interactions with Project components and activities, sea turtles are assessed together with marine mammals, with key differences noted where applicable.

6.3.1 Description of the Baseline

Marine mammals and sea turtles found in the RSA include seven species of mysticetes (baleen whales), sixteen species of odontocetes (toothed whales, dolphins, and porpoises), four species of phocids (seals), and four species of sea turtles. While some species of marine mammals remain in the waters off eastern Newfoundland year-round, many marine mammals and sea turtles arrive in the late spring and remain until the fall, feeding and socializing in the highly productive waters of the Grand Banks, the Flemish Pass, and surrounding waters.

No critical habitat for marine mammals or sea turtles has been designated in or near the Project Area, LSA, and RSA. However, there are several Ecologically and Biologically Significant Areas (EBSAs) identified in the RSA which have importance to Marine Mammals and Sea Turtles (refer to Section 6.4).

There are eleven listed species that may occur in the RSA, including four species of mysticetes, five species of odontocetes, and two species of sea turtles. Listed species are those listed under Schedule 1 of SARA or identified by COSEWIC as SOCC.

6.3.2 Anticipated Changes to the Environment

The key potential environmental interactions between planned offshore oil and gas activities and marine mammals and sea turtles – including the associated environmental changes and possible resulting environmental effects on this VC – include (as summarized and adapted from AMEC 2014):

- Temporary hearing impairment or permanent injury or mortality from exposure to loud underwater noise after coming into close contact with a Project-related underwater sound source (e.g., drilling, geophysical sound source) at or above threshold levels for onset of injury derived from published scientific literature or those used in relevant legislation
- Behavioural effects due to Project-related sound sources or other disturbances at or above threshold levels for onset of behavioural disturbance derived from published scientific literature or those used in relevant legislation. These may include alterations in the presence, abundance, and overall distribution (including avoidance) of marine mammals and sea turtles, as well as modifications to their movements, feeding, communication patterns and other activities
- Interference with (and the masking of) sounds within the marine environment that originate from and/or are used by marine biota, such as in communication between individuals, the identification and detection of predators and prey, echolocation and other activities and requirements
- Potential for injury or mortality through collisions or other interactions with offshore survey and supply vessels, including possible attraction of individual animals
- Possible changes in the availability, distribution, or quality of feed sources and/or habitats for marine mammals and sea turtles

As a result of these potential effects, identified environmental interactions, issues identified in the EIS Guidelines, and concerns raised through consultations and engagement, the assessment environmental effects on Marine Mammals and Sea Turtles (including SAR) is focused on:

- Change in Mortality or Injury (Underwater Noise)
- Change in Habitat Quality or Use (Behavioural Effects)
- Change in Mortality or Injury (Vessel Strikes)
- Change in Food Availability or Quality
- Change in Health (Contaminants)

6.3.3 Anticipated Effects (Planned Project Components and Activities)

6.3.3.1 Presence and Operation of Drilling Installation

The predicted environmental effects associated with presence and operation of a drilling installation are primarily related to increase in underwater noise that may result in a change in mortality or injury and change in habitat quality or use (behavioural effects). In assessing the potential effects of underwater noise on marine mammal and sea turtle species, the Abridged EIS relied on literature source levels, the results of acoustic modelling for other projects, and field measurements during comparable drilling operations (Zykov 2016; Maxner et al. 2017; Quijano et al. 2017). In this case, marine mammals or sea

turtles are not expected to be injured or killed as a result of underwater noise introduced during presence and operation of a drilling installation, nor is the quality or availability of their prey expected to be adversely affected. Some degree of change in habitat use in response to underwater noise is expected of individuals that occur within tens of kilometres of the drilling installation at the time of operation. The exact nature of behavioural response cannot be predicted but could include interference in communication, minor alterations in activity, or localized avoidance responses. The number of individuals affected is expected to be minimal relative to overall population sizes, effects will be of moderate duration (less for transient individuals), and there are no known concentration or critical habitat areas in the RSA. These changes are predicted to be adverse, low to medium in magnitude, within the Project Area and LSA, short- to medium-term, regular to continuous in frequency, and reversible, with a moderate level of confidence.

6.3.3.2 Drilling and Associated Marine Discharges

The predicted environmental effects to marine mammals and sea turtles associated with drilling and associated marine discharges is change in health (contaminants) related to routine discharges of drilling muds, drilling fluid, and cuttings associated with drilling activities. Chemicals used for drilling operations will be screened in accordance with a chemical management system that adheres to the C-NLOPB requirements. With the application of mitigation measures, the potential for changes in health and in food availability or quality as a result of drilling and marine discharges is predicted to be adverse but negligible. This conclusion has been determined with a high level of confidence, based on the implementation of industry-standard guidelines and best management practices and the limited potential for exposure of marine mammals and sea turtles to marine contaminants or contaminated prey. These changes are predicted to be adverse, low in magnitude, within the Project Area, short-term, regular in frequency, and reversible, with a high level of confidence.

6.3.3.3 Formation Flow Testing with Flaring

Given compliance with OWTG requirements, the potential for changes in health and food availability or quality as a result of discharges associated with formation flow testing with flaring is predicted to be adverse, negligible to low in magnitude, localized and within the Project Area, short-term, sporadic in frequency, and reversible, with a high level of confidence.

6.3.3.4 Wellhead Decommissioning

During wellhead decommissioning, disturbance during mechanical removal of wellheads and presence of the ROV may result in temporary, localized avoidance by marine mammals and sea turtles within the immediate area surrounding the wellhead. Underwater noise will be produced by either the drilling installation or an alternative vessel capable of carrying out the decommissioning activity. Changes in marine fish health (and thus changes in marine mammal and sea turtle prey quality) are not expected. As such, potential interactions with marine mammals associated with this activity will be limited to change in habitat quality or use due to an increase in underwater noise during vessel transit and change in mortality or injury from vessel strike risk. At water depths greater than 1,500 m, it is planned that the wellhead will remain in place and will not be removed, and therefore no interactions with marine mammals or sea turtles are anticipated during or after the activity. Changes are predicted to be adverse,

negligible to low in magnitude, localized with some extension into Project Area, short-term, sporadic in frequency, and reversible, with a high level of confidence.

6.3.3.5 Project-related Surveys

Underwater noise produced during VSP and other geophysical surveys have the potential for injury or mortality or behavioural changes in marine mammals and sea turtles. However, in this case, and particularly with the implementation of mitigation measures, injury or mortality and the quality or availability of prey is not expected to be adversely affected. Some degree of change in habitat use in response to underwater noise is expected for individuals that occur within a few kilometres of the surveys at the time of operation. The exact nature of behavioural response cannot be predicted but could include, for example, interference in communication, minor alterations in activity, or localized avoidance responses. Avoidance responses, where they occur, will further reduce the potential for injury. The number of individual marine mammal and sea turtles affected is expected to be minimal relative to overall population sizes, effects will be localized and of short-term duration, and there are no known concentration or critical habitat areas in the Project Area. Geological, geotechnical, and environmental surveys have a low potential to affect Marine Mammals and Sea Turtles, resulting from changes in habitat quality or use, change in mortality / injury (vessel strikes), and change in food availability and quality. The changes associated with surveys are predicted to be adverse, negligible to low in magnitude, localized with some extension into the LSA, short-term, sporadic in frequency, and reversible, with a high level of confidence.

6.3.3.6 Supply and Servicing

Marine transportation associated with support / supply / survey vessels will result in an increase in marine vessel traffic to, from and within the LSA and RSA overall, with associated increase in underwater noise and vessel strike risk. Despite the lack of underwater sound modelling and uncertainty regarding noise thresholds for different species of marine mammals and sea turtles, potential for exposure is expected to be brief and transient in nature. While vessel strikes can and do have serious consequences for individuals involved, these events are rare on a per-vessel basis and only a small number of vessels relative to current vessel traffic volumes will be added in the RSA. As standard practice, transits are typically completed at speeds of between 10 to 12 knots, occasionally transiting between 13 to 14 knots. However, observations for marine mammals and sea turtles will be conducted during offshore activities, and speeds will be reduced if marine mammals and/or sea turtles are observed in close proximity to the installation.

Helicopter support will be used for crew transfers out of St. John’s International Airport. Routine transportation activities associated with helicopter support have the potential to result in change in habitat quality or use for marine mammals and sea turtles as a result of sensory disturbances from the introduction of visual cues and noise. These changes are predicted to be adverse, low in magnitude, within the LSA, short-term, regular in frequency, and reversible, with a high level of confidence.

6.3.4 Anticipated Effects (Accidental Events)

Various species of marine mammals and sea turtles, including several SAR/SOCC, are known to occur in the RSA seasonally or year-round, and could therefore be present at the time of an accidental event. The potential for interaction of different species of marine mammals or sea turtles with an accidental event, such as a hydrocarbon release, will vary based on the timing, location, duration, and extent of the spill. Marine mammals and sea turtles may experience a change in mortality or injury (acute or immediate effects) if directly exposed to accidentally released hydrocarbons or associated volatiles and aerosols. They may experience a change in health (sub-lethal effects) from direct contact with hydrocarbons (including volatiles and aerosols) or consumption of contaminated prey. There may be a change in habitat (marine water or shoreline / haul-out) quality due to oiling and associated response measures.

Taking into consideration the results of the spill modelling exercises completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, the predicted residual environmental effects from an accidental event scenario on Marine Mammals and Sea Turtles is considered not significant. This determination of significance remains applicable and valid for ELs 1159 and 1160.

6.4 Special Areas

Several marine and coastal areas in Newfoundland and Labrador have been designated as protected under provincial, federal, and/or or legislation or agreements due to their ecological, historical, or socio-cultural characteristics and importance. Other areas have been formally identified as being special or sensitive through relevant processes and initiatives

Most of the Special Areas identified in Eastern Newfoundland are located on land or in coastal and nearshore areas, outside of the Project Area. Special Areas in offshore locations off Eastern Newfoundland include various Fisheries Closure Areas (FCAs) that protect sensitive benthic habitats from bottom fishing activities, but with no associated prohibitions of petroleum exploration and development activities within their boundaries. VME areas are identified by NAFO for their high ecological or biological activity, portions of which may eventually be designated as FCAs. In addition, EBSAs are ecologically and biologically significant areas identified through the Canadian *Oceans Act.*

6.4.1 Description of the Baseline

Figure 6-1 shows Special Areas in the Eastern Newfoundland and Labrador and Table 6.1 outlines the Special Areas that overlap with ELs 1159 and 1160, as well as their defining features.

Currently, there are no known Marine Protected Areas (MPAs) within the vicinity of the Project Area. However, nationally DFO is increasing the number of MPAs. This initiative includes the marine waters off NL. Multiple areas within offshore Newfoundland have been designated as environmentally sensitive.

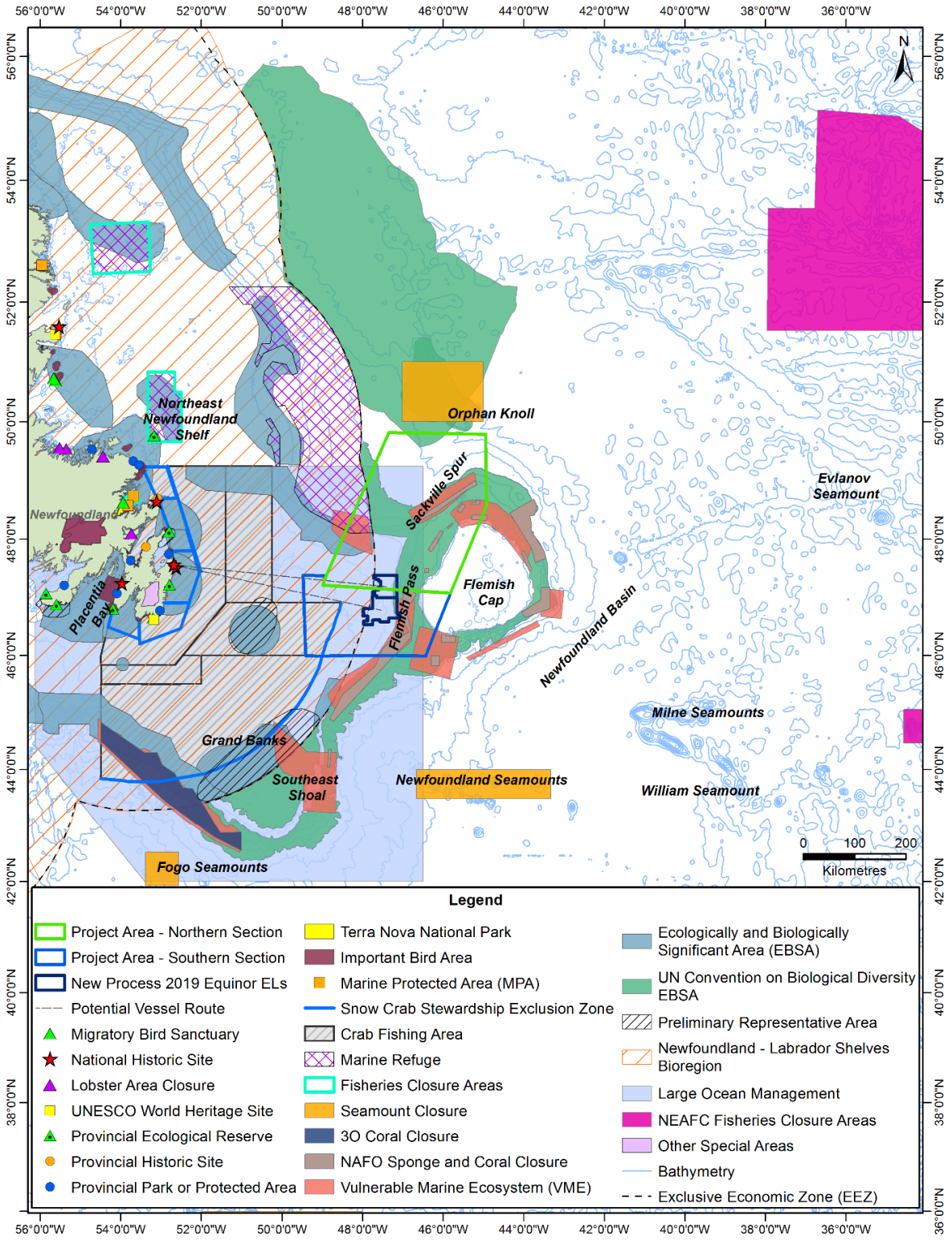


Figure 6-1 Special Areas in Eastern Newfoundland and Labrador

Table 6.1 Special Areas Overlapping with ELs 1159 and 1160

Overlapping Special Areas	Defining Features
• United Nations Convention on Biological Diversity (UNCBD) EBSA – Slopes of the Flemish Cap and Grand Bank	• Identification of the UNCBD EBSAs are part of an initiative to conserve global diversity. The Slopes of the Flemish Cap and Grand Bank EBSA contains most of the aggregations of indicator species for VMEs in the NAFO Regulatory Area. The area includes NAFO closures to protect corals and sponges and a component of Greenland halibut fishery grounds in international waters. A high diversity of marine taxa, including threatened and listed species, are found within the EBSA (UNCBD 2017).
• UNCBD EBSA – Slopes of the Flemish Cap and Grand Bank • United Nations Food and Agriculture Organization (UNFAO) VME – Southern Flemish Pass to Eastern Canyons	• See above for UNCBD EBSA defining features. • The Southern Flemish Pass to Eastern Canyons VME includes large gorgonians and high density of sponges. Vulnerable fish species in the area include striped wolffish, redfish, spiny tailed skate, northern wolffish, some black dogfish and deep-sea cat shark (WG-EAFM 2008; UNFAO 2019).

In addition to Canadian-designated EBSAs, NAFO has identified a number of areas as VMEs for deep-water corals and sponges in the offshore region, including many canyons around the continental shelf, seamounts, and knolls. The Newfoundland Seamounts and the Beothuk Knoll have been identified as potential VMEs (NAFO 2008). The VMEs are closed to bottom trawling activities in the area, to manage habitat for corals, such as gorgonians, black corals, sea pens, and sponges. These areas were created in response to the known sensitivity of corals and sponges, particularly gorgonians and black corals that cannot reattach themselves to substrate after disturbance (NAFO 2009). While DFO and NAFO have identified EBSAs and VMEs, there are no restrictions in these areas regarding drilling activity. The C-NLOPB requires mitigation be put in place to reduce potential effects on sensitive marine organisms (e.g., corals). Refer to Section 2.2.2 for information regarding pre-drill coral / sponge surveys.

6.4.2 Anticipated Changes to the Environment

Changes to the environment because of offshore oil and gas activities and their potential effects on identified Special Areas may be both direct and indirect in nature and cause. The conduct of oil and gas exploration activities directly within or near such areas may have adverse implications for these locations and their important and defining ecological and socio-cultural characteristics. These interactions may occur through the possible presence of oil and gas exploration equipment, personnel, and activities within the Special Area in question, as well as the associated emissions and discharges from Project activities. Biophysical effects resulting from oil and gas or other human activities within the RSA may also “spread” to adjacent Special Areas by affecting the marine fish, birds, mammals, or other environmental components that move to and through these areas. Resulting decreases in the real or perceived integrity of these areas in the short or long term may also affect their ecological and/or societal importance, use and value.

As a result of these identified environmental interactions, issues identified in the EIS Guidelines and concerns raised through consultation and engagement, the assessment of Project-related environmental effects on Special Areas is focused on the following potential environmental effects:

- Change in Environmental Features and/or Processes
- Change in Human use and/or Societal Value

6.4.3 Anticipated Effects (Planned Project Components and Activities)

Project exploration activities will occur in an offshore marine area that is more than 300 km from the shoreline of Eastern Newfoundland. These planned components and activities will therefore not occur within, or otherwise interact directly with the existing provincially-defined Special Areas, such as provincial ecological reserves, parks and protected areas and historic sites. Likewise, exploration drilling activities will not have a direct interaction with most federally designated areas (i.e., marine protected areas, fisheries closures within Canada's Exclusive Economic Zone (EEZ), migratory bird sanctuaries, national parks and historic sites). International designations, such as IBAs, will also not be directly affected, as they are located in coastal and onshore areas.

Special Areas outside of the ELs 1159 and 1160 have the potential to be affected by extended effects associated with sound, lighting and drill cuttings. Sound modelling results indicated that predicted cumulative sound exposure levels (over 24 hours) associated with operating drilling installations would decrease to below threshold values for potential marine mammal auditory injury at distances between 120 m and 470 m from the source (Zykov 2016). Therefore 470 m was selected as a conservative zone of influence (ZOI) for sound. Given the conservative ZOI, exploration drilling activities associated with ELs 1159 and 1160 do not extend to any additional Special Areas.

Bird colonies up to 15 km may be susceptible to stranding due to light attraction (Rodriguez et al. 2014), therefore a 15 km conservative ZOI was selected for lighting. Given this ZOI, exploration drilling activities associated with ELs 1159 and 1160 have the potential to extend to the NAFO FCA – Flemish Pass / Eastern Canyons VME. However, this VME is closed to protect extensive sponge grounds and large gorgonian corals, which are not anticipated to be adversely affected by light due to the distance to the seafloor.

Predicted environmental effects of drilling discharges on special areas identified for sensitive benthic habitats are primarily related to potential sedimentation and burial of benthic species. As discussed in Section 2.5.2, pre-drill coral and sponge surveys and risk assessments will be completed and mitigation measures, if required from the risk assessment, will be implemented prior to drilling (e.g., relocating wellsite, using a cuttings transport system). These effects are predicted to be adverse, low in magnitude, localized and within the Project Area, short to long term in duration, occurring sporadically to regularly and reversible, with these predications being made with a moderate to high level of confidence. With the implementation of appropriate mitigation measures, the overall magnitude of the effect of marine discharges on these special areas is anticipated to be low.

6.4.4 Anticipated Effects (Accidental Events)

There are a number of Special Areas offshore Eastern Newfoundland that overlap in whole or in part with the Project Area - Northern or Southern Sections, including various EBSAs, VMEs and NAFO FCAs. Key potential effects in the unlikely event of an accidental event includes potential changes in environmental features and/or processes, and changes in human use and/or societal value.

Taking into consideration the results of the spill modelling exercises completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, the predicted residual environmental effects from an accidental event scenario on Special Areas is considered not significant. This determination of significance remains applicable and valid for ELs 1159 and 1160.

6.5 Indigenous Communities and Activities

A key focus of the EIS has been assessing and evaluating the potential for the Project, and the various changes to the environment that may be associated with it, to interact with and affect Indigenous communities and their activities, including each of the socio-cultural aspects identified in Section 5(1)c of CEAA 2012. This VC also relates to and overlaps with other components of the biophysical and socioeconomic environments, including several of the other VCs being considered in this assessment. Potential effects to Indigenous communities and their activities may, for example, result from Project-related changes in air quality and noise levels (Section 2.9 of the Abridged EIS), in the availability and quality of marine resources and other components of the biophysical environment (Chapters 8-11 of the Abridged EIS), and other human components and activities (Chapter 13 of the Abridged EIS).

6.5.1 Description of the Baseline

Section 7.3.4 of the Abridged EIS identifies and describes the various Indigenous groups throughout Newfoundland and Labrador, the Maritime Provinces, and Québec who have been identified by the CEA Agency as having interests related to the Project and its potential environmental effects, including potential interactions with their commercial and current traditional hunting and fishing activities.

In addition to Indigenous groups residing in Newfoundland and Labrador, in April 2017, the CEA Agency informed the Proponent that the interests of Indigenous groups in the Maritime Provinces and Quebec may also potentially be affected by the Project, and that engagement with these groups was required. The identified interests of these groups (listed in Table 4.2 and described in Section 7.3 of the Abridged EIS) include commercial-communal swordfish licences for NAFO Divisions 3, 4, 5 (groups in PEI, NS); and asserted Aboriginal right to fish for food, social, and ceremonial (FSC) purposes where that right could be affected by Project-related effects to the Atlantic salmon population(s) identified as endangered by COSEWIC (groups in NB, NS, QC).

6.5.2 Anticipated Changes to the Environment

The presence of drilling installations and the conduct of these exploration activities is not anticipated to interact directly with or adversely affect Indigenous Communities and Activities, as the Project Area is located hundreds of kilometres from the nearest community. Indirect effects may occur if the Project

adversely affects fish and wildlife, as these biophysical effects may in turn reduce the availability or quality of such resources and their use for traditional purposes.

As a result of these identified environmental interactions, issues identified in the EIS Guidelines and concerns raised through engagement, the assessment of Project-related environmental effects on Indigenous communities and their activities is focused on the following potential environmental:

- Change in Health and Socioeconomic Conditions
- Change in the Current Use of Lands and Resources for Traditional Purposes
- Change in Physical and Cultural Heritage and Change in any Structure, Site, or Thing that is of Historical, Archaeological, Paleontological or Architectural Significance

6.5.3 Anticipated Effects (Planned Project Components and Activities)

Most Project-related activities will take place in an offshore marine environment, hundreds of kilometres from land and away from Indigenous communities. Project-related emissions and discharges and environmental interactions will be localized and short-term in nature (Chapters 8-11 and 13 of the EIS) and are unlikely to extend to or affect the physical or social health and well-being or other socioeconomic conditions of Indigenous communities.

Equinor Canada is not aware that the Indigenous groups assessed in this EIS or other Indigenous groups assert Aboriginal or Treaty rights or otherwise undertake traditional activities within or near the Project Area and LSA, pursuant to Section 35 of the *Constitution Act*, 1982. The Project, including its planned components and activities and potential vessel and aircraft traffic routes, and the environmental emissions / disturbances and associated environmental changes resulting from these (as defined through the LSA), will therefore not directly interfere with or otherwise interact with the current use of lands and resources for traditional purposes by Indigenous communities. The Project will not have adverse effects on such activities, as they do not occur within or near the LSA at any time of the year.

The environmental effects analysis also indicates there is limited potential for marine associated species that are known to be used by the identified Indigenous groups to occur within or migrate through the Project Area / LSA prior to moving to an area of traditional use (e.g., Atlantic salmon (various populations)). The implementation of the mitigation measures outlined throughout this EIS will reduce direct or indirect potential effects on these resources. The Project will not have an adverse effect on the availability or quality of resources that are currently used for traditional purposes by Indigenous groups to a nature and to a degree that would alter the nature, location, timing, intensity or value of these activities or the health or heritage of any Indigenous community.

The Project Area and LSA are not known to contain resources of historical, archaeological, paleontological, or architectural significance, and given its location far offshore Eastern Newfoundland, are not likely to contain such resources or materials that are relevant to and valued by Indigenous groups. Based on the nature, location, extent and duration of planned Project activities and the associated emission and discharges, the Project will not interact with nor adversely affect physical and cultural sites, including structures, sites, or things of historical, archaeological, paleontological, or architectural significance.

6.5.4 Anticipated Effects (Accidental Events)

Although the environmental effects assessment for the Project's planned components and activities has predicted no potential interactions with or adverse effects upon Indigenous communities and their activities, there is potential for an accidental event, such as a large oil spill to eventually reach and affect Indigenous communities and their activities elsewhere in Eastern Canada.

Taking into consideration the results of the spill modelling exercises completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, the predicted residual environmental effects from an accidental event scenario on Indigenous Communities and Activities is considered not significant. This determination of significance remains applicable and valid for ELs 1159 and 1160.

6.6 Commercial Fisheries and Other Ocean Users

Commercial fishing is a key economic activity within the Province and elsewhere, and fisheries within the RSA are extensive and diverse, involving a range of participants, species, gear types, and other characteristics at various times of the year. This includes fishing activity by Canadian enterprises and vessels (primarily within Canada's 200 nautical mile EEZ) and by both Canadian and non-Canadian fishers outside of the EEZ. There are also various regulatory jurisdictions that pertain to marine fish and fisheries in the region. The Government of Canada maintains jurisdiction over fish stocks and fishing activities within its EEZ and for benthic invertebrates (such as crab) across the entire continental shelf, while NAFO manages groundfish activities and other resources beyond the EEZ. The management and conduct of commercial fishing activities in this region is therefore the subject of various pieces of legislation, regulations and other regulatory and policy instruments involving Canadian (federal) and international jurisdictions.

A range of other anthropogenic components and human activities also occur throughout the NL Offshore Area, including marine shipping, oil and gas exploration and production, and various other commercial and recreational pursuits, military operations, and ocean infrastructure such as subsea cables with which aspects of the Project may also interact.

6.6.1 Description of the Baseline

Within the Project Area, the socioeconomic setting primarily consists of commercial fishing and industrial oil and gas activity. The waters of the Canada-NL Offshore Area, and specifically the area of the Grand Banks, are productive for marine life, and home to a number of commercially-important fish species. Domestic fisheries for groundfish, shellfish and invertebrates, and pelagic species occur in the Canada-NL Offshore Area, with northern shrimp and snow crab historically providing the majority of commercial landings after the collapse of groundfish stocks in the 1990s. The Project Area is located within NAFO Subdivisions 3KLMNO, occupying less than 30 percent of 3KLMNO, which historically have been areas of commercial fishing activity. Based on publicly available commercial fish landings data provided from DFO (2016), the Project Area – Northern Section, which primarily contains the Flemish Pass, has had a lower amount of commercial fishing activity than Project Area - Southern Section. Commercial fishing in the Project Area is made up of landings for northern shrimp, snow crab, Greenland halibut, yellowtail flounder, redfish, American plaice, and other groundfish species. Other species such as herring, capelin,

sea urchins, scallops, and lobster have landings recorded in waters that encompass the larger RSA around the Project Area.

In terms of timing of commercial fishing activities, April to August are the months in which commercial fishing in the Canada-NL Offshore Area is most active, with fishing activities gradually slowing down in the fall and winter. This is driven primarily by the snow crab fishing season, which takes place from April to August. Other fisheries, such as those for northern shrimp and groundfish species, occur year-round, but are predominantly active during the summer months, when ocean productivity is higher.

Research activities also have the potential to occur year-round. DFO conducts annual research surveys in the spring and fall in the Canada-NL Offshore Area. This includes DFO's Atlantic Zone Monitoring Program, the RAPID Climate Change Program Study, and the post-season trap survey for snow crab in partnership with Fish, Food and Allied Workers-Unifor (FFAW-Unifor). These research activities occur throughout various NAFO divisions in the Canada-NL Offshore Area, including the Project Area. Military activities do not have a set schedule but can be scheduled to occur at any time of the year. The Canada-NL Offshore Area has been subject to offshore oil and gas activity for over 30 years, and there has been some level of activity in the Project Area during this timeframe. Other oil and gas activities will, and have the potential to be, occurring during the temporal scope of this Project.

6.6.2 Anticipated Changes to the Environment

Potential interactions between offshore oil and gas exploration activities and Commercial Fisheries and Other Ocean Users can occur both directly and indirectly. Key potential interactions have been identified based on previous EAs conducted for similar projects and activities (Amec 2014), and include:

- Possible damage to fishing gear, vessels, equipment, or other components as a result of direct interactions between Project equipment or emissions and these other ocean users
- Loss of access to important and established fishing grounds, or other areas of potential marine use, as a result of Project activities, and associated decreases in value (economic or otherwise) of these activities
- Possible indirect effects on Commercial Fisheries and Other Ocean Users due to biophysical effects on the presence, abundance, distribution, or quality of marine fish species or other resources
- Possible interference with scheduled government / industry research activities, including direct disturbance and/or effects on research results and associated management decisions

As a result of these identified environmental interactions, issues identified in the EIS Guidelines and concerns raised through consultation and engagement, the assessment of Project-related environmental effects on Special Areas is focused on:

- Direct interference, resulting in a change in the distribution, intensity and/or functions (effectiveness / efficiency) of Commercial Fishing and Other Ocean Users
- Damage to fishing gear, vessels, and other equipment and components
- Change in the abundance distribution and quality of marine resources, resulting in a change in distribution, intensity and/or function (effectiveness / efficiency) of Commercial Fishing and Other Ocean Uses

6.6.3 Anticipated Effects (Planned Project Components and Activities)

6.6.3.1 Presence and Operation of Drilling Installation (Including Drilling and Associated Discharges)

The predicted environmental effects associated with the presence and operation of a drilling installation are primarily associated with environmental effects on fish (Section 6.1 and Chapter 8 of the Abridged EIS). Project-related biophysical effects to fish or other marine resources have the potential to result in a subsequent change in the nature, quality, and/or value of one or more of the marine activities that depend upon them. However, disturbance to fish or other marine biota will be localized and of short-term duration at any one location. It is therefore unlikely that marine resources will be affected or disrupted due to presence of the drilling installation and associated drilling activities in a manner and to a degree that would affect the overall availability or quality of a marine resource, and thus, the overall nature, intensity or value of related commercial activity.

The presence and operation of the drilling installation and the safety zone may require commercial fishers and other oceans users (e.g., research surveys) to reroute, relocate or reschedule their activities. However, with implementation of mitigation measures, such as communication protocols (Notices to Shipping) and the relatively small footprint of the safety zone, the overall magnitude of the effect of drilling and marine-associated discharges on Commercial Fisheries and Other Ocean Users is anticipated to be low. The slight decrease in access to fishing or other ocean use will be localized, short-term, occurring continuously when drilling activities are scheduled, and reversible, with a high level of confidence.

6.6.3.2 Formation Flow Testing with Flaring

Formation flow testing, including associated flaring activity, is not expected to have adverse interactions with or effects on Commercial Fisheries and Other Ocean Users. When well fluids are sent through the wellbore and to the drilling installation for testing, it is in a closed casing and does not interact with the surrounding marine environment. Likewise, flaring is not anticipated to have an interaction with commercial fishing activity and other ocean users, as it will take place above the drilling installation and will therefore not come into contact with commercial fishing activities or resources, nor have an interaction that would result in an effect on other ocean users.

6.6.3.3 Wellhead Decommissioning

In water depths less than 500 m, the wellhead will be cut below the seafloor and removed, with no potential for interaction with fishing gear. In water depths between 500 m and 1,500 m, the wellhead will be removed with a portion of the casing (approximately 0.85 m) remaining above the seafloor. Equinor Canada will provide the locations for each decommissioned well to fishers and the Canadian Hydrographic Service, enabling mobile-gear and fixed-gear fishers to avoid these locations. Given the implementation of mitigation measures, the resulting residual environmental effects on Commercial Fisheries and Other Ocean Users is expected to be adverse, low in magnitude, localized, long-term in duration, continuous in occurrence, and reversible, made with a high level of confidence.

6.6.3.4 Project-Related Surveys

The effects of underwater noise associated with Project-related surveys on marine fish species have been assessed in the Marine Fish and Fish Habitat VC and it was concluded that there would not be a significant residual environmental effect on marine fish species (including commercial fish species). Therefore, underwater noise is likely to have only limited indirect effects on catch rates and associated economic value for commercial fishers.

Some Project-related surveys that use geophysics, such as VSP and wellsite surveys, can result in direct interference with commercial fishing activity because the sound waves have the potential to interact with fishing gear (e.g., crab pots) that may already be set in an area where surveying is taking place. However, due to the transient and localized nature of Project-related surveys, and their short-term duration, gear damage is not likely. Similarly, although there is a potential for interaction with research gear, and other vessels, the likelihood is low due to the nature of the Project activity.

In consideration of the limited temporal scope of Project-related surveys, and the implementation of mitigation, the residual environmental effects of Project-related surveys are predicted to be adverse, low in magnitude, localized, short-term in duration, occurring sporadically, and reversible, with a high level of confidence.

6.6.3.5 Supply and Servicing

The contribution of the Project to existing offshore supply vessel and helicopter traffic serving the offshore industry will be negligible and will continue at approximately the same level as current traffic supporting the operators' ongoing exploration activities in the region. Residual environmental effects on Commercial Fisheries and Other Ocean Users associated with supply and servicing operations are predicted to be low in magnitude, localized, short-term in duration, occurring at regular intervals, and reversible, with a high level of confidence.

6.6.4 Anticipated Effects (Accidental Events)

Accidental events that have the potential to interact with Commercial Fisheries and Other Ocean Users are primarily related to the release of hydrocarbons from a surface batch spill or subsurface blowout. These releases could interact with Commercial Fisheries and Other Ocean Users by potentially impeding the ability of fishers to harvest fish, affecting the biological health of commercial fish species, reducing the marketability of commercial fish products, and interfering with marine research activities or offshore military exercises.

Taking into consideration the results of the spill modelling exercises completed in the Flemish Pass and Eastern Newfoundland EISs, and planned mitigation, the predicted residual environmental effects from an accidental event scenario on Commercial Fisheries and Other Ocean Users is considered not significant. This determination of significance remains applicable and valid for ELs 1159 and 1160.

6.7 Effects of the Environment on the Project

The planning and conduct of offshore oil and gas exploration and other marine activities in the RSA are often influenced by environmental factors, including climatological and meteorological conditions (wind, precipitation, fog, and visibility), oceanographic conditions (waves, currents), the seasonal presence of sea ice and icebergs, geology and seismicity, and other environmental features and conditions.

6.7.1 Key Environmental Considerations

Key components of the environment that could potentially affect the Project include:

- weather conditions
- oceanographic conditions
- sea ice, icebergs, and superstructure icing
- geological stability and seismicity

The overall Project Area exhibits spatial and temporal (seasonal) variability in its meteorological conditions, including the potential for, and nature and degree of, associated severe or extreme weather conditions. Air temperatures are coolest in January or February and warmest from July through September. Prevailing winds are from the west to northwest in winter and from the southwest in summer. The strongest wind speeds occur in winter, reaching 31-32.4 m/s in February (climatology MSC50 data created by Oceanweather), with 100-year extreme wind speeds reaching 34.0-34.6 m/s. Precipitation varies within localized regions of the Project Area with rain or drizzle occurring at any time of year and snow and freezing rain occurring from October through May. There is also a year-round potential for thunderstorms (mostly in summer) and hail (mostly in winter).

Within and around the Project Area, the largest seas are typically found farthest offshore, usually during the winter season. Mean significant wave heights average 0.7 m in July to 4.6 m in January, with maximum significant wave heights of 13.8 to 14.2 m in December and January in the Project Area. The annual 100-year extreme significant wave height ranges from 15.6 to 17.2 m.

Severe weather (e.g., fog, heavy rain, snow) and oceanographic conditions (e.g., high winds and waves) can delay movement of supply and/or personnel to and from the drilling installation and increase stress conditions on vessels and equipment, thereby increasing risk of accidental spills, suspension or delay of Project activities, evacuation of the drilling installation, and in extreme cases, fatalities.

The Project Area is subject to seasonal intrusions of sea ice and icebergs, and vessel icing, although it varies spatially and temporally. Conditions are influenced by winter conditions and seasonal wind patterns over Newfoundland and surrounding waters. The iceberg season may last from January to August and comprise growlers (< 1 m height) to very large (100-200 m in length) icebergs. Several factors can contribute to vessel icing potential, including air and sea temperature, wind speed, wave height, and precipitation. With sub-zero temperatures and strong winds common, icing of the ship’s superstructure can be an important consideration and risk as a few tens of centimetres of ice over a complex deck and superstructure represents many tonnes of loading. Vessel icing in this region is likely to occur between November and May, with the highest occurrence typically in February (Amec 2014).

The geology of the Canada-NL Offshore Area is complex and dynamic, and the current bedrock and surficial characteristics of the area have been shaped by various natural and human factors and processes over time. Potential offshore geohazards include slope instability, sediment loading, venting of shallow gas, gas hydrates, seabed instabilities, and ice scour. It would likely take a major earthquake in the northern Flemish Pass to trigger future landslides; Cameron et al. (2014) estimated such a quake would occur approximately every 10,000 years in a worst-case scenario. The results of a slope stability evaluation in the Project Area – Northern Section indicate that a triggering event of greater magnitude than the 3,000-year recurrence interval Abnormal Level Earthquake event is required for slope instability over large areas of the Flemish Pass flanks.

6.7.2 Residual Effects Summary

The key environmental factors that may affect the Project include severe and/or extreme weather conditions, sea ice, icebergs and superstructure icing, oceanographic conditions, and geological stability and seismicity (unlikely due to low probability of occurrence). Engineering design, operational procedures, and the implementation of mitigation measures will reduce the potential adverse effects to the Project. The short-term duration of offshore activities between 2018 and 2027 (i.e., 35 to 65 days per well (up to 30 wells)), the absence of fixed offshore infrastructure, the harsh-weather design criteria for the drilling installation, and offshore requirements and guidelines (C-NLOPB 2017; *Newfoundland Offshore Certificate of Fitness Regulations*; NEB et al. 2008) also reduce the potential for, and possible magnitude of, effects of the environment on the Project.

With the application of the engineering and environmental design standards, operational procedures, regulations (e.g., *Newfoundland Offshore Certificate of Fitness Regulations*, *Newfoundland Offshore Petroleum Installations Regulations*), and adherence to the Offshore Physical Environmental Guidelines (NEB et al. 2008), no significant adverse residual effects of the environment on the Project are predicted.

6.8 Cumulative Effects

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

6.8.1 Approach and Methods

The cumulative effects assessment considers the overall (total) effect on the VCs as a result of predicted effects resulting from the Project and those of other relevant projects and activities in the RSA. In terms of its scope, the cumulative effects assessment focusses upon the same set of VCs as those considered in the Project-specific analysis, as these represent the key components of the environment that may be affected by the Project, and thus, which it may contribute to cumulative effects upon. The spatial and temporal boundaries for the cumulative effects assessment are also consistent with those established for the Project-specific assessment (see earlier LSA and RSA definitions, Section 5.4).

Past and on-going projects and activities and their environmental effects are reflected in the existing (baseline) environmental conditions for each VC (see above Sections 6.1 to 6.6). The current condition of the VC as a result of natural and anthropogenic factors, and thus its overall sensitivity or resiliency to further change, has been considered throughout the effects assessments. The assessment considers how this existing environmental condition may be changed by the Project, and then, whether and how the effects of other on-going and future projects and activities would affect the same VCs through direct overlap in space and time and/or by affecting the same individuals or populations. The following other projects and activities are considered in the cumulative effects assessment for each VC as relevant:

- Existing oil production projects (Hibernia, Terra Nova, White Rose and Extension, Hebron
- Offshore petroleum exploration programs (seismic, drilling and others)
- Fishing activity
- Other marine vessel traffic
- Hunting

The assessment also includes the consideration of mitigation measures to avoid or reduce potential environmental (including cumulative) effects and evaluates the significance of predicted cumulative effects on each VC using the same criteria used for the Project-specific effects assessment.

6.8.2 Marine Fish and Fish Habitat (including Species at Risk)

Potential interactions with Marine Fish and Fish Habitat as a result of exploration drilling on ELs 1159 and 1160 are primarily related to underwater sound, light emissions, marine discharges, and direct interaction with the benthic environment. Potential interactions will, however, be short-term and localized in nature, and are not expected to have overall (population level) adverse effects on fish. Potential effects on corals and sponges will be reduced or avoided by implementing mitigation measures such as completing pre-drill surveys.

There are currently four operational production facilities in the Project Area – Southern Section (i.e., Hibernia, Terra Nova, White Rose and Hebron), each of which will contribute somewhat to environmental effects on Marine Fish and Fish Habitat. However, ongoing environmental effects monitoring (EEM) programs for these projects have generally demonstrated a localized (i.e., less than 10 km) geographic extent for the project-induced changes on fish habitat. It is assumed that the proposed Bay du Nord development project (located in the Project Area – Northern Section) and Hebron will have similar ZOIs. This suggests a limited potential for cumulative effects to occur between exploration drilling activities carried out on ELs 1159 and 1160 and these ongoing petroleum production projects.

It is acknowledged that White Rose is located approximately 2 km from the closest edge of EL 1160. However, this production facility has a safety zone of approximately 95 km², and the South White Rose Extension has a safety zone of 9 km², which would aid in increasing the separation distance between exploration drilling activities and production, and in turn reduce the potential for cumulative effects to Marine Fish and Fish Habitat.

Exploration drilling activities carried out on ELs 1159 and 1160 will operate for a short period of time in one location, resulting in a short-term disturbance within a relatively limited ZOI. This will reduce the

potential for individuals and populations to be affected through multiple interactions with exploration drilling activities on ELs 1159 and 1160 and other activities in the marine environment, and for species to be affected simultaneously and repeatedly by multiple projects and activities. As part of the planning and implementation of its activities, Equinor Canada will continue to communicate with relevant marine users and other stakeholders to make a reasonable effort to provide appropriate spatial and temporal separation that is maintained as required for operational, regulatory and safety reasons. This, and the implementation of other planned mitigation measures, will reduce the potential for and degree of associated cumulative effects on Marine Fish and Fish Habitat.

Exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse cumulative environmental effects on Marine Fish and Fish Habitat (including SAR) in combination with other projects and activities that have been or will be carried out.

6.8.3 Marine and Migratory Birds (including Species at Risk)

Potential interactions with Marine and Migratory Birds as a result of exploration drilling on ELs 1159 and 1160 are primarily related to potential attraction and/or disorientation of birds due to artificial light sources associated with the drilling installation and vessels. However, these potential interactions will entail a localized and short-term disturbance at any one location and time. This reduces the potential for individuals and populations to be affected repeatedly through multiple interactions with, and the degree and duration of overlap between, the effects of exploration drilling on ELs 1159 and 1160 and other activities in the marine environment.

It is acknowledged that White Rose is located approximately 2 km from the closest edge of EL 1160. However, this production facility has a safety zone of approximately 95 km², and the South White Rose Extension has a safety zone of 9 km², which would aid in increasing the separation distance between exploration drilling activities and production, and in turn reduce the potential for cumulative effects to Marine and Migratory Birds.

ELs 1159 and 1160 are located within, or partially within, the Project Area – Southern Section, and there is potential for cumulative effects to result from the combined effects of exploration drilling on ELs 1159 and 1160 and other offshore exploration and production activities, marine traffic, and commercial fishing activity. All four production facilitations (i.e., Hibernia, Terra Nova, White Rose and Hebron) are located within the Project Area – Southern Section. Although these are long-term operations with similarly long-term environmental disturbances, the localized nature of these effects, and the short-term and localized nature of the effects associated with exploration drilling activities on ELs 1159 and 1160, will reduce the potential for cumulative effects to occur. It is assumed that the proposed Bay du Nord development project (located in the Project Area – Northern Section) and Hebron will have similar ZOIs. This suggests a limited potential for cumulative effects to Marine and Migratory Birds and from exploration drilling activities carried out on ELs 1159 and 1160 and these ongoing petroleum production projects.

Exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse cumulative environmental effects on Marine and Migratory Birds (including SAR) in combination with other projects and activities that have been or will be carried out.

6.8.4 Marine Mammals and Sea Turtles (including Species at Risk)

Potential interactions with Marine Mammals and Sea Turtles as a result of exploration drilling on ELs 1159 and 1160 are primarily related to possible injury or disturbance from the movement and sound associated with the drilling installation and vessels. However, potential interactions are likely to be highly transient and temporary for individual marine mammals and sea turtles, especially in consideration of anticipated large-scale daily and seasonal fluctuations within the assessment areas and alternate habitats available throughout the RSA.

Other projects and activities that may affect Marine Mammals and Sea Turtles include commercial fishing, marine traffic, other exploration drilling and activities, and production facilities. Safety zones are required between offshore oil and gas activities, which help reduce the degree to which the potential environmental ZOIs from sound may overlap and interact in space and time. There is, however, the potential that underwater sound produced from these activities may extend beyond these established safety zones and interact spatially with those of other projects and activities. Individual marine mammals and sea turtles may also be exposed to multiple sources of underwater sound while in the RSA due to their widespread, mobile, and migratory nature, which could increase the risk of mortality or physical injury and may result in behavioural changes in individuals exposed to multiple sound sources.

The four production facilities have vessel traffic occurring year-round, which results in a continuous sound source, however, levels from these activities are below those expected to cause auditory injury (Zykov 2016). Sound generated by exploration drilling and geophysical surveys is temporary and relatively short-term in nature. As it is assumed that the proposed Bay du Nord development project (located in the Project Area – Northern Section) and Hebron will have similar ZOIs, there is a limited potential for cumulative effects to Marine Mammals and Sea Turtles from exploration drilling activities carried out on ELs 1159 and 1160 and these ongoing petroleum production projects.

It is acknowledged that White Rose is located approximately 2 km from the closest edge of EL 1160. However, this production facility has a safety zone of approximately 95 km², and the South White Rose Extension has a safety zone of 9 km², which would aid in increasing the separation distance between exploration drilling activities and production, and in turn reduce the potential for cumulative effects to Marine Mammals and Sea Turtles.

Project vessel traffic within the RSA and vessel traffic associated with other projects and activities pose a risk of mortality or physical injury to marine mammals and sea turtles due to the increased potential for vessel strikes. Vessel traffic associated with ELs 1159 and 1160 is short-term and transient in nature, which limits the potential for vessel strikes.

Exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse cumulative environmental effects on Marine Mammals and Sea Turtles (including SAR) in combination with other projects and activities that have been or will be carried out.

6.8.5 Special Areas

Many of the Special Areas in eastern Newfoundland are in the nearshore and onshore areas and will therefore not have direct contact with exploration drilling activities on ELs 1159 and 1160. Several

Special Areas, or portions of them, overlap with the Project Area and potential traffic routes including but not limited to EBSAs, VMEs, NAFO FCAs (refer to Section 6). Exploration drilling activities are not prohibited from occurring in these Special Areas. Moreover, given the overall nature, scale and duration of the planned Project activities, the overall and defining biophysical and socio-economic environments within these areas will not be adversely affected by it. While there is some potential for other types of human activities (such as oil and gas exploration or fishing activity) to have varying degrees of effect on the same special areas that may interact with this Project, most such activities result in a short-term disturbance within a relatively limited ZOI, with applicable mitigation measures implemented to avoid or reduce their environmental consequences. This reduces the potential for particular areas and their environmental characteristics to be affected simultaneously and repeatedly by multiple projects and activities, to a degree and duration that will affect their defining characteristics and overall integrity.

Exploration drilling activities on ELs 1159 and 1160 are not likely to result in significant adverse cumulative environmental effects on Special Areas in combination with other projects and activities that have been or will be carried out.

6.8.6 Indigenous Communities and Activities

Other past and ongoing projects and activities in Eastern Canada have, to varying degrees, interacted with and affected Indigenous communities and activities, depending on their location, nature and scale in relation to the communities, activities and other components and interests of individual groups. The description of the socioeconomic characteristics of these Indigenous communities provided in the EIS inherently reflects such past and on-going activities and effects.

Given the nature, location and timing of the various activities and associated environmental changes likely to occur as a result of this Project, it is not expected to have direct, adverse effects on Indigenous communities and activities. The effects analysis also indicates that few of the marine associated resources (species) that are known to be used by these Indigenous groups migrate through the Project Area / LSA or are thus likely to be affected by Project activities and disturbances. The Project (including exploration activities on ELs 1159 and 1160) will therefore not result in residual environmental effects on Indigenous Communities and Activities or contribute to cumulative effects on this VC.

6.8.7 Commercial Fisheries and Other Ocean Users

Fisheries and other marine activities may be affected both individually and collectively by offshore oil and gas exploration and production, general marine traffic and other activities, each of which may result in direct disturbance, damage to equipment, effects on marine resources or other interactions, which may accumulate or interact on a regional scale. The extensive and dynamic nature of fishing and other marine activity throughout the region (in terms of locations, seasons, gear types and key species), and possible future changes in the fisheries off Eastern Newfoundland, makes it difficult to predict specific areas and times from year to year for both domestic and foreign activities, and thus, the potential for interactions between the effects of separate projects on these.

Although Project components and activities, including the associated safety zones, will temporarily reduce access for fishing and other activities in certain areas, such disturbances will be localized, short

term, and reversible once Project activity ceases at a particular location. The potential for interference by offshore oil and gas installations and vessels, as well as general marine traffic can be further mitigated through good communication and cooperation between industries, with fishing gear damage compensation initiatives being implemented as required. These mitigation measures will apply to the Project and other oil and gas activities in the region. Due to the relatively localized and short-term duration of these activities, it is unlikely there will be any significant cumulative effects on Commercial Fisheries and Other Ocean Users.

6.8.8 Cumulative Effects Summary

The Project is not likely to result in significant adverse cumulative environmental effects to the assessed VCs in combination with other projects and activities that have been or will be carried out. Moreover, the relative contribution of this Project to overall effects within the RSA will be low and will not likely be perceptible. Mitigation and monitoring or follow-up programs identified as part of the Project-specific effects assessment (Chapters 8 to 13 in the Abridged EIS) would be applicable to cumulative effects, in that they are relevant to addressing the Project's potential contribution to cumulative effects in the region. No additional or revised mitigation measures, monitoring or follow-up is required or proposed.

7.0 MITIGATION MEASURES AND COMMITMENTS

Design features and mitigation measures have been incorporated into the Project to prevent or reduce potential environmental effects. These design-feature mitigation measures, in combination with VC-specific mitigation measures will reduce environmental effects to acceptable levels. A summary of mitigation and commitments set out in the Abridged EIS is provided in Table 7.1. In addition, Equinor Canada will apply conditions outlined in the Decision Statement (CEA Agency 2019) and address IRs received during the EA process for the Flemish Pass EIS, to exploration drilling activities on ELs 1159 and 1160.

Table 7.1 Summary of Mitigation and Commitments

No.	Commitment Source	Operator Commitment
General*		
1	EIS	Adherence to C-NLOPB guidelines (environmental and drilling/production) and compliance with regulations, as applicable.
2	EIS	Equinor Canada will provide an update of planned activities to fishers and fish processors that will include timing of exploration activities and locations of planned wells. In addition, Equinor Canada will provide an EA update to the C-NLOPB each year that offshore operations are planned. The EA update will provide an overview of planned activities as defined by the scope of the project, update on recent and on-going engagement activities and their outcomes, and an overview of new information regarding commercial fishing activities and updates to SAR, if applicable, as well as outlining the proposed work for the coming year and evaluating the continued applicability and validity of the EIS predictions and mitigation measures.

Table 7.1 Summary of Mitigation and Commitments

No.	Commitment Source	Operator Commitment
3	EIS	A copy of the EA update will be sent to Indigenous groups and stakeholders identified in Chapter 3 of the EIS. Equinor Canada will follow up with Indigenous groups and stakeholders on questions arising from the EA update.
4	EIS	Use of existing and common travel routes for vessels and helicopters will be used where possible and practicable.
5	EIS	Low-level aircraft operations will be avoided where it is not required per Transport Canada protocols.
6	EIS	Operational discharges will be treated prior to release in accordance with the OWTG and other applicable regulations and standards.
7	EIS	The selection and screening of chemicals to be discharged, including drilling fluids, will be in accordance with the Offshore Chemical Selection Guidelines for Drilling and Production Activities on Frontier Lands (OCSG).
8	EIS	During formation flow testing with flaring, produced hydrocarbons and produced water will be flared. If there is a large amount of produced water encountered, it will be treated in accordance with the relevant regulatory requirements prior to ocean discharge or shipped to shore for appropriate disposal.
9	EIS	Appropriate handling, storage, transportation and on-shore disposal of solid and hazardous waste.
10	EIS	Spill prevention plans and procedures as required by the C-NLOPB, will be developed and submitted for approval to the C-NLOPB as a requirement of the OA and will include, at a minimum, the following: • Training of project personnel in spill prevention and response • Spill Response equipment for containment (e.g., booms) and/or removal • Implementation of measures to deter birds from contacting spilled oil (e.g., bird scaring devices) • Shoreline response measures, if oil is predicted to contact shoreline • Shoreline clean-up measures, if in the event oil contacts shoreline • Measure to be implemented for the rehabilitation and recovery of oiled seabirds • Overview of monitoring that could be conducted in relation to various spill events
11	Flemish Pass IR-01, IR-04	Submit a Notification to Suspend / Abandon to the C-NLOPB for approval.
12	Flemish Pass IR-07	Submit monthly compliance reports, including volumes of liquid wastes discharged to the marine environment (e.g., ballast water, bilge water, deck drainage, BOP testing fluids, produced water, well treatment fluids) to the C-NLOPB.
13	Flemish Pass IR-07	Submit annual environmental reports, including volumes of liquid wastes, to the C-NLOPB.
14	Flemish Pass IR-07	Equinor Canada will keep records of chemicals screened (i.e., chemicals that are, or have to the potential to be, discharged to the marine environment), and will make them available to the C-NLOPB upon request.

Table 7.1 Summary of Mitigation and Commitments

No.	Commitment Source	Operator Commitment
15	Flemish Pass IR-78, IR-78-2	The type and concentration of biocides to be used and discharged to the marine environment will be outlined, if applicable, in Equinor Canada's Environmental Protection Plans (EPPs).
Air Emissions		
16	EIS	Sulphur content in diesel fuel will meet the *Sulphur in Diesel Fuel Regulations* and will comply with the sulfur limits in fuels for large marine diesel engines, per the *Vessel Pollution and Dangerous Chemicals Regulations* under the *Canada Shipping Act*.
17	EIS	Adherence with the *Canadian Environmental Protection Act*, the Newfoundland *Air Pollution Control Regulations* for specified criteria air contaminants in exhaust emissions, relevant regulations under MARPOL, and use of the National Ambient Air Quality Objectives as the benchmark for assessing air quality
Marine Fish and Fish Habitat		
18	EIS	Prior to the start of a drilling campaign, a pre-drill coral survey will be undertaken (see Section 2.5.2 of the Abridged EIS). A report summarizing the coral mapping, risk assessment and planned mitigation measures (if corals are identified) will be prepared and submitted to C-NLOPB/DFO for review and acceptance.
19	EIS	Relocation of well and/or redirection of WBM cuttings discharge location in the event that the pre-drill coral survey and risk assessment identifies mitigations required to protect sensitive benthic habitat (i.e., corals and sponges)
20	EIS	SBM-related drill cuttings will be returned to the drilling installation and treated in accordance with the OWTG before being discharged to the marine environment. WBM-related drill cuttings will be discharged without treatment.
21	EIS	Use of explosives will not be employed for removal of wellheads.
22	EIS	At the time of decommissioning a well, the well will be inspected in accordance with applicable regulatory requirements.
23	Flemish Pass IR-16/16a-2	Generate a short list of potential research activities with Indigenous organizations (e.g., Unama'ki Institute of Natural Resources, Mi'kmaw Conservation Group) to address Indigenous concerns regarding knowledge/data gaps for salmon.
24	Flemish Pass IR-16/16a-2	Purchase 18 additional tags for the Atlantic Salmon Federation (ASF) salmon tagging program of kelt in Greenland in fall 2018.
25	Flemish Pass IR-16/16a-2	Consider deploying acoustic receivers in the Project Area to provide higher resolution data (i.e., location) within the Project Area.
26	Flemish Pass IR-16/16a-2	Present the data gap associated with the migratory route of salmon in the far offshore (Project Area) to the Environmental Studies Research Fund (ESRF) Secretariat in the fall management meeting as a potential new priority.
27	Flemish Pass IR-23	If DP is used instead of anchors, then the transponder areas would also be subjected to a pre-drill coral and sponge survey.
28	Flemish Pass IR-23-2	Provide copies of resumes associated with the selected Marine Biologists / Scientists, if requested by the C-NLOPB and/or DFO.
29	Flemish Pass IR-23-2	Provide video footage to C-NLOPB, DFO, stakeholders and/or Indigenous groups, if requested.

Table 7.1 Summary of Mitigation and Commitments

No.	Commitment Source	Operator Commitment
Marine and Migratory Birds		
30	EIS	Equinor Canada will avoid, where possible, established bird colonies. Helicopters will avoid known coastal seabird colonies per requirements of the NL *Seabird Ecological Reserve Regulations, 2015*
31	EIS	During drilling operations, routine observations of seabirds, following the Canadian Wildlife Service (CWS) protocols will be undertaken from the drilling installation.
32	EIS	Routine searches for stranded birds will be conducted on the platform and supply vessels, and appropriate programs and protocols for the collection and release of marine and migratory birds will be implemented for any birds that become stranded (i.e., Routine searches for stranded birds will be conducted on the platform and supply vessels, and appropriate programs and protocols for the collection and release of marine and migratory birds will be implemented for birds that become stranded (i.e., ECCC-CWS's "Procedures for handling and documenting stranded birds encountered on infrastructure offshore Atlantic Canada" [ECCC 2016] and Williams and Chardine "The Leach's storm-petrel - General Information and Handling Instructions" [no date; adapted in Appendix I of EC 2015]).
33	EIS	Equinor Canada will obtain a Seabird Handling permit from ECCC-CWS.
34	EIS	Maceration of sewage and kitchen waste, in accordance with the OWTG to 6 mm particle size.
35	EIS	Operators are required to notify the C-NLOPB for plans to flare associated with formation flow testing for exploration drilling. The C-NLOPB then consults with ECCC-CWS to determine a safe timeline to proceed to minimize effects on migrating birds
36	Flemish Pass IR-30	Requirements associated with seabird observation program will be outlined in the EPP and will take into consideration the latest information from ECCC.
37	Flemish Pass IR-30-2	Develop a seabird observation protocol in consultation with ECCC-CWS prior to commencing the first exploration drilling program. Information outlined in the seabird observation protocol will be determined in consultation with ECCC-CWS, and aspects such as frequency of searches, reporting procedures and training requirements will be included.
38	Flemish Pass IR-45	Requirements associated with oiled seabirds will be described in OSRPs.
Marine Mammals and Sea Turtles		
39	EIS	Project associated vessel traffic will be approximately eight to ten trips per month for one drilling installation. Use of existing and common travel routes will be used where possible and practical. Vessels will maintain a steady course and safe vessel speed whenever possible.
40	EIS	Use of explosives will not be employed for removal of wellheads.
41	Flemish Pass Decision Statement	Passive acoustic monitoring will be implemented as per the condition in the Flemish Pass Decision statement.

Table 7.1 Summary of Mitigation and Commitments

No.	Commitment Source	Operator Commitment
42	Flemish Pass IR-26	If a vessel strikes a marine mammal or sea turtle and assistance is required, then DFO will be contacted (1-888-895-3003) and details of the incident (e.g., species involved, speed of the vessel at the time of impact, state of the animal) will be recorded and reported.
43	EIS	As required in the Geophysical, Geological, Environmental and Geotechnical Program Guidelines (C-NLOPB 2019), mitigation measures applied during the project's geophysical surveys will be consistent with those outlined in the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment (SOCP) (DFO 2007b). The following is a partial list of those mitigation measures. Trained Marine Mammals Observers (MMOs) will be used to monitor and report on marine mammal and sea turtle sightings during VSP and geophysical surveys where seismic source arrays are used. A ramp-up of the source array (i.e., gradually increasing seismic source elements over a period of at least 20 minutes until the operating level is achieved) starting from a single source element. MMOs will implement a pre-ramp up watch of 30 minutes prior to the start of the air source. Ramp-up will be delayed if any marine mammal or sea turtle is sighted within the safety zone. Shut down of the seismic source array if a marine mammal or sea turtle listed as endangered or threatened on SARA Schedule 1.
Indigenous Communities and Activities		
44	EIS	The mitigation measures outlined elsewhere in this EIS will serve to avoid or reduce environmental emissions, disturbances and resulting environmental changes by minimizing reducing the nature, degree, extent and duration of these changes, and therefore, reducing the potential for these to interact with and adversely affect the various components and activities that comprise this VC. A copy of the EA update will be sent to the Indigenous groups and stakeholders identified in Chapter 3 of the Abridged EIS. Equinor Canada will follow up with Indigenous groups and stakeholders on questions arising from the EA update. Equinor Canada will continue to communicate with relevant Indigenous communities and representative organizations, through established and/or informal engagement processes, as required and requested. The specific nature, frequency, subject matter and format of such future engagement will be determined in discussion with the Indigenous organizations and outlined in an Indigenous Communities Fisheries Communication Plan.
45	Flemish Pass IR-16/16a-2	Provide Indigenous groups with result of research studies associated with salmon migration.
46	Flemish Pass IR-84-2	Equinor Canada will share its plans for monitoring and follow-up programs with Indigenous groups during upcoming and ongoing engagement. Throughout all phases of the Project, Equinor Canada will continue to engage with interested Indigenous groups and provide updates regarding the implementation of monitoring and follow-up programs and will share the results of these programs.
47	Flemish Pass IR-87-2	Share results and learnings from spill response exercise with Indigenous groups, if requested.

Table 7.1 Summary of Mitigation and Commitments

No.	Commitment Source	Operator Commitment
48	Flemish Pass IR-87-2	Provide Indigenous groups with a copy of the final OSRP.
Refer to Marine Fish and Fish Habitat and Commercial Fisheries and Other Ocean Users for additional commitments from IR/CLs responses that are also applicable to Indigenous Communities and Activities.		
Commercial Fisheries and Other Ocean Users		
49	EIS	Establishment of a safety zone around drilling installations in accordance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations*.
50	EIS	Issuance of Notices to Shipping, Notices to Mariners (where appropriate) regarding planned project activities.
51	EIS	Ongoing communications with commercial fishers through One Ocean, FFAW-Unifor and seafood producers regarding planned project activities, including timely communication of drilling locations, safety zone and decommissioned wellsites. This information will also be communicated to Indigenous commercial fishers in accordance with the Indigenous Communities Fisheries Communication Plan.
52	EIS	Ongoing communications with the NAFO Secretariat, through DFO as the Canadian representative, regarding planned project activities, including timely communication of drilling locations, safety zone and decommissioned wellsites.
53	EIS	In accordance with the One Ocean “Risk Management Matrix Guidelines,” the need for a Fisheries Liaison Officer (FLO) and/or fisheries guide vessels during drilling installation movement from port to its offshore location will be determined in consideration of the guidelines. Use of a FLO during geophysical programs will also be determined in consideration of these guidelines.
54	EIS	A single point of contact (SPOC) will be established during Project activities to facilitate communications between fishers and Equinor Canada regarding gear loss / damage and other compensation matters.
55	EIS	Develop and implement a compensation program for damages resulting from Project activities. This compensation program will be developed in consideration of C-NLOPB guidelines, including the Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity (C-NLOPB and CNSOPB 2017) and as revised. This program will outline compensation procedures for actual loss or damages to commercial fishers, including Commercial-communal fishers, attributable to Equinor Canada resulting from a spill or debris, or expenses incurred in taking remedial action. Actual loss or damage includes loss of income or future income; loss of hunting, fishing, or gathering opportunities; and costs and expenses incurred for action taken to remedy a situation involving a spill, including measure to control or clean a spill.
56	Flemish Pass IR-41-2	Develop the compensation program in consultation with Indigenous groups with communal-commercial licenses that overlap with the Project Area prior to commencing the first exploration drilling program.
57	EIS	The communication of suspended and/or abandoned wellsite locations to the appropriate authorities for inclusion on nautical charts for use by commercial fishers and other mariners.
58	EIS	Contact DFO regarding timing and locations of planned DFO research surveys

Table 7.1 Summary of Mitigation and Commitments

No.	Commitment Source	Operator Commitment
59	EIS	Contact Department of National Defence (DND) regarding timing of planned offshore military exercises
Effects of the Environment on the Project		
60	EIS	Selection criteria for drilling installations where the installation is capable of operating at required water depths and in environmental conditions prevalent in the Northwest Atlantic Ocean.
61	EIS	Third party certification – a Certificate of Fitness – of the drilling installation and other facilities, as required to obtain an OA issued by the C-NLOPB.
62	EIS	Physical environment data observations, weather forecasting, and reporting will be conducted in accordance with the Offshore Physical Environmental Guidelines.
63	EIS	Implementation of an Ice Management Plan. Options to be investigated for ice management include ice detecting radar on drilling installations and use of satellite data to monitor for presence of ice
64	EIS	Ability to quick disconnect riser in event of emergency.
*General mitigation measures are applicable to the assessment of potential environmental effects on all identified VCs.		

8.0 SIGNIFICANCE OF RESIDUAL EFFECTS

Chapters 8 to 14 of the Abridged EIS present the residual environmental effects (i.e., after mitigation measures have been applied) for each VC for routine Project-related interactions, as well as cumulative effects. Table 8.1 summarizes the residual effect findings for each VC and indicates the significance of these effects. Where an effect is predicted to be significant (refer to the specific VC-chapter of the Abridged EIS for predefined criteria for each VC), the likelihood of that effect occurring is also presented. With the implementation of proposed mitigation measures (refer to Table 7.1), residual adverse environmental effects of routine Project activities and components are predicted to be not significant for all VCs.

Chapter 15 of the Abridged EIS presents the residual environmental effects related to accidental events. Table 8.1 also summarizes the residual effect findings for each VC and indicates the significance of these effects. In the extremely unlikely event of a Project-related accidental event resulting in the large-scale release of oil, residual effects on Marine and Migratory Birds has potential to be significant if the spill trajectory overlaps spatially and temporally with sensitive receptors. Spill prevention techniques and response strategies (e.g., cap stacks, spill response processes detailed in Section 15.1 of the Abridged EIS) will be incorporated into the design and operations for Project activities as part of contingency planning.

Table 8 Summary of Residual Environmental Effects for Routine Operations, Accidental Events, and Cumulative Effects

VC	Routine Operations	Accidental Events		Cumulative Effects
	Significance of Residual Environmental Effect	Significance of Residual Environmental Effect	Likelihood of Significant Effect	Significance of Residual Environmental Effect
Marine Fish and Fish Habitat	N	N	N/A	N
Marine and Migratory Birds	N	S	L	N
Marine Mammals and Sea Turtles	N	N	N/A	N
Special Areas	N	N	N/A	N
Indigenous Communities and Activities	N	N	N/A	N
Commercial Fisheries and Other Ocean Users	N	N	N/A	N

Key:
N = Not significant residual environmental effect (adverse)
S = Significant residual environmental effect (adverse)
L = Low likelihood
N/A = Not Applicable

9.0 FOLLOW-UP AND MONITORING

Equinor Canada will obtain the required permits, approvals, and authorizations for the Project, and Equinor Canada and its contractors will comply with these and relevant regulations and guidelines in planning and implementing the Project. This includes the mitigation measures summarized in the preceding sections, the implementation of which will be directed, managed and tracked in accordance with the Equinor Canada's existing policies and procedures.

The following sections summarize the monitoring and follow-up programs to which Equinor Canada has committed in the EIS.

9.1 Follow-Up Program

Under CEAA 2012, a follow-up program is defined as a program for "verifying the accuracy of the environmental assessment of a designated project" and "determining the effectiveness of any mitigation measures." Based on the information presented in the EIS, and the conclusion of the effects assessment, a follow-up program will be undertaken in consideration of sensitive benthic habitat. Follow-up monitoring will occur if drilling is undertaken in the following circumstances:

- Within an identified VME or FCA
- Adjacent / near to an identified VME or FCA, such that drill cuttings dispersion model predicts that drill cuttings deposition may occur within the VME or FCA at levels above the biological effects threshold, or
- In an area where the results of the pre-drill coral survey and risk assessment (DFO / C-NLOPB reviewed and accepted) indicate that monitoring is required

The purpose of the follow-up monitoring program would be to determine the effectiveness of mitigation measures in protecting the sensitive benthic habitat. The monitoring program may include parameters such as:

- Sediment traps and/or seabed core samples to measure drill cuttings deposition
- Current and turbidity measurements
- Visual assessments using high-definition images / video

Detailed design of a follow-up monitoring program would be based on the pre-drill coral survey, potential ZOI as estimated in the drill cuttings dispersions modelling, location of the well in proximity to the sensitive benthic habitat, other site-specific information collected during planning, and industry experience in conducting similar monitoring programs (e.g., Norwegian Continental Shelf experience). If exploration wells are planned to be drilled near sensitive benthic habitat as outlined above, a follow-up monitoring program plan will be developed and submitted for C-NLOPB / DFO review and acceptance.

The effects of exploration drilling activities are well understood, and mitigation measures are effective, allowing for a high level of confidence in the environmental effects predictions. Therefore, follow-up monitoring is not proposed for other VCs, including SAR.

9.2 Environmental Monitoring and Observation Programs

Equinor Canada is proposing to implement monitoring and observation programs related to Marine Fish and Fish Habitat, Marine and Migratory Birds, and Marine Mammals and Sea Turtles, as well as environmental compliance monitoring as required by the *Drilling and Production Regulations*. A summary of these monitoring programs is provided in Table 9.1, with additional detail available in the EIS. The implementation schedule and program details will be developed in consultation with the appropriate regulatory agencies, including C-NLOPB, DFO, and Canadian Wildlife Service (CWS), as applicable.

Table 9.1 Summary of Monitoring Programs for Routine Project Activities

Proposed Monitoring Program	Program Overview	Applicable VC(s)	Proposed Intervention/Adaptive Management	Schedule	Reporting
Benthic Sedimentation Monitoring in VMEs / FCAs and / or other sensitive benthic habitat	Site specific monitoring program to be developed based on results of coral mapping and risk assessment. Monitoring program to be reviewed and accepted by C-NLOPB / DFO. May include: • sediment traps and/or seabed core samples to measure drill cuttings deposition • current and turbidity measurements • visual assessments using high-definition images / video	Marine Fish and Fish Habitat	Survey is for data gathering purposes. Coral mapping, risk assessment, and mitigation processes may be improved based on the results and learnings.	Drilling and Post-Drilling	A monitoring report will be provided to the C-NLOPB / DFO within 12 months of completing the monitoring program
Migratory Bird Observations	Operational program including: • A trained Environmental Observer will be onboard to record marine bird (and marine mammals) sightings during Project operations, which will be undertaken in accordance with CWS's monitoring protocol from fixed platforms • Regular searches of vessel decks will be undertaken and accepted protocols for the collection / handling of bird mortalities and release of birds that become stranded	Migratory and Marine Birds	Survey is for data gathering purposes.	Mobilization to well decommissioning	If a SAR is found alive (stranded) or dead on the drilling installation or survey vessel, a report will be sent to CWS for identification. Seabird observations report will be submitted to the C-NLOPB within 90 days of well suspension and/or decommissioning An annual report summarizing stranded and/or seabird handling will be submitted to the CWS in accordance with the Seabird Handling permit requirements.

Table 9.1 Summary of Monitoring Programs for Routine Project Activities

Proposed Monitoring Program	Program Overview	Applicable VC(s)	Proposed Intervention/Adaptive Management	Schedule	Reporting
Marine Mammal and Sea Turtle Observations	Operational program for marine mammals during geophysical surveys where sound source is used, including VSP: • A trained MMO will be onboard to record marine mammal and sea turtle sightings during Project operations • A marine mammal and sea turtle monitoring plan will be submitted to the applicable regulators for review at least 30 days prior to the commencement of the first geophysical survey • Visual monitoring for the presence of marine mammals and sea turtles within a pre-determined exclusion zone will take place during geophysical operations where an air source array is used • Observational / shutdown procedures will follow the SOCP	Marine Mammals and Sea Turtles	Survey is for data gathering purposes and reducing potential interactions	Geophysical surveys with use of sound source, VSP Surveys; as required	A report of the observational program will be submitted annually to the C-NLOPB and DFO, including documentation of marine mammal and sea turtle sightings. Vessel strikes involving marine mammals or sea turtles will be reported to DFO within 24 hours.

Table 9.1 Summary of Monitoring Programs for Routine Project Activities

Proposed Monitoring Program	Program Overview	Applicable VC(s)	Proposed Intervention/Adaptive Management	Schedule	Reporting
Environmental Compliance Monitoring	Environmental compliance monitoring is a requirement of the *Drilling and Production Regulations*. Monitoring of volumes and hydrocarbon concentration for the following treated effluents is completed: • Bilge and ballast water • Deck drainage • Drill cuttings	All			Monthly compliance monitoring report submitted to C-NLOPB during drilling operations. Final compliance monitoring report submitted to C-NLOPB within 90 days of completion of drilling activities.

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