Canadian Environmental Assessment Agency | Agence canadienne d'évaluation environnementale



Flemish Pass Exploration Drilling Project and Eastern Newfoundland Offshore Exploration Drilling Project

Draft Environmental Assessment Report

February 13, 2019

Canada

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Projet de forage exploratiore dans la passe Flamande et Project de forage exploratiore extracôtier à l'est de Terre-Neuve – rapport provisoire d'évaluation environnementale

Executive Summary

Equinor Canada Ltd. (Equinor) and ExxonMobil Canada Ltd. (ExxonMobil) are two proponents each proposing to conduct an offshore exploration drilling program within offshore exploration licences located in the northwest Atlantic Ocean.

Equinor proposes to conduct the Flemish Pass Exploration Drilling Project within four exploration licences (1139, 1140, 1141, 1142) in the Flemish Pass Basin. The closest licence is about 460 kilometres east of St. John's, Newfoundland and Labrador. Between 2019 and 2027, Equinor could drill up to 24 offshore wells (up to six per exploration licence).

ExxonMobil proposes to conduct the Eastern Newfoundland Exploration Drilling Project within three exploration licences (1134, 1135, 1137) in the Flemish Pass Basin and Jeanne d'Arc Basin. The closest licence is about 265 kilometres from St. John's, Newfoundland and Labrador. Between 2019 and 2029, ExxonMobil could to drill up to 18 offshore wells (up to six per exploration licence).

One or two drilling installations designed for year-round operations in deep water would be used for each project (collectively referred to as "the Projects"), as well as supply vessels and helicopters that would travel between the drilling areas and an existing supply base and airport in St. John's, Newfoundland and Labrador.

Each project would require authorization under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and may require authorization under the *Fisheries Act*. A permit under the *Species at Risk Act* may be required for effects on species that are listed as endangered or threatened on Schedule 1 of that act.

The Canadian Environmental Assessment Agency (the Agency) conducted a federal environmental assessment (EA) of each of the Projects based on the requirements of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). The Projects are subject to CEAA 2012 because they are described in the Schedule to the *Regulations Designating Physical Activities* as follows:

> *The drilling, testing, and abandonment of offshore exploratory wells in the first drilling program in an area set out in one or more exploration licences issued in accordance with the Canada-Newfoundland and Labrador Atlantic Accord Implementation Act or the Canada-Nova Scotia Offshore Petroleum Resources Accord Implementation Act.*

This EA Report provides a summary and the main findings of the federal EAs for each of the two Projects. The Projects are similar in nature and timing, and the proponents collaborated in the planning and completion of key technical documents. A single EA Report has been prepared by the Agency to provide information about both Projects to enable process efficiencies and avoid duplication for reviewers.

The Agency prepared this report in consultation with the Canada-Newfoundland and Labrador Offshore Petroleum Board, Fisheries and Oceans Canada, Environment and Climate Change Canada, Health Canada, Natural Resources Canada, Transport Canada, the Parks Canada Agency, the Department of National Defence, and Indigenous and Northern Affairs Canada following a technical review of the proponents' Environmental Impact Statements and an evaluation of the potential environmental effects of each project. The Agency also considered the views of Indigenous peoples and the general public.

The EAs focused on features of the natural and human environments that may be adversely affected by the Projects and that are within federal jurisdiction as described in Subsection 5(1) of CEAA 2012, and on changes that may be caused in the environment that are directly linked or necessarily incidental to federal authorizations as described in Subsection 5(2) of CEAA 2012. These are referred to as valued components. The Agency selected the following valued components for this EA:

- fish and fish habitat (including marine plants);
- marine mammal and sea turtles;
- migratory birds;
- species at risk;
- special areas;
- commercial fisheries; and
- current use of lands and resources for traditional purposes and health and socio-economic conditions of Indigenous peoples.

The Agency assessed the potential for the Projects to cause significant adverse environmental effects on these valued components based on information provided by the proponents, specialist or expert information and knowledge from government organizations, and input from Indigenous peoples and the general public. During the EAs, participants raised concerns about each project's potential routine and accidental effects on the marine environment (e.g. marine mammals and sea turtles, fish, birds, special areas) and commercial fishing, and on related effects on Indigenous peoples.

The potential environmental effects of the Projects' routine operations include:

- effects on fish habitat caused by the discharge of drilling waste (used drilling fluid and cuttings) to the marine environment;
- effects on marine mammals, fish and/or sea turtles caused by underwater noise from well site surveys and vertical seismic profiling operations, and from support vessels and drilling installation(s) operations;
- effects on migratory birds caused by lights on the drilling installation(s) and supply vessels and, if well testing is required, flaring; and
- interference with commercial fisheries, Indigenous or otherwise, including effects on fishing activity that may be caused by the need to avoid the safety exclusion zone around drilling installations.

The proponents' project planning and design incorporates measures to mitigate the adverse effects of their respective Projects through implementation of their respective corporate policies, commitments, and management systems.

Accidents and malfunctions could occur during exploration drilling and cause adverse environmental effects. These accidents and malfunctions include batch fuel (diesel) spills, spills of drilling muds, and blowouts. Oil spill fate and trajectory modelling and analyses were performed to help evaluate potential effects of certain accidental spills (i.e. blowouts and batch spills) and to assist in spill response planning.

Historically, the incidence of large oil spills during exploration drilling is extremely low. The proponents proposed design measures, operational procedures, and dedicated resources to prevent and respond to spills of any size from the Projects. The proponents stated that in the unlikely event of a blowout, oil spill response measures would be undertaken in a safe, prompt, and coordinated manner. These response measures could include containment, application of dispersants, mechanical recovery and shoreline protection operations, as applicable. To minimize response times, the Canada-Newfoundland and Labrador Offshore Petroleum Board will require submission of well capping and containment plans that explore all options to reduce response times.

The Agency identified key mitigation measures and follow-up program requirements for consideration by the Minister of Environment and Climate Change in establishing conditions as part of CEAA 2012 decision statements for each of the Projects, in the event that the Projects are ultimately permitted to proceed. Given the current and potential expansion of activity of the offshore oil and gas sector in the Newfoundland and Labrador offshore area, the Agency is of the view that information gathered through the implementation of these conditions be presented and shared with industry, Indigenous groups, stakeholders, and other interested parties. In addition to the Projects, there are a number of other offshore exploration drilling projects and related activities being proposed for the Newfoundland and Labrador offshore area, including a regional assessment currently being led by the Agency. The information gathered from the proponents would be an important contribution to other processes, to help the industry as a whole evolve, and to foster greater knowledge and understanding among all parties.

The Projects' possible effects on potential or established Aboriginal or treaty rights were also examined. One of the primary concerns raised by Indigenous groups during the EAs were the potential effects of routine operations and accidental events on Atlantic Salmon, a species with significant importance to Indigenous cultures that has experienced population declines in recent decades, with some populations classified as endangered or threatened. Recognizing the data gaps in Atlantic Salmon migration patterns and population declines, the proponents have contributed to salmon conservation research and are exploring potential future research collaborations with Indigenous groups. Indigenous groups also raised concerns about the potential effects of large-scale spills on fishing for commercial or traditional purposes and associated health effects. The Agency is of the opinion that the recommended measures to mitigate potential environmental effects on fish and fish habitat and commercial fisheries, and to prevent or reduce the effects of accidents and malfunctions, are appropriate measures to accommodate for potential impacts on rights.

The Agency concludes that the Eastern Newfoundland Offshore Exploration Drilling Project is not likely to cause significant adverse environmental effects, taking into account the implementation of mitigation measures. The Agency also concludes that the Flemish Pass Exploration Drilling Project is not

likely to cause significant adverse environmental effects, taking into account the implementation of mitigation measures.

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List of Abbreviations and Acronyms

Abbreviation/Acronym	Definition
Agency	Canadian Environmental Assessment Agency
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
CO_2	Carbon Dioxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EA Report	Environmental Assessment Report
EA	Environmental Assessment
EIS	Environmental Impact Statement
EIS Guidelines	Guidelines for the Preparation of an Environmental Impact Statement
Equinor	Equinor Canada Ltd. (formerly Statoil Canada Ltd.)
Equinor's project	Flemish Pass Exploration Drilling Project
ExxonMobil	ExxonMobil Canada Ltd.
ExxonMobil's project	Eastern Newfoundland Offshore Exploration Drilling Project
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
MARPOL	International Convention for the Prevention of Pollution from Ships
MCPEI	Mi'kmaq Confederacy of Prince Edward Island
MMS	Mi'gmawei Mawiomi Secretariat
MTI	Mi'gmawe'l Tplu'taqnn Incorporated
NAFO	Northwest Atlantic Fisheries Organization
NOx	Nitrogen Oxides
Projects	Flemish Pass Exploration Drilling Project and Eastern Newfoundland Offshore Exploration Drilling Project
Proponents	Equinor Canada Ltd. and ExxonMobil Canada Ltd.
Section 35 Rights	Potential or established Aboriginal or treaty rights protected under section 35 of the *Constitution Act, 1982*
WNNB	Wolastoqey Nation of New Brunswick

Glossary

Term	Definition
Abandonment	The process of securing a drilled well in a manner that allows it to be left indefinitely without further attention, and which prevents movement of petroleum (or potential petroleum) from its reservoir to another subsurface formation or to the environment.[1]
Ballast water	Water that is brought on board a vessel to increase the draft, change the trim, regulate the stability, or to maintain stress loads within acceptable limits.[2]
Blowout preventer	An apparatus affixed to the top of a wellhead during drilling operations that contains high-pressure wellhead valves designed to shut off the uncontrolled flow of reservoir fluids to the environment in a case where a loss of well control has been experienced.[1]
Conductor Casing	The first casing that is installed and cemented in place in a borehole to provide structural support for wellhead equipment and to prevent washout while drilling the hole for the surface casing. [1]
Cuttings	Chips and small fragments of rock produced by drilling that are circulated up from the drill bit to the surface by drilling mud.[1]
Drilling installation	A drillship, semi-submersible drilling unit, jack-up drilling unit or other floating or fixed structure used in a drilling program and fitted with a drilling rig, and includes the drilling rig and other facilities and equipment necessary for drilling of wells for petroleum exploration or development.[1]
Exploratory well	A well in an area where petroleum has not been previously found or one targeted for formations above or below known reservoirs.[1]
Flaring	The burning of unwanted petroleum (gas or liquid) as it is released to the atmosphere through a pipe, which has a burner and ignition system affixed (also called a flare tip). [1,3]
Formation	The term for the primary unit in stratigraphy consisting of a succession of strata useful for mapping or description which possesses certain distinctive lithologic and other features.[1]
Marine Riser	For drilling installations with open water between the drill floor and the seabed, a pipe that extends from the top of the blowout preventer to the bottom of the drill floor. The drill string is operated through the riser, and the riser allows drilling fluid circulated down the drill string to return to the installation. It also supports the choke, kill and control lines and may be used as a running string for the blowout preventer. [1]
Produced water	Water associated with formation fluids in petroleum reservoirs that is produced along with oil and gas.[1]
Reservoir	A subsurface body of rock having sufficient porosity and permeability to store and transmit fluids and which contains petroleum. [1,3]
Subsea Well	A well where the casing commences below the surface of the sea and above the seabed.[1]
Suspended well	A well in which drilling operations have temporarily ceased - the well has been made secure but measures to permanently abandon the well have not been completed.[1]
Synthetic-based mud	A drilling mud in which the continuous phase is a synthetic fluid that should have a total polycyclic aromatic hydrocarbon concentration of less than 10 milligrams per kilogram, be relatively nontoxic in marine environments and have the potential to biodegrade under aerobic conditions.[1]

Vertical seismic profiling	A class of borehole seismic measurements used for correlation with surface seismic data, for obtaining images of higher resolution than surface seismic images and for looking ahead of the drill bit.[3]
Water-based mud	A drilling fluid in which fresh or salt water is the continuous phase as well as the wetting (external) phase whether oil is present or not.[1,3]
Wellbore	The hole that would be drilled as part of the exploration drilling activities.[3]
Wellhead	During drilling, the location at the top of the surface casing where the blowout preventer connects to the well to provide fluid and pressure containment for drilling activities.[1]

References

1 Canada-Newfoundland and Labrador Offshore Petroleum Board

2 Transport Canada (https://www.tc.gc.ca/eng/marinesafety/oep-environment-ballastwater-defined-249.htm)

3 Schlumberger Limited (https://www.glossary.oilfield.slb.com/)

1 Introduction

1.1 Purpose of the Draft Environmental Assessment Report

The purpose of the Environmental Assessment (EA) Report is to provide a summary of information and analysis considered by the Canadian Environmental Assessment Agency (the Agency) in reaching its conclusion on whether the Flemish Pass Exploration Drilling Project (Equinor's project) and the Eastern Newfoundland Offshore Exploration Drilling Project (ExxonMobil's project) (collectively referred to as "the Projects") are likely to cause significant adverse environmental effects, after taking into account the proposed mitigation measures (Appendix A). The Minister of the Environment and Climate Change will consider this report and comments received from Indigenous groups and the public in making a decision on whether each project is likely to cause significant adverse environmental effects, following which the Minister will issue an EA decision statement for each project.

Equinor Canada Ltd. (Equinor, formerly known as Statoil Canada Ltd.) is proposing to conduct an exploration drilling project within four offshore exploration licences located in the Flemish Pass Basin, approximately 460 to 580 kilometres east of St. John's, Newfoundland and Labrador. Equinor's project would determine the presence, nature, and quantities of the potential hydrocarbon resource in exploration licences 1139, 1140, 1141, and 1142. Over a period from 2019 to 2027, Equinor could drill up to 24 offshore wells (up to six per exploration licence). For the purposes of the EA and to account for uncertainties regarding the exact number of wells that may be drilled, Equinor included initial estimates of up to 30 wells in its environmental effects analysis.

ExxonMobil Canada Ltd. (ExxonMobil) is proposing to conduct an offshore exploration drilling project within three offshore exploration licences in the Flemish Pass Basin and the Jeanne d'Arc Basin, approximately 265 to 450 kilometres east of St. John's, Newfoundland and Labrador. ExxonMobil's project would determine the presence, nature, and quantities of the potential hydrocarbon resource in exploration licences 1134, 1135, and 1137. Over a period from 2019 to 2029, ExxonMobil could drill up to 18 offshore wells (up to six per exploration licence). For the purposes of the EA and to account for uncertainties regarding the exact number of wells that may be drilled, ExxonMobil included initial estimates of up to 35 wells in its environmental effects analysis.

1.1.1 *Coordination of the Environmental Assessments*

Both Equinor's and ExxonMobil's projects are designated projects under the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) and each requires an EA. Although these are two separate projects, they are similar in nature and timing. Equinor and ExxonMobil (collectively referred to as "the proponents") worked closely together throughout their EAs including collaborating in the planning and completion of key technical documents (i.e. Environmental Impact Statements [EISs], responses to Information Requirements). The Agency determined that preparing a single EA Report for both Projects would improve the efficiency of the EA processes by avoiding duplication and allowing Indigenous groups and the public to review and comment on a single document. The Minister of Environment and Climate Change will consider the final EA Report and issue a separate EA Decision Statement for each project.

1.2 Scope of Environmental Assessment

1.2.1 *Environmental assessment requirements*

Canadian Environmental Assessment Act, 2012 Requirements

The Projects are each subject to CEAA 2012 because they involve activities that are described in item 10 of the Schedule to the *Regulations Designating Physical Activities* of CEAA 2012 and are therefore designated projects as defined in CEAA 2012. The Projects would each include the drilling, testing, and abandonment of offshore exploratory wells in the first drilling program in an area set out in one or more exploration licences issued in accordance with the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act*.

The proponents' project descriptions provided the basis for the Agency to conduct screenings of the Projects in accordance with CEAA 2012 to determine if an EA of each project would be required. A breakdown of key dates for the screening processes for each project is as follows:

- Equinor's project
    - August 8, 2016: Equinor submitted a project description
    - August 19, 2016: the Agency commenced a screening and invited the public and Indigenous peoples to comment on the designated project and its potential environmental effects
    - October 3, 2016: the Agency determined that a federal EA was required and the EA commenced
- ExxonMobil's project
    - September 16, 2016: ExxonMobil submitted a project description
    - September 28, 2016: the Agency commenced a screening and invited the public and Indigenous peoples to comment on the designated project and its potential environmental effects
    - November 10, 2016: the Agency determined that a federal EA was required
    - November 14, 2016: the EA commenced

Other environmental assessment requirements

The Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) is an independent joint agency of the Governments of Canada and Newfoundland and Labrador and is responsible for regulation of petroleum activities in the Newfoundland and Labrador offshore area. The C-NLOPB requires EAs of proposed exploration drilling programs to support its authorization process under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act*. The federal EAs of the Projects conducted by the Agency is intended to satisfy the C-NLOPB's EA requirements.

The Projects are not subject to Newfoundland and Labrador provincial EA requirements.

1.2.2 *Designated Projects*

The Agency issued Guidelines for the Preparation of an EIS (EIS Guidelines) to each proponent on December 23, 2016. The EIS Guidelines for each project can be found at the following links:

- Equinor's project: http://www.ceaa-acee.gc.ca/050/documents/p80129/116854E.pdf
- ExxonMobil's project: http://www.ceaa-acee.gc.ca/050/documents/p80132/122446E.pdf

Sections 3.1 of the respective EIS Guidelines describes the designated projects subject to EA under CEAA 2012.

Equinor's project subject to EA under CEAA 2012 includes the drilling, testing, and abandonment of up to 24 offshore wells within exploration licences 1139, 1140, 1141, and 1142 and other associated incidental activities.

ExxonMobil's project subject to EA under CEAA 2012 initially included the drilling, testing, and abandonment of up to 18 offshore wells within exploration licences 1135 and 1137 and other associated incidental activities. On March 1, 2018, ExxonMobil requested that exploration licence 1134 be included in the scope of the ongoing federal EA. After considering this request, the Agency amended the EIS Guidelines for ExxonMobil's project on March 23, 2018 to include exploration licence 1134 in the federal EA of the project and required preparation of an addendum to the EIS.

1.2.3 *Factors considered in the environmental assessment*

Subsection 19(1) of CEAA 2012 requires the following factors to be considered in a federal EA:

- the environmental effects of the project, including the effects of malfunctions or accidents that may occur in connection with the project and any cumulative effects that are likely to result from the project in combination with other physical activities that have been or will be carried out;
- the significance of the environmental effects;
- comments from the public;
- technically and economically feasible measures to mitigate any significant adverse environmental effects of the project;
- the requirements of a follow-up program in respect of the project;
- the purpose of the project;
- alternative means of carrying out the project that are technically and economically feasible and the environmental effects of these alternatives; and
- changes to the project that may be caused by the environment.

The Agency considered comments from Indigenous peoples and the public during the review of the proponents' EISs and EIS summaries and the preparation of this draft EA Report. The Agency also requested specialist or expert information or knowledge from the C-NLOPB, Fisheries and Oceans Canada, Environment and Climate Change Canada, Natural Resources Canada, Health Canada, Transport Canada, the Parks Canada Agency, the Department of National Defence, and Indigenous and Northern Affairs Canada.

1.2.4 *Selection of valued components*

The EAs for each project focused on those components of the environment which have particular value or significance and may be affected by the Projects. These valued components play an important role in the ecosystem or have value placed on them by humans.

The proponents' valued component selection processes were based on and informed by a number of key considerations and inputs including the EIS Guidelines, regulatory guidance, Indigenous and stakeholder engagement and concerns, the nature and characteristics of the Projects, the existing environmental settings, experience and knowledge from other offshore oil and gas projects, and the professional experience of the proponents and their consultants.

In accordance with subsection 5(1) of CEAA 2012, the Agency assessed potential environmental effects of the Projects on fish and fish habitat as defined in the *Fisheries Act*, aquatic species as defined in the *Species at Risk Act*, and migratory birds as defined in the *Migratory Birds Convention Act*. Also in accordance with subsection 5(1) of CEAA 2012, the Agency took into account any change that may be caused to the environment that would occur on federal lands (i.e. in the marine environment including marine special areas). The Agency also considered the potential for effects on Indigenous peoples of any changes that may be caused to the environment by the Projects.

Subsection 5(2) of CEAA 2012 requires the Agency take into account the effects of any changes in the environment that are directly linked or necessarily incidental to a federal authority's exercise of a power, duty or function that would permit the Projects to proceed in whole or in part. Accordingly, the Agency assessed the potential effects of project-induced changes on commercial fishing, based on the need for authorization by the C-NLOPB under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act*, and the potential need for authorization under the *Fisheries Act* and a permit under the *Species at Risk Act*. In accordance with subsection 5(2) of CEAA 2012, the Agency also considered the potential for environmental effects on certain coastal special areas.

In addition to CEAA 2012 requirements, Section 79 of the *Species at Risk Act* requires the Agency to consider a project's environmental effects on species at risk.

Based on the above considerations, the valued components considered by the Agency and the corresponding valued components selected by the proponents are presented in Table 1.

Table 1 Valued Components Selected by the Agency

Component	Included in Agency's analysis?	Agency rationale	Corresponding valued component selected by the proponent
Effects identified under Subsection 5(1) of CEAA 2012			
Fish and Fish Habitat	Yes	Included because of its ecological importance, the legislated protection of fish and fish habitat and applicable species at risk, the socio-economic importance of fisheries resources, and the nature of potential project-valued component interactions. Includes corals and sponges.	Marine Fish and Fish Habitat
Marine Plants	Yes	Potential effects on marine plants were considered in the Agency's assessment of effects on fish and fish habitat.	Marine Fish and Fish Habitat
Marine Mammals and Sea Turtles	Yes	Included because of its ecological importance, the legislated protection of marine mammals and applicable species at risk, and the nature of potential project-valued component interactions.	Marine Mammals and Sea Turtles

Component	Included in Agency's analysis?	Agency rationale	Corresponding valued component selected by the proponent
Migratory Birds	Yes	Included because of its ecological importance, the legislated protection of migratory birds and applicable species at risk, and the nature of potential project-valued component interactions.	Marine and Migratory Birds
Current Use of Lands and Resources for Traditional Purposes and Health and Socio-Economic Conditions of Indigenous Peoples	Yes	Certain species of importance to Indigenous communities (e.g. Atlantic Salmon, some species of migratory birds) may pass through the project area before moving to areas that could be subject to traditional harvesting. Indigenous fisheries or harvesting could also be affected by an accident or malfunction associated with the Projects. The contamination (or perception thereof) of fish and seafood in the event of a major spill could affect country food consumption in some Indigenous communities. Indigenous communal commercial fishing licences overlap with exploration licences included in the Projects. These were considered in the Agency's assessment of effects on commercial fishing (below).	Indigenous Communities and Activities; Commercial Fisheries and Other Ocean Users
Physical or Cultural Heritage of Indigenous Peoples and Historical, Archaeological, Paleontological or Architectural Sites or Structures of Indigenous Peoples	No	The exploration licences are located at least 265 kilometres offshore from St. John's, Newfoundland and Labrador. Project activities and components are not anticipated to result in any changes to the environment that would have an effect on physical and cultural heritage. Surveys conducted prior to seabed disturbance (drilling) would allow detection and avoidance of heritage resources, if present.	None
Special Areas (Marine)	Yes	There are several marine special areas that may be affected by the Projects.	Special Areas
Air Quality and Greenhouse Gas Emissions	No	While there are direct emissions of greenhouse gases from the Projects, there are no upstream emissions. The Projects would be short-term and routine activities would contribute a relatively small amount to provincial totals (i.e. 1.3 to 1.9 percent of Newfoundland and Labrador's average annual emissions). Additional information on greenhouse gases is provided in Section 2.5.3.	None

Component	Included in Agency's analysis?	Agency rationale	Corresponding valued component selected by the proponent
		The Projects would adhere to applicable regulations and standards, including the *Newfoundland and Labrador Air Pollution Control Regulations* under the Environmental Protection Act and the *Management of Greenhouse Gas Act*; and regulations and emission limits under the *International Convention for the Prevention of Pollution from Ships*. The Projects would also operate within the *National Ambient Air Quality Objectives* and the *Canadian Ambient Air Quality Standards* framework. Given their locations at least 265 kilometres offshore from St. John's, Newfoundland and Labrador, the Projects would not be close to permanent receptors sensitive to atmospheric emissions.	
Effects identified under Subsection 5(2) of CEAA 2012			
Commercial Fisheries	Yes	Commercial fishing activity could be affected by routine operations (e.g. safety exclusion zones) or by accidental events. Indigenous communal commercial fishing licences overlap with exploration licences that are included in the Projects.	Commercial Fisheries and Other Ocean Users
Recreational Fisheries	No	There is no known recreational fishing activity in the vicinity of the exploration licences, which range from approximately 265 to 580 kilometres from St. John's, Newfoundland and Labrador. In nearshore and coastal waters, there is a recreational groundfish fishery during designated times in summer and fall, and angling for smelt year-round. Routine project activities and components are not expected to interfere with nearshore recreational fisheries beyond current levels because supply vessels would use existing routes and harbour approaches, avoiding interference with nearshore activities outside the approaches. Nearshore recreational fishing may be affected by accidental events associated with the Projects. Measures proposed to mitigate effects on fish and fish habitat would mitigate similar environmental effects on recreational fisheries.	Commercial Fisheries and Other Ocean Users

Component	Included in Agency's analysis?	Agency rationale	Corresponding valued component selected by the proponent
Special Areas (Coastal)	Yes	There are several coastal areas of importance in the regional study area. These may be affected by the Projects in the event of an unmitigated subsea blowout.	Special Areas
Human Health	No	Other than human presence on the drilling installations themselves, there is only intermittent and relatively low human presence on fishing and other vessels in the vicinity of the exploration licences, which range from approximately 265 to 580 kilometres from St. John's, Newfoundland and Labrador. Therefore, routine project activities would not expose the general public to a health risk. Similarly, the distance from land and anticipated spill trajectories in the event of a large-scale spill offshore would have low potential for shoreline oiling and associated effects on coastal communities and human health.	None
Effects identified under Subsection 79 (2) of the *Species at Risk Act*			
Species at Risk	Yes	The *Species at Risk Act* requires consideration of listed species when conducting an EA under CEAA 2012. The Agency also examined effects on species assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as endangered, threatened, or of special concern. There are species at risk in the regional study area that could be affected by the Projects.	The proponents assessed applicable species at risk within their analyses of effects on fish and fish habitat, marine mammals and sea turtles, and migratory birds.

1.2.5 *Spatial and Temporal Boundaries as Defined by the Proponents*

Spatial and temporal boundaries of an EA are established to define the area and timeframe within which a project may interact with the environment and cause environmental effects. The spatial and temporal boundaries may vary among valued components depending on the nature of the potential environmental interactions with a project. Spatial boundaries reflect the geographic range over which a project's potential environmental effects may occur, recognizing that some environmental effects could extend beyond the immediate vicinity of a project. Temporal boundaries identify when an environmental effect may occur in relation to specific project activities and components.

As described below, the proponents defined three types of spatial boundaries for each project: project area, local study area, and regional study area, as illustrated in Figure 1. These boundaries are the same for both of the Projects:

Proponents' Project Area: The proponents described the project area as the overall geographic area within which all planned project-related components and activities would take place, with the exception of vessel and helicopter routes to and from the island of Newfoundland. The project area is approximately 100 800 square kilometres in size and covers exploration licences off eastern Newfoundland and Labrador where exploration drilling activities may be carried out, as well as a surrounding area to account for potential ancillary and support activities. The proponents divided the project area into two smaller areas:

1. project area – northern section: a 66 878 square kilometre area that includes Equinor's exploration licences 1139, 1140, 1141, and 1142, ExxonMobil's exploration licence 1135, and part of ExxonMobil's exploration licence 1134
2. project area – southern section: a 33 930 square kilometre area that includes ExxonMobil's exploration licences 1137 and part of 1134

Note: The proponents defined the project area for the EAs as described above. References to the project area throughout this report are consistent with that definition for the purposes of describing the proponents' effects analysis. However, the Agency notes that project activities for the designated projects subject to federal EA (Section 1.2.2) would be limited to the exploration licences within which exploration drilling could occur (i.e. exploration licences 1139, 1140, 1141 and 1142 for Equinor's project and exploration licences 1134, 1135, and 1137 for ExxonMobil's project), as well as routes to and from these exploration licences to the supply base and airport on the island of Newfoundland.

Proponents' Local Study Areas: The proponents defined local study areas for each valued component (Table 2). The local study areas encompass the geographic area over which planned and routine project-related environmental interactions with each valued component may occur.

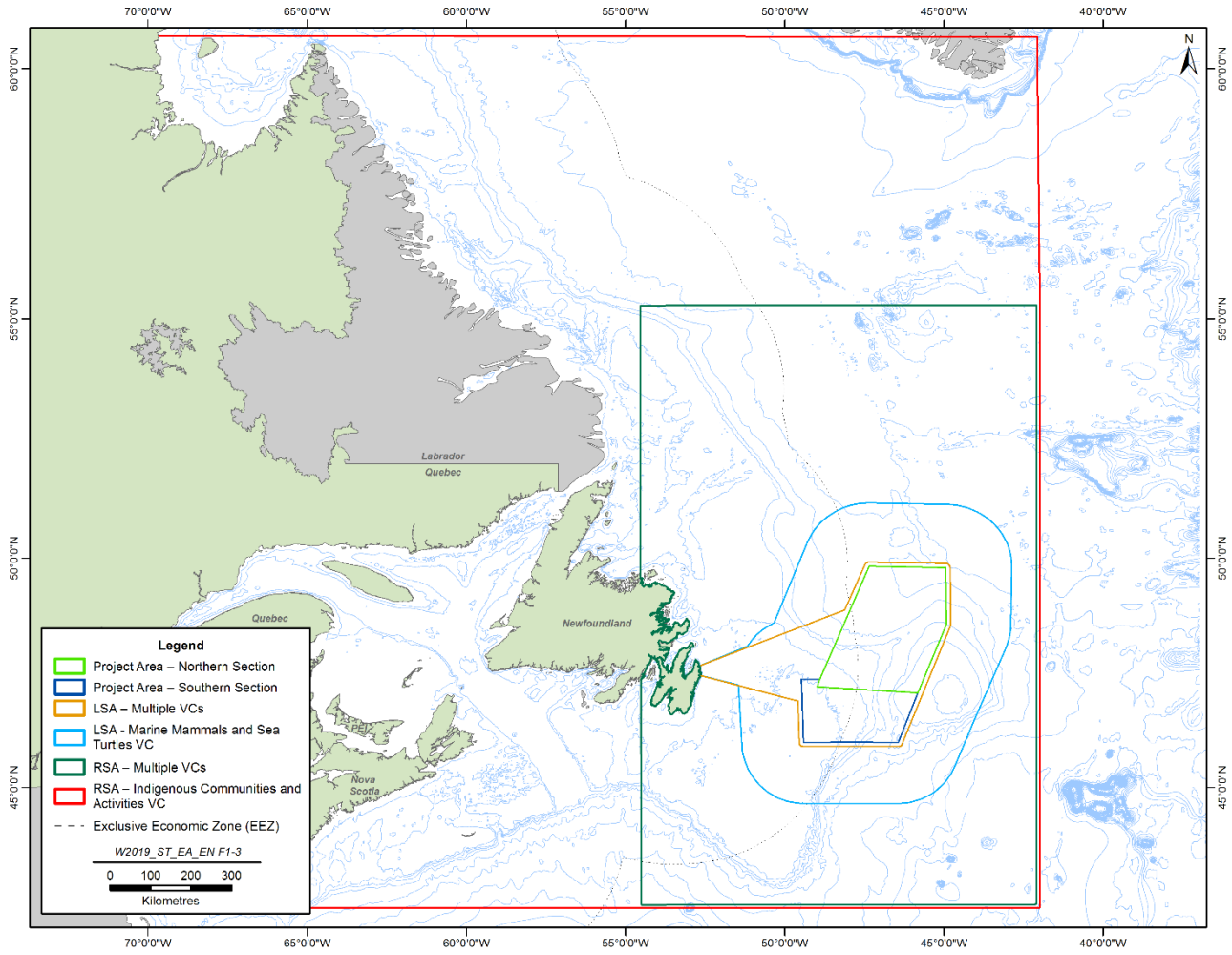
Table 2 Local Study Areas for Valued Components as Described by the Proponents

Valued Components	Local Study Area
- Marine Fish and Fish Habitat - Marine and Migratory Birds - Special Areas - Indigenous Communities and Activities - Commercial Fisheries and Other Ocean Users	The project area and an approximately ten kilometre buffer around it, as well as the associated vessel and aircraft traffic routes.
- Marine Mammals and Sea Turtles	The project area and an approximately 150 kilometre buffer around it, as well as the associated vessel and aircraft traffic routes and a ten-kilometre area buffer around those routes.

Source: Equinor Canada Ltd., 2017 and ExxonMobil Canada Ltd., 2017

Proponents' Regional Study Area: The proponents' defined the regional study area by considering the characteristics, distributions, and movements of valued components within the larger regional areas within which they occur and function, as well as the potential nature and geographic extent of an oil spill. The regional study area is the same for all valued components except for Indigenous communities and activities (Figure 1). The regional study area for Indigenous communities and activities recognizes and considers the spatial distribution and overall geographic extent of the various Indigenous communities and activities under consideration, as well as the distribution and movements of the various marine-associated resources that are used for traditional purposes by these communities.

Figure 1 Environmental Assessments' Spatial Boundaries as Defined by the Proponents



Source: Equinor Canada Ltd., 2017 and ExxonMobil Canada Ltd., 2017

1.2.6 *Methods and Approach*

In their EISs, the proponents assessed the Projects' effects based on a structured approach that is consistent with accepted practices for conducting EAs and with the Agency's *Operational Policy Statement: Determining Whether a Project is Likely to Cause Significant Adverse Environmental Effects under the Canadian Environmental Assessment Act, 2012*. The proponents used a standardized framework to facilitate individual assessments of each valued component. They identified and focused their assessments on likely environmental interactions between the Projects and valued components, and evaluated the nature and degree of changes to, and resulting effects on, the existing (baseline) environment that may potentially occur as a result of Projects. The application of mitigation measures was also considered in the analyses (a list of key mitigation, monitoring and follow-up commitments is provided in Appendix A).

The predicted residual environmental effects (i.e. those effects that remain after the planned mitigation measures have been implemented) on each valued component were then characterized based on the following assessment criteria:

- nature/direction of the effect: whether the effect was predicted to be positive, adverse, or neutral;
- magnitude: the degree of change from baseline conditions in the affected area;
- geographic extent: the spatial area within which the environmental effect would likely occur;
- duration: the period of time over which the environmental effect would likely be evident;
- frequency: how often the environmental effect would likely occur (i.e. continuous or at specific time intervals); and
- reversibility: the ability of an environmental component to return to an equal or improved condition once the disturbance(s) has ended.

In addition to the criteria above, the proponents also considered the current condition of each environmental component as a result of natural and/or anthropogenic factors, and thus its resulting resiliency or sensitivity to further change (i.e. ecological/socioeconomic context). The proponents then determined the significance of residual project-related environmental effects based on pre-defined standards or thresholds (i.e. significance rating criteria). They also considered the level of confidence in their environmental effects predictions and identification of mitigation, along with sources of uncertainty, data gaps, and issues of reliability, sensitivity, and approaches to conservativeness.

Appendix B summarizes the proponents' residual effects assessments for valued components for routine operations. Effects of accidents and malfunctions are described in Section 7.1.

The Agency reviewed various sources of information in conducting its analysis, including:

- the proponents' EISs and EIS Summaries;
- additional information received from the proponents in response to the information requirements issued by the Agency following its review of the EISs;
- advice from expert departments and agencies, including the C-NLOPB;
- comments received from the public; and
- comments received from Indigenous peoples.

The Agency determined the significance of residual effects of routine project operations (Section 6) by taking into account the mitigation measures that it considered necessary. The Agency also considered the effects of accidents and malfunctions that may occur in connection with the Projects (Section 7.1), as well as the effects of the environment on the Projects (Section 7.2) and cumulative environmental effects (Section 7.3).

2 Overviews of the Projects

2.1 Locations of the Projects

The Projects would take place in exploration licences located in the northwest Atlantic Ocean, as described below.

The proponents would rely on existing shore base facilities on the island of Newfoundland. Helicopter support would be based out of the St. John's International Airport.

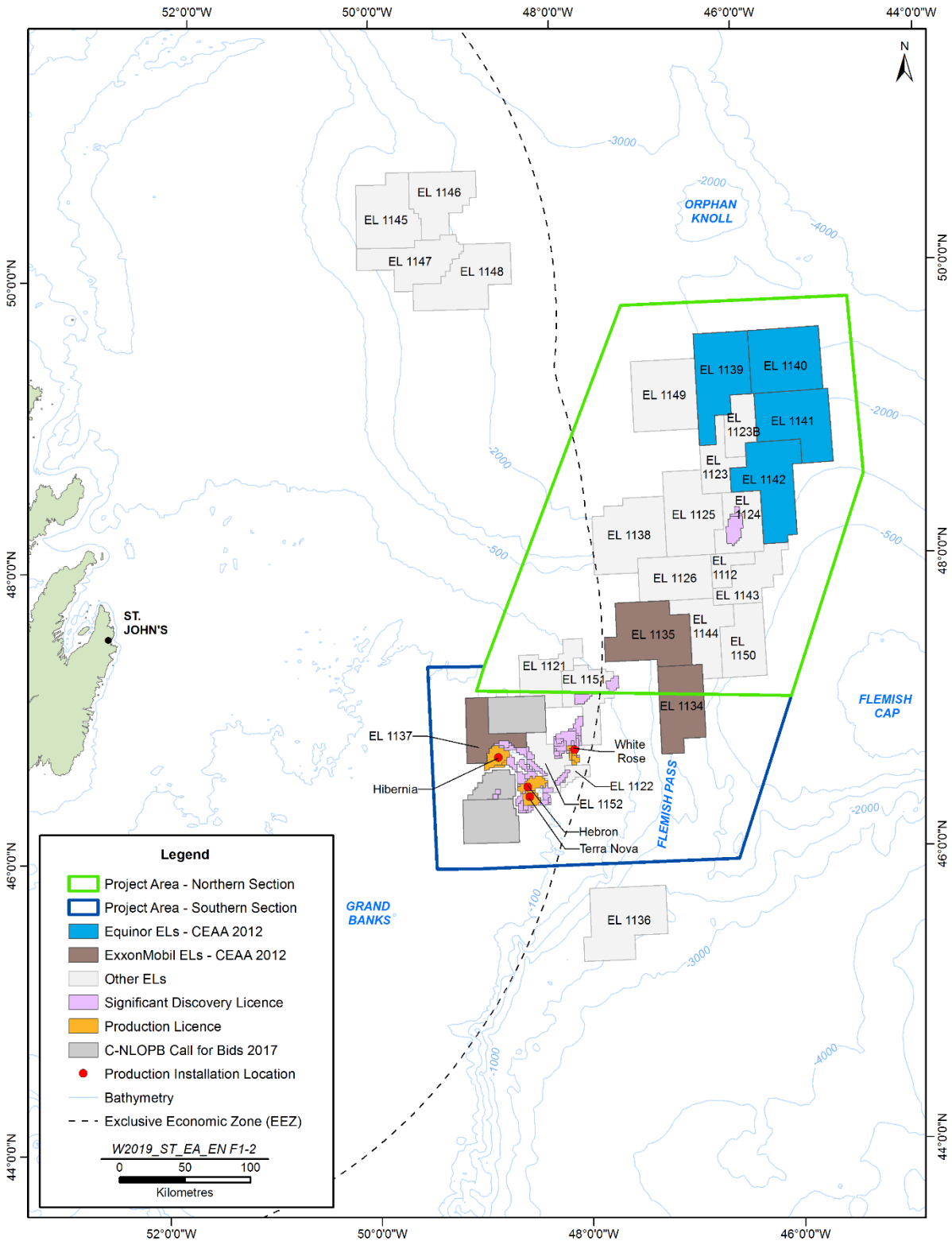
2.1.1 *Flemish Pass Exploration Drilling Project*

Equinor's project would take place within exploration licences 1139, 1140, 1141, and 1142, located approximately 460 to 580 kilometres east of St. John's, Newfoundland and Labrador in water depths varying from 1000 to 3500 metres (Figure 2). The exploration licences have a combined surface area of approximately 10 527 square kilometres and are located outside Canada's 200 nautical mile Exclusive Economic Zone on the outer continental shelf. Exact drilling locations within the exploration licences have not yet been finalized.

2.1.2 *Eastern Newfoundland Offshore Exploration Drilling Project*

ExxonMobil's project would take place within exploration licences 1134, 1135, and 1137, located approximately 265 to 450 kilometres east of St. John's, Newfoundland and Labrador in water depths varying from 70 to 1250 metres (Figure 2). The exploration licences have a combined surface area of approximately 5839 square kilometres. Exploration licence 1137 is located within Canada's 200 nautical mile Exclusive Economic Zone, while exploration licences 1134 and 1135 are outside the Exclusive Economic Zone on the outer continental shelf. Exact drilling locations within the exploration licences have not yet been finalized.

Figure 2 Locations of the Projects



Source: Equinor Canada Ltd., 2017 and ExxonMobil Canada Ltd., 2017

2.2 Components of the Projects

The Projects would include the drilling of offshore exploration wells and potentially associated delineation wells with up to two drilling installations operating at a time (either floating semi-submersible unit(s) and/or a drill ship(s)) for each project. Logistical support required for the Projects would consist of:

- supply and service vessels for geophysical, environmental, and geotechnical surveys, re-supply activities, and on-site standby during drilling activities; and
- helicopter support for personnel transport and delivering light supplies and equipment.

The drilling installations, supply and service vessels, and helicopters would be owned by third-party service providers and contracted for use by the proponent.

2.3 Activities of the Projects

The Projects would include the following routine project activities:

- geophysical, environmental, and geotechnical surveys;
- offshore well drilling;
- formation flow testing and flaring;
- supply and servicing; and
- well suspension or abandonment.

There would also be maintenance activities conducted as required throughout the Projects.

2.3.1 *Geophysical, Environmental and Geotechnical Surveys*

Throughout the Projects, geophysical, environmental, and geotechnical surveys may be required to support drill planning and operations. Geophysical surveys include wellsite surveys and vertical seismic profile surveys. Remotely operated vehicle/autonomous underwater vehicle surveys may also be used during any or all of the surveys.

Wellsite surveys would be conducted to collect information necessary for well location planning and well design. Initial wellsite surveys would be used to identify unstable areas beneath the seafloor (i.e. shallow gas deposits) or hazards (i.e. large boulders, ocean debris, shipwrecks), so as to avoid these hazards when drilling. These surveys would also be used to identify areas where coral structures or other anomalies may be located. These surveys would involve mapping the seabed through the use of various techniques, including seismic sound sources, multibeam echosounders, side-scan sonar, sub-bottom profilers, video and other non-invasive equipment. The equipment would be deployed either by vessel or remotely operated vehicle. In some cases, existing data may be sufficient to analyze potential hazards or other geophysical features, and certain surveys may therefore not be required for each well location.

Vertical seismic profiling could be used to further define the depth of geological features and potential petroleum reserves by obtaining high resolution images of a target. Vertical seismic profiling surveys are similar to surface geophysical surveys in that a sound source and a receptor would be used to measure the refraction and reflection of sound waves. Vertical seismic profiling surveys would be conducted using hydrophones inside

an existing wellbore and a sound source near the surface and usually take less than 48 hours per well to complete.

Environmental surveys could be conducted to analyze the physical, chemical, and biological aspects of a drilling area. Sampling would typically be carried out from a support vessel, dedicated vessel, or helicopter. Environmental surveys could include oceanography, meteorology, and ice surveys. They could also include biota, water, and sediment sample collection, and visual surveys. Environmental surveys would typically take five to 20 days to complete.

Geotechnical surveys could be conducted to measure the physical properties of the seabed and subsoil through the collection of sediment samples and in-situ testing. Geotechnical surveys are typically carried out using dedicated vessels provided by specialist marine geotechnical suppliers. Methods to collect samples would typically include drilled boreholes or gravity coring. Installation of piezometers in boreholes to measure soil properties may also be carried out.

Remotely operated vehicle/autonomous underwater vehicle surveys would be used to conduct visual inspections. They may be used during pre-drill surveys and before marine installations to determine presence or absence of physical objects on the seafloor. They may also be used during any or all of the surveys described above to support drilling operations.

2.3.2 *Offshore Well Drilling*

Up to two drilling installations may be actively engaged in drilling activities for each project at any one time.

Once a wellsite is selected, a drilling installation would be either towed or self-propelled to the correct location. The drilling installation would be held in position by either a dynamic positioning system or by anchors. If a dynamic positioning system is used, equipment would be installed on the seafloor prior to the drilling installation being positioned over the wellsite. If the installation is moored, eight to 12 anchors would be pre-set on the seabed and connected to the installation. A safety exclusion zone of one square kilometre (dynamic positioning system) or of approximately 12 square kilometres (moored system) would be established around the drilling installation.

Wells would be drilled in varying water depths: Equinor's exploration licences are located in water depths between 1000 and 3500 metres, while ExxonMobil's exploration licences are located in water depths between 70 and 1250 metres. Well design (e.g. hole size, casing/liner size, vertical depth, drilling fluid type) would involve consideration of many factors, including water depth, reservoir potential, and geological properties of the reservoir. Individual well design would be determined for each well prior to drilling and would be submitted to the C-NLOPB for approval. Each well would take approximately 35 to 65 days to drill, with this range corresponding to wells in shallow and deeper water, respectively. The time to drill each well would also depend on well design, depth of the reservoir, weather, and technical requirements. The proponents noted that the maximum of 65 days drilling time could be exceeded in the event of weather delays or technical requirements.

The wells would be drilled using a drill bit and in a number of sections of progressively smaller-diameter intervals with increased depth. The drill bit would be controlled from the drilling installation through a series of

pipes, referred to as the drill string. Drilling mud or fluid would be required to lubricate the drill bit, maintain well pressure, and move the drill cuttings up the wellbore. Different types of drilling fluids (e.g. water-based mud, synthetic-based mud) would be used depending on well design and anticipated geological conditions. Drilling fluids would include a base fluid, weighting agents, and other chemicals.

Drilling would be divided into two stages – riserless and riser drilling. A riser is a pipe that connects a drilling installation on the sea surface to the well on the seafloor, allowing the recovery of drilling fluid and cuttings for treatment and disposal. For the first sections of the well (conductor and/or surface hole), there would be no riser, and the water-based drilling muds, cuttings, and excess cement would be released directly to the seafloor. Once the initial sections have been drilled, a riser would be installed and fluids would be recirculated back to the drilling installation, where they would be recycled and reused, treated and discharged.

Once the initial sections are drilled, a steel casing would be cemented in place to prevent the wall of the wellbore from caving in and to prevent the seepage of muds and other fluids. The riser and blowout preventer would then be installed onto the wellhead. A blowout preventer is a piece of safety equipment which 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. A wellhead provides structural integrity to house a blowout preventer and pressure integrity for drilling operations.

The remaining sections of the well would then be drilled to predefined depths. Casing would continue to be cemented in place at set depths along the well to reinforce the wellbore.

The Projects may also employ batch drilling, which is the process of consecutively drilling the initial sections (i.e. conductor and surface hole) of multiple wells. The initial sections of the well are completed without a riser and using water-based mud. Once the initial sections have been drilled, the wells would be temporarily suspended in compliance with C-NLOPB requirements. A drilling installation would then return at a later date to drill the deeper well sections with a riser and blowout preventer in place.

2.3.3 *Formation Flow Testing and Flaring*

A formation flow test involves flowing well fluids from a reservoir to gather additional information on its properties (e.g. potential productivity, connected volumes, fluid composition, flow rate, pressure, temperature). A formation flow test may be carried out on wells where hydrocarbons are discovered and additional reservoir data is needed. In addition, in the event that potential commercial quantities of hydrocarbons are discovered, formation flow testing is required by the C-NLOPB to convert an exploration licence into a significant discovery licence. Testing may occur while a drilling installation is drilling a well, immediately after a well is drilled, or at a later date by re-entering a suspended well.

Flaring could be used to manage hydrocarbons generated by a flow test. A formation flow test with flaring would typically include up to three days of flaring; however, if an extended flow test were required, flaring could last up to five days.

The proponents stated that produced water would not be expected during formation flow testing; however, if produced water were to be encountered and required handling, surface separators would be used to separate

water and hydrocarbons prior to flaring. The separated produced water would then be treated and disposed of as per the *Offshore Waste Treatment Guidelines* or shipped to shore for treatment and disposal. Produced water would not normally be flared other than the liquid droplets entrained in the flare gas.

An alternative to formation flow testing with flaring is formation testing while tripping, which does not require flaring. In this situation, well fluids would be sent through the wellbore to the drilling installation for testing in a closed casing. The proponents noted that produced water is typically not generated during formation testing while tripping. While formation testing while tripping is an option for some formation testing, the proponents indicated that formation testing with flaring may be required by the C-NLOPB to gather certain specific information on the reservoir.

Formation flow tests would require review and approval by the C-NLOPB.

2.3.4 *Supply and Servicing*

Offshore drilling activities would be supported by a number of logistical activities. An onshore supply base would provide temporary storage, re-fueling, staging, and loading of materials and supplies to support offshore drilling. The shore base facilities would be owned and operated by independent third-party service providers and located in the established port of St. John's, Newfoundland and Labrador. Should the facilities in St. John's be inaccessible or if the port facility cannot service the Projects, other existing supply facilities in the province may be used.

Offshore supply vessels would be engaged to support various activities. These vessels would be contracted from independent third-party suppliers to provide support in transporting equipment, supplies and personnel, and for conducting various surveys or other operations. It is anticipated that an average of eight to ten transits per month would occur in support of a drilling campaign where a single drilling installation is used, and approximately double that if two drilling installations are used simultaneously. Supply and service vessels would transit in a straight-line approach to and from the port of St. John's to the drilling installation or survey location.

Helicopters would be used for crew transfers to and from the drilling installation. Helicopter support would be supplied by an independent third-party operator based out of the St. John's International Airport.

2.3.5 *Well Suspension or Abandonment*

When drilling is complete, a well would be suspended or abandoned. In some instances it may be necessary to re-enter a wellbore at a later date for batch drilling, additional testing, data collection, following technical/operational challenges, or, although unlikely, to develop an exploration well for production. In any of these circumstances, a well would be "suspended": the wellhead would remain in place and a temporary abandonment/debris cap would be installed to protect the wellhead connector. The proponents indicated that based on historic data, wells are typically suspended for two to three years. Proponents are required to indicate the duration of suspension when requesting approval from the C-NLOPB.

When a well would not be re-entered, it would be "abandoned". Suspension and abandonment would involve placing cement and/or mechanical plugs at varying depths in a wellbore to prevent hydrocarbons from escaping.

If a wellhead were to be removed, the surrounding seabed would be inspected (typically with a remotely operated vehicle) to check that no equipment or obstructions remain in place.

The proponents proposed the following approach for determining if a wellhead is to be removed or left in place:

- in water depths less than 500 metres – wellheads would be removed below the seafloor by employing conventional internal cutting (i.e. cutting from within the well) using a drilling installation;
- in water depths between 500 and 1500 metres - wellheads would be removed by either cutting the wellhead internally (as described above) or externally (i.e. cut from outside the well leaving a portion of the casing approximately 0.85 metres above the seafloor); and
- in water depths greater than 1500 metres - wellheads would remain in place and would not be removed; they would typically extend approximately 2.5 metres above the seafloor.

Abandonment or suspension of wellheads may be carried out following the drilling of the final well in a campaign or later during another drilling campaign. External cutting would be carried out at the end of a drilling campaign or at any other time during the year. Explosives would not be used to sever wellheads for retrieval.

Well abandonment would be authorized in compliance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations*. Long-term monitoring of abandoned wells is not required by the Regulations.

2.4 Schedules

Project activities, including well abandonment or suspension, would be aligned with the exploration licence periods and would end once regulatory obligations and commitments have been met and a licence has either been reverted back to government or converted to a significant discovery licence. Equinor's project would occur between 2019 to 2027 and ExxonMobil's project would occur between 2019 to 2029. An exact schedule for exploration drilling activities has not been set; for the purpose of the EAs, it is assumed that activities could occur at any time within the periods described above, subject to the necessary regulatory approvals, authorizations and permits.

The following is an estimate of the timelines for drilling a single well:

- Wellsite survey: seven to 21 days
- Pre-drill coral survey: three to seven days
- Installation of transponders for a dynamic positioning system: up to 18 hours
- Drilling installation transit to site and positioning: two to six days
- Drilling well: 35 to 65 days, (includes well suspension and/or abandonment activities, except for wellhead removal)
- Wellhead removal: up to two days
- Removal of drilling installation: one day or less

2.5 Greenhouse Gas Emissions

During offshore exploration drilling, routine and non-routine activities would result in emissions of greenhouse gases. Routine activities contributing to greenhouse gas emissions include combustion from the drilling

installation and supply vessels, fixed and mobile deck equipment, and helicopters. Greenhouse gas emissions per well drilled, including emissions associated with potential flaring during formation well testing, are estimated in Table 3.

Table 3 Estimated Greenhouse Gas Emissions per Well Drilled

Project Component/Activity	Greenhouse Gas Emissions (tonnes emitted per well drilled, assuming 65 days of drilling)			
	Carbon Dioxide	Methane	Nitrous Oxide	Total carbon dioxide equivalent emissions
Drilling Installation[1]	29 900 - 44 135	37.7 - 54.6	1300 - 1950	31 238 - 46 140
Supply Vessels[2]	9750 - 12 285	1.3 - 1.95	141.1 - 175.5	9892 - 12 462
Helicopter[3]	845 - 1690	0.26 - 0.46	7.15 - 14.3	852 - 1705
Flaring[4]	15 669 - 26 115	-	-	15 669 - 26 115
Total	56 164 - 84 225	39.3 - 57.0	1448 - 2140	57 651 - 86 422

Ranges for each project component represent low and high estimates based on variations in equipment and activities as follows:

[1] semi-submersible versus drillship

[2] newer (2016) versus older (1997) supply vessel

[3] range of distances to each project area

[4] formation testing with flaring for minimum three and maximum five days (estimated emissions of 5223 tonnes of carbon dioxide equivalent per day)

Source: Proponents' response to IR-08, 2018

Including estimated emissions from formation flow testing with flaring (assumed three wells drilled per year, with flaring for one well per year for three to five days), each project could emit a total of 141 615 to 207 036 tonnes of CO_2 equivalent per year, which would represent 1.3 to 1.9 percent of Newfoundland and Labrador's average annual greenhouse gas emissions and between 0.02 to 0.03 percent of Canada's.

Industrial facilities that emit more than 10 000 tonnes of CO_2 equivalent per year are required to quantify and report greenhouse gas emissions to Environment and Climate Change Canada.

3 Purpose of Projects and Alternative Means

3.1 Purpose of Projects

The purpose of each project is to determine the presence, nature, and volume of potential offshore oil and gas resources through exploratory drilling programs. The Projects would also enable the proponents to meet the work expenditure commitments that must be fulfilled over the term of the exploration licences.

The proponents have indicated that exploration drilling is essential to enable continued oil and gas discoveries, which would maintain production and meet global energy demands. The proponents stated that the eastern Newfoundland and Labrador offshore area has the potential to contain important and commercially significant hydrocarbon resources.

3.2 Alternative Means of Carrying Out the Project

CEAA 2012 requires that federal EAs of a designated project take into account the alternative means of carrying out the project that are technically and economically feasible and also consider the environmental effects of any such alternative means. The Agency's Operational Policy Statement *Addressing "Purpose of" and "Alternative Means" under the Canadian Environmental Assessment Act, 2012* sets out the general requirements and approach to address the alternative means of carrying out a designated project.

The proponents assessed alternative means of carrying out the Projects by:

1. identifying potential alternative means of carrying out the Projects;
2. considering the economic and technical feasibility of the alternative means identified;
3. considering the environmental effects of the identified technically and economically feasible alternative means; and
4. selecting the preferred alternative mean, based on the consideration of effects and of technical and economic feasibility.

The proponents evaluated alternatives for drilling fluid selection, drilling installation selection, drilling waste management, lighting, and formation flow testing and nighttime flaring. They also provided an overview of the chemical selection process to demonstrate how chemical selection alternatives would be identified and considered during drilling program planning.

The proponents stated that evaluation of alternatives for water management and effluent discharge points is not feasible, since these would be specific to the configuration of the selected drilling installation. They further noted that a Certificate of Fitness for the drilling installation would be required to confirm that the effluent discharge and water management system comply with statutory requirements.

Drilling Fluid Selection

The proponents evaluated the following drilling fluid options: use of water-based mud, use of synthetic-based mud, or use of a combination of the two. Depending on the stage of drilling, use of either water-based or synthetic-based muds may be technically and economically feasible. For deeper sections of a well, the

proponents indicated that the use of water-based mud would be technically and economically inferior and may not be feasible for these stages of drilling. Synthetic-based mud would be superior to water-based mud for the following reasons:

- synthetic-based mud provides greater hole stability and overall management of casing installation and drilling-related issues, such as stuck pipes or hole collapses;
- water-based mud does not provide adequate mitigation against hydrate formation at the expected seabed temperature and wellhead pressure;
- synthetic-based mud can reduce casing, riser, and drill pipe wear since it has a lower coefficient of friction and a higher lubricity than water-based mud; and
- synthetic-based mud has a longer usable shelf life than water-based mud and the potential for multiple reuses is greater.

The proponents proposed to use a combination of water-based and synthetic-based muds. Water-based mud would be preferred for shallow, riser-less drilling while synthetic-based mud would be the preferred option for deeper, riser drilling to minimize technical challenges and subsequent potential safety risks.

The proponents considered the potential environmental effects of both water-based and synthetic-based muds in their assessments (Section 6).

Drilling Installation Selection

There are three main types of drilling installations which are used for offshore drilling: a jack-up rig, a semi-submersible drill rig, and a drill ship. The technical feasibility of each of these alternatives is largely dependent on drilling water depths.

In water depths less than 100 metres, a jack-up rig would be a technically feasible option. Water depths in the exploration licences that comprise the Projects range from approximately 70 to 3500 metres. And thus a jack-up rig was not considered as a potential option. Floating semi-submersible drill rigs can be used in either shallow (less than 500 metres depth) or deep (greater than 500 metres depth) waters; they can be moored via anchors in shallower water, or use dynamic positioning to maintain location in deep water. Drill ships are also a feasible alternative for drilling in deeper waters. Drill ships maintain position through dynamic positioning.

For the Projects, drilling installations must be capable of drilling year-round and in environmental conditions predominant in the North Atlantic. Both semi-submersible drill rigs and drill ships could be used, and the proponents stated that they have not yet selected a preferred option. The process for drilling installation selection would evaluate technical feasibility and in consideration of previous operating history, water depths, and environmental operating conditions.

The proponents considered the potential environmental effects of both semi-submersible drill rigs and drill ships in their assessments (Section 6).

Drilling Waste Management

The proponents evaluated three potential options for the management of drilling waste (i.e. synthetic-based mud, water-based mud, cuttings): re-injection, shipment to shore, and disposal at sea.

Re-injection would involve processing cuttings waste and pumping it into a dedicated disposal well. Re-injection from fixed wellhead platforms is a proven technology, but execution from a drilling installation would not be practical. The process would require specialized equipment and a viable subsurface injection zone near the wellsite. Additional equipment and a large storage capacity would be required on the drilling installation, which would add both complexity and cost to the operation. Due to the uncertainty associated with exploration drilling and the economics required to install the additional equipment, the proponents concluded that reinjection of cuttings in a dedicated disposal well would not be a technically or economically feasible alternative.

The shipment of drilling waste to shore would be an option during drilling with a riser when synthetic-based mud would primarily be used. The proponents considered shipping the synthetic-based mud cuttings to shore for disposal at an approved facility; however, they noted that there are no approved treatment facilities in the province of Newfoundland and Labrador. The cuttings would have to be shipped to shore and then trucked to the nearest waste treatment facility in eastern Canada. While technically and economically feasible, this option would result in increased costs and potential operational delays. It could reduce certain potential effects on the marine environment, but would involve additional safety and environmental risks associated with increased handling, transfer, and transportation of the cuttings. In addition, this option would result in increased greenhouse gas emissions and may result in additional onshore environmental effects related to the treatment and disposal of the waste. The proponents indicated that their preferred option would be overboard discharge of synthetic-based mud cuttings after treatment.

The disposal of drilling waste at sea was identified as the only technically feasible option for the management of water-based mud and cuttings during riserless drilling, since these drilling wastes cannot be returned to a drilling installation in the absence of a riser. A cuttings transfer system could be used to discharge water-based mud and cuttings away from a wellhead (up to approximately 500 metres away from a well location). The proponents stated that use of a cuttings transfer system would be considered should the results of pre-drill coral surveys and risk assessments indicate that mitigation would be required and relocation of a well would not be feasible.

The proponents considered the potential environmental effects of drilling waste disposal at sea in their assessments (Section 6).

Lighting

Lighting would be used on the drilling installation and supply and service vessels and is required under Canadian and international law. Deck lighting would be required 24 hours a day for maritime and crew safety. The proponents stated that a reduction in the amount of lighting on the drilling installation would not be practical given regulatory requirements and the possibility of compromising the safety of personnel and third-party navigators.

The proponents considered two options for lighting itself: standard lighting and spectral modified lighting. Spectral modified lighting, which uses green light, has been tested on offshore platforms and has been demonstrated to have a reduced effect on migratory birds. However, the proponents noted that this technology has not been proven to be technically or economically feasible at a commercial scale and implementation is restricted by commercial availability (i.e. lack of for-contract drilling installations and vessels with modified lighting), limited capability in extreme weather, safety concerns related to helicopter landings, and lower energy

efficiency. Due to operational and regulatory requirements, the proponents have chosen to use standard lighting at minimum levels that would not impede the safety of the workplace or drilling operations.

The proponents considered the potential environmental effects of lights in their assessments (Section 6).

Formation Flow Testing and Nighttime Flaring

The proponents proposed two alternatives for formation flow tests: formation flow testing with flaring and formation flow testing while tripping, where fluids are circulated in the closed casing of a wellbore and flaring is not carried out. Depending on the type of data the proponents would need to gather on the formation, either method may be used, subject to C-NLOPB requirements and approval.

During a formation flow test with flaring, flaring would occur to safely dispose of hydrocarbons that may come to surface. Produced water would not normally be flared other than the liquid droplets entrained in the flare gas. Alternative options for the timing or amount of flaring were considered. Flaring could be restricted to daylight and fair weather conditions to reduce light generation during night and poor weather when visibility is low. However, avoiding these periods could compromise the information generated by a formation flow test and would mean a prolonged period of formation flow testing, which could lead to increased safety risk and increased operational costs. The proponents indicated that reduced flaring is not a preferred option.

When it occurs, flaring is expected to be intermittent and short-term, generally lasting two to three days but sometimes up to five days for an extended flow test. The C-NLOPB, under its *Measures to Protect and Monitor Seabirds in Petroleum-Related Activity in the Canada-Newfoundland and Labrador Offshore Area* requires operators to provide it with notification of plans to flare. The C-NLOPB would subsequently consult with Environment and Climate Change Canada to determine a safe timeline for flaring to reduce effects on migratory birds.

If a formation test while tripping were to be carried out, flaring would not occur. However, formation testing while tripping may not be feasible if certain data is required, as per C-NLOPB requirements.

The proponents considered the potential environmental effects of flaring in their assessments (Section 2.5.3 and Section 6).

3.2.2 *Views Expressed*

Federal Authorities

Federal authorities did not comment on potential alternative means of carrying out the Projects.

Indigenous Peoples

The Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO) inquired about alternative treatment processes for ocean discharges, whether treatment to acceptable levels could be accomplished on the drilling installation, and whether the proponents would be required to ship wastes to shore if treatment offshore were not possible. Miawpukek First Nation and the Innu de Ekuanitshit also requested more information on drilling muds that would be used and the chemicals they may contain. The proponents indicated that chemical selection and treatment processes would be specific to each drilling installation and drilling site, and that this information is

not yet available. In the absence of site- and project-specific information, the proponents provided more information on typical reagents and treatment processes based on previous exploratory drilling experience. They stated that discharges would be in accordance with the *Offshore Waste Treatment Guidelines*, and if waste streams were not in compliance with the prescribed discharge limits or requirements, then they would not be discharged to the marine environment. In this case, waste would either be re-treated offshore until in compliance with the discharge criteria or transported back to shore for disposal.

Given the number of proposed and existing petroleum activities offshore Newfoundland and Labrador, Miawpukek First Nation suggested that the proponents and other operators create an approved treatment facility for synthetic-based cuttings in the province, reducing the amount of waste released into the marine environment. This comment was provided to the proponents and the C-NLOPB for their consideration.

The NunatuKavut Community Council requested that, if a feasible alternative to flaring exists and poses less of an impact on the environment, then the proponents should be required to use it. KMKNO also inquired about the considerations that go into choosing a formation testing alternative. Additional information on these factors was provided by the proponents and incorporated in the project description and alternatives described above.

Public

A member of the public requested that the Projects avoid discharging synthetic-based mud cuttings and drilling installation grey water (including food waste) into the marine environment. The proponents stated that waste discharges would meet the requirements of the *Offshore Waste Treatment Guidelines* and the *International Convention for the Prevention of Pollution from Ship* (MARPOL). Bilge and drainage water would be treated prior to discharge. Grey water from the galley, washing and laundry facilities and black water from accommodations would be macerated prior to discharge. Ballast water would be managed in accordance with federal *Ballast Water Control and Management Regulations* under the *Canada Shipping Act*, the International Convention for the Control and Management of Ships' Ballast Water and Sediments, and the *Offshore Waste Treatment Guidelines*.

The same individual requested further justification as to why spectral lighting was not selected by the proponents as a viable option. The proponents provided additional information on this, which has been incorporated into the text above.

3.2.3 *Agency Analysis and Conclusion*

The Agency is satisfied that the proponents adequately assessed alternative means of carrying out the Projects.

4 Consultation Activities

4.1 Crown Consultation with Indigenous Peoples

The Crown has a duty to consult Indigenous peoples in Canada, and to accommodate where appropriate, when its proposed conduct might adversely impact a potential or established Aboriginal or treaty right protected under Section 35 of the *Constitution Act, 1982* (Section 35 Rights). Indigenous consultation is also undertaken more broadly to aid good governance, sound policy development, and decision-making. For example, in certain instances there may not be a constitutional duty to consult, but the Agency may decide to engage with Indigenous groups for policy reasons.

4.1.1 *Indigenous Consultation Led by the Agency*

For the EAs of the Projects, the Agency served as Crown Consultation Coordinator for a whole-of-government approach to consultation.

In 2016, the Agency identified the following three Indigenous groups in Newfoundland and Labrador that may be affected by the Projects in the unlikely case of a spill impacting resources used by those groups:

- Innu Nation
- Nunatsiavut Government
- NunatuKavut Community Council

In addition to the above, the Agency also identified the following two additional groups, which hold communal commercial fishing licenses in North Atlantic Fisheries Organization (NAFO) areas that overlap with the project area:

- Qalipu First Nation
- Miawpukek First Nation

In May 2017, following a letter from Mi'gmawe'l Tplu'taqnn Incorporated (MTI), the Agency identified 35 additional groups in Nova Scotia, New Brunswick, Prince Edward Island, and Quebec because of populations of Atlantic Salmon that have been listed as endangered or threatened and may migrate between the project area and areas where these groups have potential or established Section 35 Rights. At that time, Fisheries and Oceans Canada also advised the Agency that six of these additional groups hold communal commercial fishing licences for Swordfish in NAFO areas that overlap with the project area (note: communal commercial fishing is described in Section 6.6). These additional groups are listed below:

Nova Scotia

Mi'kmaq:

- Acadia First Nation
- Annapolis Valley First Nation
- Bear River First Nation
- Eskasoni First Nation

- Glooscap First Nation
- Membertou First Nation
- Millbrook First Nation
- Paqtnkek (Afton) First Nation
- Pictou Landing First Nation
- Potlotek (Chapel Island) First Nation
- Sipekne'katik First Nation
- Wagmatcook First Nation
- We'kmoqma'q (Waycobah) First Nation

These groups are represented in consultation by the KMKNO, except Millbrook and Sipekne'katik First Nations.

New Brunswick

Wolastoqiyik (Maliseet):

- Kingsclear First Nation
- Madawaska Maliseet First Nation
- Oromocto First Nation
- St. Mary's First Nation
- Tobique First Nation
- Woodstock First Nation

These groups are represented in consultation by the Wolastoqey Nation of New Brunswick (WNNB), except Woodstock First Nation.

Mi'gmaq:

- Buctouche First Nation
- Eel River Bar First Nation
- Fort Folly First Nation
- Esgenoopetitj First Nation
- Indian Island First Nation
- Pabineau First Nation
- Eel Ground First Nation
- Metepenagiag Mi'kmaq Nation
- Elsipogtog First Nation

These groups are represented in consultation by MTI, except Elsipogtog First Nation.

Prince Edward Island

Mi'kmaq:

- Abegweit First Nation
- Lennox Island First Nation

These groups are represented in consultation by the Mi'kmaq Confederacy of Prince Edward Island (MCPEI).

Quebec

Mi'gmaq:

- Mi'gmaq of Gespapegiag
- Nation Micmac de Gespeg
- Listuguj Mi'gmaq Government

These groups are represented in consultation by the Mi'gmawei Mawiomi Secretariat (MMS).

Innu:

- Innu de Ekuanitshit
- Première Nation de Nutashkuan

These groups represent themselves in consultation.

In July 2017, the Agency included the following additional group in its consultations for the Projects given their interests in Atlantic Salmon that are endangered and could migrate through the project area.

Peskotomuhkati:

- Peskotomuhkati Nation at Skutik (Passamaquoddy)

The Agency made a preliminary determination that the depth of consultation with 39 of these Indigenous groups would be low on the consultation spectrum based on an analysis of Section 35 Rights and the potential for adverse effects on these rights from the Projects[1]. It provided this analysis to Indigenous groups, along with draft consultation plans, and requested feedback on the plans. No comments on the plans were provided although some Indigenous groups did not agree with the Agency's preliminary determination for depth of consultation.

The Agency also contacted the Qalipu First Nation and Miawpukek First Nation, which were being engaged for the purposes of good governance and provided them with information on the Projects and engagement opportunities.

For both Projects, the Agency integrated the Crown's consultation and engagement activities into the EAs and invited Indigenous groups to review and comment on the documents listed in Table 4.

[1]In describing the preliminary determination regarding the depth of consultation, the Agency contacted the above-listed Indigenous groups, with the exception of Qalipu First Nation and Miawpukek First Nation, as the latter groups were being engaged for the purpose of good governance and were contacted separately with a description of engagement opportunities.

Table 4 Comment Opportunities during the Environmental Assessments

Document or Subject of Consultation	Dates
Flemish Pass Exploration Drilling Project	
Summary of the Project Description	August 19, 2016 – September 8, 2016 (20 days)
Draft EIS Guidelines	October 3, 2016 – November 2, 2016 (30 days)
EIS Summary	January 5, 2018 – February 12, 2018 (38 days)*
Draft EA Report and Potential Conditions	Ongoing*
Eastern Newfoundland Offshore Exploration Drilling Project	
Summary of the Project Description	September 28, 2016 – October 19, 2016 (21 days)
Draft EIS Guidelines	November 14, 2016 – December 14, 2016 (30 days)
EIS Summary	January 5, 2018 – February 12, 2018 (38 days)*
Draft EA Report and Potential Conditions	Ongoing*
*Comment periods on the EIS Summaries for the Projects and on this Draft EA Report were coordinated for the two Projects.	

The Agency considered comments received from Indigenous groups following their reviews of the EISs and associated summaries and asked the proponents to provide additional information on a number of topics. Indigenous groups were provided an opportunity to review and comment on the additional information, as applicable.

In addition to written comment opportunities, the Agency consulted with Indigenous groups through a variety of methods including phone calls, emails, letters, and in-person meetings to discuss the EA processes, to respond to questions, and to discuss comments. For example, the Agency organized four information sessions in October 2017 that:

- provided information about the Agency;
- provided information about the Projects, as well as two other proposed offshore exploration drilling projects subject to federal EA[2];
- invited feedback on how the Agency could help facilitate participation in the EAs ; and
- invited feedback on the potential environmental effects of the Projects and potential impacts to Section 35 Rights.

The Agency also organized three workshops in April 2018 to:

- build relationships between Indigenous groups, proponents, and government;
- provide an overview of offshore drilling projects; and

[2] Information was provided about Equinor's project, ExxonMobil's project, the Husky Energy Exploration Drilling Project, and the Nexen Energy ULC Flemish Pass Exploration Drilling Project.

- identify and address concerns from Indigenous groups.

Proponents were invited to participate in the Agency's April 2018 workshops so that they could provide information and answer questions about their projects.

In addition to the Projects, there are several other offshore exploration drilling projects proposed in the offshore Newfoundland and Labrador area. Given the similarities between these projects and the potential environmental effects, and to enable efficiencies and reduce the potential for consultation fatigue, the information sessions and workshops covered multiple projects. In addition, during the October 2017 information sessions, the Agency offered to apply and consider comments provided by Indigenous groups in relation to one particular project to the other projects, as applicable.

The Agency held regular or as-needed discussions in person or via teleconference with individual Indigenous groups and with aggregate organizations (i.e. KMKNO, MTI, WNNB) related to the EAs of the Projects. Examples of meetings and calls between the Agency and Indigenous groups are listed in Table 5.

Table 5 Examples of Agency Meetings and Calls with Indigenous Peoples

Group or Community	Date	Purpose
Elsipogtog First Nation, Première Nation de Nutashkuan, KMKNO, Miawpukek First Nation, MMS, MTI, Nunatsiavut Government, NunatuKavut Community Council, Peskotomuhkati Nation at Skutik, Sipekne'katik First Nation, WNNB	October 17-24, 2017	Four information sessions on EAs of offshore exploration drilling projects (conference call/webinar)
WNNB (Consultation Coordinators)	February 13, 2018	Conference call to discuss the EA process, participant funding program, and the Projects
Peskotomuhkati Nation at Skutik	February 14, 2018	Meeting to provide an update on the status and next steps of the EAs for offshore exploration drilling projects and discuss participant funding program
Miawpukek First Nation	March 20, 2018	Conference call to discuss proponent engagement
Atlantic Policy Congress of First Nations Chiefs Secretariat, Innu de Ekuanitshit, Première Nation de Nutashkuan and Institut de développement durable des Premières Nations du Québec et du Labrador, Innu Nation, KMKNO, Miawpukek First Nation, MCPEI, Millbrook First Nation, MMS, MTI, NunatuKavut Community Council, Peskotomuhkati Nation at Skutik, Qalipu First Nation, WNNB	April 12, 18, and 20, 2018	Workshops in Moncton, Quebec City, and St. John's to discuss five offshore exploration drilling projects
KMKNO	April 26, 2018	Meeting to discuss Unama'ki Institute of Natural Resources' report on Atlantic Salmon, EA processes, and participant funding program

Group or Community	Date	Purpose
Elsipogtog First Nation	April 27, 2018	Call to discuss participant funding program and possible workshop
Innu de Ekuanitshit, Première Nation de Nutashkuan, Millbrook First Nation, Nunatsiavut Government, NunatuKavut Community Council, WNNB	May 2-4, 2018	Individual calls to provide an update on the status and next steps of the EAs for offshore exploration drilling projects
Elsipogtog First Nation	July 9, 2018	Meeting to provide an update on the status and next steps of the EAs for offshore exploration drilling projects and to discuss proponent engagement, participant funding program, consultation processes, issues and concerns
Sipekne'katik First Nation	July 19, 2018	Call to provide an update on the status and next steps of the EAs for offshore exploration drilling projects
Première Nation de Nutashkuan	September 7, 2018	Call to provide an update on the status and next steps of the EAs for offshore exploration drilling projects and to discuss related issues and concerns
Miawpukek First Nation	September 17, 2018	Call to provide an update on the status and next steps of the EAs for offshore exploration drilling projects and to discuss proponent engagement, consultation processes, issues, concerns, and mitigation
Miawpukek First Nation	October 10, 2018	Meeting to discuss proposed projects and proponent engagement

The areas of concern raised by Indigenous groups included:

- potential impacts on Aboriginal rights and interests (e.g. food, social, and ceremonial fishing; commercial fishing; Atlantic Salmon, American Eel, cold water corals, species at risk, marine mammals, marine birds; community wellbeing and socio-economic conditions);
- effects of routine Project activities (e.g. vessel traffic) and accidents and malfunctions (blowouts);
- consideration of climate change during project planning;
- data gaps related to Atlantic Salmon and opportunities for funding studies to address data gaps;
- effects of dispersants on fish and the process for approving dispersant use;
- capping stack availability and the proponents emergency response capabilities;
- compensation for effects on fishing and socio-cultural impacts;
- design and implementation of follow-up and monitoring programs;
- incorporation of Indigenous knowledge into project planning; and

- funding for meaningful engagement during the EAs and throughout project operations.

Appendix C contains a summary of comments provided by Indigenous groups during the EA processes for five offshore exploration projects, including the Projects, up to the release of this draft EA Report, along with the proponents' and Agency's responses. A subset of comments provided in relation to the Projects are also discussed in the context of individual valued components in Sections 6 and 7.

The Agency supported the participation and consultation of Indigenous groups during the EA through its participant funding program. Funding was made available to assist in reviewing and providing comments on the EISs and their summaries, and the draft EA Report and potential EA conditions. In total, the Agency allocated $221,575.40 to 13 Indigenous groups and aggregate organizations for Equinor's project and an additional $221,575.40 to the same 13 Indigenous groups and aggregate organizations for ExxonMobil's project to reimburse eligible expenses. Details of the funding allocation for each project are available on the Canadian Environmental Assessment Registry.

4.1.2 *The Proponents' Indigenous Engagement Activities*

The proponents engaged 41 Indigenous groups located in Newfoundland and Labrador, Nova Scotia, New Brunswick, Prince Edward Island, and Quebec. Early engagement began in June 2016 with the Nunatsiavut Government, the Innu Nation, the NunatuKavut Community Council, Qalipu First Nation, and Miawpukek First Nation. Engagement over the course of the EAs included face-to-face meetings, phone calls, emails, and reports. The proponents stated that they would continue their engagement efforts throughout the Projects.

The proponents funded an Indigenous knowledge study with MTI, which was completed in September 2018. They are also in negotiations with Miawpukek First Nation regarding potential funding for studies and other initiatives.

In April 2018, the proponents participated in three workshops organized by the Agency with Indigenous groups (Section 4.1.1). The proponents organized additional workshops in October 2018, in which the Agency also participated, to provide updates and solicit discussion and feedback on the Projects and the associated EAs as well as other potential offshore exploratory drilling projects.

4.2 Public Participation

4.2.1 *Public participation Led by the Agency*

The Agency provided four opportunities for the public to participate in the EAs as listed in Table 4. Comment periods on the EIS Summaries and on this draft EA Report and potential conditions were or are being coordinated between the two Projects given their similarities and timing of the EAs.

Notices of the comment periods were posted on the Canadian Environmental Assessment Registry website and advertised through local media. In response to the notices, industry organizations, Indigenous groups, and individuals participated in the EAs. During the comment period on the EIS summaries, submissions were received from:

- the Fish, Food and Allied Workers' Union;

- the Newfoundland and Labrador Oil & Gas Industries Association; and
- three individuals.

Of the three individuals who submitted comments, two raised concerns about or were generally opposed to oil and gas exploration and one supported the Projects. The Fish, Food and Allied Workers' Union provided information on the nature and importance of the fishing industry and traditional knowledge. Their submission also included concerns about the potential effects of the Projects on fish, including from noise and oil spills, potential effects on the ongoing or potential recovery of groundfish stocks, cumulative effects, and potential socio-economic impacts. The Newfoundland and Labrador Oil & Gas Industries Association issued its support for the Projects and highlighted the economic importance of the offshore oil and gas sector.

The Agency made funding available through its participant funding program to support the public in reviewing and providing comments on the EIS summaries, this draft EA Report, and on the potential EA conditions. Through this program, $11,200 was allocated to one member of the public to reimburse eligible expenses related to their participation in the EA of ExxonMobil's project.

4.2.2 *Public Participation Activities by the Proponents*

The proponents engaged with key stakeholders and environmental non-government organizations, including:

- the Fish, Food and Allied Workers' Union;
- fish processors, including Ocean Choice International, the Association of Seafood Producers, and the Groundfish Enterprise Allocation Council;
- One Ocean;
- Nature Newfoundland and Labrador;
- World Wildlife Federation;
- Canadian Parks and Wilderness Society;
- Protected Areas Association of Newfoundland; and
- Sierra Club (Newfoundland Chapter).

The proponents conducted engagement efforts for their EISs from March 2016 until October 2017. They used a variety of engagement methods including face-to-face meetings, written correspondence, and project presentation meetings, and committed to continuing engagement throughout the duration of the Projects.

4.3 Participation of Federal Government Experts

Federal departments and agencies with specialist information or expert knowledge relevant to the Projects supported the Agency throughout the EAs, including providing information to inform: the Agency's decision to require federal EAs for the Projects; development of the EIS Guidelines; the review of the EISs and additional information requirements; and preparation of the draft EA Report and potential EA conditions. The Agency sought input from the C-NLOPB, Fisheries and Oceans Canada, Environment and Climate Change Canada, Natural Resources Canada, Health Canada, Transport Canada, the Parks Canada Agency, the Department of National Defence, and Crown-Indigenous Relations and Northern Affairs Canada.

5 Geographical Setting

The project area is an open-ocean location with limited human presence associated with activities such as fishing, oil and gas exploration and production, shipping, military exercises, and scientific research. The regional study area is rich in marine life, including numerous species of fish, benthos, plankton, birds, mammals, and turtles.

5.1 Physical Environment

5.1.1 *Atmospheric Environment*

Mean hourly wind speeds in the project area range from approximately six to seven metres per second in July to 12 metres per second in January, while the strongest winds of approximately 31 to 32 metres per second occur in February and December. Air temperature exhibits strong seasonal variations, with mean temperatures ranging from approximately -0.4 degrees Celsius in January to 14 degrees Celsius in August. The coldest observed air temperature on record was -13.6 degrees Celsius in February, while the highest observed temperatures were as high as 24.5 degrees Celsius during the summer months. Rain occurs in the project area approximately nine to 16 percent of all months of the year, while snow is most likely to occur in December, January, February, and March. The project area and surrounding areas have some of the highest occurrence rates of marine fog in North America. Fog is most prevalent in spring and summer and least prevalent in the fall. The existing ambient air quality within the project area can be generally categorized as good, and is occasionally and locally influenced by exhaust emissions from marine vessel and helicopter traffic and from the operations of the existing oil production platforms.

5.1.2 *Oceanography*

Mean wave heights in the project area range from approximately 1.7 metres in July to 4.6 metres in January. The most severe sea states occur in December and January, when maximum significant wave heights of up to 14.2 metres are possible. The cold Labrador Current dominates the general circulation over the Canada-Newfoundland and Labrador offshore area. The Labrador Current is divided into two streams: (1) an inshore branch that flows along the coast on the continental shelf and (2) an offshore branch that flows along the outer edge of the Grand Banks. Mean current speeds typically range between approximately five and 20 centimetres per second.

Water levels in the project area are also influenced by tides, but these are generally quite predictable, and any seawater level surges are relatively small compared to coastal areas. The total amplitude of the tides in the project area is predicted to be approximately 37 centimetres.

Sea ice conditions can vary greatly across the project area and from year to year and even within a given year. In general, for a given week during the ice season, the sea ice is more likely of greater concentration and thickness in the western portions of the project area and less severe further offshore to the east. Ice is generally present as early as January and as late as May, and is most likely to occur from February to April, although again, this varies significantly within the project area. Ice thickness generally ranges from a few centimetres to approximately 120 centimetres or potentially even greater. There is also the potential for landfast ice nearshore,

which is a type of sea ice and which forms and remains fast along the coast and can extend from a few metres to several hundred kilometres offshore. Landfast ice has the potential to influence conditions within the potential vessel traffic routes; however, the proponents predicted that it is unlikely to be a factor in the project area itself.

The east coast of Newfoundland extending out to and including the project area can have high occurrences of icebergs in their journeys south from the fjords of Greenland. Icebergs are masses of fresh water ice which calve each year from the glaciers along west Greenland. Icebergs are moved by both the wind and ocean currents and typically spend one to three years travelling a distance up to approximately 2900 kilometres to the waters off the island of Newfoundland. Although variations can be expected, icebergs typically appear in the project area by February or March, and are most common in April and May but can occur throughout the summer and into early fall. The number of icebergs reported annually in the project area can vary greatly from year to year (from 1985 to 2014, the number of icebergs reported annually in the project area ranged from zero to 730). The size of icebergs also varied significantly. Based on available data, approximately 60 to 70 percent of icebergs in the project area were “small” or “medium” (height = 5 to 50 metres; length = 15 to 100 metres), but much smaller or larger icebergs were documented.

5.1.3 *Water Quality*

In the northern section of the project area, mean water temperatures at the surface range from 1.6 degrees Celsius in March to 5.2 degrees Celsius in August. Minimum temperatures at the surface range from -1.8 degrees Celsius in January to 1.1 degrees Celsius in August and September, while maximum sea surface temperatures range from 4.0 degrees Celsius in March to 11.8 degrees Celsius in August. This seasonal temperature cycle is observed down to 250 metres. For depths greater than 250 metres, sea temperature is only slightly variable with monthly mean temperatures ranging from 2.9 degrees Celsius to 3.9 degrees Celsius and averaging 3.4 degrees Celsius down to 2000 metres. From 2000 to 3000 metres, temperatures are approximately one degree colder ranging from 2.0 degrees Celsius to 3.0 degrees Celsius.

In the southern section of the project area, mean sea surface temperatures range from 0.6 degrees Celsius in April to 10.9 degrees Celsius in September. Minimum temperatures at the surface range from -1.8 degrees Celsius in April to 4.9 degrees Celsius in September. Maximum sea surface temperatures range from 5.8 degrees Celsius in February to 19.6 degrees Celsius in September. This seasonal temperature cycle is observed down to 300 metres, where temperatures are higher in the summer than in winter. For depths greater than 300 metres however, sea temperature is only slightly variable by depth with monthly mean temperatures ranging from 3.2 degrees Celsius to 3.6 degrees Celsius.

Salinity is an important characteristic of seawater and influences the presence of marine life. Sea surface salinities range from a minimum of 32.1 practical salinity units in November to a maximum of 34.0 practical salinity units in April.

Turbidity and pH data for the project area are scarce and limited both in temporal and spatial resolution. The proponents noted that surface waters in the Atlantic Ocean have a pH (adjusted to 25 degrees Celsius) range of 8.0 to 8.1, which decreases to approximately 7.7 at 1000 metres depth. Turbidity measurements taken in March in an area north of the Flemish Pass were approximately 0.2 to 0.3 Nephelometric Turbidity Units, but the proponents noted that there is potential for seasonal variability.

5.1.4 *Acoustic Environment*

Underwater noise is an important factor when assessing effects on certain species, especially marine mammals that rely on sound to communicate, locate food, or detect threats. Sound transmits far better in water than in air. The existing sound environment or sound-scape of the project area is characterized by a degree of existing atmospheric and underwater sound, resulting from natural conditions and processes, such as weather and wave action, marine mammals, as well as from other human activities that occur in parts of the project area on either a continuous basis (i.e. existing petroleum production platforms) or those which are more intermittent and transient in nature, such as fishing activity, other oil and exploration programs, and marine transportation.

Sound produced by these or other sources propagates through the underwater environment, and because of variations in temperature, salinity and pressure, sound waves can deviate markedly from a straight line path. As they travel, sound waves may interact with the surface and the seabed by reflection and scattering. The level of signal arriving at a distant point is therefore difficult to predict.

5.2 Human Environment

Other than temporary living accommodations on existing oil production drilling installations, supply vessels, and other ocean going vessels, there are no human settlements within 250 kilometres of the project area.

Fisheries are an important component of the human environment of Newfoundland and Labrador, including for the various communities and regions along the eastern coastline of the island Newfoundland. Commercial fishing off the coast of Newfoundland and Labrador has been an important economic activity and is one of the main factors that led to people living in the region year-round. For many decades before 1992, the primary harvesting activities taking place in the offshore areas of Newfoundland and Labrador were for groundfish species. With the collapse of groundfish stocks in the early 1990s, a moratorium was declared and commercial fisheries for groundfish dropped drastically. This moratorium is still in effect, other than for some small directed commercial groundfish fisheries offshore. With the reduction of groundfish fisheries in offshore Newfoundland and Labrador, shellfish species have taken on a larger economic role in the area since 1992. Snow Crab and Northern Shrimp are now the primary species harvested by fishers offshore Newfoundland and Labrador by both weight and value, although some groundfish and pelagic fish harvesting is still conducted. Additional information on commercial fisheries can be found in Section 6.6.

In addition to fishing, the eastern Newfoundland and Labrador offshore area is also used for a variety of other human activities that have the potential for interactions with the Projects. These include marine research activities, marine shipping, other offshore oil and gas activity, military operations, and marine subsea cables.

6 Predicted Effects on Valued Components

6.1 Fish and Fish Habitat

This section discusses the potential effects of routine project activities on fish and fish habitat. Potential routine effects on fish species at risk are considered in this section, as well as in Section 6.5 Species at Risk. Potential effects on special areas are considered in Section 6.4. The effects of potential accidents and malfunctions are described in Section 7.1.

As described in the analysis below and taking into account the implementation of key mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on fish and fish habitat.

6.1.1 Proponent's assessment of environmental effects

Existing Environment

The Projects would take place within the Flemish Pass Basin and Jeanne d'Arc Basin (ExxonMobil's project only), including the shelf and slope of the Grand Banks and parts of the Flemish Cap and Orphan Basin. Within this area, there are relatively shallow shelf zones on the continental slope to deep abyssal regions, which support a variety of fish and invertebrate species, as well as regionally important areas of biodiversity and marine productivity. The project area overlaps with several special areas, including those identified for corals and sponges (Section 6.4), and supports five fish species listed on Schedule 1 of the *Species at Risk Act* and 17 species assessed as endangered, threatened, or special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Section 6.5, Appendix D).

Invertebrates in the project area include zooplankton (e.g. copepods, euphasiids and krill) as well as macroinvertebrates (e.g. crustaceans, molluscs, and echinoderms). Over 50 species of corals and sea pens and at least 32 species of sponges have been identified in the project area, with relatively high densities observed along the continental slope. The proponents noted that species diversity and distribution may be slightly different than reported, as sponges cannot always be identified to species due to damage during sampling, and low numbers of coral observations in deeper water may be related to lack of surveys in these areas rather than lack of occurrence. Exploration licences 1134, 1135, 1141, and 1142 support demosponges (e.g. Geodia, Astrophorida, and Ancorinidae sponges) and corals (e.g. soft corals, sea pens, solitary stony corals, black-wire corals). Exploration licences 1139 and 1140, which occur in water depths of 3000 to 3500 metres, provide habitat for sponges (unknown species), and exploration licence 1137, which occurs in water depths less than 200 metres, supports sponges (unknown species), soft corals, and Gorgonian Corals.

There is a relatively high fish species richness and diversity in the project area. Pelagic finfish include resident (i.e. Lanternfish) and migratory species (i.e. mackerel, herring, North Atlantic Swordfish, sharks, tunas), which seasonally migrate from temperate areas into northern waters to feed. Capelin has regionally high densities and is a key prey source for other animals. American Eel follow the continental shelf during fall to the Sargasso Sea and have the potential to occur seasonally at shallow depths in the project area. The project area also provides important habitat for groundfish. The project area – northern section is an aggregation area for Atlantic Cod,

Thorny Skate, Greenland Halibut, and wolffish. Seasonal phytoplankton blooms in the spring and fall coincide with the presence of early life stages of various fish and invertebrate species.

Marine plant species are not abundant in the project area, which is generally too deep to support macroalgae (i.e. kelps, seaweeds, coralline algae) and seagrass. Some seaweeds occur on the Grand Banks in water depths up to 100 metres; however, these areas support few species and low biomass.

Atlantic Salmon

The COSEWIC has identified 16 populations of Atlantic Salmon, each of which has been delineated in terms of natal river destination. Six populations have been assessed as endangered or threatened by COSEWIC; one of these (Inner Bay of Fundy) is listed as endangered under Schedule 1 of the *Species at Risk Act*. Atlantic Salmon are of particular importance to Indigenous peoples in Atlantic Canada.

Anadromous Atlantic Salmon spawn in freshwater rivers. Young typically leave natal rivers during the spring as smolt and spend from one to four years in the marine environment before returning to spawn. The proponents stated that there has been extensive research on the freshwater portion of salmon life history, but less is known once they leave their natal rivers and undertake migrations in the North Atlantic Ocean.

Populations not currently considered at risk have shown declines in recent years, particularly in the number of salmon returning to spawn. There are many hypotheses for this decline, including predation, fisheries, and physical/biological environment. Top-ranked hypotheses for salmon decline are associated with the marine phase of a salmon's life cycle.

The proponents noted that Labrador populations of Atlantic Salmon are unlikely to migrate through the project area, but individuals from the island of Newfoundland, Nova Scotia, Prince Edward Island, New Brunswick, and the Gulf of St. Lawrence could pass through the project area to and from their maturation and winter feeding grounds in the Labrador Sea and off Greenland. In addition, individuals appear to congregate south of the project area, near the southern and eastern slopes of the Grand Banks, and east of the Strait of Belle Isle prior to migrating back to natal rivers.

Studies on Atlantic Salmon populations in the Bay of Fundy revealed that kelt salmon (i.e. salmon that have spawned) often remained in or near the Bay of Fundy regardless of season, while some individuals from the outer Bay of Fundy population travelled to the Scotian Shelf, south coast of the island of Newfoundland, and southern edge of the Grand Banks. One tagged outer Bay of Fundy kelt migrated to Labrador via the Grand Banks and a second remained on the eastern edge of the Grand Banks (outside the project area), corroborating that this area may be a feeding area prior to return migrations. In addition, recently published research identified the western North Atlantic as a probable summer feeding region for adult salmon returning to the Saint John River in New Brunswick based on comparison of temporal trends in carbon signature of salmon scales and sea surface temperatures. The proponents stated that the areas of highest correlation (and therefore most likely feeding areas) were off the coast of Labrador and northern Newfoundland (Labrador Sea area), outside of the project area.

The proponents stated that there is little to no data to support the project area being used by Atlantic Salmon as overwintering habitat or as a major feeding area. They stated that the temperature profiles on the Grand Banks

and the Flemish Cap are generally not favourable for overwintering. Changes in oceanographic conditions due to climate change may alter the temporal and spatial distribution of preferred at-sea habitat of Atlantic Salmon. However, even when considering predicted sea surface temperature increases, temperatures would remain below the preferred range for Atlantic Salmon but above the temperatures known to be physically avoided. In addition to potentially changing their distribution, climate change may have other effects on Atlantic Salmon. Studies have shown that ocean climate variations can affect the growth and survival of salmon at sea and alter feeding areas, suggesting that general stock declines in the North Atlantic over the past three decades has likely been a response, at least in part, to global climate change.

Predicted Effects

The proponents predicted the following potential key environmental interactions between the Projects and fish and fish habitat:

- destruction, contamination, or alteration of marine habitats, fish, and benthic organisms due to discharge and deposition of drill cuttings and/or fluids, other environmental discharges, deployment and use of project equipment, and the introduction and spread of aquatic invasive species;
- attraction of marine fish to the drilling installation and vessels, leading to increased potential for injury, mortality, contamination, or other interactions;
- behavioural effects and temporary avoidance of areas by marine fish due to underwater sound or other disturbances;
- changes in the availability, distribution, or quality of feed sources and/or habitats for fish and invertebrates; and
- injury, mortality or disturbance to marine fish as a result of exposure to sound from well site surveys or vertical seismic profiling survey activity.

Potential interaction with project components and activities include those described below.

Presence and Operation of Drilling Installations

The potential effects on fish and fish habitat associated with the presence and operation of drilling installations are primarily related to underwater vibration/sound, light emissions, discharges, interactions with the benthic environment, and introduction of aquatic invasive species.

The proponents predicted that continuous underwater sound from the Projects, such as that generated during drilling activities or from project vessels, would not likely result in mortality or injury to fish. Sound levels were predicted to decrease to below the threshold for recoverable injury at distances of less than 150 metres from a drilling installation. This threshold applies to fish with swim bladders involved in hearing, and effects would likely be much less for species with no swim bladder or those that do not use one in hearing. Sound from a drilling installation may also have physiological or behavioral effects on fish, with the most likely response from most mobile fish being avoidance of a localized area around the source.

Lighting from the drilling installation may also have behavioral or physiological effects on fish. Some species avoid artificially lit areas, and may be displaced from otherwise suitable habitats. Sea-cage experiments on Atlantic Salmon demonstrated avoidance behaviours to light and sound simulations, but also showed that the fish returned to their original swimming depth and speed within 20 minutes of the disturbance. Very intense light (immediately turned on in the cage) appeared to cause temporary blindness; however, the Projects would

not emit intense light emissions underwater. Light from the drilling installation and vessels may shine on the near surface of the water but would be quickly attenuated by refraction and absorption. Given estimated ranges for light penetration into seawater, the proponents conservatively estimated that migrating Atlantic Salmon could be affected up to 50 metres from the source, but that any such effect could be considered negligible.

The proponents stated that attraction to sound and light emissions from the drilling installation is also possible for some fish species. For example, sharks may be attracted to low frequency vibrations in the range of 25 to 1000 hertz, which could be produced by the Projects. Several species (e.g. shrimp, amphipods, squid) are attracted to artificially lit areas, and large pelagics (e.g., sharks, swordfish) may use such congregations of prey species as opportunities to feed. Attraction to offshore infrastructure could expose fish to related emissions and discharges (e.g. drilling wastes, cement, liquid and sewage/greywater). However, the proponents predicted that highly mobile fish would likely avoid reduced visibility conditions or irritants.

The presence of a drilling installation may have an overall localized positive effect on fish abundance and diversity due to a “reef effect”. Light emissions from a drilling installation may increase plankton concentrations resulting in increased local productivity and food sources, while the physical structure could promote invertebrate colonization and provide refuge for fish. Safety exclusion zones around drilling operations may also afford localized, short-term protection to species that would otherwise be exposed to fishing. On this basis, fish may remain near a drilling installation despite associated sound, and marine discharges. Positive effects would be temporary, and would disappear once a drilling installation is removed.

If a drilling installation is moored to the seafloor, which may occur in the shallow water (i.e. exploration licences 1135 and 1137), the placement of the anchors could disturb bottom habitats causing injury or mortality to benthic invertebrates, including corals and sponges. If a drilling installation uses dynamic positioning, seafloor transponders would be deployed which would also disturb benthic environments, but to a lesser degree due to the smaller size.

Drilling installations, support vessels, and associated ballast water and bilge water serve as potential pathways for the introduction of aquatic invasive species. The likelihood of introduction would depend on recent sailing history, maintenance, operational practices, and adherence to regulations. Support vessels for the Projects would likely be sourced locally from vessels that operate mostly offshore Newfoundland and Labrador; however, drilling installations and vessels for survey work may be sourced internationally and therefore frequent other marine areas. Applicable regulations (*Ballast Water Control and Management Regulations* and other applicable regulations under the *Canada Shipping Act, 2001*; the International Convention for the Control and Management of Ships' Ballast Water and Sediments, and the *Offshore Waste Treatment Guidelines*) would be followed to prevent the introduction of aquatic invasive species; therefore, the likelihood that a project vessel or drilling installation would result in an introduction is relatively low.

Drilling Wastes and Other Marine Discharges

As described in Section 2.3.7, the Projects would use both water-based and synthetic-based drilling muds, and the discharge of these muds and associated drill cuttings represents one of the primary potential interactions with fish and fish habitat. Potential effects from the discharge of drill muds and cuttings include chemical toxicity, bioaccumulation (uptake of contaminants by fish), increase in suspended particles in the water column,

and potential seabed disturbance (e.g. change of substrate composition, smothering of habitat, and burial of immobile or sessile species).

Drilling of the initial sections of wells would be carried out mainly with seawater interspaced with water-based mud to sweep the cuttings out of the hole. These sections of a well would be drilled without a riser; therefore, cuttings and water-based mud would be discharged directly to the sea. Once a riser is connected, synthetic-based mud would generally be used. Synthetic-based cuttings and mud would be brought to the drilling installation via the riser for treatment in accordance with the *Offshore Waste Treatment Guidelines*, which limit the amount of synthetic-based oil on cuttings discharges to 6.9 grams of oil per 100 grams wet solid (or 6.9 percent). Treated cuttings would be discharged overboard via a cuttings chute. Most of the synthetic-based mud would be reconditioned and reused while drilling. Excess or spent synthetic-based mud that can no longer be used, as well as any other drill waste not acceptable for ocean discharge, would be sent to shore for disposal at an approved waste management facility. Volumes of drill cuttings and drilling muds that would be discharged during the drilling of five hypothetical wells were estimated (Table 6).

Table 6 Range of Drill Cuttings and Mud Discharge Volumes Per Well Estimated for the Five Cutting Dispersion Modelling Locations

Type of Discharge	Discharge volume (cubic metres)
Water-based mud cuttings	205 – 340
Synthetic-based mud cuttings	105 – 244
Water-based mud	2500*
Synthetic-based mud retained on cuttings	7.2 – 16.8
*Estimated maximum water-based mud used to sweep cuttings from first two well sections; includes approximately 400 cubic metre bulk discharge prior to installing the riser and switching mud delivery system to synthetic-based mud.	

Source: Equinor Canada Ltd., 2017; ExxonMobil Canada Ltd., 2017; and additional information provided by the proponents

Due to the relatively non-toxic nature of water-based mud components, toxic effects to fish and benthic invertebrates would not be expected. The proponents stated that exposure to water-based mud at low concentrations has not shown toxicity to sea scallops, polychaetes, amphipods, shrimp, and various other fish species. Due to the physical properties of water-based mud, associated metals would not be readily incorporated into the tissues of mobile fish and benthic species, limiting the availability of metals for bioaccumulation; however, infaunal species (i.e. species that live in the substrate) such as polychaetes and bivalves, may accumulate metals from water-based mud because of their inability to avoid mud deposition.

Although levels of acute toxicity of synthetic-based mud is considered relatively low, synthetic-based mud cuttings and mud would be returned to the drilling installation for treatment before discharge. The proponents predicted that it would be unlikely for treated synthetic-based mud cuttings to contaminate marine biota or habitats, as these materials would have low toxicity and would result in only localized biological effects based on thickness and extent of the cuttings pile that may accumulate.

Suspended particles from discharge of drilling muds and cuttings may have effects on suspension-feeding benthic invertebrates. Species of both sponges and corals have been documented to have sensitivities to suspended sediments: effects include increased larval mortality and change in feeding behaviour. Depending on

the receiving environment, the deposition of muds and cuttings may also change the substrate composition of the seabed, altering the benthic community composition. Degradation of organic components in the drill muds and cuttings could initiate eutrophication responses to create an anoxic environment, but this does not normally occur beyond approximately 500 metres depth and has been documented only in localized areas around well sites.

The discharge of drill muds and cuttings may result in localized sedimentation or burial of benthic invertebrates. The proponents conducted modelling for five sites in the project area to predict the extent of dispersion and deposition that could result from releases of water-based mud drill cuttings and treated synthetic-based mud drill cuttings. A burial depth of 6.5 millimetres or less was identified as the "no effect" threshold for non-toxic sedimentation, with a threshold of 1.5 millimetres identified for more susceptible species.

Water-based mud cuttings would be released between two and four metres from the seafloor; therefore, there would be little time for the cuttings to be transported by ambient currents prior to settling. Modelling of water-based mud cuttings showed that:

- the area of exceedance of the 6.5-millimetre threshold for each well ranged from 0.01 to 0.03 square kilometres around wellsites;
- the area of exceedance of the 1.5-millimetre threshold for each well ranged from 0.025 to 0.1 square kilometres around wellsites; and
- threshold exceedances were generally in circular patches of deposition extending approximately 200 metres to 900 metres from wellsites, with some seasonal results predicting localized patches above thresholds as far as 1400 metres from wellsites.

The proponents stated that areas of threshold exceedance by water-based mud cuttings deposition would be localized and that any burial effects would be limited spatially, and noted that the area may easily be recolonized.

Cuttings with synthetic-based mud would be treated to contain no more than 6.9 percent of residual synthetic oils as per the requirements of the *Offshore Waste Treatment Guidelines* prior to release. They would be discharged near the sea surface, increasing potential dispersal distance. Modelling of synthetic-based mud cuttings showed that:

- for model sites in exploration licences 1134, 1135 and 1140, the vast majority (94 to 98 percent) of synthetic-based mud cuttings settled beyond the model domain of 32 kilometres from wellsites, with initial settling thicknesses below the 6.5 millimetre threshold; and
- for model sites in exploration licences 1137 and 1142, the majority (59 to 97 percent) of synthetic-based mud cuttings usually settled within the 32 kilometres of wellsites, with initial settling thicknesses below the 6.5 millimetre threshold.

Overall, the proponents concluded that synthetic-based cuttings deposition has relatively low potential for adverse environmental effects. The need to verify their cuttings deposition predictions through a follow-up program would be determined based on a risk assessment carried out as part of the coral and sponge survey.

In addition to drilling muds and cuttings, the Projects would also result in other discharges to the marine environment (e.g. cement, bilge and deck drainage, ballast water, sewage, cooling water). Waste discharges would be treated as required and discharged in accordance with the *Offshore Waste Treatment Guidelines* and

the *International Convention for Prevention of Pollution from Ships* (MARPOL), thereby reducing any potential effects on the marine environment. Bilge and deck drainage water that comes into contact with drilling installation equipment could become contaminated with oil, and thus would be treated prior to discharge. Wastewater from the galley, washing, laundry facilities and accommodations would be macerated to reduce particle size prior to discharge. The proponents stated that although discharges of organic wastes could lead to localized organic enrichment, no adverse effects are anticipated as volumes would be quite small at each drill site

Project-Related Surveys

Vertical seismic profiling surveys and wellsite surveys that use geophysical survey techniques would produce sound that may result in changes to fish mortality/injury, fish health, fish behaviour, and fish presence and abundance. The proponents stated that the effects of sound on fish vary depending upon levels, distance from source, and species and life stage. Behavioural responses of fish typically begin to occur at sound levels above 155 dB re 1 µPa (decibels relative to a fixed reference pressure of 1 micropascal), while mortality may start to occur at 210 dB re 1 µPa. The proponents stated that some project-related surveys would produce sounds levels above these thresholds. The proponents estimated that sound levels from vertical seismic profiling surveys would not exceed thresholds for fish injury beyond 500 metres for fish species with a swim bladder involved in hearing, and may be much less (i.e. between 40 and 160 metres or less) for other species. These surveys would be short-term (e.g. less than two days per well for vertical seismic surveys and five to 21 days for geophysical wellsite surveys) and localized, and mobile species, including Atlantic Salmon, were predicted to temporarily avoid areas of survey operations, minimizing potential interactions. Furthermore, the geophysical sound source would go through a “ramp-up” phase to increase avoidance. The proponents predicted that it was unlikely that fish would be displaced from key habitats or disrupted during key activities over extended areas or periods, or be otherwise affected in a manner that causes negative and detectable effects on fish populations in the region. Immobile fish species or life stages (e.g. eggs, larvae and benthic invertebrates) could be affected within a few metres of a sound source array, including potential injury or mortality.

Other surveys, such as geological, geotechnical, environmental or underwater video surveys, are generally short-term, occasional, and localized in nature, with limited interaction with fish and fish habitat. When used, sediment sampling equipment would be in direct contact with the seabed and underwater video surveys could have lighting and sound emissions. Fish may also move away from a survey area while short-term activity is ongoing.

Other Activities

During formation testing with flaring, any produced water of a volume greater than can be managed through the flare would be treated and discharged in accordance with the *Offshore Waste Treatment Guidelines*. Produced water would be low in volume and would rapidly disperse in the water column; the proponents predicted that any resulting effects on fish and fish habitat would be localized and short-term.

Wellhead cutting as part of well abandonment could result in short-term, low-magnitude emissions of sound and light, and fish would likely temporarily avoid the area during these activities.

Sound from marine vessels could mask the acoustic sensory environment of fish and invertebrates, causing some degree of attraction, avoidance or other behavioural responses by individual fish (depending upon the species involved). The proponents predicted that fish would likely not be disturbed by vessel activity due to its transitory nature and thus its short-term presence at any one location.

Proposed Mitigation Measures, Monitoring and Follow-Up

The proponents proposed measures to mitigate potential effects on fish and fish habitat, including:

- provide information regarding chemical selection and waste management to the C-NLOPB for review and approval;
- select and screen chemicals to be discharged, including drilling fluids, in accordance with the *Offshore Chemical Selection Guidelines;*
- treat operational discharges in accordance with the *Offshore Waste Treatment Guidelines* and other applicable regulations and standards;
- macerate grey and black wastewater prior to discharge;
- manage ballast water in accordance with the federal *Ballast Water Control and Management Regulations* under the *Canada Shipping Act,* the International Convention for the Control and Management of Ships' Ballast Water and Sediments, and the *Offshore Waste Treatment Guidelines;*
- store hazardous wastes in designated areas for transport to shore in compliance with the *Transportation of Dangerous Goods Act* and its regulations and obtain applicable approvals for the transportation, handling, and temporary storage of hazardous wastes, as required;
- ensure appropriate handling, storage, transportation, and on-shore disposal of solid waste;
- prepare Coral and Sponge Survey Plans for individual pre-drill coral and sponge surveys, and submit these plans to Fisheries and Oceans Canada and the C-NLOPB for review and approval prior to implementing the surveys. The plans would contain site-specific information, including:
    - survey methodology (surveys would include use of a remotely operated vehicle with a high-definition camera);
    - survey schedules (surveys would occur at least three months prior to drilling activities);
    - survey team composition (the survey team would include a geophysical specialist, remotely operated vehicle operator, and an independent marine scientist); and
    - survey area identification around wellsites, mooring and anchors, and rationale for determining the survey area.
- conduct coral and sponge surveys at each well location, as well as 50 metres around each anchor pattern, and prepare a Coral and Sponge Survey Results and Risk Assessment Report for review and approval by Fisheries and Oceans Canada and the C-NLOPB prior to drilling, which could include:
    - consideration of the abundance, type and condition of the corals and sponges present, and anticipated potential effects based on drill cuttings dispersion modelling results, and distance from mooring locations; and
    - development of additional mitigation and monitoring in consultation with Fisheries and Oceans Canada and the C-NLOPB based on findings of the report. This may include relocating wells and/or redirecting water-based mud cuttings discharges to protect sensitive benthic habitats.
- do not use explosives for removal of wellheads; and

- at the time of well suspension and/or abandonment, inspect the well in accordance with applicable regulatory requirements.

Proposed follow-up measures include:

- monitor the implementation of the mitigation measures in accordance with existing operational procedures and policies;
- provide an overview of compliance monitoring systems and submit monthly compliance reports and annual environmental reports to the C-NLOPB, which would include information on volumes of liquid wastes discharged;
- conduct specific follow-up monitoring if drilling is undertaken in an area where the Coral and Sponge Survey Results and Risk Assessment Report indicates that monitoring is required to determine the effectiveness of mitigation measures in protecting the sensitive benthic habitat. Monitoring may include parameters such as:
    - sediment traps and/or seabed core samples to measure drill cuttings deposition;
    - current and turbidity measurements; and/or
    - visual assessment using high-definition images/video.

Follow-up monitoring program design would be based on the coral and sponge survey, potential zone of influence estimated in drill cuttings dispersion modelling, well location in proximity to the sensitive benthic habitat, other site-specific information collected during planning, and industry experience with similar monitoring programs and submitted to the C-NLOPB and Fisheries and Oceans Canada for review and acceptance at least 60 days prior to drilling.

Follow-up in relation to effects on benthic habitat in Special Areas is described in Section 6.4.

The proponents, in collaboration with other operators, are also pursuing research to address knowledge gaps regarding Atlantic Salmon migration. Discussions are ongoing with Indigenous groups to generate a short list of potential research activities, and the proponents have been in discussion with Petroleum Research Newfoundland and Labrador and the Environmental Studies Research Fund to potentially initiate new research in this area. In the meantime, Equinor has purchased and provided the Atlantic Salmon Federation with 18 salmon tags to use in their salmon tagging program in Greenland. The proponents also noted that Husky Energy has placed receivers for tagged salmon on its SeaRose production facility on the Grand Banks. Equinor indicated that it is also considering deploying an acoustic receiver in the Flemish Pass area. Data from these initiatives will contribute to knowledge on salmon migration.

Predicted Residual Effects

The proponents predicted that the residual effects of the Projects on fish and fish habitat would be: negligible to low in magnitude; generally localized in the immediate vicinity of the activity, but occasionally extending to the project area for certain interactions such as those from sound or more highly dispersed discharges; short- to long-term in duration, depending on the nature of the effect; occur regularly or sporadically throughout the life of the Projects; and reversible. Overall, it was predicted that the residual environmental effects of routine project activities on fish and fish habitat, including species at risk, were likely to be not significant.

6.1.2 *Views expressed*

Federal Authorities

Fisheries and Oceans Canada, the Agency, KMKNO, and a member of the public requested additional information on coral and sponge surveys. Fisheries and Oceans Canada also requested that the analysis of the effects of sound on fish be updated, taking into consideration sound levels included in the qualitative assessment conducted for the Projects. Additional information on both these topics was provided by the proponents and considered in the text above.

Fisheries and Oceans Canada requested clarification related to the criteria that would be used to define coral and sponge aggregations. The proponents indicated that a risk assessment approach would be used to identify site-specific mitigation and monitoring requirements based on the results of coral and sponge surveys, and that several factors (e.g. number of living soft corals per a defined area, condition of hard and soft corals, percentage of sponge coverage) would be considered to determine if mitigation is required. A Coral and Sponge Survey Results and Risk Assessment Report for each wellsite would be prepared and submitted to the C-NLOPB and Fisheries and Oceans Canada for approval prior to drilling.

The Agency requested information on the likely distance between wells and the potential for overlapping effects of discharges given that multiple wells could be drilled for each project. The proponents stated that distances between exploration wells would vary, and subsequent delineation/appraisal wells would typically be completed within approximately 20 kilometres of initial wells. The proponents stated that it was not feasible to assess potential overlap of synthetic-based cuttings dispersion given that well locations have not been selected. However, they noted that: modelling predicted the majority of synthetic based cuttings would settle beyond 32 kilometres from wellsites; cuttings would be highly dispersed and negligible in thickness once settled; and it is not anticipated that overlapping synthetic-based cuttings would occur to a degree that exceeds the no-effects thresholds. In exploration licence 1137, synthetic-based cuttings were predicted to be deposited within 32 kilometres of the modelled wellsite at generally low thickness; any higher accumulations were predicted over a small area reducing potential effects on fish and fish habitat.

Fisheries and Oceans Canada provided information on the migration patterns of Atlantic Salmon in the northwest Atlantic and on the potential effects of the Projects. It advised that Atlantic Salmon that spawn in rivers of eastern Canada (including New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador, and Quebec) travel throughout the northwest Atlantic Ocean. As there have been few marine surveys of the species, their oceanic movement is not well understood. Atlantic Salmon in the northwest Atlantic are found most abundantly west of Greenland and in the Labrador Sea in summer and fall and along the eastern

slope of the Grand Banks in spring. Surveys have also detected salmon in waters of the Jeanne d'Arc Basin/Flemish Pass region, but in lower abundances than the areas previously noted, and only in the spring. Fisheries and Oceans Canada further advised that it is possible that some salmon overwinter in the Jeanne d'Arc Basin/Flemish Pass region, and that salmon are likely to be present in the Jeanne d'Arc Basin/Flemish Pass region at some times of the year as they migrate through the area, to and from home rivers. The department advised that monitoring of finfish for the past 25 to 30 years in the Newfoundland and Labrador offshore has revealed no effects on fish health from ongoing oil and gas operations.

Fisheries and Oceans Canada advised the Agency that the mitigation measures, monitoring, and follow-up programs proposed by the proponents and recommended by the Agency would adequately address the potential effects of the Projects on fish and fish habitat.

Indigenous Peoples

The KMKNO, MTI, Miawpukek First Nation, Sipekne'Katik First Nation, Première Nation de Nutashkuan, Innu de Ekuanitshit, NunatuKavut Community Council, Elsipogtog First Nation, WNNB, and Woodstock First Nation commented on the Projects' potential effects on Atlantic Salmon, which was identified as a species of particular concern to Indigenous groups. Several Indigenous groups provided submissions specific to Atlantic Salmon, which included additional information or research for consideration by the proponents. The Agency also heard concerns about Atlantic Salmon from Indigenous groups during workshops in April 2018, including concerns and questions about migration patterns, potential use of the project area, and potential interactions with the Projects. Additional information and analysis provided by the proponents has been incorporated above.

The KMKNO, Sipekne'katik First Nation, Qalipu First Nation, and Innu de Ekuanitshit expressed concerns about potential effects on American Eel, stressing the cultural importance of this species and requesting additional information on potential measures to mitigate effects. The proponents recognized that American Eel may migrate through the shallow waters in the project area. They stated that general mitigation measures for fish and fish habitat would avoid or reduce potential adverse effects on American Eel.

MTI stated that North Atlantic Swordfish are a commercially and culturally important species and requested a more comprehensive assessment of potential effects, including consideration of Indigenous knowledge, especially given that the species only tolerates small environmental changes. The proponents engaged MTI to conduct an Indigenous Knowledge Study, in which participants noted Swordfish presence in the big water of the Flemish Pass. The proponents stated that Swordfish generally occupy Canadian waters for foraging from June to October, and that Swordfish have been shown to be attracted to marine structures and to low frequency sounds that are typical of offshore operations. Attraction to a drilling installation may result in increased exposure of individual Swordfish to emissions and discharges, and discharges may also reduce visibility in the water and affect the ability to capture prey fish. The proponents stated that the Swordfish is a highly mobile species that is likely able to avoid anthropogenic effects associated with drilling installations and associated vessels, and that the distance from the project area to spawning habitats reduces potential interactions with important habitats and critical life stages.

Miawpukek First Nation requested additional information on the use and potential effects of biocides. The proponents stated that biocides are not commonly used as part of exploration drilling activities, but potentially

could be used in cooling water systems, introduced to the wellbore during well abandonment, or added to water-based mud if pre-mixing and storage is necessary. Although a biocide was approved for use in Equinor's 2017 exploration drilling programs, it was never used. Research on the effects of biocides in municipal wastewater systems has shown that chlorinated wastewater effluents can cause acute lethality to fish and changes in benthic community structure up to 500 metres from the outfall; however, the proponents note that this analysis is not easily translatable to the potential effects from the Projects given the differences in distance from shore, water depths, wave action, and temperature. The proponents noted that discharge volumes associated with offshore oil and gas platforms would be substantially lower than those for large-scale sources such as municipal wasterwater systems. Any biocides that could be used would be screened and approved in accordance with the *Offshore Chemical Selection Guidelines*.

A summary of issues raised by Indigenous groups is presented in Appendix C.

Public

A member of the public requested additional information to support the prediction that temporary infrastructure could have positive effects on benthic habitat recovery. Similarly, the Première Nation de Nutashkuan questioned whether short-term habitat created by infrastructure could contribute significantly to biodiversity. The proponents indicated that artificial structures can increase benthic community structure, species diversity and abundance through the addition of hard substrate and habitat complexity. The proponents noted that recovery and recolonization of the area would only be enhanced if the temporary infrastructure supported connectivity to areas that were previously inaccessible by benthic invertebrates. These areas would potentially support succession of the area once the infrastructure was removed. However, the proponents noted that the short-term duration of drilling activities would limit both positive and negative effects of infrastructure presence

6.1.3 *Agency Analysis and Conclusion*

Analysis of Effects

The Agency is aware that parts of exploration licences included in the Projects may support aggregations of sponges and corals. Habitat complexity and biodiversity in deep-sea environments is highly dependent on these long-lived, structure-forming organisms, which provide refuge, nursery and foraging areas for many fish and invertebrate species. Without adequate mitigation, benthic habitat, including corals and sponges, could be affected by the disposal of drilling muds and cuttings from the Projects; sedentary or slow moving species may be smothered and the sediment quality would be altered by nutrient enrichment and oxygen depletion at cuttings deposition thicknesses above the 6.5 millimetre threshold for burial effects (the proponents also identified a 1.5 millimetre threshold for more susceptible species). Given the importance and sensitivity of corals and sponges, the proponents would be required to conduct surveys at each wellsite and around anchor points prior to drilling. If aggregations of habitat-forming corals or sponges or other environmentally sensitive features are identified, the proponents would be required to relocate the well and/or redirect cuttings discharges to avoid affecting them, unless not technically feasible. If it is determined that it is not technically feasible to move the well or redirect cuttings discharges, the proponents would be required to conduct a comprehensive assessment of the benthic habitat in consultation with Fisheries and Oceans Canada prior to drilling to

determine the potential for serious harm or alteration of coral and sponge aggregations and related options for mitigation to reduce any identified risks.

Fish and fish habitat could also be affected by other marine discharges. The Agency notes that all chemicals would be selected in accordance with the *Offshore Chemical Selection Guidelines* and any discharges would meet or exceed standards set out in the *Offshore Waste Treatment Guidelines* and the *International Convention for the Prevention of Pollution from Ships* (MARPOL). The implementation of these measures would limit effects on fish.

Continuous underwater sound from operation of the drilling installation and support vessels may cause recoverable injury in certain species of fish at distances of 150 metres or less from the source. Sound may also result in behaviour responses, including avoidance or attraction, and may mask fish sensory abilities. Sound from vertical seismic profiling surveys could also affect fish, including potentially causing injury or mortality. Sound levels from these surveys may exceed injury thresholds up to 500 metres for some species or life stages. Mobile species would likely exhibit avoidance behaviour, and the surveys would begin with a "ramp-up" phase to increase initial avoidance and limit any potential effects. Although fish may temporarily avoid the area, it is predicted that they would not be displaced from key habitats or disrupted during key activities over extended areas or periods. Immobile species or life stages may experience injury and mortality, but these effects would be localized.

Certain fish species that could be affected by the Projects are of particular importance to Indigenous groups and are used or have been historically used by these groups for traditional purposes, in particular Atlantic Salmon. During the EAs, Indigenous groups and the proponents provided information on Atlantic Salmon and its potential interaction with the Projects. Fisheries and Oceans Canada reviewed applicable information and confirmed that there is uncertainty regarding the at-sea migration patterns and habitat use of Atlantic Salmon; there have been few marine surveys of the species and its oceanic movements are not well understood. That said, it is known that at-sea salmon are most abundant west of Greenland and in the Labrador Sea in summer and fall and along the eastern slope of the Grand Banks in spring. Salmon have been detected in the spring in waters of the Jeanne d'Arc Basin and Flemish Pass, but in lower abundances than in the areas previously noted. The department advised that it is possible that some salmon overwinter in the Jeanne d'Arc Basin/Flemish Pass region, and that salmon are likely to be present at some times of the year as they migrate through to and from home rivers, but this is not known to be a significant migration route or overwintering area. It advised that it is possible that warming water as a result of climate change could affect salmon distribution in future; however, this would be outside the timeframes of the Projects.

Given the potential for some Atlantic Salmon to occur in areas that overlap with the Projects, potential effects on the species could occur. Fisheries and Oceans Canada has advised that potential effects of the Projects are expected to be negligible to low and spatially and temporally limited. This prediction is made with a moderate level of certainty given uncertainties about Atlantic salmon distributions and reasons for population declines.

Given the uncertainty about Atlantic Salmon and the importance of the species to Indigenous groups, the proponents have committed to undertake and contribute to research on the presence and distribution of Atlantic Salmon in the Jeanne d'Arc Basin and Flemish Pass and will work with Indigenous groups to generate a

list of potential research activities to address data gaps. Equinor has purchased and provided the Atlantic Salmon Federation with 18 salmon tags to use in their salmon tagging program in Greenland and is also considering deploying acoustic receivers in the Flemish Pass area to receive and record acoustic signals from tagged Atlantic Salmon and provide additional data regarding potential migration through this area. Additional research may be supported through Petroleum Research Newfoundland and Labrador or through the Environmental Studies Research Fund. The results should be made readily available to existing or future regional databases and proactively shared with government, Indigenous groups, and the public

Key Mitigation Measures to Avoid Significant Effects

The Agency considered the mitigation measures proposed by the proponents, expert advice from federal authorities, and comments from Indigenous groups and the public, and identified the following key measures to mitigate the Projects' effects on fish and fish habitat:

- prepare a coral and sponge survey plan for each wellsite and submit to Fisheries and Oceans Canada and the C-NLOPB for review and approval prior to implementing the survey. The survey plan should include:
    - use of a remotely-operated vehicle to collect high-definition visual data to confirm the presence or absence of sensitive environmental features, including aggregations of habitat-forming corals or sponges; and
    - survey transect length and pattern around wellsites, which should be based on applicable drill cutting dispersion model results. Transects around anchor sites should extend 50 metres from the extent of the anchor pattern.
- based on approved plans, undertake a coral and sponge survey at each well location and around each anchor point, if applicable, prior to commencing drilling a well. Retain a qualified independent marine scientist to provide advice in real-time. When undertaking the coral and sponge survey:
    - if aggregations of habitat-forming corals or sponges or other environmentally sensitive features are identified, relocate the well and/or redirect cuttings discharges to ensure that the drilling installation, anchors, or drill muds and cuttings deposits will not affect them, unless not technically feasible. No drilling should occur before a decision is made by the C-NLOPB and Fisheries and Oceans Canada regarding appropriate mitigation and monitoring; and
    - if aggregations of habitat-forming corals or sponges or other environmentally sensitive features are identified and it is determined, to the C-NLOPB's satisfaction, that it is not technically feasible to relocate the well or redirect cuttings discharges, conduct a comprehensive assessment of the potentially-affected benthic habitat in consultation with Fisheries and Oceans Canada prior to drilling to determine the potential for serious harm or alteration of coral and sponge aggregations and related options for mitigation to reduce any identified risk.
- select chemicals to be used during the Projects in accordance with the *Offshore Chemical Selection Guidelines* and use lower toxicity drilling muds and biodegradable and environmentally-friendly additives within muds and cements, where feasible;
- ensure that all discharges from a drilling installation meet the *Offshore Waste Treatment Guidelines*;
- transport spent or excess synthetic-based mud that cannot be re-used during drilling operations to shore for disposal at an approved facility;
- ensure that all discharges from supply vessels meet or exceed the standards established in the International Convention for the Prevention of Pollution from Ships (MARPOL); and

- conduct a pre-drill survey with qualified individual(s) at each well site to determine the presence of any unexploded ordnance or other seabed hazards. If any such ordnance or seabed hazard is detected, avoid disturbing or manipulating it, and contact the nearest Joint Rescue Coordination Centre and the C-NLOPB prior to commencing drilling to determine an appropriate course of action. Additional measures to mitigate effects on fish and fish habitat are included in Section 6.2 Marine Mammals and Sea Turtles.

Follow-up

The Agency identified the following measures as part of a follow-up program, to be developed in consultation with , C-NLOPB and Fisheries and Oceans Canada, to ensure the effectiveness of mitigation measures and to verify the accuracy of predictions of effects on fish and fish habitat:

- provide the results of coral and sponge surveys to Fisheries and Oceans Canada and the C-NLOPB prior to commencing drilling. Results of the surveys should be provided to Indigenous groups and posted online for public access;
- monitor the concentration of synthetic-based mud on drill cuttings to verify compliance with the performance target specified in the *Offshore Waste Treatment Guidelines*. Report results to the C-NLOPB;
- for the first well on each exploration licence, and for any well where drilling is undertaken in an area determined by coral and sponge surveys to be sensitive benthic habitat, conduct specific follow-up monitoring, including:
    - measurement of sediment deposition extent and thickness post-drilling and prior to departing the location to verify drill cuttings dispersion modelling predictions;
    - survey of benthic fauna present after drilling has been concluded;
    - reporting of results, including a comparison of modelling results to in situ results, to the C-NLOPB and Fisheries and Oceans Canada; and
    - results should be provided to Indigenous groups and posted online for public access;
- participate in or advance research on the presence and distribution of Atlantic Salmon in the Jeanne d'Arc Basin and Flemish Pass, and update the C-NLOPB annually on research activities. It is noted that the proponents have indicated they are pursuing research initiatives through organizations such as Petroleum Research Newfoundland and Labrador and the Environmental Studies Research Fund and will work with Indigenous groups to generate a list of potential research activities to address data gaps.

Additional follow-up that would also be applicable to fish and fish habitat is included in Section 6.2 Marine Mammals and Sea Turtles.

Agency Conclusion

The Agency determined that the adverse residual environmental effects of the Projects on fish and fish habitat would be low-magnitude, occur locally, and occur continuously or regularly during drilling operations. Effects on fish and fish habitat would be reversible.

Taking into account the implementation of the mitigation measures described above, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on fish and fish habitat.

6.2 Marine Mammals and Sea Turtles

This section discusses the potential effects of routine project activities on marine mammals and sea turtles, including species at risk. Potential routine effects on applicable species at risk are also discussed in Section 6.5 Species at Risk. The effects of potential accidents and malfunctions are described in Section 7.1.

As described in the analysis below and taking into account the implementation of key mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on marine mammals and sea turtles.

6.2.1 *Proponents' Assessments of Environmental Effects*

Existing Environment

The Projects would take place within the Flemish Pass Basin and Jeanne d'Arc Basin (ExxonMobil's project only), which support a diverse array of marine mammals and sea turtles and contain important feeding areas, migratory routes, and breeding and whelping areas. Twenty-seven species of marine mammals may be found in the project area, including:

- 23 species of cetaceans (whales, dolphins and porpoises) - seven mysticetes (baleen whales) and 16 odontocetes (toothed whales); and
- four species of pinnipeds[3], all of which are phocids[4] (seals).

Several species are present in the project area year-round (e.g. Blue Whale, Fin Whale, Humpback Whale, Killer Whale, Northern Bottlenose Whale, Grey Seal, Harbour Seal, Harp Seal), while others are present seasonally (e.g. Sei Whale, Common Bottlenose Dolphin, Short-beaked Common Dolphin, Striped Dolphin, Hooded Seal). Four species of sea turtle migrate and forage through the Flemish Pass Basin and Jeanne d'Arc Basin and may occur in the project area.

Eight species of marine mammals and sea turtles that may occur[5] in the project area are listed under the *Species at Risk Act*: Blue Whale (Atlantic population), Fin Whale (Atlantic population), North Atlantic Right Whale, Beluga Whale (St. Lawrence Estuary population), Northern Bottlenose Whale (Scotian Shelf population), Sowerby's Beaked Whale, Leatherback Sea Turtle (Atlantic population), and Loggerhead Sea Turtle. In addition, three species of marine mammal identified by COSEWIC as species of conservation concern could occur in the project area: the Bowhead Whale (Eastern Canada-West Greenland population), Harbour Porpoise (Northwest Atlantic

[3] A term used to describe all three groups that form the superfamily Pinnipedia: phocids (true seals or earless seals), otariids (eared seals or fur seals and sea lions), and walrus. (Appendix C – Flemish Pass Exploration Drilling Project EIS)

[4] A term used to describe all members of the family Phocidae. These true/earless seals are more adapted to in-water life than are otariids, which have more terrestrial adaptations. Phocids use their hind flippers to propel themselves. (Appendix C – Flemish Pass Exploration Drilling Project EIS)

[5] The North Atlantic Right Whale and the Beluga Whale (St. Lawrence Estuary population) have a low incidence of opportunistic sightings in the project area, with one observation of each species recorded in the northern section of the project area based on Fisheries and Oceans Canada, Ocean Biographic Information System, and Equinor marine mammal observer records.

population), and Killer Whale (Northwest Atlantic/Eastern Arctic population). There is no designated critical habitat for marine mammals or sea turtles in the regional study area

Predicted Effects

The proponents predicted the following potential key environmental interactions between the Projects and marine mammals and sea turtles:

- injury or behavioural effects from sound or other disturbances caused by the Projects;
- injury or mortality through collisions or other interactions with offshore survey and supply vessels; and
- changes in the availability, distribution, or quality of feed sources and the quality of habitats.

Potential interactions with project components and activities are described below.

Presence and Operation of Drilling Installation

The proponents predicted that continuous exposure to sound over a 24-hour period from an operating drilling installation could cause auditory injury[6] in marine mammals and sea turtles as far as 470 metres from the source. They stated that this is not expected to occur because it is unlikely that marine mammals and sea turtles would approach or remain in areas of intense underwater sound.

The proponents predicted that the National Oceanic and Atmospheric Administration's behavioural threshold[7] for marine mammals exposed to continuous underwater sound could be exceeded up to greater than 150 kilometres from the drilling installation during winter and approximately 51.6 kilometres during summer based on the most conservative estimates[8]. Behavioural disturbances may include changes in diving/ breathing rate, habitat avoidance, and changes in migration or movement patterns or activity state. Marine mammals rely on their ability to hear and use underwater sounds to communicate, locate prey, and avoid predators, and masking could occur when underwater sound is strong enough to impair detection of these sounds that marine mammals rely on. Mysticetes vocalize primarily at lower frequencies and are therefore expected to be the most susceptible to potential masking from sound produced by the drilling installation.

The proponents stated that little is known about potential effects of sound on sea turtles and that they do not vocalize or use sound for communication. Potential effects of a drilling installation on a change in sea turtle habitat quality or use would generally be expected to include the same effects discussed for marine mammals.

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[6] The proponents indicated that they used both the US National Oceanic and Atmospheric Administration's *National Marine Fisheries Service Guidelines* (NMFS) (2016) and Southall et al. (2007) to provide guidance on threshold levels of underwater sound for auditory injury in marine mammals. These both present dual metrics for threshold values [i.e. recommend consideration of both peak sound pressure levels (SPLpeak) and cumulative (over 24 hours) sound exposure levels (SELcum)]. The proponents indicated that conclusions were based on whichever metric was first exceeded.

[7] 120 dB re 1 µPa (decibels relative to a fixed reference pressure of 1 micropascal) root mean square sound pressure level published by the National Oceanic and Atmospheric Administration.

[8] $R_{max,}$ which is the maximum range at which the given sound level threshold is encountered in the model.

Drilling Wastes and Other Marine Discharges

Routine marine discharges could result in a temporary reduction in water and sediment quality, which could result in adverse health effects on marine mammals and sea turtles and potential secondary effects from changes to the health, abundance, and distribution of marine fish and invertebrate prey species. The proponents concluded that treated marine discharges would result in localized and temporary reduction in water and sediment quality but would be unlikely to introduce heavy metals in concentrations harmful to marine mammals and sea turtles and their prey. In addition, secondary effects would be expected to be minimal because marine mammals that regularly occur in the local study area are not known to feed on benthos.

Wellhead Suspension and Abandonment

Explosives would not be used during wellhead abandonment. Cutting of wellheads could occur at depths less than 1500 metres and take up to two days to complete, but a mechanical cutter is not is expected to produce underwater sound of an intensity or extent to present a risk of mortality or result in a measurable change in habitat quality or use.

Project-Related Surveys

Impulsive (i.e. non-continuous) sound, such as that emitted by vertical seismic profiling and other geophysical surveys, could affect hearing in marine mammals and sea turtles. The proponents estimated that thresholds for auditory injury could be exceeded at distances of up to 620 metres, 250 metres, and 170 metres from a vertical seismic profiling sound source for low-, mid- and high-frequency hearing group cetaceans, respectively, and up to 1.6 kilometres for pinnipeds. Thresholds for auditory injury for sea turtles have not been identified; however, it is assumed that these thresholds would not exceed those identified for cetaceans.

The proponents predicted that the threshold for behavioural disturbance to marine mammals[9] could be exceeded up to 3.2 kilometres from the sound source during vertical seismic profiling. Overall, the proponents indicated that brief exposure to sound pulses from a single geophysical survey would not be likely to result in prolonged behavioural disturbance of mysticetes and that odontocetes generally demonstrate some level of avoidance. While limited data exists regarding behavioural responses of pinnipeds to sound sources from geophysical activities, avoidance behaviour was noted.

Numerical threshold levels for behavioural disturbance of sea turtles have not been identified; however, the proponents described the relative risk as high within tens of metres of the sound source and low within hundreds to thousands of metres. Geophysical surveys could result in short-term behavioural effects in sea turtles, such as hearing sensitivity and increased and erratic swimming behaviour. Avoidance behaviour was also noted in some sea turtle species.

Supply and Servicing

The proponents stated that marine mammals and sea turtles could be injured or killed if struck by a project vessel and that mysticetes would be the most vulnerable to vessel collisions. In particular, North Atlantic Right Whales (endangered under the *Species at Risk Act*), Fin Whales (special concern under the *Species at Risk Act*),

[9] 160 dB re 1 µPa root mean square sound pressure level published by the National Oceanic and Atmospheric Administration.

and Humpback Whales are especially vulnerable to vessel strikes. The North Atlantic Right Whale has low potential for occurrence in the project area, and Fin Whale and Humpback Whales both have high potential for occurrence. The proponents do not anticipate that the Projects would result in an increase in the number of vessel transits over existing levels. They stated that reducing vessel speed has been shown to reduce the number of marine mammal deaths (infrequent at speeds less than 14 knots and rare at speeds less than 10 knots) and severe injuries due to vessel strikes. As standard practice, transit speeds of project vessels would be typically between 10 to 12 knots (19 to 22 kilometres per hour) and occasionally 13 to 14 knots (24 to 26 kilometres per hour).

Proposed Mitigation Measures, Monitoring and Follow-up

The proponents proposed measures to mitigate potential effects on marine mammals and turtles, including:

- maintain a steady vessel course and safe vessel speed whenever possible (vessel transit speeds would typically be between 10 to 12 knots and occasionally 13 to 14 knots);
- use existing and common vessel and aircraft travel routes for vessels and helicopters where possible and practicable;
- do not use explosives for removal of wellheads;
- follow the *Statement of Canadian Practice with Respect to the Mitigation of Geophysical Sound in the Marine Environment* during geophysical surveys and as required in C-NLOPB's *Geophysical, Geological, Environmental and Geotechnical Program Guidelines* including:
    - submitting a marine mammal and sea turtle monitoring plan to the applicable regulators for review at least 30 days prior to the commencement of the first geophysical survey;
    - using trained observers to monitor and report on marine mammal and sea turtle sightings within a pre-determined safety zone during vertical seismic profiling and geophysical surveys where geophysical source arrays are used;
    - ramping-up the source array (i.e. gradually increasing geophysical source elements over a period of at least 20 minutes until the operating level is achieved) starting from a single source element;
    - having marine mammal observers implement a pre-ramp up watch of 30 minutes prior to the start of the air source, and delaying ramp-up if a marine mammal or sea turtle is sighted within the safety zone;
    - implementing observational/shutdown procedures; and
    - shutting down the geophysical source array if a marine mammal or sea turtle listed as endangered or threatened on *Species at Risk Act* Schedule 1 is sighted.

Mitigation measures that apply to fish and fish habitat (Section 6.1) would also apply to marine mammals and sea turtles.

Proposed follow-up measures include:

- submit an annual report of the marine mammal and sea turtle observational program (for geophysical activities) to the C-NLOPB and Fisheries and Oceans Canada, including documentation of marine mammal and sea turtle sightings. Provide data from the observational program to the C-NLOPB no later than six months after termination of the fieldwork; and
- report any vessel strikes involving marine mammals or sea turtles to Fisheries and Oceans Canada within 24 hours.

Predicted Residual Effects

The proponents predicted that residual effects of the Projects on marine mammals and sea turtles would be: adverse; negligible to medium in magnitude; occur within the project area, local study area and regional study area; short- to medium-term in duration; sporadic for supply services or continuous for presence of the drilling installation and drilling operations; and reversible. Overall, it was predicted that the residual environmental effects of routine project activities on marine mammals and sea turtles, including species at risk, were likely to be not significant.

6.2.2 *Views Expressed*

Federal Authorities

Fisheries and Oceans Canada indicated that it did not have any significant concerns with the effects of the Projects on marine mammals and sea turtles based on the relatively short duration of noise disturbance, the commitment to adhere to the *Statement of Canadian Practice with Respect to the Mitigation of Geophysical Sound in the Marine Environment*, and because there is no critical habitat for marine mammal species at risk in the project area. It advised the Agency that the mitigation measures, monitoring commitments, and follow-up programs proposed by the proponents and recommended by the Agency would adequately address the potential effects of the Projects on marine mammals and sea turtles.

Indigenous Peoples

The KMKNO and MMS recommended that the proponents use passive acoustic monitoring[10] or equivalent technology to detect marine mammals in the vicinity of the Projects given limitations of visual observation particularly in case of low visibility (e.g. fog, nighttime). The proponents responded that they are of the opinion that there would be no additional benefit to passive acoustic monitoring given the relatively small radius of the zone within which temporary or permanent threshold shift values could be exceeded and because the ramp up procedure would utilize a very small air gun, which would promote temporary avoidance of the area by mobile species and help to reduce species' exposure to sound above threshold values. They advised that the probability of an undetected marine mammal or sea turtle being in close vicinity to an area where threshold levels for injury could be exceeded would be very low. The proponents proposed visual monitoring by trained observers to detect marine mammals and sea turtles within a safety zone during vertical seismic profiling and a pre-ramp up watch prior to the start-up of operation of air source arrays.

The KMKNO asked about the feasibility of extending the safety zone during vertical seismic profiling to a radius of one kilometre around the drilling installation given the number, status, and sensitivity of species likely to be present in the area. The proponents responded that extending the safety zone would be challenging and unnecessary to protect marine species. In addition, marine mammal observers would not be able to reliably identify species from the drilling installation beyond approximately 500 metres.

[10] Passive Acoustic Monitoring: means a technology that may be used to detect the subsea presence of vocalizing cetaceans (Fisheries and Oceans Canada, 2007).

Multiple Indigenous groups commented on the mitigation measures proposed by the proponents. The KMKNO advised that vessels should be required to reduce speeds (ten knot limit) when not in existing shipping lanes or whenever a marine mammal or sea turtle is observed or reported in the vicinity of a vessel. It also recommended that vessel traffic routes link with existing shipping lanes at the earliest practicable opportunity. The proponents stated that the offshore Newfoundland area does not have prescribed speed limits or shipping lanes. Speed would be set based on environmental conditions (e.g. wind, waves), distances, and fuel efficiency and proponents would follow operational best practices.

MTI suggested that additional mitigation measures be considered to reduce the effects of drilling activities on marine mammals (e.g. avoidance of drilling when North Atlantic Right Whales are more likely to be present [May 1 to September 1]; drilling be put on hold if North Atlantic Right Whales were to be observed in close proximity to the drilling installation). The proponents stated that drilling is preferred during the summer months for safety and environmental protection, and it would not be practical to avoid drilling from May to September. Observations for marine mammals and sea turtles would be conducted during vertical seismic profiling and geophysical surveys where geophysical source arrays are used. The Agency notes that the EISs state that North Atlantic Right Whale has a low incidence of opportunistic sightings in the project area, with one observation recorded in the northern section of the project area based on Fisheries and Oceans Canada, Ocean Biographic Information System, and Equinor marine mammal observer records.

The MMS emphasized the importance of follow-up programs to ensure the effectiveness of mitigation measures on marine mammals, and marine species in general, and noted that the proponents did not confirm whether they intend to implement a follow-up program to verify sound predictions and effects on marine species. The proponents responded that uncertainty associated with predicted sound levels is low, the potential for adverse environmental effects is low, and confidence in effects predictions and the effectiveness of mitigation is moderate to high. They stated that no specific follow-up related to underwater sound and related effects would be necessary.

A summary of issues raised by Indigenous groups is presented in Appendix C.

Public

Public comments included those related to the potential disruption of migration routes and interference with marine mammal communication. Concerns were also expressed about the ability of observers to identify marine mammal or sea turtle species at risk. The proponents stated that trained observers would implement a pre-ramp up watch 30 minutes prior to start of air source arrays used for vertical seismic profiling. Consistent with the *Statement of Canadian Practice with Respect to the Mitigation of Geophysical Sound in the Marine Environment*, if a marine mammal or sea turtle were to be sighted within the safety zone, ramp up would be delayed until no animal is observed for 30 minutes. The air-source array would also be shut down if a marine mammal or sea turtle species at risk were to enter the safety zone during its operation.

6.2.3 *Agency Analysis and Conclusion*

Analysis of Effects

The Projects may adversely affect marine mammals and sea turtles, including species at risk. Several species of marine mammals and sea turtles could be present year-round in the project area, including in the proponents' exploration licences, while others may be present in higher abundance during summer and fall.

Potential interactions include sound from the drilling units or geophysical activity: sound emissions may potentially result in injury or mortality to marine mammals and sea turtles or affect the quality and use of their habitats. Notably, the acoustic environment is of importance to marine mammals as many species emit sound and rely, in part, on their acoustic sense for communication, social interaction, navigation, foraging, and predator avoidance. The Projects could result in exceedances of thresholds for both auditory injury and behavioural effects in marine mammals. However, auditory injury would require continuous exposure over a 24-hour period, and it is not expected that marine mammals would remain in areas that could cause permanent auditory injury. Distances to thresholds for behavioural disturbance are likely to be lower in shallower water, including sections of ExxonMobil's exploration licences 1135 and 1137.

Although Fisheries and Oceans Canada is generally supportive of the proponents' analysis related to marine mammals and sea turtles, it advised that there is uncertainty with respect to predictions related to the extent of sound emissions from drilling units, particularly given the reliance on previous modelling work and the extent of the associated modelling domain. Given this uncertainty, Fisheries and Oceans Canada has advised that it supports that the proponents would be required to verify sound predictions from the drilling unit.

To mitigate the effects of sound emissions from vertical seismic profiling and geohazard activities, the proponents would follow the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment*. Importantly, the proponents would be required to develop a Marine Mammal and Sea Turtle Monitoring Plan and provide it to Fisheries and Oceans Canada for review. The proponents would be required to report on the findings of monitoring to government and Indigenous groups.

The Agency notes that the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment* requires the use of cetacean detection technology under certain circumstances and conditions. It states that passive acoustic monitoring or equivalent technology must be used if the full extent of a safety zone is not visible or if a survey is in an area where vocalizing cetaceans listed as endangered or threatened in Schedule 1 of the *Species at Risk Act* are likely to be encountered. The Agency notes that the Eastern Newfoundland Offshore area is known to be foggy and to encounter rough sea states which could hinder visibility, and that species at risk, such as Northern Bottlenose Whale, have a moderate to high potential to occur in the project area. Based on these considerations, Fisheries and Oceans Canada has advised that it supports that the proponents would be required to use passive acoustic monitoring or equivalent technology, noting that marine mammal species of concern for detection by this technology would include baleen whales (e.g. Blue Whale, Fin Whale, North Atlantic Right Whale), as well as beaked whales (e.g. Northern Bottlenose Whale and Sowerby's Beaked Whale), which may be detected but would be difficult to speciate.

With respect to the size of the safety zone for marine mammal and sea turtle observations during vertical seismic profile testing, the Agency notes the request from KMKNO to extend the zone beyond the 500-metre

minimum required in the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment*. Fisheries and Oceans Canada has advised that the peak threshold for auditory injury would not likely extend beyond 140 metres from the source (based on Scotian Basin modelling), and is not anticipated beyond 500 metres. Thresholds for auditory injury for 24 hours of sound exposure would be reached at greater distances; however, marine mammals and sea turtles would be expected to move away within a 24-hour period. As such, and given that there is no designated critical habitat within the zone of influence for project-related underwater sound from vertical seismic profiling, Fisheries and Oceans Canada has recommended the standard 500 metre minimum safety zone for these projects. However, it also advised that as a precautionary measure, it would support extending the requirement for immediate shut-down of air source array(s) to include the observation of any marine mammal or sea turtle species within the 500 metre safety zone, as opposed to the minimum requirement of shut-down if a species at risk is sighted.

Marine mammals and sea turtles may be struck by project vessels, resulting in injury or mortality. Specifically, in 2017, a number of North Atlantic Right Whale deaths were reported in the Gulf of St. Lawrence. The incident reports for these deaths suggested trauma from vessel collisions as one of the causes. Although there have been no incidents reported off Eastern Newfoundland, the Projects may contribute to an increased chance of collisions with species susceptible to strikes. Fisheries and Oceans Canada has advised that the Fin Whale, which is regionally abundant and listed as special concern by the *Species at Risk Act*, is the most frequently ship-struck whale species in the world. Other species susceptible to ship strike include Humpback Whale, which is also regionally abundant, and the endangered North Atlantic Right Whale, for which there is some uncertainty about migration routes and potential presence in the Eastern Newfoundland offshore. Following consultation with Fisheries and Oceans Canada, the Agency is of the opinion that the slight increase in shipping traffic due to the Projects would be unlikely to substantially increase the probability of collisions. As a precautionary measure, the proponents would be required to limit vessel speeds when a whale or sea turtle is observed or reported in the vicinity of a vessel. Fisheries and Oceans Canada has advised that it would support the requirement for vessel speed to be reduced to 7 knots (approximately 13 kilometres per hour) when within 400 metres of a marine mammal or sea turtle.

The proponents should determine whether modified or additional mitigation measures are required based on the results of their monitoring programs, including those listed above. Additional mitigation could be also be prescribed by Fisheries and Oceans Canada should it be determined that the proponents require a permit under the *Species at Risk Act.*

Key Mitigation Measures to Avoid Significant Effects

The Agency considered the mitigation measures proposed by the proponents, expert advice from federal authorities, and comments from Indigenous groups and the public, and identified the following key measures to mitigate the Projects' effects on marine mammals and sea turtles:

- conduct vertical seismic profiling and geophysical surveys in accordance with or exceeding the Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment, including:
    - establishing a safety (observation) zone of a minimum of 500 metres around the sound source;
    - implementing cetacean detection technology, such as passive acoustic monitoring, concurrent with visual observations;

    - gradually increasing the sound source intensity over a period of at least 20 minutes (ramp-up), adopting a pre-ramp up watch of 30 minutes whenever survey activities are scheduled to occur, and delaying ramp-up if a marine mammal or sea turtle is sighted within the safety zone; and
    - shutting down the sound source upon observing or detecting any marine mammal or sea turtle within the 500 metre safety zone.
- to reduce risks of collisions with marine mammals and sea turtles (except during an emergency):
    - limit supply vessels movement to established shipping lanes where they are available (i.e. in approaches to harbours); and
    - when and where such speeds do not present a risk to safety of navigation, reduce supply vessel speed to seven knots (13 kilometres per hour) when a whale or sea turtle is observed or reported within 400 metres of the vessel.
- in consultation with Fisheries and Oceans Canada, develop a Marine Mammal and Sea Turtle Monitoring Plan which includes marine mammal observer requirements using qualified individuals. Provide the plan to the C-NLOPB and Fisheries and Oceans Canada for review and approval 30 days prior to initiating activities. The plan would describe:
    - monitoring during vertical seismic profiling and geophysical surveys, including information on specific passive acoustic or equivalent technology monitoring configuration, to enable verification that species that may occur within the safety zone can be detected and to ensure ability to effectively monitor for all marine mammal vocalization frequencies that may occur within the exploration licences.

In addition, certain measures listed in Sections 6.1 and 6.3 are also expected to mitigate potential effects on marine mammals and sea turtles.

Follow-up

The Agency identified the following measures as part of a follow-up program to ensure the effectiveness of mitigation measures and to verify the accuracy of predictions of effects on marine mammals and sea turtles:

- record and report the activities, observations, and results of the Marine Mammal and Sea Turtle Monitoring Plan to the C-NLOPB and Fisheries and Oceans Canada. Results should be provided to Indigenous groups and posted online for public access ;
- promptly report any collisions with marine mammals or sea turtles to the C-NLOPB, Fisheries and Oceans Canada, and the Canadian Coast Guard Environmental Emergencies Reporting Number (1 800 565-1633) and notify Indigenous groups;
- verify predicted underwater sound levels with field measurements during the first well per exploration licence. Provide the plan on how this would be conducted to the C-NLOPB and Fisheries and Oceans in advance of drilling, and the monitoring results after well suspension or abandonment, as directed by C-NLOPB and Fisheries and Oceans Canada; and
- follow-up program results should be provided to Indigenous groups and posted online for public access.

Agency Conclusion

The Agency predicts that the adverse residual environmental effects of the Projects on marine mammals and sea turtles would be negligible to medium in magnitude and would occur within the project area, local study area, or regional study area. The effects would be sporadic or continuous for the duration of the activity, but would cease and be reversible upon well abandonment.

Taking into account the implementation of the mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on marine mammals and sea turtles.

6.3 Migratory Birds

This section discusses the potential effects of routine project activities on migratory birds. Potential routine effects on species at risk and special areas relevant to marine and migratory birds are considered in this section, as well as in Section 6.5 Species at Risk and Section 6.4 Special Areas. The effects of potential accidents and malfunctions are described in Section 7.1.

As described in the analysis below and taking into account the implementation of key mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on migratory birds.

6.3.1 *Proponents' Assessments of Environmental Effects*

Existing Environment

The proponents stated that the coastline of eastern and southern Newfoundland and Labrador and the waters offshore provide important habitat for various species of marine-associated birds (e.g. cormorants, gannets, phalaropes, gulls, terns, alcids [auks], jaegers and skuas, and tubenoses [fulmars, petrels and shearwaters]). The proponents also stated that nearshore islands and mainland cliffs provide nesting grounds for tens of millions of seabirds representing some 20 species, including some of the largest seabird colonies in eastern North America south of the Hudson Strait. The abundance and distribution of species varies considerably based on the time of year: large gulls, kittiwakes, many alcid species, fulmars and shearwaters are abundant year-round; others, such as the Northern Gannet, terns, cormorants and phalaropes are absent or scarce in the winter months; Ivory Gulls are most likely to be present in the winter months, outside the breeding season. During the winter months, the waters off eastern Newfoundland provide important wintering habitat for several other species, including Dovekies, Common Murres, Thick-billed Murres, Great Skuas, and Black-legged Kittiwakes.

The proponents stated that the Leach's Storm-petrel is the species most frequently found stranded on platforms and vessels in and near the regional study area, with the vast majority of strandings occurring in September and October, following the departure of fledglings from nearby breeding colonies.

While most landbirds do not regularly occur in the marine environment, many fly long distances over water during migration. Nocturnal migrants such as passerines may be attracted to artificial light sources at sea, particularly in foggy conditions during the late summer to fall months (July to early November). While waterfowl (e.g. ducks, geese) occur in large numbers in marine habitats off eastern Newfoundland, especially during the winter months, they tend to prefer more coastal habitats and are unlikely to occur frequently in the offshore. Similarly, shorebirds are considered to be very infrequent visitors to the offshore.

The proponents identified 14 bird species at risk protected by the *Species at Risk Act* or by COSEWIC as potentially occurring in the regional study area; these are listed in Appendix D along with their likelihood of occurrences. The Ivory Gull and Red-necked Phalarope have been observed in small numbers offshore in the

area of operation of the projects. While many of the other species are unlikely to be present in the project area due to their preference for coastal habitats, migrating species may be attracted to lights.

Within the coastal and marine areas of eastern Newfoundland and Labrador, there are several special areas identified based on characteristics related to birds, such as Important Bird and Biodiversity Areas and ecologically and biologically significant areas. These are described in Section 6.4.

Predicted Effects

The proponents listed the following potential interactions between the Projects and migratory birds:

- attraction of birds to drilling installations and vessels, resulting in possible injury or mortality (strikes, strandings, incineration, disorientation, energy expenditure);
- injury or behavioural effects on birds (particularly diving birds) due to exposure to sound within the water column during vertical seismic profile or wellsite surveys;
- changes in the presence, abundance, distribution and/or health of birds resulting from exposure to discharges from drilling installations or vessels (physical exposure, ingestion); and
- indirect effects due to changes in the availability, distribution and/or quality of food or habitats due to disturbances and/or discharges described above.

Potential interactions with project components and activities are described below:

Presence and Operation of Drilling Installations

Migratory birds are known to be attracted to light emissions, including flares from offshore drilling installations, which may result in direct mortality or injury through collisions with facility infrastructure or indirectly through disorientation. Disoriented birds may fly continuously around lights, depleting energy resources, delaying foraging or migration, and potentially increasing their susceptibility to predation. The degree of associated mortality is not known with a high level of confidence. The proponents stated that there is uncertainty with respect to attraction distances to lighting given bird attraction has been observed from less than two kilometres from gas flares and up to five kilometres from production facilities but recent studies found birds attracted from up to 16 kilometres from light sources. Attraction may be especially pronounced during periods of fog or reduced visibility. The proponents stated that light pollution is low in the project area - northern section, and therefore the lighting associated with the Projects may have a comparatively larger effect in this area relative to the project area - southern section.

The proponents predicted that the drilling installations would contribute a negligible addition to the total amount of lighting in the overall offshore area. They would be situated several hundred kilometres offshore, far from coastal breeding sites and Important Bird and Biodiversity Areas, and well beyond the foraging range of almost all species that nest on the island of Newfoundland other than the Leach's Storm-petrel, which is known to make foraging trips of thousands of kilometres during the breeding season. Therefore, effects on most breeding bird species would be low.

Leach's Storm-petrels are particularly vulnerable to light attraction, including during the breeding season due to their long foraging trips. Reported bird strandings at offshore Newfoundland drilling installations and vessels were mostly of Leach's Storm-petrels, with the majority being released and low mortalities reported. The

proponents predicted that the short-term nature (in any one location) of the Projects, relative to a production facility, means that the effects would consequently be short-term and transient in nature.

In addition to attraction to drilling installations, other localized and short-term behavioral effects (change in presence and abundance), such as displacement from the area during drilling as a result of general avoidance responses and attraction to roosting and resting sites, are expected to be localized, transient and short-term in nature.

Drilling Wastes and Other Marine Discharges

The treated discharge of some operational wastes (e.g. deck drainage) may cause surface sheening, typically under calm conditions. Small amounts of oil from sheens have been shown to affect the structure and function of seabird feathers resulting in loss of buoyancy and hypothermia. The proponents stated that the potential for sheening to occur is low, and therefore likelihood of exposure of birds to surface sheens would also be low.

The release of organic wastes could attract birds, which may increase the potential for interactions including the risk of predation, collision, exposure to contaminants, and change in preferred feeding areas. The proponents stated that given that the Projects' likely zones of influence at one time or location would represent a small proportion of a species' feeding area, negative and detectable effects to overall populations are not predicted.

Drilling wastes (e.g. cement, water-based mud and cuttings) released at the seafloor were not predicted to interact with marine-associated birds and their habitats because they would be released below the diving range of seabirds. Treated synthetic-based cutting would have only a small (and permitted) fraction of residual synthetic-based mud when discharged and would be discharged below the water's surface (discharge points would be between four and 20 metres below the water's surface); thus, effects on birds were considered unlikely.

Formation Flow Testing with Flaring

The proponents stated that nocturnal migrants and night-flying seabirds such as Leach's Storm-petrel are most at risk of attraction to flares. Mortality has been reported from gas flares in the North Sea, but typically in low numbers - two studies observed birds approaching flares with no mortality. A number of factors influence the potential severity of interactions with flares including the time of year, location, height, and weather conditions. Mortality could increase during migration, particularly when poor weather conditions force birds to fly relatively low. The proponents stated that required flaring activities would be short in duration (three to five days) and associated bird attraction would be limited to within several kilometres of the drilling installations.

Supply and Servicing

Potential effects from lighting on supply vessels were predicted to be similar to those from lighting on drilling installations; however, since project vessels are generally not stationary, light disturbance would be highly transient and bird attraction could extend along the vessel routes. The proponents stated that vessel traffic for supply and servicing would be a negligible contribution to the overall vessel traffic off the island of Newfoundland. Effects on birds from helicopter use could include temporary loss of useable habitat and increased energy expenditure due to escape reactions, increased heart rate and lower food intake due to interruptions. Helicopter sound could also disturb nesting seabirds at colonies. However, the proponents stated

that effects on Important Bird and Biodiversity Areas and coastal breeding colonies from supply and servicing activities would be unlikely. Vessels would transit in a straight line approach to port and helicopters would use commonly used routes, reducing the amount of time traveling near coastal habitats.

Proposed Mitigation Measures, Monitoring and Follow-up

The proponents proposed measures to mitigate potential effects on migratory birds, including:

- avoid low-level aircraft operations where it is not required as per Transport Canada protocols;
- macerate sewage and kitchen waste to six-millimetre particle size in accordance with the *Offshore Waste Treatment Guidelines*;
- notify the C-NLOPB of plans to flare associated with formation flow testing. The C-NLOPB would then consult with Environment and Climate Change Canada to determine a safe timeline to reduce effects on migrating birds;
- conduct routine searches for, and collection and release of, stranded birds on the platform and supply vessels using Environment and Climate Change Canada's *Procedures for Handling and Documenting Stranded Birds Encountered on Infrastructure Offshore Atlantic Canada*; and
- avoid, where possible, established bird colonies. Helicopters will avoid known coastal seabird colonies per requirements of Newfoundland and Labrador's *Seabird Ecological Reserve Regulations*, 2015.

Mitigation measures that apply to fish and fish habitat (Section 6.1) would also apply to migratory birds.

Proposed follow-up measures include:

- develop a stranded seabird observation protocol in consultation with Environment and Climate Change Canada, which includes information on frequency of searches, reporting procedures, and training requirement; and
- implement a live bird monitoring and observation program in accordance with Environment and Climate Change Canada's monitoring protocol from fixed platforms that would include having a trained Environmental Observer onboard to record marine bird sightings during operations.

Predicted Residual Effects

The proponents predicted that residual effects of the Projects on migratory birds would be: adverse; low in magnitude; localized in the immediate vicinity of the activity or within the project area due to light attraction; short-term in duration for all project components except medium-term due to the presence of the drilling installations; sporadic for intermittent discharges and emissions or of regular frequency for constant influences; and reversible. Overall, it was predicted that the residual environmental effects of routine project activities on migratory birds, including species at risk, were likely to be not significant.

6.3.2 *Views Expressed*

Federal Authorities

Environment and Climate Change Canada provided information on light attraction distances. Additional information on these factors was provided by the proponents and incorporated in the text above.

Environment and Climate Change Canada advised that Leach's Storm-petrels breeding on both Gull Island and Baccalieu Island forage in the project area during the breeding season. Depending on the timing of disturbance, the effects of light attraction caused by the Projects has the potential to impact significant numbers of Leach's

Storm-petrel and effects on these breeding birds could be of high magnitude. The proponents acknowledged that populations of Leach's Storm-petrels have declined in the past two decades. The decline is thought to be attributable to a number of factors including predation, ingestion of marine contaminants (e.g. mercury), collisions and strandings due to attraction to lighted structures, and contact with hydrocarbons. Foraging ranges for four of seven major colonies of Leach's Storm-petrels in the western Atlantic overlap with offshore oil and gas operations, and populations have declined at three of these colonies in recent decades. The proponents stated that the short-term nature of the Projects means that the related effects would be short-term and transient in nature.

Environment and Climate Change Canada advised that studies examining bird mortality at flares may not have documented much mortality because these events are infrequent and that the event at the Canaport liquid natural gas facility in 2013 where 7500 birds were estimated to be killed in one flaring event illustrates episodic mass mortality. The proponents responded that mass mortality incidents appear to be extremely rare with fewer than five documented occurrences in Canada and the United States, and that no mass mortality events have ever been reported at oil and gas operations offshore Newfoundland and Labrador. These incidents tend to occur at night during the migration season (April to May and September to October) and appear to be associated with a particular set of atmospheric conditions: foggy or misty, and with low cloud cover, which may cause birds to fly lower than they ordinarily would. To reduce the requirement for flaring, the proponents proposed treatment and disposal of produced water if present in large volumes, and routine monitoring to maintain records of bird mortality to enable identification of potential issues related to flares and other lighted structures. They stated that further mitigation may be required if it is determined that mass mortalities are occurring.

Environment and Climate Change Canada advised that until an adequate estimate of strandings and mortality at offshore infrastructure is obtained, there is uncertainty as to the level of effect on migratory birds. It also advised that systematic deck searches for stranded birds conducted by trained observers should be undertaken instead of opportunistic searches. Systematic searches should occur at least daily, and have search effort documented and observations recorded (including information on level of effort when no birds are found). The proponents responded that, in consultation with Environment and Climate Change Canada, a seabird observation protocol, which would include frequency of searches, reporting procedures, and training requirements, would be developed prior to commencing the first exploration drilling program.

Environment and Climate Change Canada recommended that it provide training to environmental observers that would record bird sightings as part of the monitoring and observation program. The proponents responded that they anticipate that seabird observers would be trained in the *Eastern Canada Seabirds at Sea* protocol by third-party providers. Environment and Climate Change Canada stated that some third party providers are not qualified to teach the protocol and that it could provide names of companies that operate within Environment and Climate Change Canada standards. With respect to the surveys for stranded birds and the documentation of stranded birds, Environment and Climate Change Canada advised that it could provide this training.

Environment and Climate Change Canada advised the Agency that the mitigation measures, monitoring, and follow-up programs proposed by the proponents and recommended by the Agency would adequately address the potential effects of the Projects on migratory birds.

Indigenous Peoples

Several Indigenous communities, including Qalipu First Nation, the NunatuKavut Community Council, MTI, Innu de Ekuanitshit and the KMKNO, submitted comments about the potential effects of the Projects on birds, including: effects on migration patterns and behaviour; effects on habitat from exposure to oil and other discharges and emissions; and interactions with other project components and activities.

The NunatuKavut Community Council expressed concern about the potential effects of flaring on birds. It recommended that if there is an alternative to flaring with less environmental effect, then it should be used. The proponents responded that formation testing while tripping is an alternative to formation flow testing with flaring; however, there are circumstances where formation flow testing with flaring may be required to address specific information requirements. Formation flow tests with flaring would be carried out under the *Newfoundland Offshore Petroleum Drilling and Production Regulations*, which require submission of a detailed testing program to the C-NLOPB for approval and demonstration that tests would be conducted safely, without pollution, and in accordance with good oil-field practices. The C-NLOPB advised that formation testing while tripping may be possible depending on site-specific conditions and data requirements.

MTI stated that a key measure to help avoid and/or reduce potential effects on birds would be for operators to avoid established/known coastal seabird colonies, where possible. The proponents were asked to identify scenarios when helicopters could avoid coastal seabird colonies and whether buffer or set-back distances would be utilized. The proponents provided information on standard helicopter altitude profiles (i.e. between approximately 610 metres and 2743 metres) and advised that onshore approaches to St. John's Airport would be flown at the same approach points and altitudes as commercial air traffic.

The KMKNO recommended consideration of additional measures to minimize the attraction of birds (e.g. alternate light colour or intensity) and to deter birds from nesting on structures. The proponents responded that they do not intend to implement mitigation measures regarding lighting intensity, colour of lighting, or shielding light in a downward direction during drilling activities due to commercial availability and safety concerns associated with helicopter approach and landing. They were unaware of operating vessels or drilling installations with modified lighting that would have the technical capability to support the Projects.

MTI commented on follow-up and monitoring measures proposed for birds; recommending additions, including onsite observers and use of automated sensors on platforms to reduce uncertainty about seabird attraction to platforms, mortality events, and chronic spills and discharges. The proponents responded that drilling installations and vessels used for the Projects would be existing equipment contracted through third-parties and that they were unaware of any equipped with avian sensors. The proponents committed to developing a seabird observation protocol in consultation with Environment and Climate Change Canada.

A summary of issues raised by Indigenous groups is presented in Appendix C.

Public

A member of the public noted that the EISs did not include information on avian species listed on the International Union for the Conservation of Nature (IUCN) Red List of Threatened Species (e.g. Bermuda Petrel, White-tailed Tropicbird). The proponents' stated that for the applicable IUCN-listed species that may be present

in the project area (i.e. Bermuda Petrel (endangered), White-tail Tropicbird (least concern), Long-tailed Duck (vulnerable), Black-legged Kittiwake (vulnerable), Atlantic Puffin (vulnerable), Leach's Storm-petrel (vulnerable)), the mitigation measures described for other marine and migratory bird species would likewise help to avoid or reduce potential environmental effects of the Projects on these additional IUCN-listed species.

6.3.3 *Agency Analysis and Conclusion*

Analysis of Effects

The Projects would occur in areas that provide important habitat for various species of marine-associated birds, whose abundance and distribution varies considerably based on the time of year. Important Bird and Biodiversity Areas and breeding colonies are found on the east coast of the island of Newfoundland, including the largest colony of Leach's Storm-petrels in the world which is located on Baccalieu Island, approximately 64 kilometres north of St. John's.

Although lighting and flaring from the Projects would have the potential to affect migratory birds, the limited spatial and temporal nature of the Projects would likewise limit the potential for extensive bird attraction. It is understood that the effects of lights and flares at night could have a proportionally larger effect in Equinor's exploration licences (1139, 1140, 1141, 1142), which are located further offshore in an area with relatively less development/activities compared to ExxonMobil's exploration licences (1134, 1135, 1137). That said, the exploration licences occupy a small portion of the ranges of migratory bird species, many of which span vast portions of the northwest Atlantic Ocean. Furthermore, the drilling areas themselves (up to two at a time for each project) would only occupy a small portion of an exploration licence. There is no critical habitat identified within the proponents' exploration licences, and the Agency notes that key western Atlantic migration routes and flyways are generally closer to the coast than further out in the ocean where the Projects would take place. Nevertheless, it is possible that migratory birds, including species at risk, could encounter and be harmed by the Projects; therefore, it is important for the proponents to implement mitigation and verify their predictions.

Bird collisions at lit structures are a known problem, particularly for nocturnal migrants and night-flying seabirds such as Leach's Storm-petrels. Attraction to lights may also result in disorientation. Disoriented birds are prone to circling a light source and may deplete their energy reserves, delay foraging or migration, and potentially increase susceptibility to predation. Environment and Climate Change Canada advised that, without adequate estimates of strandings and mortality at offshore infrastructure, the proponents' conclusions that there are no significant effects on birds, including Leach's Storm-petrels, would not have a moderate to high level of certainty. To address this uncertainty, Environment and Climate Change Canada recommended that the proponents be required to conduct systematic searches for stranded birds on drilling installations, and stand-by and supply vessels, and to have trained observers on drilling installations to observe and report on marine bird presence. Based on these monitoring results, and in consultation with relevant authorities, the Agency is of the opinion that the proponents should determine if mitigation measures are effective and if additional mitigation measures are required.

Flaring could affect birds and thus alternatives should be considered. The Agency notes that formation flow testing while tripping does not require flaring. The C-NLOPB advised that formation flow testing while tripping may be possible depending on site-specific conditions and data requirements. Although flaring would occur

several hundred kilometres offshore, beyond the foraging range of most species that nest in Newfoundland and Labrador, the Leach's Storm-petrel may forage thousands of kilometres from nest sites during the breeding season and could thus interact with the Projects during flaring (which could take up to five days). The C-NLOPB's *Measures to Protect and Monitor Seabirds in Petroleum-Related Activity in the Canada-Newfoundland and Labrador Offshore Area* require proponents to notify the C-NLOPB of plans to flare including measures to avoid potential effects on migratory birds. If flaring is proposed, the C-NLOPB would consult with Environment and Climate Change Canada on the plans and appropriateness of proposed mitigation measures prior to authorizing flaring to occur.

Water curtains are a mitigation measure that has been required for exploratory drilling projects offshore Nova Scotia. The proponents stated that they are not currently aware of any literature that suggests that water curtains are effective in preventing bird attraction. The Agency notes that monitoring may be used to ensure the effectiveness of mitigation measures and, as such, would require the proponents to operate a water-curtain barrier around the flare during flaring and to monitor its effectiveness.

The treated discharge of some operational wastes (e.g. drill cuttings, deck drainage, bilge discharge) may cause surface sheening under calm conditions. Small amounts of oil from sheens have been shown to affect the structure and function of seabird feathers, resulting in loss of buoyancy and hypothermia. Wastes would be treated in accordance with the *Offshore Waste Treatment Guidelines* and discharged below the water surface, limiting effects on surface water quality in the immediate area of the discharge. Given the low potential for sheening as a result of routine operations; the likelihood of exposure to surface sheens by marine and migratory birds would likewise be low.

Exploration licences included in the Projects are located several hundred kilometres from seabird colonies and Important Bird and Biodiversity Areas which are in coastal or inland locations. Helicopters and supply vessels may disrupt birds along transit routes or coastal seabird colonies; however, potential effects are expected to be limited as standard helicopter altitude profiles are at a minimum height of approximately 610 metres and supply vessels would transit in a straight-line approach to and from port to the drilling installation (routes would be altered as necessary to avoid pack ice), thereby reducing potential interactions with bird colonies.

Key Mitigation Measures to Avoid Significant Effects

The Agency considered the mitigation measures proposed by the proponents, expert advice from federal authorities, and comments from Indigenous groups and the public, and identified the following key measures to mitigate the Projects' effects on migratory birds:

- follow Environment and Climate Change Canada's (2017) *Procedures for Handling and Documenting Stranded Birds Encountered on Infrastructure Offshore Atlantic Canada*, which identifies procedures for safe capture and handling of different types of birds;
- restrict flaring to the minimum required to characterize a well's hydrocarbon potential and as necessary for the safety of the operation;
- where acceptable to the C-NLOPB, use formation testing while tripping rather than formation testing with flaring;
- if formation testing while flaring is required ,notify the C-NLOPB to request an authorization in advance of flaring to:

- determine whether the flaring would occur during a period of migratory bird vulnerability (identified in consultation with Environment and Climate Change Canada); and
- identify how adverse environmental effects on migratory birds would be avoided, including opportunities to reduce night-time flaring (e.g. by starting flaring for shorter periods in the morning as opposed to at night); and

- operate a water-curtain barrier around the flare during flaring.

In addition, certain measures listed in Sections 6.1, 6.2, and 6.4 are also expected to mitigate potential effects on migratory birds.

Follow-up

The Agency identified the following measures as part of a follow-up program to ensure the effectiveness of mitigation measures and to verify the accuracy of predictions of effects on migratory birds:

- Prepare a follow-up program in consultation and Environment and Climate Change Canada to monitor effects on migratory birds to verify the accuracy of the predictions made during the EA and to determine the effectiveness of the mitigation measures. As part of the follow-up program:
  - conduct monitoring for marine birds from the drilling installation using a trained observer following Environment and Climate Change Canada's Eastern Canada Seabirds at Sea Standardized Protocol for Pelagic Seabird Surveys from Moving and Stationary Platforms;
  - develop, in consultation with Environment and Climate Change Canada, and implement a protocol for systematic daily monitoring of the drilling installation and supply vessels for the presence of stranded birds. The protocol would include information on frequency of searches, reporting procedures, and training requirements, including qualifications of those delivering the training;
  - if stranded birds are observed, follow Environment and Climate Change Canada's (2017) Procedures for Handling and Documenting Stranded Birds Encountered on Infrastructure Offshore Atlantic Canada;
  - document and report the results of any monitoring carried out, including a discussion of whether the mitigation measures (e.g. water curtain) were proven effective and if additional measures are required; and
  - provide the monitoring and follow-up program and its results to the C-NLOPB and Environment and Climate Change Canada. Results should be provided to Indigenous groups and posted online for public access.

Agency Conclusion

The Agency determined that the adverse residual environmental effects of the Projects on migratory birds would generally be low in magnitude, but could be moderate for certain species, such as Leach's Storm-petrel, depending on the timing and nature of the effect. Residual adverse effects would either be localized within the immediate vicinity of the drilling activity or could extend several kilometres for effects such as those from light emissions. The effects would occur regularly or intermittently for the duration of the Projects, but would cease and be reversible upon well abandonment.

Taking into account the implementation of the mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on migratory birds.

6.4 Special Areas

This section describes the potential effects of routine project activities on special areas. Potential routine effects on critical habitat for species at risk are discussed in Section 6.5. The potential effects of accidents and malfunctions are described in Section 7.1.

As described in the analysis below and taking into account the implementation of the key mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on special areas.

6.4.1 *Proponents' Assessments of Environmental Effects*

Existing Environment

The proponents described a number of special areas that are considered important due to their ecological, historical, and socio-economic value, and/or stakeholder and regulatory interests. Adverse environmental effects on a special area could degrade its ecological integrity such that it no longer provides the same biological or ecological function for which it was designated (e.g. protection of sensitive or commercially important species).

The special areas within the zone of influence of project activities are listed in Table 7. This includes special areas that overlap with the proponents' exploration licences and potential transit routes, as well as those within 40 kilometres of the exploration licences (i.e. the predicted zone of influence for drill cuttings dispersion). In cases where a special area is within the zone of influence of one project only, the distance to the nearest exploration licence for the other project is indicated. Appendix E lists the special areas in the regional study area.

Table 7 Special Areas Within the Zone of Influence of Project Activities

Special Area	Eastern Newfoundland Offshore Exploration Drilling Project	Flemish Pass Exploration Drilling Project	Features of the Special Area
Ecologically and Biologically Significant Areas[1]			
Northeast Slope Ecologically and Biologically Significant Area	14 km from exploration licence 1135	Overlaps with transit route	Aggregations of Greenland Halibut, Spotted Wolffish and concentrations of cetaceans, pinnipeds and corals
Baccalieu Island Ecologically and Biologically Significant Area	Overlaps with transit route	406 km from exploration licence 1139	Breeding seabird habitat
Eastern Avalon Ecologically and Biologically Significant Area	Overlaps with transit route	Overlaps with transit route	Diverse assemblage of foraging seabirds
Vulnerable Marine Ecosystems[2]			
Beothuk Knoll Vulnerable Marine Ecosystem	36 km from exploration licence 1134	186 km from exploration licence 1142	Abundant gorgonian corals and high density of sponges
Southern Flemish Pass to Eastern Canyons Vulnerable Marine Ecosystem	Overlaps with exploration licence 1134	142 km from exploration licence 1142	Large gorgonians and high density of sponges
Northern Flemish Cap Vulnerable Marine Ecosystem	109 km from exploration licence 1135	Overlaps with exploration licences 1141 and 1142	High diversity of corals and vulnerable fish species
Sackville Spur Vulnerable Marine Ecosystem	62 km from exploration licence 1135	Overlaps with exploration licences 1141 and 1142 and transit route	High density of sponges
Northeast Shelf and Slope (within the Canadian Exclusive Economic Zone) Vulnerable Marine Ecosystem	15 km from exploration licence 1135	Overlaps with transit route	Abundance of gorgonian and black corals
United Nations Convention on Biological Diversity Ecologically and Biologically Significant Areas[3]			
Slopes of the Flemish Cap and Grand Banks Ecologically and Biologically Significant Area	Overlaps with exploration licences 1134 and 1135 and transit route	Overlaps with exploration licences 1140, 1141 and 1142 and transit route	Diverse marine taxa and closures to protect corals and sponges
Orphan Knoll Ecologically and Biologically Significant Area	252 km from exploration licence 1135	38 km from exploration licence 1139	Unique complex habitat

Special Area	Eastern Newfoundland Offshore Exploration Drilling Project	Flemish Pass Exploration Drilling Project	Features of the Special Area
Seabird Foraging Zone in the Southern Labrador Sea Ecologically and Biologically Significant Area	202 km from exploration licence 1135	Overlaps with exploration licence 1139	Supports approximately 40 million seabirds annually
Marine Refuge[4]			
Northeast Newfoundland Slope Closure Marine Refuge	40 km from exploration licence 1135	Overlaps with transit route	Aggregations of large structure-forming cold water corals
NAFO Fisheries Closure Areas[6]			
NAFO Fisheries Closure Areas (Flemish Pass/Eastern Canyon (2), Sackville Spur (6), Northern Flemish Cap (7), Northern Flemish Cap (8), Northern Flemish Cap (9), Northwest Flemish Cap (10), Northwest Flemish Cap (11), Northwest Flemish Cap (12))	Overlaps with exploration licence 1134	Overlaps with exploration licences 1141 and 1142 and transit route	Protects high coral and sponge concentrations from bottom-contact fishing

[1] Under Canadian jurisdiction through pieces of legislation and other processes.

[2] Under mandate of Food and Agriculture Organization of the United Nations and NAFO.

[3] Identified by United Nations Convention on Biological Diversity.

[4] Under mandate of Fisheries and Oceans Canada.

[5] Under mandate of Fisheries and Oceans Canada.

[6] Under mandate of NAFO. Fisheries and Oceans Canada manages within the Exclusive Economic Zone.

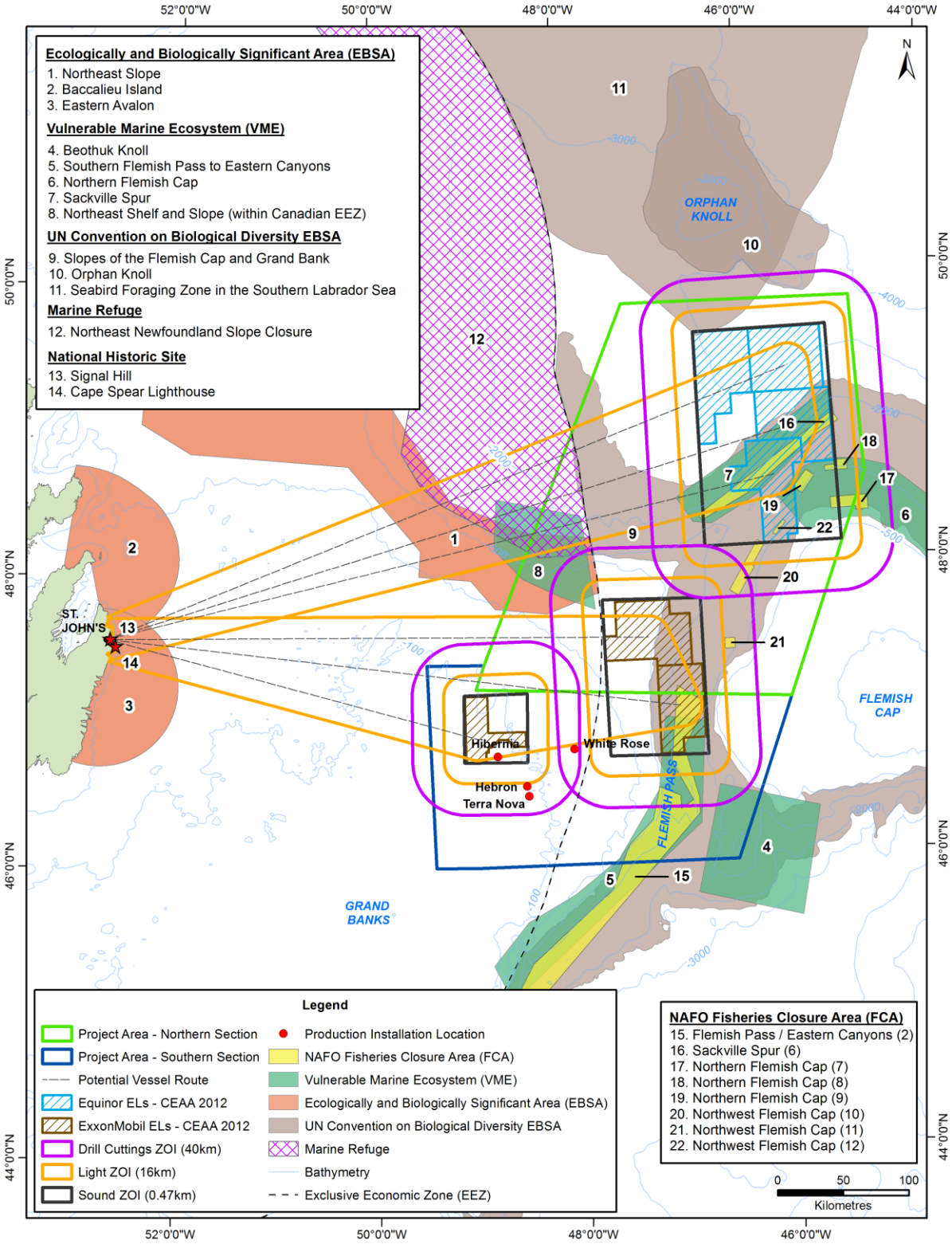
Source: Proponents' response to IR-39, 2018

Predicted Effects

The proponents assessed the potential environmental effects of the Projects on special areas that overlap the exploration licences, as well as those nearby that are within the zones of influence for effects (Figure 3). The assessments considered project activities that could result in environmental changes to special areas by affecting their overall ecological characteristics, integrity, use, and value.

The presence and operation of a drilling installation and flaring from formation flow testing would result in light emissions. Light could affect special areas that are important for migratory birds and their habitats through: attraction or avoidance; mortality or injury; effects on health, presence and abundance; and effects on habitat and food availability and quality. As recent studies have found that birds up to 16 kilometres from a light source were susceptible to stranding due to light attraction, this distance was selected as the zone of influence for potential light effects on special areas. Marine fish could also be affected by light through disturbance or changes to feeding activity; light has the potential to attract certain types of plankton, which in turn could attract fish and other predators. Light emissions were not anticipated to adversely affect benthic habitats within special areas due to the distance to the seafloor.

Figure 3 Special Areas in the Regional Study Area and Zones of Influence for Environmental Effects



Source: Proponents' response to IR-39, 2018

The proponents stated that the discharge of drill muds and cuttings from drilling installations would be a primary potential interaction with benthic habitat in special areas. Potential effects of drill muds and cuttings could include seabed disturbance (i.e. burial and smothering), chemical toxicity, and bioaccumulation. Even if drilling does not occur within a special area, these discharges could be transported by currents, and the proponents identified a zone of influence of 40 kilometres based on dispersion model results for synthetic-based mud cuttings. They noted that the high degree of dispersion predicted for cuttings would reduce potential for long-term effects due to burial. Drilling muds and cuttings also have the potential to affect marine birds in special areas; however, the proponents stated that water-based mud cuttings would be released beyond the maximum diving range of seabirds and synthetic-based mud would be treated prior to release, resulting in a low potential for negative exposure to marine birds.

Geophysical, geohazard, wellsite, and vertical seismic profiling surveys have the potential to cause sound-related effects on special areas important for fish and fish habitat; however, these effects typically do not extend more than several metres from the source and as such only short-term behavioural effects were predicted. A zone of influence of 470 metres was identified for sound effects based on distance of exceedance of threshold values for marine mammal auditory injury. No studies have tested the levels of sound (including underwater sound) that can cause injury to marine birds. The proponents stated that indirect effects of underwater sound on marine birds through potential changes to presence, abundance, or concentration of prey would be unlikely given that project effects on fish would not likely be significant.

Project vessels and helicopters could affect special areas associated with migratory birds through lighting and sound; the proponents identified a zone of influence of 16 kilometres from a vessel by combining distances for both lighting and sound effects. Helicopter use could have disturbance effects on special areas associated with birds, including temporary loss of useable habitat and increased energy expenditure due to escape reactions, increased heart rate, and lower food intake due to interruptions. The proponents stated that interactions between project-related supply and servicing activities and bird species would be minor due to the localized, short-term, and transitory nature of these activities. Project-related vessel traffic would represent a negligible contribution to the overall vessel traffic off Eastern Newfoundland, and helicopter use would be infrequent.

Additional information on the effects of project activities within special areas on associated valued components are provided in Sections 6.1, 6.2, 6.3, and 6.6.

Proposed Mitigation Measures, Monitoring and Follow-up

The proponents advised that proposed mitigation measures related to fish and fish habitat (including coral and sponge surveys and risk assessments outlined in Section 6.1), marine mammals and sea turtles (Section 6.2), migratory birds (Section 6.3), and commercial fisheries (Section 6.6) would mitigate potential effects on special areas.

The proponents proposed to conduct follow-up in relation to special areas if drilling were undertaken:

- within an identified vulnerable marine ecosystem or fisheries closure area; and
- adjacent to or near an identified vulnerable marine ecosystem or fisheries closure area, such that drill cuttings dispersion modelling predicts that drill cuttings deposition could occur within the vulnerable marine ecosystem or fisheries closure area at levels above the biological effects threshold.

Follow-up monitoring program design would be based on the coral and sponge survey, potential zone of influence estimated in dispersion modelling, well location in proximity to the sensitive benthic habitat, other site-specific information collected during planning, and industry experience with similar monitoring programs. The program would be submitted to the C-NLOPB and Fisheries and Oceans Canada for review and acceptance at least 60 days prior to drilling.

Predicted Residual Effects

The proponents predicted that with the implementation of the proposed mitigation measures, residual effects of the Projects on special areas would be: adverse; negligible to low in magnitude; localized; be short- to medium-term in duration; occur at sporadic or regular intervals; and be reversible. Overall, it was predicted that the residual environmental effects of routine project activities on special areas were likely to be not significant.

6.4.2 *Views Expressed*

Federal Authorities

Fisheries and Oceans Canada and the Agency requested further information and analysis of effects on special areas, including how special areas outside of the Canadian Exclusive Economic Zone might be affected by the Projects, and zones of influence for effects to extend to special areas that do not directly overlap with the exploration licences. Information provided by the proponents has been incorporated into the text above.

Fisheries and Oceans Canada and Environment and Climate Change Canada advised that the mitigation measures, monitoring, and follow-up programs proposed by the proponents as well as those recommended by the Agency would adequately address the potential effects of the Projects on special areas.

Indigenous Peoples

The KMKNO expressed concern over the potential for drill cuttings dispersion to affect special areas (e.g. sensitive benthic habitat). The proponents confirmed that they would complete coral and sponge surveys for each well location, and then prepare and submit a report on their findings to the C-NLOPB and Fisheries and Oceans Canada. Detailed design of the follow-up monitoring program would be based on: survey results; the potential zone of influence estimated in drill cuttings dispersion 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.

The Première Nation de Nutashkuan expressed concern about the effects of exploration drilling in marine special areas, and requested that follow-up be undertaken to validate effects predictions for drilling in special areas.

A summary of issues raised by Indigenous groups is presented in Appendix C.

Public

The Agency did not receive comments specific to special areas from the public.

6.4.3 *Agency Analysis and Conclusion*

Analysis of Effects

A number of special areas overlap with the proponents' exploration licences and associated transit routes. These include areas designed to protect sensitive features, including benthic habitat (e.g. sponges and corals), seabirds, and fish and fish habitat.

Although exploration licences are relatively large, drilled wells would result in comparatively limited footprints and zones of potential effects. Taken in the context of much larger special areas, the potential effects of the Projects within special areas would be comparatively limited. However, special areas have been identified recognizing the importance of associated characteristics and thus the Agency considered the need for additional measures that would enable protection of these features.

A number of special areas that overlap with the proponents' exploration licences are protected based on the presence of sensitive benthic features including aggregations of corals and sponges, which could be affected by the Projects, most notably from the discharge of drilling muds and cuttings. If wells are proposed within special areas, water-based drill mud and cuttings could result in localized sedimentation or burial of benthic organisms. The Agency has therefore proposed mitigation (as described in Section 6.1) that would require the proponents to conduct surveys around proposed wellsites prior to drilling to determine the presence of aggregations of habitat-forming corals or sponges or any other environmentally sensitive features. Should these features be identified, the proponents would be required to relocate the well and/or redirect discharges to ensure that sensitive features would not be affected, unless not technically feasible. If it is determined that it is not technically feasible to relocate the well or redirect cuttings discharges, the proponents would be required to conduct a comprehensive assessment of the benthic habitat in consultation with Fisheries and Oceans Canada prior to drilling to determine the potential for serious harm or alteration of coral and sponge aggregations and related options for mitigation to reduce any identified risks.

In addition to water-based mud cuttings, synthetic-based mud cuttings would also be discharged as part of the Projects. These cuttings would be released near the sea surface and thus were predicted to disperse widely with settling thicknesses generally below predicted no effects thresholds. Moreover, cuttings would be treated in accordance with the *Offshore Waste Treatment Guidelines* to contain no more than 6.9 percent of residual synthetic-based mud, limiting the potential for contamination of benthic habitat. Fisheries and Oceans Canada have advised that associated effects to benthic habitat, including within special areas, are predicted to be negligible.

Fisheries and Oceans Canada advised that habitat-forming aggregations of corals and sponges are not limited in occurrence to designated special areas, but could occur elsewhere within the exploration licences for each project. It recommended that coral and sponge surveys and associated site-specific mitigation planning be consistently applied to ensure protection of sensitive benthic habitat at every wellsite, regardless of special area designation.

The northeast corner of exploration licence 1139 (Equinor) overlaps with approximately 16 square kilometres (0.6 percent) of the Seabird Foraging Zone in the Southern Labrador Sea Ecologically and Biologically Significant Area, which supports approximately 40 million seabirds annually and is important foraging habitat. Lights and

flares from the Projects could interact with migratory birds and the Leach's Storm-petrel may be most vulnerable to this interaction. Searches conducted offshore eastern Newfoundland found that the majority of strandings occurred in September and October following the departure of fledglings from breeding colonies. Equinor would be required to implement measures to minimize effects on marine birds, including restricting flaring to a minimum and operating a water-curtain barrier around the flare during flaring. Given uncertainty about the extent of strandings offshore, systematic daily monitoring for stranded birds would also be required. Environment and Climate Change Canada advised that no additional mitigation is required in the Seabird Foraging Zone in the Southern Labrador Sea Ecologically and Biologically Significant Area, given the application of these mitigation and follow-up measures.

Cape St. Francis and Witless Bay Islands Important Bird and Biodiversity Areas are approximately 23 and 32 kilometres, respectively, from St. John's, the terminus of the transit routes. As described in Section 6.3, helicopters and supply vessels may disrupt birds along transit routes or coastal seabird colonies. Environment and Climate Change Canada guidelines state that helicopters and other aircraft should keep well away from breeding colonies, and that vessels should generally keep a minimum distance of 300 metres from colonies. Environment and Climate Change Canada further advised that the colonies of greatest concern are the coastal Important Bird and Biodiversity Areas in closest proximity to St. John's. The Agency notes that the proponents would be prohibited from operating aircraft over the Witless Bay Islands Important Bird Area at an altitude of less than 300 metres or motorized vessels within 20 to 100 metres of the area during the nesting season as per Newfoundland and Labrador's *Seabird Ecological Reserve Regulations, 2015*. Supply vessels would use shipping lanes on approach to St. John's and would not be in the immediate vicinity of either the Cape St. Francis and Witless Bay Islands Important Bird and Biodiversity Areas.

Key Mitigation Measures to Avoid Significant Effects

The Agency considered the mitigation measures proposed by the proponents, expert advice from federal authorities, and comments from Indigenous groups, and identified the following key measures to mitigate the Projects' effects on special areas:

- restrict helicopter flying altitude to a minimum altitude of 300 metres (except during take-off and landing) from active bird colonies and to a lateral distance of 1000 metres from Cape St. Francis and Witless Bay Islands Important Bird and Biodiversity Areas (unless there is an emergency situation); and
- ensure supply and other support vessels maintain a 300-metre buffer from Cape St. Francis and Witless Bay Islands Important Bird and Biodiversity Areas (unless there is an emergency situation).

In addition, measures listed in Sections 6.1, 6.2, 6.3, and 6.6 are also expected to mitigate potential effects on special areas. Specifically, proponents would be required to conduct surveys around proposed wellsites prior to drilling to determine the presence of aggregations of habitat-forming corals or sponges or any other environmentally sensitive features and to relocate wells or redirect cuttings discharges to avoid sensitive features, if technically feasible.

Follow-up

The Agency identified the following measures as part of a follow-up program, to be developed in consultation with C-NLOPB and Fisheries and Oceans Canada, to ensure the effectiveness of mitigation measures and to verify the accuracy of predictions of effects on special areas:

- conduct specific follow-up monitoring when drilling in special areas, or adjacent to or near a special area, such that drill cuttings dispersion modelling predicts that cuttings deposition could occur within the special area at level above the biological effects threshold. Monitoring will include:
    - measurement of sediment deposition extent and thickness post-drilling and prior to departing the location to verify drill cuttings dispersion modelling predictions;
    - survey of benthic fauna present after drilling has been concluded;
    - reporting of results, including a comparison of modelling results to in situ results, to the C-NLOPB and Fisheries and Oceans Canada; and
    - results should be provided to Indigenous groups and posted online for public access.

In addition, certain follow-up measures listed in Sections 6.1, 6.2, 6.3, and 6.6 are also appropriate for special areas.

Agency Conclusion

The Agency determined that the proposed follow-up measures for fish and fish habitat (Section 6.1) and migratory birds (Section 6.3) are also appropriate for special areas,. The Agency determined that the adverse residual environmental effects of the Projects on special areas would be low-magnitude, occur locally, and occur continuously or regularly during drilling operations. Effects on special areas would be reversible.

Taking into account the implementation of the mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on special areas.

6.5 Species at Risk

This section considers the potential effects of routine project activities on species at risk and associated critical habitat. The type and nature of the potential effects of the Projects on species at risk would be the same as those effects which were assessed in previous sections of the report (i.e. Section 6.1 Fish and Fish Habitat, Section 6.2 Marine Mammals and Sea Turtles, Section 6.3 Migratory Birds); therefore, this section summarizes information related to species at risk, but does not repeat the assessment from previous sections. The effects of potential accidents and malfunctions are described in Section 7.1.

Federal species at risk are those that are listed in Schedule 1 of the *Species at Risk Act* as extirpated, endangered, threatened, or of special concern. For species listed as threatened or endangered, Subsection 79(2) of the *Species at Risk Act* requires the responsible authority for a federal EA, in this case the Agency, to identify the project's adverse effects on listed wildlife species and their critical habitat. If a project proceeds, the *Species at Risk Act* requires that preventative measures be taken in accordance with applicable recovery strategies and action plans to avoid or lessen effects, and to monitor them. For these EAs, and as a matter of good practice, the Agency also considered species that have been identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as being endangered, threatened or of special concern. Collectively, these are referred to as species at risk for the purposes of the EA.

As described in the analysis below and taking into account the implementation of key mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on species at risk and associated critical habitat.

6.5.1 *Proponents' Assessment of Environmental Effects*

Existing Environment

There are 47 species at risk (i.e. 22 fish, nine marine mammals, two sea turtles, 14 birds) that may occur in the project area and surrounding region, 26 of which are listed under the *Species at Risk Act* (Appendix D). This number does not include multiple populations of a single species that have received individual designations under the *Species at Risk Act* or identification by the COSEWIC. Several of these species may be found in the project area during certain times of year, be present on a transient basis, or be unlikely visitors. For example, many of the identified bird species are shorebirds and land birds, which would not regularly be found in the project area, but could be present on a transient basis during fall migration. Fifteen of the 47 species have a recovery strategy, management plan, or action plan that describes potential threats to the species (such plans are required only for species listed in Schedule 1 of the *Species at Risk Act* as endangered or threatened).

There is no critical habitat for marine mammals, sea turtles, or migratory birds in or near the project area. Proposed critical habitat for Northern and Spotted Wolffish has been defined, and overlaps with the project area-northern section.

Predicted Effects

Fish

Four of the 22 fish species have a recovery strategy, management plan, or action plan in place: Atlantic Salmon (Inner Bay of Fundy), Atlantic Wolffish, Spotted Wolffish, and Northern Wolffish.

The proponents predicted that the nature of potential effects on fish species at risk would be the same as for other fish species and include: changes in habitat availability and quality; changes in fish mortality, injury and health; and changes in fish presence and abundance. These are described in Section 6.1. Section 6.1 also includes specific analysis related to potential effects on Atlantic Salmon, of which six populations have been identified by COSEWIC and/or listed by the *Species at Risk Act* as endangered or threatened.

Proposed critical habitat identified for Northern and Spotted Wolffish overlaps with the project area – northern section.

Marine Mammals and Sea Turtles

Five of the 11 marine mammal and sea turtle species have a recovery strategy, management plan, or action plan in place: Beluga Whale, Blue Whale, North Atlantic Right Whale, Northern Bottlenose Whale, and Leatherback Sea Turtle[11]. There is no critical habitat for marine mammals or sea turtles in or near the project area.

[11] The North Atlantic Right Whale and the Beluga Whale (St. Lawrence Estuary population) have a low incidence of opportunistic sightings in the project area, with one observation of each species recorded in the northern section of the project area based on Fisheries and Oceans Canada, Ocean Biographic Information System, and Equinor marine mammal observer records.

Potential effects on marine mammal and sea turtle species at risk are predicted to be the same as those for other marine mammals and sea turtles, and include increases in mortality or injury, changes in habitat quality or use, changes in food availability or quality, and changes in health. These effects are described in Section 6.2.

Birds

Six of the 14 species of migratory birds have a recovery strategy, management plan, or action plan in place: Ivory Gull, Piping Plover, Red Knot, Roseate Tern, Common Nighthawk, and Olive-Sided Flycatcher. The Ivory Gull and Red-necked Phalarope have been observed in small numbers offshore in the area of operation of the projects. While many of the other species are unlikely to be present in the project area due to their preference for coastal habitats, migrating species may be attracted to lights. Potential effects on bird species at risk would be the same as for other bird species, and would include: changes in mortality or injury and bird health; changes in avifauna presence and abundance; changes in habitat availability and quality; and changes in food availability or quality. These effects are described in Section 6.3. There is no critical habitat for bird species at risk in or near the project area.

Proposed Mitigation Measures, Monitoring and Follow-Up

The proponents' proposed mitigation, monitoring, and follow-up are described in the sections related to fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), and migratory birds (Section 6.3).

Predicted Residual Effects

The proponents predicted that the residual effects of the Projects on species at risk would be the same as those predicted for fish and fish habitat, marine mammals and sea turtles, and migratory birds valued components sections. Overall, it was predicted that the residual environmental effects of routine project activities on species at risk were likely to be not significant.

6.5.2 *Views Expressed*

Federal Authorities

Environment and Climate Change Canada and Fisheries and Oceans Canada provided advice and comments related to fish and fish habitat, marine mammals and sea turtles, and migratory birds, including information applicable to species at risk and their critical habitat.

Fisheries and Oceans Canada requested a specific assessment of the potential effects of the Projects on Lumpfish and White Hake, both of which have been assessed by COSEWIC as threatened. The proponents considered effects on these species, concluding that residual environmental effects would be the same as those described for fish and fish habitat and that associated mitigation measures would also apply to Lumpfish and White Hake. It further stated that areas of high aggregation and importance to these species are located outside the project area; therefore, it would be unlikely to interact with routine operations.

Fisheries and Oceans Canada asked for an analysis of potential effects of the Projects on Fin and Northern Bottlenose Whales and Harbour Porpoise, considering their high or moderate likelihood of occurrence in the project area. The proponents recognized that these species occur more frequently in the regional study area and project area than other marine mammals, but stated that the effects of project activities on these species would

not differ from those discussed for marine mammals in general, including effects related to underwater noise, vessel strikes, or contaminants.

Fisheries and Oceans Canada asked the proponents to provide a description of threats identified in applicable recovery strategies and actions plans, as well as the contribution of the Projects to these threats. Based on the information provided, the proponents indicated that oil and gas activities are identified as a potential threat in the recovery strategies for the wolffish species, Ivory Gull, Piping Plover, and Northern Bottlenose Whale. Oil and gas activities were not listed as a potential threat in the recovery strategy of the Beluga Whale (St. Lawrence Estuary population), Blue Whale (Atlantic population), North Atlantic Right Whale or Leatherback Sea Turtle (Atlantic population). However, routine discharges (e.g. liquid discharges, grey water, and drill muds), underwater noise, ship strikes, availability of prey, and accidental oil spills were identified by the proponents as potential activities that may contribute to potential threats to these species. Similarly, while oil and gas activities were not identified as potential threats for Atlantic Salmon (Inner Bay of Fundy), Red Knot, Roseate Tern, Common Nighthawk or the Olive Sided Flycatcher, the proponents recognized that accidental spills could contribute to the potential threats on these species. The proponents stated that while the activities could contribute to potential threats, the adverse effects were predicted to be not significant, given the implementation of mitigation measures.

Environment and Climate Change Canada and Fisheries and Oceans Canada reviewed the assessments of effects on species at risk and critical habitat provided by the proponents. The departments confirmed that the potential effects on species at risk would be the same as those effects described for fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), and migratory birds (Section 6.3) and that the information provided satisfies requirements under Subsection 79(2) of the *Species at Risk Act*. Environment and Climate Change Canada and Fisheries and Oceans Canada advised the Agency that the mitigation measures, monitoring, and follow-up programs proposed by the proponents as well as those recommended by the Agency would adequately address the potential effects of the Projects on species at risk.

Indigenous Peoples

Select comments from Indigenous groups related to marine fish (including Atlantic Salmon), marine mammals and sea turtles, and migratory birds, including applicable species at risk, are included in Sections 6.1, 6.2, and 6.3. Indigenous groups provided comments on a variety of matters including: monitoring and follow-up, the reporting of injured individuals of bird species at risk birds; monitoring of water quality to determine potential contamination of species at risk; and whether pre-drill surveys for sensitive species would include identification of species at risk.

A summary of issues raised by Indigenous groups is presented in Appendix C.

Public

A member of the public requested the assessment of potential effects on species classified on the International Union for Conservation of Nature Red List of Threatened Species. The proponents considered the potential effects on these species, and resulting information is summarized above and in Section 6.3.

6.5.3 *Agency Analysis and Conclusion*

Analysis of Effects

The Agency examined the Projects' potential effects on federal species at risk and their critical habitat in accordance with Subsection 79(2) of the *Species at Risk Act* as well as species identified by COSEWIC. The Agency relied on advice and input from Fisheries and Oceans Canada and Environment and Climate Change Canada, which are the lead federal agencies for administering the *Species at Risk Act* within their respective areas of responsibility (i.e. aquatic species and birds).

The Agency notes that 47 species at risk could potentially occur in the project area and surrounding area, including species of fish, marine mammals, sea turtles, and migratory birds. While there is no defined critical habitat, proposed critical habitat for Northern and Spotted Wolfish is in close proximity to ExxonMobil's exploration licence 1135.

The amended *Recovery Strategy for the Northern Wolffish and Spotted Wolffish and Management Plan for Atlantic Wolffish*, published in 2018, identify proposed critical habitats for Northern and Spotted Wolffish, defined based on attributes necessary for wolffish recovery (water temperature and depth). Of the Projects' exploration licences, ExxonMobil's exploration licence 1135 is the nearest to the proposed critical habitat; at the closest point, it is located 15.5 kilometres and 6 kilometres from the proposed Northern Wolffish and Spotted Wolffish critical habitats, respectively. Equinor's exploration licences are all outside the Canadian exclusive economic zone and are greater than 100 kilometres away from the critical habitats.

Taking into consideration information from the 2018 proposed recovery strategy and advice from Fisheries and Oceans Canada, the Agency considered potential effects of the Projects on proposed wolfish critical habitat. Drill muds and cuttings from the Projects could result in localized sedimentation or burial of benthic organisms, but were not predicted to affect proposed critical habitat given their distances from exploration licences. In general, water-based mud drill cuttings accumulations above the predicted no-effect thresholds would extend from approximately from 200 metres to 900 metres, with some seasonal model results predicting small patches above thresholds as far as 1400 metres from wellsites. High dispersion of synthetic-based mud cuttings was predicted, with most model results showing that the vast majority of synthetic-based mud cuttings would settle beyond 32 kilometres from wellsites at thicknesses well below the no-effect thresholds. Settling of synthetic-based mud cuttings within 32 kilometres was predicted for two model sites, generally at thicknesses below the no-effect thresholds. The exception was the prediction of scattered, small patches of synthetic-based cuttings deposition slightly above the conservative 1.5-millimetre threshold located 1.5 to 4.6 kilometres from the modelled wellsite in exploration licence 1137. Moreover, cuttings would be treated to contain no more than 6.9 percent of residual synthetic-based mud limited the potential for contamination. Fisheries and Oceans Canada advised that any potential effects on proposed critical habitat are predicted to be negligible.

Key Mitigation Measures to Avoid Significant Effects

The Agency determined that the measures to mitigate potential effects on fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), and migratory birds (Section 6.3) would also mitigate potential effects on species at risk and critical habitat.

Follow-up

The Agency determined that the proposed follow-up measures for fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), and migratory birds (Section 6.3.) are also appropriate for species at risk and critical habitat.

Agency Conclusion

Taking into account the implementation of the mitigation measures described for fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), and migratory birds (Section 6.3), the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on federal species at risk.

6.6 Commercial Fisheries

This section describes the potential effects of routine project activities on commercial fisheries, including fishing by Indigenous communities which hold communal commercial licences. The effects of potential accidents and malfunctions are described in Section 7.1.

As described in the analysis below and taking into account the implementation of key mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on commercial fisheries.

6.6.1 *Proponents' Assessments of Environmental Effects*

Existing Environment

Commercial fishing is a key economic activity in Newfoundland and Labrador and elsewhere in eastern Canada. The proponents described the fisheries that occur in the waters off Newfoundland and Labrador as extensive and diverse, involving a range of participants, species, and gear types at various times of the year. Fishing activity within Canada's 200-nautical mile exclusive economic zone is primarily undertaken by Canadian enterprises and vessels, while both Canadian and non-Canadian fishers conduct activities outside of the exclusive economic zone. The Government of Canada maintains jurisdiction over fish stocks and fishing within its exclusive economic zone and over benthic invertebrates across the continental shelf, while the Northwest Atlantic Fisheries Organization (NAFO) manages groundfish activities and other resources beyond Canada's exclusive economic zone.

Domestic fisheries occurring offshore Newfoundland and Labrador include those targeting groundfish, pelagics, and shellfish and other invertebrates. Northern Shrimp and Snow Crab have provided the majority of commercial landings since the collapse of groundfish stocks in the 1990s, and are the key domestic commercial fisheries within the regional study area. Other fisheries in the regional study area include groundfish (i.e. halibut and flounder), deep-water bivalves (i.e. clams and scallops), pelagics (i.e. Herring and Capelin), sea urchins, and American Lobster.

Based on publicly available landings data, the proponents stated that commercial fishing intensity is lower in the project area – northern section than in the project area - southern section. Commercial fish landings in the project area – northern section have primarily targeted Northern Shrimp, Snow Crab, and Greenland Halibut.

Located on the edge of the Grand Banks, the project area – southern section was dominated by Northern Shrimp and Snow Crab landings. Table 8 outlines the total cumulative harvest weights for these primary target species in the regional study area, project area – northern section, and project area – southern section.

Atlantic Cod, Redfish, American Plaice, and other groundfish species have also been landed from the project area.

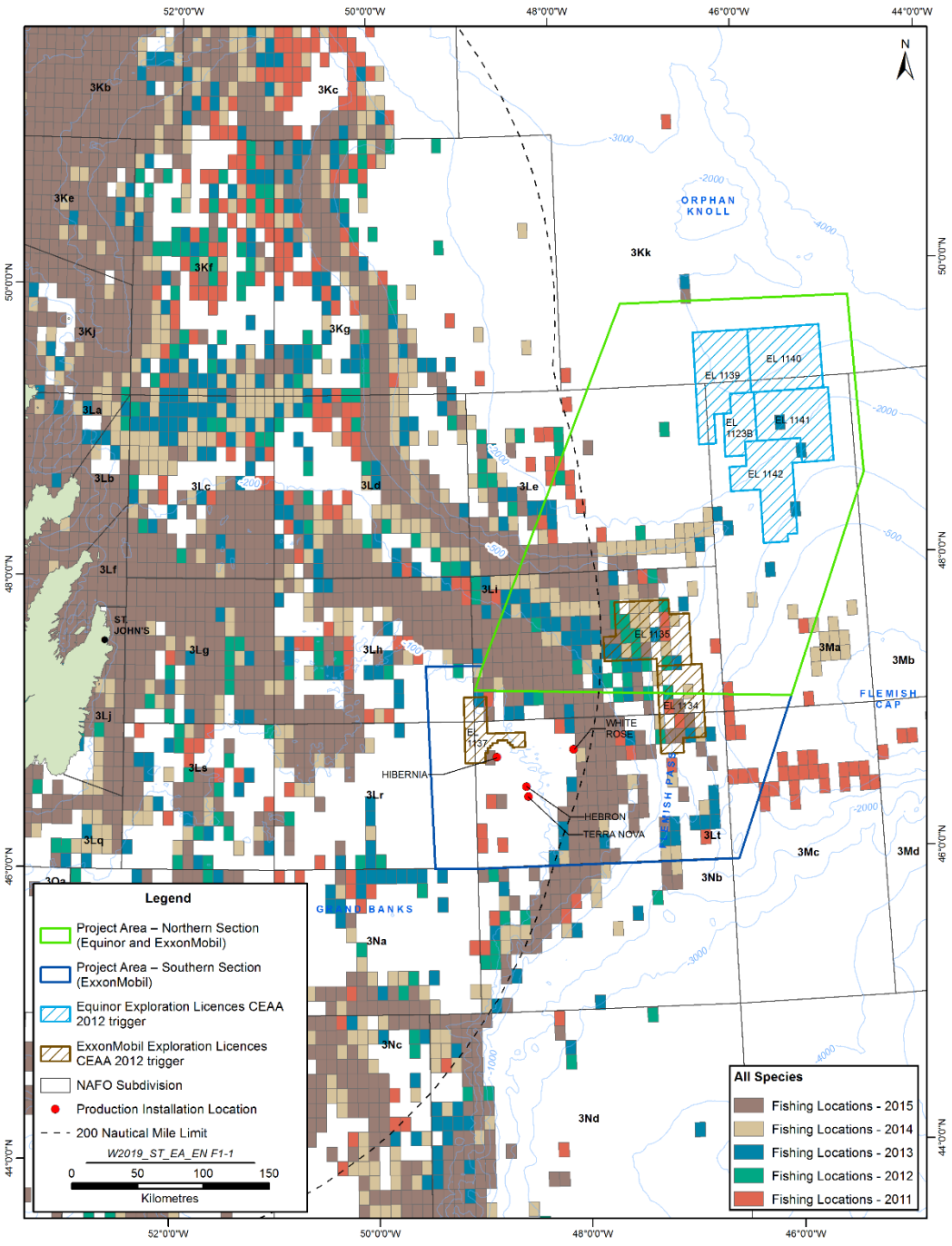
Table 8 Total Weight (tonnes) of Crab, Shrimp, and Greenland Halibut Harvested within the Project Area and Regional Study Area between 2011 to 2015

Species	Harvest Weight (tonnes) – Regional Study Area	Harvest Weight (tonnes) – Project Area – Northern Section	Harvest Weight (tonnes) – Project Area – Southern Section
Crab, Queen/Snow	207 056	15 048	43 890
Northern Shrimp	204 207	9718	9176
Turbot/Greenland Halibut	9565	467	0
Note: Some weight landings data for species has been suppressed by Fisheries and Oceans Canada for confidentiality reasons			

Source: Equinor Canada Ltd., 2017 and ExxonMobil Canada Ltd., 2017

Figure 4 illustrates harvesting locations off the coast of Newfoundland and Labrador between 2011 and 2015.

Figure 4 Domestic (Canadian) Harvesting Locations, All Species, All Months, 2011-2015[12]



Source: Equinor EIS, 2017 and ExxonMobil EIS, 2017

[12] Each colour represents commercial fisheries harvesting locations for that year, with the most recent activity (2015 data) as the top layer. While the top colour represents the most recent year, there can be fishing occurring in certain areas over multiple years, as is the case for much of the offshore area.

Commercial fishing is most active between April and August, with fishing gradually slowing down over the fall and winter. This is driven primarily by the Snow Crab fishing season. Other fisheries, such as those for Northern Shrimp and groundfish species, occur year round, but are predominantly active during the summer months.

Portions of the project area and regional study area fall outside Canada's exclusive economic zone, where international fisheries are occurring. Based on NAFO 2010 to 2015 harvest data, international harvest is taking place in NAFO Divisions 3K, 3L, 3M, 3N, and 3O, which overlap with the project area and regional study area. The highest concentrations of international fishing effort within the five divisions was taking place in 3L and 3K, both of which overlap with exploration licences in the Projects. Canada has historically dominated commercial landings in the international fisheries in this region.

The five Indigenous groups in Newfoundland and Labrador hold communal commercial fishing licences which overlap with the project area. Between the five Indigenous groups, there are five seal licences, 29 groundfish licences,and eight tuna licences.

All of the Indigenous groups located in Nova Scotia, New Brunswick, Prince Edward Island, and Quebec that are listed in Section 4 hold communal commercial licences within the regional study area, including licences for groundfish, tuna, lobster, swordfish, and eel. Of these groups, 13 hold communal commercial licences for swordfish in areas that overlap with the project area. However, based on landings data from Fisheries and Oceans Canada (2011 to 2015), there were no reported landings of swordfish originating from the project area by these groups during this time.

The landings and harvest information presented above is inclusive of fishing from Indigenous communities.

Predicted Effects

During drilling, a safety exclusion zone would be established around the drilling installation within which commercial fishing and non-project-related vessels and activities would be excluded. Safety exclusion zones would be approximately one square kilometre per drilling installation when using dynamic positioning and 12 square kilometres if a drilling installation is moored, generally in waters less than 500 metres. Safety exclusion zones would be in place for between 30 and 65 days for each well, depending on water and well depth. In certain instances, an additional short-term safety exclusion zone would be established if wellhead removal were to occur at a later date. While a safety exclusion zone would limit the potential for direct interactions between project activities and commercial fishing, it would temporarily restrict fishing in these areas.

The temporary restriction of access to fishing grounds has the potential to impact the effectiveness or efficiency of fishing (resulting in lower catches/revenues or lost time and additional operating costs), which could translate into a change in economic returns for fish harvesters. Potential effects would be more likely to occur and would potentially be of greater consequence during the summer months, when fishing is at its highest and when key seasonal fisheries (e.g. Snow Crab) are occurring. However, the proponents noted that any restrictions to access would be localized and short-term, and they predicted that there would be no detectable effect on the overall nature, intensity, or economic returns from fishing in the project area.

Following drilling, wellheads that are not completely removed from the seafloor may interact with commercial fishing, in particular fisheries using trawl gear targeting deep water species (e.g. Greeland Halibut, redfish).

Trawl gear could potentially be hooked or snagged by protruding wellheads, resulting in damage to gear. The proponents stated that at depths less than 500 metres, wellheads would be removed by cutting them below the seafloor. At depths between 500 and 1500 metres, wellheads may be removed either below or above the seafloor to a maximum height of 0.85 metres. At depths greater than 1500 metres, wellheads would be left in place, at a typical height of 2.5 metres above the seafloor. The proponents predicted that the presence of wellheads in waters deeper than 1500 metres would have little or no adverse effects on fishing, as relatively little fishing occurs at these depths. Where wellheads remain above the seabed surface, the proponents would provide the locations of the wellheads to fishers and the Canadian Hydrographic Service and issue a Notice to Mariners. Furthermore, the proponents would implement gear compensation to address any damage to fishing gear resulting from abandoned wellheads.

Commercial fisheries may operate within transit routes for supply vessels which could result in potential interactions (e.g. direct interference and damage to some gear types). Overall, interactions are predicted to be low, in particular given associated mitigation including communications with the fishing industry.

Other project activities, such as geophysical, geotechnical and environmental surveys, could interact with commercial fishing through direct interference; damage to fishing gear, vessels, and equipment; and a change in abundance, location and quality of marine life. The proponents predicted that gear damage is not likely to occur given the transient and localized nature of these surveys and their short-term duration.

In addition to direct interactions, commercial fisheries could also be indirectly affected by the Projects as a result of biophysical effects on fish and fish habitat as discussed in Section 6.1 (e.g. fish avoiding the project area as a result of underwater sound, emissions and discharges, drill cuttings). Associated effects were predicted to be unlikely to affect the overall availability or quality of marine resources, and thus the overall nature, intensity, or value of commercial fishing.

The proponents recognized the distinctive nature of communal commercial licences, but predicted that the effects of the Projects would be the same for commercial and communal commercial fisheries.

Proposed Mitigation Measures, Monitoring, and Follow-up

The proponents' proposed measures to mitigate the potential effects on commercial fishing, include:

- use existing and common travel routes for vessels and helicopters where possible and practicable;
- establish a safety exclusion zone around drilling installations in accordance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations SOR/2009-316*;
- issue Notices to Shipping and/or Notice to Mariners (where appropriate) regarding planned project activities;
- communicate on an ongoing basis with commercial fishers through One Ocean, the Fish Food and Allied Workers Union and seafood producers regarding planned project activities, including timely communication of drilling locations, safety exclusion zones, and suspended or abandoned wellheads. This information would be communicated to Indigenous fishers in accordance with an Indigenous Communities Fisheries Communication Plan;
- ensure ongoing communications with the NAFO Secretariat, using established information exchange mechanisms that are in place with Fisheries and Oceans Canada, regarding planned project activities,

including timely communication of drilling locations, safety exclusion zones, and suspended or abandoned wellheads;

- in accordance with One Ocean's *Risk Management Matrix Guidelines*, determine the need for a Fisheries Liaison Officer and/or a fisheries guide vessel during drilling installation movement from port to its offshore location and during geophysical programs;
- develop and implement a compensation program for damages resulting from project activities, including damages resulting from project-related spills or debris;
- establish a single point of contact during project activities to facilitate communications between fishers and the proponents regarding gear loss/damage and other compensation matters; and
- communicate suspended and/or abandoned wellsite locations to the appropriate authorities for inclusion on nautical charts for use by commercial fishers and other mariners.

In addition, measures listed in Section 6.1 related to fish and fish habitat would also mitigate effects on commercial fisheries.

The proponents did not propose follow-up or monitoring measures specifically related to commercial fisheries.

Predicted Residual Effects

The proponents predicted that residual effects of the Projects on commercial fisheries would be: adverse; low in magnitude; occur in the immediate vicinity of project activities in the project area; short-term in duration for the drilling installation, project related surveys and supply and servicing activities and long-term for wellhead decommissioning particularly for deep water wells; sporadic for project-related surveys, regular for marine discharges and supply and servicing, and continuous for presence and operation of the drilling installation and well decommissioning; and reversible. Overall, it was predicted that the residual environmental effects of routine project activities on commercial fisheries, were likely to be not significant.

6.6.2 *Views Expressed*

Federal Authorities

The Agency asked about the timing of wellhead removal and potential effects of temporarily leaving a wellhead in place following exploration drilling. The proponents stated that wellheads could be left in place for one or two years following drilling, and possibly longer. The timing of wellhead removal would be based on the availability of equipment and the time of year the well was drilled, as the summer season is the most efficient and safest time to perform the operation. Information on suspended or abandoned wells would be provided to the Canadian Hydrographic Service and a Notice to Shipping or Notice to Mariners would be issued, depending on the circumstance. The proponents stated that they were not aware of any issues regarding wellheads left in place offshore Newfoundland. Fisheries and Oceans Canada and the C-NLOPB confirmed that they have not been made aware of any interactions between fishers and wellheads in the area, however there is no regulatory requirement to report these interactions.

Fisheries and Oceans Canada advised the Agency that the mitigation measures, monitoring, and follow-up programs proposed by the proponents and recommended by the Agency would adequately address the potential effects of the Projects on commercial fishing.

Indigenous Peoples

Sipekne'katik First Nation and the KMKNO asked about the proposed compensation programs for damaged or lost fishing gear. Sipekene'katik First Nation noted that there are several differences between communal commercial licences and the commercial licences, and requested that the proponents consider these differences in the development and implementation of the compensation program. The KMKNO requested that Indigenous groups be provided the opportunity to participate in the development of fishing gear damage or loss compensation programs. The proponents confirmed that the compensation program would outline procedures for actual loss or damages to commercial and communal commercial fishers. Indigenous groups holding communal commercial licences that overlap with the project area would be invited to participate in the development of the compensation program.

The KMKNO, MTI, MMS, and Miawpukek First Nation requested further information on communication with Indigenous fishers about routine activities as well as accidental events, including how Indigenous fishers would be engaged in communication plan development and the need to ensure the plan includes opportunities for engagement and adaptive management over the life of the Projects. The proponents would develop an Indigenous Fisheries Communication Plan in consultation with Indigenous fishers, which would include protocols for regular, ongoing communications and feedback mechanisms for Indigenous harvesters to allow consideration of adaptive management strategies should unforeseen issues arise.

The NunatuKavut Community Council and MMS asked about the risks and long-term sustainability of well abandonment techniques, including inspection and monitoring requirements. Miawpukek First Nation stated that if removal of wellheads reduces the likelihood of accidents or malfunctions, it should be done in all circumstances rather than only at certain depths. The C-NLOPB advised that with respect to the risk for accidents and malfunctions, the integrity of abandoned wells would not be affected by where (or if) a wellhead is cut. The proponents stated that well decommissioning would be permanent, and designed in compliance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations* to ensure long-term environmental protection. They would be required to provide information on abandonment methods to the C-NLOPB to ensure wells are adequately isolated to prevent hydrocarbons from entering the environment. Wells would be inspected prior to abandonment with a remotely operated vehicle to ensure the area is free of equipment and obstructions.

Additional comments from Indigenous groups (e.g. Sipekne'katik First Nation, Elsipogtog First Nation, MMS, and KMKNO) related to the risk of collision between supply vessels and fishing vessels and the need for a follow-up monitoring program for fish and fish habitat, including species targeted by commercial fisheries. Comments about the potential effects on Fish and Fish Habitat are discussed in Section 6.1 Fish and Fish Habitat.

A summary of issues raised by Indigenous groups is presented in Appendix C.

Public

The Fish Food and Allied Workers Union commented on the potential physical and socioeconomic effects of the Projects on commercial fisheries, including consideration of cumulative effects. Concerns were raised about restricted access to fishing areas, in particular in areas of safety zones, areas of suspended or abandoned wellheads, and the need to alter fishing to mitigate issues related to increased traffic. It stated that proponents

should work with the fishing industry to minimize operational impacts of the Projects. The union also raised concerns about the potential effects of seismic sound on species and associated potential for indirect effects on the commercial fishery. It stated that the expansion of oil and gas exploration activities in the Newfoundland and Labrador offshore needs to be considered alongside the rebuilding groundfish stocks of historically important commercial species.

6.6.3 *Agency Analysis and Conclusion*

Analysis of the Effects

Commercial fishing is a key economic activity offshore Newfoundland and Labrador, including domestic fisheries for groundfish, pelagics, and shellfish and other invertebrates. The extent of historic commercial fishing varies among exploration licences included in the Projects, as illustrated in Figure 4. Based on commercial domestic harvest locations between 2011 and 2015 (Figure 4) there was comparatively more harvesting in ExxonMobil's exploration licences 1134, 1135, and 1137 than in Equinor's exploration licences 1139, 1140, 1141, and 1142. Fishing effort, as illustrated in Figure 4, was concentrated primarily along the shelf edge and slope of the Grand Banks at depths between 200 and 500 metres, an area which overlaps with portions of ExxonMobil's exploration licences. There was less fishing in the Flemish Pass itself, including the northern portion of the pass where Equinor's exploration licences are located. However, it should be noted that harvest locations are influenced by a variety of factors, and could occur in different areas in future.

Routine effects of the Projects on commercial fisheries could include loss of access to fishing grounds, damage to fishing gear, vessels, or equipment, as well as effects on fish and fish habitat affecting commercial fisheries. The potential effects of the Projects on fish and fish habitat are described in Section 6.1; these are predicted to be low in magnitude, temporary, and localized.

Loss of access to fishing grounds could occur if fishers were displaced from safety exclusion zones that would be created around drilling installations. Portions of NAFO Divisions 3K, 3L and 3M overlap with the exploration licences included in the Projects. Only a fraction of NAFO Divisions overlap with applicable exploration licences and only a fraction of this overlapping area would be affected by safety exclusion zones (Table 9). Fishers would be able to continue fishing in areas surrounding safety exclusion zones and any effects are predicted to be highly localized.

Table 9 Area and Overlap between Exploration Licences, North Atlantic Fisheries Organization Divisions, and Safety Exclusion Zones

	Flemish Pass Exploration Drilling Project (Equinor)	Eastern Newfoundland Exploration Drilling Project (ExxonMobil)
Total Area of Exploration Licences	10 527 km^2	5839 km^2
NAFO Division(s) overlapping with Exploration Licences	3K, 3L, 3M	3L
Size of NAFO Division(s) that overlap with Exploration Licences	946626.76 km^2	195393.15 km^2

Size of Safety Exclusion Zone for Single Drilling Installation*	1 km^2	1 km^2 or 12 km^2
Combined Size of Exclusion Zones for Two Drilling Installations (not contiguous)	2 km^2	2 km^2, 13 km^2, or 24 km^2
Percentage of NAFO Division(s) that would Overlap with Exploration Licences	1.1 percent	3.0 percent
Percentage of NAFO Division(s) that would Overlap with One Safety Exclusion Zone	0.000105 percent	0.00051 percent or 0.00614 percent
Percentage of NAFO Division(s) that would Overlap with Two Safety Exclusion Zones	0.000211 percent	0.00102 percent, 0.00665 percent, or 0.01228 percent
* ExxonMobil's exploration licences 1134 and 1135 include shallower waters and could thus have moored drilling installations		

Damage to fishing gear could potentially occur as a result of interactions between project vessels and fishing vessels. Proponents would utilize shipping lanes in the approach to St. John's harbour and otherwise follow direct routes to exploration licences. Effective communication between the proponents and fishers would be important to help reduce the potential for interactions and a compensation program would be available in case of incident.

Following completion of exploration drilling, wells may be suspended or abandoned. In most cases, the well would be abandoned and the wellhead removed. However, when a well is suspended (for a period limited by the C-NLOPB) and in cases where all or a portion of the wellhead remains after abandonment, there is the potential for interaction between wellhead infrastructure and fishing gear, in particular mobile gear such as trawl gear, which could result in damaged or lost gear. As part of a proponent's *Application for Approval to Drill a Well,* required by the C-NLOPB for each well, the proponents would be required to include information on planned well termination (i.e. temporary suspension or abandonment). As part of the approval process, the C-NLOPB would consider the appropriateness of the planned approach to well termination. The C-NLOPB would consider the potential for the wellhead to interfere with fisheries and would require the proponents to engage fishers on their abandonment strategy in case of potential interference. The C-NLOPB would consider geographic location and water depth and would consult Fisheries and Oceans Canada if there is uncertainty regarding the potential for interference. If it were determined that interference with fisheries was unlikely to occur and the C-NLOPB was of the opinion that suspension or abandonment with a portion of the wellhead above the mudline was a reasonable approach, commercial fishers, including Indigenous fishers, would be notified of the wellhead abandonment strategy and location of the abandoned wellhead.

The C-NLOPB has advised the Agency that they are not aware of interference between suspended or abandoned wellhead infrastructure and fishing gear in the past. In the unlikely event that damage or loss of fishing gear was caused by contact with wellhead infrastructure, the proponents would be required to provide compensation to the injured party consistent with their obligations in civil law.

C-NLOPB approval of a well termination in which all or a portion of the wellhead is left in place above the seabed does not extinguish the proponents' liability for any damage to fishing gear caused by contact between the wellhead and such gear during fishing activities. The C-NLOPB would expect proponents to consider any claims from fishers in the spirit of the *Compensation Guidelines Respecting Damages Related to Offshore Petroleum Activity*, and to act in good faith to resolve claims from fishers. If the proponents and a fisher were unable to resolve such a claim, the fisher could seek relief through the court.

The Agency is of the view that the potential effects on commercial fishing, including effects on communal commercial fisheries, could be mitigated through early identification and proper communication of restricted zones (e.g. safety exclusion zones) and information about the location of suspended or abandoned wellheads. Communication procedures should be set out in Fisheries Communication Plans for Indigenous and non-Indigenous fishers.

Key Mitigation Measures to Avoid Significant Effects

The Agency considered the mitigation measures proposed by the proponents, expert advice from federal authorities, and comments from Indigenous groups and the public, and identified the following key measures to mitigate the Projects' effects on commercial fisheries:

- in consultation with Indigenous groups and commercial fishers, develop and implement a Fisheries Communication Plan to address communications prior to and during drilling, testing and abandonment of each well. The plan should include:
    - regular updates to provide specific information on plans for project activities and an opportunity for feedback and further exchange of information on specific aspects of interest;
    - information on safety exclusions zones and suspended and abandoned wellheads;
    - procedures to notify fishers a minimum of two weeks prior to the start of drilling each well;
    - information on vessels travelling between Newfoundland and Labrador and exploration licences (e.g. number per week, general routes); and
    - procedures for determining the need for a Fisheries Liaison Officer and/or fisheries guide vessels during drilling installation movement and the use of a Fisheries Liaison Officer during geophysical programs;
- prepare a well abandonment plan, including a wellhead abandonment strategy and submit it to the C-NLOPB for acceptance at least 30 days prior to abandonment of each well. If it is proposed that a wellhead be abandoned on the seafloor in a manner that could interfere with commercial fishing, develop the strategy in consultation with Indigenous groups and commercial fishers;
- ensure that details of safety exclusion zones and the locations of abandoned wellheads, if left on the seafloor, are: published in Notices to Mariners; provided in Notices to Shipping; and communicated to fishers;
- provide information on the locations of any abandoned wellheads, left on the seafloor, to the Canadian Hydrographic Services for future nautical charts and planning; and
- ensure ongoing communication with the NAFO Secretariat, using established information exchange mechanisms that are in place with Fisheries and Oceans Canada, regarding planned project activities, including timely communication of drilling locations, safety exclusion zones, and suspended or abandoned wellheads.

The Agency expects that mitigation measures to prevent potential effects on fish and fish habitat (Section 6.1) would also mitigate potential effects on commercial fisheries.

The Agency notes that the proponents have committed to develop a compensation program for lost or damaged fishing gear based on relevant best practices and industry guidelines and to invite Indigenous groups holding communal commercial licences that overlap with the project area to participate in its development. In all cases where spills and debris or other project related activities, including authorized activities, cause damage to fishers, the C-NLOPB would expect proponents to consider claims in a manner that meets the requirements of the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and the spirit of the *Compensation Guidelines Respecting Damages Related to Offshore Petroleum Activity*, and to act in good faith to resolve claims from fishers. If the proponents and a fisher were unable to resolve such a claim, the fisher could seek relief through a compensation claim to the C-NLOPB [if applicable] or through the court.

Follow-up

The Agency identified the following measure as part of a follow-up program to ensure the effectiveness of mitigation measures and to verify the accuracy of predictions of effects on commercial fisheries:

- report annually to the C-NLOPB on whether there have been incidents of lost or damaged fishing gear in associated with the Projects, including project-related vessels.

In addition, the envisioned Fisheries Communication Plan would provide a means of identifying potential issues should they arise.

Agency Conclusion

With the implementation of mitigation measures, residual environmental effects of the Projects on commercial fishing, including communal commercial fishing, are predicted to be low in magnitude, localized, and short-term. Effects would be reversible at the end of drilling operations.

Taking into account the implementation of the mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on commercial fisheries.

6.7 Current Use of Lands and Resources for Traditional Purposes and Health and Socio-Economic Conditions of Indigenous Peoples

This section describes the potential effects of routine Project operations on the current use of lands and resources for traditional purposes by Indigenous peoples and the health and socio-economic conditions of Indigenous peoples. The effects on current use and health and socio-economic conditions of potential accidents and malfunctions are described in Section 7.1.

As described in the analysis below and taking into account the implementation of key mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on the current use of lands and resources for traditional purposes and health and socio-economic conditions of Indigenous Peoples.

6.7.1 *Proponents' Assessments of Environmental Effects*

Existing Environment

Fishing for food, social, and ceremonial purposes is an important activity for all Indigenous communities who were included in the EISs. Fisheries and Oceans Canada issues fishing licences to communities to authorize fishing activities for food, social, and ceremonial purposes, and all Indigenous communities included in the EISs hold these types of licences. Many communities also harvest aquatic birds and marine mammals for traditional purposes within their traditional territory. Most Indigenous communities place an important value on these country foods, and are of the view that they cannot necessarily be replaced or substituted by other sources or through compensation because of the cultural, social, and nutritional qualities of these country foods and harvesting activities.

Through interactions with participating communities and a review of available resources (see Section 4.1.2 for an overview of the proponents' engagement activities), the proponents concluded that no food, social, or ceremonial fishing is taking place in the project area or within the potential zones of influence of the Projects under normal operations. This includes harvesting marine mammals or aquatic birds. Since there is unlikely to be direct geographical overlap between routine project activities and most Indigenous communities' activities, the proponents' assessment focused on marine migratory species of interest that may have potential to interact with the Projects and have connections to important areas or activities associated with the traditional use of lands and resources by Indigenous communities.

In addition to food, social, or ceremonial fishing, Indigenous communities also hold communal commercial fishing licences. In certain cases, these communal commercial licences do overlap with the project area. The potential effects of the Projects on these licences is discussed in Section 6.6.

Indigenous Communities of Newfoundland and Labrador

The proponents provided information on the following groups in Newfoundland and Labrador:

- Labrador Inuit (Nunatsiavut Government)
- Labrador Innu (Innu Nation)
- NunatuKavut Community Council
- Qalipu First Nation
- Miawpukek First Nation

All of these Indigenous communities utilize resources for traditional purposes, including fish, marine mammals, and migratory birds. The preferred species for harvest may vary by community; for example, seals are more heavily utilized by Labrador Inuit than Mi'kmaq communities on the island of Newfoundland.

Mi'kmaq of Nova Scotia, New Brunswick, and Prince Edward Island

The proponents provided an historic overview of the Maritime Mi'kmaq and then detailed use of preferred species by community. For Mi'kmaq in the maritime provinces, the proponents focused their assessment on impacts to marine migratory species harvested in proximity to each community as none of the Maritime Mi'kmaq are harvesting for traditional purposes in the project area or potential zone of influence of the Projects.

The proponents reported that the Mi'kmaq of Nova Scotia, New Brunswick, and Prince Edward Island fish for American Eel, Atlantic Salmon, mackerel, Brown Trout, flounder, Gaspereau, tuna, Lobster, clams (Bar, Surf and Softshell), and scallops for food, social, and ceremonial purposes within the waters of the maritime region. The proponents did include these waters within their regional study area.

Wolastoqiyik of New Brunswick

The Wolastoqiyik communities of New Brunswick are:

- Kingsclear First Nation
- Madawaska Maliseet Nation
- Oromocto First Nation
- Tobique First Nation
- St. Mary's First Nation
- Woodstock First Nation

For each of these communities marine migratory species harvested for traditional purposes were listed. Some of these species include Lobster, Atlantic Salmon and American Eel.

Peskotomuhkati Nation at Skutik (Passamaquoddy)

The Peskotomuhkati Nation at Skutik, located in New Brunswick, was included as part of the proponents' assessments due to the Aboriginal right to fish salmon. The proponents did not provide any information on the use of marine migratory species by this community.

Mi'gmaq and Innu of Québec

The Agency required the proponents to assess potential effects on the current use for traditional purposes of both Mi'gmaq and Innu groups in Quebec known to have an interest in or to harvest salmon populations found in the project area or local study area. These communities are:

- Mi'gmaq of Gesgapegiag
- Nation Micmac de Gespeg
- Listuguj Mi'gmaq Government
- Innu de Ekuanitshit
- Première Nation de Nutashkuan

Information on the communities' harvesting habits, including seasonality and preferred species, were detailed by the proponents in the EISs. Some of the marine species harvested for traditional purposes included Atlantic Salmon, seal, oysters, American Eel, Alewife, Smelt and Winter Flounder.

Predicted Effects

The proponents stated that the Projects are located at such a distance from the communities that there is no known use for traditional purposes including food, social, or ceremonial fishing taking place within the project area or local study area. Therefore, the proponents predicted that fishing for food, social, or ceremonial purposes would not be disrupted as a result of the Projects. More broadly, the proponents stated that there is essentially no potential for biophysical effects of the Projects to translate into a decrease in the overall nature, intensity, distribution, quality, or cultural value of any traditional activities by any Indigenous communities.

The proponents acknowledged that Atlantic Salmon are of particular importance to Indigenous communities in Atlantic Canada, and due to their migratory nature, individuals of this species may migrate through the project area before moving to an area that is subject to traditional harvesting activities. The proponents predicted that there would be a very low likelihood of interactions between routine project activities and Atlantic Salmon (see Section 6.1 for additional detail on effects to fish and fish habitat), and that there would be no potential for any interactions to translate into a decrease in the overall nature, intensity, distribution, quality, or cultural value of salmon fishing by Indigenous communities.

Given the importance of the species to Indigenous groups, the proponents have committed to undertake and contribute to research on the presence and distribution of Atlantic Salmon in the Jeanne d'Arc Basin and Flemish Pass and will work with Indigenous groups to generate a list of potential research activities to address data gaps. Equinor has purchased and provided the Atlantic Salmon Federation with 18 salmon tags to use in their salmon tagging program in Greenland and is also considering deploying acoustic receivers in the Flemish Pass area to receive and record acoustic signals from tagged Atlantic Salmon and provide additional data regarding potential migration through this area. Additional research may be supported through Petroleum Research Newfoundland and Labrador or through the Environmental Studies Research Fund. The results should be made readily available to existing or future regional databases and proactively shared with government, Indigenous groups, and the public.

In general, the proponents predicted that effects from routine operations on Indigenous communities and activities would likely be negligible or low due to:

- the localized nature of operational activities;
- the short duration of operational activities;
- the low probability of species interaction with operational discharges and emissions; and
- the limited potential for biological effects if individuals were exposed to discharges.

Proposed Mitigation Measures, Monitoring and Follow-up

The proponents did not identify any mitigation measures, monitoring, or follow-up specific to Indigenous communities and activities. The proponents described mitigation, monitoring and follow-up measures for fish and fish habitat, marine mammals, migratory birds, and commercial fisheries, which by extension were applied to current use as the assessment focused on species important to Indigenous communities (see Sections 6.1, 6.2 and 6.3). In addition, they expressed an interest in undertaking collaborative research with Indigenous organizations to address knowledge gaps regarding Atlantic Salmon migration routes.

Predicted Residual Effects

The proponents predicted that there would be no residual project effects on Indigenous communities and activities, including hunting, gathering or fishing for food, social or ceremonial purposes.

6.7.2 *Views Expressed*

Almost all Indigenous communities noted the lack of primary source data and Indigenous knowledge gathered and utilized by the proponents in their EISs. NunatuKavut Community Council, MTI, KMKNO, WNNB, Woodstock First Nation, and Miawpukek First Nation stated that an Indigenous Knowledge Study should have been

undertaken as part of the EAs to provide more accurate data on use of the area and value of potentially affected species. Further to this issue, KMKNO stated that, where the proponents reference direct engagement and information gathering with communities, details as to what firsthand information was acquired from Indigenous groups, particularly related to fishing activity, and the sources of baseline data should be clearly stated (e.g. existing documentation, interview). The proponents did support the development of an Indigenous Knowledge Study undertaken by MTI and coordinated a two-day workshop for interested communities to discuss the Projects, including potential impacts and mitigation measures.

Potential effects to Atlantic Salmon populations was a key concern for all communities. Analysis of the potential effects to salmon is included in Section 6.1 of this report, but the linkage of salmon to current use was commented on by many groups. WNNB and Woostock First Nation stated that the proponents should have considered traditional use of Atlantic Salmon throughout the regional study area, rather than only in project area, when evaluating effects of changes to the environment on current use of traditional resources. Further, WNNB and Woodstock First Nation commented that potential effects to salmon be carried into the assessment of current use of lands and resources to enable Indigenous communities to review a holistic assessment of current use. The Agency requested further consideration of species of interest to Indigenous communities through the lens of current use including salmon, Swordfish and Bluefin tuna. The proponents reviewed additional information in response to Indigenous concerns but maintained that the assessment and conclusions as presented in the EISs remained accurate.

MTI expressed disagreement with the proponents' assertion that traditional activities are located at a great distance from the project area and stated that this characterization minimizes the importance of the potential impacts of the Projects on use by Indigenous communities. Furthermore, MTI noted that there are documented Swordfish harvesting locations to the south of the local study area that could be near the Projects.

Miawpukek First Nation disagreed with the methodology for assessing effects to Indigenous communities put forward by the proponents in the EISs. Innu de Ekuanitshit questioned the outcome of the effects analysis and are of the view that adverse effects would extend beyond the project area. They requested the proponents explain how the effects assessment for marine fish and fish habitat directly assessed potential impacts on Indigenous peoples. The proponents stated that they assessed effects to Indigenous peoples through the pathway of potential effect to fish and other marine species. They did not predict any effects extending beyond the project area and predicted no detectable effects at a population level for species.

The majority of Indigenous groups who provided comments were dissatisfied with the proponents' lack of follow-up or monitoring measures for effects on species of cultural importance, and by extension Indigenous communities, and recommend that follow up or monitoring measures be developed in consultation with all communities. Several groups including NunatuKavut Community Council and KMKNO specified that Indigenous Knowledge should be considered in the design and implementation of follow-up and monitoring plans. Further, NunatuKavut Community Council, Miawpukek First Nation, KMKNO and MTI specified that monitoring should be an opportunity for building capacity in Indigenous communities. MTI stated that monitoring would build confidence in the proponents' assessment and indicated the need for adaptive management if required. The proponents committed to continued engagement with groups and to develop an Indigenous Communities Fisheries Communication plan which may include updates on the monitoring and follow-up programs.

A summary of issues raised by Indigenous groups is presented in Appendix C.

6.7.3 *Agency Analysis and Conclusion*

Analysis of the Effects

The most likely interaction between Indigenous communities and the Projects' routine operations would be related to potential effects on communal commercial fishing activities that could occur in the project area. These potential effects are discussed in Section 6.6 (commercial fisheries).

No food, social, and ceremonial fishing was reported in the project area, but it occurs in other areas, including coastal regions within the regional study area. However, it is unlikely that Indigenous peoples fishing or harvesting for food, social, or ceremonial purposes would come in contact with any project components or realize any adverse impacts in their traditional territories from routine project operations. The proponents would also be required to implement measures to mitigate effects to fish and fish habitat, marine mammals, and migratory birds (refer to Sections 6.1, 6.2, and 6.3) such that there would not be a perceptible change to the current use of traditionally valued species (e.g. Atlantic Salmon) or a change in the health and socio-economic conditions of Indigenous peoples as a result of routine project operations.

The Agency acknowledges that the potential effects from a worst-case accident or malfunction (i.e. an unmitigated subsea blowout event) would be more severe. These are discussed in Section 7.1.

Key Mitigation Measures to Avoid Significant Effects

The Agency determined that the measures to mitigate effects on fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), migratory birds (Section 6.3), and commercial fisheries (Section 6.6) would also mitigate effects on the current use of lands and resources for traditional purposes and the health and socio-economic conditions of Indigenous peoples.

Follow-up

The Agency has not identified any follow-up measures specific to current use of lands and resources for traditional purposes and health and socio-economic conditions of Indigenous peoples and notes that there are related measures proposed for fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), migratory birds (Section 6.3, and commercial fisheries (Section 6.6).

Agency Conclusion

The Agency concludes that the adverse residual environmental effects of the Projects on current use of lands and resources for traditional purposes and health and socio-economic conditions of Indigenous peoples throughout the regional study area would be negligible in magnitude and would be reversible.

Taking into account the implementation of the mitigation measures described for fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), migratory birds (Section 6.3), and commercial fisheries (Section 6.6), the Agency concludes that the Projects are not likely to cause significant adverse environmental effects on the current use of lands and resources for traditional purposes and health and socio-economic conditions of Indigenous peoples.

7 Other Effects Considered

7.1 Effects of Accidents and Malfunctions

Paragraph 19(1)(a) of CEAA 2012 requires that a federal EA take into account the environmental effects of malfunctions and accidents that may occur in connection with a Project.

As described in the analysis below and taking into account the implementation of key mitigation measures, the Agency concludes that the potential effects of a worst-case accident or malfunction from the Projects (i.e. unmitigated subsea blowout) on migratory birds and special areas could be significant. In taking a precautionary approach, and considering the potential presence of species at risk, the Agency concludes that the potential effects of a worst-case accident or malfunction on fish and fish habitat and marine mammals and sea turtles could also be significant. By extension, and particularly considering potential effects on endangered or threatened populations of Atlantic Salmon and their recovery, as well as the context provided by Indigenous groups, the Agency concludes that the potential effects on the current use of lands and resources for traditional purposes and the health and socio-economic conditions of Indigenous peoples could be significant. With the implementation of mitigation measures, including the requirement to compensate for any damages to commercial fishing caused by an accident or malfunction, the Agency concludes that the potential effects of a worst-case accident or malfunction from the Projects on commercial fisheries would not be significant. However, the Agency recognizes that the probability of occurrence for a major event is very low and thus these effects are unlikely to occur. Taking into account the implementation of key mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects as a result of accidents and malfunctions.

7.1.1 *Proponents' Assessments of Environmental Effects*

The proponents identified a number of accident and malfunction scenarios that could occur including vessel collisions, dropped objects, loss of drilling installation stability or structural integrity, loss of well control, as well as potential spill scenarios (e.g. batch diesel spill, synthetic-based mud spill, and blowout). The proponents' assessments focused primarily on the potential effects of hydrocarbon releases that could occur as a result of accident scenarios. For blowouts and batch diesel spills, the proponents conducted statistical analyses of historical spill data to predict the probability of releases and conducted spill fate and behaviour modelling. The proponents also considered the potential environmental effects associated with the use of dispersants and in-situ burning.

Methods for Spill Modelling and Effects Thresholds

Modelling of subsea blowouts and batch spills of marine diesel was conducted to predict the fate and behaviour of released hydrocarbons, and to inform the assessment of potential effects. In the event of an actual oil spill, the trajectory, fate, and resultant environmental effects would be determined by the specific location and nature of the release, as well as the environmental conditions and species present at the time of the event.

Hypothetical release locations were chosen to represent the range of water depths where drilling may occur and proximity to sensitive areas. The volumes of released hydrocarbons associated with potential blowout scenarios were estimated based on current knowledge of subsea properties and the types of scenarios that could occur.

Spill durations used for modelled scenarios were based on estimated maximum timelines for spill response measures to stop oil flow (i.e. installing a capping stack could take up to approximately 30 or 36 days; mobilising a drilling installation, obtaining approvals, and drilling a relief well could take about 113 days). The modelled scenarios assumed that no response measures would be undertaken to mitigate effects; in a real event, response measures would be implemented immediately.

The proponents used three dimensional stochastic and deterministic model approaches to predict the fate and behaviour of spills:

- Stochastic modelling predicts the likelihood that a specific area might experience effects from released hydrocarbons based on statistical analysis over a variety of historical environmental conditions. Tens to hundreds of individual trajectories resulting from the same release event occurring under varying environmental conditions are layered on top of one another to create a cumulative footprint of releases.
- Deterministic modelling predicts trajectory, oil weathering, concentrations and thickness of oil, mass balance, and shoreline contact for a single release at a given time and location and under a specific set of environmental conditions. Individual trajectories for deterministic modelling were selected from stochastic model runs that represented various worst-case conditions.

The proponents used specific thresholds for surface oil thickness, shoreline oiling, and in-water oil concentration to inform the effects assessment as described in Table 10.

Table 10 Thresholds for Effects from Hydrocarbon Contamination

Threshold Type	Cutoff Threshold	Rationale/Comments
Oil Floating on Water Surface	Surface oil average thickness above 0.04 micrometres	Socioeconomic threshold: A conservative threshold for effects on socioeconomic resources (e.g. fishing may be prohibited when sheens are visible on the sea surface).
	Surface oil average thickness above 10 micrometres	Ecological threshold: Mortality of birds on water has been observed at and above this threshold. Sublethal effects on marine mammals and sea turtles are of concern.
Shoreline Oil	Shore oil average concentration above 1.0 grams per square metre	Socioeconomic threshold: A conservative threshold for effects on socioeconomic resources (e.g. shoreline cleanup may be required and shoreline recreation may be affected).
	Shore oil average concentration above 100 grams per square metre	Ecological threshold: Shoreline life has been shown to be affected by this degree of oiling.
In-Water Concentration	In-water concentration above 1.0 micrograms per litre of dissolved polycyclic aromatic hydrocarbons or above 100 micrograms per litre of total hydrocarbon concentration	Socioeconomic and ecological threshold: Effects on both ecological and socioeconomic (e.g. seafood) resources may occur at or above this threshold.

Source : Equinor EIS, 2017 and ExxonMobil EIS, 2017

Subsea Blowouts

The proponents stated that a loss of well control resulting in a subsea blowout with a continuous release of oil represents the worst-case scenario for an accidental spill event.

Based on an analysis of international and national historical spill data, well blowouts, and other well-related spills from offshore drilling activities, the proponents stated that large blowouts are relatively rare events. They estimated that if a blowout does occur, there is a 56 percent chance of it lasting two days or less and a 15 percent chance of it lasting more than two weeks.

Equinor determined the probabilities of a blowout based on the drilling of a single well and on the drilling of up to 30 exploratory wells over a period of 10 years (Table 11). ExxonMobil determined the probabilities based on the drilling of a single well and on the drilling of up to 35 exploratory wells over a period of 12 years (Table 12). Probabilities were provided per-well based on 35-day and 65-day drilling durations. Equinor and ExxonMobil stated there may fewer than 30 and 35 wells, respectively, which would reduce the overall spill risk.

Table 11 Probability of Subsea Blowout for Equinor's Modelled Blowout Scenarios

Hypothetical Spill Event	Probabilities of Occurrence			
	1 Well		30 Wells	
	35-day drilling duration	65-day drilling duration	35-day drilling duration	65-day drilling duration
4980 cubic metres per day blowout with 36-day flow duration in exploration licence 1140 and a 15 000 cubic metres per day blowout with 113-day flow duration in exploration licence 1142	0.0000018	0.000003	0.000054	0.00010

Source: Equinor Canada Ltd., 2017

Table 12 Probability of Subsea Blowout for ExxonMobil's Modelled Blowout Scenarios

Hypothetical Spill Event	Probabilities of Occurrence			
	1 Well		35 Wells	
	35-day drilling duration	65-day drilling duration	35-day drilling duration	65-day drilling duration
24 802 cubic metres per day blowout with 30-day flow duration in exploration licence 1135	0.00000011	0.00000021	0.0000040	0.0000076
24 802 cubic metres per day blowout with 113-day flow duration in exploration licence 1135	0.000000011	0.000000022	0.00000040	0.00000076

Source: ExxonMobil Canada Ltd., 2017

(i) Equinor's Project – Fate and Behaviour of Blowout

Equinor modelled the fate and behaviour of two blowout scenarios with 160-day simulation times:

- a 179 280 cubic metre release over 36 days in exploration licence 1140 (referred to by Equinor as the Northern Flemish Pass area release site); and
- a 1 695 000 cubic metre release over 113 days in exploration licence 1142 (referred to by Equinor as the Eastern Flemish Pass area release site).

For both scenarios, the stochastic modelling predicted that the highest probability of surface oiling would be in areas east of the release sites, with a much lower probability for oil to be transported to the west towards Canada's exclusive economic zone. Areas with the highest predicted likelihood of reaching or exceeding the

ecological threshold for in-water hydrocarbon concentration were to the north and east of the sites, including portions of the Orphan Knoll and Flemish Cap. There was no predicted shoreline contact from the spill scenario in exploration licence 1140. For the spill in exploration licence 1142, the probability of shoreline contact was between one and two percent. If shoreline contact were to occur, it would likely be localized, but could occur anywhere from the Avalon Peninsula and the southeast coast of Newfoundland to the northern shores of Newfoundland, southeastern shores of Labrador, or Sable Island. Shoreline contact was determined to be more likely during winter months, except at Sable Island where oil was predicted to reach the island with a low probability (one to two percent) in summer months. Minimum time estimate for first shoreline oil contact ranged between 78 and 157 days; any oil would be expected to be highly weathered, patchy, and discontinuous.

For the scenarios described above, Equinor also conducted deterministic modelling for single releases under specific, worst-case environmental conditions. For most representative scenarios, the amount of oil remaining in surface waters or on sediments at the end of the simulation was less than one percent. Surface oil from the release in exploration licence 1140 was predicted to move north and east, while surface oil in exploration licence 1142 was predicted to move to the northeast and southwest. Approximately 42 to 45 percent of oil was predicted to evaporate while 40 to 45 percent was predicted to degrade. Entrainment into the water column was predicted to range between seven and 12 percent, with in-water oil predicted to move east of the release sites. Even in the worst-case scenario, less than 0.01 percent of the released volume was predicted to make contact with the shoreline along the Avalon Peninsula and southern shores of the island of Newfoundland after 116 days.

(ii) ExxonMobil's Project –Fate and Behaviour of Blowout

ExxonMobil initially modelled the fate and behaviour of four blowout scenarios:

- a 744 062 cubic metre release over 30 days and a 2 802 633 cubic metre release over 113 days in exploration licence 1135 (referred to by ExxonMobil as the EL 1135 site); and
- a 124 964 cubic metre release over 30 days and a 470 603 cubic metre release over 113 days in exploration licence 1137 (referred to by ExxonMobil as the EL 1137 site).

In 2018, ExxonMobil conducted additional modelling in relation to a blowout on exploration licence 1134:

- a 180 292 cubic metre release over 30 days and a 679 098 cubic metre release over 113 days in exploration licence 1134 (referred to by ExxonMobil as the EL 1134 site).

The additional modelling was conducted using a new, more conservative model and updated inputs, which resulted in an increase in the predicted persistence of oil.

Simulation times for the models were for 45 days for the 30-day releases and 160 days for the 113-day releases.

For scenarios in exploration licences 1135 and 1137, the stochastic modelling predicted that the highest probability of surface oiling would be east of release sites, with a much lower probability for oil to be transported to the west towards Canada's exclusive economic zone. Areas with the highest predicted likelihood of reaching or exceeding the ecological threshold for in-water hydrocarbon concentrations generally included the project area, as defined by the proponents, or its eastern portions and areas further to the north, south, and east. For scenarios in exploration licence 1134, the modelling predicted that the highest probability of surface oiling would be in areas east and south of the release site, with a much lower probability for oil to be

transported to the north or west towards Canada's exclusive economic zone. Areas with the highest predicted likelihood of reaching or exceeding the ecological threshold for in-water hydrocarbon concentrations included areas to the east and south of the release site, including areas of the Flemish Cap, Flemish Pass, Grand Banks, and mid-Atlantic.

The 30-day release from exploration licence 1135 was not predicted to reach shore and the probability of oil above one gram per square metre making contact with shore from the 113-day release was less than ten percent in the vicinity of the southern coast of the Avalon Peninsula and Sable Island. Minimum time estimates for first shoreline oil contact from a release at this site ranged from approximately 52 to 157 days.

For releases at the exploration licence 1137 site, the model predicted small volumes of weathered oil could reach the shores of the Avalon Peninsula and/or Nova Scotia. In the 30-day release scenario, the probability of oil at concentrations above one gram per square metre making contact with the shoreline was less than ten percent around the southern coast of the Avalon Peninsula. Minimum time for first shoreline oil contact from a 30-day release at this site was estimated to be approximately 52 days. For the 113-day release, the probability of oil at or above this concentration making contact with the shoreline was approximately one to 10 percent for Sable Island and the eastern shores of Nova Scotia, 10 to 25 percent for the coast of southern Newfoundland, and up to 30 percent on the Avalon Peninsula, depending on the timing of the blowout and environmental conditions. Minimum time estimates for first shoreline oil contact from a release at this site range from 29 to 160 days.

For a 30-day release from exploration licence 1134, the probability of oil making contact with shorelines above one gram per square metre was less than five percent, and only on the island of Newfoundland. For a 113-day release, the probability of oil making contact with shorelines above this threshold was up to 25 percent along the Avalon Peninsula, primarily less than ten percent on the northern and southern coast of the island of Newfoundland, and less than five percent for Nova Scotia, Labrador, and Sable Island. Minimum time estimates for first shoreline oil contact along the coast of the island of Newfoundland ranged from approximately eight to 27 days for both the 30- and 113-day releases, and ranged from 51 to 132 days for Nova Scotia, Labrador, and Sable Island for the 113-day release only.

For the scenarios described above, ExxonMobil also conducted deterministic modelling for single releases under specific, worst-case environmental conditions. For all representative deterministic scenarios, the amount of oil remaining in surface waters or on sediments at the end of the simulation was less than five percent for a blowout in exploration licence 1135 and less than ten percent for a blowout in exploration licence 1137. Surface oil footprints were predicted to form to the south and east of both sites. A large percentage of the oil was predicted to evaporate (36 to 39 percent for the exploration licence 1135 site and 19 to 23 percent for the exploration licence 1137 site) and dissolve and degrade (25 to 35 percent for the exploration licence 1135 site and 30 to 55 percent for exploration licence 1137 site). Entrainment into the water column ranged between eight and 47 percent. Shoreline contact was minimal for these simulations, as even in a worst-case scenario, less than 0.5 percent of oil was predicted to reach shore.

With respect to exploration licence 1134, for all representative deterministic scenarios the amount of oil remaining in surface waters at the end of the simulation was less than 47 percent for the 30-day release and less

than ten percent for the 113-day release. Less than 0.01 percent of the total release volume was predicted to be on sediments at the end of the simulation. Approximately 26 to 30 percent of the oil was predicted to evaporate and another 19 to 29 percent to degrade by the end of the 45- and 160-day simulations. Entrainment into the water column ranged between three and eight percent. Shoreline contact was minimal, and even the worst-case shoreline contact cases predicted that less than 0.2 percent of the total volume released would reach shore.

Batch Spills

Batch spills of hydrocarbons are the most common type of spill associated with offshore exploration and production and are generally instantaneous or short-duration discharges. Hydrocarbon spills can involve synthetic-based mud, hydraulic fluid, lubricants, fuel oil, diesel, or crude oil and can originate from a drilling installation or supply vessel.

Between 1997 and 2015, 41 spills from exploration projects in offshore Newfoundland and Labrador accidentally released a total of approximately 128 652 litres of hydrocarbons, including synthetic-based mud. The frequency of synthetic-based mud spills was lower than for other types of hydrocarbons, but they accounted for over 95 percent of total spill volume (776.02 barrels or approximately 123 377 litres), while other hydrocarbons accounted for just over four percent of total spill volume (33.18 barrels or approximately 5275 litres).

The proponents estimated the probabilities of occurrence of 100 litre and 1000 litre batch diesel spills as presented in Table 13 and modelled the fate and behaviour of these scenarios. The volumes selected for modelling were based on batch diesel spills that were reported to the C-NLOPB between 1997 and 2017

Table 13 Probabilities of Batch Spills

Modelled Scenario Volumes of Batch Spill	Probabilities			
	35-day drilling duration		65-day drilling duration	
ExxonMobil's project	**1 well**	**35 wells**	**1 well**	**35 well**
100 litre diesel	0.012	0.42	0.023	0.81
1000 litre diesel	0.0046	0.16	0.0085	0.298
Any volume of synthetic-based mud	0.025	0.88	0.046	1.6
Equinor's project	**1 well**	**30 wells**	**1 well**	**30 wells**
100 litre diesel	0.012	0.37	0.023	0.69
1000 litre diesel	0.0046	0.14	0.0085	0.26
Any volume of synthetic-based mud	0.025	0.75	0.046	1.4

Source: Equinor Canada Ltd., 2017 and ExxonMobil Canada Ltd., 2017

(i) Equinor's Project – Batch Diesel Spill Fate and Behaviour

Modelling results predicted that batch diesel spills would not reach the threshold for ecological effects from surface slicks or in water concentrations, but would potentially reach the threshold for socioeconomic effects in some areas (ranging from 17 to 22 square kilometre surface area) for a 1000 litre spill. By the end of the 30-day simulations, 75 to 78 percent of the released diesel was predicted to have evaporated and 14 to 17 percent to have degraded. Less than 0.1 percent of a 1000 litre spill was predicted to remain on the water surface, but

could continue to be transported at the surface or in the water column for some distance. None of the batch spill scenarios modelled predicted that oil would contact shorelines.

(ii) ExxonMobil's Project – Batch Diesel Spill Fate and Behaviour

Modelling results predicted that concentrations of total hydrocarbons would be minimal and primarily located in the immediate vicinity of a spill site and within tens of metres of the surface. For 100 litre batch spills, modelling showed that surface oil spread rapidly, with an area of one square kilometre or less experiencing surface oil concentrations exceeding 0.04 micrometres on average. Modelling predicted that a 1000 litre release would result in surface oil exposure ranging from five to 46 square kilometres. At the end of the 30-day batch spill simulations for all modelled scenarios, less than 0.1 percent of the released volume was predicted to remain floating on the water surface; 60 to 76 percent was predicted to have evaporated; 15 to 28 percent was predicted to have degraded; 9 to 12 percent was predicted to remain entrained in the water column; and less than 0.02 percent was predicted to be adhered to suspended sediment. None of the batch spill scenarios modelled predicted that oil would contact shorelines.

Potential Effects of Batch Spills and Blowouts on Valued Components

Modelling results were used to assess the potential environmental effects of batch spills and blowouts on valued components. For all valued components, the nature and severity of effects would depend on the type, size, and location of a spill, the time of year, the timely implementation of mitigation and response measures, and the marine species present within the affected area.

(i) Fish and Fish Habitat

Accidental events could interact with fish and fish habitat by affecting habitat availability and quality, fish mortality, injury and health, and fish presence and abundance.

Modelling predicted that batch diesel spills would not result in an exceedance of the ecological threshold for in-water hydrocarbon concentrations; therefore, the proponents predicted that the associated potential for exposure and the likelihood of adverse effects on fish would be low. Only fish in the immediate vicinity of a spill and near the surface at the time of the spill would be exposed to elevated concentrations of hydrocarbons. Any change in habitat availability and quality would be of low magnitude and short-term as hydrocarbon concentrations were predicted to dissipate rapidly.

A subsea blowout could result in potential effects on fish health, mortality, presence, and abundance. The primary direct pathway of effect on fish would be through exposure to dissolved hydrocarbons in the water column. Exposure studies have found lethal and sublethal effects for fish in the range of 0.3 to 60 micrograms per litre dissolved polycyclic aromatic hydrocarbons. Acute toxicity effects from exposure to the more toxic components of a spill may include reduced feeding, larval deformities, or narcosis; however, these effects are generally short-term as many of these components would volatize from the oil on the order of days. Chronic, long-term exposure would also have a range of potential effects from genetic and molecular responses of cells to impacts on reproduction, growth, disease, and survival. Adult demersal and pelagic fish could potentially avoid a spill area, but juvenile and early life stages of fish and benthic invertebrates in the immediate areas of the spill would likely experience sublethal and lethal effects. Although a spill could have community and

population-level effects on fish, the proponents cited studies which suggest these effects may be relatively short-lived and they predicted no long-term effects on regional populations or communities.

Plankton and other microscopic organisms would not likely be able to avoid a spill and would be affected. Although species specific, in general, crude oil concentrations up to one milligram per litre may have a stimulant effect on phytoplankton growth, whereas concentrations over this threshold may cause growth inhibition, and concentrations over 100 milligrams per litre may result in severe or complete growth inhibition. Potential longer-term effects on plankton and microbes would be twofold: firstly, they are an important food source for higher trophic levels, and secondly, most fish and invertebrate species have one or more life stages in a planktonic phase, hence affecting recruitment in adult populations. Following the Deepwater Horizon Spill, changes in both plankton population (biomass) and diversity were observed on the Louisiana Shelf.

Oil from a blowout was not predicted to directly accumulate in sediments, but interactions with benthic fish and fish habitat, including corals and sponges, were likely to occur with flocculation and sinking events associated with plankton and microbial pathways. Sessile adult and planktonic larvae of coral and sponges have no avoidance mechanisms to an oil spill event. Following the Deepwater Horizon spill, indications of coral stress were visually observed and included partial tissue loss, excessive mucus production, retracted polyps, partial coverage from brown flocculant sourced to the spill, and mortality.

If oil from a spill reaches coastal areas, plankton, macroalgae, sea grasses, fish, and invertebrates that inhabit the coast could be affected. There would likely be changes in fish habitat quality, changes in food abundance and quality, and injury and mortality of early life history stages of fish and invertebrates.

Despite the potential for residual effects on fish and fish habitat from a spill, the proponents predicted that, with appropriate mitigation, these effects would not likely result in an overall, detectable decline in overall fish abundance, nor a change in the spatial and temporal distribution of fish populations in the regional study area for multiple generations, nor an alteration to the long-term viability of local or regional fish populations. Taking into account spill prevention techniques and response strategies, the proponents predicted that the residual environmental effects from an accidental event scenario on fish and fish habitat would not likely be significant.

(ii) Marine Mammals and Sea Turtles

Marine mammals and sea turtles could experience mortality or injury if exposed to hydrocarbons or associated volatiles and aerosols. Effects on health could result from contact with hydrocarbons or consumption of contaminated prey. A change in habitat quality could result from oiling and associated response measures.

The proponents stated that modelling of batch diesel spills suggested that the associated potential for exposure to marine mammals and sea turtles would be low. Only animals in the immediate vicinity of a spill would likely be exposed and concentrations of hydrocarbons in the water would be relatively low. A change in mortality or injury was considered unlikely, and changes in health were predicted to be of low magnitude (e.g. temporary inflammation of mucous membranes). Any change in habitat quality or use would also be greatest near the location of the release; the proponents predicted that this change would be of low magnitude and short duration.

A subsea blowout would have a much greater potential to affect marine mammals and sea turtles given the potentially large volumes of discharged oil and large area affected. Marine mammals and sea turtles in the spill area would likely experience a combination of exposures from contaminated air, water, and sediment and via a combination of pathways (inhalation, ingestion, aspiration, adsorption). Oceanic animals that are closer to the site of a blowout would be more likely to be exposed to a more constant flow and higher concentrations of fresher oil, as compared with nearshore species. Effects on marine mammals could be varied and depend on the pathway of exposure. Dolphins have been shown to decrease their respiration rate and increase their dive duration in the presence of surface oil. Oil can coat the baleen of mysticete whales and reduce filtration, thereby reducing feeding efficiency. Inhalation of volatiles and aspiration of aerosolized oil compounds from a spill could result in inflammation of the mucous membranes and absorption of hydrocarbons into the bloodstream. Mortality has also been reported in seals fouled by oil, in addition to other effects such as temporary or permanent eye damage or internal tissue damage from ingestion. Potential effects of exposure to oil in sea turtles include reduced lung capacity, decreased oxygen uptake, reduced digestion efficiency, and damaged eyelid and nasal tissues. Marine mammals and sea turtles demonstrate limited avoidance behaviour to most types of oil.

If oil were to contact shorelines or reach coastal habitats, marine mammals and sea turtles that haul out on potentially affected shorelines and those that prey on seals could experience a change in mortality or injury or a change in health; however, it is probable that only a small portion of local populations would be affected.

The proponents predicted that residual effects on marine mammals and sea turtles from a spill were not anticipated to alter the long-term viability of local or regional populations in the regional study area. Taking into account spill prevention techniques and response strategies, the proponents predicted that the residual environmental effects from an accidental event scenario on marine mammals and sea turtles would not likely be significant.

(iii) Migratory Birds

The proponents predicted that oil spills and other accidental events could have serious, adverse consequences for marine and migratory birds, leading to potential changes in their presence, abundance, distribution and/or health. Exposure to oil could affect individuals through physical exposure or ingestion, or through changes to important habitats and food sources. Marine and migratory birds are particularly vulnerable to oil spills as they may spend much of their time upon the surface of the ocean. If oil reaches coastal waters or shorelines, coastal birds could also be at risk.

Batch diesel spills were predicted to cause a temporary decrease in water quality around the spill site, lasting until the slick disperses. Based on modelling results, the potential for exposure and the likelihood of adverse effects on marine and migratory birds from a batch release were predicted to be low. Only those birds occupying the immediate footprint of the spill would be affected.

A subsea blowout would have a much greater potential to affect marine and migratory birds given the potentially large volumes of discharged oil and large area affected. Possible physical effects of oil exposure on birds include changes in thermoregulatory capability (hypothermia) and buoyancy (drowning) due to feather matting, as well as oil ingestion from excessive preening. Even small amounts of oil from sheens have been

shown to affect the structure and function of seabird feathers. The proponents stated that once birds are exposed to oil, even with rescue and cleaning efforts, the chances of survival are quite low; therefore, a key factor in predicting mortality is the probability of exposure. Behaviour-based vulnerability indices were used to estimate the probability of exposure to surface oiling and mortality rates. Mortality rates for birds in contact with a slick (0.01 to 0.1 millimetres in thickness) were estimated to range from 35 to 95 percent. Species which spend most of the time on the water's surface were predicted to be most vulnerable (95 percent mortality), while those that dive or feed at the water's surface but otherwise spend little time on the water were predicted to have a lower mortality rate (35 percent mortality). Species which often sit on the water but spend more time in the air relative to other species were predicted to have an intermediate mortality rate. Seabirds generally have relatively long lives and low annual reproductive rates, and so mortality of adults can potentially have serious effects on populations.

The proponents predicted that if oil reaches the shoreline or coastal habitats, only a small proportion of local bird populations would likely be affected. Coastal nesting birds, such as the Piping Plover, Roseate Tern, or Savannah Sparrow, could potentially experience a change in mortality or injury levels and health effects. Without mitigation and responses measures it would take at least 29 days for oil to reach the shoreline of Newfoundland and more than 78 days to reach Sable Island, and the oil would be highly weathered and patchy by this time. The application of spill response and mitigation measures would help to reduce the potential for significant adverse effects to migratory birds, including species at risk.

The proponents stated that environmental effects on marine and migratory birds from a blowout could be significant if they led to a detectable decline in overall bird abundance or a change in the spatial and temporal distribution of bird populations in the regional study area for multiple generations. Therefore, drawing a precautionary conclusion, the proponents predicted that residual environmental effects from an accidental subsea blowout on marine and migratory birds would be significant, depending on the specific occurrence and nature and degree of the event, but are extremely unlikely to occur.

(iv) Special Areas

The proponents identified various special areas located within the regional study area that may be affected by a batch spill or blowout (Appendix E). In addition, there is the potential for a worst-case blowout scenario to reach Sable Island, which is located outside of the regional study area. Potential effects include changes in environmental features and/or processes and changes in human use and/or the societal value of these areas. Effects on a special area would be closely linked to effects on other valued components, particularly the biological valued components which have been discussed above. The proponents predicted that potential effects would be limited and that it is extremely unlikely that effects would result in a change to the defining ecological and socio-cultural characteristics of special areas or in a decrease in their overall integrity, value or use.

Taking into account spill prevention techniques and response strategies, the proponents predicted that the residual environmental effects from an accidental event scenario on special areas would not likely be significant. However, in the event of a subsea blowout occurring within a special area, significant effects may result depending on the nature of the special area and the extent and duration of the spill event.

(v) Commercial Fisheries

The proponents predicted that an accidental release of hydrocarbons could interact with commercial fisheries by: impeding the ability of fishers to harvest fish; affecting the biological health of commercial fish species; or reducing the marketability of commercial fish products.

In the event of a batch spill, there may be a temporary suspension of commercial fishing activity in the immediate area of the spill. Likewise, a subsea blowout could result in the closure of fishing areas and/or fouling of gear and vessels. Any closures could translate into economic effects as fishers may have to delay or cease fishing activity. Furthermore, any change in the abundance, distribution, or quality of marine resources could have an effect on commercial fisheries. For instance, tainting could occur if fish were to be exposed to hydrocarbons and absorb oil-derived substances into their tissues, which could cause unpleasant odours and flavours. Tainting is usually lost through the normal processes of metabolism in fish species, and chemical analysis and sensory testing would usually be conducted before a species were to be declared safe to consume. Even if fish are determined not to be tainted, spills could affect consumer perceptions of fish harvested in the surrounding area, potentially reducing market value of the product and subsequent economic returns.

Taking into account spill prevention techniques and response strategies, as well as the compensation program for affected fishers, the proponents predicted that the residual environmental effects from an accidental event scenario on commercial fisheries would not likely be significant.

(vi) Current Use of Lands and Resources for Traditional Purposes and Health and Socio-economic Conditions of Indigenous Peoples

An accidental event could have adverse effects on Indigenous communities and activities, including effects on fisheries resources and/or fishing activity and various socio-cultural components and activities.

The proponents stated that a batch diesel spill would be limited in terms of its overall magnitude, extent, and duration, and thus, its potential environmental consequences. The geographic extent of such events, and the interactions with the environment, would be localized and far away from Indigenous communities.

A large subsea blowout could have the greatest potential to affect Indigenous communities and activities. A blowout could discharge a large volume of oil, which could extend beyond the local study area. However, the proponents noted that there are no Indigenous communities or traditional activities located within or near the project area itself, and oil spill modelling indicated limited potential for oil to reach traditional territories of Indigenous communities. Any potential for effects would be largely indirect in nature, and related to the possibility of marine-associated species that are used by Indigenous groups to be affected by a spill (e.g. Atlantic Salmon, American Eel).

In the even more unlikely event that oil from a spill makes contact with the shoreline, there is the potential that, in sufficient quantities, it could more directly affect Indigenous communities or activities. However, the proponents stated that there would be little or no potential for biophysical effects on marine-associated resources to translate into any detectable decrease in the overall nature, intensity, distribution, quality or cultural value of traditional activities by Indigenous communities or other aspects of socioeconomic conditions.

Taking into account spill prevention techniques and response strategies, the proponents predicted that the residual environmental effects from an accidental event scenario on Indigenous peoples would not likely be significant.

Additional Considerations

(i) Effects of a Synthetic-Based Mud Spill

A synthetic-based mud spill could result in chemical toxicity, bioaccumulation, and seabed disturbance (e.g. habitat smothering). Spilled synthetic-based mud would settle to the seabed, and therefore was predicted to have minimal potential for surface effects on marine mammals or seabirds. The proponents predicted that such a spill was not anticipated to cause effects on fish and other marine species in the water column due to their mobility. They stated that the toxicity of synthetic-based mud would be relatively low and in adherence with the *Offshore Chemical Selection Guidelines*, and would not result in adverse effects on marine biota or habitats. Benthic species could be affected by smothering and/or creation of an anoxic environment; however, mobile species would likely be able to avoid burial. Benthic and marine species that depend on retrieving food from sediment and species that have larvae settle within the sediment could also be negatively affected. Based on information gathered from previous studies, the proponents stated that recovery of the benthic community and environment following a spill of synthetic-based mud could take between one and five years.

(ii) Effects of Dispersants

Dispersants may be used to respond to spills (response measures are discussed below). These chemicals help disperse oil slicks from the sea surface into the water column, accelerate microbial degradation of spilled oil, and reduce the potential for surface oil to reach ecologically sensitive areas. However, dispersants could also result in environmental effects. They have the potential to increase hydrocarbon exposure throughout the water column (i.e. to plankton and pelagic fish) and eventually the benthic environment (i.e. to demersal fish and benthic invertebrates). Certain concentrations and ratios of dispersants have been shown to reduce the effectiveness of certain degradation pathways, which may result in increases in “marine snow” and potential effects on the benthic environment. Chemically dispersed oil may have more pronounced effects on the early life stages of fish and invertebrates than on adults, and may be more toxic to corals than untreated oil solutions. However, oil that is deposited on the seabed after effective dispersant use would likely be highly degraded.

Dispersant use in close proximity to certain bird species may reduce the capacity of insulation and waterproofing provided by feathers. However, the proponents stated that with the application of dispersants, potential exposure to floating oil on the sea surface would be reduced, and overall, dispersants mitigate the potential adverse effects of oil on marine and migratory birds compared to untreated oil.

The proponents acknowledged that research related to the effects and use of dispersants is progressing and that there are differing scientific opinions on the topic. They noted that the decision to use dispersants and the application method would depend on factors including environmental conditions and the nature of the incident, and that the efficiency and effects may vary depending on the method.

Proposed Mitigation Measures, Monitoring and Follow-up

Prevention and Preparedness Measures

The proponents described a variety of measures to reduce the likelihood of accidents and malfunctions, including those related to: engineering and design standards; standard operating procedures; maintenance, inspection, and monitoring; as well as measures to ensure the proponents would be prepared for a potential accident or malfunction (Appendix F). Select commitments are also included below:

- ensure wells are designed for the full range of risks anticipated;
- ensure continuous monitoring of wells and early diagnosis of pore pressure increase and overbalance decrease;
- implement primary barriers to prevent kicks[13] (e.g. continuously monitoring, managing, and controlling drilling and formation fluid density, pressure, and circulation);
- if primary barriers fail, use secondary barriers such as the blowout preventer system to regain well control; [14]
- if secondary barriers fail and a blowout occurs, use tertiary barriers such as a capping stack system to stop the flow of oil from a blowout;
- conduct training, workshops, safety meetings, and drills with personnel, including specific training in oil spill prevention, reporting and response requirements and procedures;
- implement measures to prevent a synthetic-based mud spill; and
- prepare and implement prevention, contingency, and response plans including:
    - Offshore Emergency Response Plan - provides specific role descriptions for personnel, provides a link between offshore operations and onshore responders, and outlines the procedures and operations associated with subsea source control;
    - Collision Avoidance Plan - identifies potential collision situations, describes communications with the threatening vessel, and lists actions to be taken in the event the threatening vessel does not respond;
    - Oil Spill Response Plan - defines procedures for response to spills originating at a drilling installation and considers various spill response tactics; and
    - Well Capping and Containment Plan – describes the initiation, mobilization, and deployment of a capping stack and other containment equipment to a wellsite (described below).

Measures related to the effects of the environment on the Projects are listed in Section 7.2.

Well Capping and Containment

As described above, the proponents would have primary barriers to maintain well control and prevent kicks and secondary barriers (e.g. blowout preventer system) to regain well control. In the event that these measures fail

[13] Drilling fluids are used to maintain well pressure and provide the primary barrier against well flow. If a permeable formation is exposed, loss of this primary barrier could result in the flow of formation fluid into the wellbore, which is referred to as a "kick".

[14] The blowout preventer is attached to the wellhead and is designed and equipped to provide redundant control systems and components to seal and secure the well. The blowout preventer is designed with multiple barriers to flow and allows the well to be shut in, the influx to be safely circulated out of the wellbore, and hydrostatic overbalance to be re-established.

and a blowout occurs, a capping stack may be implemented. A capping stack is a specialized piece of equipment used to temporarily "cap" well flow while work is being undertaken to permanently kill the well (e.g. through drilling of a relief well). Once in place, a capping stack has a design life of six months to two years.

If a subsea blowout occurs, oil spill response measures would be immediately activated, and a capping stack system would be mobilized. Detailed plans for mobilization and deployment of a capping stack and other containment equipment to the wellsite would be included in a Well Capping and Containment Plan.

Equinor stated that, if required, a capping stack would be sourced from Norway or Brazil and could be mobilized and deployed within 18 to 36 days of an incident. The lower end of the time range relates to mobilization from Norway in the summer with optimal weather conditions for rapid transit and installation, and transport directly to the wellsite (i.e. no requirement to stop in port). The longer time frame assumes mobilization from Brazil in the winter, increased transit and installation times due to ice and weather, and the requirement to stop in port for testing and commissioning prior to transit to the wellsite. Equinor advised that, due to the lack of specialized local infrastructure, including maintenance and storage facilities and transport and installation vessels, it would not be feasible to maintain a capping stack in St. John's, Newfoundland and Labrador.

ExxonMobil stated that, if required, a capping stack would be sourced from Norway or Brazil and that mobilization and installation of the capping stack could take up to 30 days under a worst-case scenario (this includes a mobilization time of 14 to 21 days). It noted that weather conditions and logistical consideration of the specific incident would be factors in the overall time required to cap a well.

The proponents stated that it is unlikely that having a capping stack system in Eastern Canada would reduce the overall time to install a capping stack. While a capping stack system in Eastern Canada or on a vessel could result in quick mobilization, the ability to modify the equipment for the specific incident would be limited, and other activities would still be in progress prior to installation, including site assessment/preparation and debris removal.

The proponents would use a relief well to permanently stop the flow from an uncontrolled well. The time required to drill a relief well would be highly dependent on rig mobilization, weather and operating conditions, well design, and location of the subsea blowout. Equinor estimated that a relief well could be drilled in approximately 100 to 113 days while ExxonMobil estimated relief well drilling would take 113 days.

Spill Response

The proponents would prepare Oil Spill Response Plans. For planning purposes, the severity of potential spills would be divided into three tiers, with tier one being a spill that poses the least threat of impact and tier three representing a major spill with the potential to affect the proponents' business operations and potentially requiring considerable local, regional, and international response resources. The parameters that the proponents would consider in selecting the appropriate tier would include: the size and nature of the oil spill; environmental and operational conditions at the time of the spill; and vessel and equipment availability.

The proponents would establish response and incident management teams, which, depending on the scale of the incident, could be called upon to respond to an incident and manage ongoing response. They would draw on external resources as necessary for a tier two or three response, which could include private response

organizations (e.g. Eastern Canada Response Corporation, Oil Spill Response Limited) and mutual aid agreements with other operators. The proponents stated that the onshore command post-spill response management by Eastern Canada Response Corporation would be unaffected by the location of a spill (i.e. inside or outside Canada' exclusive economic zone), as contractual arrangements would be in place to ensure a seamless process for the mobilization of equipment and personnel to a spill located outside Canada's exclusive economic zone.

In addition, the Canadian Coast Guard may be engaged, through a Memorandum of Understanding with the C-NLOPB, to provide response advice and field monitoring. The C-NLOPB could also call upon the National Environmental Emergencies Centre of Environment and Climate Change Canada to provide expert advice, including advice related to trajectory modelling, clean-up techniques, and protection of sensitive ecosystems and wildlife.

Oil Spill Response Plans would include supporting plans such as a Wildlife Response Plan, which would define procedures related to wildlife surveillance, deterrent techniques, and collection, handling and storage of oiled and/or deceased wildlife in the event of a spill, and which would describe the resources and procedures that would be used to mitigate the potential effects of a spill.

Potential response measures could include:

- let attenuation/degradation processes naturally metabolize and break down oil;
- use spill response equipment to contain, remove, or treat oil, including:
    - use of mechanical equipment (e.g. booms) to contain and remove oil;
    - application of vessel- or aerially-applied dispersants to treat oil before it has the opportunity to spread;
    - implementation of subsea dispersant injection as soon as possible, if warranted, to treat oil at the source before it encounters surface waters;
    - deploy in-situ burning equipment to burn thick oil near the source; and
    - outfit vessels of opportunity with appropriate oil spill response tools that would act as a line of defense against surface oil approaching shorelines.
- implement measures to deter birds and other wildlife from contacting spilled oil;
- recover, evaluate, and appropriately treat oiled seabirds, in accordance with the conditions outlined in a Seabird Handling Permit and in consultation with Environment and Climate Change Canada;
- implement shoreline response and clean-up measures including:
    - implementation of protective booming along prioritized sensitive shorelines;
    - use of sand, sand bags, and earthen barriers to prevent oil from entering specific areas;
    - use of treatment measures (e.g. low-pressure flushing, mechanical collection, manual cleaning, plowing, soil washing); and
    - development and implementation of long-term remediation strategies and plans.
- develop, in consultation with Indigenous groups, and implement Indigenous Communities Fisheries Communications Plans;
- issue a Notice to Shippers to provide timely notice of fisheries closure areas; and

- in case of fouling, compensate fishers for the cost of damaged or lost fishing gear.

The proponents would undertake a spill impact mitigation assessment, which would evaluate benefits and drawbacks of different response measures. This exercise would involve considering the environmental effects of each response tactic against a base case of no tactical response (i.e. natural attenuation/degradation). The spill impact mitigation assessment would provide direction on response strategy. Considering whether and how to use chemical dispersants would be a key component of the spill impact mitigation assessment and would require approval from the C-NLOPB.

The proponents must have the financial resources to meet a minimum liability obligation of $1 billion so they have the ability to respond to a serious incident and pay for actual losses or damages as a result of the incident. This could include loss of income, future loss of income, and loss of hunting, fishing, and gathering opportunities of Indigenous peoples. In addition, the proponents must provide a minimum of $100 million in "financial responsibility" to the C-NLOPB for any costs incurred.

7.1.2 *Views Expressed*

Federal Authorities

The C-NLOPB asked Equinor to provide a rationale for well depths selected for modelling (i.e. 1100 and 2700 metres) given that that water depths in the proponent's exploration licences range from 1000 to 3500 metres. Equinor explained that the model depths were representative of likely drilling locations. Modelling of other water depths would likely provide different footprints of potentially affected areas; however, would not change resulting environmental effects.

The C-NLOPB indicated that the initial well depths selected by ExxonMobil for modelling (i.e. 89 and 363 metres) were not representative of a deep-water well. ExxonMobil indicated modelling depths were based on tentative well locations in exploration licences 1135 and 1137. They also conducted additional spill modelling for a site in exploration licence 1134 with a water depth of 1175 metres.

Fisheries and Oceans Canada and Natural Resources Canada asked about spill modelling inputs and results, including the approach and assumptions used to determine the fate and persistence of oil in the environment, differences between the models used and associated inputs, and requested further analysis of resultant effects. The proponents provided additional information on modelling inputs and results, some of which has been included above. In particular, Natural Resources Canada noted that the spill model used is limited in its ability to predict the degradation and sinking of crude oil heavy ends, and corresponding smothering effects on benthic biota. The proponents acknowledged that this is an active area of research. They stated that the heavy compounds in question degrade slowly and are difficult to measure, but that the modelling was conservative in its assumptions and likely overestimated effects.

Environment and Climate Change Canada provided input and recommendations on the proponents' proposed spill prevention and response measures. The proponents confirmed that the spill prevention and response measures would incorporate recommendations and guidance from Environment and Climate Change Canada, including measures related to wildlife surveillance, wildlife deterrent techniques, and the collection and storage

of deceased wildlife. Specific measures would be detailed in the Oil Spill Response Plans, which would be submitted to the C-NLOPB for review and approval.

The Agency and MTI asked why a synthetic-based mud spill was not modelled and requested an expanded analysis of associated effects. The proponents responded that their modelled scenarios reflected a range of synthetic-based mud spill volumes, products, depths, and sensitive habitats, and that while the results of a modelled synthetic-based mud spill would provide a footprint of the likely area potentially affected, the associated environmental effects would not change from their initial analysis. They provided additional information on the typical fate and behaviour of spilled synthetic-based drilling mud, the area affected by spills, and the estimated recovery time for affected benthos. This information has been included above.

Natural Resources Canada and the Agency requested information on the effects of in-situ burning, including the potential for incomplete burning and resulting oil in the water. The proponents stated that effects could be related to atmospheric emissions, burn residues, water column toxicity, or effects on the surface microlayer. They acknowledged that an incomplete burn could occur if a burn had to be extinguished due to weather conditions; in this case, if oil remained present on the sea surface, then other response measures (e.g. mechanical recovery) could be implemented to complete the response. Authorization from the C-NLOPB would be required prior to in-situ burning.

Environment and Climate Change Canada, the Agency, and the KMKNO commented on the use and effectiveness of dispersants. In response, the proponents considered the results of additional studies on the effects of dispersants. This information has been included above.

The Agency, the Nunatukavut Community Council, WNNB, Woodstock First Nation, and the KMKNO asked the proponents to provide information about the effects of a spill resulting from a near-shore vessel collision. The proponents provided information from studies which indicated that oil from a coastal spill would likely move to the east and not contact the shoreline, including the *Quantitative Assessment of Oil Spill Risk for the South Coast of Newfoundland and Labrador* prepared by the Risk Management Research Institute. They stated that the possibility of a vessel-on-vessel collision and the magnitude of the associated potential environmental effects would be very low based on 30 years of Newfoundland and Labrador offshore industry activity. Vessel traffic would be subject to applicable regulatory requirements (e.g. *Canada Shipping Act, Collision Regulations, Environmental Response Arrangements Regulations*), including the requirement for vessel operators to have an arrangement with a response organization, an oil pollution prevention plan, and an oil pollution emergency plan.

For ExxonMobil's project, the C-NLOPB advised that the usual procedure for installing a capping stack may not be possible in shallow water; if vertical well access is not possible, an offset installation tool may be required to allow access at an offset distance from the wellsite. ExxonMobil indicated that the offset installation equipment would be available and suitable for use in water depths ranging from 75 to 600 metres. It confirmed that the worst-case spill scenarios included consideration of time for potential use of the offset installation equipment.

Environment and Climate Change Canada, the Agency, and the KMKNO requested additional information regarding the timing of spill response and mobilization of a capping stack, including the feasibility of decreasing response times and establishing a capping stack facility in Eastern Canada. The proponents stated that while a

capping stack system in Eastern Canada or on a vessel could result in quick mobilization, the ability to modify the equipment for the specific incident would be limited, and other activities would still be in progress prior to installation, including site assessment/preparation and debris removal. Capping stack equipment would be sourced through the proponents' memberships with Oil Spill Response Limited, whose capping stack facilities are set up such that the equipment can be quickly modified and prepared for shipment based on the specific requirements of an incident. The proponents stated that it is unlikely that having a capping stack system in Eastern Canada would reduce the overall time to install a capping stack. They also considered transporting the capping stack by air, but stated that this may result in increased logistics associated with air travel and road transportation and could result in longer mobilization times. In addition, the Rapid Cap™ system, which is one of two capping stack systems capable of air transportation, is not designed to be used with the offset installation tool for capping in shallow water. The proponents stated that their preferred mobilization method would be by vessel. Membership with Oil Spill Response Limited would allow them to remain aware of recent, ongoing, and upcoming innovations associated with capping stack technology. Additional information provided by the proponents has been incorporated above.

Indigenous Groups

Modelling conducted for Equinor's project consisted of a 113-day and a 36-day release. The KMKNO asked why both sites were not modelled for 113-days to reflect true worst-case scenarios. Equinor indicated that the exploration licence 1142 site was sufficiently representative of a worst-case scenario, as it modelled a higher release rate (three times higher than the exploration licence 1140 site) and longer duration (113 days). The C-NLOPB confirmed that spill modelling conducted by the proponents included appropriate inputs and was reflective of worst-case scenarios.

The MMS asked about the potential for oil from a spill to reach the Gulf of St. Lawrence and/or the Gaspe Peninsula coast. The proponents stated that, based on stochastic modelling of worst-case, unmitigated scenarios, there is a low probability of shoreline oiling within the Gulf of St. Lawrence (i.e. less than one percent) occurring within a minimum of 100 days of the release in association with ExxonMobil's project. In the event of an actual blowout, mitigation measures would be implemented, further reducing the potential for oil to occur in the Gulf of St. Lawrence.

Multiple Indigenous groups raised concerns about the potential effects of dispersants if these chemicals are used in response to a spill. The proponents provided additional information on dispersant application methods and on the potential benefits and drawbacks of their use. This information has been incorporated above in the proponent's assessment of environmental effects. In particular, the KMKNO requested additional information on the potential differences between and effects of subsea versus surface dispersant injection. The proponents explained that, compared to surface application, subsea dispersant injection generally results in lower concentrations of dispersed oil, reduces the amount of oil coming to the surface, requires less dispersants, is more precise, and treats all escaping oil from a single release point. The spill impact mitigation assessment would provide information on response options.

Multiple Indigenous groups raised concerns about the potential effects of an accident or malfunction on Atlantic Salmon. The proponents provided additional information about these potential effects, stating that the modelled blowout scenarios predicted the majority of affected areas would experience total hydrocarbon

concentrations below levels shown in lab studies to have behavioural or toxic effects on salmon. The proponents stated that waters with potential higher concentrations would likely be located toward the bottom of the water column and near the release site, where salmon are less likely to occur. Despite the additional information provided by the proponents and their predictions that the residual environmental effects from an accident or malfunction on fish, including salmon, would not likely be significant, Indigenous groups continued to express concern regarding potential effects on Atlantic Salmon. Groups stressed their desire to see Atlantic Salmon populations recover so harvesting can resume, and are concerned that the Projects could contribute to pressures on populations, particularly in the event of an accident or malfunction. Several Indigenous groups, including WNNB, Woodstock First Nation, Elsipogtog First Nation, and Miawpukek First Nation, noted that data gaps regarding salmon behaviour and migration patterns still exist and it is important to acknowledge uncertainty and apply a precautionary approach in conducting the effects assessment. Groups stated that the proponents took an overly compartmentalized approach to the assessment, and that a more ecosystem-based approach should be taken and Indigenous knowledge more sufficiently factored into the assessments. WNNB and Woodstock First Nation stated that the threat of extinction for some salmon populations is real and any adverse effect should be considered of high magnitude. Miawpukek First Nation also stated that the Projects, particularly in the event of an accident or malfunction, could have adverse effects on the overall abundance, distribution, and health of Atlantic Salmon, including populations which are considered species at risk, and the Projects could therefore have a significant effect on salmon.

MTI asked about potential effects of an oil spill on Atlantic Bluefin Tuna, given that hydrocarbons are known to impact tuna cardiac tissues. The proponents recognized that exposure to certain hydrocarbons has been shown to result in reduced growth rates and various developmental impairments in tuna eggs and larvae, and impaired cardiac function in juveniles. Effects on adult tuna are less understood, but certain hydrocarbons have been shown to cause reproductive alterations in large pelagic fishes. Studies on other fish species have also shown that hydrocarbon exposure can lead to reduced swimming performance, reduced immune defences, and increased physiological stress. Due to the distance of the Projects from any known tuna spawning areas (greater than 500 kilometres), Atlantic Bluefin Tuna would not likely interact with spilled oil in their early life stages, when they are sensitive to hydrocarbon and weathered crude oil exposure. Foraging adult Bluefin Tuna, which migrate to the project area in the summer, would be most likely to come in contact with spilled oil; however, adult Atlantic Bluefin Tuna have wide distributions and have high migratory capabilities and would likely have limited interactions with a spill.

Several Indigenous groups raised concerns related to potential contamination of harvested species in the event of a blowout, including perceived contamination which could influence dietary changes if country foods were avoided. The proponents stated that the probability of a blowout would be very low; released oil would likely move eastward; and response measures would likely reduce the magnitude, geographic extent, and duration of a spill. The probability of contamination of resources harvested by Indigenous communities would be very low, and the proponents maintained that an assessment of the potential effects on the health of Indigenous peoples was not required. However, in the event of a subsea blowout, the proponents agreed that actual and perceived environmental changes could potentially result in effects on socio-economic conditions of Indigenous peoples, including affecting traditional foods, which could translate to psychological effects such as increased anxiety and depression. Following the Deepwater Horizon incident in the Gulf of Mexico, people living in coastal

communities demonstrated high levels of anxiety and depression for up to two years following the event, including in areas that experienced little direct oil contamination. The cause of depression and anxiety was reported to be income loss. Three years after the spill, depression and anxiety levels were reduced back to near baseline. The proponents stated that the overall risk and impact would be significantly less from the Projects because they would be located further offshore and there is a very low probability of shoreline oiling. Nonetheless, communication with communities in the event of a spill would be important, including delivering information that may assist in understanding an incident and associated impacts. This would occur as per procedures described in the Indigenous Communities Fisheries Communications Plans. Indigenous groups would be invited to participate in the development of these plans.

Indigenous groups asked about participating in the development and implementation of the Projects' Oil Spill Response Plans. The proponents responded that that they have dedicated emergency response teams with which emergency response exercises would be conducted. They would continue to share information about spill response, consider related concerns and issues, and share results and learning from response exercises with Indigenous groups, if requested.

The Northern Peninsula (Mekap'sk) Mi'kmaq Band raised concerns about the potential effects of a spill and presented several response measures and considerations, including those related to the location of spill-prevention and response equipment and measures to ensure timely notification and communication with communities in the event of an accident.

A summary of issues raised by Indigenous groups is presented in Appendix C.

Public

A member of the public questioned the proponents' characterization of mortality risk to birds from surface oiling, stating that any birds in contact with oil would suffer high mortality. The proponents acknowledged that oiled birds have a very low survival rate and clarified that the mortality rates cited in the EISs were drawn from French-McCay (2009).

The Fish, Food, and Allied Workers Union stated that oil spills are a major threat to the fishing industry. It acknowledged that oil companies have protocols and practices in place to prevent spills from occurring and that regulatory agencies are involved in monitoring these companies, but maintained that the threat of an oil spill is imminent. It also noted that the spill impact mitigation assessment and the decision to employ measures such as dispersants require public discussion.

7.1.3 *Agency Analysis and Conclusion*

Analysis of the Effects

Offshore exploratory drilling happens in a dynamic environment and accidental events associated with these activities have occurred in the past; however, the vast majority of these events have been relatively minor. More serious events, such as a subsea blowout, are far less likely to occur, but could have major consequences. Effects from a blowout may include sub-lethal or lethal effects on fish, marine birds, marine mammals, and sea turtles, including species at risk and their critical habitats. Effects may also include impacts on commercial fisheries, special areas, and Indigenous peoples. As such, the proponents would be required to take all reasonable

measures to reduce the likelihood of an accidental event and ensure that they are prepared to respond effectively if an accidental event were to occur.

The Agency is aware that the C-NLOPB verifies that proponents have appropriate measures in place for spill prevention and preparedness. Proponents must comply with the requirements of regulations and be able to demonstrate that they meet the C-NLOPB's expectations for facility safety, pollution prevention, and emergency response capability. The C-NLOPB has advised the Agency that its authorization of drilling activities would be contingent on its confidence that the proponents have a satisfactory approach to risk management and would take all reasonable measures to minimize the probability of malfunctions and accidents. Proponents would be required to sufficiently demonstrate their preparedness to appropriately respond in the event of an accident or malfunction (e.g. batch spills, blowouts) including preparation of detailed Spill Response Plans that meet the C-NLOPB's regulatory standards. The Agency notes that the proponents operate globally and have substantial experience in offshore drilling, including in deep water.

The Agency understands that as described in the EISs, the chance of a blowout occurring during the drilling of any given well could be as high as one-in-10 000, depending on spill size and well location. If primary and secondary barriers fail and a blowout occurs, the proponents would be required to begin the immediate mobilization of a capping stack and associated equipment to the site. Simultaneously to the mobilization of a capping stack, the proponents would be required to commence mobilization of a relief well drilling installation.

The proponents estimated that mobilization and installation of the capping stack could take anywhere from 18 to 36 days, and that having a capping stack system in Eastern Canada would be unlikely to reduce the overall time for installation. The C-NLOPB confirmed that capping and containment of a blown out well requires mobilization of equipment to prepare the blowout site before use of a capping stack. This equipment would be transported by air to begin site preparation, which would include clearing of the site and cutting away of debris to ready the well for capping stack installation. The C-NLOPB has considered the various activities involved in source control and well capping, and agrees with the assessment of the proponents that the deployment of the capping stack is unlikely to be the critical path determining the overall timeline to put a capping stack in place. The C-NLOPB would require the well capping and containment plans to contain a fulsome discussion of any potential options to reduce overall timelines (e.g. detailed accounting of timelines for mobilization and installation of capping stacks from various locations; review of opportunities to conduct preparatory work that may reduce timelines [e.g. permitting requirements, Canadian Customs and Border Services Agency requirements). The proponents would be required to review environmental conditions at different times of the year to determine potential impacts on the time required to mobilize a capping stack, resulting in the need for additional mitigation.

The well capping and containment plans would include information on options and requirements for relief well drilling, including the locations of potential drilling installations that would be available to the proponents to drill a relief well. The proponents would be required to demonstrate that they have arrangements in place to access the necessary drilling installation in a manner that would minimize the time required to drill a relief well, taking into consideration location and logistics. The C-NLOPB would review the plans as part of its authorization process.

The Agency is aware that there have been a number of spills of synthetic-based mud offshore Newfoundland and Labrador over the past 20 years, and 136 000 litres of untreated synthetic based muds were accidentally released offshore Nova Scotia in 2018. The proponents would be required to have appropriate measures in place to prevent batch spills, including spills of synthetic-based mud. Spill prevention and response would be described in the proponents' Environmental Protection Plans and Spill Response Plans, which would be reviewed as part of the C-NLOPB's authorization process.

Indigenous and non-Indigenous fishers with commercial and communal commercial fishing licences could be affected by accidental spills. A large batch spill or subsea blowout could result in the closure of fishing areas, the fouling of gear and vessels, a reduction in the marketability of commercial fish products, as well as effects on fish and fish habitat. In addition, Indigenous peoples could be affected if a spill affects species that migrate through the spill area to areas where they are harvested for food, social, or ceremonial reasons (e.g. Atlantic Salmon). The Agency agrees with comments from Indigenous groups that, even if effects on these species are relatively minor, perceived contamination may discourage individuals from engaging in certain traditional practices or consuming certain species which may have interacted with a spill. For both Indigenous and non-Indigenous fishers, any damages, including the loss of commercial or food, social, and ceremonial fisheries, would require compensation in accordance with the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity*. The proponents would also be required to develop and implement Fisheries Communication Plans, which would include procedures to communicate with fishers in the event of an accident or malfunction. Indigenous groups would be engaged in the development of the Spill Response Plans, and provided with the approved version.

The Agency notes the proponents' conclusions that, with the exception of effects on migratory birds or in the event of a blowout occurring within a special area, residual environmental effects from an accidental event scenario would not likely be significant. The Agency generally agrees with the proponents' characterization of the potential residual effects of an accident or malfunction, but after considering the views of Indigenous groups and applying a precautionary approach to its own conclusions, the Agency is of the view that, although very unlikely, the potential effects of a worst-case accident could be significant in relation to additional valued components. For fish and marine mammals, the potential for significant effects is linked primarily to the potential presence of species at risk (e.g. endangered populations of Atlantic Salmon or other fish and marine mammals species at risk). While uncertainty exists within these predictions (e.g. presence, abundance, migration patterns), even small impacts to a species at risk may be significant at a population level and affect their potential recovery. By extension, this could also result in an effect on the potential ability of Indigenous groups to harvest these species in the future. The Agency notes that the uncertainty may be addressed through further research proposed by the proponents.

Key Mitigation Measures to Avoid Significant Effects

The Agency considered the mitigation measures proposed by the proponents, expert federal advice from federal authorities, and comments from Indigenous groups and the public, and identified the following key measures to prevent accidents and malfunctions and to mitigate associated effects:

- undertake all reasonable measures to prevent accidents and malfunctions that may cause adverse environmental effects and effectively implement emergency response procedures and contingencies developed for the Projects;
- submit well capping and containment plans, to establish strategies and measures for well control and containment and the drilling of a relief well, as well as options to reduce overall response timelines;
- submit a Spill Response Plan which must include:
    - procedures to respond to an oil spill (e.g. oil spill containment, oil recovery) and spills of other types;
    - measures for wildlife response, protection, and rehabilitation (e.g. collection and cleaning of marine mammals, birds, and sea turtles, including species at risk) and for shoreline protection and clean-up, developed in consultation with the C-NLOPB; and specific role and responsibility descriptions for offshore operations and onshore responders.
- consult with Indigenous groups during the development of the Spill Response Plan. Provide the approved version to Indigenous groups, and make it publicly available on the Internet;
- conduct a desktop exercise of the Spill Response Plan prior to the commencement of project activities and adjust the plan to address any deficiencies identified during the exercise;
- review and update the Spill Response Plan as required during drilling and before commencing a new well;
- prepare a plan for avoidance of collisions with vessels and other hazards which may reasonably be expected in the exploration licences and submit to the C-NLOPB for acceptance prior to drilling;
- undertake a spill impact mitigation assessment to consider all realistic and achievable spill response options and identify those techniques (including the possible use of dispersants) that would provide for the best opportunities to minimize environmental consequences and provide it to the C-NLOPB for review. Relevant federal government departments would provide advice to the C-NLOPB through the Environment and Climate Change Canada Environmental Emergency Science Table. Publish the spill impact mitigation assessment on the Internet;
- in the event of a well blowout, begin the immediate mobilization of a capping stack and associated equipment to the site of the blowout;
- compensate for any damages, including the loss of food, social and ceremonial fisheries in accordance with the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity*; and
- include a procedure to communicate with fishers in the event of an accident or malfunction in the Fisheries Communications Plan. Information that is provided to Indigenous groups and fishers needs to present a realistic estimation of potential health risks on consuming country foods, such that their consumption is not reduced unless there is a likely health risk from the consumption of these foods or specific quantities of these foods. If there is a potential health risk, consumption advisories should be considered.

Follow-Up

The Agency identified the following measures as part of a follow-up program to ensure the effectiveness of mitigation measures and to verify accuracy of predicted effects in the event of a spill:

- as required by and in consultation with the C-NLOPB, monitor the environmental effects of a spill on components of the marine environment until specific endpoints identified in consultation with expert government departments are achieved. As applicable, monitoring shall include:
    - sensory testing of seafood for taint, and chemical analysis for oil concentrations;
    - measuring levels of contamination in fish species with results integrated into a human health risk assessment to determine the fishing area closure status;

    - monitoring for marine mammals, sea turtles, and birds with visible oiling and reporting results to the C-NLOPB; and
    - monitoring benthic organisms and habitats in the event of a synthetic-based mud spill or other event that could result in smothering or localized effects to the benthic environment.
- develop a procedure to communicate monitoring results to Indigenous and commercial fishers, as well as Indigenous groups.

Agency Conclusion

In taking a precautionary approach, the Agency concludes that the potential effects of a worst-case accident or malfunction from the Projects (i.e. unmitigated subsea blowout) on migratory birds and special areas could be significant. Similarly, considering the potential presence of species at risk, the Agency concludes that the potential effects of a worst-case accident or malfunction on fish and fish habitat and marine mammals and sea turtles could also be significant. By extension, and particularly considering potential effects on endangered or threatened populations of Atlantic Salmon and their recovery, as well as the context provided by Indigenous groups, the Agency concludes that the potential effects on the current use of lands and resources for traditional purposes and the health and socio-economic conditions of Indigenous peoples could be significant. With the implementation of mitigation measures, including the requirement to compensate for any damages to commercial fishing caused by an accident or malfunction, the Agency concludes that the potential effects of a worst-case accident or malfunction from the Projects on commercial fisheries would not be significant.

However, the Agency recognizes that the probability of occurrence for a major event is very low and thus these effects are unlikely to occur. Taking into account the implementation of key mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects as a result of accidents and malfunctions.

7.2 Effects of the Environment on the Projects

Extreme environmental conditions or events can increase the probability of an accident or malfunction that could in turn affect the environment. For this reason, the effects of the environment on a project are considered.

As described in the analysis below and taking into account the implementation of the key mitigation measures, the Agency is satisfied that it is unlikely that the effects of the environment on the Projects would result in significant adverse environmental effects. The Agency is satisfied that the effects of the environment on the Projects have been adequately considered by the proponent.

7.2.1 *Proponents' Assessments of Environmental Effects*

The proponents' stated that the Projects could be affected by environmental phenomena such as weather conditions, oceanographic conditions, sea ice, icebergs, superstructure icing, and geological stability and seismicity.

Weather Conditions

Poor visibility resulting from fog, heavy rain, or snow conditions could increase the potential for accidental events (e.g. vessel or helicopter collision potentially resulting in a spill). In April/May through to July, when

warm air masses move over cold water, a reduction in visibility to less than one kilometre occurs from 40 to 50 percent of the time. Visibility and ceiling restrictions may be a factor for shipping or for helicopter support activities. Extreme wind and wave conditions could cause increased stress conditions on a drilling installation and vessels, and potentially result in failure or capsizing. Environment and Climate Change Canada officially designates the Atlantic hurricane season as occurring from June 1 through to November 30.

The proponents stated that drilling installations selected for the Projects would be all-weather semi-submersibles or drillships, specifically designed to operate in deep-water and harsh environments, including during inclement weather.

Oceanographic Conditions

Currents have the potential to increase stress on a drilling installation, including the riser, which could result in malfunctions and accidental events; however, the proponents stated that drilling installations and vessels incorporate water current loads into their design and would be able to handle the currents in the region.

Sea Ice, Icebergs, and Superstructure Icing

Sea ice and icebergs are navigational hazards and may increase the risk of an accidental event (e.g. vessel collision or impact with a drilling installation, potentially resulting in a spill). The proponents noted that sea ice is tracked and monitored to identify collision risks, and that management procedures for sea ice, such as breaking up sea ice to assist shipping, is a commonplace occurrence in Canadian waters. Depending on the section of the project area, the risk of iceberg scour is low to moderate, with the greatest risk along the western slopes of the Flemish Pass and eastern slopes of the Grand Banks leading to the Flemish Pass, and to a lesser degree on the northeastern portion of the Grand Banks approaching the Sackville Spur and along the eastern slopes of the Flemish Pass and the Flemish Cap.

Given the large range of water depths and associated iceberg distributions and scour risk in the project area, the proponents noted the need to quantify the risk to substrate infrastructure for specific areas of interest and to identify appropriate mitigation measures.

Drilling installation and vessel icing is a potential risk in the winter; however, the proponents anticipate that freezing spray or ice-forming conditions would be light and would not affect operations. Drilling installation and vessel icing could result in a raised centre of gravity, slower vessel speed, and maneuvering difficulty, as well as problems with cargo-handling equipment. If icing is not properly managed, damage could occur and there could be an increased likelihood of an accidental event.

Ice management has been conducted by the Newfoundland and Labrador offshore oil and gas industry since the early 1970s. The proponents would prepare and submit an Ice Management Plan as part of their application for authorization by the C-NLOPB.

Geological Stability and Seismicity

A tectonic event could cause an earthquake of a significant size to result in seafloor instability. Subsequently, landslides could damage subsea infrastructure and disrupt project activities and increase the risk of potential accidental events. The proponents stated that the project area has been classified as having a low tectonic hazard and since project activities are of short duration, the probability of an earthquake of sufficient magnitude

to cause structural damage (i.e. magnitude six or greater) occurring during the life of the Projects is low. Drilling installations would be designed with potential environmental loads imposed by earthquakes and other naturally occurring phenomena taken into account.

The proponents indicated that a tsunami from a tectonic event is unlikely to occur. Offshore, a passing tsunami would have a small wave height, on the order of one metre or less, and a long wave period. If necessary, drilling installations would have the capability to disconnect the riser from a well in a short period of time, reducing the risk of damage to the well, riser, and drilling installation. Support vessels and helicopter transits would likely be delayed in the event of a tsunami.

Proposed Mitigation Measures, Monitoring and Follow-up

The proponents stated that the primary measures for mitigating risks associated with effects from the environment on the Projects are engineering designs that incorporate environmental criteria so that the physical conditions of the project area can be tolerated, and sound planning that includes adherence to regulatory design and fitness standards. Engineering design of drilling installations used offshore Newfoundland and Labrador adhere to national and international standards, which consider physical environmental criteria (e.g. temperature, wind, snow, waves, ice loading, drainage), as well as the life of the expected design (i.e. choosing materials with sufficient durability and corrosion resistance).

The proponents would be required to obtain a Certificate of Fitness from an independent, third-party certifying authority prior to the onset of drilling. The certifying authority may only issue a certificate of fitness in accordance with the *Newfoundland Offshore Certificate of Fitness Regulations* where it has verified that the installation is fit for purpose, can function as intended, and can remain in compliance with those regulations without compromising safety and polluting at the drill site or in the region in which the particular installation is to be operated. In addition, modifications or repairs to an installation that affect its strength, stability, integrity, operability, safety, or regulatory compliance would require review and acceptance by the certifying authority to ensure the continued validity of the certificate.

Additional measures proposed by the proponents to mitigate potential effects of the environment of the Projects include:

- establish practices and limits for operating in poor weather, high sea state, or sea ice or icebergs prior to exploration[15];
- ensure the drilling installation and vessels are equipped with proper obstruction lighting, navigation lighting, and foghorns and maintain these in working condition;
- ensure communication systems are in place and functioning properly;
- monitor icing conditions on vessels, helicopter and drilling installations;
- conduct physical environment data observations, weather forecasting, and reporting in accordance with the *Offshore Physical Environmental Guidelines*;
- develop and implement an Ice Management Plan, which would be comprised of: detection, monitoring and assessment, and physical management (e.g. towing or deflecting icebergs; breaking up sea ice); and

[15] This mitigation measure was committed to by the Proponents in the context of potential accidents and malfunctions.

- require the drilling installation to have the ability to quickly disconnect the riser from the well in event of emergency.

7.2.2 *Views Expressed*

Federal Authorities

The C-NLOPB, Environment and Climate Change Canada, Natural Resources Canada, and Fisheries and Oceans Canada advised the Agency that, as applicable to their respective mandates and areas of expertise, the proponents' analyses were adequate for the purpose of the EAs. The C-NLOPB advised that the proposed mitigation measures would adequately address the potential effects of the environment on the Projects.

Indigenous Peoples

MTI asked how the proponents intend to monitor iceberg movement and collision potential, and how emergency evacuation and shut down could reduce the potential of an oil spill. They requested that Indigenous groups be notified of iceberg collision potential and how iceberg activity may alter or restrict the drilling program. The C-NLOPB advised that proponents are required to submit a safety plan to the C-NLOPB for approval, which addresses the possibility of pack sea ice or drifting icebergs at the drill site and the measures to protect the installation, including systems for ice detection, surveillance, data collection, reporting, forecasting and, if appropriate, ice avoidance or deflection. Through the C-NLOPB's incident disclosure policy, information on iceberg collisions would be posted on the C-NLOPB's website.

A summary of issues raised by Indigenous groups is presented in Appendix C.

Public

The Agency did not receive comments from the general public regarding the effects of the environment on the Projects.

7.2.3 *Agency Analysis and Conclusion*

Analysis of the Effects

Extreme environmental conditions or events can increase the probability of an accident or malfunction that could in turn affect the environment. The C-NLOPB has advised that the Projects could be affected by weather conditions, oceanographic conditions, sea ice, icebergs, superstructure icing of the drilling installation or supply vessels, and geological stability and seismicity. From April/May through July, reduced visibility of less than one kilometre occurs 40 to 50 percent of the time in the project area when warm air masses move over cold water. Although considered a low to moderate risk, the greatest potential for iceberg scour in the project area includes ExxonMobil's exploratory licences 1134, 1135, and 1137. The risk of iceberg scour exists to a lesser degree within Equinor's exploratory licences 1139, 1140, 1141, and 1142 due to water depth and the low incidence of iceberg observations in the area.

Meteorological and oceanographic monitoring programs would be implemented over the lifetime of the Projects to forecast and respond to severe environmental conditions. The *Offshore Physical Environmental Guidelines* describe the requirements for monitoring and reporting of environmental conditions. The development and implementation of an Ice Management Plan is required by the *Newfoundland Drilling and Production*

Regulations as part of the Safety Plan submitted by proponents with an application for authorization by the C-NLOPB. The Ice Management Plan would outline methods for monitoring iceberg and pack ice movements and the possibility of pack ice or drifting icebergs at a drill site and the measures to protect installations, including systems for ice detection, surveillance, data collection, reporting, forecasting, and potentially ice avoidance or deflection.

Key Mitigation Measures to Avoid Significant Effects

The Agency considered measures proposed by the proponents, comments from an Indigenous group, and advice from federal authorities and identified key measures to mitigate the effects of the environment on the Projects. The proponents shall:

- in consultation with the C-NLOPB and Environment and Climate Change Canada, implement a physical environment monitoring program in accordance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations* and meeting or exceeding the requirements of the *Offshore Physical Environmental Guidelines;*
- in consultation with the C-NLOPB, establish and enforce practices and limits for operating in all conditions that may be reasonably expected, including poor weather, high sea state, or sea ice or iceberg conditions;
- in consultation with the C-NLOPB and as part of the required Safety Plan, develop an Ice Management Plan including procedures for detection, surveillance, data collection, reporting, forecasting, and avoidance or deflection; and
- in consultation with the C-NLOPB , implement measures to ensure that drilling installations have the ability to quickly disconnect the riser from the well in event of an emergency or extreme weather conditions.

Follow-Up

The Agency identified the following measure as part of a follow-up program:

- in accordance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations,* report annually to the C-NLOPB on whether there has been a need to modify operations based on extreme environmental conditions and on the efficacy of the practices and limits established for operating in poor weather, high sea state, or sea ice or iceberg conditions.

The Agency notes that incidents and near misses involving collisions (including iceberg collisions) that result in or could result in a spill or unauthorized discharge or impairment to critical equipment would be posted on the C-NLOPB's website as part of its incident disclosure policy.

Agency Conclusion

Based on commitments made by the proponents and with the implementation of the mitigation and follow-up measures listed above and required by the C-NLOPB, the Agency is satisfied that the effects of the environment on the Projects have been adequately considered and are not likely to result in significant adverse environmental effects.

7.3 Cumulative Environmental Effects

This section describes cumulative environmental effects that are likely to result from the Projects in combination with the environmental effects of other physical activities that have been or would be carried out.

As described in the analysis below and taking into account the implementation of key mitigation measures, the Agency concludes that the Projects are not likely to cause significant adverse cumulative environmental effects.

7.3.1 *Proponents' Assessments of Environmental Effects*

The proponents assessed cumulative environmental effects by: selecting valued components; defining spatial and temporal boundaries; identifying past, present and future (i.e. certain or reasonably foreseeable) projects and activities whose environmental effects could potentially affect the same valued components as those which would be affected by the Projects; identifying technically and economically feasible mitigation and follow up measures; and applying criteria for the determination of significance for residual cumulative environmental effects. The proponents selected the same valued components for their cumulative environmental effects assessments as considered in the project-specific effects assessments.

The proponents' cumulative environmental effects assessments considered the overall effect on valued components as a result of the Projects' predicted residual environmental effects and those of other relevant projects and activities. The proponents used the same spatial and temporal boundaries for the cumulative environmental effects assessments as for the project-specific effects assessments (Section 1.2.5 and Figure 1.

Other Physical Activities Considered

Physical activities that were considered in the cumulative environmental effects assessments are listed in Table 14.

Table 14 Projects and Activities Considered in the Cumulative Environmental Effects Assessments

Project / Activity	Overview
Hibernia Oilfield	Located in the project area – southern section and approximately eight kilometres from the closest exploration licence (1137). Production activities at this oilfield are planned to extend throughout the temporal duration of the Projects.
Terra Nova Oilfield	Located in the project area - southern section and approximately 38 kilometres from the closest exploration license (1137). Production activities at this oilfield are planned to extend throughout the temporal duration of the Projects.
White Rose Oilfield and Extension Project	Located in the project area - southern section and approximately 37 kilometres from the closest exploration license (1137). Production activities at this oilfield are planned to extend throughout the temporal duration of the Projects.
Hebron Oilfield	Located in the project area - southern section and approximately 30 kilometres from the closest exploration license (1137). Production activities at this oilfield are planned to extend throughout the temporal duration of the Projects.
Bay du Nord Development Project (proposed)	Located in the project area – northern section and approximately 35 kilometres from the closest exploration license (1142). If the proposed project is carried out, activities at this oilfield would partially overlap temporally with the Projects.
Offshore Petroleum Exploration - Drilling	The Eastern Newfoundland offshore area is subject to on-going and planned offshore exploration drilling programs (see *http://www.cnlopb.ca/assessments*). As of May 31, 2017, a total of 168 exploration wells and 56 delineation wells had been drilled in the Newfoundland and Labrador Offshore Area.
Offshore Petroleum Exploration – Geophysical and Other Exploration Activities	Offshore geophysical surveys may include two-dimensional, three-dimensional, or four-dimensional geophysical data acquisition, as well as associated geochemical, environmental, and geotechnical survey activities. While exploration activities are multi-year programs that can cover large offshore areas, the type and level of activity conducted each year varies. There are offshore geophysical programs in the Eastern Newfoundland offshore area in various stages of approval (see *http://www.cnlopb.ca/assessments*).
Fishing Activity	Commercial fisheries within and around the project area are extensive and diverse.
Other Marine Vessel Traffic	Vessel traffic includes tanker traffic and supply vessels associated with the existing offshore oil developments, as well as cargo ships and fishing vessel transits. Vessels are transitory, minimizing potential effects at any location or time.
Hunting	Wildlife populations off Newfoundland and Labrador are subject to hunting. Although little or no hunting is expected to occur in the project area, these activities do affect the bird and seal populations that occur in the region.

Source: Equinor Canada Ltd., 2017; ExxonMobil Canada Ltd., 2017; and proponents' response to IR-90

Potential Cumulative Environmental Effects on Marine Fish and Fish Habitat

The proponents stated that past and on-going activities, as well as climate change and other natural and anthropogenic processes, have collectively influenced to varying degrees the presence, distribution, and abundance of fish and invertebrates and the size and health of fish populations. They assessed the potential for cumulative environmental effects on fish and fish habitat to result in a change in habitat availability and quality; change in fish mortality, injury risk, and fish health; and change in fish presence and abundance.

The proponents stated that there would likely be some degree of overlap between the effects on fish and fish habitat of commercial fishing activities and those of the Projects. Commercial fishing effort is primarily concentrated in the project area - southern section and in the southwest corner of the project area - northern section, in the vicinity of ExxonMobil's exploration licences. The proponents stated that, given the short-term and localized nature of the Projects' effects and the implementation of safety exclusion zones, the potential for direct interactions between the effects of commercial fisheries and effects of project-related activities on fish and fish habitat would be reduced.

Drill cuttings dispersion modelling identified limited areas (i.e. up to approximately 0.1 square kilometres) where drill cuttings could result in the creation of anoxic areas and smother benthic species. These small and localized areas of benthic disturbance mean that they would not likely accumulate or interact with other projects and activities in the region. Potential effects of the Projects on sensitive benthic habitats would also be eliminated or reduced by conducting pre-drill coral surveys and establishing appropriate setbacks, as required. Furthermore, the proponents anticipate that cuttings accumulations on the seabed would eventually be recolonized.

The proponents also noted that on-going environmental effects monitoring programs for petroleum production projects have demonstrated localized (i.e. less than 10 kilometres) geographic effects on fish habitat from drill cuttings and chemical contaminants. This suggests a limited potential for cumulative environmental effects between the Projects and ongoing petroleum production projects.

While mobile fish and invertebrates have higher potential to interact with multiple projects, they also have higher avoidance capabilities. The proponents predicted that the typical movement patterns and ranges of most species, coupled with the availability of alternative habitats and the limited zone of influence of project-related disturbances, limits the potential for cumulative environmental effects to occur.

The proponents predicted that the Projects, in combination with other projects and activities, would not result in significant adverse cumulative environmental effects on fish, including species at risk, and fish habitat.

Potential Cumulative Environmental Effects on Marine Mammals and Sea Turtles

The widespread and migratory nature of marine mammals and sea turtles and their sensitivity to certain types of disturbances increases the potential for individuals and populations to be affected by multiple disturbances, and for cumulative environmental effects to occur.

Underwater sound from commercial fisheries, non-project vessel traffic, and other offshore oil and gas activities could overlap with project-related sound and result in cumulative environmental effects. However, the limited distances to thresholds for auditory injury to marine mammals from an operating drilling installation (as far as 470 metres from source) limits the potential for cumulative environmental effects. For geophysical surveys,

sound levels were predicted to decrease below auditory injury thresholds at distances over 140 metres (for high frequency cetaceans) and over 40 metres (for low to mid-frequency cetaceans and pinnipeds) from the source. The proponents stated that marine mammals are not expected to remain within 500 metres of an operating drilling installation or active vertical seismic profiling survey for 24 hours so auditory injury is predicted to be unlikely.

Thresholds for behavioural disturbance from sound may be much further. In-field measurements in the shallow waters of the Jeanne d'Arc Basin suggested that marine mammals within 35 kilometres of operating production platforms may be exposed to sound levels capable of causing behavioural disturbance. Based on modelling for a deep water site, the proponents also predicted that the National Oceanic and Atmospheric Administration's behavioural threshold[16] for marine mammals exposed to continuous underwater sound could be exceeded up to greater than 150 kilometres[17] from the drilling installation during winter and approximately 51.6 kilometres during summer based on the most conservative estimates. However, many species have vast ranges and the project area represents a very small percentage of those ranges. Effects of the Projects and other exploratory drilling and related activities were predicted to be transient and temporary. In addition, production and exploration projects have established safety exclusion zones and therefore would not occur in the same area at the same time, reducing the degree of overlap and interaction.

Project vessel activity in combination with general vessel traffic and commercial fishing activity may result in effects on marine mammals and sea turtles through entrapment and or collisions with vessels. Project-related traffic would be short-term, transient, and localized, which limits the opportunity for cumulative environmental effects.

Routine discharges of drilling wastes and other materials from the Projects together with other on-going and future projects and activities in the region have the potential to contribute to and result in cumulative environmental effects on the health of marine mammals and sea turtles. With the implementation of standard mitigation measures, which are also anticipated to be in place for other projects, discharges, both from the Projects as well as in combination with other projects and activities, are not expected to result in a measurable change in health of marine mammals and sea turtles.

The proponents predicted that the Projects, in combination with other projects and activities, would not result in significant adverse cumulative environmental effects on marine mammals and sea turtles, including species at risk.

[16] 120 dB re 1 µPa (decibels relative to a fixed reference pressure of 1 micropascal) root mean square sound pressure level published by the National Oceanic and Atmospheric Administration

[17] JASCO Applied Sciences (Canada) provided qualitative predictions of underwater sound levels for the Projects. They compared environmental properties and source levels between the Projects and the Scotian Basin Exploration Drilling Project and concluded by comparing the radii of possible effects to marine life to those reported in the Scotian Basin Exploration Drilling Project. The modelling was performed to the maximum distance of 150 kilometres from the source.

Potential Cumulative Environmental Effects on Migratory Birds

The proponents stated that in general, populations of most marine-associated birds occurring off Eastern Newfoundland are considered stable overall, although Leach's Storm-petrels have declined in recent years. The proponents predicted that potential cumulative environmental effects on migratory birds would be related primarily to possible attraction and disorientation associated with lighting around drilling installations and vessels and effects from waste discharges and other related vessel and aircraft traffic. The Leach's Storm-petrel is thought to be particularly vulnerable to the effects of offshore artificial lighting, potentially resulting in collisions and strandings. In addition, because Leach's Storm-petrels may forage hundreds of kilometres from nest sites during the breeding season, there may be risk of exposure to spills and routine discharges.

The proponents stated that a drilling installation would emit less light than a fully lit production platform, and therefore the spatial extent of lighting effects would be smaller. The project area – northern section has a low level of artificial light relative to the project area – southern section, and exploration licences located in the project area – northern section are at least 67 kilometres away from the nearest production facilities. In addition, Equinor's exploration licences in the project area – northern section are clustered together and, for the most part, adjacent to other licences also held by Equinor, which decreases the possibility of other operators completing simultaneous exploration drilling activities nearby. This, along with the relatively limited geographic zone of influence related to light (i.e. 16 kilometres), means that there is little potential for overlap and interaction. Any potential project effects are also likely to be transient and temporary in nature.

There is greater potential for cumulative environmental effects in the project area – southern section due to the exploration licences being located as close as eight kilometres from production facilities. The proponents noted that although production platforms are long-term operations with long-term environmental disturbances, the localized nature of these effects and the short-term and localized disturbances that may result from the Projects would reduce the potential for cumulative effects.

A notable exception would be for the Leach's Storm-petrel, which undertake long foraging trips and could potentially be exposed to more than one source of disturbance. The proponents also noted that Leach's Storm-petrels are the most commonly found species stranded on vessels. The proponents stated that because the foraging and wintering grounds of marine birds, including Leach's Storm-petrels, are so large, attraction and displacement effects of lighting from offshore oil and gas activities would potentially disrupt only a small percentage of the individuals in a population.

Discharges from offshore platforms and vessels may interact with birds both directly and indirectly, particularly in the winter months when thermoregulatory stress is highest. These discharges are managed through adherence to relevant regulations.

Entanglement in fishing gear can cause mortality and injury to seabirds. In Newfoundland and Labrador, murres and shearwaters are the birds most commonly caught as bycatch in fishing gear. The southwest slope of the Grand Banks has seasonally high bycatch rates, although Common Murre populations in southeastern Newfoundland have not shown signs of decrease. The proponents determined that the spatially and temporally limited nature of effects from fishing activity, along with required mitigation measures, would reduce the potential for interaction with the Projects.

The proponents predicted that the Projects, in combination with other projects and activities, would not result in significant adverse cumulative environmental effects on marine and migratory birds, including species at risk.

Potential Cumulative Environmental Effects on Special Areas

Several special areas overlap with the exploration licences and the Projects' vessel traffic routes (Section 6.4). Given these special areas are generally valued because of the habitat they provide for fish, marine mammals, sea turtles, and migratory birds, much of the analysis of cumulative environmental effects provided for those valued components is also applicable to special areas.

Special areas could be affected by planned or potential oil and gas exploration activities, including offshore geophysical surveys. These activities could result in a short-term disturbance within a relatively limited zone of influence, reducing the potential for special areas to be affected simultaneously by multiple projects and activities.

The proponents stated that vessel traffic associated with the Projects would be intermittent and transient at any one location and time and thus would negligibly contribute to cumulative environmental effects in an area.

The proponents predicted that the Projects, in combination with other projects and activities, would not result in significant adverse cumulative environmental effects on special areas.

Potential Cumulative Environmental Effects on Commercial Fisheries

There is a relatively low amount of commercial fishing in the project area – northern section compared to other areas within the regional study area. The closest exploration licence (1134) in the project area – northern section is approximately 67 kilometres away from the nearest production facility and the associated fishing exclusion zones, so cumulative environmental effects are unlikely. The proponents stated that the effects of loss of access to fishing grounds from other exploration drilling projects' safety exclusion zones, combined with those implemented for the Projects are expected to be localized and short-term. Relatively small areas would be restricted from use cumulatively, especially in comparison to the overall size of the offshore Newfoundland region.

The project area – southern section contains higher levels of marine traffic and other activity than other areas of offshore Newfoundland and Labrador, mostly due to the presence of established production platforms and higher volumes of marine research, commercial fishing, and shipping. Cumulative environmental effects to commercial fisheries could occur due to the increase in vessel traffic from the Projects; however, project-related vessel traffic would only contribute a small increase to the existing marine traffic in the project area. Due to the short-term nature of the Projects, transient nature of supply vessel operations, established traffic routes, and communications protocols, the proponents stated that they do not anticipate that the Projects would contribute to detectable, adverse cumulative environmental effects on commercial fisheries associated with increased vessel activity.

The often spatially extensive nature of geophysical surveys increases the potential for these surveys and the Projects to result in cumulative environmental effects on fishing enterprises. The proponents stated that, as part of the planning and implementation of survey activities, proponents of geophysical surveys would typically

communicate and coordinate with relevant marine users and other stakeholders, including exploration drilling project proponents, to plan and coordinate activities so as to provide spatial and temporal separation.

The proponents predicted that the Projects, in combination with other projects and activities, would not result in significant adverse cumulative environmental effects on commercial fisheries.

Potential Cumulative Environmental Effects on the Current Use of Lands and Resources for Traditional Purposes and Health and Socio-Economic Conditions of Indigenous Peoples

The proponents stated that there are no documented food, social, or ceremonial licences, nor any current use of lands and resources for traditional purposes within the project area. They also indicated that few of the marine associated resources that are known to be used by Indigenous groups are likely to migrate through the local study area, and for those that may (e.g. Atlantic Salmon) there would be a very low likelihood of interactions that could translate into a negative effect on traditional activities. Overall, the proponents predicted that there is almost no potential for the availability or quality of resources that are currently used for traditional purposes by Indigenous groups to be reduced or negatively affected as a result of routine project activities, especially to a degree that would alter the nature, location, timing, intensity, or value of these activities or the health or heritage of Indigenous peoples (Section 6.7).

The proponents indicated that a number of Indigenous communities hold communal commercial Swordfish, seal, groundfish, tuna, lobster and eel licences that overlap or are near the project area. Potential cumulative effects on these communal commercial fisheries would be the same as those on commercial fisheries in general, and are discussed above.

The proponents predicted that the Projects would not result in residual environmental effects on Indigenous communities or activities, and would therefore not result in or contribute to cumulative effects.

7.3.2 *Views Expressed*

Federal Authorities

Environment and Climate Change Canada asked the proponents to consider additional references to support their assessment of the effects of light and to provide greater certainty about migratory bird attraction distances. The proponents identified the zone of influence of light to be 16 kilometres around its source. Environment and Climate Change Canada advised that the presence of artificial lighting along foraging flight paths should be the basis of the analysis of cumulative environmental effects rather than the potential overlap of light sources. It stated that the cumulative effect of multiple artificial light footprints illuminating a previously pristine environment needs to be taken into account, particularly with respect to how this may be altering the behaviour of nocturnal species that may forage in or migrate through the area (e.g. Leach's Storm-petrels). To increase the level of certainty related to predictions about the effects of light on migratory birds, the proponents committed to obtaining information on stranding and mortality rates associated with the Projects through surveys and monitoring (e.g. regular searches of decks for stranded birds).

Fisheries and Oceans Canada and Environment and Climate Change Canada advised that the mitigation measures, monitoring, and follow-up programs proposed by the proponents and recommended by the Agency would adequately address the potential cumulative environmental effects on migratory birds, fish and fish

habitat, marine mammals, sea turtles, including applicable species at risk, as well as on commercial fishing and special areas.

Indigenous Peoples

Several Indigenous groups expressed concern about cumulative environmental effects, including on declining salmon populations and on the current/future use of Atlantic Salmon, American Eel, Swordfish, and Bluefin Tuna. The proponents responded that salmon in particular have a low potential to be found in the project area. Project activities would operate for a short period of time in any one location resulting in a short-term disturbance to species with a relatively limited zone of influence. This would reduce the potential for individuals and populations to be affected through multiple interactions with the Projects and other activities. The proponents stated that mitigation measures would further reduce the potential for cumulative environmental effects.

MTI asked about the cumulative environmental effects of multiple drilling fluid releases on species including Swordfish, Atlantic Salmon, and Bluefin Tuna. The proponents stated that they would adopt measures to prevent synthetic-based mud spills (Section 7.1). However, should a spill occur, they stated that fish and mobile invertebrates would be capable of avoiding spilled muds and were not expected to be negatively affected. They also stated that synthetic-based mud has a low toxicity, and therefore are not expected to affect fish or other marine species in the water column. The proponents predicted that the likelihood of effects on fish would be very low, and therefore no effects on the current or future use of Atlantic Salmon, Swordfish, and Atlantic Bluefin tuna by Indigenous peoples were predicted.

Several Indigenous groups commented on the importance of a thorough cumulative effects assessment. The Nunatsiavut Government recommended that research or monitoring programs developed for the projects include data collection that would improve confidence in effects analysis and contribute to the overall understanding of cumulative effects of the oil and gas industry on the offshore environment. The proponents responded that other offshore oil and gas projects have localized environmental effects, exploration activities are short-term and transient, and the Projects would have a small footprint (up to 12 square kilometres per exploration well) relative to the offshore area. The distances between the Projects and other oil and gas activities would decrease the potential for interactions between the effects of multiple activities. The proponents also proposed various monitoring measures for project-specific effects that they stated would also be applicable to cumulative environmental effects.

A summary of issues raised by Indigenous groups is presented in Appendix C.

Public

A member of the public expressed concern about potential cumulative effects on migratory birds, particularly with respect to attraction to project-related light sources. As described above in relation to Environment and Climate Change Canada's views expressed, additional information and analysis was provided by the proponents.

7.3.3 *Agency Analysis and Conclusion*

The Agency has considered the analysis of cumulative environmental effects provided by the proponents, advice from expert authorities and comments from Indigenous groups, and is of the opinion that the residual

environmental effects of the Projects could interact cumulatively with the effects of other projects and activities.

While most mobile fish species, including Atlantic Salmon, have higher potential to interact with multiple projects, these species also generally have higher avoidance capabilities and access to alternative habitats. Given the limited zone of influence of project-related disturbances on these species, potential cumulative effects of the Projects would be limited. Cumulative environmental effects on corals and sponges are predicted to be unlikely or minimal given the requirement for proponents to relocate drilling activities or discharges, as required, if aggregations of coral and sponges or other environmentally-sensitive species are identified during pre-drill surveys.

Marine mammals in the Eastern Newfoundland offshore area may be affected by the Projects in combination with effects of other exploration and production activities as well as effects of vessels from shipping, fishing, and other activities. The potential cumulative effects of sound on marine mammals are of particular concern. Baseline underwater sound recorded 35 kilometres from the White Rose, Terra Nova, and Hibernia production platforms was at the threshold for behavioural disturbance (120 dB re µPa for continuous sound) for marine mammals and sea turtles. The proponents also predicted that behaviour-altering sound from the Projects, although transient and temporary, could extend 150 kilometers from drilling installations, and this could result in overlapping zones of influence between the Projects and production facilities, as well as vessels in the vicinity of Projects at some points in time. The proponents would be required to implement mitigation measures to reduce the effects of sound from the Projects on marine mammals (Section 6.2), as well as potential effects on marine mammals from other potential project interactions, which would in turn reduce the Projects contribution to cumulative effects. However, given uncertainties about the effects of sound, the proponents would be required to verify sound predictions from drilling installations and provide results to Fisheries and Oceans Canada and the C-NLOPB.

The Projects would contribute to an increase in night lighting in offshore Eastern Newfoundland. Based on the proponents' zone of influence for lighting, a drilling installation in exploration licence 1137 or 1142 could cumulatively interact with lighting from the Hibernia and Hebron production platforms potentially resulting in an increase in migratory bird attraction and displacement. Although this interaction may indeed create a single larger area in which migratory birds may experience attraction and displacement due to artificial lighting, this is not the only way in which project lighting may contribute to cumulative effects. Environment and Climate Change Canada has advised that the presence of artificial lighting along a foraging flight path should be the basis of a cumulative analysis (rather than overlapping light sources). On this basis, the same individual or individuals from the same population could be affected by light from production facilities and/or exploration facilities located far away from one another, and outside their individual zones of influence. The presence of the drilling installation would be short-term (35 to 65 days); however, in addition the implementation of mitigation to reduce light attraction (for example, reduced flaring duration, employing alternatives to flaring) and associated monitoring would be important to mitigate potential cumulative environmental effects on migratory birds. Moreover, the proponents would be required to monitor potential bird strandings, so as to increase the level of information regarding potential effects and inform the need for additional mitigation, if applicable.

Commercial fishing could be affected by the Projects and other petroleum activities given that additional safety exclusion zones would be created as part of the Projects. However, the contribution of the Projects to

cumulative environmental effects is predicted to be minor given the small size and short-term duration of safety exclusion zones. The Agency notes that the exploration licences do not contain unique fishing grounds.

The potential for cumulative environmental effects offshore Eastern Newfoundland have been raised as a concern by Indigenous groups, due to the number of potential projects that could occur. Given these potential activities, the Government of Canada is working with the Province of Newfoundland and Labrador and the C-NLOPB on a regional approach for assessing the environmental effects of offshore exploratory drilling in the offshore area of eastern Newfoundland, which would aim to examine the effects of existing and anticipated offshore oil and gas exploratory drilling, including cumulative environmental effects. In advance of the Regional Assessment, operators are working together in conducting effects analyses (including for these Projects), engaging Indigenous groups, and identifying research needs (e.g. migration and effects to Atlantic Salmon).

In conducting the review of the Projects, the Agency has identified a series of mitigation measures, as well as follow-up and monitoring, related to fish and fish habitat, marine mammals and sea turtles, and migratory birds. These measures will reduce project specific impacts, reducing their contribution to any cumulative impacts; and verify the accuracy of the predictions made during the EAs. This proposed monitoring and follow-up will also enhance the understanding, and reduce any uncertainty, with respect to the potential effects from offshore exploratory activities, potentially contributing to the wider analysis of cumulative effects as part of the regional assessment.

Key Mitigation Measures to Avoid Significant Effects

Mitigation, follow-up, and monitoring for the Projects would contribute to the mitigation or monitoring of cumulative environment effects. Additional measures have not been identified at this time, but could be recommended following completion of the Regional Assessment.

Agency Conclusion

The Agency concludes that the Projects are not likely to cause significant adverse cumulative environmental effects.

8 Impacts on Potential or Established Aboriginal or Treaty Rights

8.1.1 *Potential or Established Aboriginal or Treaty Rights*

The Projects are both located in the northwest Atlantic Ocean, with the nearest potential drilling location being approximately 265 kilometres east of St. John's, Newfoundland and Labrador and roughly 800 kilometres from the nearest Indigenous community on the island of Newfoundland. There are no recognized treaties overlapping the exploration licences or the larger project area. Since there are no Aboriginal or treaty rights in the project area, the pathways for potential impacts to rights of Indigenous groups are through impacts from project activities to migratory species that are harvested or fished within Indigenous groups' traditional territories. The potential impacts were examined through the lens of routine operations and accidents or malfunctions.

Migratory species of particular concern to Indigenous groups include Atlantic Salmon, seals, whales, migratory birds, and American Eel. Effects assessments on migratory species are summarized in Section 6.1 Fish and Fish Habitat, Section 6.2 Marine Mammals and Sea Turtles, and Section 6.3 Migratory Birds.

Labrador

The Nunatukavut Community Council asserts an Aboriginal right to hunt, fish, and gather throughout its asserted traditional territory within Labrador and to resources along the offshore area immediately adjacent to the Labrador coast. The NunatuKavut Community Council holds food, social, and ceremonial fishing licenses for species that may migrate between the project area and the Labrador coast.

The Innu of Labrador (Innu Nation), who reside primarily on two reserves, Sheshatshiu in central Labrador and Natuashish on the North Coast of Labrador, assert Aboriginal rights to hunt, fish, and gather resources within Labrador and along the Labrador coast. Innu Nation holds food, social, and ceremonial fishing licences for species that may migrate between the project area and the Labrador coast.

The Nunatsiavut Government is an Inuit regional government within Newfoundland and Labrador. In 2005, the Province of Newfoundland and Labrador finalized the *Labrador Inuit Lands Claims Agreement*, a modern-day treaty between it, Canada, and the Nunatsiavut Government. The project area is located greater than 500 kilometres southeast of the Labrador Inuit Settlement Area, however, the Nunatsiavut Government holds food, social, and ceremonial fishing licences for species that may migrate between the project area and the Labrador Inuit Settlement Area.

Nova Scotia, New Brunswick and Prince Edward Island

Nova Scotia, New Brunswick, and Prince Edward Island Indigenous groups[18] (Maritime First Nations) are signatories to Peace and Friendship Treaties, which provide the right to fish for a moderate livelihood. In addition, the Maritime First Nations have an established Aboriginal right to harvest migratory species within

[18] See Section 4.1.1 of this EA Report for a list of Nova Scotia, New Brunswick, and Prince Edward Island Indigenous groups the Agency consulted

their traditional territories for food, social, or ceremonial purposes. This includes on land and in the marine environment. Although the Projects are located approximately 1000 kilometres east of Nova Scotia, endangered Atlantic Salmon populations, which Maritime First Nations have traditionally harvested in their territories, may pass through the project area as they migrate to or from their natal rivers located within these territories .

Quebec

Innu de Ekuanitshit and Première Nation de Nutashkuan, who reside on the north shore of the Gulf of St. Lawrence, assert an Aboriginal right to harvest Atlantic Salmon (and other migratory species) for food, social or ceremonial purposes in their territories, including on Anticosti Island, Quebec. Atlantic Salmon populations from the Gulf of St. Lawrence may pass through the project area during migration to or from their natal rivers located within the territories of these Innu Nations of Quebec.

Mi'gmaq of Gesgapegiag, Nation Micmac de Gespeg and Listuguj Mi'gmaq Government (represented by Mi'gmawei Mawiomi Secretariat) are part of the Peace and Friendship Treaties, which provide the right to fish for a moderate livelihood. In addition, the Mi'gmaq of Quebec have an established Aboriginal right to harvest migratory species within their traditional territories for food, social, or ceremonial purposes, including Atlantic Salmon that may pass through the project area as they migrate to or from their natal rivers located within these territories.

8.1.2 *Potential Adverse Impacts of the Projects on Potential or Established Aboriginal or Treaty Rights*

This section summarizes how the Projects may impact potential or established Aboriginal or treaty rights. Appendix C provides a summary of concerns identified by Indigenous groups during this environmental assessment.

Proponents' Assessment

The proponents stated that most project-related activities would take place in an offshore marine environment, hundreds of kilometres from Indigenous communities. Project-related emissions and discharges and environmental interactions would be localized and short-term in nature, and are unlikely to extend to or affect the physical or social health and well-being or other socio-economic conditions of an Indigenous community.

The proponents determined through existing documentation and engagement with Indigenous communities, that there are no food, social, or ceremonial licences within or near the project area or the local study area. Indigenous communities do not otherwise undertake the current use of resources in the marine environment for traditional purposes within or near these areas. This does not mean that those Indigenous communities would not fish in those areas in the future. However, given the nature of the Projects, including their limited, localized, and short-term environmental disturbances, and the associated small safety exclusion zone (one to 12 square kilometres), it is not anticipated that there would be adverse effects to any such fishing activity, even if it did occur in the local study area over the course of the Projects.

With regards to migratory marine species, and Atlantic Salmon in particular, the proponents noted that Labrador populations of Atlantic Salmon are unlikely to migrate through the project area, but individuals from the island

of Newfoundland, Nova Scotia, Prince Edward Island, New Brunswick, and the Gulf of St. Lawrence could pass through the project area to and from their maturation and winter feeding grounds in the Labrador Sea and off Greenland. In addition, individuals appear to congregate south of the project area, near the southern and eastern slopes of the Grand Banks, and east of the Strait of Belle Isle prior to migrating back to natal rivers. The proponents stated that there is little to no data to support the project area being used by Atlantic Salmon as overwintering habitat or as a major feeding area (see Section 6.1 and 6.5 for additional detail). Furthermore, they stated that the potential effects of planned project activities and overall risks to Atlantic Salmon is low and would not contribute to or exacerbate declines to salmon populations.

The proponents acknowledged that there are some data gaps regarding migratory routes. The understanding of salmon migration continues to evolve, and additional data on migratory routes of salmon may supplement the broad research ongoing by Fisheries and Oceans Canada, Indigenous Groups, and the Atlantic Salmon Federation. The proponents, in collaboration with research partners (potentially including Indigenous communities), are also pursuing additional research to address knowledge gaps regarding Atlantic Salmon migration through organizations such as Petroleum Research Newfoundland and Labrador and the Environmental Studies Research Fund.

For other migratory species of interest to Indigenous groups, like whales, birds, and American Eel, the proponents found that routine project activities would not adversely affect populations. Further, there would be no change in ability to harvest these species within the regional study area, which includes the traditional territories of all Indigenous communities consulted by the Agency for the Projects.

Effects assessments on migratory species of interest to Indigenous groups are summarized in Sections 6.1, 6.2, and 6.3.

Accidental Spill

The oil spill modelling completed by the proponents indicated a limited potential for oil to reach traditional territories of Indigenous communities. Any potential effect from an oil spill would therefore be largely indirect in nature, related to its potential effects on migratory marine species harvested by Indigenous groups. With appropriate mitigation in place, the proponents predicted that accidental events would not be expected to result in significant adverse effects on marine fish, birds or mammals. As such, the proponents stated that there would be little potential for indirect biophysical effects of a spill to decrease the quantity, quality, or health of marine species fished by Indigenous groups to an extent that would compromise their ability to continue fishing and harvesting activities. Nevertheless, the proponents would implement various spill prevention and response measures to further reduce the likelihood of a spill and any resultant effects. Taking into account the spill response measures, the proponents found there would not be significant adverse effects to fish and Indigenous groups fishing activities from an accident or malfunction. See Section 7.1 Effects of Accidents and Malfunctions for further analysis and detail.

Views of Indigenous Groups

All participating Indigenous communities expressed concern about the potential for the Projects to affect salmon and by extension to adversely impact the Aboriginal right to harvest salmon in their traditional territories. Salmon is a cultural keystone species for Indigenous communities in the Atlantic Region, and

Indigenous knowledge demonstrated the vital role that salmon plays in culture and sustenance in communities. Project-related sound from routine operations, marine shipping associated with the projects, accidents and malfunctions, and cumulative effects were all cited as pathways by which migrating salmon could be adversely affected. The KMKNO, MTI, and NunatuKavut Community Council requested that the proponents consider the precautionary principle in their assessment owing to the endangered status of certain salmon populations, the lack of data on migration routes and overwintering locations, the high rates of at-sea mortality, climate change, and the lack of information on specific effects of offshore drilling on this species. In responding to these concerns, the proponents considered additional research and data related to Atlantic Salmon. Additional information and analysis related to Atlantic Salmon has been summarized above and in Section 6.1.

The KMKNO recommended that no drilling activities take place between January and August so as not to interact with migratory Atlantic salmon in the project area. Based on advice from Fisheries and Oceans Canada and the C-NLOPB, the Agency determined that such a measure was not warranted and would unnecessarily limit the timing of proponents drilling activities.

The NunatuKavut Community Council, Sipekne'katik First Nation, and Nunatsiavut Government were concerned that drilling muds, cuttings, and accidental events would adversely affect breeding and/or feeding grounds of numerous marine species and could cause impacts to food, social, and ceremonial fisheries.

Many groups including MTI, the KMKNO, and NunatuKavut Community Council requested that the proponents develop Incident Management Plans, Spill Response Plans, Environmental Protection Plans, Safety Plans, and Net Environmental Benefit Analyses in consultation with Indigenous communities. The MMS and KMKNO recommended that, in the event of a spill, proponents be required to compensate for any loss of productivity of species harvested by the Mi'kmaq. The proponents committed to engaging Indigenous groups in the development of the Indigenous Communities Fisheries Communications Plans and continue to share information about spill response, consider concerns and issues, and share results and learning from response exercises with Indigenous groups, if requested. MTI relayed that it remains concerned about the risk of a spill affecting migration, spawning, or feeding grounds of species of importance to Mi'gmaq culture.

A summary of issues raised by Indigenous groups is presented in Appendix C.

Agency Analysis

In analyzing the Projects' impacts on potential or established Aboriginal or treaty rights, the Agency relied on information in the proponents' EISs and associated documents, and information provided by Indigenous groups.

Even though there are no Indigenous food, social and ceremonial licenses in the project area, Indigenous groups may fish species in their traditional territories that migrate through the project area. However, the Agency determined that the Projects' routine activities would likely have a low impact on the potential or established Aboriginal or treaty rights of Indigenous groups with food, social and ceremonial licenses to harvest migratory species because routine operations would likely have limited effects on these species (Section 6). With respect to Atlantic Salmon, a species of particular concern to many Indigenous communities, Fisheries and Oceans Canada reviewed applicable information and confirmed that there is uncertainty regarding the at-sea migration patterns and habitat use of this species. It advised that it is possible that some salmon overwinter in the Jeanne d'Arc Basin/Flemish Pass region, and that salmon are likely to be present at some times of the year as they

migrate through to and from home rivers, but this is not known to be a significant migration route or overwintering area. Fisheries and Oceans Canada has advised that potential effects of the Projects on Atlantic Salmon are expected to be negligible to low and spatially and temporally limited.

Although routine project operations would likely have limited effects on species that migrate through the project area, in the unlikely event of a major oil spill (discussed in Section 7.1 Effects of Accidents and Malfunctions), there is the potential for more serious effects on these species, particularly species at risk, and therefore potential impacts on the potential or established Aboriginal or treaty rights of Indigenous groups. The potential impacts from a spill event may decrease the quantity, quality and health of the fish harvested by Indigenous groups.

The Agency acknowledges the potential consequences of an accidental spill on Indigenous fishers and Indigenous communities. However, available data shows that the probability of a major subsea blowout is extremely low and therefore its potential effects would be unlikely to occur. In the unlikely event of a blowout, spill modelling predicts that shoreline oiling would be unlikely, and if it did occur, generally minimal. The Agency notes that the proponents would be required to take all reasonable measures to reduce the probability of an accidental event and ensure that they are prepared to respond effectively if an accidental event does occur. In conjunction with spill response measures, any damages incurred by Indigenous fishers, including the loss of commercial or food, social, and ceremonial fisheries, would require compensation in accordance with the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity*. The proponents would also be required to develop and implement Fisheries Communication Plans, which would include procedures to communicate with fishers in the event of an accident or malfunction. Indigenous groups would be engaged in the development of spill response plans, and provided with the approved version (see Section 7.1 for additional details).

8.1.3 *Proposed Accommodation Measures*

Mitigation measures and follow-up identified for fish and fish habitat (Section 6.1), marine mammal and sea turtles (Section 6.2), migratory birds (Section 6.3), commercial fisheries (Section 6.6), and accidents and malfunctions (Section 7.1) would also function as accommodation measures to minimize or avoid potential adverse impacts on potential or established Aboriginal or treaty rights. Key mitigation and follow-up measures identified by the Agency are provided in Appendix A. Key requirements related to potential impacts on rights include:

- ensure that all waste discharges and emissions from the drilling installation into the marine environment are in accordance with the *Offshore Waste Treatment Guidelines* and the *International Convention for the Prevention of Pollution from Ships*;
- plan and conduct vertical seismic profiling activity in consideration of the Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment;
- prepare follow-up programs for fish and fish habitat, marine mammals and sea turtles, and migratory birds to verify the accuracy of the predications made during the EAs and to determine the effectiveness of the mitigation measures. Share results of these programs with Indigenous communities;
- in consultation with Indigenous fishers, develop and implement a Fisheries Communication Plan to facilitate and coordinate communication with fishers;

- provide an opportunity for Indigenous groups to be involved in the development of the Oil Spill Response Plan. Provide the approved version to Indigenous groups; and
- compensate for any damages, including the loss of food, social and ceremonial fisheries in accordance with the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity*.

Given the uncertainty about Atlantic Salmon and the importance of the species to Indigenous groups, the proponents have committed to undertake and contribute to research on the presence and distribution of Atlantic Salmon in the Jeanne d'Arc Basin and Flemish Pass and will work with Indigenous groups to generate a list of potential research activities to address data gaps

8.1.4 *Issues to be Addressed During the Regulatory Approval Phase*

The regulatory approval phase, during which any federal permits or authorizations would be considered, would be completed after the EAs are complete. In order to proceed, the Projects require authorization by the C-NLOPB under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation* Act. They may also require *Fisheries Act* authorization and a *Species at Risk Act* permit from Fisheries and Oceans Canada. The federal government would consult Indigenous communities as appropriate prior to making regulatory decisions. The decision to undertake additional Crown consultation would take into consideration the consultation record for the EAs.

8.1.5 *Agency Conclusion*

After taking into consideration the mitigation measures, the Agency concludes that routine project activities would likely have a low/negligible impact on potential or established Aboriginal or treaty rights of Indigenous groups. The Agency expects that any impacts would likely be low-magnitude, short-term, and reversible. Mitigation measures would ensure that there would be no interruption in the practice of rights and that rights could be practiced in the same or similar manner as before the Projects. The Agency acknowledges that a blowout incident could have more serious repercussions, but has a very low probability of occurrence.

Taking into account the analysis of environmental effects of the Projects and the related mitigation measures outlined for fish and fish habitat (Section 6.1), marine mammal and sea turtles (Section 6.2), migratory birds (Section 6.3), commercial fisheries (Section 6.6), and accidents and malfunctions (Section 7.1), the Agency concludes that the potential impacts of the Projects on potential or established Aboriginal or treaty rights have been adequately identified and appropriately mitigated.

No specific follow-up measures are identified in relation to potential impacts on asserted or established Aboriginal and treaty rights, however, the Agency considers follow-up measures outlined for fish and fish habitat (Section 6.1), commercial fisheries (Section 6.6), and effects of accidents and malfunctions (Section 7.1) would also be effective in confirming potential impacts to potential or established Aboriginal and treaty rights.

9 Agency Conclusion

The Agency considered the proponents' environmental impact statements and responses to information requests from the Agency. Information requirements reflected the views of the public, government agencies, and Indigenous peoples. The Agency also considered the measures that would be implemented to mitigate the Projects' effects, as well as the follow-up (monitoring) measures to be implemented by the proponents.

The environmental effects of the Projects and their significance have been determined using assessment methods and analytical tools that reflect current accepted practices of environmental and socio-economic assessment practitioners, including consideration of the effects of potential accidents and malfunctions.

The Agency concludes that the proposed Flemish Pass Exploration Drilling Project and Eastern Newfoundland Offshore Exploration Drilling Project are not likely to cause significant adverse environmental effects, taking into account the implementation of the mitigation measures described in this draft EA Report.

The Agency has identified key mitigation measures and follow-up program requirements for consideration by the Minister of Environment and Climate Change in establishing conditions as part of her decision statements. Following the comment period on this draft EA Report, the Agency will submit the final EA report to inform the Minister's decision whether the Projects are likely to cause significant adverse environmental effects, taking into account the implementation of mitigation measures. The Agency will also recommend that the Minister establish, through her decision statements, conditions that the proponents must meet with respect to mitigation and follow-up program requirements in the event that the Projects are permitted to proceed.

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11 Appendices

Appendix A Key Mitigation and Follow-Up Measures Identified by the Agency

Valued Component (VC)	Mitigation	Follow-Up
Fish and Fish Habitat (Section 6.1)	• Prepare a coral and sponge survey plan for each wellsite and submit to Fisheries and Oceans Canada and the C-NLOPB for review and approval prior to implementing the survey. The survey plan should include: ○ use of a remotely-operated vehicle to collect high-definition visual data to confirm the presence or absence of sensitive environmental features, including aggregations of habitat-forming corals or sponges; and ○ survey transect length and pattern around wellsites, which should be based on applicable drill cutting dispersion model results. Transects around anchor sites should extend 50 metres from the extent of the anchor pattern. • Based on approved plans, undertake a coral and sponge survey at each well location and around each anchor point, if applicable, prior to commencing drilling a well. Retain a qualified independent marine scientist to provide advice in real-time. When undertaking the coral and sponge survey: ○ if aggregations of habitat-forming corals or sponges or other environmentally sensitive features are identified, relocate the well and/or redirect cuttings discharges to ensure that the drilling installation, anchors, or drill muds and cuttings deposits will not affect them, unless not technically feasible. No drilling should occur before a decision is made by the C-NLOPB and Fisheries and Oceans Canada regarding appropriate mitigation and monitoring; and ○ if aggregations of habitat-forming corals or sponges or other environmentally sensitive features are identified	• Provide the results of coral and sponge surveys to Fisheries and Oceans Canada and the C-NLOPB prior to commencing drilling. Results of the surveys should be provided to Indigenous groups and posted online for public access. • Monitor the concentration of synthetic-based mud on drill cuttings to verify compliance with the performance target specified in the *Offshore Waste Treatment Guidelines*. Report results to the C-NLOPB. • For the first well on each exploration licence, and for any well where drilling is undertaken in an area determined by coral and sponge surveys to be sensitive benthic habitat, conduct specific follow-up monitoring, including: ○ measurement of sediment deposition extent and thickness post-drilling and prior to departing the location to verify drill cuttings dispersion modelling predictions; ○ survey of benthic fauna present after drilling has been concluded; ○ reporting of results, including a comparison of modelling results to in situ results, to the C-NLOPB and Fisheries and Oceans Canada; and ○ results should be provided to Indigenous groups and posted online for public access. • Participate in or advance research on the presence and distribution of Atlantic Salmon in the Jeanne d'Arc Basin and Flemish Pass, and update the C-NLOPB annually on research activities. It is noted that the proponents have indicated they are pursuing research initiatives through organizations such as Petroleum Research Newfoundland and Labrador and the Environmental Studies Research Fund and will

Valued Component (VC)	Mitigation	Follow-Up
	and it is determined, to the C-NLOPB's satisfaction, that it is not technically feasible to relocate the well or redirect cuttings discharges, conduct a comprehensive assessment of the potentially-affected benthic habitat in consultation with Fisheries and Oceans Canada prior to drilling to determine the potential for serious harm or alteration of coral and sponge aggregations and related options for mitigation to reduce any identified risk. • Select chemicals to be used during the Projects in accordance with the *Offshore Chemical Selection Guidelines* and use lower toxicity drilling muds and biodegradable and environmentally-friendly additives within muds and cements, where feasible. • Ensure that all discharges from a drilling installation meet the *Offshore Waste Treatment Guidelines*. • Transport spent or excess synthetic-based mud that cannot be re-used during drilling operations to shore for disposal at an approved facility. • Ensure that all discharges from supply vessels meet or exceed the standards established in the International Convention for the Prevention of Pollution from Ships (MARPOL). • Conduct a pre-drill survey with qualified individual(s) at each well site to determine the presence of any unexploded ordnance or other seabed hazards. If any such ordnance or seabed hazard is detected, avoid disturbing or manipulating it, and contact the nearest Joint Rescue Coordination Centre and the C-NLOPB prior to commencing drilling to determine an appropriate course of action. Additional measures to mitigate effects on fish and fish habitat are included in Section 6.2 Marine Mammals and Sea Turtles.	work with Indigenous groups to generate a list of potential research activities to address data gaps.

Valued Component (VC)	Mitigation	Follow-Up

Marine Mammals and Sea Turtles (Section 6.2)	• Profiling and geophysical surveys in accordance with or exceeding the Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment, including:
	  ○ establishing a safety (observation) zone of a minimum of 500 metres around the sound source;
	  ○ implementing cetacean detection technology, such as passive acoustic monitoring, concurrent with visual observations;
	  ○ gradually increasing the sound source intensity over a period of at least 20 minutes (ramp-up), adopting a pre-ramp up watch of 30 minutes whenever survey activities are scheduled to occur, and delaying ramp-up if a marine mammal or sea turtle is sighted within the safety zone; and
	  ○ shutting down the sound source upon observing or detecting any marine mammal or sea turtle within the 500 metre safety zone.
	• To reduce risks of collisions with marine mammals and sea turtles (except during an emergency):
	  ○ limit supply vessels movement to established shipping lanes where they are available (i.e. in approaches to harbours); and
	  ○ when and where such speeds do not present a risk to safety of navigation, reduce supply vessel speed to seven knots (13 kilometres per hour) when a whale or sea turtle is observed or reported within 400 metres of the vessel.
	• In consultation with Fisheries and Oceans Canada, develop a Marine Mammal and Sea Turtle Monitoring Plan which includes marine mammal observer requirements using qualified individuals. Provide the plan to the C-NLOPB and
		• Record and report the activities, observations, and results of the Marine Mammal and Sea Turtle Monitoring Plan to the C-NLOPB and Fisheries and Oceans Canada. Results should be provided to Indigenous groups and posted online for public access.
		• Promptly report any collisions with marine mammals or sea turtles to the C-NLOPB, Fisheries and Oceans Canada, and the Canadian Coast Guard Environmental Emergencies Reporting Number (1 800 565-1633) and notify Indigenous groups.
		• Verify predicted underwater sound levels with field measurements during the first well per exploration licence. Provide the plan on how this would be conducted to the C-NLOPB and Fisheries and Oceans in advance of drilling, and the monitoring results after well suspension or abandonment, as directed by C-NLOPB and Fisheries and Oceans Canada.
		• Follow-up program results should be provided to Indigenous groups and posted online for public access.

Valued Component (VC)	Mitigation	Follow-Up
	Fisheries and Oceans Canada for review and approval 30 days prior to initiating activities. The plan would describe: ○ monitoring during vertical seismic profiling and geophysical surveys, including information on specific passive acoustic or equivalent technology monitoring configuration, to enable verification that species that may occur within the safety zone can be detected and to ensure ability to effectively monitor for all marine mammal vocalization frequencies that may occur within the exploration licences.	
Migratory Birds (6.3)	• Follow Environment and Climate Change Canada's (2017) *Procedures for Handling and Documenting Stranded Birds Encountered on Infrastructure Offshore Atlantic Canada*, which identifies procedures for safe capture and handling of different types of birds. • Restrict flaring to the minimum required to characterize a well's hydrocarbon potential and as necessary for the safety of the operation. • Where acceptable to the C-NLOPB, use formation testing while tripping rather than formation testing with flaring. • If formation testing while flaring is required ,notify the C-NLOPB to request an authorization in advance of flaring to: ○ determine whether the flaring would occur during a period of migratory bird vulnerability (identified in consultation with Environment and Climate Change Canada); and ○ identify how adverse environmental effects on migratory birds would be avoided, including opportunities to reduce night-time flaring (e.g. by starting flaring for shorter periods in the morning as opposed to at night). • Operate a water-curtain barrier around the flare during flaring.	• Prepare a follow-up program in consultation and Environment and Climate Change Canada to monitor effects on migratory birds to verify the accuracy of the predictions made during the EA and to determine the effectiveness of the mitigation measures. As part of the follow-up program: ○ conduct monitoring for marine birds from the drilling installation using a trained observer following Environment and Climate Change Canada's Eastern Canada Seabirds at Sea Standardized Protocol for Pelagic Seabird Surveys from Moving and Stationary Platforms; ○ develop, in consultation with Environment and Climate Change Canada, and implement a protocol for systematic daily monitoring of the drilling installation and supply vessels for the presence of stranded birds. The protocol would include information on frequency of searches, reporting procedures, and training requirements, including qualifications of those delivering the training; ○ if stranded birds are observed, follow Environment and Climate Change Canada's (2017) Procedures for Handling and Documenting Stranded Birds Encountered on Infrastructure Offshore Atlantic Canada; ○ document and report the results of any monitoring carried out, including a discussion of whether the mitigation measures (e.g.

Valued Component (VC)	Mitigation	Follow-Up
		water curtain) were proven effective and if additional measures are required; and ○ provide the monitoring and follow-up program and its results to the C-NLOPB and Environment and Climate Change Canada. Results should be provided to Indigenous groups and posted online for public access.
Special Areas (Section 6.4)	• Restrict helicopter flying altitude to a minimum altitude of 300 metres (except during take-off and landing) from active bird colonies and to a lateral distance of 1000 metres from Cape St. Francis and Witless Bay Islands Important Bird and Biodiversity Areas (unless there is an emergency situation). • Ensure supply and other support vessels maintain a 300-metre buffer from Cape St. Francis and Witless Bay Islands Important Bird and Biodiversity Areas (unless there is an emergency situation).	• Conduct specific follow-up monitoring when drilling in special areas, or adjacent to or near a special area, such that drill cuttings dispersion modelling predicts that cuttings deposition could occur within the special area at level above the biological effects threshold. Monitoring will include: ○ measurement of sediment deposition extent and thickness post-drilling and prior to departing the location to verify drill cuttings dispersion modelling predictions; ○ survey of benthic fauna present after drilling has been concluded; ○ reporting of results, including a comparison of modelling results to in situ results, to the C-NLOPB and Fisheries and Oceans Canada; and ○ results should be provided to Indigenous groups and posted online for public access.
Federal Species at Risk (Section 6.5)	The Agency determined that the measures to mitigate potential effects on fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), and migratory birds (Section 6.3) would also mitigate potential effects on species at risk and critical habitat.	The Agency determined that the proposed follow-up measures for fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), and migratory birds (Section 6.3.) are also appropriate for species at risk and critical habitat.
Commercial Fisheries (Section 6.6)	• In consultation with Indigenous groups and commercial fishers, develop and implement a Fisheries Communication Plan to address communications prior to and during drilling, testing and abandonment of each well. The plan should include: ○ regular updates to provide specific information on plans for project activities and an opportunity for feedback	• Report annually to the C-NLOPB on whether there have been incidents of lost or damaged fishing gear in associated with the Projects, including project-related vessels.

Valued Component (VC)	Mitigation	Follow-Up
	and further exchange of information on specific aspects of interest; ○ information on safety exclusions zones and suspended and abandoned wellheads; ○ procedures to notify fishers a minimum of two weeks prior to the start of drilling each well; ○ information on vessels travelling between Newfoundland and Labrador and exploration licences (e.g. number per week, general routes); and ○ procedures for determining the need for a Fisheries Liaison Officer and/or fisheries guide vessels during drilling installation movement and the use of a Fisheries Liaison Officer during geophysical programs. • Prepare a well abandonment plan, including a wellhead abandonment strategy and submit it to the C-NLOPB for acceptance at least 30 days prior to abandonment of each well. If it is proposed that a wellhead be abandoned on the seafloor in a manner that could interfere with commercial fishing, develop the strategy in consultation with Indigenous groups and commercial fishers. • Ensure that details of safety exclusion zones and the locations of abandoned wellheads, if left on the seafloor, are: published in Notices to Mariners; provided in Notices to Shipping; and communicated to fishers. • Provide information on the locations of any abandoned wellheads, left on the seafloor, to the Canadian Hydrographic Services for future nautical charts and planning. • Ensure ongoing communication with the NAFO Secretariat, using established information exchange mechanisms that are in place with Fisheries and Oceans Canada, regarding planned project activities, including timely communication	

Valued Component (VC)	Mitigation	Follow-Up
	of drilling locations, safety exclusion zones, and suspended or abandoned wellheads.	
Current Use of Lands and Resources for Traditional Purposes and Health and Socio-Economic Conditions of Indigenous Peoples (Section 6.7)	The Agency determined that the measures to mitigate effects on fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), migratory birds (Section 6.3), and commercial fisheries (Section 6.6) would also mitigate effects on the current use of lands and resources for traditional purposes and the health and socio-economic conditions of Indigenous peoples.	The Agency has not identified any follow-up measures specific to current use of lands and resources for traditional purposes and health and socio-economic conditions of Indigenous peoples and notes that there are related measures proposed for fish and fish habitat (Section 6.1), marine mammals and sea turtles (Section 6.2), migratory birds (Section 6.3, and commercial fisheries (Section 6.6).

Accidents and Malfunctions (Section 7.1)	• Undertake all reasonable measures to prevent accidents and malfunctions that may cause adverse environmental effects and effectively implement emergency response procedures and contingencies developed for the Projects.
	• Submit well capping and containment plans, to establish strategies and measures for well control and containment and the drilling of a relief well, as well as options to reduce overall response timelines.
	• Submit a Spill Response Plan which must include:
	  ○ procedures to respond to an oil spill (e.g. oil spill containment, oil recovery) and spills of other types;
	  ○ measures for wildlife response, protection, and rehabilitation (e.g. collection and cleaning of marine mammals, birds, and sea turtles, including species at risk) and for shoreline protection and clean-up, developed in consultation with the C-NLOPB; and specific role and responsibility descriptions for offshore operations and onshore responders.
	• Consult with Indigenous groups during the development of the Spill Response Plan. Provide the approved version to
		• As required by and in consultation with the C-NLOPB, monitor the environmental effects of a spill on components of the marine environment until specific endpoints identified in consultation with expert government departments are achieved. As applicable, monitoring shall include:
		  ○ sensory testing of seafood for taint, and chemical analysis for oil concentrations;
		  ○ measuring levels of contamination in fish species with results integrated into a human health risk assessment to determine the fishing area closure status;
		  ○ monitoring for marine mammals, sea turtles, and birds with visible oiling and reporting results to the C-NLOPB; and
		  ○ monitoring benthic organisms and habitats in the event of a synthetic-based mud spill or other event that could result in smothering or localized effects to the benthic environment.
		• Develop a procedure to communicate monitoring results to Indigenous and commercial fishers, as well as Indigenous groups.

Valued Component (VC)	Mitigation	Follow-Up
	Indigenous groups, and make it publicly available on the Internet. • Conduct a desktop exercise of the Spill Response Plan prior to the commencement of project activities and adjust the plan to address any deficiencies identified during the exercise. • Review and update the Spill Response Plan as required during drilling and before commencing a new well. • Prepare a plan for avoidance of collisions with vessels and other hazards which may reasonably be expected in the exploration licences and submit to the C-NLOPB for acceptance prior to drilling. • Undertake a spill impact mitigation assessment to consider all realistic and achievable spill response options and identify those techniques (including the possible use of dispersants) that would provide for the best opportunities to minimize environmental consequences and provide it to the C-NLOPB for review. Relevant federal government departments would provide advice to the C-NLOPB through the Environment and Climate Change Canada Environmental Emergency Science Table. Publish the spill impact mitigation assessment on the Internet. • In the event of a well blowout, begin the immediate mobilization of a capping stack and associated equipment to the site of the blowout. • Compensate for any damages, including the loss of food, social and ceremonial fisheries in accordance with the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity*. • Include a procedure to communicate with fishers in the event of an accident or malfunction in the Fisheries Communications Plan. Information that is provided to Indigenous groups and fishers needs to present a realistic	

Valued Component (VC)	Mitigation	Follow-Up
	estimation of potential health risks on consuming country foods, such that their consumption is not reduced unless there is a likely health risk from the consumption of these foods or specific quantities of these foods. If there is a potential health risk, consumption advisories should be considered.	
Effects of the Environment on the Projects (Section 7.2)	• In consultation with the C-NLOPB and Environment and Climate Change Canada, implement a physical environment monitoring program in accordance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations* and meeting or exceeding the requirements of the *Offshore Physical Environmental Guidelines.* • In consultation with the C-NLOPB, establish and enforce practices and limits for operating in all conditions that may be reasonably expected, including poor weather, high sea state, or sea ice or iceberg conditions. • In consultation with the C-NLOPB and as part of the required Safety Plan, develop an Ice Management Plan including procedures for detection, surveillance, data collection, reporting, forecasting, and avoidance or deflection. • In consultation with the C-NLOPB , implement measures to ensure that drilling installations have the ability to quickly disconnect the riser from the well in event of an emergency or extreme weather conditions.	• In accordance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations,* report annually to the C-NLOPB on whether there has been a need to modify operations based on extreme environmental conditions and on the efficacy of the practices and limits established for operating in poor weather, high sea state, or sea ice or iceberg conditions.
Cumulative Environmental Effects (Section 7.3)	Mitigation for the Projects would contribute to the mitigation of cumulative environment effects. Additional measures have not been identified at this time, but could be recommended following completion of the Regional Assessment.	Follow-up, and monitoring for the Projects would contribute to the monitoring of cumulative environment effects. Additional measures have not been identified at this time, but could be recommended following completion of the Regional Assessment.

Appendix B Proponents' Summary of Residual Environmental Effects of Routine Project Operations

Valued Component	Project Activity	Nature of Effect	Residual Environmental Effects Characteristics					Significance	Prediction Confidence
			Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
Fish and Fish Habitat including Species at Risk	Presence/Operation of Drilling Installation	Adverse	Low	L-PA	Short-term to Medium-term	Occurs on a regular basis	Reversible	Not significant	High
	Drilling Wastes and Other Discharges	Adverse	Low	L-PA	Medium-term to Long-term	Occurs on a regular basis	Reversible	Not significant	High
	Formation Flow Testing and Flaring	Adverse	Low	L	Short-term	Occurs sporadically	Reversible	Not significant	High
	Well Suspension and Abandonment	Adverse	Negligible to Low	L	Short-term	Occurs sporadically	Reversible	Not significant	High
	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys	Adverse	Low	PA	Short-term	Occurs sporadically	Reversible	Not significant	High
	Geological, Geotechnical and Environmental Surveys	Adverse	Negligible to Low	L	Short-term	Occurs sporadically	Reversible	Not significant	High
	Supply and Servicing	Adverse	Low	L	Short-term	Occurs on a regular basis	Reversible	Not significant	High
Marine Mammals and Sea Turtles	Presence/Operation of Drilling Installation	Adverse	Low to Medium	PA-LSA	Short-term to Medium-term	Occurs on a regular basis to continuously	Reversible	Not significant	Medium

Valued Component	Project Activity	Nature of Effect	Residual Environmental Effects Characteristics					Significance	Prediction Confidence
			Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
including Species at Risk	Drilling Wastes and Other Discharges	Adverse	Low	L-PA	Short-term	Occurs on a regular basis to continuously	Reversible	Not significant	High
	Formation Flow Testing and Flaring	Adverse	Negligible to Low	L-PA	Short-term	Occurs sporadically	Reversible	Not significant	High
	Well Suspension and Abandonment	Adverse	Negligible to Low	L-PA	Short-term	Occurs sporadically	Reversible	Not significant	High
	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys	Adverse	Negligible to Low	L-LSA	Medium-term	Occurs sporadically	Reversible	Not significant	High
	Geological, Geotechnical and Environmental Surveys	Adverse	Negligible	L-PA	Short-term	Occurs sporadically	Reversible	Not significant	High
	Supply and Servicing	Adverse	Low	L-LSA	Short-term	Occurs on a regular basis	Reversible	Not significant	High
Migratory Birds including Species at Risk	Presence/Operation of Drilling Installation	Adverse	Low	L-PA	Short-term to Medium-term	Occurs on a regular basis	Reversible	Not significant	Medium
	Drilling Wastes and Other Discharges	Adverse	Low	L	Short-term	Occurs sporadically	Reversible	Not significant	Medium
	Formation Flow Testing and Flaring	Adverse	Low	L-PA	Short-term	Occurs sporadically	Reversible	Not significant	Medium
	Well Suspension and Abandonment	Neutral	-	-	-	-	-	Not significant	High

Valued Component	Project Activity	Nature of Effect	Residual Environmental Effects Characteristics					Significance	Prediction Confidence
			Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys	Adverse	Low	L-PA	Short-term	Occurs sporadically	Reversible	Not significant	High
	Geological, Geotechnical and Environmental Surveys	Neutral	-	-	-	-	-	Not significant	High
	Supply and Servicing	Adverse	Low	L	Short-term	Occurs on a regular basis	Reversible	Not significant	High
Special Areas	Presence/Operation of Drilling Installation	Adverse	Negligible to Low	L-PA	Short-term to Medium-term	Occurs on a regular basis	Reversible	Not significant	High
	Drilling Wastes and Other Discharges	Adverse	Negligible to Low	L-PA	Short-term to Medium-term	Occurs on a regular basis	Reversible	Not significant	High
	Formation Flow Testing and Flaring	Neutral	-	-	-	-	-	Not significant	High
	Well Suspension and Abandonment	Adverse	Negligible to Low	L	Short-term	Occurs sporadically	Reversible	Not significant	High
	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys	Adverse	Negligible to Low	L-PA	Short-term	Occurs sporadically	Reversible	Not significant	High
	Geological, Geotechnical and Environmental Surveys	Neutral	-	-	-	-	-	Not significant	High

Valued Component	Project Activity	Nature of Effect	Residual Environmental Effects Characteristics					Significance	Prediction Confidence
			Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
	Supply and Servicing	Neutral	-	-	-	-	-	Not significant	High
Commercial Fisheries and Other Ocean Users	Presence/Operation of Drilling Installation	Adverse	Low	L	Short-term	Occurs continuously	Reversible	Not significant	High
	Drilling Wastes and Other Discharges	Adverse	Low	L	Short-term	Occurs on a regular basis	Reversible	Not significant	High
	Formation Flow Testing and Flaring	Neutral	-	-	-	-	-	Not significant	High
	Well Suspension and Abandonment	Adverse	Low	L	Long-term	Occurs continuously	Reversible	Not significant	High
	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys	Adverse	Low	L	Short-term	Occurs sporadically	Reversible	Not significant	High
	Geological, Geotechnical and Environmental Surveys	Adverse	Low	L	Short-term	Occurs sporadically	Reversible	Not significant	High
	Supply and Servicing	Adverse	Low	L	Short-term	Occurs on a regular basis	Reversible	N/A	High
Indigenous Communities and Activities	Presence/Operation of Drilling Installation	Neutral	-	-	-	-	-	N/A	High
	Drilling Wastes and Other Discharges	Neutral	-	-	-	-	-	N/A	High
	Formation Flow Testing and Flaring	Neutral	-	-	-	-	-	N/A	High

Valued Component	Project Activity	Nature of Effect	Residual Environmental Effects Characteristics					Significance	Prediction Confidence
			Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
	Well Suspension and Abandonment	Neutral	-	-	-	-	-	N/A	High
	Geophysical, Geohazard, Wellsite, Seabed and Vertical Seismic Profiling Surveys	Neutral	-	-	-	-	-	N/A	High
	Geological, Geotechnical and Environmental Surveys	Neutral	-	-	-	-	-	N/A	High
	Supply and Servicing	Neutral	-	-	-	-	-	N/A	High

Valued Component	Project Activity	Nature of Effect	Residual Environmental Effects Characteristics					Significance	Prediction Confidence
			Magnitude	Geographic Extent	Duration	Frequency	Reversibility		
KEY: **Magnitude – Biophysical Valued Components** **Negligible**: there is potential for Project-VC interaction, there would be no detectable effect. **Low**: detectable change that is within the range of natural variability, with no associated adverse effect on viability of affected population. **Medium**: detectable change that is beyond the range of natural variability, but with no associated adverse effect on the viability of the affected population. **High**: detectable change that is beyond the range of natural variability, with an adverse effect on the viability of the affected population. -: Rating not required because the effect is not expected to occur or because the effect is neutral. **Magnitude – Socioeconomic Valued Components** **Low**: detectable change that is within the range of natural variability, with no associated adverse effect on overall nature, intensity, quality/health or value of the affected VC or activity **Medium**: detectable change that is beyond the range of natural variability, but with no associated adverse effect on overall nature, intensity, quality/health or value of the affected VC or activity. **High**: detectable change that is beyond the range of natural variability, with an adverse effect on overall nature, intensity, quality/health or value of the affected VC or activity -: Rating not required because the effect is not expected to occur or because the effect is neutral.				**Geographic Extent** **L** = Localized, in immediate vicinity of the activity. **PA** = within project area. **LSA** = Within local study area. **RSA** = Within regional study area and/or beyond -: Rating not required because the effect is not expected to occur or because the effect is neutral. **Duration** **Short-term**: for duration of the activity. **Medium-term**: beyond duration of activity. **Long-term**: beyond duration of activity. -: Rating not required because the effect is not expected to occur or because the effect is neutral.		**Frequency** **Not Likely to occur** **Occurs once** **Occurs sporadically.** **Occurs on a regular basis.** **Occurs continuously.** -: Rating not required because the effect is not expected to occur or because the effect is neutral. **Reversibility** **Reversible**: will recover to baseline. **Irreversible**: permanent. -: Rating not required because the effect is not expected to occur or because the effect is neutral.		

Appendix C Summary of Indigenous Concerns

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
EA Process				
Qalipu First Nation	Scope of project	Concerned that transportation routes were excluded from the Projects' scopes. Recommended that potential effects of shipping be scoped into the assessments.	The proponents included transportation routes in the scope of their Projects and related affects were assessed.	The Agency required the proponents to consider vessel traffic and transit routes as part of the scope of the Projects and the assessments.
Fish and Fish Habitat				
Innu de Ekuanitshit KMKNO Qalipu First Nation	Effects on American Eel	Concern related to potential changes to habitat quality (e.g. due to noise from drilling or seismic), food availability and quality, and migration patterns. This species has particular cultural importance for Indigenous communities. The proponents should provide justification to support the assertion that it is unlikely that American Eels pass through the project area. Additional information on avoidance and mitigation measures for the American Eel is required.	The proponents recognized that American Eel may migrate through the shallow waters in the project area; however, the main threats to this species are largely in freshwater systems. Seismic activities, including those that would be carried out as part of the Projects, could result in localized stress and mortality of larval stages at sea, but there is no indication that the larval densities at sea that may encounter these activities would result in effects on the population. The proponents stated that general mitigation measures for fish and fish habitat would avoid or reduce potential adverse effects on American Eel.	The Agency requested additional information from the proponents regarding the potential effects of the Projects on American Eel and relevant mitigation measures. This information has been incorporated into its analysis. The Agency has identified key mitigation measures and proposed EA conditions for fish and fish habitat and marine mammals and sea turtles, which would mitigate effects on American Eel. These are described in Sections 6.1.3, 6.2.3, and Appendix A, and include selecting chemicals to be used in accordance with the *Offshore Chemical Selection*

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				Guidelines and ensuring that all discharges from a drilling installation meet the *Offshore Waste Treatment Guidelines*.
Elsipogtog First Nation Innu de Ekuanitshit KMKNO MCPEI (Lennox Island First Nation and Abegweit First Nation) Miawpukek First Nation MMS MTI Innu Nation Millbrook First Nation NunatuKavut Community Council Qalipu First Nation WNNB	Effects on Atlantic Salmon	Concern about potential impacts of the Projects on migrating salmon populations and the Aboriginal right to fish this species. Effects may include those related to project-related sound, increased shipping, and accidents and malfunctions. The proponents should consider the precautionary principle in their assessment owing to the declining status of populations, including several being designated as endangered, the lack of data on migration routes and overwintering locations, the high rates of at-sea mortality, climate change, and the lack of information on specific effects of offshore drilling on this species. Appropriate mitigation and accommodation measures should be outlined. Recommended that no activities take place between January-August so as not to interact with Atlantic Salmon.	The proponents considered additional information related to migration and behaviour of Atlantic Salmon and incorporated this into their analysis. They stated that the project area is not likely used by Atlantic Salmon as overwintering habitat or as a major feeding area; however, they acknowledged that there are data gaps regarding migratory routes and are pursuing research in collaboration with other operators. Any discharges would be treated in accordance with the *Offshore Waste Treatment Guidelines* and/or other relevant regulations and guidelines, as applicable, and the proponents would follow the *Statement of Canadian Practice with Respect to the Mitigation of Geophysical Sound in the Marine Environment* during geophysical surveys. Taking into account the mitigation measures, the proponents predicted that the residual effects of the Projects on fish, including Atlantic Salmon, would be negligible to low in magnitude and would not likely be significant.	The Agency requested additional information from the proponents related to potential presence of Atlantic Salmon in the project area and their migratory routes and behaviours. The Agency also considered additional information which was supplied by Indigenous groups, and which was given to the proponents to consider. This information has been incorporated into the Agency's analysis. Fisheries and Oceans Canada reviewed applicable information and confirmed that there is uncertainty regarding the at-sea migration patterns and habitat use of this species. It advised that it is possible that some salmon overwinter in the Jeanne d'Arc Basin/Flemish Pass region, and that salmon are likely to be present at some times of the year as they migrate through to and from home rivers, but this is not known to be a significant

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
Woodstock First Nation				migration route or overwintering area. The Agency acknowledges the proponents' commitments to pursuing ongoing research related to Atlantic Salmon migration and behaviour at sea. The Agency is of the view that a complete ban on activities between January and August would be impractical and unnecessary. Fisheries and Oceans Canada has advised that potential effects of the Projects on Atlantic Salmon are expected to be negligible to low and spatially and temporally limited. The Agency has identified key mitigation measures and proposed EA conditions for fish and fish habitat and marine mammals and sea turtles, which would mitigate effects on Atlantic Salmon. These are described in Sections 6.1.3, 6.2.3, and Appendix A, and include selecting chemicals to be used in accordance with the *Offshore Chemical Selection Guidelines* and ensuring that all discharges from a drilling

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
				installation meet the *Offshore Waste Treatment Guidelines*.
Elsipogtog First Nation KMKNO Miawpukek First Nation Première Nation de Nutashkuan WNNB Woodstock First Nation	Atlantic Salmon - follow-up and monitoring	Given the lack of data on Atlantic Salmon in the project area and their migration, as well as uncertainty with respect to impact predictions, it is recommended that follow-up monitoring for the potential presence of Atlantic Salmon in the project area be implemented. The proponents should provide funding for tracking studies of Atlantic Salmon (e.g. using satellite pop-up tags) to be completed before any exploration activities take place. Installation of acoustic receivers on the drilling installations should be considered. Potential research collaborations should consider that key concerns and research priorities would differ amongst Indigenous communities.	The proponents acknowledged that there are data gaps regarding Atlantic Salmon migration. The proponents, in collaboration with other operators, are pursuing research to address these data gaps. Discussions are ongoing with Indigenous groups to generate a short list of potential research activities, and the proponents have been in discussion with Petroleum Research Newfoundland and Labrador and the Environmental Studies Research Fund to potentially initiate new research. In the meantime, Equinor has purchased and provided the Atlantic Salmon Federation with 18 salmon tags to use in their salmon tagging program in Greenland. The proponents also noted that Husky Energy has placed receivers for tagged salmon on its SeaRose production facility on the Grand Banks. Equinor is also considering deploying an acoustic receiver in the Flemish Pass area.	The Agency requested additional information from the proponents related to the potential presence of Atlantic Salmon in the project area and their migratory routes and behaviours. This information has been incorporated into its analysis. The Agency acknowledges the proponents' commitments to pursuing ongoing research related to Atlantic Salmon migration and behaviour at sea.
Elsipogtog First Nation Innu Nation	Atlantic Salmon - Indigenous Knowledge	Indigenous knowledge about Atlantic Salmon populations has not been factored into management planning and environmental assessments.	The proponents engaged Indigenous groups over the course of the EAs through face-to-face meetings, phone calls, emails, and reports. In April 2018, the proponents participated in workshops organized by the Agency	The Agency required the proponents to provide additional information and analysis on the effects of the Projects on Atlantic Salmon, including considering additional

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
Miawpukek First Nation Millbrook First Nation MTI NunatuKavut Community Council Qalipu First Nation			with Indigenous groups. They organized additional workshops in October 2018 to solicit discussion and feedback on the Projects from Indigenous groups. The proponents also funded an Indigenous Knowledge Study with MTI, which was completed in September 2018. The proponents considered information presented in the study, including Indigenous knowledge and updated data and analysis on population declines of Atlantic Salmon. The proponents stated that they would continue their engagement efforts throughout the life of the Projects.	references, submissions, and other information from Indigenous groups and the dialogue that occurred at engagement meetings and workshops with these groups. This information has been incorporated into the Agency's analysis. The Agency acknowledges the proponents' commitments to pursuing ongoing research related to Atlantic Salmon migration and behaviour at sea and to continue their engagement efforts with Indigenous groups for the life of the Projects. The Agency received a copy of the Indigenous Knowledge Study completed by MTI, and considered the information presented in its analysis.
KMKNO Miawpukek First Nation	Primary and secondary productivity of marine ecosystems	Concern related to potential effects of the Projects on primary and secondary productivity of marine ecosystems, including on zooplankton and forage fish such as Capelin. The proponents should provide additional information on these effects	The proponents considered the effects of the Projects on zooplankton and forage fish such as Capelin. They provided additional information regarding these effects in response to concerns raised by Indigenous groups. This information has been incorporated into their analysis.	The Agency requested additional information from the proponents related to the potential effects of the Projects on primary and secondary productivity of water bodies, including on zooplankton and forage fish such as Capelin. This

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
		and how they may affect marine ecosystems and food sources.	The proponents predicted that there may be adverse effects on fish and fish habitat, including primary and secondary producers such as zooplankton and Capelin, but that with the implementation of mitigation measures, effects would be negligible to low magnitude, short-term, localized and reversible. The proponents predicted the residual environmental effects on fish and fish habitat would not be significant.	information has been incorporated into its analysis. The Agency has identified key mitigation measures and proposed EA conditions related to fish and fish habitat. These are described in Section 6.1.3 and Appendix A and include selecting chemicals to be used in accordance with the *Offshore Chemical Selection Guidelines,* transporting spent or excess synthetic-based mud that cannot be re-used during drilling operations to shore for disposal at an approved facility, and ensuring that all discharges from a drilling installation meet the *Offshore Waste Treatment Guidelines*.
KMKNO Miawpukek First Nation Qalipu First Nation	Effects on corals and sponges	It is unclear how the proponents would avoid or mitigate harm to corals and sponges where they are observed in proximity to a proposed well site. Recommend pre-drill surveys leading to avoidance as key mitigation. Seabed investigation should be conducted via underwater video system (not via drop camera/video system)	The proponents proposed to prepare Coral and Sponge Survey Plans for individual pre-drill coral and sponge surveys, and submit these plans to Fisheries and Oceans Canada and the C-NLOPB for review and approval prior to implementing the surveys. The plans would contain site-specific information, including: • survey methodology (surveys would include use of a remotely operated vehicle with a high-definition camera);	The Agency requested additional information from the proponents related to pre-drill coral and sponge surveys. This information has been incorporated into its analysis. The Agency has identified key mitigation measures, follow-up requirements and proposed EA conditions that would require the proponents to prepare a coral and sponge survey plan

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		at each wellsite and mooring location, and not only in areas where coral gardens or sponge grounds are known or likely to be present.	• survey schedules (surveys would occur at least three months prior to drilling activities); • survey team (the survey team would include an independent marine scientist); and • survey area description around wellsites, mooring and anchors, and rationale for determining the survey area. The proponents would then prepare a Coral and Sponge Survey Results and Risk Assessment Report for review and approval by Fisheries and Oceans Canada and the C-NLOPB prior to drilling, which could include: • consideration of the abundance, type and condition of the corals and sponges present, and anticipated potential effects based on drill cuttings modelling results, and distance from mooring locations; and • development of additional mitigation and monitoring in consultation with Fisheries and Oceans Canada and the C-NLOPB based on findings of the report. This may include relocating wells and/or redirecting water-based mud cuttings discharges to protect sensitive benthic habitats.	for each wellsite and submit to Fisheries and Oceans Canada and the C-NLOPB for review prior to implementing the survey. The survey would include use of a remotely-operated vehicle to collect high-definition visual data to confirm the presence or absence of sensitive environmental features, including aggregations of habitat-forming corals or sponges, around wellsites and anchor/mooring locations. If aggregations of habitat-forming corals, sponges, or other environmentally sensitive features are identified, the proponents would be required to relocate the well or redirect cuttings discharges, if technically feasible. No drilling would occur before a decision is made by the C-NLOPB and Fisheries and Oceans Canada that mitigation and monitoring are appropriate. If it were determined that it would not be technically feasible to relocate the well or redirect cuttings discharges, the proponents would be required to conduct a comprehensive assessment of the potentially-affected benthic

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				habitat in consultation with Fisheries and Oceans Canada prior to drilling to determine the potential for serious harm or alteration of coral and sponge aggregations and related options for mitigation to reduce any identified risk For the first well on each exploration licence, and for any well where drilling is undertaken in an area determined by coral and sponge surveys to be sensitive benthic habitat, the proponents would also be required to conduct follow-up to verify drill waste deposition modelling predictions. Results of coral and sponge surveys and follow-up monitoring would be provided to Indigenous groups and posted online for public access.
Miawpukek First Nation MTI NunatuKavut Community Council	Routine discharges	Concerned about impacts of routine discharges to the environment. Recommend that the proponents undertake follow-up monitoring to detect the accumulation of any	The proponents noted that potential effects of drilling wastes and other marine discharges could include chemical toxicity, bioaccumulation, increase in suspended particles, and seabed disturbance. To mitigate these potential effects, the proponents would select and screen chemicals to be	The Agency requested additional information from the proponents related to drilling wastes and other marine discharges, including their potential effects on the marine environment. This information

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
		contaminants in marine organisms. Proponents should be required to use least harmful drilling fluid regardless of cost.	discharged, including drilling fluids, in accordance with the *Offshore Waste Treatment Guidelines* and would provide information regarding chemical selection and waste management to the C-NLOPB for review and approval. Any discharge would also be treated in accordance with the *Offshore Waste Treatment Guidelines* prior to release. Coral and sponge surveys would also be conducted prior to drilling (as described above). The proponents predicted that residual effects would be negligible to low in magnitude, reversible, and not likely to be significant. The proponents committed to monitoring the implementation of the mitigation measures, including submitting monthly compliance reports to the C-NLOPB, which would include information on volumes of liquid wastes discharged.	has been incorporated into its analysis. The Agency has identified key mitigation measures and proposed EA conditions that would mitigate the effects of drilling wastes and marine discharges on the marine environment. These are described in Section 6.1.3 and Appendix A. The proponents would be required to: • select chemicals in accordance with the Offshore Chemical Selection Guidelines and use lower toxicity drilling muds and biodegradable and environmentally friendly additives within muds and cements where feasible; • ensure that all discharges meet the *Offshore Waste Treatment Guidelines;* • transport spent or excess synthetic-based mud that cannot be re-used during drilling operations to shore for disposal at an approved facility; and • ensure that all discharges from supply vessels meet

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
				or exceed the standards established in the *International Convention for the Prevention of Pollution from Ships* (MARPOL). The proponents would be required to monitor the concentration of synthetic-based mud on drill cuttings to verify compliance with the performance target specified in the *Offshore Waste Treatment Guidelines.*
KMKNO	Drill waste dispersion modelling	The proponents should verify and validate the drill cuttings dispersion modelling predictions. Such a follow-up program should not, as the proponents propose, be dependent on specific circumstances. The monitoring program should be conducted via seabed video and/or benthic sampling to determine, among other things, infaunal recolonization rates following drilling.	The proponents proposed follow-up measures to verify their impact predictions and determine the effectiveness of mitigation measure in protecting sensitive benthic habitat, including: • conducting specific follow-up monitoring if drilling is undertaken in an area where the Coral and Sponge Survey Results and Risk Assessment Report indicates that monitoring is required. Follow-up monitoring program design would be based on: the coral and sponge survey; potential zone of influence estimated in dispersion modelling; well location in proximity to the sensitive benthic habitat; other site-	The Agency requested additional information from the proponents related to their coral and sponge survey plans and the subsequent mitigation and follow-up measures. This information has been incorporated into its analysis. The Agency identified follow-up requirements to ensure the effectiveness of mitigation measures and to verify the accuracy of predictions of effects on benthic species and habitats. These are described in Section 6.1.3 and Appendix A and include:

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
			specific information collected during planning; and industry experience with similar monitoring programs. The program design would be submitted to the C-NLOPB and Fisheries and Oceans Canada for review and acceptance at least 60 days prior to drilling.	• providing the results of coral and sponge surveys to Fisheries and Oceans Canada and the C-NLOPB prior to commencing drilling and to Indigenous groups after each well is suspended and/or abandoned. Results would also be posted online; and • for the first well on each exploration licence, and for any well where drilling is undertaken in an area determined by coral and sponge surveys to be sensitive benthic habitat, measuring sediment deposition extent and thickness after drilling is complete and prior to departing the location to verify drill cuttings deposition modelling predictions. Results would be provided to Indigenous groups and posted online for public access.
Marine Mammals and Sea Turtles				
KMKNO	Effects of vertical seismic profiling	Concerns related to the effects of vertical seismic profiling surveys on marine mammals	The proponents committed to follow the *Statement of Canadian Practice with Respect to the Mitigation of Geophysical*	The Agency requested additional information from the proponents related to the potential effects of vertical

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
Miawpukek First Nation		and sea turtles. The proponents should implement measures to minimize impacts on marine mammals and sea turtles during vertical seismic profiling. Observers able to identify sensitive or protected species should be posted on watch during surveys. In addition, given the likely presence of endangered or threatened marine mammal species (and possible presence of Right Whales), the proponents should be required to employ passive acoustic monitoring or equivalent technology before and throughout vertical seismic profiling surveys, during periods of low visibility when observers cannot effectively observe the entire safety zone (e.g. periods of fog, at night).	*Sound in the Marine Environment* during geophysical surveys, which would include: • submitting a marine mammal and sea turtle monitoring plan to the applicable regulators for review at least 30 days prior to the commencement of the first geophysical survey; • using trained observers to monitor and report on marine mammal and sea turtle sightings within a pre-determined safety zone during vertical seismic profiling and geophysical surveys where geophysical source arrays are used; • ramping-up the source array (i.e. gradually increasing geophysical source elements over a period of at least 20 minutes until the operating level is achieved) starting from a single source element; • having marine mammal observers implement a pre-ramp up watch of 30 minutes prior to the start of the air source, and delaying ramp-up if a marine mammal or sea turtle is sighted within the safety zone; • implementing observational/shutdown procedures; and • shutting down the geophysical source array if a marine mammal or sea turtle listed as endangered or	seismic profiling surveys and associated mitigation measures and incorporated it into its analysis. The Agency has identified key mitigation measures and follow-up requirements and proposed EA conditions that would mitigate the potential effects of vertical seismic profiling on marine mammals and sea turtles. These measures are described in Section 6.2.3 (marine mammals and sea turtles) and Appendix A and include: • conducting vertical seismic profiling surveys in accordance with the ***Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment***; • implementing cetacean detection technology, such as passive acoustic monitoring, concurrent with visual observations; • shutting down the sound source upon observing or detecting any marine mammal or sea turtle

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
			threatened on the *Species at Risk Act* Schedule 1 is sighted. The proponents responded that they are of the opinion that there would not be additional benefit to passive acoustic monitoring given the relatively small radius of the zone within which temporary or permanent threshold shift values could be exceeded and because the ramp up procedure would utilize a very small air gun, which would promote temporary avoidance of the area by mobile species and help to reduce species' exposure to sound above threshold values. They advised that the probability of an undetected marine mammal or sea turtle being in close vicinity to an area where threshold levels for injury could be exceeded would be very low.	within the 500 metre safety zone; • developing a Marine Mammals and Sea Turtle Monitoring Plan; and • verifying predicted underwater sound levels with field measurements during the first well per exploration licence. The proponents would be required to provide monitoring and follow-up program results to Indigenous groups and post online for public access.
KMKNO Miawpukek First Nation	Potential effects from noise on whales	Concern related to the potential impacts on whales due to the energy and frequency of noise produced by the Projects, including cumulative effects from other projects. The proponents should conduct follow-up monitoring studies to evaluate the effects of noise on marine wildlife, with results of these shared with Indigenous groups.	The proponents acknowledged that underwater sound from commercial fisheries, non-project vessel traffic, and other offshore oil and gas activities could overlap with project-related sound and result in cumulative environmental effects. They stated that the limited distances to thresholds for auditory injury to marine mammals from an operating drilling installation would limit the potential for cumulative environmental effects. They further stated that although distances to	The Agency requested additional information from the proponents related to the potential effects of project-related noise on marine species and associated mitigation measures and incorporated it into its analysis. The Agency has identified key mitigation measures, follow-up requirements and proposed EA conditions that would mitigate

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			thresholds for behavioural disturbance from sound may be much further, the project area represents a very small percentage of the range of marine mammals species, and the effects of the Projects and other exploratory drilling and related activities were predicted to be transient and temporary. In addition, production and exploration projects have established safety exclusion zones and would not occur in the same area at the same time, reducing the degree of overlap and interaction. The proponents committed to visual monitoring by trained observers to detect marine mammals and sea turtles within a safety zone during vertical seismic profiling and a pre-ramp up watch prior to the start-up of operation of air source arrays. The proponents would submit an annual report of the marine mammal and sea turtle observational program (for geophysical activities) to the C-NLOPB and Fisheries and Oceans Canada, including documentation of marine mammal and sea turtle sightings.	the potential effects of sound on marine mammals and sea turtles. These are described in Section 6.2.3 and Appendix A and include: • conducting vertical seismic profiling surveys in accordance with the ***Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment***; • implementing cetacean detection technology, such as passive acoustic monitoring, concurrent with visual observations; • implementing a ramp-up procedure; • shutting down the sound source upon observing or detecting any marine mammal or sea turtle within the 500 metre safety zone; • developing a Marine Mammals and Sea Turtle Monitoring Plan; and • verifying predicted underwater sound levels with field measurements during the first well per exploration licence.

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
				The proponents would be required to provide monitoring and follow-up program results to Indigenous groups and post online for public access.
KMKNO	Vessel speeds	Project-related vessels should be required to reduce speeds (10-knot limit) when not in existing shipping lanes and/or whenever a marine mammal or sea turtle is observed in the vicinity of the vessel. These speed limits should also be implemented when near a raft of seabirds, and vessels should be required to avoid approaching congregations of marine birds.	The proponents stated that the offshore Newfoundland area does not have prescribed speed limits or shipping lanes. Speed would be set based on environmental conditions (e.g. wind, waves), distances, and fuel efficiency, and proponents would follow operational best practices The proponents committed to: • maintain a steady vessel course and safe vessel speed whenever possible (vessel transit speeds would typically be between 10 to 12 knots and occasionally 13 to 14 knots); • use existing and common vessel and aircraft travel routes for vessels and helicopters where possible and practicable; and • report any vessel strikes involving marine mammals or sea turtles to Fisheries and Oceans Canada within 24 hours.	The Agency requested additional information from the proponents and incorporated it into its analysis. The Agency has identified key mitigation measures and proposed EA conditions that would mitigate the potential effects of vessels on marine mammals, sea turtles, and migratory birds. These are described in Section 6.2.3 and Appendix A. The proponents would be required, except during an emergency, to: • limit supply vessels' movement to established shipping lanes where they are available (i.e. in approaches to harbours); and • when and where such speeds do not present a risk to safety of navigation,reduce supply vessel speed to seven knots (13 kilometres per hour)

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
				when a whale or sea turtle species at risk is observed or reported within 400 metres of the vessel.
Migratory Birds				
Innu de Ekuanitshit KMKNO MTI Qalipu First Nation	Effects on migratory birds	The Projects could have various impacts on marine and migratory birds, including effects from exposure to oil, disruption of migration patterns and behaviour, strandings, and effects on habitats. Among other measures, the proponents should document the presence of hydrocarbons on the surface of the water and any subsequent impacts on seabirds following the drilling work. It is also important to document the presence and abundance of waterfowl species, eiders, and Canada Geese in the work area. If injured avian Species at Risk are stranded on the drilling installation or on a vessel, every effort should be made to transport the bird to a wildlife rescue centre for rehabilitation.	The proponents provided additional information related to the Projects' potential effects on migratory birds. The Projects have the potential to affect migratory birds through multiple pathways, but the proponents predicted that, with the implementation of mitigation measures, these effects would be low in magnitude, localized, reversible, and overall not likely to be significant. The proponents committed to the following mitigation and follow-up measures: • conduct routine searches for, and collection and release of, stranded birds on the platform and supply vessels in accordance with appropriate protocols and guidelines; • develop a stranded seabird observation protocol in consultation with Environment and Climate Change Canada, which includes information on frequency of searches, reporting procedures, and training requirement; and	The Agency requested additional information from the proponents related to the potential effects of the Projects on migratory birds and incorporated it into its analysis. The Agency has identified key mitigation measures, follow-up requirements and proposed EA conditions related to migratory birds. These are described in Section 6.3.3 and Appendix A and include following appropriate procedures for safe capture and handling of stranded birds, conducting systematic daily monitoring for stranded birds, restricting flaring, and conducting monitoring for marine birds from the drilling installation using a trained observer and following Environment and Climate Change Canada's protocol. The proponents would be required to provide monitoring and follow-up

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
			• implement a live bird monitoring and observation program in accordance with Environment and Climate Change Canada's monitoring protocol from fixed platforms that would include having a trained Environmental Observer onboard to record marine bird sightings during operations. Mitigation measures that apply to fish and fish habitat and marine mammals would also apply to migratory and marine birds.	program results to Indigenous groups and post online for public access.Key mitigation measures identified by the Agency to reduce the effects on fish and fish habitat (Section 6.1) and marine mammals and sea turtles (Section .2) would also mitigate potential effects on migratory birds.
KMKNO MTI Nunatukavut Community Council	Flaring	The proponents should avoid flaring during periods when birds are more vulnerable (e.g. periods of fog, at night, etc.) and should implement additional mitigation measures to minimize the chance of episodic mass mortality at flares. Water-curtain barriers should be requirement around the flare during flaring. The proponents should be required to notify Environment and Climate Change Canada in advance of planned flaring to determine whether the flaring	The proponents committed to notifying the C-NLOPB of plans to flare associated with formation flow testing. The C-NLOPB would then consult with Environment and Climate Change Canada to determine a safe timeline to reduce effects on migrating birds. The proponents stated that formation testing while tripping is an alternative to formation flow testing with flaring; however, there are circumstances where formation flow testing with flaring may be required to address specific information requirements. Formation flow tests with flaring would be carried out under the *Newfoundland Offshore Petroleum Drilling and Production Regulations*, which require submission of a detailed testing	The Agency requested additional information from the proponents related to the requirements to flare and the potential effects of flaring on birds. This information has been incorporated into the Agency's analysis. The Agency has identified key mitigation measures, which are described in Section 6.3.3 and Appendix A, and proposed EA conditions including the requirement for the proponents to: • restrict flaring to the minimum required to characterize a well's

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
		would occur during a period of migratory bird vulnerability. If an alternative to flaring is an option through which to capture similar data and the alternative poses less of an impact on the environment, then the alternative must be used.	program to the C-NLOPB for approval and demonstration that tests would be conducted safely, without pollution, and in accordance with good oil-field practices.	hydrocarbon potential and as necessary for the safety of the operation; • use formation testing while tripping where acceptable to the C-NLOPB; • if formation testing with flaring is required, notify the C-NLOPB at least 30 days in advance of planned flaring to determine if flaring would occur during periods of migratory bird vulnerability (in consultation with Environment and Climate Change Canada) and to identify how to avoid adverse effects; and • operate a water-curtain barrier around the flare during flaring.
KMKNO MTI	Helicopter traffic	Concern regarding potential effects of helicopter traffic on birds. The proponents should adhere to the minimum altitude and distance for helicopter flight to minimize disturbance to birds (e.g. altitude greater than 300 metres and lateral distance of greater than 2 kilometres from any active bird colony).	The proponents provided information on standard helicopter altitude profiles (i.e. between approximately 610 metres and 2743 metres) and advised that onshore approaches to the St. John's Airport would be flown at the same approach points and altitudes as commercial air traffic. The proponents committed to avoiding low-level aircraft operations where it is not required as per Transport Canada	The Agency requested additional information from the proponents related to helicopter operations and incorporated it into its analysis. The Agency has identified the following mitigation measure to mitigate effects of helicopters on bird colonies:

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
			protocols and to avoid, where possible, established bird colonies.	• restrict helicopter flying altitude to a minimum altitude of 300 metres (except during take-off and landing) from active bird colonies and to a lateral distance of 1000 metres from Cape St. Francis and Witless Bay Islands Important Bird and Biodiversity Areas (unless there is an emergency situation).
KMKNO MTI Nunatukavut Community Council	Migratory birds - mitigation and monitoring	The proponents should consider additional mitigation measures to minimize the attraction of birds to project infrastructure (e.g. light colour, intensity, amount, timing, etc.), and to deter birds from nesting on structures. The proponents should implement monitoring, and should consider the use of acoustic and/or camera based monitoring to document bird sightings and interactions with the drilling installation and project vessels. The proponents should provide quantifiable targets (e.g. number of bird standings/deaths) which would be used to determine the	The proponents do not intend on implementing further mitigation measures regarding lighting intensity, colour of lighting, or shielding light in a downward direction due to lack of commercial availability and safety concerns associated with helicopter approach and landing. The drilling installations and vessels used for the Projects would be existing equipment contracted through third-parties, and that the proponents are unaware of any equipped with avian sensors. Despite not implementing these types of measures, the proponents maintain that the Projects potential residual effects on birds would still not likely be significant. The proponents committed to implementing a live bird monitoring and observation program that would include	The Agency requested additional information from the proponents related to mitigation measures and monitoring of effects of the Projects on migratory birds. This information has been incorporated it into the Agency's analysis. ○ The Agency has identified key mitigation measures, follow-up requirements and proposed EA conditions related to migratory birds. These are described in Section 6.3.3 and Appendix A. Key

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
		effectiveness of mitigation measures and to serve as adaptive management thresholds.	having a trained observer onboard to record marine bird sightings during operations.	mitigation measures include following appropriate procedures for safe capture and handling of stranded birds and restricting flaring. The proponents would also be require to implement a follow-up program, which would include systemic daily monitoring for stranded birds, and monitoring for marine birds from the drilling installation. The proponents would be required to document and report the results of any monitoring carried out, including a discussion of whether mitigation measures were proven effective and if additional measures may be required, and provide the monitoring and follow-up results to Indigenous groups.
Special Areas				

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
KMKNO	Impacts on special areas	Concern related to potential effects of the Projects on special areas. To minimize potential impacts to sensitive benthic habitats and areas of high ecological or biological activity and significance, the location of special areas and predicted drill cuttings dispersion should be factored into wellsite selection.	The proponents stated that the proposed mitigation measures related to fish and fish habitat (e.g. coral and sponge surveys), marine mammals and sea turtles, and migratory birds would also mitigate potential effects on special areas. The proponents proposed to conduct follow-up in relation to special areas if drilling were undertaken: • within an identified vulnerable marine ecosystem or fisheries closure area; and • adjacent to or near an identified vulnerable marine ecosystem or fisheries closure area, such that drill cuttings dispersion modelling predicts that drill cuttings deposition could occur within the vulnerable marine ecosystem or fisheries closure area at levels above the biological effects threshold. Follow-up would be undertaken in relation to relevant components of the defining environmental features of the special area. Follow-up monitoring plans would be developed and submitted to the C-NLOPB and Fisheries and Oceans Canada for review and acceptance.	The Agency requested additional information from the proponents regarding potential effects of the Projects on special areas. This information has been incorporated into its analysis. The Agency is of the view that key mitigation measures proposed for other valued components, including fish and fish habitat, marine mammals and sea turtles, and migratory birds, would mitigate potential effects on special areas. The Agency has identified a potential EA condition that would require the proponents to conduct follow-up monitoring when drilling in special areas, or adjacent to or near a special area, such that drill cuttings dispersion modelling predicts that cuttings deposition could occur within the special area at level above the biological effects threshold. Monitoring would include: • measuring sediment deposition extent and thickness after drilling is complete and prior to departing the location to

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				verify drill cuttings deposition modelling predictions; • survey of benthic fauna present after drilling has been concluded; and • reporting of results, including a comparison of modelling results to in situ results, to the C-NLOPB and Fisheries and Oceans Canada. The proponents would be required to provide monitoring and follow-up program results to Indigenous groups and post online for public access.
NunatuKavut Community Council	Shipping routes and special areas	The proponents should consider avoiding special areas and other potentially sensitive areas with supply vessels, and plan routes to avoid these areas.	The proponents committed to use existing and common vessel and aircraft travel routes for vessels and helicopters where possible and practicable.	The Agency identified key mitigation measures and proposed EA conditions that would mitigate the potential effects of vessel traffic, including potential effects on special areas. These are described in Section 6.2.3, 6.4.3 and Appendix A. The proponents would be required to, except during an emergency: • limit supply vessels movement to established shipping lanes where they are available (i.e. in

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
				approaches to harbours); and • ensure supply and other support vessels maintain a 300-metre buffer from Cape St. Francis and Witless Bay Islands Important Bird and Biodiversity Areas (unless there is an emergency situation).
Commercial Fisheries				
Innu Nation KMKNO Miawpukek First Nation Millbrook First Nation MMS MTI NuntuKavut Community Council Qalipu First Nation	Effects on commercial fisheries and communication with fishers	Concern related to potential impacts on commercial fisheries, including shrimp fishery. Indigenous groups requested the proponents develop a communication plan to inform fishers and to facilitate dialogue related to any project issues affecting the commercial fishery. The proponents should be required to accommodate any impacts to commercial fishery operations resulting from the Projects, including from an accident or malfunction. As a follow-up program, the proponents should ensure that issues and concerns can be	The proponents predicted that, with the implementation of mitigation measures, the adverse environmental effects of routine project activities on commercial fisheries, including the shrimp fishery, would be low in magnitude, localized, short-term and reversible. The proponents predicted residual environmental effects of the Projects on commercial fisheries would not be significant. The proponents committed to communicate on an ongoing basis with commercial fishers in general through One Ocean, the Fish Food and Allied Workers Union, and seafood producers regarding planned project activities, including timely communication of drilling locations, safety exclusion zones, and suspended or abandoned wellheads. The proponents also	The Agency requested additional information from the proponents and identified measures to mitigate effects on fishery resources and fishing activity. These are described in Section 6.6.3 and Appendix A. The Agency has identified key mitigation measures for each project, including: • implement a Fisheries Communication Plan, including a procedure for determining the need for a Fisheries Liaison Officer and/or fisheries guide vessels during drilling installation movement. • These measures would be developed in consultation

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		raised by Indigenous groups throughout the Projects' lives, and fishers should be provided with monthly updates (at a minimum).	committed to continued engagement with Indigenous groups and to develop an Indigenous Communities Fisheries Communication Plan, which may include updates on the monitoring and follow-up programs. The proponents have also committed to develop a compensation program for lost or damaged fishing gear based on relevant best practices and industry guidelines and to invite Indigenous groups holding communal commercial licences that overlap with the project area to participate in its development.	with Indigenous groups and commercial fishers. In addition, in all cases where spills, debris, or other project-related activities cause damage to fishers, the C-NLOPB would expect the proponents to consider claims in a manner that meets the requirements of the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and the spirit of the *Compensation Guidelines Respecting Damages Related to Offshore Petroleum Activity*, and to act in good faith to resolve claims from fishers. If the proponents and a fisher were unable to resolve such a claim, the fisher could seek relief through a compensation claim to the C-NLOPB [if applicable] or through the court.
Nunatsiavut Government NunatuKavut Community Council Qalipu First Nation	Effects of drilling wastes on commercial fisheries	Concern that drilling fluids, cuttings, and accidental events may adversely affect breeding and/or feeding grounds of numerous marine species, which could result in impacts to commercial and food, social, and ceremonial fisheries.	The proponents noted that due to the relatively non-toxic nature of water-based mud components, toxic effects to fish and benthic invertebrates would not be expected, and that synthetic-based mud cuttings and mud would be returned to the drilling installation for treatment before discharge.	The Agency requested additional information from the proponents and incorporated it into its analysis. The Agency has identified key mitigation measures and proposed EA conditions related to marine species. These are described in Section 6.1.3, 6.2.3,

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Sipekne'katik First Nation			Any potential biophysical effects related to the discharge of drilling wastes would not likely affect the overall availability or quality of marine resources, and thus the overall nature, intensity, or value of commercial fishing.	6.3.3 and Appendix A. Key mitigation measures include ensuring that all discharges from the mobile offshore drilling unit meet the *Offshore Waste Treatment Guidelines*. The Agency has also identified key mitigation measures and proposed EA conditions related to accidents and malfunctions. These are described in Section 7.1 and Appendix A. These include Oil Spill Response Plans to be developed in consultation with Indigenous groups.
KMKNO MMS Sipekne'katik First Nation	Compensation	Indigenous fishers should be compensated for any impeded access to fishing activity and for damaged or lost fishing gear. Furthermore, in the event of a spill, proponents must compensate for any loss of productivity of species harvested by Indigenous communities.	The proponents confirmed that the compensation program would outline procedures for actual loss or damages to commercial and communal commercial fishers. Indigenous groups holding communal commercial licences that overlap with the project area would be invited to participate in the development of the compensation program.	The Agency requested additional information from the proponents and identified measures to mitigate effects on fishery resources and fishing activity. These are described in Appendix A and Section 6.6.3 and include measures such as implementing a Fisheries Communication Plan. In addition, in all cases where spills, debris, or other project-related activities cause damage to fishers, the C-NLOPB would expect the proponents to consider claims in a manner that meets the requirements of the *Canada-Newfoundland and*

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				Labrador Atlantic Accord Implementation Act and the spirit of the *Compensation Guidelines Respecting Damages Related to Offshore Petroleum Activity*, and to act in good faith to resolve claims from fishers. If the proponents and a fisher were unable to resolve such a claim, the fisher could seek relief through a compensation claim to the C-NLOPB [if applicable] or through the court.
Current Use of Lands and Resources for Traditional Purposes and Potential Impacts on Aboriginal Rights				
Innu de Ekuanitshit KMKNO MTI NunatuKavut Community Council Première Nation de Nutashkuan	Indigenous knowledge and effects assessment	Indigenous knowledge must be applied in conducting EAs to accurately determine the impacts to Aboriginal rights and to assist in the development of mitigation and monitoring. Indigneous knowledge can also contribute to providing an ecosystem perspective in EAs and follow-up. More specifically, and in relation to these EAs in particular, the proponents should explain the rationale for not undertaking specific studies on current use of lands and resources for traditional	The proponents engaged Indigenous groups over the course of the EAs through face-to-face meetings, phone calls, emails, and reports. They also coordinated a two-day workshop for interested communities to discuss the Projects, including potential impacts and mitigation measures, and participated in workshops organized by the Agency with Indigenous groups. The proponents also supported the development of an Indigenous Knowledge Study undertaken by MTI and are in negotiations with Miawpukek First Nation regarding potential funding for studies and other initiatives.	The Agency directed the proponents to engage Indigenous communities in the preparation of their EISs and consider Indigenous knowledge in their analysis. The Agency has considered comments received from Indigenous groups following their reviews of the EISs, and asked the proponents to provide additional information on a number of topics. Indigenous groups were provided an opportunity to review and comment on the additional information, as

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
		purposes, particularly given that Indigenous harvesting activities in the vicinity of shorelines could be impacted by an oil spill.	Regarding potential impacts to shorelines or nearshore environments, the proponents predicted that the probability of spilled oil making contact with shorelines would be low, and if it did, only small portions of the released oil would actually reach shorelines (less than 0.5 percent) and the oil would likely be weathered, patchy, and discontinuous. As a result, only a small portion of species and habitats would likely be affected, and there would be little or no potential for biophysical effects to translate into any detectable decrease in the overall nature, intensity, distribution, quality or cultural value of traditional activities by Indigenous communities or other aspects of socioeconomic conditions.	applicable. The Agency also consulted Indigenous groups through phone calls, emails, letters, and in-person meetings. For example, the Agency organized four information sessions with Indigenous groups in October 2017, in which the proponents also participated. The Agency received a copy of the Indigenous Knowledge Study completed by MTI, and considered the information presented in its analysis.
Elsipogtog First Nation	Effects on resources and harvesting within traditional territories	Request that Elsipogtog First Nation play a central role in the assessment of and decision-making respecting any development that has potential to impact fish, fish habitat, fisheries, and management within their territory, including the Projects.	The proponents engaged Elsipogtog First Nation in the development of their EISs, and the proponents remain committed to continuing to engage with Indigenous groups. Each proponent would develop, in consultation with Indigenous groups, an Indigenous Communities Fisheries Communications Plan and have committed to timely communication of such things as drilling locations, safety exclusion zones, and suspended or abandoned wellheads. The proponents would also continue to share information related to spill	The Agency integrated consultation and engagement activities with Elsipogtog First Nation into the EAs. Elsipogtog First Nation was given the opportunity to review and submit comments on various documents, and was also consulted through other methods, including phone calls, emails, letters, and in-person meetings. Elsipogtog First Nation's input has been

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			response, consider related concerns and issues, and share results and learning from response exercises with Indigenous groups, if requested.	considered and incorporated into the Agency's analysis. The Agency has identified key mitigation measures which would ensure Elsipogtog First Nation continues to be appropriately involved, including through participation in the development of the Fisheries Communications Plans and Oil Spill Response Plans.
Accidents and Malfunctions				
Innu Nation KMKNO Miawpukek First Nation Millbrook First Nation NunatuKavut Community Council Qalipu First Nation	Capping stack location and response times, use in deep water	Concerned about the amount of time required to mobilize and deploy a capping stack. Recommend a capping stack be located and maintained in the Atlantic region. Alternative transportation options, such as transporting the capping stack by air, should also be considered. Concern about the proposed use of a capping stack in deep water. No approval should be given for capping stack use in water depths beyond 3048 metres, unless the proponents can demonstrate the application of proven capping stack	The proponents stated that while a capping stack system in Eastern Canada or on a vessel could result in quick mobilization, the ability to modify the equipment for the specific incident would be limited, and other activities would still be in progress prior to installation, including site assessment/preparation and debris removal. Existing capping stack facilities are set up such that the equipment can be quickly modified and prepared for shipment based on the specific requirements of an incident. It is unlikely that having a capping stack system in Eastern Canada would reduce the overall time to install a capping stack. The proponents also considered transporting the capping stack by air, but stated that this may result in	The Agency requested additional information from the proponents related to capping stack locations and response times and use of a capping stack in deep water. This information was incorporated it into its analysis. The Agency relied on the C-NLOPB's expertise and advice in reviewing the proponents' analyses and proposed approach to spill response, including the proposed approach to capping stack mobilization and deployment, and the Agency notes that the C-NLOPB was satisfied with the information presented by the proponents.

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
		technology at the proposed depth.	increased logistics associated with air travel and road transportation and could result in longer mobilization times. The proponents stated that their preferred mobilization method would be by vessel. Membership with Oil Spill Response Limited would allow them to remain aware of recent, ongoing, and upcoming innovations associated with capping stack technology. The proponents stated that, for deepwater applications, the Oil Spill Response Limited capping stacks that would be used are currently rated to operate in water depths up to 3000 metres. If drilling is planned in a location with waters deeper than 3000 metres, further analysis and modifications would be performed to confirm the capping stack technology selected is fit for purpose prior to initiating drilling operations.	The Agency notes that the C-NLOPB's authorization of drilling activities is contingent on its confidence that the proponents have a satisfactory approach to risk management. The proponents would also be required to demonstrate their preparedness to appropriately respond in the event of an accident or malfunction, including preparation of detailed spill response plans and well capping and containment plans, which would include discussion of any potential options to reduce overall response timelines. The Agency has identified key mitigation measures that would ensure the proponents fulfil these commitments (refer to Section 7.1.3 and Appendix A), which include the requirement to prepare Spill Response Plans and well capping and containment plans, which would be submitted to the C-NLOPB for acceptance prior to drilling, and would establish well control strategies and measures, including the capping of a blowout.

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
KMKNO	Emergency response plan training and implementation	The proponents must take all reasonable measures to reduce the probability of an accidental event and ensure they are prepared to respond effectively if an event does occur. In addition to directed training and response exercises around emergency preparedness, experts should be engaged, prior to drilling program initiation, to provide training specific to operating in harsh weather environments (including specialized training for technical experts, decision-making factors and processes, and roles and responsibilities).	The proponents committed to establishing response and incident management teams, which, depending on the scale of the incident, could be called upon to respond to an incident and manage ongoing response. They would draw on external resources as necessary, which could include private response organizations (e.g. Eastern Canada Response Corporation, Oil Spill Response Limited) and mutual aid agreements with other operators. In addition, the Canadian Coast Guard may be engaged through a Memorandum of Understanding with the C-NLOPB, to provide response advice and field monitoring. The C-NLOPB could also call upon the National Environmental Emergencies Centre to provide expert advice, including advice related to trajectory modelling, clean-up techniques, and protection of sensitive ecosystems and wildlife.	The Agency requested additional information from the proponents and incorporated it into its analysis. The Agency has identified key mitigation measures, follow-up programs and proposed EA conditions for accidents and malfunctions. These are described in Section 7.1.3 and Appendix A. Key mitigation measures include preparing a Spill Response Plan, undertaking a spill impact mitigation assessment, and undertaking all reasonable measures to prevent accidents and malfunctions and to effectively implement emergency response procedures and contingencies developed for the Projects. The C-NLOPB has also advised the Agency that its authorization of drilling activities is contingent on its confidence that the proponents would be able to appropriately respond in the event of an accident or malfunction. In addition, the proponents would be required to, in in consultation with the C-NLOPB, establish and enforce practices

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				and limits for operating in all conditions that may be reasonably expected, including poor weather, high sea state, or sea ice or iceberg conditions.
KMKNO Miawpukek First Nation MMS MTI Nunatsiavut Government	Indigenous involvement in emergency response planning	Indigenous groups should be involved in the development and implementation of the Oil Spill Response Plans and other emergency response and contingency plans, including emergency response and preparedness planning, exercises, and training. The proponents should ensure that information about accidental events would be shared with Indigenous groups, including consultation in relation to the findings of the dispersion modelling and to the scope of emergency preparedness and response planning.	The proponents have dedicated emergency response teams, with which emergency response exercises would be conducted. They would continue to share information with Indigenous groups about spill response, consider related concerns and issues, and share results and learning from response exercises, if requested. They would also develop, in consultation with Indigenous groups, an Indigenous Communities Fisheries Communications Plan.	The Agency requested additional information from the proponents on the details of their spill response plans and strategies and incorporated this information into its analysis. The Agency has identified key mitigation measures, follow-up programs, and proposed EA conditions for accidents and malfunctions. These are described in Section 7.1.3 and Appendix A, and include the following: • involve Indigenous groups in the development of the Oil Spill Response Plans and provide the approved versions to Indigenous groups; • include procedures to communicate with fishers in the event of an accident or malfunction in Fisheries Communications Plans; and • develop procedures to communicate monitoring

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				results to Indigenous groups.
Innu de Ekuanitshit KMKNO MTI NunatuKavut Community Council	Potential shoreline impacts	Concern related to discharges and spills reaching shore and any resulting potential impacts to commercial or food, social, and ceremonial fisheries.	The proponents predicted that the probability of spilled oil making contact with shorelines above the socioeconomic threshold for effects (i.e. above one gram per square metre) would generally be less than ten percent, but was up to 25 percent along the Avalon Peninsula for a 113-day unmitigated release at ExxonMobil's exploration licence 1134 site. Furthermore, deterministic modelling predicted that, even in worst-case conditions, only small portions of the released oil would reach shorelines (less than 0.5 percent) and the oil would likely be weathered, patchy, and discontinuous. Only a small portion of species and habitats would likely be affected if oil were to reach shorelines. The proponents stated that there would be little or no potential for biophysical effects to translate into any detectable decrease in the overall nature, intensity, distribution, quality or cultural value of traditional activities by Indigenous communities or other aspects of socioeconomic conditions.	The Agency requested additional information from the proponents related to the potential for a spill to reach shorelines and the potential effects of a spill on shorelines and nearshore environments (Section 7.1). The Agency notes that the probability of oil making contact with shorelines is relatively low. Mitigation measures proposed for accidents and malfunctions and commercial fishing (e.g. development of Fisheries Communication Plans and compensation for any damages, including loss of food, social, and ceremonial fisheries), would also mitigate potential effects on Indigenous commercial and food, social, and ceremonial fisheries.

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Innu de Ekuanitshit KMKNO MMS MTI Première Nation de Nutashkuan Sipekne'katik First Nation	Impact of a spill on species of importance to Indigenous groups	Concern regarding the potential effects of an accidental event or malfunction on species of importance to Indigenous communities (e.g. Atlantic Salmon, Bluefin Tuna, Swordfish).	The proponents provided additional information about potential effects of a spill, including on species of importance to Indigenous groups such as Atlantic Salmon and Bluefin Tuna. With regards to Atlantic Salmon, modelled blowout scenarios predicted that the majority of affected areas would experience total hydrocarbon concentrations below levels shown to have behavioural or toxic effects on salmon. Waters with potential higher concentrations would likely be located towards the bottom of the water column, near the release site where salmon are less likely to occur. With regards to Bluefin Tuna, the proponents recognized that exposure to certain hydrocarbons has been shown to affect fish, including tuna eggs, larvae, and juveniles. Due to the distance of the Projects from any known tuna spawning areas, Atlantic Bluefin Tuna would not likely interact with spilled oil in their early life stages. Foraging adult Bluefin Tuna would be most likely to come in contact with spilled oil; however, they have wide distributions and high migratory capabilities and would likely have limited interactions with a spill. The proponents committed to a variety of measures to prevent and respond to	The Agency requested additional information from the proponents regarding a spill's potential effects on various species, including Atlantic Salmon and Bluefin Tuna. The Agency notes that the C-NLOPB's authorization of drilling activities is contingent on its confidence that the proponents have a satisfactory approach to risk management. The proponents would also be required to demonstrate their preparedness to appropriately respond in the event of an accident or malfunction, including preparation of detailed spill response plans that meet the C-NLOPB's regulatory standards. Nonetheless, in taking a precautionary approach, and also in considering the potential presence of species at risk, the Agency concludes that the potential effects of a worst-case accident or malfunction (i.e. unmitigated subsea blowout) on fish and fish habitat and marine mammals and sea turtles could be significant. By extension, and particularly

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			accidents and malfunctions (Section 7.1.1 and Appendix F). The proponents predicted that, with appropriate mitigation, any residual effects of an accident or malfunction on fish, including Atlantic Salmon, would not likely result in a detectable decline in overall abundance, nor a change in the spatial and temporal distribution of fish populations in the regional study area for multiple generation. The proponents also stated that any biophysical effect from a spill would not likely translate into any detectable decrease in the overall nature, intensity, distribution, quality, or cultural value of traditional activities by Indigenous communities.	considering potential effects on endangered or threatened populations of Atlantic Salmon and their recovery, as well as the context provided by Indigenous groups, the Agency has concluded that the potential effects of a worst-case accident or malfunction on the current use of lands and resources for traditional purposes and the health and socio-economic conditions of Indigenous peoples could be significant. The Agency also recognizes that the probability of occurrence for a major event is very low and thus these effects are unlikely to occur. On this basis, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects as a result of accidents and malfunctions.
Innu de Ekuanitshit KMKNO MMS	Potential contamination of resources and effects on current use and socioeconomic conditions and wellbeing of Indigenous communities	Concerns related to potential contamination of harvested species, including perceived contamination which could influence dietary changes if country foods were avoided. The potential psychosocial impacts of an oil spill should be	In the event of a subsea blowout, actual and perceived environmental changes could potentially result in effects on socio-economic conditions of Indigenous peoples, including affecting traditional foods, which could translate to psychological effects such as increased anxiety and depression.	In response to this concern, the Agency requested additional information from the proponents related to the Projects' potential effects on current use and health and socio-economic conditions of Indigenous peoples, particularly

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		assessed, and the emergency response plan should include engagement with Indigenous groups and mitigation for the psychosocial stresses that may arise from a spill or blowout.	However, the proponents stated that: the probability of a blowout would be very low; released oil would likely move eastward; and response measures would likely reduce the magnitude, geographic extent, and duration of a spill. The probability of contamination of resources harvested by Indigenous communities would be very low and an assessment of effects on the health of Indigenous peoples was not required. Communication with communities in the event of a spill would be important, including delivering information that may assist in understanding an incident and associated impacts. This would occur as per procedures described in the Indigenous Communities Fisheries Communications Plans. Indigenous groups would be invited to participate in the development of these plans.	in the even of a blowout (Sections 6.7 and 7.1). The Agency acknowledges that current use and health and socio-economic conditions in Indigenous communities could be affected if project-related changes in the marine environment occur as a result of an accidental event or malfunction (e.g. cause decreased catch rates, or a decrease in fish quality for human consumption). The Agency considers that mitigation measures identified for fish and fish habitat, accidents and malfunctions, commercial fishing (e.g. development of Fisheries Communication Plans and compensation for any damages, including loss of food, social, and ceremonial fisheries), would also mitigate potential effects on the current use and health and socio-economic conditions of Indigenous peoples. Nonetheless, in taking a precautionary approach, and also in considering the potential presence of species at risk, the

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				Agency concludes that the potential effects of a worst-case accident or malfunction (i.e. unmitigated subsea blowout) on fish and fish habitat and marine mammals and sea turtles could be significant. By extension, and particularly considering potential effects on endangered or threatened populations of Atlantic Salmon and their recovery, as well as the context provided by Indigenous groups, the Agency has concluded that the potential effects of a worst-case accident or malfunction on the current use of lands and resources for traditional purposes and the health and socio-economic conditions of Indigenous peoples could be significant. The Agency also recognizes that the probability of occurrence for a major event is very low and thus these effects are unlikely to occur. On this basis, the Agency concludes that the Projects are not likely to cause significant adverse environmental effects as a result of accidents and malfunctions.

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Innu Nation KMKNO Miawpukek First Nation Millbrook First Nation MMS NunatuKavut Community Council Qalipu First Nation	Effects of dispersants	Concern related to the potential effects of dispersants on fish. Request clarification on the differences between and the potential effects of subsea versus surface dispersant injection. Request that a net environmental benefit analysis be undertaken to help guide the development of the response methods and plans, including determining if dispersants should be used. Given that scientific understanding of dispersants and their effects on the environment is evolving, the analysis should reference, evaluate, and integrate the most recently-available information and literature. The proponents should explore potential for Indigenous involvement in this process.	The proponents provided information on dispersant application methods and on the potential benefits and drawbacks of their use. Compared to surface application, subsea dispersant injection generally results in lower concentrations of dispersed oil, reduces the amount of oil coming to the surface, requires less dispersants, is more precise, and treats all escaping oil from a single release point. As part of the C-NLOPB's approval process, the proponents would undertake a spill impact mitigation assessment, which would evaluate benefits and drawbacks of different response measures. Considering whether and how to use dispersants would be a key component of the spill impact mitigation assessment and would require approval from the C-NLOPB.	The Agency requested additional information from the proponents on dispersants, including application methods and potential benefits and drawbacks. The Agency relied on the C-NLOPB's advice and input in reviewing this information, and this information has be incorporated into its analysis. The Agency has identified key mitigations and a proposed EA conditions for accidents and malfunctions. These are described in Section 7.1.3 and Appendix A. Key mitigation measures include undertaking a spill impact mitigation assessment to consider all realistic and achievable spill response options and identify those techniques (including the possible use of dispersants) that would provide for the best opportunities to minimize environmental consequences and provide it to the C-NLOPB for review. Relevant federal government departments would provide advice to the C-NLOPB on the spill impact mitigation assessment through

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				the Environment and Climate Change Canada Environmental Emergency Science Table. The spill impact mitigation assessment would be published on the internet for the information of Indigenous groups and the public.
KMKNO	Vessel routes and collision risks	Concern regarding the potential for collisions between supply vessels and fishing vessels and other ocean users. The proponents should provide more detail to better understand the level of collision risk. To minimize the potential for interference with commercial fisheries, project vessel transit routes should be required to link up with existing and common traffic routes at the earliest practicable opportunity, even where this may result in moderately decreased efficiency.	The proponents considered the risk of vessel collisions. They stated that the possibility of a vessel-on-vessel collision and the magnitude of the associated potential environmental effects would be very low based on 30 years of Newfoundland and Labrador offshore industry activity. Vessel traffic would be subject to applicable regulatory requirements (e.g. *Canada Shipping Act, Collision Regulations, Environmental Response Arrangements Regulations*), including the requirement for vessel operators to have an arrangement with a response organization, oil pollution prevention plan, and oil pollution emergency plan. The proponents stated that the offshore Newfoundland area does not have prescribed speed limits or shipping lanes. Speed would be set based on environmental conditions (e.g. wind, waves), distances, and fuel efficiency, and proponents would follow operational best practices. The vessels	The Agency requested additional information from the proponents related to vessel traffic and the risks and potential effects of a collision. The Agency relied on advice and input from the C-NLOPB, Transport Canada, and other federal authorities to review and determine the accuracy and reasonableness of the proponents' information and analyses. This information has been incorporated into the Agency's analysis. The Agency has identified key mitigations and proposed EA conditions for each project that would address the risk and potential effects associated with a vessel collision. These are described in Section 6.2.3, Section 7.1.3 and Appendix A.

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			would transit in a straight-line approach to and from the port of St. John's to the drilling installations or survey locations.	Key mitigation measures include: • prepare a plan for avoidance of collisions with vessels and other hazards and submit to the C-NLOPB for acceptance prior to drilling; • limit supply vessels movement to established shipping lanes where they are available (i.e. in approaches to harbours); and • when and where such speeds do not present a risk to safety of navigation, reduce supply vessel speed to seven knots (13 kilometres per hour) when a whale or sea turtle is observed or reported within 400 metres of the vessel.
Cumulative Effects				
MTI Nunatsiavut Government	Atlantic Salmon - cumulative effects	The proponents must fully consider the cumulative effects of the Projects on the marine environment, and in particular, Atlantic Salmon.	The proponents considered cumulative effects of the Projects on Atlantic Salmon and provided information on potential factors that may be contributing to declines in Atlantic Salmon populations, including climate change. The proponents stated that the	The Agency requested additional information from the proponents regarding the Projects' potential cumulative effects on Atlantic Salmon as well as consideration of the impacts that climate change

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		To assess cumulative effects, the proponents should provide more detail and analysis that documents the population declines in Atlantic Salmon that have occurred within the traditional waters of Indigenous communities. Subsequently, the proponents should consider the impacts that climate change has had on the distribution of salmon and how the Projects could potentially contribute and exacerbate an already declining population of salmon in the region. It would also be important to implement well-planned monitoring programs to understand the cumulative effects of oil and gas activities on this species.	project area is not likely used by Atlantic Salmon as overwintering habitat or as a major feeding area. The proponents stated that offshore oil and gas projects have localized environmental effects and that exploration activities, such as those proposed as part of the Projects, are short-term and transient, which would limit the potential for interactions between the effects of the Projects on Atlantic Salmon and those other activities. The mitigation measures proposed would further reduce the potential for cumulative environmental effects of the Projects on Atlantic Salmon and other marine species. The proponents also proposed monitoring measures for project-specific effects, which would also be applicable to cumulative effects of the Projects, but did not propose monitoring of cumulative effects in particular. The proponents, in collaboration with other operators, are also pursuing additional research on Atlantic Salmon. Discussions are ongoing with Indigenous groups to generate a short list of potential research activities, and the proponents have been in discussion with Petroleum Research Newfoundland and Labrador and the Environmental Studies Research Fund to potentially initiate new research. In the meantime, Equinor has purchased and provided the	may have had on the distribution of Atlantic Salmon, and whether the Projects could potentially contribute to or exacerbate and already declining population of salmon in the region. The Agency also requested that the proponents discuss the need for follow-up related to project-specific or cumulative effects on Atlantic salmon. The Agency is working with the Province of Newfoundland and Labrador and the C-NLOPB on a regional approach for assessing the environmental effects of offshore exploratory drilling in the offshore area of eastern Newfoundland, which would aim to examine the effects of existing and anticipated offshore oil and gas exploratory drilling, including cumulative environmental effects. In advance of the Regional Assessment, operators are working together in conducting effects analysis (including for these Projects), engaging Indigenous groups, and identifying research needs (e.g.

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
			Atlantic Salmon Federation with 18 salmon tags to use in their salmon tagging program in Greenland. Equinor is also considering deploying an acoustic receiver in the Flemish Pass area.	mitigation and effects to Atlantic Salmon).
Innu de Ekuanitshit Institut de développement durable des Premières Nations du Québec et du Labrador KMKNO Miawpukek First Nation MMS MTI Nunatsiavut Government NunatuKavut Community Council Première Nation de Nutashkuan	Cumulative effects of offshore drilling	Concern regarding cumulative impacts of drilling fluid releases, other discharges, and other effects, both from routine operations and accidental events, on fish, including Swordfish, Atlantic Salmon, Bluefin Tuna, and other species.	The proponents responded that other offshore oil and gas projects have localized environmental effects, exploration activities are short-term and transient, and the Projects would have a small footprint (up to 12 square kilometres per exploration well) relative to the offshore area. The distances between the Projects and other oil and gas activities would decrease the potential for interactions between the effects of multiple activities. Furthermore, the project activities would operate for a short period of time in any one location resulting in a short-term disturbance to species with a relatively limited zone of influence. These conditions would reduce the potential for individuals and populations to be affected through multiple interactions with the Projects and other activities. The proponents proposed various mitigation and monitoring measures for project-specific effects that they stated would also be applicable to cumulative environmental effects.	The Agency requested additional information from the proponents related to cumulative effects of the Projects on species of importance to Indigenous groups. This information has been incorporated into its analysis. The Agency is of the view that the mitigation, follow-up, and monitoring proposed for the Projects would contribute to the mitigation or monitoring of cumulative environmental effects. The Agency is working with the Province of Newfoundland and Labrador and the C-NLOPB on a regional approach for assessing the environmental effects of offshore exploratory drilling in the offshore area of eastern Newfoundland, which would aim to examine the effects of existing and anticipated offshore oil and gas exploratory

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
			The proponents would adopt measures to prevent spills, including synthetic-based mud spills. However, should a spill occur, they stated that fish and mobile invertebrates would be capable of avoiding spilled muds and were not expected to be negatively affected. They also stated that synthetic-based muds have a low toxicity, and therefore are not expected to affect fish or other marine species in the water column. The proponents predicted that the likelihood of effects on fish would be very low, and therefore no effects on the current or future use of Atlantic Salmon, Swordfish, and Atlantic Bluefin tuna by Indigenous peoples were predicted.	drilling, including cumulative environmental effects. In advance of the Regional Assessment, operators are working together in conducting effects analysis (including for these Projects), engaging Indigenous groups, and identifying research needs (e.g. mitigation and effects to Atlantic Salmon).
MTI	Regional assessment	A regional EA or a more comprehensive cumulative effects assessment for the Projects as well as other proposed and potentially upcoming exploration and production projects must be conducted to provide a more accurate assessment of the potential magnitude of cumulative effects on migrating fish species, sea mammals, and migratory birds.	In advance of the Regional Assessment, operators, including the proponents, are working together in conducting effects analyses (including for these Projects), engaging Indigenous groups, and identifying research needs (e.g. migration and effects to Atlantic Salmon).	The Agency is working with the Province of Newfoundland and Labrador and the C-NLOPB on a regional approach for assessing the environmental effects of offshore exploratory drilling in the offshore area of eastern Newfoundland, which would aim to examine the effects of existing and anticipated offshore oil and gas exploratory drilling, including cumulative environmental effects.
Miscellaneous				

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
KMKNO Miawpukek First Nation MTI Nunatsiavut Government NunatuKavut Community Council	Monitoring and follow-up	Recommend that the proponents engage in additional follow-up monitoring, especially in relation to water quality, wildlife populations, fish tissue contamination and effects on species at risk and cumulative effects. Monitoring programs should include data collection that would improve the confidence level of assessing cumulative effects. The proponents should provide detailed information on how the Indigenous groups would participate in the development and implementation of monitoring and follow-up measures, including integrating traditional knowledge in these activities.	The proponents committed to various follow-up measures related to fish and fish habitat (Section 6.1), Marine Mammals and Sea Turtles (Section 6.2), Migratory Birds (Section 6.3), and Special Areas (Section 6.4). The proponents stated that they would continue their engagement efforts with Indigenous communities throughout the life of the Projects. In particular, they committed to continue to share information about spill response, consider related concerns and issues, and share results and learning from response exercises with Indigenous groups, if requested. They also committed to develop an Indigenous Communities Fisheries Communication Plan, which may include updates on the monitoring and follow-up programs.	The Agency identified various follow-up programs and proposed EA conditions. These are described throughout Sections 6 and 7 and Appendix A. Results and information from follow-up and monitoring programs would be shared with Indigenous groups.
Nunatsiavut Government	Climate change/effects of the environment on the Projects	The proponents should take into account changes to predicted weather and marine patterns due to climate change, particularly in regards to extreme weather events.	As part of their EISs, the proponents considered climate change and potential changes in marine patterns. The engineering designs of drilling installations consider the physical and environmental conditions of the project area, and the drilling installation would be verified to ensure it is fit for purpose and can function as intended in the environment in which it would operate.	The Agency agrees that climate change may lead to changes in predicted weather and marine patterns, including changes to the frequency and severity of extreme weather events. It has proposed EA conditions that take these potential changes into account, including requiring the proponents to monitor meteorological and

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
				oceanographic conditions over the lifetime of the Projects to forecast and respond to severe conditions. In addition, the proponents would be required to establish and enforce practices and limits for operating in all conditions that may be reasonably expected, including poor weather or high sea state, and ensure that the drilling installation has the ability to quickly disconnect the riser from the well in the event of extreme weather conditions. Finally, the proponents would be required to report annually to the C-NLOPB on whether there has been a need to modify operations based on extreme environmental conditions and on the efficacy of the practices and limits established for operating in poor weather or high sea state. These measures are intended to be adaptive to potential changes to predicted weather and marine patterns due to climate change that could occur over the life of the Projects.
Innu de Ekuanitshit	Icebergs and emergency response measures	How would iceberg movement be monitored and potential	The proponents would each be required to submit a safety plan to the C-NLOPB	The Agency has identified key mitigation measures and

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
MTI		collisions be avoided? Are there emergency evacuation and shut down procedures to reduce some of the effects.	for approval, which addresses the possibility of pack sea ice or drifting icebergs at the drill site and the measures to protect the installation, including systems for ice detection, surveillance, data collection, reporting, forecasting and, if appropriate, ice avoidance or deflection.	proposed EA conditions for each project to reduce the potential for iceberg collisions. These are described in Section 7.2.3 and Appendix A. Key mitigation measures include: • in consultation with the C-NLOPB and Environment and Climate Change Canada, implement a physical environment monitoring program in accordance with the Newfoundland Offshore Petroleum Drilling and Production Regulations and meeting or exceeding the requirements of the Offshore Physical Environmental Guidelines; • in consultation with the C-NLOPB, establish and enforce practices and limits for operating all conditions that may be reasonably expected, including poor weather, high sea state, or sea ice or iceberg conditions ; • in consultation with the C-NLOPB and as part of the required Safety Plan, develop an Ice Management Plan including

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
				procedures for detection, surveillance, data collection, reporting, forecasting, and avoidance or deflection; and • in consultation with the C-NLOPB , implement measures to ensure the drilling installations have the ability to quickly disconnect the riser from the well in the event of an emergency or extreme weather conditions.
Miawpukek First Nation MMS NunatuKavut Community Council	Decommissioning – effects of abandoned wellheads	Concern regarding the potential risks and effects of abandoned wellheads, including potential effects on commercial fisheries and risks of accidents and malfunctions. The proponents must provide further justification for leaving wellheads in place. If removal of the wellhead reduces the likelihood of spills, accidents or malfunctions, then it should be done in all circumstances (not just for depths less than 1,500 m).	The proponents stated that at depths less than 500 metres, wellheads would be removed by cutting them below the seafloor. At depths between 500 and 1500 metres, wellheads may be removed either below or above the seafloor to a maximum height of 0.85 metres. At depths greater than 1500 metres, wellheads would be left in place, at a typical height of 2.5 metres above the seafloor. The proponents predicted that the presence of wellheads in waters deeper than 1500 metres would have little or no adverse effects on fishing, as relatively little fishing occurs at these depths. Where wellheads remain above the seabed surface, the proponents would provide the locations of the wellheads to fishers and the Canadian Hydrographic Service	The Agency requested additional information from the proponents on their well abandonment strategies. This information has been incorporated into its analysis. The Agency also notes that the C-NLOPB has advised that, with respect to the risk for accidents and malfunctions, the integrity of abandoned wells would not be affected by where (or if) a wellhead is cut. The Agency has identified key mitigation measures and proposed EA conditions related to well abandonment, including:

Source	Subject	Comment or Concern	Summary of Proponents' Responses	Agency Response
			and issue a Notice to Mariners. Furthermore, the proponents would implement gear compensation to address any damage to fishing gear resulting from abandoned wellheads. The proponents stated that well decommissioning would be permanent, and designed in compliance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations* to ensure long-term environmental protection. They would be required to provide information on abandonment methods to the C-NLOPB to ensure wells are adequately isolated to prevent hydrocarbons from entering the environment. Wells would be inspected prior to abandonment with a remotely operated vehicle to ensure the area is free of equipment and obstructions. Long-term monitoring of abandoned wells would not be required.	• preparing a well abandonment plan, including a wellhead abandonment strategy, and submitting it to the C-NLOPB for acceptance at least 30 days prior to abandonment of each well. If an abandoned wellhead could interfere with commercial fishing, develop the strategy in consultation with commercial fishers and Indigenous groups; • ensure that details of abandoned wellheads, if left on the seafloor, are: published in Notices to Mariners; provided in Notices to Shipping; and communicated to fishers; and • provide information on the locations of any abandoned wellheads, left on the seafloor, to the Canadian Hydrographic Services for future nautical charts and planning.

Appendix D Species at Risk and COSEWIC-listed Species that May be Found in the Project Area and Surrounding Area

Species	Likelihood to Occur in Project Area	Time of Year Present in Project Area	*Species at Risk Act* Status (Schedule 1)	COSEWIC Assessment
Acadian Redfish (*Sebastes fasciatus*) – Atlantic population	High	Year-round	Not listed	Threatened
American Plaice (*Hippoglossoides platessoides*)	High	Year-round	Not listed	Threatened
Atlantic Cod (*Gadus morhua*) - Newfoundland and Labrador population	High	Year-round	Not listed	Endangered
Lumpfish (*Cyclopterus lumpus*)	High	Year-round	Not listed	Threatened
Atlantic Wolffish (Striped Wolffish) (*Anarhichas lupus*)	High	Year-round	Special concern	Special concern
White Hake (*Urophycis tenuis*) – Atlantic and Northern Gulf of St. Lawrence population	High	Year-round	Not listed	Threatened
Cusk (*Brosme brosme*)	Moderate	Year-round	Not listed	Endangered
Deepwater Redfish (*Sebastes mentalla)* – Northern population	High	Year-round	Not listed	Threatened
Northern Wolffish (*Anarhichas denticulatus*)	High	Year-round	Threatened	Threatened
Roundnose Grenadier (*Coryphaenoides rupestris*)	High	Year-round	Not listed	Endangered
Smooth Skate (*Malacoraja senta*) - Laurentian-Scotian population	High	Year-round	Not listed	Endangered
Spiny Dogfish (*Squalus acanthias*) - Atlantic population	Low	Year-round	Not listed	Special concern
Spotted Wolffish (*Anarhichas minor)*	High	Year-round	Threatened	Threatened
Thorny Skate (*Amblyraja radiata*)	High	Year-round	Not listed	Special concern
American Eel (*Anguilla rostrata*)	Transient	September to November	Not listed	Threatened
Atlantic Bluefin Tuna (*Thunnus thynnus*) – Western Atlantic population	Moderate to high	June to November	Not listed	Endangered

Species	Likelihood to Occur in Project Area	Time of Year Present in Project Area	*Species at Risk Act* Status (Schedule 1)	COSEWIC Assessment
Winter Skate (*Leucoraja ocellata*) – Eastern Scotian Shelf - Newfoundland population	High	Year-round	Not listed	Endangered
Atlantic Salmon (*Salmo salar*) - Inner Bay of Fundy population	Unlikely	Unknown	Endangered	Endangered
Atlantic Salmon (*Salmo salar*) - Outer Bay of Fundy population	Transient	Spring migration possible; July to November	Not listed	Endangered
Atlantic Salmon (*Salmo salar*) - Eastern Cape Breton population	Transient	Spring migration possible; July to November	Not listed	Endangered
Atlantic Salmon (*Salmo salar*) - Nova Scotia Southern Upland population	Transient	Spring migration possible; July to November	Not listed	Endangered
Atlantic Salmon (*Salmo salar*) - South Newfoundland population	Transient	Spring migration possible; July to November	Not listed	Threatened
Atlantic Salmon (*Salmo salar*) - Quebec Eastern North Shore population	Transient	Spring migration possible; July to November	Not listed	Special concern
Atlantic Salmon (*Salmo salar*) - Quebec Western North Shore population	Transient	Spring migration possible; July to November	Not listed	Special Concern
Atlantic Salmon (*Salmo salar*) - Anticosti Island population	Transient	Spring migration possible; July to November	Not listed	Endangered
Atlantic Salmon (*Salmo salar*) - Inner St. Lawrence population	Transient	Spring migration possible; July to November	Not listed	Special concern

Species	Likelihood to Occur in Project Area	Time of Year Present in Project Area	*Species at Risk Act* Status (Schedule 1)	COSEWIC Assessment
Atlantic Salmon (*Salmo salar*) - Gaspe-Southern Gulf of St. Lawrence population	Transient	Spring migration possible; July to November	Not listed	Special concern
Basking Shark (*Cetorhinus maximus*) – Northeast Atlantic population	Transient	June to August	Not listed	Special concern
White Shark (*Carcharodon carcharias*) – Atlantic population	Transient	June to August	Endangered	Endangered
Porbeagle Shark (*Lamna nasus*)	Transient	June to August	Not listed	Endangered
Shortfin Mako Shark (*Isurus oxyrinchus*) – Atlantic population	Transient	June to August	Not listed	Special concern
Beluga Whale (*Delphinapterus leuca*) – St. Lawrence Estuary population	Low	Unknown	Endangered	Endangered
Blue Whale (*Balaenoptera musculus*) – Atlantic population	Low to moderate	Year-round	Endangered	Endangered
Bowhead Whale (*Balaena mysticetus*) – Eastern Canada-West Greenland population	Low	Unknown	Not listed	Special concern
Fin Whale (*Balaenoptera physalus*) – Atlantic population	High	Year-round	Special concern	Special concern
North Atlantic Right Whale (*Eubalaena glacialis*)	Low	Unknown	Endangered	Endangered
Northern Bottlenose Whale (*Hyperoodon ampullatus*) - Scotian Shelf population	Moderate	Year-round	Endangered	Endangered
Northern Bottlenose Whale (*Hyperoodon ampullatus*) - Davis Strait-Baffin Bay-Labrador Sea population	Moderate	Year-round	Not listed	Special concern
Harbour Porpoise (*Phocoena phocoena*) - Northwest Atlantic population	Moderate	Year-round	Not listed	Special concern
Killer Whale (*Orcinus orca*) - Northwest Atlantic/Eastern Arctic population	Low to moderate	Year-round	Not listed	Special concern
Sowerby's Beaked Whale (*Mesoplodon bidens*)	Low	Year-round	Special concern	Special concern
Leatherback Sea Turtle (*Dermochelys coriacea*) – Atlantic population	Low to moderate	April to October	Endangered	Endangered

Species	Likelihood to Occur in Project Area	Time of Year Present in Project Area	*Species at Risk Act* Status (Schedule 1)	COSEWIC Assessment
Loggerhead Sea Turtle (*Caretta caretta*)	Low to moderate	April to October	Endangered	Endangered
Bank Swallow (*Riparia riparia*)0	Unlikely	Potentially during fall migration	Threatened	Threatened
Barrow's Goldeneye (*Bucephala islandica*)	Unlikely	Prefers coastal habitat	Special concern	Special concern
Bobolink (*Dolichonyx oryzivorus*)	Low	Potentially during fall migration	Threatened	Threatened
Buff-breasted Sandpiper (*Tryngites subruficollis*)	Unlikely	Prefers coastal habitat	Special concern	Special concern
Common Nighthawk (*Chordeiles minor*)	Unlikely	Unknown; single observation of vagrant in November 2014	Threatened	Threatened
Harlequin Duck (*Histrionicus histrionicus*)	Unlikely	Prefers coastal habitat	Special concern	Special concern
Ivory Gull (*Pagophila eburnea*)	Low	Winter (November to February)	Endangered	Endangered
Olive-sided Flycatcher (*Contopus cooperi*)	Low	Potentially during fall migration	Threatened	Special concern
Peregrine Falcon (*Falco peregrinus*)	Unlikely	Unknown; single observation of vagrant in October 2015	Special concern	Not at risk
Piping Plover (*Charadrius melodus melodus*)	Unlikely	Prefers coastal habitat	Endangered	Endangered
Red Knot (*Calidris canutus rufa*) – Rufa subspecies	Unlikely	Prefers coastal habitat	Endangered	Endangered

Species	Likelihood to Occur in Project Area	Time of Year Present in Project Area	*Species at Risk Act* Status (Schedule 1)	COSEWIC Assessment
Red-necked Phalarope (*Phalaropus lobatus*)	Low	January to February, May to December	Not listed	Special concern
Roseate Tern (*Sterna dougallii*)	Unlikely	Unlikely in project area; Sable Island colony present in summer	Endangered	Endangered
Short-eared Owl (*Asio flammeus*)	Unlikely	Unknown; single observation of vagrant in October 2015	Special concern	Special concern

Source : Equinor Canada Ltd., 2017; ExxonMobil Canada Ltd., 2017; and proponents' IR responses, 2018. Species listings updated as per Canada's Species at Risk Public Registry, accessible at: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html.

Appendix E Special Areas in the Regional Study Area and their Proximity to the Exploration Licences and Transit Routes

Table 1 Special Areas in the Regional Study Area and their Proximity to the Exploration Licences

Special Area	Distance to Nearest Exploration Licence (kilometres)	
	Eastern Newfoundland Offshore Exploration Drilling Project	Flemish Pass Exploration Drilling Project
Marine Protected Areas and Areas of Interest		
Eastport – Duck Islands Marine Protected Area	385	521
Eastport – Round Island Marine Protected Area	387	532
Laurentian Channel Area of Interest	585	839
Gilbert Bay Marine Protected Area	780	735
Newfoundland and Labrador Shelves Ecologically and Biologically Significant Areas		
Orphan Spur	222	207
Notre Dame Channel	377	424
Fogo Shelf	377	463
Grey Islands	484	549
Gilbert Bay	751	707
Labrador Marginal Trough	680	572
Labrador Slope	597	472
Hamilton Inlet	830	745
Refined Placentia Bay/Grand Banks Large Ocean Management Area Ecologically and Biologically Significant Areas		
Northeast Slope	14	111
Virgin Rocks	77	355
Lilly Canyon-Carson Canyon	124	343
Southeast Shoal	225	481
Eastern Avalon	219	435
Southwest Slope	374	658
Smith Sound	336	492
Placentia Bay	357	559
Laurentian Channel	558	815
Haddock Channel Sponges	375	637

Special Area	Distance to Nearest Exploration Licence (kilometres)	
	Eastern Newfoundland Offshore Exploration Drilling Project	Flemish Pass Exploration Drilling Project
South Coast	614	800
St. Mary's Bay	329	544
Bonavista Bay	355	481
Baccalieu Island	238	406
Marine Refuges		
Northeast Newfoundland Slope Closure	40	93
Hawke Channel Closure	665	568
Funk Island Deep Closure	375	426
Canadian Fisheries Closures within the Exclusive Economic Zone		
Eastport Lobster Management Area	370	509
Funk Island Deep Box	375	426
Hawke Box	664	568
Lobster Area Closures		
Mouse Island	545	645
Glover's Island	533	633
Gander Bay	469	568
Gooseberry Island	363	534
Penguin Islands	602	794
Snow Crab Stewardship Exclusion Zones		
Crab Fishing Area 5A (2 zones)	345	477
Crab Fishing Area 6A (2 zones)	309	473
Crab Fishing Area 6B	245	432
Crab Fishing Area 6C	225	434
Crab Fishing Area 8A	244	477
Crab Fishing Area 8BX	Overlaps with Exploration Licence 1135	234
Crab Fishing Area 9A (2 zones)	344	593
Near Shore (2 zones)	222	431
Preliminary Representative Marine Areas		
Virgin Rocks	79	343

Special Area	Distance to Nearest Exploration Licence (kilometres)	
	Eastern Newfoundland Offshore Exploration Drilling Project	Flemish Pass Exploration Drilling Project
South Grand Bank Area	186	429
Northwestern Conception Bay	287	456
Southern Coast of Burin Peninsula and Southeastern Placentia Bay	469	683
Migratory Bird Sanctuaries		
Terra Nova	396	540
Ile aux Canes	617	655
Shephard Island	623	659
Coastal National Parks and Historic Sites		
Cape Spear National Historic Sites	269	471
Signal Hill National History Site	274	473
Ryan Premises National Historic Site	342	479
Castle Hill National Historic Site	369	577
Terra Nova National Park	379	522
Coastal Provincial Ecological Reserves		
Witless Bay Seabird Ecological Reserve	280	495
Baccalieu Island Seabird Ecological Reserve	298	465
Mistaken point Fossil Ecological Reserve	314	551
Funk Island Seabird Ecological Reserve	417	475
Cape St. Mary's Seabird Ecological Reserve	389	612
Lawn Bay Seabird Ecological Reserve (Middle Lawn, Swale, and Colombier Islands)	495	707
Fortune Head Fossil Ecological Reserve	513	718
Coastal Provincial Parks and Protected Areas		
Marine Drive Provincial Park Reserve	287	476
Chance Cove Provincial Park	300	533
Dungeon Provincial Park	341	477
Bellevue Beach Provincial Park Reserve	355	548
Gooseberry Cove Provincial Park	379	593
Windmill Bight Provincial Park Reserve	405	505

Special Area	Distance to Nearest Exploration Licence (kilometres)	
	Eastern Newfoundland Offshore Exploration Drilling Project	Flemish Pass Exploration Drilling Project
Deadman's Bay Provincial Park	417	515
Frenchman's Cove Provincial Park	478	681
Dildo Run Provincial Park	493	587
Coastal Provincial Historic Sites		
Cape Bonavista Lighthouse	343	477
Heart's Content Cable Station	332	514
United Nations Convention on Biological Diversity Ecologically and Biologically Significant Areas		
Labrador Sea Deep Convection Area	1000	869
Seabird Foraging Zone in the Southern Labrador Sea	202	Overlaps with EL 1139
Orphan Knoll	252	38
Slopes of the Flemish Cap and Grand Banks	Overlaps with Exploration Licences 1134 and 1135	Overlaps with Exploration Licences 1140, 1141, and 1142
United Nations Food and Agriculture Organization Vulnerable Marine Ecosystems		
Northeast Shelf and Slope (within Canadian Exclusive Economic Zone)	15	107
Sackville Spur	62	Overlaps with Exploration Licences 1141 and 1142
Northern Flemish Cap	109	Overlaps with Exploration Licences 1141 and 1142
Southern Flemish Pass to Eastern Canyons	Overlaps with Exploration Licence 1134	142
Beothuk Knoll	36	186
Deep Water Coral Area	138	224
Flemish Cap East	239	197
South East Shoal and Adjacent Shelf Edge/Canyons	224	473
Division 3O Coral Closure	415	694
Northwest Atlantic Fisheries Organization Fisheries Closure Areas		
Tail of the Bank (1)	262	471
Flemish Pass/Eastern Canyon (2)	Overlaps with Exploration Licence 1134	127
Beothuk Knoll (3)	95	238

Special Area	Distance to Nearest Exploration Licence (kilometres)	
	Eastern Newfoundland Offshore Exploration Drilling Project	Flemish Pass Exploration Drilling Project
Eastern Flemish Cap (4)	203	193
Northeast Flemish Cap (5)	202	69
Sackville Spur (6)	65	Overlaps with Exploration Licences 1141 and 1142
Northern Flemish Cap (7)	135	27
Northern Flemish Cap (8)	150	2
Northern Flemish Cap (9)	125	Overlaps with Exploration Licence 1142
Northwest Flemish Cap (10)	35	Overlaps with Exploration Licence 1142
Northwest Flemish Cap (11)	21	75
Northwest Flemish Cap (12)	88	Overlaps with Exploration Licence 1142
Beothuk Knoll (13)	73	197
Eastern Flemish Cap (14)	205	127
Orphan Knoll Seamount	248	46
Newfoundland Seamounts	305	459
Fogo Seamounts (1)	540	807
Fogo Seamounts (2)	654	898
3O Coral Area Closure	411	693
Important Bird and Biodiversity Areas		
Quidi Vidi Lake	273	472
Witless Bay Islands	276	490
Cape St. Francis	282	467
Baccalieu Island	295	462
Grates Point	301	467
Mistaken Point	304	545
The Cape Pine and St. Shotts Barren	336	572
Placentia Bay	360	567
Terra Nova National Park	377	519
Funk Island	410	468

Special Area	Distance to Nearest Exploration Licence (kilometres)	
	Eastern Newfoundland Offshore Exploration Drilling Project	Flemish Pass Exploration Drilling Project
Cape Freels Coastline and Cabot Island	389	493
Cape St. Mary's	378	602
Wadham Islands and Adjacent Marine Area	434	514
Corbin Island	463	675
Middle Lawn Island	495	708
Green island	531	741
United Nations Educational, Scientific and Cultural Organization World Heritage Sites		
Mistaken Point Ecological Reserve	312	551
Red Bay National Historic Site	734	734
L'Anse aux Meadows National Historic Site	673	672

Source: Equinor Canada Ltd., 2017 and ExxonMobil Canada Ltd., 2017

Table 2 Special Areas in the Regional Study Area Overlapping with Project Vessel Routes

Special Area	Vessel Traffic Routes	
	Eastern Newfoundland Offshore Exploration Drilling Project	Flemish Pass Exploration Drilling Project
Eastern Avalon Ecologically and Biologically Significant Area	Overlaps	Overlaps
Northeast Slope Ecologically and Biologically Significant Area	No overlap	Overlaps
Northeast Newfoundland Slope Closure Marine Refuge	No overlap	Overlaps
Snow Crab Stewardship Exclusion Zone – 6C	Overlaps	Overlaps
Snow Crab Stewardship Exclusion Zone – Near Shore	Overlaps	Overlaps
Slopes of the Flemish Cap and Grand Bank Ecologically and Biologically Significant Area	Overlaps	Overlaps
Sackville Spur Vulnerable Marine Ecosystem	No overlap	Overlaps

Special Area	Vessel Traffic Routes	
	Eastern Newfoundland Offshore Exploration Drilling Project	Flemish Pass Exploration Drilling Project
Northeast Shelf and Slope within the Canadian Economic Exclusion Zone Vulnerable Marine Ecosystem	No overlap	Overlaps
Flemish Pass/Eastern Canyon (2) Fisheries Closure Area	Overlaps	No overlap

Source: Equinor Canada Ltd., 2017 and ExxonMobil Canada Ltd., 2017

Appendix F Summary of Standard Measures to Prevent an Accident or Malfunction

- Verify drilling installation design and safety systems, including obtaining a third-party issued Certificate of Fitness.
- Establish and implement routine maintenance, inspection, and testing schedules for all aspects of the drilling program.
- Use appropriately trained and competent personnel.
- Use weather and natural hazard preparedness processes, such as weather forecasting tools.
- Establish and follow drilling and monitoring procedures.
- Identify conditions when precautionary riser unlatching or rig evacuations are required.
- Conduct regular inspections and audits of the drilling installation to ensure proper environmental operating practices.
- Measures to prevent a collision between a non-project vessel and the drilling installation include:
    - maintain a 500-metre to 2-kilometre radius safety exclusion zone around the drilling installation at all times;
    - monitor the safety exclusion zone and communicate its boundaries to mariners; and
    - use robust positioning systems, certified watch-keepers, navigation aids, weather radars, and alarms to keep the drilling installation and vessels on position and to highlight the presence of other vessels and changing weather conditions.
- Measures to prevent large dropped objects include:
    - use tested and certified lifting equipment;
    - employ clear specifications for equipment limits;
    - use lifting plans; and
    - monitor, prepare for, and respond to extreme weather events.
- Measures to prevent loss of drilling installation stability or structural integrity include:
    - use positioning and control systems, alarms, and operator interventions to ensure the drilling installation is operated correctly, including careful control of variable deck load; and
    - if the drilling installation loses position, implement the emergency disconnect protocol that would allow the well to be shut in and the drilling installation to move off location.
- Implement primary barriers to prevent “kicks”, including:
    - maintain fluid density in overbalance and main fluid level in well/riser;
    - use a calibrated trip tank which is monitored and filled frequently during tripping operations to maintain volume control;
    - control pulling speed of pipe or other tools out of the hole to minimize surge/swab pressures, evaluate the mud density prior to tripping (allow a mud weight “trip margin”), or pump while pulling out of the hole;
    - plan the drill string and well design to reduce friction effects;
    - if losses occur, re-evaluate fluid density (while still maintaining overbalance) or pump lost circulation materials;

- continuously monitor mud properties and background/connection gas, undertake flow checks while drilling and on connections, and undertake pore pressure prediction and follow-up;
- drill with a fluid density that maintains overbalance with the riser removed (referred to as “riser margin”);
- if riser margin is not available, ensure two well barriers are in place prior to riser disconnect; and
- ensure a given kick size can be handled and circulated out of the well in a safe way.

- Measures to prevent synthetic-based mud spills include:
  - maintain volume control of synthetic-based mud in the well by monitoring volumes being pumped into and returned from the well and volumes in all surface pits/tanks to ensure there are no losses;
  - complete inspections and/or testing of critical hoses, valves, and equipment prior to loading synthetic-based mud on the drilling installation and prior to displacing the well to synthetic-based mud;
  - use a spotter during mud transfers from vessel to drilling installation; and
  - use transfer hoses that are equipped with valves that would re-seal in the event that a hose breaks.