NEWFOUNDLAND ORPHAN BASIN EXPLORATION DRILLING PROJECT

DRAFT ENVIRONMENTAL ASSESSMENT REPORT

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Executive Summary

BP Canada Energy Group ULC (the proponent) is proposing to conduct an offshore exploration drilling program within offshore exploration licences located in the Northwest Atlantic Ocean. The Newfoundland Orphan Basin Exploration Drilling Project (the Project) would involve drilling in four exploration licences (1145, 1146, 1148 and 1149) in the Orphan Basin. The closest licence is located 343 kilometres northeast of St. John's, Newfoundland and Labrador. Between 2021 and 2026, the proponent could drill up to twenty offshore wells.

A single mobile offshore drilling unit would be used, along with supply vessels and helicopters that would travel between the drilling areas and existing shore-based facilities either in St. John's or Bay Bulls on the island of Newfoundland and the airport in St. John's, Newfoundland and Labrador.

The Project would require authorization under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act*. Authorization under the *Fisheries Act* may also be required and 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 Impact Assessment Agency of Canada (the Agency) conducted a federal environmental assessment (EA) of the Project under the requirements of the *Canadian Environmental Assessment Act, 2012* (CEAA 2012). The Project is subject to CEAA 2012 as it would involve activities that are described in item 10 of the Schedule to the *Regulations Designating Physical Activities* of CEAA 2012 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.***

On August 28, 2019, the *Impact Assessment Act* (IAA) came into force and CEAA 2012 was repealed. However, in accordance with the transitional provisions of the IAA, the environmental assessment of this Project is being continued under CEAA 2012 as if that Act had not been repealed.

This draft EA Report provides a summary and the main findings of the federal EA. The Agency prepared the 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 and Transport Canada following a technical review of the proponent's Environmental Impact Statement and an evaluation of the potential environmental effects of the Project. The Agency also considered the views of Indigenous peoples and the general public.

The EA focused on features of the natural and human environment that may be adversely affected by the Project 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 proponent selected the following valued components and they are carried through 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 socioeconomic conditions of Indigenous peoples.

During the environmental assessment, Indigenous groups and members of the public who submitted comments raised concerns about the Project's potential routine and accidental effects on the marine environment (e.g., marine mammals, fish, birds, special areas), commercial fishing, related effects on Indigenous peoples and communities, and the cumulative effects of the Project.

Notable potential environmental effects of the Project's routine operations include:

- effects on fish and fish habitat caused by the discharge of used drilling muds and cuttings to the marine environment;
- effects on marine mammals, fish and sea turtles caused by underwater sound from operation of the mobile offshore drilling unit and support vessels and from vertical seismic profiling surveys;
- effects on migratory birds caused by lights on the mobile offshore drilling unit 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 500 metre safety exclusion zone around drilling operations.

The proponent's project planning and design incorporates measures to mitigate the adverse effects of the Project. These include adherence to existing guidelines and regulations and planning to identify, control and monitor environmental risks.

Accidents and malfunctions could occur during exploration drilling and cause adverse environmental effects. These accidents and malfunctions include batch fuel (diesel) spills, batch spills of synthetic-based drilling fluid (also referred to as drilling mud), and subsea hydrocarbon releases (blowouts). Oil spill fate and trajectory modelling and analyses were performed to help evaluate potential effects of accidental spills and to assist in spill response planning.

Historically, the incidence of large oil spills during exploration drilling is extremely low. The proponent proposed design measures, operational procedures, and dedicated resources to prevent and respond to spills of any size from the Project. The proponent stated that in the unlikely event of a subsea hydrocarbon release, 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 would require submission of a Well Capping and Containment Plan that explores 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 a CEAA 2012 decision statement, in the event the Project is 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 Project, 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 Project's possible effects on potential or established Aboriginal or treaty rights were also examined. One of the primary concerns raised by Indigenous groups during the environmental assessment for the Project, as well as previous offshore exploration drilling projects, is the potential effects of routine operations and accidental events on Atlantic Salmon. Atlantic Salmon have significant importance to Indigenous cultures and populations of salmon have experienced declines in recent decades, with some populations classified as endangered or threatened. Recognizing the data gaps in Atlantic Salmon migration, and by extension the potential effects on the species from offshore exploration drilling, in May 2019 the Environmental Studies Research Fund issued a call for proposals for studies related to Atlantic Salmon. The Environmental Studies Research Fund is funded through levies paid by interest holders such as oil and gas companies and is directed by a joint government/industry/public management board. Indigenous groups also raised concerns about the potential effects of large-scale spills on fishing for commercial or traditional purposes and associated socioeconomic and 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 Newfoundland Orphan Basin 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	Impact Assessment Agency of Canada
CEAA 2012	*Canadian Environmental Assessment Act, 2012*
C-NLOPB	Canada-Newfoundland and Labrador Offshore Petroleum Board
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Fisheries and Oceans Canada
EA	Environmental Assessment
EA Report	Environmental Assessment Report
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EIS guidelines	Guidelines for the Preparation of an Environmental Impact Statement
ESRF	Environmental Studies Research Fund
KMKNO	Kwilmu'kw Maw-klusuaqn Negotiation Office
MARPOL	International Convention for the Prevention of Pollution from Ships
MMS	Mi'gmawei Mawiomi Secretariat
MODU	Mobile Offshore Drilling Unit
MTI	Mi'gmawe'l Tplu'taqnn Incorporated
NAFO	Northwest Atlantic Fisheries Organization
NRCan	Natural Resources Canada
Offshore Chemical Selection Guidelines	*Offshore Chemical Selection Guidelines for Drilling & Production Activities on Frontier Lands*
Project	Newfoundland Orphan Basin Exploration Drilling Project
Proponent	BP Canada Energy Group ULC

Abbreviation/Acronym	Definition
VSP	Vertical Seismic Profiling
WNNB	Wolastoqey Nation of New Brunswick

Glossary

Abbreviation/Acronym	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 muds 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].
Mobile offshore drilling unit (MODU)	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].
Ecologically and Biologically Significant Area	Ecologically and Biologically Significant Areas are areas within Canada's oceans that have been identified through Fisheries and Oceans Canada's formal scientific assessments. Identifying Ecologically and Biologically Significant Areas is a means of calling attention to areas that have particularly high ecological and biological significance and in which management of some activities may warrant elevated precaution. The identification of Ecologically and Biologically Significant Areas is not enacted under Canadian legislation and therefore no regulatory protections or prohibitions exist within these areas[3].
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, 4].

Abbreviation/Acronym	Definition
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 Protected Area	A marine protected area is part of the ocean that is managed to protect and conserve important fish and marine mammal habitats, endangered marine species, unique features, and areas of high biological productivity or biodiversity. These areas are legally protected by regulations developed under the *Oceans Act* and administered by the Government of Canada. Regulations for individual marine protected areas provide different levels of protection and may allow some current and future activities depending on their impacts to the ecological features being protected. However, in April 2019, the Government of Canada announced new marine protected area standards which prohibit all oil and gas activities, including seismic and exploration drilling within a designated marine protected area[3].
Marine Refuge	A marine refuge is an area-based fisheries management measure in Canadian waters intended to protect important species and habitats. These areas are designated by the Government of Canada in response to Canada's marine conservation commitments to protect ten percent of marine and coastal waters by 2020. Marine refuges are designated under the *Fisheries Act*, and are legally protected from some types of fishing activity. There are currently no prohibitions on oil and gas related activities within these areas[3].
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 mud 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, 4].
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 mud that should have a total polycyclic aromatic hydrocarbon concentration of

Abbreviation/Acronym	Definition
	less than ten milligrams per kilogram, be relatively nontoxic in marine environments and have the potential to biodegrade under aerobic conditions[1].
Vertical seismic profiling (VSP)	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[4].
Water-based mud	A drilling mud in which fresh or salt water is the continuous phase as well as the wetting (external) phase whether oil is present or not[1, 4].
Wellbore	The hole that would be drilled as part of the exploration drilling activities[4].
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 (n.d.).

[2] Transport Canada (2019).

[3] Fisheries and Oceans Canada (2019).

[4] Schlumberger Limited (2019).

1. Introduction

BP Canada Energy Group ULC (the proponent) is proposing to conduct an exploration drilling project within the areas of four offshore exploration licences located in the Orphan Basin, 343 to 496 kilometres northeast of St. John's, Newfoundland and Labrador. The purpose of the Newfoundland Orphan Basin Exploration Drilling Project (the Project) is to determine the presence, nature, and quantities of potential hydrocarbon resources within the exploration licences 1145, 1146, 1148, and 1149. The Project would also enable the proponent to meet the work expenditure commitments that must be fulfilled over the term of the exploration licences.

The proponent has indicated that exploration drilling is a critical activity to enable continued oil and gas discoveries to maintain production and meet global demand for energy.

The proponent plans to drill up to 20 wells throughout the life of the Project, which is anticipated to operate until 2026.

1.1. Purpose of the Environmental Assessment Report

The purpose of the Environmental Assessment (EA) Report is to provide a summary of the analysis conducted by the Impact Assessment Agency of Canada (the Agency) in reaching its conclusion on whether the Project is 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 in making a decision on whether the Project is likely to cause significant adverse environmental effects, following which the Minister will issue an EA decision statement for the Project.

1.2. Scope of Environmental Assessment

1.2.1. Environmental Assessment Requirements

On August 28, 2019, the *Impact Assessment Act* (IAA) came into force and the *Canadian Environmental Assessment Act, 2012* (CEAA 2012) was repealed. However, in accordance with the transitional provisions of the IAA, the environmental assessment of this Project is being continued under CEAA 2012 as if that Act had not been repealed.

The Project is subject to the CEAA 2012 as it would involve activities that are described in item 10 of the Schedule to the *Regulations Designating Physical Activities* of CEAA 2012:

> ***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.

The key dates for the EA of the Project, up to the release of this draft EA Report, are as follows:

- January 8, 2018: The proponent submitted a project description to the Agency.
- March 5, 2018: The Agency determined that a federal EA was required, the EA commenced and the Agency issued the final Guidelines for the Preparation of an Environmental Impact Statement (EIS guidelines) to the proponent.
- September 25, 2018: The proponent submitted the Environmental Impact Statement (EIS) and EIS summary.

The Agency co-operated with the Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) during the EA of the Project. The 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 also undertakes EAs of petroleum exploration and production projects proposed for the Newfoundland and Labrador offshore area. The EA conducted by the Agency is intended to also satisfy the C-NLOPB's EA requirements.

The Project is not subject to Newfoundland and Labrador provincial EA requirements.

1.2.2. Factors Considered in the Environmental Assessment

The Agency issued EIS guidelines to describe the information the proponent must provide to support the EA process, including the environmental effects and the factors that must be considered. The EIS guidelines for the Project can be found on the Canadian Impact Assessment Registry Internet site at the following link:
https://iaac-aeic.gc.ca/050/evaluations/proj/80147.

The EIS guidelines focus the assessment by identifying components that have particular value or significance and may be affected by the Project (valued components). The valued components considered by the Agency and the corresponding valued components selected by the proponent 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 due to the ecological importance, the legislated protection of fish and fish habitat and species at risk, the socioeconomic importance of fisheries resources, and the nature of potential project-valued component interactions. Includes corals and sponges.	Marine Fish and Fish Habitat (including Species at Risk)
Marine Plants	Yes	Potential effects on marine plants were included in the Agency's assessment of effects on fish habitat.	Marine Fish and Fish Habitat (including Species at Risk)
Marine Mammals and Sea Turtles	Yes	Included due to the ecological importance and legislated protection of marine mammals, as well as associated species at risk. There is also a high likelihood of project-valued component interactions.	Marine Mammals and Sea Turtles (including Species at Risk)
Migratory Birds	Yes	Included due to the ecological importance and legislated protection of migratory birds, as well as associated species at risk. There is also a high likelihood of project-valued component interactions.	Marine and Migratory Birds (including Species at Risk)
Current Use of Lands and Resources for Traditional Purposes and Health and Socioeconomic Conditions of Indigenous Peoples	Yes	Migratory species of importance to Indigenous communities (e.g., Atlantic Salmon, migratory birds) may pass through the project area before moving to areas that could be subject to traditional harvesting. In addition, Indigenous fisheries could be affected by an accident or malfunction associated with the Project. 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 Project. These were considered in the Agency's assessment of effects on commercial fishing (below).	Indigenous Peoples and Community Values; Commercial Fisheries and Other Ocean Users
Physical or Cultural Heritage of Indigenous Peoples and	No	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 of heritage resources,	None

Component	Included in Agency's analysis?	Agency rationale	Corresponding valued component selected by the proponent
Historical, Archaeological, Paleontological or Architectural Sites or Structures of Indigenous Peoples		if present. If any anthropogenic sensitivities are identified during the survey, the proponent would notify the C-NLOPB immediately to discuss an appropriate course of action. This may involve further investigation and/or moving the well site if it is feasible to do so.	
Special Areas (Marine)	Yes	There are several marine special areas that may be affected by the Project.	Special Areas
Air Quality and Greenhouse Gas Emissions	No	While there are direct emissions of greenhouse gases from the Project, there are no upstream emissions (i.e., emissions from other projects or industrial activities that could occur earlier in the lifecycle of a resource or other product). The Project would be short-term and routine activities would contribute a relatively small amount to provincial totals. Additional information on greenhouse gases is provided in Section 2.4. The Project would adhere to applicable regulations and standards, including the *Newfoundland and Labrador Air Pollution Control Regulations*; the federal *National Ambient Air Quality Objectives* and the *Canadian Ambient Air Quality Standards* and regulations and emission limits under the *International Convention for the Prevention of Pollution from Ships* (MARPOL). Given its location, the Project would not be close to permanent receptors sensitive to atmospheric emissions.	None
Effects identified under Subsection 5(2) of CEAA 2012			
Commercial Fisheries	Yes	The project area overlaps with commercial fishing activity, including potential Indigenous communal commercial fishing that could be affected by routine operations (e.g., safety zones) or by accidental events.	Commercial Fisheries and Other Ocean Users
Recreational Fisheries	No	There is no known recreational fishing activity within the project area. There are recreational fisheries in nearshore and coastal waters. Routine project activities and components are not expected to interfere with nearshore recreational fisheries beyond	Commercial Fisheries and Other Ocean Users

Component	Included in Agency's analysis?	Agency rationale	Corresponding valued component selected by the proponent
		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 Project. Measures proposed to mitigate effects on fish and fish habitat would mitigate similar environmental effects on recreational fisheries.	
Special Areas (Coastal)	Yes	There are several coastal areas of importance in the regional assessment area. These may be affected by the Project in the event of an unmitigated subsea blowout.	Special Areas
Human Health	No	Other than human presence on the mobile offshore drilling units (MODUs), there is intermittent human presence on fishing and other vessels in the exploration licences. 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*			
Federal 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.	The proponent assessed applicable species at risk within their analyses of effects on fish and fish habitat, marine mammals and sea turtles, and marine and migratory birds.

1.2.3. Methods and Approach

The proponent assessed the Project's 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 application of mitigation measures was considered in the analyses, and the predicted residual environmental effects (see Appendix B for a list of the proponent's

proposed mitigation and follow-up measures). The predicted residual environmental effects were 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; and
- reversibility: the ability of an environmental component to return to an equal or improved condition once the disturbance(s) has ended.

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

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

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

The Agency highlighted key environmental effects based on information provided by the proponent. 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 Project (Section 7.1), as well as the effects of the environment on the Project (Section 7.2), and cumulative environmental effects (Section 7.3).

The Agency's analysis, including how the Agency incorporated views expressed by Indigenous peoples, the public, and expert departments and agencies, is provided throughout this report.

2. Project Overview

2.1. Project Location and Spatial Boundaries of the Environmental Assessment

The Project is located in the northwest Atlantic Ocean, within exploration licences 1145, 1146, 1148, and 1149, located 343 to 496 kilometres northeast of St. John's, Newfoundland and Labrador in water depths varying from 970 to 3000 metres (Figure 1). The exploration licences have a combined area of 9432 square kilometres. Exploration licences 1145, 1146 and 1148 are located within Canada's 200 nautical mile exclusive economic zone, while exploration licence 1149 is outside the exclusive economic zone. Exact drilling locations within the exploration licences have not yet been finalized.

Spatial boundaries of an EA are established to define the area within which a project may interact with the environment and cause environmental effects. The proponent defined three types of spatial boundaries for the EA: project area, local assessment area, and regional assessment area.

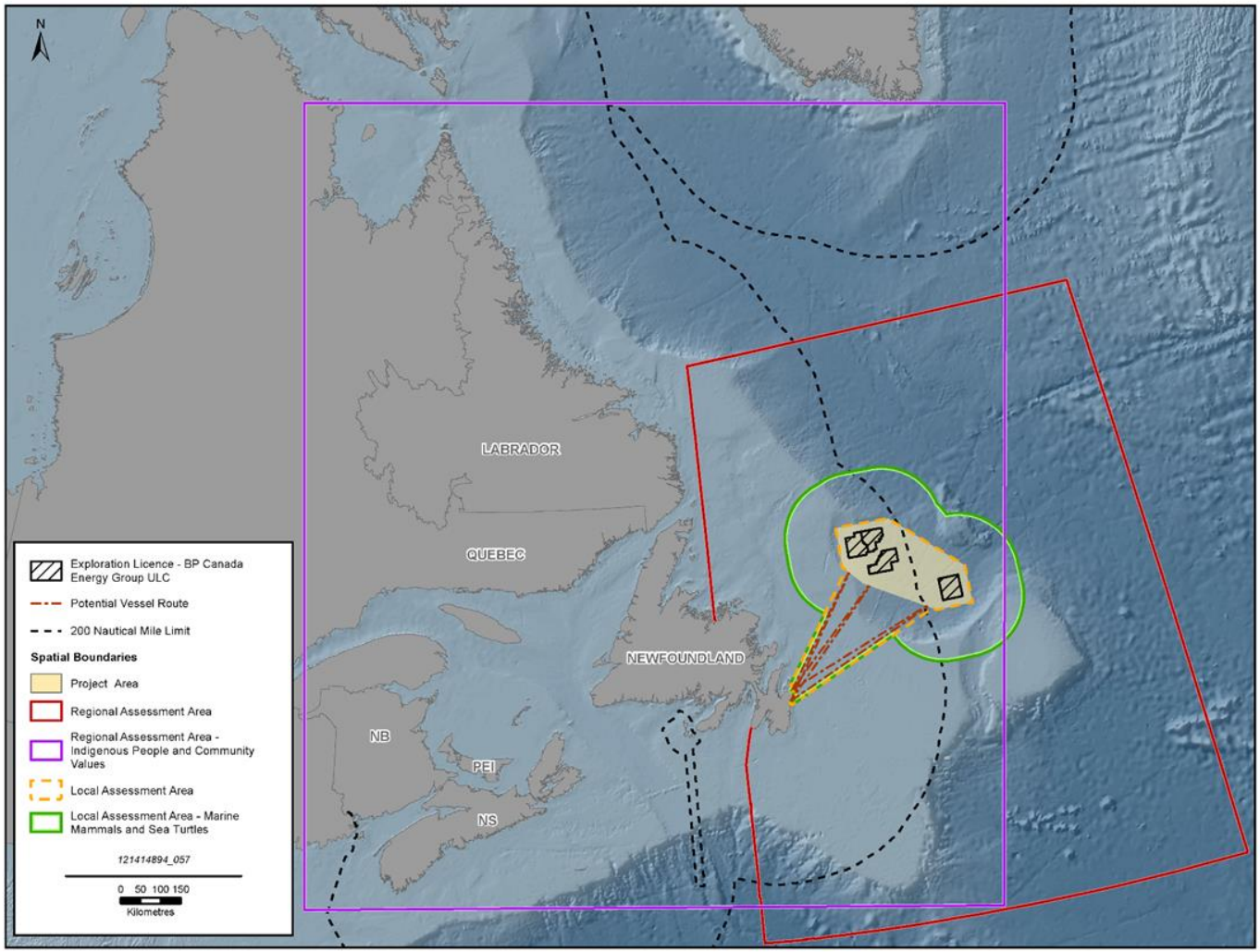
Proponent's Project Area: The project area was defined as the immediate area within which project activities and components may occur (the exploration licences) plus a 20 kilometre buffer within an area of 44 695 square kilometres.

Note: References to the project area throughout this report are consistent with the proponent's definition. However, project activities for the designated project subject to federal EA would be limited to the exploration licences within which exploration drilling could occur as well as routes to and from these exploration licences to the supply base and airport on the island of Newfoundland.

Proponent's Local Assessment Areas: The local assessment areas were defined for each valued component as the maximum area within which environmental effects from routine project activities and components can be predicted or measured. The local assessment areas for marine fish and fish habitat, marine and migratory birds, special areas, Indigenous communities and activities, and commercial fisheries and other ocean users include the project area as well as the associated supply vessel and air transit route. The local assessment area for marine mammals and sea turtles included the project area with a 150 kilometre buffer, and the supply vessel and aircraft transit route had a ten kilometre buffer around this transit route.

Proponent's Regional Assessment Area: The regional assessment area was defined as the area within which residual environmental effects from project activities and components may interact cumulatively with the residual environmental effects of other past, present and future physical activities. It is possible that effects from larger scale unplanned events (e.g., subsea blowout) could extend beyond the regional assessment area. The regional assessment area is consistent for all valued components except for Indigenous communities and activities which 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 Assessment's Spatial Boundaries as Defined by the Proponent



Source: BP Canada Energy Group ULC (2018)

2.2. Project Components and Activities

The Project would include the drilling, testing and abandonment or suspension of up to 20 offshore wells within the exploration licences and associated incidental activities. The Project would include the following routine project activities: mobile offshore drilling unit (MODU) mobilization and drilling; vertical seismic profiling (VSP) operations; well evaluation and testing; well decommissioning and abandonment; and supply and servicing. There would also be maintenance activities conducted as required throughout the Project.

2.2.1. Mobile Offshore Drilling Unit Mobilization and Drilling

Drilling locations would be selected using geohazard and geophysical data, and seabed baseline conditions. Prior to any drilling activity, a comprehensive regional geohazard baseline review would be conducted to select a proposed well site. Once a well site is selected, the MODU would be either towed or self-propelled to the well site location.

As part of mobilizing the rig and prior to spudding the well, an imagery-based seabed survey using a remotely operated vehicle would be conducted in an area within a 500 metre radius at the proposed well site(s) to ground-truth the findings of the geohazard baseline review prior to drilling. If any environmental or anthropogenic sensitivities are identified during the survey, the C-NLOPB would be notified immediately to discuss an appropriate course of action. This may involve further investigation and/or moving the well site if feasible.

Once the MODU is in place, positioning and stability operations would occur which would include ballasting to increase the stability of the MODU and implementing the dynamic positioning system to maintain position. Due to the depth of water in the exploration licences the use of anchors is not feasible. A safety exclusion zone with a 500 metre radius from the well location would be established around the MODU.

Well design (e.g., hole size, casing/liner size, vertical depth, drilling mud type) would involve consideration of many factors including the geology of the formations. The time to drill each well is estimated to take 60 days, dependent on well design, depth of the reservoir, weather, and technical requirements.

The wells would be drilled using a drill bit, in a number of progressively smaller diameter intervals with increased depth. The drill bit would be controlled from the MODU 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 muds (e.g., water-based mud, synthetic-based mud) would be used depending on well design and anticipated geological conditions. Drilling muds 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 mud 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 wellhead is installed then a blowout preventer and a riser can be connected to the well and muds would be recirculated back to the MODU, where they would be treated and discharged.

The Project may also employ batch drilling, which is the process of consecutively drilling the initial section of multiple wells. The initial sections of the wells are completed without a riser using water-based mud. Once the initial sections have been drilled, the wells would be temporarily suspended in compliance with the C-NLOPB requirements. A MODU would return at a later date to drill the deeper well sections with a riser and install the blowout preventer.

2.2.2. Vertical Seismic Profiling

VSP surveys could be carried out to facilitate the correlation of surface seismic data to well data. VSP 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. However, VSP surveys are quieter and more localized than surface seismic surveys as they are conducted within the wellbore with the sound source near the surface or near the well. A VSP survey typically takes between one and four days. VSP surveys would be planned and conducted in consideration of the *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment*.

2.2.3. Well Evaluation and Testing

If the exploration drilling results indicate that hydrocarbons are present in the target formations, the wells would be evaluated and possibly tested to gather information about subsurface characteristics such as potential productivity, connected volumes, fluid properties, composition, flow, pressure, and temperature. 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 to demonstrate the potential for sustained production. Formation flow testing would likely be run using conventional drill stem test tooling, subsea safety systems and temporary surface flow equipment to manage and measure the well fluids, collect fluid samples, and necessary data sets. Where it is carried out, the well testing process would occur over a one-month window after drilling is complete; however, it is possible that it could extend up to three months.

Any formation hydrocarbons, such as gas, oil, or formation water, that are brought to the surface as part of the well test activity would be flared using high efficiency combustion equipment to enable their safe disposal. Flaring could be used for operational purposes, such as flushing, or bleeding, where it would be carried out for between one and six hours each with low flow rates. Flaring may also be required during a series of separate periods of well test flow that could last up to two or three days for any one period.

An alternative to formation flow testing with flaring is formation testing while tripping. Formation testing while tripping offers environmental, safety, and economic benefits as it may be conducted without the requirement for topside production equipment, flaring of hydrocarbons, and exposure of personnel to pressurized equipment containing live hydrocarbons. Formation flow tests would require review and approval by the C-NLOPB.

2.2.4. Well Suspension or Abandonment

If necessary, once drilling and well evaluation programs are completed, the exploratory well would be plugged and abandoned in accordance with applicable proponent practices and would be authorized by the C-NLOPB in compliance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations*.

Wells may be designed for suspension and re-entry. Well abandonment would involve placing cement plugs above and between any hydrocarbon bearing intervals at appropriate depths in the well, as well as at the surface.

The proponent proposed in water depths greater than 900 metres (all exploration licences have a minimum water depth of 970 metres) that approval be sought from the C-NLOPB to leave the wellhead in place. If the wellheads are left in place it would be approximately 1.5 to 3.7 metres in height and have a permanent footprint of less than one square metre. All other subsea infrastructure, including the blowout preventer would be removed. Long-term monitoring of abandoned wells is not required.

2.2.5. Supply and Servicing

An existing supply base facility in the St. John's region would be used to support logistical requirements for offshore operations. Supply base activities would be conducted by a third-party contractor.

Supply vessels would be engaged to support the MODU to re-supply the drilling vessel with fuel, equipment, drilling mud, and other supplies during the drilling program, as well as removing waste. 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 two to three round trips per week would occur between the MODU and the supply base (St. John's or Bay Bulls). Common shipping routes would be used as practicable to reduce incremental marine disturbance, although most common vessel routes are either to the north or south of the project area. Where common vessel routes do not exist, a straight-line approach would be used.

Helicopters would be used for crew changes on a routine basis, to support medical evacuation from the MODU and for search and rescue activities in the area, if required. Helicopter support would be supplied by an independent third-party operator based out of the St. John's International Airport.

2.3. Emissions and Waste Management

Potential operational discharges associated with offshore exploration drilling programs include noise, light and other atmospheric emissions as well as discharges of waste such as drilling muds, drill cuttings, cement, blowout preventer fluid, produced water, bilge/deck water, ballast water, grey/black water, cooling water, other non-routine operational liquid discharges, solid and hazardous wastes associated with the MODU, supply vessels and aircraft.

Any chemicals intended for marine discharge would adhere to the C-NLOPB requirements under the *Offshore Chemical Selection Guidelines for Drilling & Production Activities on Frontier Lands (the Offshore Chemical Selection Guidelines)*. The proponent would prepare a chemical screening and management plan in accordance with those guidelines, which would be developed as part of the supporting documentation for the Operations Authorization application to the C-NLOPB. Furthermore, any discharges to the environment would adhere to the *Offshore Waste Treatment Guidelines*, which may involve treatment of discharges prior to release. In addition to these two guidelines, there are other existing regulations and guidelines that pertain to operational discharges and waste materials associated with offshore exploration activities, including:

- *International Convention for the Prevention of Pollution from Ships* (MARPOL);
- *Environmental Protection Plan Guidelines*;
- *Drilling and Production Guidelines*;
- *Fisheries Act*;
- *Canadian Environmental Protection Act*;
- *Oceans Act*;
- *Management of Greenhouse Gas Act ;*
- *Canada Shipping Act,2001*.

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 fuel combustion from the engines associated with the MODU, supply vessels, fixed and mobile deck equipment, and helicopters. Flaring during well test activity, if required, would also contribute to greenhouse gas emissions. Greenhouse gas emissions are estimated in Table 2.

Table 2 Estimated Project Total Greenhouse Gas Emissions by Activity

Project Component/Activity	Greenhouse Gas Emissions (tonnes emitted per day and per year)			
	Carbon Dioxide	Methane	Nitrous Oxide	Total carbon dioxide equivalent emissions
MODU[1]	241 (28 920/year assumes 2 wells/year drilling 120 days)	0.012 (1.44/year)	3.76 (451/year)	252 (30 240/year)
Supply Vessels[2]	266 (13 832/year assumes 52 trips over 120 days)	0.002 (0.10/year)	5.44 (282.9/year)	269 (13 988/year)
Helicopter[3]	14.5 (3480/year for 240 trips assume 2/day for 120 days)	0.0002 (0.048/year)	0.12 (28.8/year)	14.7 (3528/year)
Flaring[4]	7137 (14274/year)	21.5 (43.0/year)	0.071 (0.142/year)	7697 (15 394/year)
Total	522 excludes flaring (46 232/year)	0.014 excludes flaring (1.59/year)	9.31 excludes flaring (763/year)	535/day or 64 200/year excludes flaring

Project Component/Activity	Greenhouse Gas Emissions (tonnes emitted per day and per year)			
	Carbon Dioxide	Methane	Nitrous Oxide	Total carbon dioxide equivalent emissions
				79 594/year including flaring

Assumptions for annual calculations are as follows:
[1] assumes two wells are drilled each year over a 120 day drilling program
[2] assumes three trips per week over a 120 day drilling program
[3] assumes two trips per day over a 120 day drilling program
[4] assumes two tests per year

Source: BP Canada Energy Group ULC response to IR-08 and IR-08-02, 2019

Including estimated emissions from formation flow testing with flaring (assumed with 3180 cubic metres (20 000 barrels) of oil flared and 15 million standard cubic feet of total gas for a single zone well test), the Project could emit a total of 79 594 tonnes of carbon dioxide equivalent per year. This would represent 0.76 percent of Newfoundland and Labrador's average annual greenhouse gas emissions and 0.011 percent of Canada's national 2017 inventory (BP Canada Energy Group ULC 2019; ECCC 2019). Industrial facilities that emit more than 10 000 tonnes of carbon dioxide equivalent per year are required to quantify and report greenhouse gas emissions to Environment and Climate Change Canada (ECCC).

2.4. Schedules

The planned temporal scope for the Project is from 2021 to 2026, but drilling activities would not be continuous over this period. Project activities would be aligned with the exploration licence periods and would end once regulatory obligations and commitments have been met and a licence has either reverted back to the C-NLOPB or been converted to a significant discovery licence. Drilling activities would be in part determined by rig availability and previous wells' results.

It is expected that each well would require approximately 60 days to drill. Drilling could occur year-round; however, the proponent's preference is for drilling activities to be conducted between May and October. VSP operations would take approximately one to four days per well and well testing, where required, would occur over a one to three month period. Well abandonment would be conducted following drilling and/or well testing.

3. Alternative Means of Carrying Out the Project

CEAA 2012 requires that EAs of designated projects take into account the alternative means of carrying out the project that are technically and economically feasible, and the environmental effects of any such alternative means. The proponent identified and evaluated alternatives for drilling mud selection, drilling unit selection, drilling waste management, water management and effluent discharge, and supply vessel lighting (including flaring).

Drilling Mud Selection

The use of synthetic-based mud, use of water-based mud, or use of a combination of the two were evaluated. Both water-based and synthetic-based muds are acceptable under current regulatory regimes. Synthetic-based mud is not permitted for ocean discharge without treatment, and therefore cannot be used for riserless drilling where the cuttings are disposed directly on the seafloor. The sole use of water-based mud could potentially cause challenges with borehole stability, increasing the cost due to non-productive time and losses. The proponent proposed to use a combination of water-based and synthetic-based muds. Water-based mud would be preferred for shallow, riserless drilling while synthetic-based mud would be the preferred option for deeper, riser drilling to minimize technical challenges and subsequent potential safety risks.

Driling Unit Selection

There are three main types of MODUs 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. A jack-up rig would not be a technically feasible option as the water depths in the exploration licences are over 100 metres. Floating semi-submersible drill rigs and drill rigs were both considered to be technically and economically feasible options and would have comparable environmental effects.

Drilling Waste Management

Three potential options were considered for the management of drilling waste: disposal at sea, offshore re-injection, and ship-to-shore for onshore treatment/disposal. The disposal of drilling waste at sea was identified as the preferred 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. Discharge to the water column following treatment of synthetic-based mud was selected as the preferred option for the management of this drilling waste. The proponent anticipates some localized effects on the seafloor from the discharge of cuttings and mud.

Water Management and Effluent Discharge

The proponent 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 MODU. However, a

Certificate of Fitness for the MODU would confirm that the effluent discharge and water management system comply with statutory requirements.

Liquid wastes, not approved for discharge in the *Offshore Waste Treatment Guidelines* such as waste chemicals, cooking oils, or lubricating oils, would be transported onshore for transfer to an approved disposal facility. Liquid wastes that conform to the *Offshore Waste Treatment Guidelines* would be discharged from the MODU to the marine environment. Effluent discharge points on a MODU are typically just below or above the sea surface.

Vessel Lighting (including Flaring)

Options to reduce lighting on the MODU would be considered; however, it would be maintained at a level that would not impede the safety of the workforce or drilling operations. Two lighting options were considered: spectral modified lighting and standard lighting. Spectral modified lighting, which uses green or blue light, has been tested on offshore platforms and has been demonstrated to have a reduced effect on migratory birds. However, the proponent noted that this technology has not been proven to be technically or economically feasible due to restricted commercial availability, limited capability in extreme weather, and safety concerns related to helicopter approach and landings. Due to operational and regulatory requirements, the proponent selected standard lighting as their preferred option.

Four alternatives for flaring during well tests were proposed: no flaring, formation testing while tripping, reduced flaring, and flaring as required with water curtain. Flaring is required during formation flow testing to safely dispose of hydrocarbons that may come to the surface, and as such, the proponent does not consider testing without flaring a feasible option.

Formation testing while tripping does not require flaring; however, it does not provide the same data as formation flow testing with flaring and therefore may not be a suitable alternative in all cases. Formation testing while tripping would be considered on a case-by-case basis to ensure well testing meets the C-NLOPB requirements. Reduced flaring and not commencing flaring during periods of poor visibility including at night and during inclement weather, would reduce the effect of light generated during flaring. However, once the test begins, the data gathered during the test could be compromised if the well flow was restricted during the test period, so was not selected as a preferred option. A water curtain was selected as the preferred option because it provides protection of personnel and equipment on the MODU and serves as a potential bird deterrent from the general vicinity of the flare. The proponent selected formation testing while tripping and flaring as required with a water curtain as the preferred options.

3.1. Views Expressed

Federal Authorities

The C-NLOPB requested the proponent identify any opportunities to outperform the *Offshore Waste Treatment Guidelines* if technically feasible and that the proponent consider various technological approaches to cuttings treatment to reduce the concentration of synthetic on cuttings to the lowest achievable concentration.

There were no views expressed on alternative means from Indigenous groups or members of the public.

3.2. Agency Analysis and Conclusion

The Agency is satisfied that the proponent adequately assessed alternative means of carrying out the Project.

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. 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

The Agency served as Crown Consultation Coordinator for a whole-of-government approach to consultation. The Agency consulted communities and groups that held communal commercial fishing licences in Northwest Atlantic Fisheries Organization (NAFO) areas that overlap with the regional assessment area, or hold licences for species that migrate through the project area, such as swordfish. In addition, the Agency consulted communities that fish for and have an interest in certain Atlantic Salmon populations, a species which could be potentially affected by the Project. These groups are listed below:

- **Labrador Inuit:** Nunatsiavut Government, NunatuKavut Community Council;
- **Labrador Innu**: Innu Nation;
- **Nova Scotia Mi'kmaq First Nations**: Acadia, Annapolis Valley, Bear River, Eskasoni, Glooscap, Membertou, Millbrook, Paqtnkek (Afton), Pictou Landing, Potlotek (Chapel Island), Sipekne'katik, Wagmatcook, and We'kmoqma'q (Waycobah);
- **New Brunswick Wolastoqiyik (Maliseet) First Nations**: Kingsclear, Madawaska Maliseet, Oromocto, St. Mary's, Tobique, and Woodstock;
- **New Brunswick Mi'gmaq First Nations**: Buctouche, Eel River Bar, Fort Folly, Esgenoopetitj, Indian Island, Pabineau, Eel Ground, Metepenagiag, and Elsipogtog;
- **New Brunswick Peskotomuhkati Nation at Skutik (Passamaquoddy)**;
- **Prince Edward Island Mi'kmaq First Nations:** Abegweit and Lennox Island;
- **Quebec Mi'gmaq**: Micmacs of Gespapegiag, Nation Micmac de Gespeg, and Listuguj Mi'gmaq Government; and
- **Quebec Innu**: Conseil des Innus de Ekuanitshit and Première Nation des Innus de Nutashkuan.

Several groups are represented in consultation by aggregate organizations including:

- Kwilmu'kw Maw-klusuaqn Negotiation Office (KMKNO) represents the Nova Scotia Mi'kmaq First Nations with the exception of Millbrook and Sipekne'katik First Nations;
- Wolastoqey Nation of New Brunswick (WNNB) represents the New Brunswick Wolastoqiyik (Maliseet) First Nations. Woodstock First Nation was being consulted separately until the community joined WNNB in March 2019;

- Mi'gmawe'l Tplu'taqnn Incorporated (MTI) represents the New Brunswick Mi'gmaq First Nations with the exception of Elsipogtog First Nation;
- Mi'kmaq Confederacy of Prince Edward Island represents the Prince Edward Island Mi'kmaq First Nations; and
- Mi'gmawei Mawiomi Secretariat (MMS) represents the Quebec Mi'gmaq.

The Agency determined that the depth of consultation with these Indigenous groups would be low on the consultation spectrum based on an analysis of potential or established Aboriginal or treaty rights protected under section 35 of the *Constitution Act, 1982*, and the potential for adverse effects on these rights from the Project[1]. It provided this analysis to Indigenous groups, along with draft consultation plans, and requested feedback. Comments were received on the plan and the determination of depth of the 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 Project and opportunities to submit comments.

The Agency integrated the Crown's consultation and engagement activities into the EA and invited Indigenous groups to review and comment on the documents listed in Table 3.

Table 3 Comment Opportunities during the Environmental Assessment

Document or Subject of Consultation	Dates
Summary of the Project Description	January 19, 2018 – February 8, 2018 (20 days)
EIS Summary	October 29, 2018 – November 29, 2018 (31 days)
Draft EA Report and Potential Conditions	Ongoing

The Agency considered comments received from Indigenous groups following their reviews of the EIS and associated summary and asked the proponent 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. The Agency organized three workshops in April 2018 to build relationships between Indigenous groups, proponents, and government; provide an overview of offshore drilling projects; and identify and address concerns from Indigenous groups.

[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.

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

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, migratory birds; community wellbeing and socioeconomic conditions);
- effects of routine Project activities (e.g., vessel traffic) and accidents and malfunctions (blowouts);
- effects of flaring on migratory birds;
- effects on special areas;
- data gaps related to Atlantic Salmon and opportunities for funding studies to address data gaps;
- data gaps related to the exploration licence outside Canada's exclusive economic zone;
- consultation and compensation for effects on fishing and sociocultural impacts;
- incorporation of Indigenous knowledge into project planning;
- effects of accidents and malfunctions (e.g., blowout) on other nations (St. Pierre and Miquelon, Greenland and Azores);
- effects of accidents and malfunctions on fish and in particular Atlantic Salmon;
- lessons learned from near misses, accidents and malfunctions at other Atlantic offshore exploration and production projects;
- design and implementation of follow-up and monitoring programs;
- limitations of spill response due to adverse weather conditions;
- cumulative effects on fish and fish habitat; and
- funding for meaningful engagement during the EA and throughout project operations.

Appendix C contains a summary of comments provided by Indigenous groups along with the proponent's and Agency's responses. A subset of comments provided in relation to the Project is also discussed in the context of individual valued components in Section 6 and Section 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 EIS summary, the draft EA Report and potential EA conditions. In total, the Agency allocated $229,630 to 13 Indigenous groups and aggregate organizations.

4.1.2. The Proponent's Indigenous Engagement Activities

The proponent engaged 41 Indigenous groups located in Newfoundland and Labrador, Nova Scotia, New Brunswick, Prince Edward Island, and Quebec. Early engagement began in November 2017. Engagement over the course of the EA included face-to-face meetings, phone calls, and emails. The proponent stated that it would continue their engagement efforts throughout the Project.

4.2. Public Participation

4.2.1. Public Participation Led by the Agency

To date, the Agency has provided two opportunities for the public to participate in the EA, including reviewing and providing comment on the proponent's summary of the Project Description and the EIS Summary. The release of this draft EA report and potential conditions for review and comment represents a third opportunity.

In response to the public notice during the comment period on the EIS summary, submissions were received from the following:

- Balaena Institute for Cetacean Conservation Studies;
- the Fish, Food and Allied Workers - Unifor;
- the Newfoundland and Labrador Oil & Gas Industries Association; and
- three individuals.

The three individuals who submitted comments raised concerns about, or were generally opposed to oil and gas exploration. The Balaena Institute for Cetacean Conservation Studies raised concerns regarding the potential environmental effects of the Project on the marine ecosystem, in particular cetaceans, including species at risk, and a lack of data both inside and outside Canada's exclusive economic zone.

The Fish, Food and Allied Workers - Unifor provided information on the nature and importance of the fishing industry. Their submission included concerns regarding marine conservation including the potential effects of the Project on the Northeast Newfoundland Slope Closure marine refuge, the potential effects of the Project from oil spills, cumulative effects of the Project on the fishing industry, and potential socioeconomic impacts. The Newfoundland and Labrador Oil & Gas Industries Association issued its support for the Project 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. Through this program, $24,070 was allocated to two members of the public.

4.2.2. Public Participation Activities by the Proponent

The proponent engaged with stakeholders and environmental non-government organizations, including One Ocean Expeditions; Fish, Food and Allied Workers - Unifor; Association of Seafood Producers; Ocean Choice International; Groundfish Enterprise Allocation Council; Canadian Association of Prawn Producers; and Newfoundland and Labrador Oil & Gas Industries Association. The proponent conducted engagement primarily through their website including the publication of quarterly newsletters. The proponent also maintains a dedicated email to respond to information inquiries.

4.3. Participation of Federal Government Experts

Federal departments and agencies with specialist information or expert knowledge relevant to the Project supported the Agency throughout the EA. The Agency requested information from the C-NLOPB, Fisheries and Oceans Canada (DFO), ECCC, Natural Resources Canada (NRCan), Health Canada, Transport Canada, Parks Canada Agency, Department of National Defence, and Indigenous Services Canada. Their advice and expertise has been incorporated into the sections that follow.

5. Existing Marine Ecosystem

CEAA 2012 defines the environment as the components of the Earth, including the land, water, and air, all organic and inorganic matter and living organisms, and the interacting natural systems that include these components. Similarly, marine ecosystems include the physical and chemical environment along with varied, complex and naturally dynamic organisms. Human activities can cause changes that affect the health of marine ecosystems.

This section summarizes information on the existing marine ecosystem presented by the proponent and available online in DFO's report Canada's Oceans Now: Atlantic Ecosystems, (2018a).

5.1. Physical and Chemical Environment

5.1.1. Physical Environment

The Project would be located in the Orphan Basin of the Northwest Atlantic which is a wide continental rift, approximately 160 000 square kilometres in size and is bound by the Charlie-Gibbs Transfer Fault Zone to the north, the Continent-Ocean Boundary to the east, the Cumberland Belt Transfer Fault Zone to the south and the Bonavista Fault Zone to the west. The Orphan Basin is influenced by seasonal changes in currents, water temperature, sea ice, oxygen levels, acidification, and nutrient levels. Changes in the physical environment may have important impacts on biological systems at different scales, including changes in species growth rates or changes in food webs.

The predominant ocean currents in the project area consist of the Labrador Current and the Gulf Stream. The Labrador Current brings cool Arctic water to the project area while the Gulf Stream provides warm water from the south. The Labrador Current flows southward until it reaches the southern part of the Orphan Basin, where it is diverted eastward by the bathymetry. One of the branches of the Gulf Stream flows northward on the eastern side of the Flemish Cap to the Orphan Basin region. The mixing of these two flows creates an area of high productivity along the tail of the Grand Banks which is located south of the project area within the regional assessment area.

The North Atlantic is temperate with ocean temperatures changing with the season. The surface water temperatures in the project area vary with air temperature ranging from a mean temperature of 2.0 degrees Celsius in April to a mean temperature of 13.1 degrees Celsius in August. Deeper waters do not show as much seasonal variation but are, instead, influenced by currents. An important interaction is the mixing of cooler, fresher water from the Labrador Current with the warmer, saltier waters of the Gulf Stream. Temperature influences both physical processes such as sea ice formation and mixing in the water column, and the condition and behaviour of the species inhabiting the area.

Seasonal changes in sea ice and the layers in the water column play important roles in the way the ecosystem in the project area functions. An important feature in the project area is the cold intermediate layer which forms when the cold winter mixed layer is trapped by the warm spring surface water, along with freshwater from sea ice melt and runoff from land, forming a less dense layer at the top of the water column. The cold intermediate layer influences mixing within the water column which affects how nutrients

are distributed, having an impact on the productivity of the ecosystem. Seasonal changes in sea ice influence freshwater input and the timing of phytoplankton blooms. Sea ice also provides habitat for organisms that live under and on the ice. The project area generally has sea ice from January until July with the highest frequency of ice in mid-March. Icebergs are frequently observed in the project area between February and May with over 300 sightings on average within each month. Although the number of icebergs vary each year, icebergs can be present anytime of the year.

The climate of the project area is governed by the passage of high and low-pressure circulation systems. This results in periods with high winds, large wave heights, low visibility and severe weather. The highest average wind speeds of 46.1 to 52.2 kilometres per hour occur in winter, with maximum wind speeds recorded of 142.6 kilometres per hour in January. The air temperature varies from a low of -17 degrees Celsius in February to a high of 21 degrees Celsius in August. Precipitation occurs within the project area approximately 28 percent of the time. The highest precipitation, 54.1 percent of the time, occurs in January with the majority occurring as snow, and the lowest precipitation, 6.8 percent of the time, occurs in August with the majority occurring as rain/drizzle. Fog frequently reduces visibility in the project area with the majority of the fog occurring in June and July.

Underwater sound is an important factor when assessing the potential effects of exploration drilling on certain species, especially marine mammals that rely on sound to communicate, locate food, and detect threats. The ambient, or background, sound levels in the project area are comprised of both natural and anthropogenic sources, including wind, precipitation and sea ice, whale songs, seismic surveys, and offshore oil and gas extraction platforms. Seismic surveys were the dominant sound sources in the soundscape from July to October over 100 kilometres from the source of the sound and had a peak frequency of 50 hertz. This was consistent over the two year study period (Delarue et al. 2018).

5.1.2. Chemical Environment

The chemical environment includes components such as dissolved oxygen, ocean acidity, and nutrient availability. The amount of dissolved oxygen in seawater is important for the health of marine organisms. In deep water, as in the project area, mixing from surface waters can replace oxygen. When there is little mixing, dissolved oxygen can be depleted by the respiration of organisms and the breakdown of organic matter. If oxygen levels are too low there may be serious effects on ecosystems such as slowing growth, reducing reproductive success, and effects on the way species are distributed as most species will leave an area before hypoxia can cause potential adverse effects.

Ocean acidity is increasing as the ocean absorbs atmospheric carbon dioxide. An increase in acidity makes the water more corrosive to calcium carbonate, the main element in the skeletons and shells of many organisms including plankton and corals, and can also cause increased physiological stress for these organisms. These changes can have implications for food webs and ecosystems as a whole. The acidity of the ocean waters on the Newfoundland Shelf has been increasing steadily since consistent measurements started in 1993.

Phytoplankton require light and nutrients to grow. The most important nutrients include nitrogen, phosphorous, and silica. Nitrogen is usually the limiting nutrient for the growth of phytoplankton in the ocean. As a result, nitrogen cycling within the water column is very important.

5.2. Biological Environment

The biological components of the marine ecosystem include phytoplankton, zooplankton, corals and sponges, fish and invertebrate communities, marine mammals, sea turtles and sea birds. The biological environment is changing with species distributions shifting causing changes to the food web.

Phytoplankton are microscopic plants that produce oxygen and organic matter from sunlight, carbon dioxide, and inorganic nutrients. They support many marine food webs as the key food source for zooplankton, which are, in turn, food for many fish and marine mammals. Phytoplankton abundance is an indicator of the productivity of an ecosystem. Changes in the timing of the spring bloom can have consequences for many other organisms in the ecosystem. In general, the abundance of phytoplankton in the Orphan Basin, and the entire Northwest Atlantic, is in decline.

Zooplankton are small animals that drift in the water column, feeding on phytoplankton, bacteria, and fungi. They are the critical link between phytoplankton and larger marine animals and changes in zooplankton abundance have important consequences for animals that rely on them as their primary food source. In general, zooplankton have been experiencing a shift in community structure with a lower abundance of energy-rich copepod *Calanus finmarchicus* and a higher abundance of small and warm-water copepods as well as non-copepods.

Corals grow mainly on boulders and bedrock but can also anchor in soft sediments. The distribution of deep-water corals is patchy, influenced by the condition of the seabed, temperature, salinity, and currents. Sponges are found along continental shelves, slopes, canyons and deep fjords, at depths down to 3000 metres. Both deep-sea corals and sponges are vulnerable to human activities such as fishing and resource extraction. Corals and sponges may be the only complex habitat-forming features on the seafloor. Their structure provides areas for other species to rest, feed, spawn, avoid predators and provide protection for eggs and juveniles of various species. Sponges contribute significantly to the nitrogen, carbon and silicon cycles in the ocean. This results from their large filter-feeding capacity, a diet mainly composed of dissolved organic matter, and a silicified skeleton.

Marine fish and invertebrates within pelagic, demersal, and benthic communities are part of a complex ecological network. These communities are closely connected to the physical, chemical and biological environment in which they live. An example of this is how physical conditions affect the capelin population. A key factor is the timing of melting sea ice in spring that generates ocean conditions that are favourable to the spring bloom of phytoplankton. If blooms occur too early, due to early ice retreat, zooplankton may miss the maximum peak of phytoplankton production. This creates a mismatch in energy flow, and reduces zooplankton productivity. The result is lower forage fish production. Capelin and herring production are directly linked with the abundance of their zooplankton prey and capelin growth and spawning may be directly impacted by poor zooplankton production. In turn, capelin availability has been shown to be an important driver of the abundance of northern Atlantic Cod stock and reproductive rates in Harp Seals.

Marine fish and fish habitat components that are relevant to the project area include plankton, benthos and finfish. Within the project area, habitats transition from the Newfoundland slope to the abyssal plain. The Newfoundland slope areas support regionally important areas of biodiversity and marine productivity and are used by fish and invertebrate species of commercial, cultural and ecological value. The abundance and distribution of these fish and invertebrate species depend on their linkages with other species across fish

habitats and interactions with the physical parameters of the marine environment. The Project would take place in the vicinity of the Orphan Basin, and adjacent slope and abyssal habitats, which are unique functional units with specific oceanographic characteristics and species assemblages. The Northeast Shelf Deep Sub-Group is the fish assemblage that best describes the project area and includes the following species: Acadian Redfish, Atlantic Cod, Thorny Skate, American Plaice, Striped Wolffish, Greenland Halibut, Witch Flounder, and Roughhead Grenadier. Structure-forming benthic invertebrate species in the project area include corals (e.g., small and large gorgonians [soft corals], stony corals and black corals), sponges and seapens. These provide nurseries, areas of refuge and spawning, and breeding grounds for a variety of species.

Many of the marine mammals present in the project area are summer migrants which come to the Northwest Atlantic to feed mainly on capelin, Atlantic Herring, and krill. The role of marine mammals in the Atlantic food web varies widely, from fish-eating Grey Seals to slow-moving copepod- and fish-eating Northern Atlantic Right Whales. As many marine mammal species are highly mobile and migratory, their movements can reflect changes in prey or in environmental conditions.

Three species of sea turtle are potentially present in the project area, the Leatherback, the Loggerhead and Green Sea Turtle. These species are migratory, moving between beaches, nearshore coastal waters, and the open ocean in different life stages. Leatherbacks are typically found from June to December spending most of their time in near-surface waters. Young Loggerhead turtles are mainly present during summer and fall in warm offshore waters. Sea turtles transport nutrients and energy between marine and terrestrial ecosystems. Leatherbacks also contribute to ecosystem balance in some areas by consuming jellyfish, which are a major predator of zooplankton and larval fish.

Seabirds are top predators and can be effective indicators of overall health of marine ecosystems. Some populations of seabirds have been increasing such as Common Murres and Atlantic Puffins while others have stabilized after a period of increased abundance such as Northern Gannets; however, certain surface-feeding species such as Black-legged Kittiwakes, Leach’s Storm-petrel and Herring Gulls have experienced population declines. Abundance of seabirds can be indirectly affected by human activities such as commercial fishing and oil and gas exploration and production or by changes in oceanographic conditions. For example, Leach's Storm-petrels are vulnerable to light effects from the Project as they hunt at night for species such as lanternfish. Lanternfish vertically migrate during the day, spending the daytime in deep water and rising to the surface at nighttime. Thus, the effect of the Project’s lighting on Leach's Storm-petrel is two-fold; attraction and disorientation of birds to the light and potentially affecting the availability of food sources.

5.3. Human Activities

The project area and larger eastern Newfoundland and Labrador offshore area is known to be used for a variety of human activities. These include fishing, oil and gas exploration and production, shipping, military exercises, and scientific research.

Fisheries are an important component of the human environment of Newfoundland and Labrador, especially for communities and regions along the eastern coastline of Newfoundland. Prior to 1992, the primary harvesting activities taking place in the offshore areas 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. As a result of the moratorium, shellfish species, such as Snow Crab and Northern Shrimp, have taken on a larger economic role. However, due to the shift and rapid rate of harvesting for these species, some areas have since been placed under harvesting moratoria.

6. Predicted Effects on Valued Components

Section 6 discusses the potential effects of the Project on the valued components considered by the Agency. Potential effects on special areas and species at risk are specifically considered in Section 6.4 and 6.5, respectively, as well as in the other sections where the valued component may include relevant special areas or species at risk. The potential effects of an accident or malfunction on these valued components are discussed in Section 7.1.

A summary of the proponent's proposed mitigation measures, monitoring and follow-up is provided in Appendix B.

As described in the analysis below and taking into account the implementation of key mitigation measures, the Agency concludes that the Project is not likely to cause significant adverse environmental effects on fish and fish habitat, marine mammals and sea turtles, migratory birds, special areas, species at risk, commercial fisheries, or the current use, health and socioeconomic conditions of Indigenous peoples.

6.1. Fish and Fish Habitat

6.1.1. Proponent's Assessment of Environmental Effects

Existing Environment

The project area and surrounding marine environments are used by fish and invertebrate species of commercial, cultural, and ecological value and support regionally important areas of biodiversity and marine productivity. Species distributions fluctuate as species migrate on daily or seasonal cycles. The most abundant fish species in the project area include Acadian and Deepwater Redfish, Roughhead and Roundnose Grenadier[2], Greenland Halibut and Northern Wolffish, a species listed as threatened under Schedule 1 of the *Species at Risk Act*. Invertebrates in the project area include deep-water shrimp species, corals and sponges.

Structure forming sponges and corals provide nurseries, areas of refuge and spawning and breeding grounds for a variety of species. Corals and sponges are present in the northwest sections of exploration licences 1145 and 1146 and the southwest portion of exploration licence 1148. These exploration licences overlap with the Northeast Newfoundland Slope Closure marine refuge, which is closed to bottom-contact fishing to protect corals and sponges. Limited data was available on coral and sponge presence in exploration licence 1149. Of the four exploration licences included in the Project, 1145 appears to contain the highest diversity of corals.

[2] These species of redfish and grenadier are assessed as at risk by the COSEWIC; see Appendix D for more information.

There are multiple fish species at risk that may occur in the project area or have ranges overlapping the regional assessment area (see Appendix D). These include the following three species which have been highlighted by Indigenous groups as being of particular concern:

- **American Eel**, travel from freshwater environments during the fall to the Sargasso Sea to spawn, and have the potential to occur seasonally in the project area;
- **Atlantic Bluefin Tuna**, migrate to the waters of the northwest Atlantic Ocean during the summer before leaving the area in the fall, and have a low potential to occur seasonally in the project area; and
- **Atlantic Salmon**, could pass through the project area en route to and from their maturation and winter feeding grounds in the Labrador Sea and off Greenland.

While there is a general understanding of the spatial and temporal distribution of Atlantic Salmon at sea, the information available is limited, which is complicated by evidence of climate change-induced alterations to Atlantic Salmon distribution patterns. Atlantic Salmon populations appear to migrate north to feeding areas, with most individuals from a population expected to migrate to the feeding grounds by the most direct path. Overwintering distribution is not well-defined but is generally believed to encompass an area from the southern Labrador Sea, to the eastern edge of the Scotian shelf, with the Labrador Sea as the primary overwintering area. The proponent stated there is no information on abundance, relative population composition or overwintering specific to the project area. However, it noted that research vessels have caught Atlantic Salmon within the project area in the spring.

Predicted Effects

Change in Risk of Mortality or Physical Injury

The release of drill cuttings and muds is a key potential interaction with fish and fish habitat during offshore drilling programs. Although marine water column organisms (i.e., plankton, pelagic invertebrates and fish) are generally at low risk of harm due to avoidance behaviours and rapid dilution and dispersal of discharges, the accumulation of drill cuttings on the seafloor could cause lethal and sub-lethal effects to benthic organisms through direct toxicity, burial, changes in sediment grain size, nutrient enrichment, and oxygen depletion. To predict the extent of drill cuttings deposition, the proponent conducted dispersion modelling for two sites representative of varying water depths in the exploration licences. A burial depth of 6.5 millimetres was selected as the threshold for mortality or physical injury of benthic species from crushing or smothering. Deposition thickness above the burial depth threshold may extend up to 128 metres from the discharge point at the shallower site in West Orphan Basin (exploration licence 1149) and 57 metres at the deeper site in East Orphan Basin (exploration licences 1145, 1146, and 1148). The maximum area of water-based drill cuttings deposition above threshold was predicted to be 8500 square metres for the West Orphan Basin site and 6400 square metres for the East Orphan Basin site.

The proponent considered a more conservative deposition threshold for considering significant effects to the benthic community given the exploration licences' overlap with the Northeast Newfoundland Slope Closure marine refuge. The proponent used a 1.5 millimetre deposition threshold for potential interference with benthic feeding structures, resulting in a deposition area of 540 metre from the discharge point at the shallower site in West Orphan Basin (exploration licence 1149) and 125 metres at the deeper site in East Orphan Basin (exploration licences 1145, 1146, and 1148). It concluded that the effects of drilling waste

accumulation would not result in population level effects to benthic species even at the more conservative thresholds.

Synthetic-based mud cuttings discharged at the sea surface would spread over a larger area at thicknesses below the burial threshold. The predicted areal coverages for synthetic-based mud under low ambient current scenarios was 422 metres from the discharge point in West Orphan Basin and 599 metres in East Orphan Basin, with maximum deposition thickness of 2.1 millimetres and 0.5 millimetres, respectively.

In exploration licences 1145, 1146, and 1148, there is potential for the smothering or disturbance of these species in the immediate area of well sites. The potential for corals, sponges and sea pens in exploration licence 1149 is unknown due to a lack of data in the area. Discharge of drilling cuttings has also been shown to decrease diversity and density of organisms associated with structure-forming deep-sea sponges. The proponent stated that recovery of benthic communities would occur, and that localized environmental changes associated with the discharge of drill cuttings subside with time, generally one to four years. Overall, benthic mortality rates as a result of cuttings discharges would not result in irreversible changes to local populations, but acknowledged that data on effects of drilling waste on corals and sponges is limited and recovery rates for these communities would be expected to be longer in deepwater environments.

The proponent noted that the concentration of most metals of concern in modern drilling muds are similar to that of fine-grained marine sediments, and metals are largely unavailable for uptake by marine organisms, therefore making direct toxicity of cutting discharges to benthic fauna unlikely. Several bioaccumulation tests using water-based drilling muds and cuttings recorded similar metal concentrations in the tissues of exposed and unexposed marine animals. Additionally, results of environmental effects monitoring at three producing oilfields in the eastern Newfoundland offshore have shown that sediments have been mostly non-toxic to laboratory test species.

The Project would also result in other discharges to the marine environment (e.g., cement, bilge and deck drainage, ballast water, sewage, cooling water). These discharges would be managed in accordance with the applicable requirements and are not predicted to cause mortality or physical injury to marine fish.

Fish, including eggs and larvae, within the project area could be subject to mortality, physical injury, or health effects due to increased underwater sound levels. VSP surveys would produce the highest levels of underwater sound. Although intense, the VSP sound source would be activated intermittently and for a short period of time, with survey operations occurring for one to four days for each well. The source sound pressure level associated with VSP operations[3] is estimated to exceed the threshold for recoverable injury proposed by Popper et al. (2014) of fish species most sensitive to sound (i.e., those with a swim bladder involved in hearing) that are exposed to impulsive underwater sound from seismic air gun sources[4]. The proponent noted that the sound pressure level to which fish are exposed would depend on various factors, including the distance between the source and receiver.

The operation of the MODU would include continuous sound generated by dynamic positioning and drilling activities. The source sound pressure level associated with the operation of a MODU exceeds the

[3] 247.8 decibels relative to a fixed reference pressure of one micropascal root mean square sound pressure level at one metre from source.

[4] 207 decibels relative to a fixed reference pressure of one micropascal root mean square sound pressure level

continuous exposure guidelines proposed by Popper et al. (2014) for temporary impacts to hearing and recoverable injuries to sensitive fish species.[5] Considering these guidelines and the acoustic modelling conducted for similar exploration drilling projects in the eastern Newfoundland offshore area, the proponent concluded that potential physical injury effects to fish associated with MODU operations would be localized, with mobile fish expected to move away before injury could occur. There has been no direct evidence of fish mortality as a result of exposure to continuous underwater sound.[6]

Change in Habitat Quality and Use

Underwater sound from the MODU, VSP surveys and supply vessels could affect fish and fish habitat in a variety of ways depending on source levels, duration of exposure, proximity of the sound source, species sensitivities and environmental conditions. Avoidance and short duration startle responses to underwater sound by some fish species may occur in close proximity to the sound source during the start-up of these project components. However, given the localized and temporary nature of the drilling and VSP activity, potential behavioural effects on fish from exposure to continuous underwater sound are not predicted to extend beyond the project area, and displacement of fish from habitats and population level disturbances would be unlikely.

A temporary increase in suspended particulate matter and turbidity in the water column would occur as drilling muds and cuttings disperse and settle rapidly to accumulate on the seafloor. Deposition of drill cuttings can change sediment grain size and physical or chemical properties of sediments, causing a change in the abundance, composition, and diversity of the benthic community within a localized area. Cold-water corals provide habitat for marine species, so effects on corals could result in a change in habitat quality and use. Different species of cold-water corals provide habitats of varying physical size and life spans; as a result, the fauna associated with some corals is more diverse than others. However, both seapens and larger structure-forming corals play an important role as habitat.

Wellhead abandonment could result in localized disturbance depending on the abandonment method. In water depths greater than 900 metres, the proponent stated that it may seek approval from the C-NLOPB to leave the wellhead in place, which would provide hard substrate that may be suitable for colonization by benthic communities. Removal of wellheads would involve temporary and localized increases in underwater sound levels.

6.1.2. Views Expressed

Federal Authorities

DFO reviewed the proponent's drill cuttings modelling and required additional information, including how modelled particle size was determined and how much waste was transported outside of the modelling boundary. The proponent clarified its method for determining particle size and stated that based on the

[5] 158 and 170 decibels relative to a fixed reference pressure of one micropascal root mean square sound pressure level for 12 and 48 continuous hours, respectively

[6] 247.8 decibels relative to a fixed reference pressure of one micropascal root mean square sound pressure level peak at one metre from source

model, the waste outside the boundary would have a thickness of less than one micron and suspended particulate matter concentrations would likely be indistinguishable compared to the water column.

DFO and the C-NLOPB requested an expanded rationale for the selected 500 metre radius for the proposed imagery-based seabed survey. The proponent indicated that the radius is conservative based on modelling predictions, and has been applied by the proponent in other jurisdictions. The proponent indicated that studies show measurable changes to benthic macrofauna are most often confined to within a 250 metre radius and seldom detected beyond 500 metres from the drill site.

DFO advised the Agency that the mitigation measures, monitoring and follow-up programs proposed by the proponent as well as those recommended by the Agency would adequately address the potential effects of the Project on fish and fish habitat.

Additional views expressed by federal authorities overlapped with views expressed by Indigenous groups. Some of these key views and comments are discussed below.

Indigenous Peoples

KMKNO requested additional information on the presence and distribution of marine species including coral and sponges within the project area. The proponent noted that it used data from DFO surveys, for which no survey data was available for exploration licence 1149 as it is outside Canada's exclusive economic zone. Further, NAFO fisheries data did not overlap with the project area. Given the lack of data, the proponent concluded that it took a conservative approach for the assessment for environmental effects and committed to specific mitigation related to corals and sponges. These have been incorporated into the key mitigation identified by the Agency (Section 6.1.3).

KMKNO requested additional information on the conclusion that changes in corals and sponges habitat could be reversible. The proponent referenced research that showed a coral species was able to clear and reject sediment in laboratory conditions. Environmental effects monitoring programs conducted in offshore Newfoundland and Nova Scotia have shown that sediments have mostly been non-toxic and that effects were less adverse than predicted. The proponent concluded that while the effects are not expected to be permanent, corals and sponges are generally slow growing and long lived; therefore, recovery after a disturbance may take a decade or more. With the estimated low level of drill cuttings and appropriate mitigation measures, the proponent indicated that there would likely not be a permanent loss of habitat.

KMKNO raised concerns regarding the effects of underwater sound on immobile and low mobility invertebrates and fish species. The proponent noted that while there is some evidence of effects to lower mobility invertebrates, there remains substantial gaps in the understanding of the effects of sound pressure or particulate motion on fish and invertebrates. While low mobility species may be impacted by sound to a greater extent than high mobility species, given the small benthic footprint exposed to these sounds the proponent did not predict any changes at the population level.

Première Nation des Innus de Nutashkuan, WNNB, KMKNO and DFO provided comments on planned drilling activities and well site locations in relation to sensitive habitats and corals and sponges. The proponent stated that it would develop criteria to determine feasibility of well site locations to avoid or minimize impacts on corals, sponges, and sensitive areas in consultation with DFO and the C-NLOPB. The proponent committed to reporting the survey results to the C-NLOPB and providing a summary to the public and Indigenous groups. The proponent would notify the C-NLOPB immediately if environmental

sensitivities are identified to discuss the appropriate course of action, which may include additional mitigation measures.

WNNB, Première Nation des Innus de Nutashkuan, and KMKNO submitted comments specific to Atlantic Salmon regarding the effects of light and sound, research opportunities and initiatives, and lack of data on salmon that utilize New Brunswick waters but may at various life stages utilize the project area. Indigenous groups that participated in Agency-led workshops noted that many of the populations on which they rely are at risk or in decline; some groups are abstaining from fishing salmon to assist in population recovery. These groups expressed concern that offshore exploration drilling could have a negative effect on population recovery. The proponent clarified that the Inner Bay of Fundy Atlantic Salmon population has the potential to occur in the project area, however it is considered unlikely and that the project area may serve as a summer marine feeding area for the Outer Bay of Fundy salmon population. The proponent noted that it contributes to a mandatory industry-wide research fund, the Environmental Studies Research Fund (ESRF) managed by the federal government. The proponent and other offshore exploration operators have recommended to the federal government that the priority of the fund be placed on Atlantic Salmon research offshore eastern Newfoundland and that Indigenous representatives be involved in the design and implementation of the research. The proponent noted that a study of caged Atlantic Salmon found responses to light and noise stimuli were temporary, with individuals returning to their original depth and speed within minutes of being exposed. The proponent concluded that should Atlantic Salmon be exposed to light and sound emissions from project activities, the effects are expected to be low in magnitude, medium term, and reversible.

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

Public

A member of the public raised a concern on the effects of the project on smothering benthic communities. Concerns from stakeholders with respect to fish and fish habitat were considered by the Agency when conducting its analysis and addressed by the proponent and incorporated into the text above, where appropriate.

6.1.3. Agency Analysis and Conclusion

Analysis of Effects

Fish and fish habitat, including benthic species could be affected by the discharge of drilling muds and cuttings from the Project; sedentary or slow moving species may be smothered and the sediment quality may be altered by nutrient enrichment and oxygen depletion at cutting deposition thicknesses above the threshold for burial effects. The Agency is aware that parts of exploration licence areas included in the Project 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 discharge of drilling muds and cuttings from the Project; sedentary or slow moving species may be smothered and the sediment quality may be altered by nutrient enrichment and oxygen depletion at cuttings deposition thicknesses above the threshold for burial effects. Given the importance and sensitivity of corals and sponges, the proponent would be required

to conduct surveys at each well site prior to drilling. If aggregations of habitat-forming corals or sponges or other environmentally sensitive features were identified, the proponent would be required to relocate the well and/or redirect cuttings discharges to avoid affecting them if technically feasible. If it is determined that it is not technically feasible to move the well or redirect cuttings discharges, the proponent would be required to conduct a comprehensive assessment of the benthic habitat in consultation with DFO prior to drilling to determine the potential for non-compliance with the Fish and Fish Habitat Protection Provision of the *Fisheries Act* with respect to 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 MARPOL. The implementation of these measures would limit effects on fish.

Continuous underwater sound from operation of the MODU and supply vessels may cause recoverable injury or temporary hearing threshold shift in certain species. Although the proponent did not conduct sound modelling specific to this Project, it noted that modelling conducted for other offshore exploration drilling projects with similar sound sources and environmental conditions was applicable. Modelling for an exploration drilling project with an overlapping regional assessment area (CNOOC 2017) predicted that continuous underwater sound from operation of a MODU and supply vessels may cause recoverable injury or temporary hearing threshold shift (i.e., a temporary reduction in hearing sensitivity caused by exposure to intense sound) in certain species of fish at distances of up to 150 and 330 metres from the source, respectively. Sound may also result in behaviour responses, including avoidance or attraction, and may mask fish sensory abilities.

Sound from VSP surveys could also affect fish, including potentially causing injury or mortality. Sound levels from these surveys may exceed injury thresholds for some species or life stages in the immediate vicinity of the sound source. Mobile species would likely exhibit avoidance behaviour, and the surveys would begin with a “ramp-up” phase to increase initial avoidance and limit potential effects. Although fish may temporarily avoid the area, it is predicted that they would not be displaced from important 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.

The Agency was provided information by DFO on other offshore exploratory drilling projects on the migration patterns of Atlantic Salmon in the northwest Atlantic and on the potential effects of the Project. 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. DFO 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 natal rivers but it is not known to be a significant migration route or overwintering area. 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.

Certain fish species that could be affected by the Project 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 EA, Indigenous groups and the proponent provided information on Atlantic Salmon and its potential interaction with the Project. The Agency notes that DFO reviewed available information and confirmed the uncertainty regarding the at-sea migration patterns and habitat use of Atlantic Salmon. Given the potential for some Atlantic Salmon to occur in areas that overlap with the Project, effects on the species could occur. DFO has advised that potential effects of the Project 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 proponent would be required participate in or support research on the presence and distribution of Atlantic Salmon in Eastern Canadian offshore regions. The Agency notes additional research on the presence, migration, and distribution of Atlantic Salmon may be supported through the ESRF and that in May 2019 a call for proposals for studies related to Atlantic Salmon was issued.

Key Mitigation Measures to Avoid Significant Effects

The Agency considered the mitigation measures proposed by the proponent (Appendix B), expert advice from federal authorities, and comments from Indigenous groups and the public, and identified the following key measures to mitigate the Project's effects on fish and fish habitat:

- prepare a pre-drill seabed investigation plan for each well site and submit to DFO and the C-NLOPB for review and approval prior to implementing the survey. The plan should be designed to:
  - collect high-definition visual data to confirm the presence or absence of sensitive environmental features, including aggregations of habitat-forming corals or sponges;
  - identify the equipment used for the surveys, to be operated by a qualified individual; and
  - include information on survey transect length and pattern around each well site, which should be based on applicable drill cutting dispersion model results;
- based on approved plans, undertake a seabed investigation survey at each well location prior to commencing drilling a well. Retain a qualified independent marine scientist to provide advice in real-time;
- provide the results of the seabed investigation survey to the C-NLOPB and DFO prior to commencing drilling. In addition, provide a description of additional mitigation and monitoring based on the results of the survey and predicted areas of sedimentation and disturbance. Results of the surveys should be provided to Indigenous groups and posted online for public access;
- if aggregations of habitat-forming corals or sponges or other environmentally sensitive features are identified when undertaking the survey:
  - relocate the well and/or redirect cuttings discharges to ensure that the MODU or drilling muds and cuttings discharges would not affect them, if technically feasible. No drilling should occur before a decision is made by the C-NLOPB and DFO regarding appropriate mitigation and monitoring; or

  - if 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 DFO prior to drilling to determine the potential for non-compliance with the fish and fish habitat protection provisions of the *Fisheries Act* with respect to coral and sponge aggregations and related options for mitigation to reduce any identified risk;
- select chemicals to be used during the Project 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 the MODU 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 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; and
- implement mitigation listed in Section 6.2 related to the conduct of VSP surveys.

Follow-up

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

- monitor the concentration of synthetic-based mud on drill cuttings to verify that the discharge meets, at a minimum, 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 the seabed investigation survey to be sensitive benthic habitat, conduct specific follow-up monitoring, including:
  - measurement of sediment deposition extent and thickness (e.g., core samples and/or high definition visual data) 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 DFO; and
  - results should be provided to Indigenous groups and posted online for public access;
- participate in or support research on the presence and distribution of Atlantic Salmon in the Eastern Canadian offshore areas, and update the C-NLOPB and Indigenous groups annually on research activities. Research initiatives can be explored through organizations such as the ESRF and through input from and collaboration with Indigenous groups; and

- implement the follow-up measures listed in Section 6.2 related to the verification of underwater sound as a result of the Project.

Agency Conclusion

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

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

6.2. Marine Mammals and Sea Turtles

6.2.1. Proponent's Assessment of Environmental Effects

Existing Environment

The Orphan Basin supports a diverse array of marine mammals[7] and sea turtles and contains important feeding and refuge areas, migratory routes, and breeding and whelping areas. Twenty-four species of marine mammals may be found in the project area.

Several species are present in the project area year-round (e.g., Fin Whale, Blue Whale, Northern Bottlenose Whale, Sowerby's Beaked Whale, and Sperm Whale), while others are present seasonally (e.g., North Atlantic Right Whale, Sei Whale, and Common Bottlenose Dolphin). Some of these species, including the Northern Bottlenose Whale, Blue Whale, and North Atlantic Right Whale, are considered at risk (see Appendix D for a list of species at risk that may occur in the project area or surrounding area).

Predicted Effects

Risk of Mortality or Physical Injury

The proponent predicted that continuous exposure to sound over a 24-hour period from an operating MODU could cause auditory injury[8] in high frequency marine mammals as far as 3.3 kilometres from the source and as far as 200 metres from the source for other marine mammal hearing groups based on the

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7 Marine mammals include cetaceans, commonly known as whales, dolphins and porpoises and pinnipeds, commonly known as seals, sea lions and walrus.

Cetaceans include toothless/baleen whales and toothed whales, which are further subdivided into beaked whales, sperm whales, dolphins and porpoises.

8 The proponent indicated that it 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 proponent indicated that conclusions were based on whichever metric was first exceeded.

R_{max} distance estimate [9]. Thresholds for injury of sea turtles are not available; the proponent indicated that relative risk has been categorized as high at tens of metres from the source, and low at distances of hundreds to thousands of metres. Thresholds for auditory injury for sea turtles are assumed to be similar to fish species whose swim bladder is not involved with hearing. The sound levels are predicted to be below these threshold levels at distances beyond a couple of hundred metres. Injury is not expected to occur because it is anticipated that marine mammals and sea turtles would avoid the immediate area around the MODU and, therefore, would be unlikely to incur auditory injury.

Impulsive sound, such as that emitted by VSP, could affect hearing in marine mammals and sea turtles. The 24 hour sound exposure level threshold for auditory injury could be exceeded at estimated distances of up to 9.7 kilometres from a VSP sound source for low-frequency hearing group cetaceans and up to 400 metres for other marine mammal hearing groups based on the R_{max} distance estimate. This assumes that a marine mammal or sea turtle occurs within these distances of the VSP sound source for a 24-hour period. In contrast, distances from the VSP sound source at which peak pressure levels (i.e., the maximum instantaneous sound pressure level) could result in injury to marine mammals would not likely extend beyond 120 metres.

The proponent stated that there is little potential for marine mammals and sea turtles to interact with well abandonment activities. Cutting of wellheads would be restricted to the project area, unlikely to occur, short-term in duration and reversible.

Marine mammals and sea turtles could be injured or killed if struck by a supply vessel and baleen whales 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*), and Humpback Whales are 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. It is estimated that two to three supply vessels would be required with two to three return transits per week between the MODU and the supply base. Reducing vessel speed has been shown to reduce the number of marine mammal deaths and severe injuries due to vessel strikes (infrequent at speeds less than 14 knots [25.9 kilometres per hour] and rare at speeds less than ten knots [18.5 kilometres per hour]). Typically, transit speeds of supply vessels would be approximately 12 knots (22 kilometres per hour). Based on existing knowledge, transit routes would not cross marine mammal breeding grounds, feeding concentrations, and/or migration routes.

Change in Habitat Quality and Use

The National Oceanic and Atmospheric Administration's behavioural threshold[10] for marine mammals exposed to continuous underwater sound could be exceeded up to approximately 61 kilometres from the MODU (based on the R_{max} distance estimate)[11]. Using the more representative $R_{95\%}$ distance estimate, the behavioural threshold for continuous sound would be reached at 40 kilometres from the MODU. Behavioural disturbances may include changes in vocalizations, foraging behavior, habitat avoidance, and

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9 $R_{max,}$ is the maximum range at which the given sound level threshold is encountered in the model.

10 120 dB re 1 µPa (decibels relative to a fixed reference pressure of one micropascal) root mean square sound pressure level published by the National Oceanic and Atmospheric Administration.

11 $R_{95\%,}$ is the range to the given sound level after the five percent farthest points are excluded in the model.

changes in migration or movement patterns or activity state. Baleen whales vocalize primarily at lower frequencies and are therefore expected to be the most susceptible to potential masking (impairing detection of sounds they rely on) from sound produced by the MODU.

The threshold for behavioural disturbance to marine mammals[12] could be exceeded up to nine kilometres from the sound source during VSP surveys based on the more conservative R_{max} distance estimates and up to six kilometres based on the more representative $R_{95\%}$ distance estimate. Baleen whales generally tend to avoid VSP sound sources, but avoidance radii are quite variable. However, baleen whales often react to sound from seismic sources by deviating from their normal migration route and/or interrupting their feeding and moving away. Toothed whales reactions to sound from large sound sources are variable and at least for dolphins, seem to be confined to a smaller radius than has been observed for the more responsive baleen whales and some other toothed whales. Overall, the proponent indicated that any avoidance is predicted to be temporary, particularly given the short duration of VSP surveys.

Sea turtles have been shown to move away from VSP sound sources and the rigid external anatomy of sea turtles may afford protection from the potential effects of impulsive sound. Sea turtles are considered rare in the project area and if they do occur there, responses are expected to be localized and temporary, particularly given the short duration of VSP surveys.

Treated discharges would result in localized and temporary reductions in water and sediment quality but would be unlikely to introduce heavy metals in concentrations harmful to marine mammals and sea turtles. In addition, secondary effects would be expected to be minimal because marine mammals that regularly occur in the project area are not known to feed on benthos.

6.2.2. Views Expressed

Federal Authorities

DFO indicated the effects of the Project on marine mammals and sea turtles would be limited 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 Seismic Sound in the Marine Environment*, and because there is no critical habitat for marine mammal species at risk in the project area. Although DFO is generally supportive of the proponent's 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 a MODU. Given this uncertainty, DFO has advised that it supports that the proponent would be required to verify sound predictions from the MODU.

The Agency noted that the proponent used the $R_{95\%}$ distance estimate for the zone of influence for underwater sound which is less conservative than the R_{max} estimate which has been used by other exploration projects in the Newfoundland Offshore. The proponent stated that the underwater sound assessment should use the $R_{95\%}$ distance estimate as it is considered to be the most statistically representative of the real world aerial extent of sound levels. The proponent stated that the R_{max} estimate is

[12] 160 dB re 1 µPa root mean square sound pressure level published by the National Oceanic and Atmospheric Administration.

likely to represent localized outlying distance values or locations which are less representative of the aerial extent of the sound field.

DFO advised the Agency that the mitigation measures, monitoring commitments, and follow-up programs proposed by the proponent as well as those recommended by the Agency would adequately address the potential effects of the Project on marine mammals and sea turtles.

Indigenous Peoples

Multiple Indigenous groups commented on mitigation for supply vessel collisions with marine mammals and sea turtles. KMKNO advised that supply vessels should be required to reduce speeds to a ten knot limit when a marine mammal or sea turtle is observed or reported in the vicinity of a supply vessel. The proponent responded that mitigation measures such as requiring that maximum supply vessel speed not exceed 12 knots (22 kilometres per hour) except as needed in the case of an emergency would be included in an Environmental Protection Plan and the Marine Operations Manual for the Project. The proponent stated it does not intend to designate dedicated marine mammal observers on board the supply vessels but marine mammal and sea turtle sightings would be recorded opportunistically by crew during supply vessel transit. If crews observe congregations of whales along supply routes, the captain may use their discretion to change the transit route.

MTI suggested that additional mitigation measures be considered to reduce the effects on marine mammals (e.g., avoidance of drilling when North Atlantic Right Whales are more likely to be present [early May to mid-October]; drilling be put on hold if North Atlantic Right Whales were to be observed in close proximity to the MODU). The proponent stated that observations for marine mammals and sea turtles would be conducted for 60 minutes (greater than the 30 minutes identified in the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment*) prior to ramp-up and during the VSP surveys. VSP surveys would be delayed if any marine mammal or sea turtle were detected within the 500 metre safety zone (verses species at risk as identified in the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment)*. During VSP surveys, shut-down procedures would be implemented if a marine mammal or sea turtle species at risk is observed within 500 metres of the sound source, independent of a positive species at risk identification.

KMKNO requested rationale for not implementing a follow-up program to verify sound predictions and effects on marine species. The proponent referenced the results of studies offshore eastern Newfoundland and Nova Scotia to characterize underwater sound levels and verify predictive modelling, and concluded that effects on marine mammals and sea turtles are expected to be short-term, localized, and negligible to low in magnitude.

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

Public

The Balaena Institute for Cetacean Conservation Studies identified the slope of the Orphan Basin as an important area for cetaceans and that Northern Bottlenose Whales have been documented in the project area (Balaena Institute for Cetacean Conservation Studies unpublished study). The proponent noted that the EIS included reference to information received from a member of the Balaena Institute for Cetacean Conservation Studies and that data were not published nor available on the Ocean Biographic Information

System database. A review of the Ocean Biographic Information System database did not yield any additional sightings for species at risk in the project area. The proponent indicated that the EIS acknowledged the potential presence of several marine species at risk within the regional assessment area and project area, including the Northern Bottlenose Whale, Fin Whale, and Blue Whale.

6.2.3. Agency Analysis and Conclusion

Analysis of Effects

The Project 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 proponent's exploration licences, while others may be present in higher abundance during summer and fall.

Sound from the MODU or VSP surveys may potentially result in injury 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 Project could result in exceedances of thresholds for both auditory injury (as far as 3.3 kilometres from an operating MODU or 9.7 kilometres from the VSP sound source) and behavioural effects (as far as 61 kilometres from the MODU as the most conservative estimate). 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.

To mitigate the effects of sound emissions from VSP activities, the proponent would follow the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment*. Importantly, the proponent would be required to develop a Marine Mammal and Sea Turtle Monitoring Plan and provide it to DFO for review. In addition, the proponent would be required to verify sound predictions from the MODU. The proponent 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 have potential to occur in the project area. Based on these considerations, DFO has advised that it supports requiring the proponent to use passive acoustic monitoring or equivalent technology, noting that marine mammals 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 differentiate by species.

With respect to the size of the safety zone for marine mammal and sea turtle observations during VSP surveys, DFO has advised that the peak threshold for auditory injury would not likely extend beyond 120 metres from the source. Thresholds for auditory injury for 24 hours of sound exposure could 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 VSP surveys, DFO has recommended the standard 500 metre minimum safety zone for this project. The Agency notes the proponent proposed mitigation to include shut-down of the air source array if a marine mammal or sea turtle species at risk is sighted. Furthermore, DFO advised 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 supply vessels, resulting in injury or mortality. Specifically, in 2017 and 2019, 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 Project may contribute to an increased chance of collisions with species susceptible to strikes. DFO 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. The Agency notes that North Atlantic Right Whales are considered rare in the regional assessment area and there is one recorded sighting of two individuals south of the project area based on DFO, Ocean Biographic Information System (Harris 2015). Following consultation with DFO, the Agency is of the opinion that the slight increase in vessel traffic due to the Project would be unlikely to substantially increase the probability of collisions. As a precautionary measure, the proponent would be required to limit vessel speeds when a whale or sea turtle is observed or reported in the vicinity of a supply vessel. DFO has advised that it would support the requirement for supply vessel speed to be reduced to seven knots (approximately 13 kilometres per hour) when within 400 metres of a marine mammal or sea turtle.

The proponent 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 DFO should it be determined that the proponent 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 proponent, expert advice from federal authorities, and comments from Indigenous groups and the public, and identified the following key measures to mitigate the Project's effects on marine mammals and sea turtles:

- conduct VSP 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 60 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 marine mammal or sea turtle is observed or reported within 400 metres of the vessel;
- in consultation with DFO, 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 DFO for review and approval 30 days prior to initiating activities. The plan would describe:
  - monitoring during VSP 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;
- implement mitigation listed in Section 6.1 and Section 6.3 which may also benefit 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 DFO. 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, DFO, 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 DFO in advance of drilling, and the monitoring results after well suspension or abandonment, as directed by the C-NLOPB and DFO; and
- provide follow-up program results to Indigenous groups and post online for public access.

Agency Conclusion

The Agency determined that the adverse residual environmental effects of the Project on marine mammals and sea turtles would be negligible to low in magnitude and would occur within the project area, local assessment area or regional assessment area. The effects could be both sporadic (e.g., effects from VSP

surveys or from vessel collision) or regular (e.g., effects from drilling noise) for the duration of the activity but would cease upon well abandonment.

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

6.3. Migratory Birds

6.3.1. Proponent's Assessment of Environmental Effects

Existing Environment

Migratory birds (e.g., phalaropes, gulls, terns, puffins, petrels, and cormorants) are the most likely to be found in the project area. Waterfowl, loons, grebes, shorebirds, and landbirds may also be found in the project area; however, most of these species tend to prefer coastal habitats and occur only as vagrants offshore. The eastern and southern coastlines and the offshore waters (including the project area) of Newfoundland and Labrador provide important habitat for Leach's Storm-petrels (e.g., the largest colony of Leach's Storm-petrels in the world is located on Baccalieu Island, approximately 64 kilometres north of St. John's) and this species travels thousands of kilometres to foraging areas far offshore. The core foraging area of Leach's Storm-petrels nesting on Baccalieu Island and Gull Island include all of the project area and the eastern end of the project area, respectively.

Several bird species at risk listed under Schedule 1 of the *Species at Risk Act* or by COSEWIC (e.g., Ivory Gull, Red-necked Phalarope, Ross's Gull, etc.) potentially occur in the regional assessment area and may interact with the Project (see Appendix D for a list of species at risk that may occur in the project area or surrounding area). The proponent also considered the presence of and effects on avian species listed on the International Union for the Conservation of Nature Red List of Threatened Species (e.g., Atlantic Puffin, Bermuda Petrel, Leach's Storm-petrel).

Predicted Effects

Change in Risk of Mortality or Physical Injury

Migratory birds are known to be attracted to light emissions, including lighting and flares from MODUs and supply vessels, which may result in mortality or injury through strandings, collisions, increased opportunities for predation or exposure to other vessel-based threats. Disoriented birds may fly continuously around lights, depleting energy resources, delaying foraging or migration, and potentially increasing their susceptibility to predation. Attraction and the resultant effects may be especially pronounced at the end of nesting season, during the new moon when moonlight levels are lowest, or during periods with a low cloud ceiling particularly when accompanied by fog or rain. Attraction can also be influenced by wavelength and intensity of lighting; reducing the intensity of lighting from full illumination to only beacon and obstruction lights has also been shown to reduce the effect on birds.

Leach's Storm-petrels are particularly vulnerable to light attraction, and are known to make foraging trips of thousands of kilometres from nest sites during the breeding season. Strandings of Leach's Storm-petrels

peak from mid-September until mid-October when fledglings and adults abandon the nesting colonies to begin their southward migration. It is difficult to quantify the mortality rate of birds attracted to lighting because the available estimates rely on recovery of birds on platforms and vessels and it is not known how many birds are killed but not recovered.

VSP surveys will result in localized underwater sound emissions for approximately one day per well. Based on current scientific knowledge regarding the effects of underwater sound on birds, diving migratory birds appear to be less sensitive to underwater sound emissions than fish, marine mammals, or sea turtles. The effects associated with VSP operations on migratory birds is predicted to be negligible to low in magnitude, localized within portions of the project area, short-term, irregular in frequency, and reversible.

The treated discharge of some operational wastes from the MODU and supply vessels 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. Discharging the drill cuttings below the water surface mitigates the potential for contact with migratory birds.

Potential effects from supply vessel or helicopter lighting were predicted to be similar to those from lighting on the MODU; however, since supply vessels are not generally stationary, except during VSP activities, disturbance would be transient and extend across a wider area along the transit routes. Disturbances would be transient and short-term, and the amount of project-related traffic is generally in keeping with the overall marine traffic that has occurred throughout the region for years and would utilize existing and established routes wherever possible.

Change in Habitat Use and Quality

The presence of offshore platforms can provide new habitats for birds using the offshore who forage around platforms, or as hunting grounds for predatory species which take advantage of concentrations of birds around structures. This may increase the risk of predation, collision, and exposure to contaminants; however, this would be minimized with waste management practices and adherence to associated MARPOL requirements. The creation of new habitats and food availability would be short-term at a project drilling location and may result in both positive (increased prey and resting sites) and negative effects on migratory birds (increased exposure to contaminants, sound, predation, and avoidance behaviour altering migratory routes or natural foraging behaviour).

Helicopter sound emissions can cause increased energy expenditure of birds due to escape reactions, increased heart rate, decreased food intake due to interruptions and temporary loss of suitable habitat. Birds could also be displaced from habitat or otherwise disturbed as a result of project activities, such as drilling sound, VSP surveys, and supply vessel and helicopter transits.

6.3.2. Views Expressed

Federal Authorities

ECCC raised concerns regarding potential effects of the Project on Leach's Storm-petrels taking into consideration potential threats to the species and population trends. The proponent acknowledged that the number of nesting pairs of Leach's Storm-petrels has declined by 55 percent from 1979 to 2011 in the colony on Great Island in the Witless Bay Islands Ecological Reserve. The threats identified for Leach's

Storm-petrel include predation by gulls, attraction to lights and flares with mortality from collisions or strandings, and the contribution of small spills of hydrocarbons and synthetic drilling muds to chronic oil pollution. However, large declines in the numbers of Herring Gulls nesting in the Witless Bay Islands Ecological Reserve suggest that predation pressure on the Leach's Storm-petrel is decreasing. The proponent asserted that no changes to mitigation, follow-up or significance predictions as presented in the EIS were required.

ECCC advised that until an adequate estimate of strandings and mortality at offshore infrastructure is obtained, the information currently available is likely an underrepresentation of the number of individuals coming into contact with the MODU and supply vessels. ECCC identified an uncertainty as to the level of effect on migratory birds and, thus, the need for a systematic monitoring protocol to search for and document stranded birds. The proponent provided information gathered during systematic searches conducted during geophysical exploration programs which suggest a high percentage of stranded Leach's Storm-petrels were found alive and could be released shortly afterward. The proponent acknowledged that occasionally large numbers of land birds have been reported to be found dead on platforms; however, it is unclear if a high mortality rate from collisions is applicable to Leach's Storm-petrel. The proponent committed to undertaking systematic deck searches for stranded and dead birds by trained observers on the MODU and supply vessels. The proponent would consult ECCC in the process of preparing the monitoring protocol and share the results of the monitoring program publically.

ECCC raised concerns with measures to be taken to mitigate the effects of flaring including describing how flaring would be minimized and if it would be feasible to schedule flaring outside of mid-September to mid-October during fledgling of Leach's Storm-petrel. The proponent stated that it did not intend to conduct well testing or flaring; however, if required, it would notify the C-NLOPB at least 30 days in advance to determine if it was during a period of migratory bird vulnerability. The proponent did not commit to avoiding flaring between mid-September to mid-October; however, stated that flaring could be planned such that it does not commence during periods of poor visibility. It committed to using well testing methods that don't require flaring if approved by the C-NLOPB.

ECCC advised the Agency that the mitigation measures, monitoring, and follow-up programs proposed by the proponent as well as those recommended by the Agency would adequately address the potential effects of the Project on migratory birds.

Indigenous Peoples

Several Indigenous communities, including MTI and KMKNO, commented on the potential effects of the Project as wells as mitigation measures and monitoring. Comments included: effects of supply vessels and helicopters on migratory bird nesting colonies, procedures and protocols if a bird species at risk is found injured on a MODU or supply vessel, the need for systematic searches for migratory birds on the MODU and supply vessels; and effects of flaring on migratory birds.

KMKNO expressed concern about the potential effects of supply vessel traffic near migratory bird nesting colonies and requested the proponent commit to reducing speeds to ten knots when in the vicinity of migratory birds and that helicopter speeds and altitude limits be restricted. The proponent committed to avoid transiting supply vessels near known migratory bird nesting colonies and complying with *Seabird Ecological Reserve Regulations, 2015* and ECCC's *Guidelines to Avoid Disturbance to Seabird and Waterbird Colonies in Canada*. The proponent stated that supply vessels would travel at a speed of

12 knots when transiting to and from the MODU and that additional details would be provided in the Project's Environmental Protection Plan.

KMKNO expressed similar concerns as ECCC regarding the potential effects of flaring on migratory birds and requested that formation testing while tripping be used if well testing is required and it meets the requirements of the C-NLOPB.

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

Public

A member of the public requested baseline information on ambient light in the project area and that spectral modified lighting be used where available to mitigate for potential effects. The proponent responded that the project area is assumed to be a dark-sky site given the lack of offshore platforms and low level of existing vessel traffic. The proponent indicated that modified lighting was not available on MODUs and supply vessels that have the technical capability to support the Project. Given the potential short duration of each well (approximately 60 days) and, therefore, potentially the MODU contract, the proponent stated it would not have the flexibility to change lights should spectral modified lighting become available over the lifetime of the Project. The proponent committed to conducting systematic (daily) searches for stranded birds on the MODU and supply vessels using trained personnel in accordance with applicable regulations and guidelines. Results from the monitoring program would be shared publically to improve the understanding of bird strandings and mortality in the Newfoundland and Labrador offshore area.

A member of the public raised the concern regarding the potential for discharges from the Project to cause a reef effect which could cause adverse effects on migratory birds. The proponent described how biological growth on a MODU can increase the reef effect and reiterated that the effect has a neutral net effect on migratory birds.

A member of the public raised concerns regarding the lack of data related to potential oiling of sea birds from discharges of operational waste. The proponent acknowledged the lack of data on the occurrence of oiling of migratory birds around platforms; the frequency, likelihood, persistence, fate, and thickness of sheens resulting from discharges, drilling muds and produced water; the direct effect of sheens on migratory birds; and the effects of sheens on the abundance of pelagic migratory birds in Atlantic Canada. The proponent committed to immediately notifying the Canadian Coast Guard and the C-NLOPB if a sheen is observed during normal operating conditions. The C-NLOPB noted that Morandin and O'Hara (2016) indicated that there is a paucity of data regarding sub-lethal impacts of low-concentration hydrocarbons on marine ecosystems, which provide little information to inform policy and regulatory decisions. Despite that, the Offshore Waste Treatment Guidelines were developed through a review of available information regarding the impacts associated with regulated discharges and the availability of treatment technologies. The C-NLOPB also notes that exploration drilling projects do not normally generate produced water, the primary of source sheen generation around production projects. The largest volume waste stream associated with exploration drilling is treated drill cuttings. When synthetic-based drilling muds are used, the discharged solids would be sampled and analyzed by the proponent to verify that retained synthetic-on-cuttings content is less than 6.9 percent in accordance with the Offshore Waste Treatment Guidelines. As part of the application for authorization, the C-NLOPB would require the proponent demonstrate that its

waste management approach meets the minimum requirements and the expectation of best practice to minimize the production of sheens that could adversely affect birds.

6.3.3. Agency Analysis of Conclusion

Analysis of Effects

Although lighting and flaring from the Project would have the potential to affect migratory birds, the limited spatial and temporal nature of the Project would limit the potential for extensive effects on migratory birds in general. Nevertheless, the impact of creating a lit area in a previously dark-sky site could result in adverse effects on sensitive nocturnal species such as the Leach's Storm-petrel or for those whose foraging paths overlap with the project area.

The effect of project lighting or flaring on migratory birds may be different across the regional assessment area. In portions of the regional assessment area that already experience higher levels of human activity, such as the southwestern portion where there are existing production projects, existing sources of artificial lighting are more numerous. However, the Project would be located in a previously undisturbed area of the regional assessment area with few sources of artificial lighting. Introducing a new source of artificial lighting in a darker portion of the regional assessment area may have a comparatively larger direct effect on migratory birds than introducing an additional source of artificial lighting to an area with a large amount of existing artificial lighting. Nonetheless, the Project may also increase the cumulative effects of lighting on migratory birds by increasing the cumulative artificial lighting footprint of the offshore environment as a whole.

Bird collisions with lit structures are a known problem, particularly for nocturnal migrants and night-flying migratory birds. This problem is of particular concern for the Leach's Storm-petrel, which travels thousands of kilometres to foraging areas far offshore, including the project area, and for which the project lighting would be detectable, regardless of other light sources in the area. Declines in the populations of Leach's Storm-petrel have also been partially attributed to collisions, strandings and contact with hydrocarbons. The Agency agrees with ECCC that the effects of the Project on migratory birds, and this species in particular, would not necessarily be of low magnitude and the effects predictions cannot be made with a high level of certainty.

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. To address ECCC's concern related to uncertainty with estimates of strandings and mortality, the proponent would be required to conduct systematic searches for stranded birds on the MODU and supply vessels using trained observers. Based on these monitoring results, and in consultation with relevant authorities, the proponent would determine if mitigation measures are effective and if additional mitigation measures are required.

Flaring could also have an effect on birds, and alternatives should be considered. Alternative formation testing technology, such as formation testing while tripping could minimize or eliminate the requirement to flare. The C-NLOPB advised that use of formation testing while tripping may be possible depending on site-specific conditions and data requirements. If flaring is proposed, the C-NLOPB's *Measures to Protect and Monitor Seabirds in Petroleum-Related Activity in the Canada-Newfoundland and Labrador Offshore Area* require the proponent notify the C-NLOPB of plans to flare including measures to avoid potential effects on

migratory birds. Prior to authorizing the flaring, the C-NLOPB would consult with ECCC on the plans and appropriateness of proposed mitigation measures, which may include delaying or altering the timing of the flaring activity.

Water curtains are a mitigation measure that have been required for exploratory drilling projects in offshore Nova Scotia and Newfoundland and Labrador, and has been proposed by the proponent. The effectiveness of water curtains in mitigating potential effects from flaring on migratory birds is not fully known, but the Agency is of the view that such measures would provide an overall net benefit and would likely keep some birds away from the flare. The Agency notes that monitoring may be used to ensure the effectiveness of mitigation measures and, as such, would require the proponent to operate a water curtain barrier around the flare during flaring and to monitor its effectiveness.

The Agency is of the view that there remain uncertainties regarding the potential effects of project lighting and flaring on migratory birds, including the attraction distance to lighting and flares as well as mortality rates from collisions and strandings and the magnitude of associated effects. Despite these uncertainties and the potential for cumulative effects, the exploration licences, and the well site itself, occupy a small portion of the ranges of migratory bird species, many of which span vast portions of the northwest Atlantic Ocean. However, this area overlaps directly with important foraging ranges of a number of migratory bird species, including the Leach's Storm-petrel. There is no critical habitat identified within the proponent's exploration licences, and the Agency notes that key western Atlantic migration routes and flyways are generally closer to the coast than further offshore where the Project would take place. In addition, drilling of each well would take approximately 60 days, limiting the duration of the potential effects. Nevertheless, it is possible that migratory birds, including species at risk, could encounter and be harmed by the Project; therefore, it is important for the proponent to implement mitigation and verify its predictions.

In addition to effects of project lighting and flaring, drilling wastes and other discharges and emissions may effect migratory birds. For example, the treated discharge of some operational wastes may cause surface sheening under calm conditions and may affect the structure and function of seabird feathers. 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. With proper management of waste discharge, the likelihood of exposure to surface sheens by migratory birds and any related effects would be low.

Key Mitigation Measures to Avoid Significant Effects

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

- follow ECCC's (2016) *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, conduct formation testing while tripping, or utilize a similar technology, rather than formation testing with flaring;

- if formation testing while flaring is required, notify the C-NLOPB to request an authorization at least 30 days in advance of flaring to:
  - determine whether the flaring would occur during a period of migratory bird vulnerability (identified in consultation with ECCC) along with a description of how the proponent plans to prevent harm to migratory birds; and
  - identify how adverse environmental effects on migratory birds would be avoided, including opportunities to reduce nighttime flaring,;
- operate a water curtain barrier around the flare during flaring; and
- implement all mitigation listed in Section 6.1 related to chemical selection, waste discharge and the disposal of spent synthetic-based muds, as well as those in Section 6.4 related to the maintenance of buffers for supply and support vessels and helicopters over active bird areas and special areas for 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 with ECCC 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 migratory birds from the MODU using a trained observer following ECCC's *Eastern Canada Seabirds at Sea Standardized Protocol for Pelagic Seabird Surveys from Moving and Stationary Platforms*;
  - develop, in consultation with ECCC, and implement a protocol for systematic daily monitoring of the MODU and supply vessels for the presence of stranded birds. The protocol would include information on the frequency of searches, reporting procedures, and training requirements, including qualifications of those delivering the training;
  - if stranded birds are observed, follow ECCC's (2016) *Procedures for Handling and Documenting Stranded Birds Encountered on Infrastructure Offshore Atlantic Canada*;
  - document and report the results of any monitoring activities, including information on level of effort when no birds are found and 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 ECCC. 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 Project on migratory birds would generally be low in magnitude, but could be moderate for certain species, such as Leach's Storm-petrel. Residual adverse effects would either be localized within the immediate vicinity of the project activity or component or could extend several kilometres for effects such as those from light emissions. The effects would be short-term to medium-term for the presence and operation of the MODU and would occur regularly or intermittently for the duration of the Project, but would cease upon well abandonment.

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

6.4. Special Areas

6.4.1. Proponent's Assessment of Environmental Effects

Existing Environment

Special areas (designated because of ecologically or biologically sensitive features) that overlap with the proponent's exploration licences, potential transit routes, as well as those within the zone of influence are provided in Table 4. Figure 2 illustrates the location of special areas in the regional assessment area. Three of the special areas which overlap with the exploration licences, the Northeast Newfoundland Slope Closure marine refuge, the Orphan Spur Ecologically and Biologically Significant Area, and the Seapens Newfoundland and Labrador Shelves Bioregion Significant Benthic Area are designated to protect sensitive benthic features such as corals and sponges. Other special areas include ecologically and biologically sensitive areas designated to protect corals, aggregations of fish, birds, marine mammals and sea turtles including species at risk. Appendix E lists all special areas in the regional assessment area.

Oil and gas exploration activities are not prohibited within the special areas that overlap with the exploration licences; however, all bottom contact fishing activities are prohibited in the Northeast Newfoundland Slope Closure Marine Refuge.

Table 4 Special Areas Within the Zone of Influence[13] of Routine Project Activities

Special Area	Distance from Closest Exploration Licence or Transit Route	Features of the Special Area
Marine Refuges[1]		
Northeast Newfoundland Slope Closure	Overlaps with exploration licences 1145, 1146 and 1148, overlaps with transit route.	High species diversity and contains corals, fish (including several rare or endangered species [Spotted, Northern and Atlantic Wolfish]), marine mammals and birds

13 The zone of influence is defined as a 61 kilometre buffer from the MODU around the exploration licences at which behavioral effects on marine mammals related to underwater sound may occur. The zone of influence is inclusive of the zones of influence for light (16 kilometres) and drill cuttings dispersion (625 metres maximum distance from the West Orphan Basin wellsite with sediment thickness over 1 millimetre).

Special Area	Distance from Closest Exploration Licence or Transit Route	Features of the Special Area
Ecologically and Biologically Significant Areas[2]		
Orphan Spur	Overlaps with exploration licence 1145 and 1148, overlaps with transit route	High concentrations of corals. Densities of sharks and species of conservation concern (e.g., Northern, Spotted, and Atlantic Wolffish, skates, Roundnose Grenadier, American Plaice, and redfish). Birds including Thick-billed Murre, storm-petrels, Black-legged Kittiwake, skuas and jaegers, Northern Fulmar, Greater Shearwater and Dovekie also frequent this area.
Northeast Slope (3L) [referred to as Northeast Shelf and Slope in EIS]	Overlaps with transit route	High aggregations of Greenland Halibut and Spotted Wolfish, which congregate in spring. Concentrations of cetaceans, pinnipeds and corals
Baccalieu Island	Overlaps with transit route	Important for capelin spawning along beaches. Large patches of eelgrass are present. Area around Newman Sound is an important nursery are for demersal fishes. Important areas for sea ducks and half of all tern species colonies.
Eastern Avalon	Overlaps with transit route	Capelin spawning beaches, waterfowl areas and fish-eating bird colonies (Northern Fulmar, Atlantic Puffins, Razorbills, Black-legged Kittiwake, Common Mures, Thick-billed Mures) (Wells et al. 2019). Cetaceans including Killer Whales and mysticetes, leatherback turtles and seals feed in the area from spring to fall (Wells et al. 2019).
Important Bird and Biodiversity Areas[3]		
Quidi Vidi Lake	Overlaps with transit route	Supports a globally significant population of gulls and a nationally significant population of migratory birds. Gulls use Quidi Vidi Lake as a daytime resting site in the late fall, winter and early spring when there is ice on the lake. The following gulls occur in substantial numbers: Herring Gull, Great Black-backed Gull, Iceland Gull, Glaucous Gull, and Common Black-headed Gull.
Witless Bay	Overlaps with transit route (if Bay Bulls Supply Base is used)	Supports a globally significant colony of breeding migratory birds. Great Island supports the largest colony of Atlantic Puffins in eastern North America. Also present in large numbers are Leach's Storm-petrels, Common Murres, Black-legged Kittiwakes and Herring Gulls. Species of migratory birds known to nest on these islands include: Great Black-backed Gulls, Black Guillemots, Thick-billed Murres, Razorbills, and Northern Fulmars. The marine areas surrounding the islands are also

Special Area	Distance from Closest Exploration Licence or Transit Route	Features of the Special Area
		important for migrating sea ducks such as White-winged and Surf Scoter, Oldsquaws and Common Eider.
Newfoundland and Labrador Shelves Bioregion Significant Benthic Areas[4]		
Seapens	Overlaps with exploration licence 1145, 1146, 1148, and transit route	High probability for significant concentration of seapens.
Small Gorgonian Corals	14 kilometres from exploration licence 1145 and overlaps with transit route	High probability for significant concentration of small gorgonian corals.
Large Gorgonian Corals	31 kilometres from exploration licence 1145	High probability for significant concentration of large gorgonian corals.
United Nations Convention on Biological Diversity Ecologically and Biologically Significant Areas[5]		
Seabird Foraging Zone in the Southern Labrador Sea	16 kilometres from exploration licence 1149	Supports globally important populations of marine vertebrates, including an estimated 40 million birds annually. Important foraging habitat for migratory birds, including 20 populations of over-wintering Black-legged Kittiwakes, Thick-billed Murres and breeding Leach's Storm-petrels.
Slopes of the Flemish Cap and Grand Bank	16 kilometres from exploration licence 1149	Contains most of the aggregations of indicator species for vulnerable marine ecosystems in the NAFO Regulatory Area. Includes NAFO closures to protect corals and sponges and a component of Greenland halibut fishery grounds in international waters. A high diversity of marine taxa, including threatened and listed species, are found within the ecologically and biologically significant area.
Vulnerable Marine Ecosystems NAFO Fisheries Closure Areas[6]		
Sackville Spur 6	52 kilometres from exploration licence 1149	Closed to protect extensive sponge grounds. These sponge grounds host a high diversity and abundance of associated megafaunal species (Food and Agriculture Organization of the United Nations, 2019a).

Special Area	Distance from Closest Exploration Licence or Transit Route	Features of the Special Area

[1] Designated under the *Fisheries Act* by the Government of Canada.
[2] Identified by DFO through formal scientific assessments.
[3] Identified by BirdLife International to identify and protect critical bird habitats (n.d).
[4] Identified by DFO Ecological Risk Assessment Framework (2013).
[5] Identified by United Nations Convention on Biological Diversity (n.d.).
[6] Under mandate of Food and Agriculture Organization of the United Nations and NAFO (2019).

Predicted Effects

The potential environmental effects of project activities on special areas that overlap with the exploration licences, as well as those within the zones of influence for effects, were assessed by the proponent. The zone of influence is defined as a 61 kilometre buffer around the exploration licences at which behavioral effects on marine mammals related to underwater sound may occur based on the conservative R_{max} distance estimate. The zone of influence is inclusive of the zones of influence for light for birds (16 kilometres) and drill cuttings dispersion (540 metres maximum distance from the West Orphan Basin well site with sediment thickness over 1.5 millimetre).

Adverse environmental effects on a special area could degrade its ecological integrity such that it no longer protects the components of the ecosystem for which it was designated (e.g., protection of sensitive or commercially important species). The key potential environmental issues and potential environmental changes to special areas as a result of the Project are as follows:

- change in habitat quality from underwater sound and increased light levels from the presence of project components and activities;
- physical disturbance and sedimentation of the seabed (benthic environment) from the discharge of drill cuttings and muds;
- alteration of sediment quality in terms of oxygen depletion and nutrient enrichment, which may reduce species diversity and abundance; and
- effects on water quality due to discharges into the marine environment (e.g., from organic matter, deck drainage, bilge water, produced water)

Five special areas were identified by the proponent for which the zone of influence for project activities could overlap with special areas:

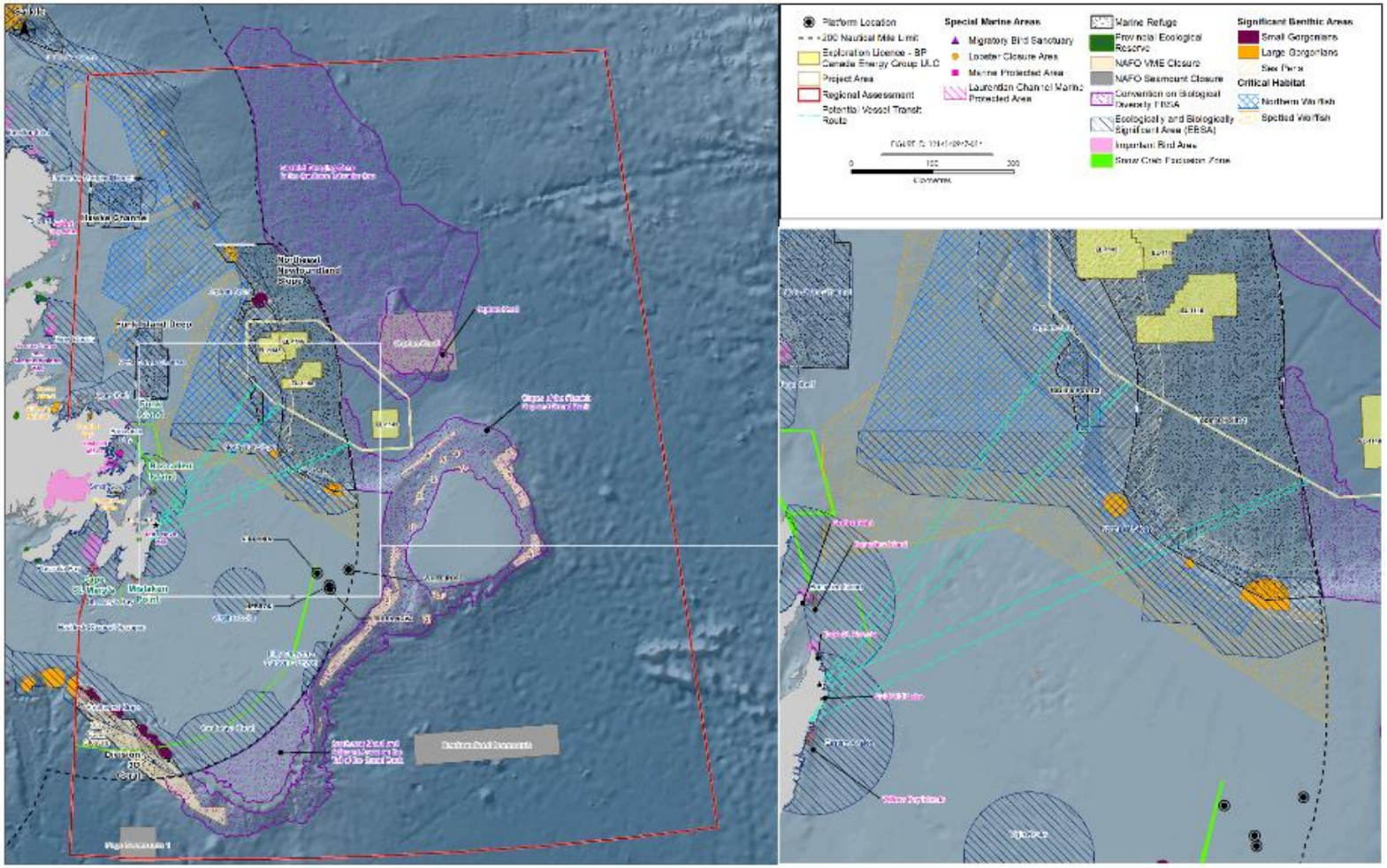
- Northeast Newfoundland Slope Closure marine refuge – potential temporary effects on habitat quality due to underwater sound, artificial light, and drill cuttings;
- Seabird Forging Zone in the Southern Labrador Sea Ecologically and Biologically Significant Area (Convention on Biological Diversity) – no predicted effects from light emissions or drill cutting

deposition. Potential effects from underwater sound from project activities if wells are drilled in the northwest portion of exploration licence 1148 or 1149.

- Slopes of the Flemish Cap and Grand Bank Ecologically and Biologically Significant Area – no predicted effects from light emissions or drill cutting deposition. Potential effects from underwater sound from project activities if wells are drilled in the northwest portion of exploration licence 1149.
- Orphan Spur Ecologically and Biologically Significant Area – potential effect on habitat quality from underwater sound and light emissions, depending on the well locations within exploration licence 1145, 1146, and 1148. Effects on habitat quality from drill cuttings deposition are unlikely but could occur depending on well location within exploration licence 1145 or 1148.
- Eastern Avalon Ecologically and Biologically Significant Area (DFO) – supply vessels may transit through the area potentially impacting habitat quality due to intermittent and transient underwater sound from supply vessels. No predicted effects on habitat quality due to project activities occurring within the exploration licences.

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

Figure 2 Locations of Special Areas within the Regional Assessment Area



Source: BP Canada Energy Group ULC, IR-48-02

6.4.2. Views Expressed

Federal Authorities

DFO advised that although oil and gas exploration activities have been prohibited in Marine Protected Areas designated under the *Oceans Act*, the special areas which overlap with the Project's exploration licences include a Marine Refuge designated under the *Fisheries Act* and an Ecologically and Biologically Significant Area and a Significant Benthic Area which have no regulatory protections. There are currently no prohibitions related to oil and gas activities within these special areas.

The Agency raised a concern with the proponent's conclusion that the effects of the Project would be reversible when the proponent intends to abandon wellheads in place. The proponent acknowledged that abandoning the wellhead in place would represent a permanent change in habitat within a special area for those special areas in which drilling may occur.

The Agency noted that seapen habitat within the Northeast Newfoundland Slope Closure marine refuge was not described and potential effects on habitat quality from discharges and emissions had not been assessed. The proponent responded that the four habitat variables mud, minimum salinity, depth and gravel would be important in predicting seapen presence in the Newfoundland offshore. The proponent noted that seapens found in the Newfoundland Offshore can provided microhabitats for up to fourteen species and can be found over a wide range of depths (100 to less than 2000 metres). The proponent stated that seapens could be smothered causing mortality, reduced growth rates, reduced larval settlement and a change in fauna composition and that this could affect the species dependent upon them.

DFO and ECCC advised that the mitigation measures, monitoring, and follow-up programs proposed by the proponent as well as those recommended by the Agency would adequately address the potential effects of the Project on special areas.

Indigenous Peoples

KMKNO, Conseil des Innus de Ekuanitshit, and Première Nation des Innus de Nutashkuan expressed concern about the effects of project activities associated with exploration licences 1145, 1146 and 1148, which are located within the Northeast Newfoundland Slope Closure marine refuge. KMKNO requested a benthic sampling program to determine infaunal recolonization rates following drilling. Conseil des Innus de Ekuanitshit and Première Nation des Innus de Nutashkuan were concerned that a precautionary approach was not being used in allowing oil and gas exploration within a marine refuge. The proponent stated that proposed mitigation measures, including pre-drill and post-drill seabed investigation, would protect special areas and that environmental effects monitoring for recovery rates for infaunal organisms is typically not required for exploration drilling programs.

KMKNO raised further concerns that the proponent's assessment of effects did not consider drill cuttings, water-based muds, synthetic-based muds, and barite on marine species in the Northeast Newfoundland Slope Closure marine refuge. The proponent stated that it is possible that drilling cuttings and muds may release metals and organic compounds that may accumulate in benthic organisms. However, several bioaccumulation studies using water-based mud found that metal concentrations in exposed animal tissues were similar to those in the tissues of unexposed animals. The proponent further stated that the environmental effects monitoring for the White Rose production project has demonstrated no significant

difference in plaice fillets or crab tissue collected in the White Rose Oilfield and the reference areas. Synthetic-based muds can cause a decrease in species diversity and density in the short-term due to a reduction in available oxygen. However, the proponent stated that recolonization of benthic habitat typically approaches baseline conditions within two years of drilling at distances of 200 to 600 metres from the well site. Based on the White Rose environmental effect monitoring program, elevated barium concentrations can extend up to two kilometres from the source; however, all but two of the samples were found to be non-toxic to amphipod survival.

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

Public

A member of the public was concerned with the reversibility of effects given the slow recovery rates for corals and sponges. The proponent maintained that although the recovery rate of corals is slow the benthic ecosystems are expected to recover.

6.4.3. Agency Analysis and Conclusion

Analysis of Effects

Several special areas overlap with the proponent's exploration licences, the potential transit route, or are within 61 kilometres (i.e., the predicted zone of influence for behavioral effects on marine mammals related to sound) of the exploration licences (see Table 4) based on the conservative R_{max} distance estimate. Several special areas are designated based on the presence of sensitive benthic features, including aggregations of corals and sponges. These features could be affected by the Project, most notably from local sedimentation and burial due to discharge of drilling muds and cuttings. The proponent predicted that drill cuttings deposition would exceed one millimetre over a maximum area of approximately 0.081 and 0.035 square kilometres around the wellhead for the West Orphan Basin and East Orphan Basin sites, respectively.

The Northeast Newfoundland Slope Closure marine refuge has an area of approximately 55 353 square kilometres. All of exploration licences 1145, 1146 and 1148 (combined area of 6789 square kilometres) are within the Northeast Newfoundland Slope Closure marine refuge, covering approximately 13 percent of it. The Seapens Newfoundland and Labrador Shelves Bioregion Significant Benthic Area also overlaps 39 percent of exploration licences 1145, 1146 and 1148. However, drilled wells would have limited footprints and zones of influence within the exploration licences, resulting in limited potential effects within these two special areas.

A small portion of exploration licence 1145 overlaps with the Orphan Spur Ecologically and Biologically Significant Area. Exploration licence 1145 comprises less than one percent of the Orphan Spur Ecologically and Biologically Significant Area. As noted above, drilled wells have limited footprints and zones of influence within exploration licences, resulting in limited effects in the Orphan Spur Ecologically and Biologically Significant Area.

The Agency is of the view that key mitigation measures described in Section 6.1 and Section 6.2 would also mitigate the potential effects within the Northeast Newfoundland Slope Closure marine refuge, Newfoundland and Labrador Shelves Bioregion Significant Benthic Area for Seapens and the Orphan Spur

Ecologically and Biologically Significant Area, as well as the other special areas which may be impacted by project activities.

As outlined in Section 6.1, the proponent would be required to conduct benthic surveys prior to drilling to determine the presence of aggregations of habitat-forming corals, sponges, seapens or any other environmentally sensitive features. Should these features be identified, the proponent would be required to relocate the well or redirect discharges to ensure that sensitive features would not be affected, if technically feasible. If it is determined that it is not technically feasible to relocate the well or redirect cuttings discharges, the proponent would be required to conduct a comprehensive assessment of the benthic habitat in consultation with DFO and the C-NLOPB prior to drilling to determine the potential for serious harm or alteration of coral, sponge and seapen aggregations and related options for mitigation to reduce any identified risks.

The Agency notes advice from DFO that habitat-forming aggregations of corals and sponges are not limited to designated special areas, and that protections for these features should not be limited to or be more robust within special areas. 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 well site, regardless of special area designation because corals and sponges are not limited to the special areas.

In addition to the mitigation measures that would be consistently applied across all areas of the exploration licences, the proponent would also be required to conduct follow-up monitoring when drilling in or adjacent to a special area.

Taking into account these mitigation and follow-up measures, DFO has advised that potential effects to benthic habitat, including within special areas, would likely be negligible.

Other special areas that could be affected by the Project are protected, at least in part, based on the important habitat they provide for birds. For instance, Quidi Vidi Lake Important Bird and Biodiversity Area located within St. John's and Witless Bay Islands Important Bird and Biodiversity Area, located within the Eastern Avalon Ecologically and Biologically Significant Area, overlap with the transit routes depending on if the supply base is located in St. John's or Bay Bulls, respectively. As described in Section 6.3, helicopters and supply vessels may disrupt migratory birds along transit routes.

The Agency is of the view that key mitigation measures for migratory birds (Section 6.3) would also mitigate the effects on special areas and the migratory birds and bird species at risk found within them. ECCC (2017) guidelines state that helicopters and other aircraft should keep well away from breeding colonies, and ECCC further advised that supply vessels should generally keep a minimum distance of 300 metres from colonies. ECCC advised that the colonies of greatest concern are the coastal Important Bird and Biodiversity Areas in closest proximity to St. John's. In consideration of the *Guidelines to Avoid Disturbance to Seabird and Waterbird Colonies in Canada* and the input from ECCC, the proponent would be prohibited from operating aircraft over the Cape St. Francis and Witless Bay Islands Important Bird and Biodiversity Area at an altitude of less than 300 metres. The Newfoundland and Labrador's *Seabird Ecological Reserve Regulations, 2015,* prohibit motorized vessels within 20 to 100 metres of the area during the nesting season. Supply vessels would use shipping lanes, where they exist, 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 proponent, expert advice from federal authorities, and comments from Indigenous groups. The Agency expects that mitigation measures proposed for Section 6.1, Section 6.2, and Section 6.3 would also mitigate potential effects on special areas. The Agency identified the following additional key measures to mitigate the Project's effects on special areas:

- restrict helicopter flying altitude to a minimum altitude of 300 metres (except during take-off and landing) over 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 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).

Follow-up

The Agency identified the following measures as part of a follow-up program, to be developed in consultation with the C-NLOPB and DFO, 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 a level above the biological effects threshold. Monitoring would 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 DFO;
  - results should be provided to Indigenous groups and posted online for public access; and
  - implement all mitigation listed in Section 6.1, Section 6.2, Section 6.3, and Section 6.6.

Agency Conclusion

The Agency determined that the adverse residual environmental effects of the Project on special areas would be low-magnitude, occur locally, and occur continuously or regularly during drilling operations.

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

6.5. Species at Risk

6.5.1. Proponent's Assessment of Environmental Effects

Several fish, marine mammal, sea turtle, and bird species at risk protected by the *Species at Risk Act* or by the COSEWIC[14] have been identified as potentially occurring in the regional assessment area (see Appendix D). The proponent also considered species listed by the International Union for the Conservation of Nature. Several of these species may be found in the project area year-round, while others may be present only during certain times of year, on a transient basis. For example, many of the identified bird species at risk are shorebirds and land birds, which would not regularly be found in the project area, but could be present during species migration.

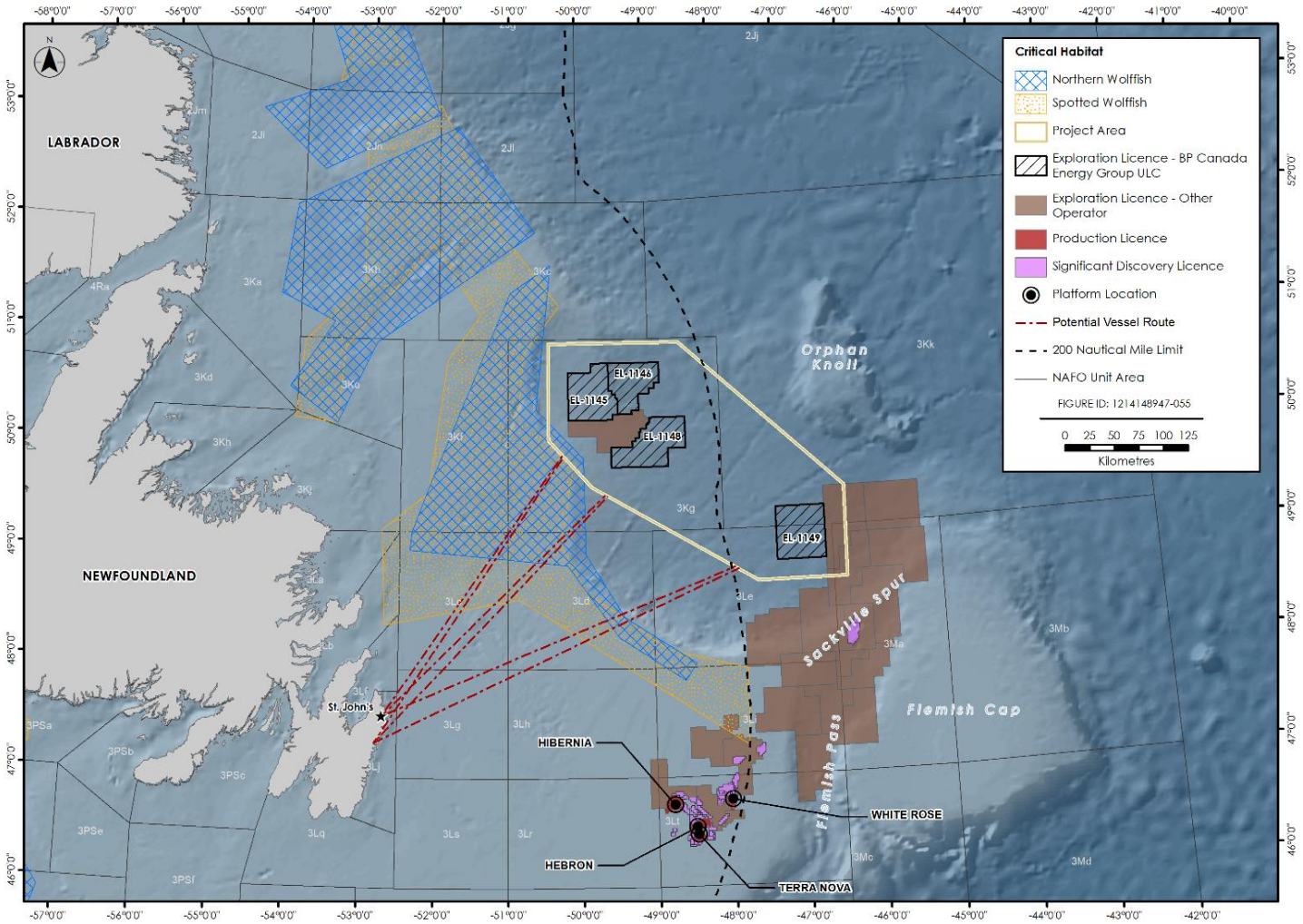
The *Species at Risk Act* requires the implementation of management plans, recovery strategies and/or action plans, depending on the category of risk, for species listed as at risk on Schedule 1. These documents describe the potential threats to the species and habitats, and actions required to ensure protection of the species. The proponent identified recovery strategies, action and management plans for species at risk with the potential to be affected by the Project, taking into consideration the identified threats to the species and the contribution of the Project to these threats. The proponent identified a key threat to many of the species at risk as chronic oil pollution in marine waters and habitat loss due to oil or contaminant spills. The proponent maintained that managing discharges in accordance with the *Offshore Waste Treatment Guidelines*, the MARPOL, and the *Offshore Chemical Selection Guidelines* would reduce the threats to species at risk.

There is no critical habitat for species at risk for fish, birds, marine mammals or sea turtles in or near the project area. Critical habitat has been proposed for the Northern and Spotted Wolfish located 16 and 30 kilometres, respectively, from exploration licence 1145 and the transit route would intersect with the proposed critical habitat (Figure 3). Approximately 0.6 percent of the proposed Northern Wolffish critical habitat overlaps the project area, though not the exploration licences, along a portion of the Northeast Newfoundland Slope Closure marine refuge. The proponent indicated that the geographic distribution of wolfish species is quite large, with high concentrations occurring outside the project area.

The proponent predicted that the type and nature of the potential effects of the Project 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, Section 6.2, and Section 6.3).

[14] Collectively, these are referred to as species at risk for the purposes of the Agency analysis in this EA.

Figure 3 Proposed Critical Habitat for Northern and Spotted Wolffish



Source : BP Canada Energy Group ULC, CL-16

6.5.2. Views Expressed

Federal Authorities

DFO required additional information on the link between the habitat within the exploration licences, project area and local assessment area, and the life history requirements of stages of the fish and marine mammal species at risk, including wolfish. The proponent provided further information and indicated no update was required to the effects assessments on these species.

ECCC and DFO reviewed the assessments of effects on species at risk and critical habitat provided by the proponent. The departments confirmed that the potential effects on species at risk would be the same as those effects described in Section 6.1, Section 6.2, and Section 6.3 and that the information provided satisfies requirements under Subsection 79(2) of the *Species at Risk Act*. ECCC and DFO advised the Agency that the mitigation measures, monitoring, and follow-up programs proposed by the proponent as well as those recommended by the Agency would adequately address the potential effects of the Project 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 Section 6.1, Section 6.2, and Section 6.3.

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

6.5.3. Agency Analysis and Conclusion

Analysis of Effects

The Agency examined the Project's potential effects on species listed under Schedule 1 of the *Species at Risk Act* and species identified by COSEWIC (Appendix D), with advice from DFO and ECCC, the lead federal agencies responsible for administering the *Species at Risk Act*. Based on this input, the Agency is in agreement with the proponent that potential effects on species at risk would be the same as those effects described in Section 6.1, Section 6.2, and Section 6.3.

While there is no current critical habitat for any species at risk within the project area, the Agency notes that the amended *Recovery Strategy for the Northern Wolffish and Spotted Wolffish and Management Plan for Atlantic Wolffish*, published in 2018, identifies proposed critical habitats for Northern and Spotted Wolffish. The Recovery Strategy identifies proposed critical habitats for Northern and Spotted Wolffish based on attributes necessary for wolfish recovery, i.e., water temperatures and depths. Further, the proposed critical habitat has been identified based on an Area of Occurrence Approach, which recognizes that the critical

habitat is not comprised of the entire area but identifies that within the boundaries, the functions and features necessary for the species survival or recovery exist (DFO 2018b). [15]

Approximately 0.6 percent of the proposed critical habitat for Northern Wolffish overlaps with the project area; however, there is no overlap with the Project's exploration licences. Exploration licence 1145 is closest to the proposed Northern Wolffish critical habitat, approximately 16 kilometres. At this minimum distance from any potential well site, the proposed critical habitat is outside the predicted zone of influence for drill cuttings dispersion (i.e., a maximum of 540 metres from the discharge point for cuttings deposition thickness above the 1.5 millimetre deposition thresholds[16]. There could be overlap between the zone of influence for light emissions and underwater sound with the proposed critical habitat for wolffish. There is the potential for sound to result in avoidance behaviour of wolffish; however, effects would be limited based on the small amount of overlap and the distance of the exploration licences from the critical habitat. DFO 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 described in Section 6.1, Section 6.2, and 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 described in Section 6.1, Section 6.2, and 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 In Section 6.1, Section 6.2, and Section 6.3, the Agency concludes that the Project is not likely to cause significant adverse environmental effects on federal species at risk.

6.6. Commercial Fisheries

6.6.1. Proponent's Assessment of Environmental Effects

Existing Environment

Commercial fishing is an important component of the socioeconomic and cultural environment in Newfoundland and Labrador. Fishing activity, locations and fishing gear vary throughout the year and between fisheries. While some fisheries are operational year-round, other fisheries have well-defined seasons. Canadian domestic fisheries operate primarily on the continental shelf, including on the slopes

[15] 2018 Recovery Stategy [proposed] https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/recovery/wolffish-northern-spotted-atlantic-strategy-management-plan.html#toc20

[16] The predicted no effect threshold is considered to be a deposition thickness of greater than or equal to 6.5 milimetres when benthic communities comprised of sedentary or slow moving species, may be smothered and the sediment quality altered in terms of nutrient enrichment and oxygen depletion.

along the Orphan Basin, and the Grand Banks and Labrador Shelf (Figure 4). Within the project area, Greenland Halibut accounts for approximately 43 percent of the landed weight, while Northern Shrimp and Snow Crab combined comprise approximately 57 percent. Groundfish make up less than one percent of the total landed weight. International fisheries also operate in the regional assessment area; Canadian harvest accounted for approximately 73 percent of the total catch weight between 2012 and 2017. Overall, however, the project area is in an area with relatively low levels of commercial fishing activity compared to other areas offshore Newfoundland and Labrador.

For conservation reasons, the shrimp fisheries in NAFO Divisions 3LMNO, which overlap with the project area and regional assessment area, are under a fishing moratorium. Likewise there is a fishing moratorium for Atlantic Cod and Atlantic Plaice in NAFO Divisions 2J+3KL and 3LMNO respectively. While currently under moratorium it is possible that some level of harvest for these species in these areas might be reinstated within the temporal scope of the Project.

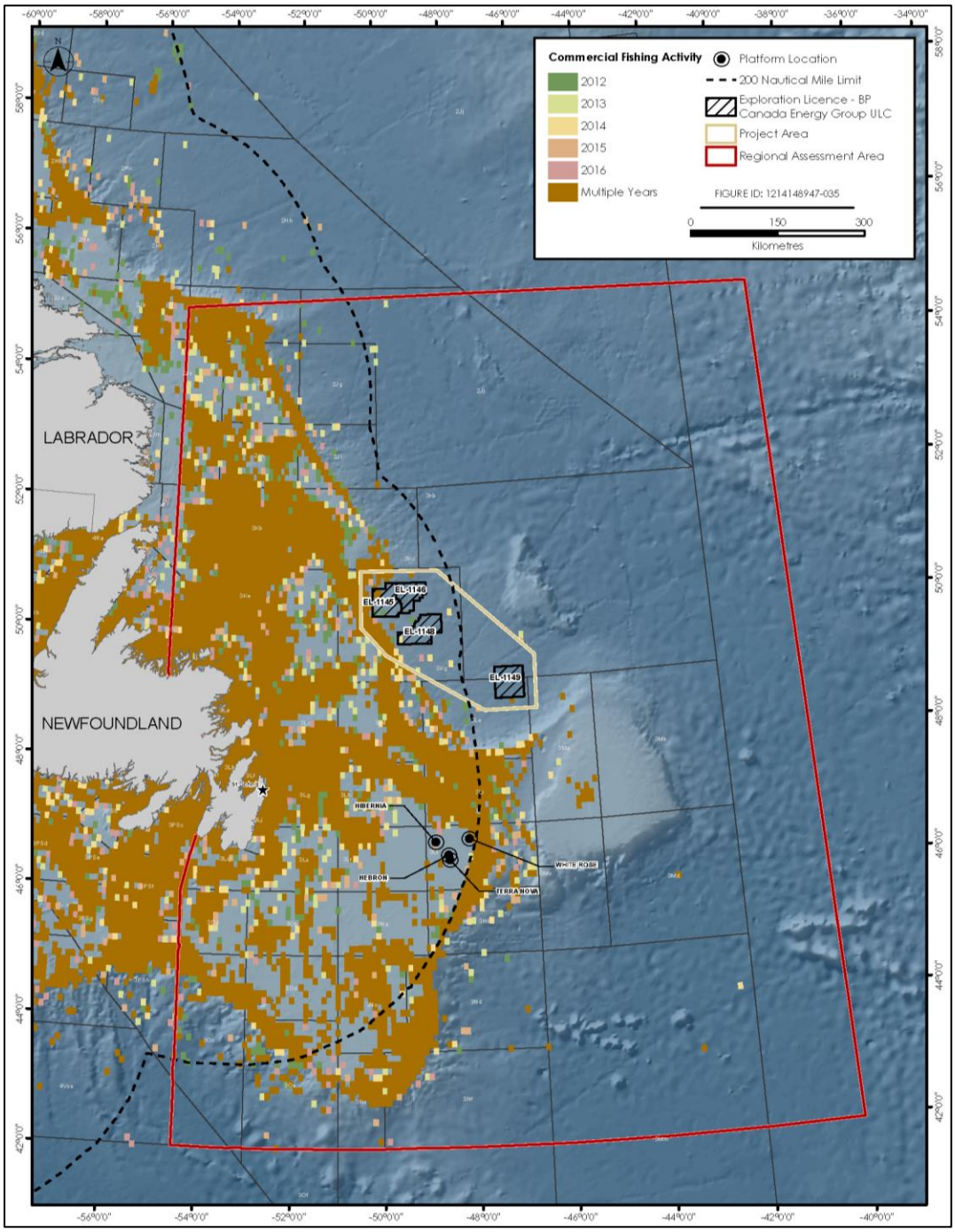
Figure 4 illustrates domestic commercial harvest locations offshore Newfoundland and Labrador between 2012 and 2016.

Five Indigenous groups in Newfoundland and Labrador hold communal commercial fishing licences for a variety of species that overlap with the project area, including those for inshore and mid-shore groundfish, Greenland Halibut, scallop, seal, shrimp, tunas, swordfish, Snow Crab, and a pelagic fishery access (herring, mackerel, and capelin) which occurs close to shore.

All of the Indigenous groups located in Nova Scotia, New Brunswick, and Prince Edward Island hold communal commercial licences within the regional assessment area, including licences for groundfish, tuna, lobster, swordfish, and eel. Of these groups, 15 hold communal commercial licences for swordfish and/or tuna in areas that overlap with the project area and regional assessment area.

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

Figure 4 Domestic (Canadian) Harvesting Locations, All Species, All Months, 2012 to 2016.



Source: BP Orphan Basin EIS, 2018

Predicted Effects

Access to fishing areas could be restricted during exploration drilling through the establishment of a safety exclusion zone around the MODU which would prohibit commercial fishing and non-project-related vessels

from the area, creating a localized fisheries exclusion zone. The temporary restriction of access has the potential to lower economic returns for commercial fishers for the season; however, the project area is in an area with relatively low levels of commercial fishing activity and a 500 metre radius safety exclusion zone would cover approximately 0.8 square kilometres. Further, the Northeast Newfoundland Slope Closure marine refuge which overlaps with exploration licences 1145, 1146 and 1148, restricts bottom contact fishing activity, which would substantially reduce the amount of harvest activity occurring in the area of the exploration licences, therefore reducing the potential for interaction with commercial fishers.

The discharge of drilling muds and cuttings and other wastes, could change sediment and water quality, potentially affecting the quality of commercial fish species. However, results from offshore drilling and production environmental effects monitoring programs have shown negligible effects on commercial species. Discharges and emissions would be treated in accordance with applicable guidelines.

Wellheads left in place after abandonment would protrude from the seafloor, potentially interacting with fishing gear, which could result in damage and lost time or catch. The planned maximum height above the seafloor would be 3.7 metres which would not interact with mid-water fishing gear. Bottom contact fishing is prohibited in the Northeast Newfoundland Slope Closure marine refuge.

Supply and servicing operations, as well as the transit of the MODU to the drill site, may interact with commercial fishing activity, however supply and servicing vessels would follow common vessel shipping routes and would select the most appropriate routes once near the project area. The proponent indicated that supply and servicing traffic would only provide a small increase in existing marine traffic levels, and that commercial fishers are aware of and have become accustomed to operating around supply vessels moving throughout offshore Newfoundland and Labrador.

Underwater sound associated with VSP, the presence of the MODU, and supply vessels has the potential to startle fish, causing temporary avoidance and reducing catchability. Given the small amount of commercial harvest in the project area, and the reduced commercial fishing activity due to the Northeast Newfoundland Slope Closure marine refuge, it is unlikely a substantial change in availability of resources would be created.

6.6.2. Views Expressed

Federal Authorities

The Agency required information on active fisheries in the Northeast Newfoundland Slope Closure marine refuge that do not utilize bottom contact gear. The proponent stated that, in areas of overlap between the Northeast Newfoundland Slope Closure marine refuge and the project area, based on available data from 2016, there was an active the Snow Crab pot fishery, Greenland Halibut gill net fishery, and a small amount of redfish caught by gillnet. Prohibitions of bottom contact fishing within the Northeast Newfoundland Slope Closure marine refuge came into effect in 2018, as such there is a delay in the overlap of data that is to be considered. DFO indicated that there has been no crab fishery in the marine refuge since the area were closed to bottom contact fishing.

DFO advised the Agency that the mitigation measures, monitoring, and follow-up programs proposed by the proponent as well as those recommended by the Agency would adequately address the potential effects of the Project on commercial fishing.

Indigenous Peoples

KMKNO and Nunastiavut Government requested information on the involvement of Indigenous groups and communal commercial fishers in the development of the proposed compensation programs for damaged or lost fishing gear. The proponent confirmed that compensation claims would be discussed during ongoing engagement with Indigenous groups and fisheries stakeholders. The proponent indicated that a single point of contact would be designated to address grievances and claims and that it would adhere to guidelines related to compensation defined by the C-NLOPB.

KMKNO, MTI and Nunatsiavut Government requested further information on the Indigenous Fisheries Communication Plan. The proponent stated that draft communication plans would be shared for discussion with Indigenous groups and fishery stakeholders, and that engagement would continue throughout the life of the Project. It also stated that the Indigenous Fisheries Communication Plan and the Fisheries Communication Plan would be similar, but that the Indigenous Fisheries Communication Plan may include an outline of consultation and/or engagement responsibilities as a result of any Agency conditions, along with information on the proposed system for communication, conflict resolution and claims management. The proponent indicated that the results of monitoring and follow-up programs would be published and Indigenous groups and One Ocean would be notified.

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

Public

The Fish, Food and Allied Workers - Unifor commented on the potential physical and socioeconomic effects of the Project on commercial fisheries, including consideration of cumulative effects. Concerns included restricted access to fishing areas, potential effects on future fisheries as the fisheries are in flux, and the need to alter fishing to mitigate issues related to increased traffic.

6.6.3. Agency Analysis and Conclusion

Analysis of the Effects

Commercial fishing is a key economic activity offshore Newfoundland and Labrador. While the extent of commercial fishing varies across offshore areas there is low domestic and international fish harvest recorded within the project area relative to other areas in offshore Newfoundland and Labrador, as illustrated in Figure 4, and less within the boundaries of the exploration licences. However, harvest locations are influenced by a variety of factors, and could occur in different areas in future.

Potential effects of the Project on commercial fisheries include loss of access to fishing grounds, damage to fishing gear, vessels, or equipment, as well as potential effects on fish and fish habitat affecting commercial fisheries. The potential effects of the Project on fish and fish habitat are described in Section 6.1.

Loss of access to fishing grounds could occur if fishers are displaced by safety exclusion zones created around the MODU. The exploration licences overlap with 1.8 percent of the area of NAFO Division 3K and 3L (Table 5); therefore, for a single MODU, commercial fishing would be excluded from a less than one percent (0.0001 percent; 0.8 square kilometre area) of NAFO Divisions 3K and 3L. Given that only a

fraction of NAFO Divisions overlap with applicable exploration licences, only a fraction of this overlapping area would be affected by safety exclusion zones (Table 5).

Table 5 Area and Overlap between Exploration Licences 1145, 1146, 1148 and 1149, Northwest Atlantic Fisheries Organization Divisions, and Safety Exclusion Zones

Area and Overlap	Newfoundland Orphan Basin Exploration Drilling Project
Total Area of Project Exploration Licences (1145, 1146, 1148, 1149)	9 432 square kilometres
NAFO Division overlapping with Project Exploration Licences	3K, 3L
Size of NAFO Divisions that overlap with Project Exploration Licences	518 077.99 square kilometres
Safety Exclusion Zone Area for Single MODU	0.8 square kilometres
Percentage of NAFO Divisions that would Overlap with Project Exploration Licences	1.8 percent
Percentage of NAFO Divisions that would Overlap with One Safety Exclusion Zone	0.000154 percent

Calculation ranges are based on a minimum safety exclusion zone with a 500 metre radius.

Supply and servicing operations have the potential to interact with commercial fisheries that may operate within transit routes. The risk of interaction in the transit route is greater than potential for interaction with fishing gear in areas where drilling-associated activities are occurring. Fishing gear, in particular crab pots, set in the transit route areas are weighted to the bottom with an attached buoy(s) at the surface. This creates potential for entanglement. The proponent would utilize shipping lanes where they exist, follow direct routes to well site, and implement safety exclusion zones. Effective communication between the proponent and fishers would reduce the potential for interactions and a compensation program would be available in case of incident.

Damage to fishing gear could potentially occur as a result of direct interference with supply vessels. The proponent would utilize shipping lanes where available and otherwise follow direct routes to and from the exploration licences. Effective communication between the proponent and fishers would be important to aid in reducing the potential for interactions and a compensation program would be available in case of an incident

Following completion of the well evaluation program, wells may be suspended or abandoned. Abandoned wells may have the wellhead removed or left in place depending on water depth. The proponent would seek approval from the C-NLOPB to abandon the wellhead in place. If a well is suspended (for a period limited by the C-NLOPB) or if 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 proponent would be required to include information on planned well termination. In its assessment, the C-NLOPB would consider the planned approach to well termination including consideration of geographic location, water depth, and the potential for the wellhead to interfere with fisheries. The C-NLOPB would require the proponent to engage fishers on the abandonment strategy in case of potential interference. The C-NLOPB would consult DFO if there is uncertainty regarding the potential for interference. Commercial fishers, including Indigenous fishers, would be notified of the wellhead abandonment strategy and location of the abandoned wellhead if the C-NLOPB determined well suspension or abandonment above the mudline is appropriate.

The 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 proponent's liability for any damage to fishing gear caused by contact with the wellhead. The proponent would be required to consider 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. In the unlikely event that damage or loss of fishing gear was caused by contact with wellhead infrastructure, the proponent would be required to provide compensation to the injured party consistent with their obligations in civil law. If the proponent and a fisher were unable to resolve such a claim, the fisher could seek relief through the court. The C-NLOPB has advised the Agency that they are not aware of interference between suspended or abandoned wellhead infrastructure and fishing gear.

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. The proponent would be required to develop and implement a Fisheries Communication Plan. The plan would be developed in consultation with both Indigenous and commercial fishers and the C-NLOPB. It would include communication objectives, participants and key contacts, and would provide guidance and instruction related to ensuring interested parties are kept up to date with respect to operational activities and accidental events. Parties would also have the ability to provide feedback.

Key Mitigation Measures to Avoid Significant Effects

The Agency considered the mitigation measures proposed by the proponent, expert advice from federal authorities, and comments from Indigenous groups and the public, and identified the following key measures to mitigate the Project 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 exclusion 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 MODU 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 DFO, regarding planned project activities, including timely communication of drilling locations, safety exclusion zones, and suspended or abandoned wellheads; and
- implement all mitigation listed in Section 6.1 related to providing the results of the seabed investigation survey, wellhead abandonment procedures, selection of chemicals, disposal of spent synthetic-based muds and the discharge of waste.

The Agency also notes that the proponent has committed to developing a Fishing Gear Damage or Loss Compensation Program, based on best practices, precedents and industry guidelines, as well as in accordance with applicable C-NLOPB requirements to address any unplanned interactions between the Project and commercial fishing equipment.

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 associated with the Project, including supply vessels.

In addition, the Fisheries Communication Plan Le promoteur demanderait à l'OCTNLHE l'autorisation de laisser la tête de puits en place would provide a means of identifying potential issues should they arise.

Agency Conclusion

The Agency determined that adverse residual environmental effects of the Project on commercial fishing, including communal commercial fishing, are predicted to be low in magnitude, localized, and short-term.

Taking into account the implementation of the mitigation measures, the Agency concludes that the Project is 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 Socioeconomic Conditions of Indigenous Peoples

6.7.1. Proponent's Assessment of Environmental Effects

Existing Environment

Fishing for food, social, and ceremonial purposes is an important activity for Indigenous communities. DFO issues fishing licences to communities to authorize fishing activities for food, social, and ceremonial purposes, and the Indigenous communities included in the EIS hold these types of licences. Multiple species of fish are or have been harvested for food, social, and ceremonial purposes, including Atlantic Salmon, American Eel, mackerel, flounder, Gaspereau, Lobster, clams, oysters, and scallops. The preference for certain species varies across communities and based on regional differences. 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 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 proponent's engagement activities), the proponent concluded that food, social, or ceremonial fishing (including marine mammal and bird harvesting) is unlikely to overlap with the project activities under normal operations. Since there is unlikely to be direct geographical overlap between project activities and most Indigenous communities' activities, the proponent's assessment focused on marine migratory species of interest that may have potential to interact with the Project 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 overlap with the project area. The potential effects of the Project on these licences is discussed in Section 6.6.

Predicted Effects

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

The proponent acknowledged that American Eel and 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 proponent predicted that there would be a very low likelihood of interactions between project activities and American Eel 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 interactions to result in a decrease in the overall nature, intensity, distribution, quality, or cultural value of salmon fishing by Indigenous communities.

Given the importance of Atlantic Salmon to Indigenous groups, the proponent supports and recommends research on the presence and distribution of Atlantic Salmon which includes potential new studies through the ESRF that has issued a new call for proposals on May 15, 2019 for environmental and social studies related to Atlantic Salmon. The proponent has expressed an interest in this or other research being undertaken collaboratively with Indigenous organizations, and recommended the results be available to existing or future regional databases and proactively shared with government, Indigenous groups, and the public.

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

- the localized nature of Project activities;
- the short duration of Project 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.

6.7.2. Views Expressed

Several Indigenous groups, including KMKNO and MTI, have indicated that the proponent did not use Indigenous knowledge in its valued components (e.g., Atlantic Salmon, Bluefin Tuna, swordfish) baseline information or environmental effects analysis. Indigenous groups advised that traditional knowledge be used to assist in developing mitigation, environmental protection plans, and project monitoring. The proponent noted Indigenous groups were invited to share knowledge related to the Project and its potential effects. The proponent has also committed to continue to accept and consider knowledge, inputs and perspectives as part of ongoing engagement initiatives. The proponent indicated that it had received information related to Indigenous knowledge through engagement with Indigenous groups, including the importance of, and reliance on Atlantic Salmon and other species as a food source, and in cultural and traditional medicine practices. However, given that the project area is over 343 kilometres from any Indigenous community and that no Indigenous groups hold, claim or assert Aboriginal or Treaty rights or otherwise undertake traditional activities within or near the project area, the proponent is of the view that the use of secondary sources of information, and the Indigenous knowledge that it did consider, are sufficient. Despite the proponent's response, KMKNO maintained that, without gathering primary sources of information from Indigenous groups, the proponent's assessment of effects on Indigenous groups, such as health impacts of a spill, is insufficient.

Potential effects to Atlantic Salmon populations was a key concern for all communities. Analysis of the potential effects to Atlantic Salmon is included in Section 6.1 of this report. Conseil des Innus de Ekuanitshit requested additional research be conducted to address the data gap identified with migration patterns of Atlantic Salmon. The proponent responded that it is contributing to a mandatory industry-wide research fund which is planning on funding a project to study Atlantic Salmon migratory patterns,

abundance, behaviour, and the declining numbers of some species. However, the Agency requested that the proponent further consider the potential impacts of the Project on species of interest to Indigenous communities through the lens of current use including Atlantic Salmon, American Eel, swordfish and Bluefin Tuna. The proponent reviewed existing information in response to Indigenous concerns and maintained that the assessment and conclusions as presented in the EIS remained accurate.

The majority of Indigenous groups who provided comments were dissatisfied with the proponent's lack of follow-up or monitoring measures for effects on species of cultural importance, and recommend that follow-up or monitoring measures be developed in consultation with all communities. Several groups including MTI noted that it would be beneficial to implement an Indigenous advisory committee and Indigenous Guardian-type program whereby Indigenous communities, could be involved in monitoring oversight, and emergency response readiness, including provisions for training capacity. The proponent 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.

KMKNO, MTI and Nunatsiavut Government raised concerns regarding the amount of Indigenous involvement with the development of the Fisheries Communication Plan, as well as monitoring and follow-up programs. The proponent committed to: engage with Indigenous groups throughout the life of the Project; consult on its Indigenous Communications Plan. Also, if required by the Agency, it would consult on the frequency and format of communications, and notify Indigenous groups when results of monitoring and follow-up programs are published on the Internet. In April 2019, a group of proponents of offshore exploration drilling projects in the eastern Newfoundland and Labrador offshore area, including the proponent of this Project shared a proposed joint Indigenous Communications Plan for comment by Indigenous communities. The Plan shows how the companies propose to communicate with Indigenous communities during exploration operations and in the case of an emergency.

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 Project's 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.

No food, social, and ceremonial fishing was reported in the project area. 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 project operations. The proponent would also be required to implement measures to mitigate effects to fish and fish habitat, marine mammals and sea turtles, and migratory birds (refer to Section 6.1, Section 6.2, and Section 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 socioeconomic conditions of Indigenous peoples as a result of 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 measures to mitigate effects described in Section 6.1, Section 6.2, Section 6.3, and Section 6.6 would also mitigate effects on the current use of lands and resources for traditional purposes and the health and socioeconomic 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 socioeconomic conditions of Indigenous peoples and notes that there are related measures proposed in Section 6.1, Section 6.2, Section 6.3, and Section 6.6.

Agency Conclusion

The Agency concludes that the adverse residual environmental effects of the Project on current use of lands and resources for traditional purposes and health and socioeconomic conditions of Indigenous peoples throughout the regional assessment area would be negligible in magnitude.

Taking into account the implementation of the mitigation measures described in Section 6.1, Section 6.2, Section 6.3, and Section 6.6, the Agency concludes that the Project is not likely to cause significant adverse environmental effects on the current use of lands and resources for traditional purposes and health and socioeconomic 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.

7.1.1. Proponent's Assessment of Environmental Effects

The proponent identified a number of potential accident scenarios that could occur including vessel collisions, dropped objects, loss of MODU stability or structural integrity, and loss of well control. Although the causes and consequences of these scenarios can vary, the proponent's assessment focused mainly on the potential effects of an unplanned release of hydrocarbons. The proponent analyzed historical data to predict the probability of a spill, and conducted spill fate and behaviour modelling for marine diesel batch spills and subsea blowouts.

Probability of Hydrocarbon Releases

The proponent calculated the probability and potential frequency of spills based on a review of national and international records of historical offshore spills. It estimated that the probability of a very small hydrocarbon batch spill (less than one barrel) was considerably higher at 1.50 spills per well drilled (i.e., one spill per 0.67 wells), than the probability of a small batch spill of petroleum (one to 49.9 barrels) was 0.0145 per well (i.e., one spill per 69 wells). The probability of a medium (50 to 999 barrels) to large (greater than 1000 barrels) batch spill occurring is lower than a small spill. The probability of a synthetic-based mud spill occurring is 0.0833 for spills less than 50 barrels and 0.0233 for synthetic-based mud spills between 50 and 999 barrels.

The probability of a blowout incident is extremely low. Based on the historic frequency of well blowouts in Atlantic Canada, the probability of occurrence is calculated as 0.0026 spills per well drilled or one blowout for every 382 exploration wells. In consideration of drilling technology advancements and Canadian drilling standards, the likely number of blowouts over the life of the Project (assuming up to 20 exploration wells) is 0.0062. These probabilities do not imply the release would be a worst-case scenario, only that there would be a release as a result of a blowout.

Methods for Spill Modelling and Effects Thresholds

Modelling of subsea blowout incidents and instantaneous, small-scale batch spills of diesel was conducted to predict the fate and behaviour of released hydrocarbons, and to inform the assessment of potential effects. In the event of a hydrocarbon spill, the trajectory, fate, and resultant environmental effects would be determined by the specific location, timing, and nature of the release, as well as the environmental conditions and species present at the time of the event.

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determined by the specific location, timing, and nature of the release, as well as the environmental conditions and species present at the time of the event.

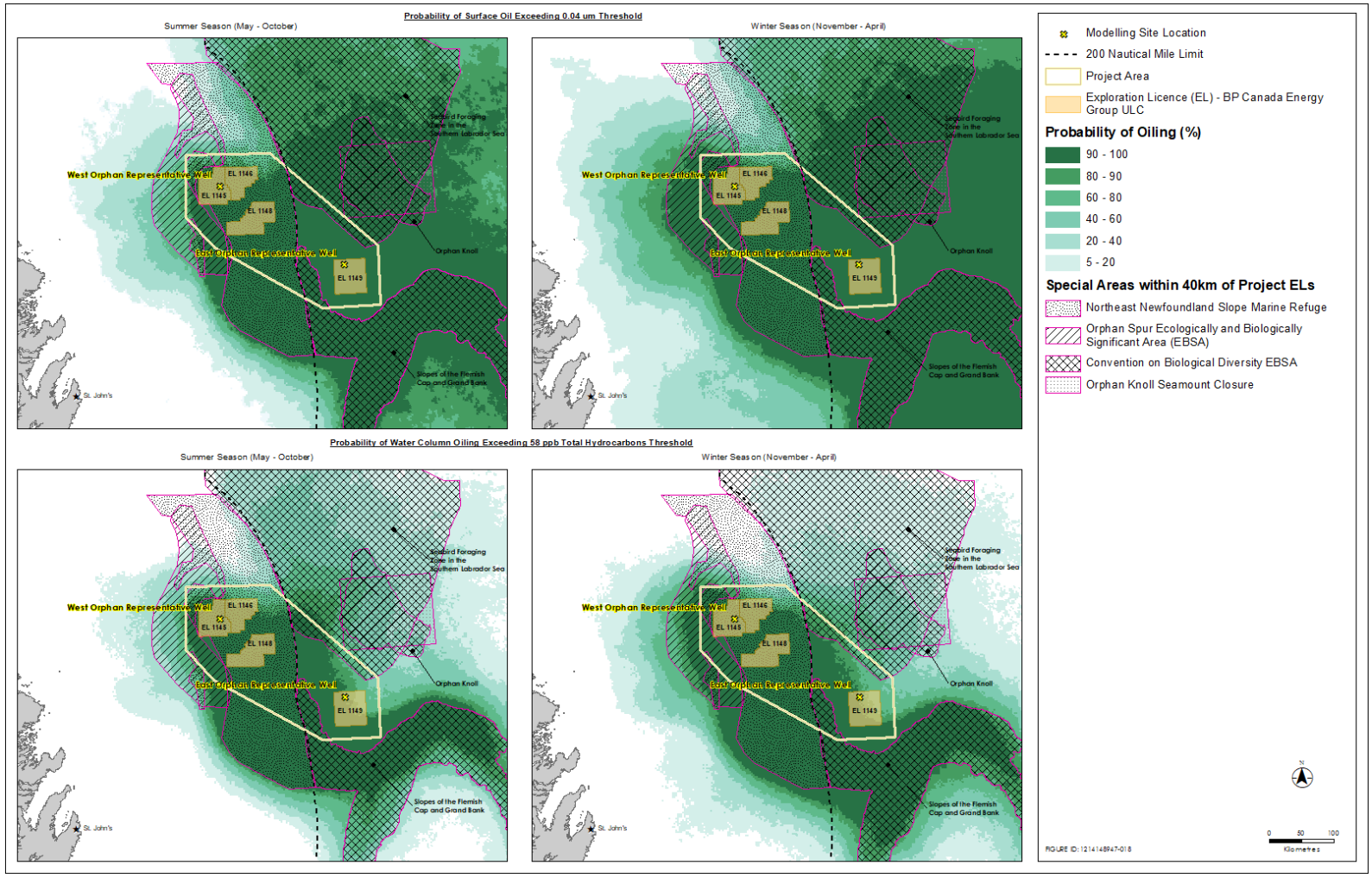
The hypothetical spill scenarios modelled by the proponent were modelled at two possible drilling locations in the exploration licences to evaluate the potential impact of water depth and proximity to sensitive receptors (see Figure 5 for the West Orphan Basin and Figure 6 for the East Orphan Basin). For the blowout scenarios, spill durations were based on estimated maximum timelines for spill response to stop oil flow (i.e., 30 days for a capping stack and 120 days for a relief well), and took account of seasonality (i.e., modelling was conducted for both summer and winter). The modelled scenarios were run without mitigation and, therefore, probabilities of oil presented below also assume no mitigation. However, in a real event response measures would be implemented where possible.

The probably of potential effects considered thresholds for surface oil thickness, shoreline oiling, and in-water oil concentrations, as described in Table 6. Modelled scenarios were run until the amount of oil in the system fell below these thresholds.

Table 6 Thresholds for Effects from Hydrocarbon Contamination

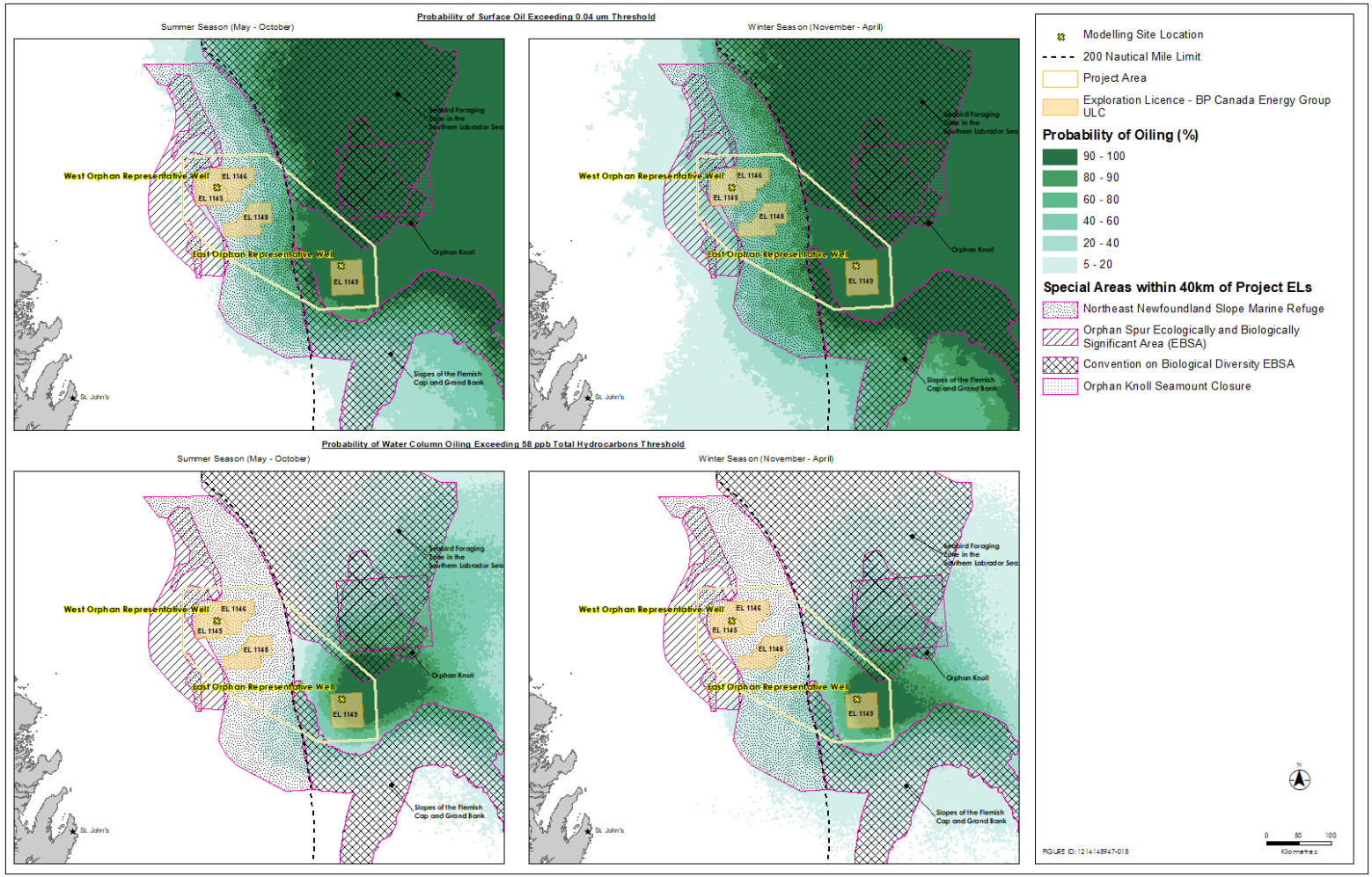
Threshold Type	Selected Threshold	Rationale/Comments
Surface Oil Thickness	0.04 micrometres	Potential for socio-economic effects (e.g., fisheries closure) in the presence of a barely visible or silver sheen on the water surface.
Shoreline Oil Mass	1.0 gram per square metre	Potential to trigger the need for shoreline clean-up.
In-Water Concentration (dissolved and entrained, top 100 metres)	58 parts per billion total hydrocarbons	Potential acute exposure to dispersed oil, based on the toxicity of chemically dispersed oil to various aquatic species.

Figure 5 West Orphan Basin Well Blowout (Unmitigated 120 day Relief Well Worst-case Scenario) – Probability of Surface and Water Column Oiling in Special Areas within 40 kilometres of BP Exploration Licences



Source: BP Canada Energy Group ULC (2019) Revised IR-49

Figure 6 East Orphan Basin Well Blowout (Unmitigated 120 day Relief Well Worst-case Scenario) – Probability of Surface and Water Column Oiling in Special Areas within 40 kilometres of BP Exploration Licences



Source: BP Canada Energy Group ULC (2019) Revised IR-49

Fate and Behaviour of a Blowout

For all of the modelled subsea blowout scenarios, stochastic modelling predicted areas with the highest potential likelihood (over 90 percent) to exceed the thresholds for effects would be to the east and south of the release sites in the West Orphan Basin spill scenarios, and to the east and north of the East Orphan Basin spill scenarios.

The West Orphan Basin subsea blowout stochastic modelling worst-case scenario (120 day unmitigated blowout) predicted zero percent probability of surface oil thickness exceeding the threshold in near coastal waters in summer, but increasing to five percent probability in winter. If surface oil was to enter the nearshore area of Newfoundland during the winter season, it would take a minimum of 50 days to arrive. In the East Orphan Basin blowout scenarios there was a one percent probability of surface oil being present in the near-coastal waters of the Avalon Peninsula during the winter months, taking a minimum of 70 days to arrive.

Stochastic modelling results indicated that shoreline contact from either of the modelled subsea blowout scenarios is unlikely. The highest probability of shoreline contact resulting in exceedance of shoreline mass threshold was five to seven percent in the West Orphan Basin winter, worst-case scenario (unmitigated 120 day release requiring a relief well). Less than five percent probability of shoreline contact was predicted for the other modelling scenarios. Arrival time for shoreline oiling ranged from 27 to 145 days for scenarios where beaching of oil occurred. No shoreline contact was predicted for either of the summer capping stack scenarios.

Stochastic model results indicated that there is potential for spill effects exceeding threshold levels beyond the regional assessment area boundary, and in some instances reaching Saint-Pierre and Miquelon, France, Greenland and the Azores, with a minimum time for first shoreline contact greater than 50 days.

For the scenarios described above, deterministic modelling in both the West Orphan Basin and East Orphan Basin predicted that for the 120 day spill scenarios the majority of oil released would be dispersed, biodegraded and evaporated, with less than one percent predicted to remain on the surface after 160 days. In both scenarios, shoreline oiling exceeding thresholds was predicted to be limited to the Avalon Peninsula. In the West Orphan Basin the maximum length of shoreline impacted, 20 kilometres, was predicted to occur after 119 days, and the maximum mass of oil accumulated on the shoreline (403 tonnes) is predicted to occur after 107 days which represents 0.03 percent of the total oil released. In the East Orphan Basin, maximum shoreline impacted (27 kilometres) is predicted to occur after 132 days and the maximum mass of oil accumulated on the shoreline (271 tonnes) would occur after 98 days which represents 0.06 percent of the total oil released.

Potential Effects of Blowouts on Valued Components

Modelling results were used to assess the potential environmental effects of a blowout 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 species present within the affected area.

Fish and Fish Habitat

Accidental events could interact with fish and fish habitat by affecting habitat use and quality, and fish mortality or physical injury. Potential effects pathways include: reduction in water and/or sediment quality; reduced primary productivity; and effects from acute or chronic exposure to water-soluble fractions of hydrocarbons.

There may be temporary declines in phytoplankton abundance following a subsea blowout in the immediate area. Zooplankton that cannot avoid exposure and experience sub-lethal effects would expel contaminants once the spill has subsided. Likewise, in the immediate area of the spill, there could be lethal effects where phytoplankton, fish eggs, larvae or juveniles are located; however this would be short-term due to dilution and weathering, the ability of mobile species to detect and avoid areas, and the ability of some species and life stages to metabolize hydrocarbons.

Following a blowout, larval and juveniles fish species are considered to be at greatest risk as they are less mobile than adults and have shown higher sensitivities to lower concentrations of hydrocarbons. Conversely, adult pelagic and benthic fish species are considered to have lower exposure risk as they are highly mobile and have the ability to avoid oiled areas. The risk to benthic invertebrates is considered moderate to high, varying based on mobility and how they are using the sediment.

Most fish species in the regional assessment area spawn in a variety of large areas over long time scales. As the area affected by a spill is unlikely to encompass all spawning locations for any given species or to overlap with the entire spawning period which may be many months or the entire year, it is unlikely that an entire year class would be lost due to the toxic effects to early life stages of fish species from a large blowout. However, fish that spawn or occur in nearshore areas and shallow reef zones are at higher risk of chronic exposure in areas of shoreline oiling or contamination of sediment.

Marine Mammals and Sea Turtles

Marine mammals and sea turtles could experience mortality, injury, or changes in habitat quality and use if exposed to hydrocarbons through external coatings of oil, inhalation of aerosols of particulate oil and hydrocarbons, and consumption of contaminated prey. There are varying results from studies examining the ability of marine mammals to detect and/or avoid oil contaminated waters. Some studies have documented that cetaceans and seals behave normally in the presence of oil, whereas other studies indicate that individuals avoid surface slicks. Unlike marine mammals, it is unknown if sea turtles are able to detect oil spills, but evidence suggest that they do not avoid oil at sea.

Fur-bearing marine mammals, such as seals, may experience reduced thermoregulation abilities and reduced locomotion, when in direct contact with oil, which may result from swimming through and surfacing in floating oil while feeding and moving to and from haul-out sites. However, in healthy seals hypothermia is not likely a major problem since they rely primarily on blubber for insulation.

With respect to marine mammal species at risk and their critical habitat (i.e., Northern Bottlenose Whale), a five percent or less chance that surface oil would exceed visible sheen thresholds in the Gully Marine Protected Area was predicted for one to three days. It is not expected to alter valued habitat of the Gully Marine Protected Area beyond a point which would not sustain the population or community.

Migratory Birds

Accidental spill scenarios may potentially result in a change in risk of mortality or physical injury and/or a change in habitat quality and use for migratory birds. Risk of mortality or physical injury due to exposure to hydrocarbons can occur through external exposure (resulting in coating of oil on feathers), inhalation of particulate oil and volatile hydrocarbons and ingestion of oil. With respect to a change in risk of mortality or physical injury, although there may be direct effects on nesting habitat following a subsea blowout, there is greater potential for direct effects on foraging habitats at sea. Hydrocarbon exposure within foraging habitat may result in hypothermia and deaths of affected birds. While some birds may survive the immediate effects, long-term physiological changes may eventually result in lower reproductive rates or premature death. In the event of a nearshore spill, effects may be greatest within the vicinity of a nesting colony, as the largest number of adult birds rest on the waters around the colony for extended periods of time, and on diving species which spend most of their time on the sea surface.

In relation to a change in habitat quality and use, hydrocarbon spills are not likely to permanently alter the quality of migratory bird habitat; however, prey availability may be reduced or migratory birds may avoid affected habitat. Seabird colonies and special areas important to migratory birds could be affected by nearshore surface oiling and/or stranding of oil from an unmitigated well blowout. The implementation of mitigation measures would reduce the probability of a spill extending beyond the regional assessment area, and likely reduce the magnitude, duration, and geographic extent of the spill and associated residual environmental effects.

With respect to migratory birds species at risk and their critical habitat (i.e., Roseate Tern), a five percent or less chance that surface oil would exceed visible sheen thresholds in the waters adjacent to Sable Island National Park Reserve was predicted for one to three days. It is not expected to alter valued habitat of Sable Island National Park Reserve beyond a point which would not sustain the population or community.

Special Areas

Recognizing that the probability of a blowout during the life of the project is predicted to be low (0.0062), the proponent identified domestic and international marine protected areas and special areas that may be affected by a worst-case scenario unmitigated event. Within Canada, the special areas within the zone of influence of routine project activities (Table 4), as well as others in close proximity to the exploration licences, such as the Northeast Flemish Cap NAFO vulnerable marine ecosystem, are predicted to experience surface oil and dispersed and dissolved oil in the water column, in the event of a major blowout. In addition, the model predicted a less than five percent probability of stranded oil intersecting the shoreline of provincial parks and other special areas in Newfoundland. However there is less than a six percent probability of surface oil intersecting the Gully Marine Protected Area and waters adjacent to Sable Island National Park Reserve depending on the spill location and response scenario.

As well, the modelled worst-case scenario for unmitigated events predicted stranded oil may reach protected and special areas in St. Pierre and Miquelon, France and Azores, Portugal; while surface oil and dissolved and dispersed oil in the water column may reach protected and special areas in Azores, Portugal and marine protected areas in areas beyond national jurisdiction managed by the OSPAR Commission . The marine protected area with the highest probability of surface oil (87 percent) is the Charlie-Gibbs South High Seas Marine Protected Area located in the mid-Atlantic approximately 800 kilometres to the east of the Project. However, there is less than a five percent probability of stranded oil from these scenarios

intersecting protected areas on international shorelines, depending on the spill location and response scenario.

Potential effects from a spill on a special area could include changes in habitat quality, and may degrade the ecological integrity such that it is not capable of providing the same ecological function for which it was designated. These effects would be closely linked to effects on other valued components, particularly the biologically valued components which have been discussed above.

Commercial Fisheries

A release of hydrocarbons could interact with commercial fisheries through a change in availability of resources for harvest. A subsea blowout could potentially alter the ability of fishers to harvest fish, affect the biological health of commercial fish species, reduce the marketability of fish products, or result in lost or damaged fishing gear. Fisheries for various species could be affected, and potential effects could potentially occur in various fishing regions, including NAFO Divisions 2J+3KLMNO.

Direct effects from a subsurface release include the potential fouling of fishing gear and vessels in the immediate area of a spill as well as the temporary suspension of commercial fishing activity. Furthermore, any change in the abundance, distribution, or quality of marine resources could have an effect on commercial fisheries. Tainting could result from the uptake of hydrocarbons by exposed fish, which may pose a potential threat to human consumers and affect the marketability of catches. It was noted that even after exposure levels have returned to levels safe for consumption, market perceptions of poor product quality can persist thereby prolonging potential effects on fishers.

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

An accidental event could result in indirect and direct effects on Indigenous communities and activities. If a subsea blowout was to occur, it is possible that hydrocarbons would reach active communal commercial fishing areas where harvesting is likely to occur, resulting in the potential for adverse effects on availability of fishery resources, access to fisheries resources, and fouling of fishing gear, and potential effects to socioeconomic aspects in Indigenous communities. In the case of a spill, surface oiling could have short-term effects on communal commercial fisheries due to closed areas restricting access. The presence of hydrocarbons may temporarily affect habitat quality and risk of mortality for migratory birds and seals, animals identified by Indigenous groups as important. In addition, there is also potential for adverse effects from a spill to change current Indigenous use of lands and resources for traditional purposes, including to food, social and ceremonial harvest. While there is no known food, social, and ceremonial harvest in the project area, species harvested for food, social, and ceremonial purposes (e.g., Atlantic Salmon, American Eel) have the potential to migrate through the area. While traditional food may currently be a small portion of the communities' diet, it is important considering the food insecurity faced by some community members, therefore perception that a spill would result in a negative effect to the fishery with impacts to the quality of life within communities is a concern of Indigenous groups.

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Additional Considerations

Fate, Behaviour, and Effects of Batch Diesel Spills and Synthetic-Based Mud Spills

As noted previously, the most likely types of spills would be smaller, operational batch spills. These spills could occur during routine loading, discharging, and bunkering operations or a larger diesel spill could occur as a result of a vessel collision. Although smaller spills may occur more often, the average volume is 0.72 barrels.

The proponent modelled the fate and behaviour of two hypothetical surface release batch spills of diesel at each of the East Orphan Basin and West Orphan Basin model sites. Modelled results indicated less than one percent probability of surface oiling in excess of sheen thresholds extending beyond 25 kilometres in the summer, or extending beyond 15 kilometres in the winter months. In addition, the predicted total hydrocarbon concentrations and dissolved oil concentrations were within tens of metres of the surface, as they are the result of entrained oil from wind-induced surface breaking waves within the surface mixed layer. Modelling also indicted that surface oil would rapidly evaporate and disperse into the water column. In the 100 barrel batch spill scenario, approximately 60 percent of the spill is predicted to evaporate from the surface within three days of the release, with the remaining portions dispersing or biodegrading within the same period. The proponent noted that results were similar for both West and East Orphan Basin modelling sites.

With respect to potential changes in habitat quality and use, modelling results indicate that diesel spilled from the MODU or supply vessels is likely to evaporate and disperse within days following the release. In the immediate vicinity of a batch spill, fish, marine mammals, and sea turtles are not likely to experience biological effects on a large scale. There is the potential for mortality of some birds, as a result of ingestion and hypothermia, and those that survive may potentially experience long-term physiological changes resulting in lower reproductive rates or premature death. Foraging birds have the potential to become oiled and bring hydrocarbons back to the nest contaminating eggs or nestlings. However, the number of birds affected would be limited due to the short time and small area covered by the diesel batch spill.

The proponent also modelled the fate and behaviour of an accidental surface release of diesel. The modelling indicated that within the first 30 days the majority of diesel would evaporate, disperse, or biodegrade. Response measures would be initiated in less than 30 days therefore reducing the spatial extent of the spill and associated environmental effects on marine fish and fish habitat, and migratory birds. A diesel spill has the potential to change the risk of mortality or physical injury for marine mammals or sea

turtles given the behavior of the species influences the likelihood of their being oiled. Probabilities of lethal effects on exposure varied between species groups. However, diesel fuel would disperse faster than crude oil, therefore limiting the potential for surface exposures. In addition it is expected that most marine mammals would avoid surfacing in areas of harmful hydrocarbon concentrations.

The analysis of a synthetic-based mud spill was based on modelling conducted for CNOOC International Flemish Pass Exploration Drilling Project, located south of the project area. The proponent considered this appropriate given the similarity in depth between the two projects while noting the ambient currents at the West Orphan Basin and East Orphan Basin locations appear to be more variable and stronger than those in the CNOOC International Flemish Pass Exploration Drilling Project exploration licence 1144. However, this implies that the synthetic-based muds would be transported over a greater distance and result in a thinner layer compared to those for the CNOOC International Flemish Pass Exploration Drilling Project.

Synthetic-based muds are heavy, dense muds that sink rapidly through the water column and therefore would behave differently than spilled oil. For synthetic-based mud spills, the predicted area and thickness of the footprint varies based on spill scenario, location of the spill, water depth, and time of the year. Based on CNOOC International Flemish Pass Exploration Drilling Project modelling, an accidental surface release of synthetic-based mud would likely reach the seafloor within a maximum of one kilometre from the drilling site, but this distance would be much less in certain circumstances, such as a release from the wellhead versus the surface.

Although the effects of a synthetic-based mud spill on marine mammals, sea turtles, and migratory birds would be adverse, they would likely be localized. In relation to fish, effects related to a synthetic-based mud spill would generally be restricted to smothering of sessile or slow moving individuals and sedimentation. Acute toxicity of synthetic-based muds is low and would not result in adverse effects from contamination of marine biota or habitats.

An accidental spill of synthetic-based muds would also have the potential to result in a small, thin surface sheen resulting in potential effects on migratory birds, marine mammals and sea turtles with respect to change in physical injury or mortality and habitat quality and use. However, given the temporary nature and limited size of the sheen, only individuals in the immediate area would be potentially affected. Further, given the low surface oil thickness required for the sheen to form, it is expected that the effects on marine mammals and sea turtles would be minor and unlikely to result in mortality.

Effects of Dispersants

Dispersants may be used in spill response, and although they can accelerate the degradation of spilled oil, there is the potential to increase hydrocarbon exposure throughout the water column to plankton and pelagic fish. For example, fish in early life stages may experience short-term exposure to toxic concentrations of oil in the water column and to persistent components that remain bioavailable, resulting in sub-lethal effects. However, fish larvae or egg mortalities would not be expected to cause population or community level effects.

Potential effects of dispersed oil on birds is similar to potential effects of untreated oil (e.g., effects on plumage insulation, thermoregulation). In addition, dispersants and dispersed oil may cause ophthalmic effects which could lead to partial or complete loss of vision and ultimately affect foraging ability and survival of some migratory birds. While dispersed oil is considered to result in fewer adverse effects on

marine mammals and birds due to a reduction in the exposure to floating oil on the sea surface, dispersant use in close proximity to various species may expose feeding or swimming marine mammals and birds to skin or fur contamination, consumption of contaminated plankton, and potential clogging of baleen.

With respect to corals, modelling suggests that deep-water dispersed oil would be localized to the area of the wellhead and that risks to corals are low based on the predictions of low water column concentrations in the deeper and colder waters at the ocean bottom.

Prevention, Preparedness and Response Measures

The proponent 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 proponent would be prepared for a potential accident or malfunction. The proponent's response strategy includes well control, well intervention and oil spill tactical response strategies (Appendix B).

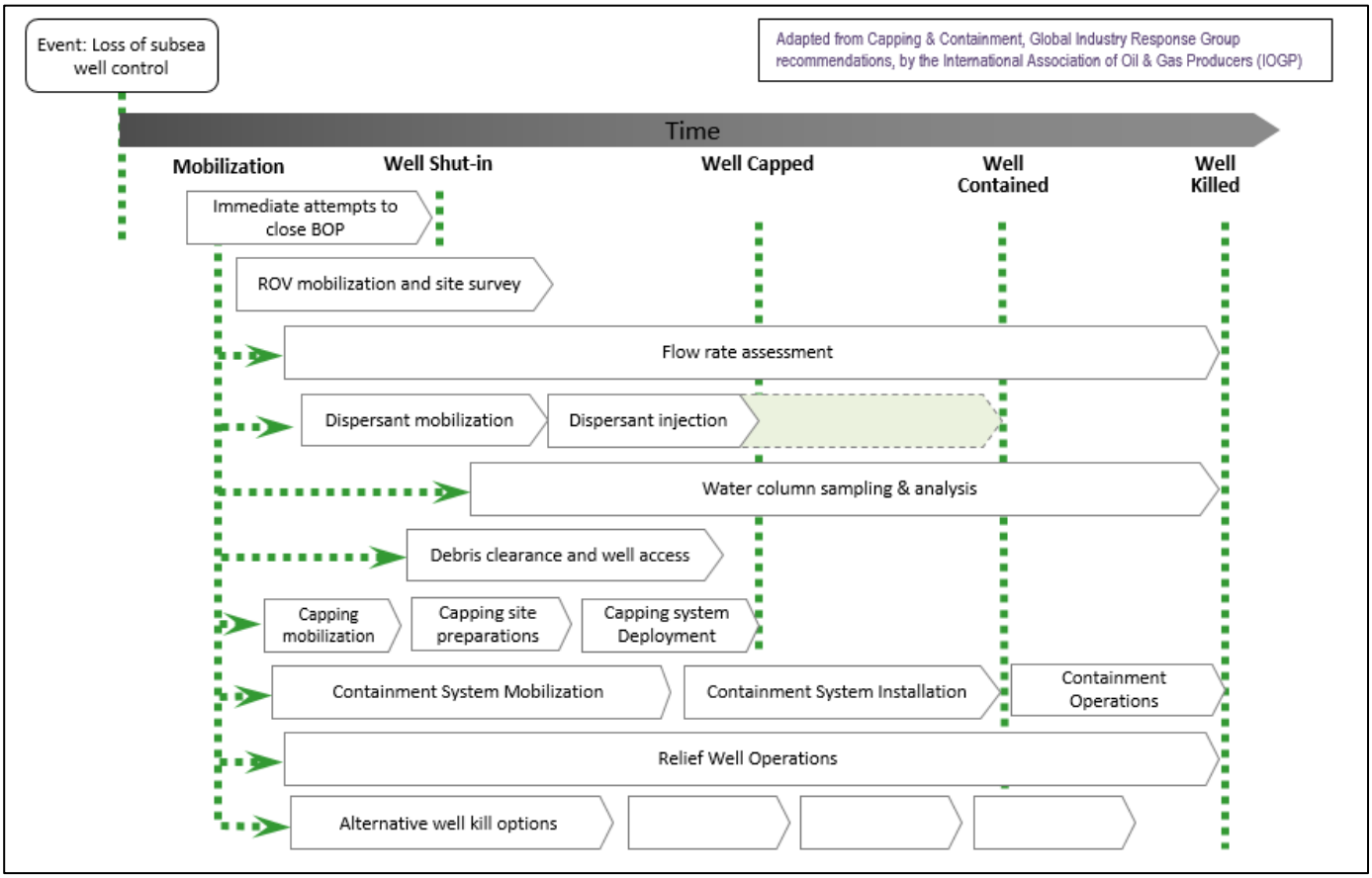
Well Control Response Strategies

The proponent would have primary barriers to maintain well control and prevent kicks (e.g., continuous monitoring, managing and controlling drilling and formation fluid density, pressure and circulation) and secondary barriers to regain well control (e.g., blowout preventer system). In the event that these measures were to fail and an uncontrolled release occur, the proponent would launch multiple simultaneous activities to respond to and stop the flow of hydrocarbons (Figure 7), including blowout preventer intervention, mobilization and installation of a capping stack, and drilling of a relief well if required.

If required, a capping stack would be used to temporarily cap well flow while work is being undertaken to permanently stop the flow of the well (e.g., through drilling of a relief well). Once in place, the capping stack would have a design life of six months to two years. A capping stack would be sourced from Norway and would be transported directly to the well site by a specialized vessel, or delivered to an airport in either Gander, Newfoundland and Labrador, or Halifax, Nova Scotia, depending on suitability for receipt and onward transfer. The mobilization and deployment of a capping stack by vessel is expected to range from 13 to 17 days, depending on weather conditions, vessel cruising speed and if there is a need for a port call. The most likely timing for mobilization and installation of an air-freightable capping stack is nine days. A number of simultaneous activities would be conducted in preparation for the capping stack deployment (Figure 7).

A relief well would be required to permanently eliminate well flow. The proponent would develop a relief well plan as part of the Source Control Contingency Plans. Initiation of a relief well drilling plan would begin at the time of the release and in parallel with the deployment of the capping stack. If a relief well is needed, a MODU would be mobilized to the site to drill the relief well. The relief well is generally drilled as a vertical hole down to the planned deviation where it is turned to the target well using directional drilling technology and tools. Considering the time for mobilization as well as additional activities that would be required, the proponent estimated it could take up to 120 days to drill the relief well.

Figure 7 Generic Sequence of Response for Source Control



Source: BP Canada Energy Group ULC, 2018

Spill Response

The proponent would prepare a Spill Response Plan to outline details of response methods that could be used in the event of a spill. Tactical response measures and activities that would be considered following a spill incident, include surveillance and monitoring, mechanical containment and recovery, dispersant planning and application, in-situ burning, shoreline protection and clean-up measures, and oiled wildlife response. The proponent would engage Indigenous groups, fishery stakeholders, and regulatory authorities in the development of the Spill Response Plan, prior to its submission to the C-NLOPB as part of the operating authorization process. The Spill Response Plan would outline the options and procedures necessary to respond outside the Canadian exclusive economic zone, given there is a possibility that the oil from a blowout may reach international waters and the shorelines of other countries. In addition, a Wildlife Emergency Response Plan would be developed in cooperation with experts in wildlife response in the offshore area of Newfoundland and Labrador.

The proponent would undertake a spill impact mitigation assessment (also known as a net environmental benefit analysis) to qualitatively evaluate the risks and trade-offs for all feasible and effective response options, when compared to no action to inform the overall spill response strategy. The spill impact mitigation assessment would inform the selection of response options considering ecological,

socioeconomic, cultural resources and safety of responders. It would be used during pre-spill contingency planning and if needed, during incident response. If identified as a preferred response option, the use of chemical dispersants would not occur without approval from the C-NLOPB.

7.1.2. Views Expressed

Federal Authorities

NRCan required information related to the potential effects of oil pour point temperature on model results for relevant deep water temperatures. The proponent provided a rationale for the selection of the representative crude composition used in the modelling and the methods used to characterize the weathering of crude oil during oil trajectory modelling. The proponent stated that oil temperature during droplet formation is the temperature that affects viscosity which in turn affects the size of the droplets. The modelled blowout used average temperature during droplet size formation, rather than ambient temperature as it has been found to allow for a better prediction of the droplet size distribution. Additionally, the proponent stated that the model is designed to take account of the weathering processes including dispersion.

NRCan required information on how the modelled subsea blowout accounted for sunken oil and the effects of this component of oil on special areas. Information on the pathways that may result in oil being incorporated into bottom sediment was provided. The proponent predicted that an oil release would not exceed the observed effect concentration threshold in sediment around the Grand Banks and Flemish Cap. The proponent determined that the acute threshold levels were not predicated to occur in either worst-case scenario.

NRCan advised that the model does not consider the contents of the persistent portions of the crude oil and that biodegradation rates are therefore over-estimated; however, NRCan agrees that this is indeed on ongoing area of research and has indicated that it will conduct simulations, publish data, and continue ongoing discussions with industry to further advance existing models. Despite the potential shortcomings identified by NRCan, DFO and the C-NLOPB are of the view that the model results provide sufficient information to inform the effects predictions and to recommend mitigation and follow-up measures.

The Agency requested a rationale for modelling a 30 day period for drilling mud and cuttings dispersion modelling when it is expected to take 60 days to drill a well. The proponent stated that 60 days is a conservative drilling duration, and the well durations employed in dispersion modelling are based on the best estimates of the drilling schedule. Furthermore, the amount of material being released would not change, and there would be no significant difference in the footprint and thickness of cuttings deposited on the seabed if the drilling schedule was extended by 30 days.

The Agency requested a rationale for the selection of boundaries for stochastic spill modelling and limitations on the spatial extent of spill dispersion results. The proponent indicated that modelling domain was limited by the spatial extent of the data set used to drive oil dispersion and transport in the model. While it recognized that oil artificially accumulates along the boundary, thereby distorting the outputs, it was noted that any transboundary effects along the eastern margin are likely to be minimal as oil arriving along the model boundary would be substantially weathered.

ECCC and the Agency required information related to sub-sea transport of oil below 100 metres and the fate of oil in sediment. The proponent indicated that the depth of water column modelling was treated to allow for the identification of a maximum lateral extent of surface and shoreline oiling to be determined at an acceptable resolution. It was further noted that the potential effects on species in the water column below 100 metres were determined in the worst-case scenarios, where stochastic modelling was extended to the seafloor to allow for determination of the lateral extent of oil droplets and dissolved oil in water.

ECCC requested information related to the deployment of subsea dispersant equipment. The proponent outlined factors that influence the ability to deploy subsea dispersant and stated equipment would be mobilized concurrent with the capping stack. Dispersants are expected to arrive within 28 to 72 hours of notification, with the objective to commence injection of subsea dispersants within ten days of notification, pending regulatory approval.

The Agency required information related to how the shoreline geology of the Newfoundland and Labrador may influence the predicted environmental effects of a marine diesel spill in the nearshore environment. The proponent noted that the rocky shorelines around most Newfoundland seabird colonies would not absorb oil, as oil has a short persistence on rocky shorelines. It was further noted that a nearshore diesel spill is not anticipated to reach the coastal shorelines of Newfoundland and Labrador, Nova Scotia, New Brunswick, Prince Edward Island or Quebec.

DFO requested additional information regarding well site setback to protect benthic habitat based on synthetic-based mud spill modelling results. Modelling completed for the CNOOC International Flemish Pass Exploration Drilling Project predicted that an accidental release of synthetic-based mud would reach the seafloor within a maximum of one kilometre from the drill site. The proponent stated results from environmental effects monitoring following a discharge of synthetic-based muds from an exploration well offshore Nova Scotia indicated that sedimentation on the seafloor was similar in nature and extent to the predicted model and did not exceed predicted dispersion from routine drilling discharges. The proponent confirmed that well site setbacks to protect sensitive benthic habitat would be determined in consultation with the C-NLOPB based primarily on predictive modelling of routine discharges and emissions and the proximity of corals and sponges to the well site.

Additional views expressed by federal authorities overlapped with views expressed by Indigenous groups. Some of these key views and comments are discussed below.

Indigenous Groups

KMKNO raised concerns on the potential impacts of hypoxic conditions as a result of biodegradation of hydrocarbons by bacteria following a spill. The proponent stated that prolonged periods of low oxygen availability can reduce the survival and reproduction of many aerobic species. Modelling exercises suggested that a spill in the western North Atlantic Ocean would be unlikely to create substantial hypoxic zones and if they were to occur the hypoxic area would be smaller than the overall oil spill plume.

MTI raised concerns about the potential effects of a spill on Atlantic Salmon. The proponent provided additional information on potential effects, and stated that Atlantic Salmon have been noted as avoiding areas of hydrocarbon contamination during migration. In addition, while there may be effects on sensitive life stages, given the spatial and temporal limit of a spill, population level effects are not predicated. The Agency notes that Indigenous groups have expressed concern regarding potential effects on Atlantic

Salmon during the EAs of other exploration drilling projects in the eastern Newfoundland offshore area. Groups have stressed their desire to see Atlantic Salmon populations recover so harvesting can resume, and are concerned that offshore oil and gas exploration could contribute to pressures on populations, particularly in the event of an accident or malfunction. Several Indigenous groups noted data gaps regarding Atlantic Salmon behaviour and migration patterns and that it is important to acknowledge uncertainty and apply a precautionary approach in conducting the effects assessment. Groups have also stated that EAs of offshore exploration drilling projects take a compartmentalized approach, and that an ecosystem-based approach should be used with Indigenous knowledge more sufficiently factored into the assessments. In addition, several groups have noted that, in consideration of recent declines in Atlantic Salmon populations and the possible threat of extinction for some of these populations, any adverse effects on Atlantic Salmon could be of high magnitude, significant, and would be an impact on Aboriginal rights.

Several Indigenous groups requested information on the level of involvement of Indigenous groups in the development and implementation of the Spill Response Plan. The proponent committed to ongoing Indigenous and stakeholder engagement during its development, and to consulting with Indigenous groups and fishers on appropriate communication protocols. The proponent stated that the plan would be posted on the internet once it is approved by the C-NLOPB. The proponent also committed to engaging with Indigenous groups throughout the life of the Project and to explore opportunities to provide education in spill response, which could include sharing plans, workshops, or information bulletins. The proponent confirmed that spill readiness exercises would be conducted by emergency response personnel. The proponent stated that in the event of the activation of the proponent's Spill Response Plan, an emergency response claims process would be activated.

KMKNO and Première Nation des Innus de Nutashkuan, as well as a member of the public, requested information on lessons learned and monitoring conducted following recent accidental events in offshore operations in Atlantic Canada. The proponent indicated that results of investigation findings from the ice incursion incident at the White Rose Oilfield would be in the Ice Management Plan for this Project. Likewise, results of the investigation of the hydrocarbon spill at White Rose, would be incorporated into the planning and implementation of the Project. With respect to the synthetic-based mud spill from the Scotian Basin Exploration Drilling Project, the need for improved riser mud boost line inspection procedures and enhanced pressure monitoring of boost lines during operations were identified and have been implemented globally within the proponent's operations. At the time of writing, the investigation by the Canada-Nova Scotia Offshore Petroleum Board was still ongoing, however the proponent committed to incorporating ongoing and future investigations, where feasible.

KMKNO requested information on the potential effect of a spill on the Northeast Newfoundland Slope Closure marine refuge. The proponent indicated there is a relatively high probability of oil reaching the Northeast Newfoundland Slope Closure marine refuge see Figure 5 and Figure 6.

Additional views expressed by Indigenous groups overlapped with those views expressed by federal authorities. Some of these key views and comments were discussed above.

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

Public

A member of the public requested information about the spill containment and recovery rates. The proponent stated several factors may influence the recovery rate and indicated that based on historic data, recovery rates of one to ten percent are typical. However given the conditions in the North Atlantic, recovery rates are expected in the lower end of this range.

DFO and a member of the public raised concerns about the potential environmental effects of a spill on pelagic fish larvae and juveniles given the fate of oil following a spill prior to reaching the surface. The proponent noted that stochastic modelling provided the surface area exposure estimates of the acutely toxic water-soluble oil concentrations for the top 100 metres of the water column, the zone that fish eggs, larvae and juveniles are expected to reside. The effects of a spill on fish is expected to be greater during the spring and summer when there are greater concentrations of eggs, larvae, and juvenile fish in the pelagic zone. However, given the low risk of exposure as a result of the vast offshore pelagic zone that eggs, larvae, and juvenile fish inhabit, population level effects are not predicted.

7.1.3. Agency Analysis and Conclusion

Analysis of Effects

Offshore exploratory drilling occurs in a dynamic environment and accidental events associated with these activities have occurred in the past. More serious events, such as a 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, migratory 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 proponent would be required to take all reasonable measures to reduce the likelihood of an accidental event and ensure that it is 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. The proponent must comply with the requirements of regulations and be able to demonstrate that it meets 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 proponent has a satisfactory approach to risk management and would take all reasonable measures to minimize the probability of malfunctions and accidents. The proponent 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. Among other elements, the Spill Response Plans would incorporate recommendations and guidance from ECCC, including measures related to wildlife surveillance, wildlife deterrent techniques, and the collection and storage of deceased wildlife.

The proponent would also be required to 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. Certain response measures, such as the use of dispersants and in-situ burning, would also require approval from the C-NLOPB prior to actual implementation in consultation with other federal departments.

The Agency notes that the proponent has decades of experience managing the extraction of oil and natural gas in all types of environments around the world, and has operated in the North Atlantic.

Primary and secondary barriers would be implemented to regain well control and prevent any accidental release of oil, but if those barriers fail and a blowout occurs, the proponent 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 proponent would be required to commence mobilization of a relief well MODU.

The proponent estimated that mobilization and installation of the capping stack could take anywhere from nine to 17 days. 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 proponent's assessment 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 Plan to contain a fulsome discussion of any potential options to reduce overall timelines. The proponent 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 Plan would include information on options and requirements for relief well drilling, including the locations of potential MODUs that would be available to the proponent to drill a relief well. The proponent would be required to demonstrate that it has arrangements in place to access the necessary MODU 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. Offshore of Newfoundland, there have been batch spills of 250 000 litres of oil in November 2018 from the SeaRose platform, and an estimated 12 000 itres of oil from the Hibernia platform in July 2019 (C-NLOPB 2019c).The proponent 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 proponent's Incident Management Plan and Spill Response Plans, which would be reviewed as part of the C-NLOPB's authorization process.

Despite the measures the proponent would implement to prevent and respond to a spill, the potential effects on fish and fish habitat, marine mammals and sea turtles, and migratory birds could, in a worst-case scenario and under worst-case conditions, result in both individual and population level effects. These effects could be especially detrimental to populations of species that are particularly sensitive to such an event (e.g., migratory birds) or are at risk (e.g., endangered Inner Bay of Fundy population of Atlantic Salmon, North Atlantic Right Whale). The Agency also notes that an unmitigated worst-case spill, although predicted to be unlikely, could affect domestic and international special areas and critical habitats, such as the Charlie-Gibbs Marine Protected Area, Sable Island National Park Reserve, and the Gully Marine Protected Area, as well as international shorelines. If such an event were to occur, effects on special areas or otherwise sensitive habitats and associated species could be of high magnitude.

Indigenous and non-Indigenous fishers with commercial and communal commercial fishing licences could also be affected by accidental spills. A large batch spill or 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. In accordance with the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activity*, compensation to fishers would be required for any damages, including the loss of income and future income. In the case of Indigenous fishers, this would also include any loss of hunting, fishing and gathering opportunities (e.g., food, social, or ceremonial fisheries). The proponent would also be required to develop and implement a Fisheries Communication Plan, which would include procedures to communicate with fishers in the event of an accident or malfunction. Views provided by Indigenous groups would be considered in the development of the Spill Response Plans, and groups would be provided the approved version.

The proponent predicted significant adverse residual effects to migratory birds from a blowout incident, large batch spill or vessel spill. This determination takes into account the conservatism of the spill modelling and assumptions, and the use of mitigation measures to prevent and reduce the effects from a spill. Similarly, with respect to an unmitigated blowout, the proponent conservatively predicted significant adverse environmental effects on commercial fisheries and on the current use of lands and resources for traditional purposes and the health and socioeconomic conditions of Indigenous peoples. The proponent predicted no significant adverse effects on fish and fish habitat, marine mammals and sea turtles and special areas from any accidental event. With exception to those scenarios, the proponent concluded that, residual adverse environmental effects from any accidental event scenario would not likely be significant.

The Agency generally agrees with the proponent's characterization of the potential residual adverse 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 also be significant to for fish and fish habitat, marine mammals and sea turtles, and special areas. 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 ERSF.

Key Mitigation Measures to Avoid Significant Effects

The Agency considered the mitigation measures proposed by the proponent, expert 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 Project;
- submit a Source Control Plan, which includes strategies and measures for well capping, containment of fluids lost from the well, and the drilling of a relief well, as well as options to reduce overall response timelines. The Source Control Plan must include procedures to provide up-to-date information to the C-NLOPB prior to drilling and at regular intervals during drilling related to the availability of appropriate capping stacks and vessels, and appropriate drilling rigs capable of drilling a relief well at the project site;
- 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 (e.g., synthetic-based mud or cuttings spill);
  - reporting thresholds and notification procedures;
  - 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 ECCC; and
  - specific role and responsibility descriptions for offshore operations and onshore responders;
- consider views of 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. Provide results of the exercise to Indigenous groups following its review by the C-NLOPB;
- 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 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 ECCC Environmental Emergency Science Table. Publish the spill impact mitigation assessment on the Internet;
- in the event of an uncontrolled blowout from the well, begin immediate mobilization of a capping stack and associated equipment to the site of the uncontrolled blowout. Simultaneously, commence the mobilization of a relief well MODU;
- if drilling is anticipated in water depths in excess of 2500 metres, undertake further analysis to confirm the capping stack technology selected can be operated safely at the proposed depth and submit this analysis to the C-NLOPB for approval;
- 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 provided to Indigenous groups and fishers needs to present a realistic estimation of potential health risks associated with 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 recreational, commercial and traditionally harvested 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 for signs of contamination or oiling and reporting results to the C-NLOPB, DFO and ECCC; 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 Project (i.e., unmitigated 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 Atlantic Salmon and their recovery, as well as the context provided by Indigenous groups, the Agency concludes that the potential effects on the current (or future, as it pertains to at-risk Atlantic Salmon populations) use of lands and resources for traditional purposes and the health and socioeconomic 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 Project 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 Project is not likely to cause significant adverse environmental effects as a result of accidents and malfunctions.

7.2. Effects of the Environment on the Project

Severe 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 the project is considered.

7.2.1. Proponent's Assessment of Environmental Effects

The Project could be affected by environmental phenomena such as weather conditions, oceanographic conditions, sea ice, icebergs, superstructure icing, geological stability and seismicity. The engineering design of a MODU would consider the type and magnitude of loads imposed by ice, snow, waves, tides, currents, wind and operating ambient temperatures.

Weather and Oceanographic Conditions

Poor visibility resulting from fog, rain, or snow conditions could increase the potential for accidental events. From June through August, visibility is poor (one to two kilometres) or very poor (less than one kilometre) from 23 to 34 percent of the time in the exploration licences. Severe sea states can occur year-round with maximum significant wave heights exceeding ten metres from September through April with wave heights reaching 15 metres in December and January. Reduced visibility, high wind, wave conditions, and other extreme weather conditions may delay cargo and personnel transit, increase the potential for supply vessel and helicopter collisions, increase the potential for accidental spills, delay or suspend project activities, require evacuation of the MODU and in extreme cases, cause injury or fatality.

Sea Ice, Icebergs and Superstructure Icing

Sea ice and icebergs represent navigational hazards with the potential to affect supply vessel transportation, operation of the MODU, risk of an accidental event, risk to human health, and risk of damage to the MODU. Supply and personnel movement could be delayed and the MODU may be required to disconnect and move off the well site to avoid collision with an iceberg. Superstructure icing can result in a raised centre of gravity, slower supply vessel speed, maneuvering difficulty, and problems with equipment. Potential spray icing conditions start during November with a frequency of icing potential of 1.1 percent in the East Orphan Basin and 5 percent in the west Orphan Basin. As temperatures cool throughout the winter, the frequency of icing potential increases to a maximum in February. Extreme sea spray icing conditions (icing rate greater than four centimetres per hour) were calculated to occur during the months of January through March in the west Orphan Basin.

Geological Stability and Seismicity

The project area has a low to moderate seismic hazard according to the Seismicity Hazard Map of Canada (NRCan 2015). Six earthquakes have been recorded in the project area between 1985 and 2018, of which two 4 to 4.7 magnitude earthquakes occurred within exploration licences 1145 and 1146. Other potential offshore geohazards include: slope instability; sediment loading; venting of shallow gas; gas hydrates; and seabed instabilities. There is a major risk of a landslide every 20 000 years and a minor risk every few thousand years in the eastern Canada offshore. Most large failures on the seabed occurred 10 000 years ago when large amounts of sediment were deposited on the slope of the continental shelf.

The proponent indicated that given the project activities are of short duration (up to seven years, approximately 60 days per well for up to 20 wells), the probability of a major seismic event and potential for a subsequent tsunami or submarine landslides occurring during the life of the Project is low.

7.2.2. Views Expressed

Federal Authorities

The C-NLOPB requested information on the proponent's plan to move MODUs when sea ice or iceberg conditions threaten the safety of the MODU. The proponent responded that as part of the *Newfoundland Offshore Petroleum Drilling and Production Regulations* it would submit an Ice Management Plan which would include details on sea ice/iceberg monitoring and detection, risk assessment, mitigation and contingency procedures. Ice management principles, strategy and approach would be included in the Ice Management Plan as well as ice alertness and physical response measures such as towing, ice deflection, and disconnect and departure from the well site to a safe location.

NRCan and the C-NLOPB were concerned with the proponent's assessment of the probability of seismic events and submarine landslides. NRCan noted that the proponent did not discuss the geohazards presented by submarine landslides and the importance of elevated or excess pore pressure in slope stability. The proponent assessed the probability of a submarine landslide as low based on: the correlation of debris flow; shear strengths of competent glacial tills on the seafloor; favorable preconditioning due to excess pore water pressures which may be reduced in the northern project area due to low sedimentation rates and sufficient time for natural dewatering; and that future seismic events would not be expected to cause a major slope failure as the area has been previously subjected to seismicity. However, NRCan advised that the uncertainty of this conclusion is high based on a lack of surficial geological data in the area. The C-NLOPB advised that the level of uncertainty with respect to geohazards in the Orphan Basin would be considered through a risk assessment during the Approval to Drill a Well process as required by the *Newfoundland Offshore Petroleum Drilling and Production Regulations*.

ECCC and DFO advised the Agency that, as applicable to their respective mandates and areas of expertise, the proponent's analyses were adequate for the purpose of the EA. The C-NLOPB advised that the proposed mitigation measures are appropriate in the context of the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* and associated regulations.

Indigenous Peoples

MTI was concerned with the limitations of spill response equipment (e.g., booms, skimmers, in-situ burning) and activities (e.g., spill surveillance) in adverse weather conditions frequently encountered in the offshore of Newfoundland. The proponent acknowledged offshore Newfoundland is a challenging environment which can place limits on the effectiveness and feasibility of response tactics. The proponent would develop a Spill Response Plan, Tactical Response Plans and a Spill Impact Mitigation Assessment. These would describe monitoring, surveillance, potential response tactics, as well as their limitations, effectiveness and feasibility. The proponent stated that in most spill scenarios, a single response option is unlikely to be completely effective, and in many cases multiple response options are required. The proponent stated that in adverse weather conditions a spill can be tracked using a satellite tracking buoy, satellite imagery, and multispectral imagery from fixed wing sources.

KMKNO also was concerned with the lack of geological data provided and the potential risk this data gap might pose to the Project, as discussed within the federal views above.

Public

A member of the public was concerned that an accident similar to the November 16, 2018, Husky Energy SeaRose production platform flowline spill could re-occur. This accident occurred when the production platform was restarted during a storm where wave heights were recorded at 8.4 metres. While the potential for this particular type of accidental event is more relevant for production projects, with respect to mitigating the risk of an accidental event during exploratory drilling the proponent stated that it would develop well-specific operating guidelines to manage operational risk based on the MODU's safe operating limits. If conditions are deemed unsafe, the Offshore Installation Manager on the MODU has the authority to modify, suspend, or delay operations before the operating limits are reached.

7.2.3. Agency Analysis and Conclusion

Analysis of Effects

Severe environmental conditions or events can increase the probability of an accident or malfunction that could in turn affect the environment. The Project could be affected by weather conditions, oceanographic conditions, sea ice, icebergs, superstructure icing, geological stability and seismicity. These environmental conditions can affect the overall stability and functioning of the MODU or supply vessels. In extreme situations these conditions may result in a required evacuation, failure of the MODU, vessel capsizing, result in a spill or another unplanned event.

The proponent would obtain a Certificate of Fitness for the MODU as required by the *Newfoundland Offshore Certificate of Fitness Regulations* to ensure it is fit for purpose and can function as intended. Meteorological and oceanographic monitoring programs would also be implemented over the life of the Project 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 Offshore Petroleum Drilling and Production Regulations* as part of the Safety Plan submitted by the proponent 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 well site and the measures to protect installations, including systems for ice detection, surveillance, data collection, reporting, forecasting, and potentially ice avoidance or deflection. The proponent would be required to establish and enforce practices and limits for operating in severe environmental conditions and to ensure that the MODU has the ability to quickly disconnect the riser from the well.

NRCan and the C-NLOPB advised that the potential for geohazards in the exploration licences is unknown due to a lack of geological data. The C-NLOPB advised that a geohazards assessment is required as part of the Approval to Drill a Well process as required by the *Newfoundland Offshore Petroleum Drilling and Production Regulations* and that the C-NLOPB can require additional mitigations based on the assessment of risk. The C-NLOPB will not issue a drilling approval until geohazards have been assessed and adequately mitigated.

Key Mitigation Measures to Avoid Significant Effects

The Agency considered measures proposed by the proponent (Appendix B), comments from Indigenous groups and the public, and advice from federal authorities and identified key measures to mitigate the effects of the environment on the Project. The proponent shall:

- in consultation with the C-NLOPB and ECCC, implement a physical environment monitoring program in accordance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations* and meet or exceed 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, severe 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 of icebergs; and
- in consultation with the C-NLOPB , implement measures to ensure that the MODU has the ability to quickly disconnect the riser from the well in event of an emergency or severe 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 severe 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, 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 proponent 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 Project have been adequately considered and are not likely to result in significant adverse environmental effects.

7.3. Cumulative Environmental Effects

7.3.1. Proponent's Assessment of Environmental Effects

The cumulative environmental effects assessment considered the overall effect on valued components as a result of the Project's predicted residual environmental effects and those of other relevant projects and activities. The same spatial and temporal boundaries were used for the cumulative environmental effects

assessment as for the project-specific effects assessment of each valued component (Section 2.1 and Figure 1).

Other Physical Activities Considered

Physical activities that were considered in the cumulative environmental effects assessment are listed in Table 7. This list is compiled from information provided by the proponent and augmented with information provided on the C-NLOPB's website as well as Agency analysis. Distances were measured from exploration licence 1149 as it is the southernmost exploration licence in the proponent's block, therefore the closest to all other projects.

Table 7 Projects and Activities Considered in the Cumulative Environmental Effects Assessment

Production Projects	Distance (kilometres) from Exploration Licence 1149	Duration of Project Activities
Hibernia Oilfield	269	Until at least 2040.
Terra Nova Oilfield	290	Until at least 2031 (Suncor, n.d.).
White Rose Oilfield and White Rose Extension Project	247	White Rose - extend until 2020 followed by several years of production from West White Rose extension.
Hebron Oilfield	283	Until at least 2042.
Bay du Nord Development Project (proposed)	102	Currently subject to a federal EA; overlap subject to project approval.
Other Projects/Activities	**Overview**	
Offshore Petroleum Exploration – Exploration and Delineation Drilling Programs	As of August 13, 2019, a total of 39 exploration wells had been drilled in the Eastern Newfoundland and Labrador offshore area (C-NLOPB 2019a). The Jeanne d'Arc and Eastern Newfoundland offshore area are also subject to ongoing and planned offshore exploration drilling programs which have the potential to temporally overlap with the proposed project including (C-NLOPB 2019b): • Equinor Canada Ltd. Flemish Pass Exploration Drilling Project: 2018-2028, located adjacent to exploration licence 1149; • ExxonMobil Canada Limited Eastern Newfoundland Offshore Exploration Drilling Project: 2018-2028, located 130 kilometres from exploration licence 1149; • Husky Energy Exploration Drilling Project: 2018-2025, located 182 kilometres from exploration licence 1149;	

	• CNOOC Petroleum North America ULC (formerly known as Nexen Energy ULC) Flemish Pass Exploration Drilling Project: 2018-2028, located 129 kilometres from exploration licence 1149; • ExxonMobil Canada Limited Southeastern Newfoundland Offshore Exploration Drilling Project: 2020-2029, located 347 kilometres from exploration licence 1149; • Chevron Canada Limited West Flemish Pass Exploration Drilling Project: 2021-2030, located 50 kilometres from exploration licence 1149; • BHP Canada Exploration Drilling Project: 2019-2028, located nine kilometres from exploration licence 1149; • Equinor Canada Limited Central Ridge Exploration Drilling Project: 2020-2029, located 174 kilometres from exploration licence 1149; and • Suncor Energy Offshore Exploration Partnership Tilt Cove Exploration Drilling Project 2019-2028, located 276 kilometres from exploration licence 1149.
Offshore Petroleum Exploration – Geophysical Survey Programs	Offshore geophysical surveys may include two-dimensional, three-dimensional, or four-dimensional geophysical data acquisition. While geophysical and other exploration activities are multi-year programs that can cover large offshore areas, the type and level of activity conducted each year varies. Ongoing and proposed geophysical surveys within the regional assessment area which have the potential to temporally overlap with the proposed Project[6] include: • Husky Energy Jeanne d'Arc Basin/Flemish Pass Regional Seismic Program: 2012-2020; • Suncor Energy's Eastern Newfoundland Offshore Area 2D/3D/4D Seismic Program: 2014-2024; • WesternGeco Canada Southeastern Newfoundland Offshore Seismic Program: 2015 to 2024; • WesternGeco Canada Eastern Newfoundland Offshore Seismic Program: 2015 to 2024; • Hibernia Management and Development Company Ltd. 2D/3D/4D Seismic Projects for the Hibernia Oil and Gas Production Field: 2013 to Remaining Life of Field; • ExxonMobil Canada Eastern NL Geophysical Program 2015-2024; • CGG Services (Canada) Inc. Newfoundland Offshore 2D 3D 4D Seismic Program 2016-2025; • Seitel's East Coast Offshore 2D 3D 4D Seismic Program 2016-2025; • Fugro GeoSurveys Offshore Seafloor and Seep Sampling Program, 2017-2027; • Polarcus UK Ltd. Eastern Newfoundland Offshore 2D, 3D and 4D Seismic Program 2016-2022;

	• CNOOC Petroleum North America ULC Eastern Newfoundland and Labrador Offshore Geophysical, Geochemical, Environmental and Geotechnical Program, 2018-2023; • Multiklient Invest AS Newfoundland Offshore Seismic Program, 2018-2023; • BP Canada Energy Group ULC – Ephesus Prospect ROV Survey 2019-2024; and • Chevron's Capelin 3D Seismic Survey of EL 1138 Offshore Newfoundland and Labrador (2018-2021). The proponent also identified Navitas' potential future (unnamed) 3D seismic survey in exploration licence 1147 located in the project area and adjacent to three project exploration licences (1145, 1146 and 1148).
Commercial Fishing Activity	Commercial fisheries within the project area are limited with the majority of the fishing effort being concentrated along the continental shelf. The use of bottom-contact fishing gear is prohibited within exploration licences 1145, 1146, and 1148 because of the overlap with the Northeast Newfoundland Slope Closure marine refuge. Occurs year-round, currently ongoing and will continue for the foreseeable future.
Various other ocean users	Vessel traffic includes tanker traffic and supply vessels associated with the existing offshore oil developments, as well as research vessels, military training exercises, marine shipping and transportation, aircraft traffic and the presence and operation of subsea fibre optic cables and infrastructure. Occurs year-round, currently ongoing and will continue for the foreseeable future.
Hunting Activity	Wildlife (especially migratory bird and seal) populations off of Newfoundland and Labrador are subject to hunting activity. Although little or no hunting is expected to occur in the project area, hunting activities do affect the bird and seal populations that occur in and move through the regional assessment area.

Potential Cumulative Environmental Effects on Fish and Fish Habitat

The Project may contribute to cumulative effects on fish, including species at risk, and fish habitat as a result of residual changes in mortality or physical injury and residual changes in fish habitat quality and associated use. Potential cumulative effects on fish and fish habitat were identified from the following project and non-project activities: offshore petroleum production projects, geophysical surveys, exploration and delineation drilling; commercial fishing; and other ocean users.

Underwater sound emissions generated by offshore petroleum exploration and production drilling, geophysical surveys, fisheries, and other ocean users may generate sound levels harmful to fish at close ranges. The establishment of a 500 metre radius safety zone around the MODU within which non-project activities are prohibited would reduce potential cumulative effects on individual fish associated with

simultaneous exposure to underwater sound emissions. However, individuals of mobile species may still be exposed to elevated sound levels from the Project and other activities throughout their life cycle and thus be subject to a cumulative change in risk of mortality or physical injury.

To assess the cumulative effects of drilling muds and cuttings deposition on benthic invertebrates, a one millimetre threshold was used (Section 6.4). For wells drilled in West or East Orphan Basin, modelling predicted an areal coverage of 0.081 or 0.035 square kilometres per well, respectively. Although complete recovery of deep-water slow-growing coral and sponge species requires many years because they reproduce and grow slowly, recovery is likely to be initiated shortly after completion of cuttings discharges and is expected to be well advanced within three to five years once the synthetic material has degraded to low concentrations. The adherence to the key mitigations listed in Section 6.1 would mitigate for potential effects.

Historically, the project area has not been subject to a high level of bottom-contact fishing, and this activity is now prohibited with the Northeast Newfoundland Slope Closure marine refuge that encompasses three of the four exploration licences 1145, 1146, and 1148. The temporary and localized nature of Project effects and the implementation of safety exclusion zones would limit the potential for direct interactions between the effects of commercial fisheries and effects of project-related activities on fish and fish habitat.

Fish species at risk may interact with project activities; however, all of these species are highly mobile in their adult stages. Given the localized and short-term nature of project activities and their potential environmental effects, the Project would not have any adverse effects upon these species. Proposed critical Northern and Spotted Wolffish habitat key habitats of individuals or populations are not anticipated to be substantially adversely affected. Furthermore, any potential effects of the Project would be negligible in comparison to effects on these species resulting from commercial fisheries and climate change.

In addition to the cumulative effects from drilling multiple wells for the Project itself, there would also be potential for interaction between effects of the Project and effects of other offshore petroleum exploration activities (e.g., seismic surveys, geophysical surveys, drilling), fishing activities, other marine vessel traffic and hunting activity. The residual cumulative environmental effect on marine fish and fish habitat are predicted to be not significant.

Potential Cumulative Environmental Effects on Marine Mammals and Sea Turtles

The following activities have the potential to cumulatively interact with the Project and cause effects to marine mammals and sea turtles: offshore petroleum production projects, geophysical surveys, exploration and delineation drilling; commercial fishing, hunting; and other ocean users. As discussed in Section 6.2, the behavioural thresholds for marine mammals exposed to continuous underwater sound could be exceeded up to 61 kilometres from the MODU based on the maximum range to the behavioural threshold for continuous noise (R_{max} for 120 dB re 1µPa). Although the highly mobile nature of marine mammals increases the potential for individuals and groups to be affected by multiple perturbations, conversely, this trait allows them to avoid or pass through disturbed areas reducing the potential adverse effects.

Underwater sound emissions from Project and other activities may potentially result in a cumulative change in risk of mortality and physical injury or change in habitat quality and use. The effects of underwater sound discussed for the cumulative effects on fish and fish habitat would also be applicable to marine mammals and sea turtles. It is possible marine mammals and sea turtles could be exposed to underwater sound from

seismic surveys while Project activities are taking place. There have been as many as three concurrent three-dimensional seismic surveys south of the project area with a concurrent two-dimensional survey to the north. However, given that the Project is not expected to result in auditory injury to marine mammals and sea turtles, there is limited potential for this type of cumulative residual effect.

Supply vessel activity in combination with general vessel traffic and commercial fishing activity may result in effects on marine mammals and sea turtles through an increased risk of collisions with vessels or entanglement in fishing gear. Supply vessels would represent a small increase over existing levels of marine traffic and would therefore cause a small increase in the cumulative change in risk of mortality or physical injury for marine mammals and sea turtles. Project supply vessels would reduce the risk of collision by limiting their maximum speed to 12 knots. Project-related traffic would be short-term, transient, and localized, which limits the opportunity for cumulative environmental effects.

Hunting pressure on marine mammals (primarily seals) that frequent the project area has the potential to contribute to a cumulative change in risk of mortality or physical injury. However, resource management measures help to mitigate potential residual adverse effects on seals, thus also mitigating potential cumulative effects.

In addition to the three marine mammal species at risk (Blue Whale, North Atlantic Right Whale and Northern Bottlenose Whale) and two turtle species at risk (Leatherback and Loggerhead sea turtles) identified by the proponent to have the potential to occur in the project area, the Agency also identified the Fin Whale, Harbour Porpoise, and Killer Whale as having the potential to be in the project area (see Appendix D).

The potential interactions between marine mammal and sea turtle species at risk and the Project, and other activities are the same as those for marine mammals and sea turtles that are not listed. The Agency notes that there is no critical habitat for marine mammals and sea turtles within the project area. Therefore, the effects are likely to be transient and temporary in nature without any significant adverse cumulative effects on individuals or populations.

Potential Cumulative Environmental Effects on Migratory Birds

Potential cumulative effects on migratory birds were identified from the following project and non-project activities: offshore petroleum production projects, geophysical surveys, exploration and delineation drilling; commercial fishing; hunting and other ocean users. Of particular concern is the Leach's Storm-petrel population which has declined in recent years as explained in Section 6.3.

Within the regional assessment area, cumulative effects of the Project in combination with other light sources in the offshore environment have the potential to attract and disorient migratory birds. Each source of light may attract nocturnally active birds from up to 16 kilometres. The current production projects are located between 247 and 290 kilometres from the closest project exploration licence, while the proposed production project, Bay du Nord, would be located 102 kilometres away. Each source of artificial night lighting can result in a cumulative change in risk of mortality or physical injury due to potential stranding and increased opportunities for predation, collisions, exposure to vessel-based threats and emissions.

Persistent oil in the marine environment is very high along Newfoundland coastlines due to the density of marine traffic resulting in oiled migratory birds causing mortality. Research has indicated illegal pumping of waste oil and oil-water mixtures from vessels as the source of the chronic oil pollution. Non-routine

discharges from the Project and other activities could contribute to a cumulative risk of mortality or physical injury. However, routine discharges would comply with government standards and requirements and are therefore unlikely to cause a measureable cumulative change in risk of mortality or physical injury.

Entanglement in fishing gear can cause mortality and injury to migratory birds particularly murres and shearwaters. Hunting activity also results in mortality of murres and waterfowl. General vessel traffic to and through the project area may affect migratory birds through lighting, discharges and displacement/disturbance, but the highly transitory nature of these disturbances limit any effects at any location and time, and thus, the potential for cumulative effects.

Underwater sound could result in a change in risk of physical injury or change in habitat quality and use for some bird species. However, based on scientific knowledge regarding the effects of underwater sound on birds, diving migratory birds appear to be less sensitive than fish, marine mammals and sea turtles. Therefore, given the short duration diving birds spend underwater, the short temporal scale of Project related noise would reduce the potential effects on birds.

There is also the potential for a cumulative increase in migratory bird strikes from Project and non-project related activity. However, residual effects would be spatially and temporally limited so that potential cumulative interactions would be minimal. Atmospheric sound emissions from Project and non-project related activities may cause behavioural responses such as temporary habitat avoidance or changes in activity state (e.g., feeding, resting, or travelling). However, the area affected by the Project represents a small portion of the total available bird habitat.

The proponent predicted that the Project would not result in adverse effects on migratory bird species at risk, and therefore, contribute not to cumulative effects on these species.

Potential Cumulative Environmental Effects on Special Areas

As described in Table 4, several special areas overlap with the Project's exploration licences and vessel traffic routes (Section 6.4). Many of the mechanisms for cumulative effects on fish and fish habitat, migratory birds, and marine mammals and sea turtles are also applicable to special areas. Special areas could be cumulatively affected by offshore petroleum geophysical surveys and exploration drilling, commercial fishing, and other ocean users.

Potential Cumulative Environmental Effects on Fisheries and Other Ocean Users

There is the potential for cumulative effects from the following non-project sources: offshore petroleum production projects, geophysical surveys, exploration and delineation drilling; commercial fishing, hunting; and other ocean users. There is the potential for the following to cause cumulative environmental effects on fisheries and other ocean users: temporary displacement of fishers within the safety exclusion zone around active MODUs; increased competition with other displaced fishers; risk of incidents of gear loss or damage; and other general space use conflicts. However, with the application of the proposed mitigation and environmental protection measures the residual cumulative effects are predicted to be not significant.

Marine vessel traffic is also common, although transient with limited disturbances to other ocean uses. Vessel traffic is required to remain specified distances from other marine activities, including active offshore exploration drilling and seismic programs.

The often spatially extensive nature of geophysical surveys increases the potential for these surveys and the Project to result in cumulative environmental effects on fisheries. 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.

Potential Cumulative Environmental Effects on the Current Use of Lands and Resources for Traditional Purposes and Health and Socioeconomic Conditions of Indigenous Peoples

Although there is no known food, social, or ceremonial fishing occurring in the project area, routine project activities may interact with species traditionally and currently harvested by Indigenous communities elsewhere. Few of the marine associated resources used by Indigenous groups are likely to migrate through the project area, and for those that may (e.g., American Eel, Atlantic Salmon) there would be a very low likelihood of interactions that could translate into a negative effect on traditional activities. The residual effects are predicted to be not significant and the Project is not expected to result in measurable effects on socioeconomic conditions for Indigenous communities or Aboriginal or treaty rights.

7.3.2. Views Expressed

Federal Authorities

The C-NLOPB noted that the discussion of cumulative effects was qualitative with respect to seismic, geophysical, and other exploration activities.

ECCC advised that in addition to migratory birds being attracted to offshore exploration and production facilities, the cumulative effects of artificial light have created a significant footprint in the offshore which did not exist a few decades ago. ECCC further 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. ECCC advised that a new light source in the regional assessment area where there is currently no offshore production may have a greater effect on migratory birds compared to the incremental effect of a new light source in the more active area around the production projects given that creating a new light source in a previously dark area would expand the overall lit area in the offshore. The cumulative effect of multiple artificial light footprints illuminating a previously dark environment may be altering the behaviour of nocturnal species that may forage in or migrate through the area (e.g., Leach's Storm-petrels). To address this, the proponent committed to developing a program for standardized searches to document the effect of lighting on stranded migratory birds.

DFO and ECCC advised that the mitigation measures, monitoring, and follow-up programs proposed by the proponent as well as those recommended by the Agency would adequately address the potential cumulative environmental effects on migratory birds, fish and fish habitat, marine mammals, sea turtles, including species at risk, as well as on commercial fishing and special areas.

Indigenous Peoples

Several Indigenous groups commented on the importance of a thorough cumulative effects assessment. Première Nation des Innus de Nutashkuan expressed concern related to the cumulative effects of the Project on fish and fish habitat, in particular the cumulative effects associated with an increase in oil production projects. The proponent referenced the environmental effects monitoring programs which are designed to identify and quantify environmental effects related to production projects. Thus far, these programs in Atlantic Canada have not demonstrated adverse environmental impacts in the offshore oil industry, beyond minor, localized changes that were predicted. The proponent maintains that the predicted residual cumulative environmental effects on fish and fish habitat would not be significant and the conclusion was determined with a moderate to high level of confidence.

Conseil des Innus de Ekuanitshit expressed concern that the cumulative effects analysis did not consider the numerous seismic surveys and previous exploration wells drilled in the offshore of Newfoundland. The Agency notes (Table 7) that based on the C-NLOPB schedule of wells, 39 exploration wells (C-NLOPB 2019a) have been drilled in the Eastern Newfoundland offshore region between 1974 and 2017 and that up to 15 seismic surveys are proposed in the offshore of Newfoundland.

Conseil des Innus de Ekuanitshit also suggested that the Regional Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador should be conducted before further exploratory drilling is authorized. The Agency notes that in advance of the Regional Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador, proponents are working together to conduct effects analyses (including this Project), engaging Indigenous groups, and identifying research needs (e.g., migration and effects to Atlantic Salmon).

KMKNO had concerns with cumulative effects that multiple wells might have on the accumulation of drill cuttings and requested the proponent conduct a follow-up study to validate the dispersion modelling to confirm that there are no cumulative effects. The Agency considered these concerns in the development of key mitigation and conditions with which the proponent must comply.

KMKNO and MTI noted concern regarding the cumulative effect of vessel traffic from the Project, commercial fishing vessels and vessels from other ocean users on marine mammals and sea turtles from collisions. The Agency considered these concerns in the development of key mitigation and conditions with which the proponent must comply.

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

Public

The Fish, Food and Allied Workers - Unifor raised concerns regarding the loss of fishable area due to the multiple safety exclusion zones and increased vessel traffic. They stated that due to the nature in which fishing gear is set it can be challenging to avoid a particular location which leads to a larger area of avoidance, noting specifically that the proposed 20 wells would amount to considerable less fishable area. The proponent calculated a cumulative area of 399 square kilometres in which fisheries and other ocean users may be temporarily excluded due to the presence of Project and non-Project safety zones which represents approximately 0.03 percent of the regional assessment area. The proponent noted that approximately nine percent of the regional assessment area is subject to fisheries restrictions or closures associated with the designated special areas; however, the rest is available for fisheries.

A member of the public noted that evidence regarding the effectiveness of mitigation measures for migratory birds has not been provided. The proponent referred to five studies, to support the efficacy of the proposed mitigation measures (described in Appendix B).

7.3.3. Agency Analysis and Conclusion

The Agency has considered the analysis of cumulative environmental effects provided by the proponent, advice from federal authorities and comments from Indigenous groups, and is of the opinion that the residual environmental effects of the Project could interact cumulatively with the effects of other projects and activities.

Fish and fish habitat in the regional assessment area may be affected by the Project in combination with 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. Furthermore, given the limited zone of influence and short-term nature of project-related disturbances on these species, potential cumulative effects of the Project would be limited.

The Agency agrees with the C-NLOPB that the proponent's cumulative effects assessment was generally qualitative in nature, including its analysis of potential accumulation of drill cuttings from multiple wells, and notes KMKNO and DFO related concerns. Through a review of available information and based on the proponent's modelling of drill cuttings deposition, the Agency conducted a more quantitative assessment of potential cumulative effects from accumulation of drill cuttings from multiple wells. Based on a review of the C-NLOPB's Schedule of Wells Summary, 39 historical wells were drilled in the Eastern Newfoundland offshore area, of which four are located in the project area although none are within the exploration licences, which lessens the potential for cumulative effects (C-NLOPB 2019a). The drill cuttings dispersion modelling conducted by the proponent considered two scenarios: a 1360 metre water depth example well in the West Orphan Basin (exploration licence 1145) and a 2785 metre water depth example well in the East Orphan Basin (exploration licence 1149). The model predicted that in exploration licence 1145 and 1149, drill cuttings would be deposited with a thickness greater than one millimetre across a maximum area of 0.081 and 0.07 square kilometres, respectively. The areas of exploration licences 1145 and 1149 provided by the proponent are 2336.54 and 2642.49 square kilometres, respectively. The Agency calculated that if all 20 potential exploration wells were drilled in one exploration licence, the maximum area covered with drill cuttings would be 0.07 percent and 0.05 percent of the areas of exploration licences 1145 and 1149, respectively. Based on the proponent's zone of influence for drill cuttings, a MODU within the exploration licences is unlikely to have effects which extend beyond the project area.

The Agency also notes that ongoing environmental effects monitoring programs for petroleum production projects have demonstrated localized (i.e., less than ten kilometres) geographic effects on fish habitat from drill cuttings and chemical contaminants. This suggests a limited potential for cumulative environmental effects between the Project and ongoing petroleum production projects. Furthermore, cumulative environmental effects on corals and sponges are predicted to be unlikely or minimal given the requirement for the proponent 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 (see Section 6.1). Cumulative environmental effects on special areas would similarly be unlikely or minimal.

Marine mammals and sea turtles in the eastern Newfoundland offshore area may be affected by the Project in combination with effects of other exploration and production projects 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 (see Section 6.2). Based on the proponent's predicted zone of influence for sound (see Section 6.4.1) and based on information available for other offshore exploration and production projects in the region, the Agency has identified at least two exploration drilling projects (Equinor Canada Ltd. Flemish Pass Exploration Drilling Project and ExxonMobil Canada Limited Eastern Newfoundland Offshore Exploration Drilling Project) with sound effects that could spatially overlap with the Project's. Even if the Project's sound effects do not spatially overlap with those of another activity, marine mammals and sea turtles can travel great distances and may experience disturbances from multiple anthropogenic sound sources across a relatively large region. The potential effects of sound from the Project could therefore act cumulatively with the effects of other projects and activities in a region much larger than the zone of influence of the Project's effects. In addition, although the mobile nature of marine mammals and sea turtles may allow them to avoid or pass through disturbed areas, avoidance of otherwise suitable habitat is a negative effect, and is of particular concern when considering potential cumulative effects from multiple projects.

Despite the potential for cumulative effects to marine mammals and sea turtles, the Agency also notes that activities producing potential behaviour altering sound in the marine environment, including those of the Project, are generally short-term, transient, and temporary (e.g., VSP surveys, vessel traffic, drilling), which would limit the potential for the Project's effects to temporally overlap with the effects from other projects and activities, including those projects which have effects that may overlap spatially with those of the Project. The proponent would be required to implement mitigation measures to reduce the effects of sound from the Project on marine mammals and sea turtles (Section 6.2), which would in turn reduce the Project contribution to cumulative effects. In addition, given uncertainties about the effects of sound, the proponent would be required to verify sound predictions from the MODU and VSP surveys and provide the results to DFO and the C-NLOPB.

The Project would contribute to an increase in night lighting in the eastern Newfoundland offshore area which has the potential to cause adverse effects to migratory birds. Based on the proponent's zone of influence for lighting (see Section 6.4.1), a MODU in exploration licence 1145, 1146, 1148, or 1149 is unlikely to have light effects which overlap with any of the existing production projects as the maximum predicted zone of influence is 16 kilometres and the closest production project is White Rose Oilfield and White Rose Extension Project located 247 kilometres from the edge of exploration licence 1149 and the proposed Bay du Nord Development project would be located 102 kilometres from exploration licence 1149.

Regardless of whether light effects from the Project overlap spatially with other production or exploration projects, the Agency notes ECCC's advice that the basis for the cumulative effects analysis should be the presence of artificial lighting along flight paths and not spatially overlapping light sources. In this context, the Project has a greater potential to act cumulatively with the effects of other offshore projects and activities on migratory birds. However, the Agency notes that the presence of the MODU would be short-term (approximately 60 days per well) and the effects of light would be spatially limited relative to the regional assessment area. In addition, proponent would be required to implement mitigation to reduce light attraction (e.g., reduced flaring duration, employing alternatives to flaring) and implement a protocol for daily monitoring for the presence of stranded birds. The results of monitoring would be shared with the C-NLOPB, ECCC, Indigenous groups and the public. The monitoring results would improve the

understanding of potential effects on migratory birds and inform the need for additional mitigation, if applicable.

The potential for cumulative environmental effects in the eastern Newfoundland offshore area 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 Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador, 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 this Project), engaging Indigenous groups, and identifying research needs (e.g., migration and effects to Atlantic Salmon).

In conducting the review of this Project, the Agency has identified mitigation measures, as well as follow-up and monitoring, related to fish and fish habitat, marine mammals and sea turtles, migratory birds, special areas, and commercial fisheries. These measures would reduce project-specific effects, reducing their contribution to cumulative effects; and verify the accuracy of the predictions made during the EA. The proposed monitoring and follow-up would 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 this Project would contribute to the mitigation or monitoring of cumulative environmental effects. Additional measures have not been identified at this time, but could be recommended following completion of the regional assessment.

Agency Conclusion

Taking into account the implementation of the mitigation measures proposed for the Project, the Agency concludes that the Project is not likely to cause significant adverse cumulative environmental effects.

8. Impacts on Potential or Established Aboriginal or Treaty Rights

8.1. Potential or Established Aboriginal or Treaty Rights

The Project is located in the northwest Atlantic Ocean, with the nearest potential drilling location being over 343 kilometres from the nearest Indigenous community on the island of Newfoundland. There are no recognized treaties overlapping the exploration licences or the 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 operations and accidents or malfunctions.

Migratory species of particular concern to Indigenous groups include Atlantic Salmon, American Eel, seals, whales, and migratory birds. Effects assessments on migratory species are summarized in Section 6.1, Section 6.2, and Section 6.3.

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 licences 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 *Labrador Inuit Lands Claims Agreement* was finalised, 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[17] (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 their traditional territories for food, social, or ceremonial purposes. This includes on land and in the marine environment. Although the Project is 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

Conseil des Innus de Ekuanitshit and Première Nation des Innus 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.

8.2. Potential Adverse Impacts of the Project on Potential or Established Aboriginal or Treaty Rights

This section summarizes how the Project may impact potential or established Aboriginal or treaty rights. Appendix C provides a summary of concerns identified by Indigenous groups during this environmental assessment.

Proponent's Assessment

The proponent 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 socioeconomic conditions of an Indigenous community.

[17] 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

The proponent 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 assessment area. Indigenous communities do not otherwise currently undertake harvesting 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 Project, including their limited, localized, and short-term environmental disturbances, and the associated small safety zone (500 metres around the MODU), it is not anticipated that there would be adverse effects to any such fishing activity, even if it did occur in the local assessment area over the course of the Project.

With regards to migratory marine species, and Atlantic Salmon in particular, the proponent 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. The proponent did not find data to support the project area being used by Atlantic Salmon as overwintering habitat or as a major feeding area (see Section 6.1.9 for additional detail). Furthermore, it 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 Atlantic Salmon populations.

The proponent identified some uncertainty in their prediction of the effect of the Project on Atlantic Salmon because there is limited data on their ocean migration behaviour. However, the proponent reviewed ongoing research by DFO, Indigenous Groups, and the Atlantic Salmon Federation, including an Atlantic Salmon tagging program in the Flemish Pass and the Grand Banks being conducted by the Atlantic Salmon Federation.The proponent is providing fiscal support to the ERSF which sponsors environmental and social studies associated with oil and gas exploration and development on Canada’s frontier lands. The ESRF is designed to assist in the decision-making process related to oil and gas exploration and development.

For other migratory species of interest to Indigenous groups, including whales, birds, and American Eel, the proponent found that project activities would not adversely affect populations. Further, there would be no change in ability to harvest these species within the regional assessment area, which includes the traditional territories of all Indigenous communities consulted by the Agency for the Project.

Effects assessments on migratory species of interest to Indigenous groups are summarized in Section 6.1, Section 6.2, and Section 6.3.

Accidental Spill

The proponent indicated that its oil spill modelling showed a limited potential for oil to reach traditional territories of Indigenous communities. Any potential effect from an oil spill would therefore be largely indirect, related to its potential effects on migratory marine species harvested by Indigenous groups. With appropriate mitigation in place, the proponent predicted that accidental events would not be expected to result in significant adverse effects on marine fish, birds or mammals. As such, the proponent stated that there would be little potential for indirect biophysical effects of a spill to decrease the quantity, quality, or health of marine species harvested by Indigenous groups to an extent that would compromise their ability to continue fishing and harvesting activities. Nevertheless, the proponent 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 proponent found there would be a low likelihood of a significant adverse effects to wildlife and Indigenous groups fishing activities from an accident or malfunction. See Section 7.1 for further analysis and detail.

Views of Indigenous Groups

All participating Indigenous communities expressed concern about the potential for the Project to affect Atlantic Salmon and by extension to adversely impact the Aboriginal right to harvest Atlantic Salmon in their traditional territories. Atlantic Salmon is a cultural keystone species for Indigenous communities in the Atlantic Region, and Indigenous knowledge demonstrated the vital role that Atlantic Salmon plays in culture and sustenance in communities. Project-related sound from operations, marine shipping associated with the Project, accidents and malfunctions, and cumulative effects were all cited as pathways by which migrating Atlantic Salmon could be adversely affected. Indigenous communities requested that the proponent consider the precautionary principle in their assessment owing to the endangered status of certain Atlantic Salmon populations, the limited 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 these species. In responding to these concerns, the proponent 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.

Several Indigenous communities, including Conseil des Innus de Ekuanitshit and Première Nation des Innus de Nutashkuan were concerned about the deposition of drilling muds and cuttings causing harm to corals, sponges and the species dependent upon them in the Northeast Newfoundland Slope Closure Marine Refuge. Indigenous groups were also concerned that accidental events may adversely affect breeding and feeding grounds of marine species and could impact food, social, and ceremonial fisheries.

Many groups requested that the proponent develop Incident Management Plans, Spill Response Plans, Environmental Protection Plans, Safety Plans, and Net Environmental Benefit Analyses in consultation with Indigenous communities. KMKNO recommended that, in the event of a spill, the proponent be required to compensate for any loss of productivity of species harvested by the Mi'kmaq. The proponent in collaboration with other operators of exploratory drilling projects in the Newfoundland and Labrador offshore has developed an Indigenous Fisheries Communications Plan with all Indigenous groups which incorporates feedback from Indigenous groups. It outlines how 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 Project's impacts on potential or established Aboriginal or treaty rights, the Agency relied on information provided by the proponent and Indigenous groups.

Indigenous groups may fish species in their traditional territories that migrate through the project area. The Agency determined that because the Project's activities would likely have limited effects on these fish species (Section 6) it would also likely have a low impact on the potential or established Aboriginal or treaty

rights of Indigenous groups with food, social, and ceremonial licences to harvest migratory species. With respect to Atlantic Salmon, a species of particular concern to many Indigenous communities, DFO 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 Atlantic Salmon overwinter in the Orphan Basin, and that Atlantic Salmon are likely to be present at some times of the year as they migrate through to and from home rivers, but the project area is not known to be a significant migration route or overwintering area. DFO has advised that potential effects of the Project on Atlantic Salmon are expected to be negligible to low and spatially and temporally limited.

Although 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), there is 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, the probability of a major subsea blowout is extremely low and therefore the 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 occurred, generally minimal. The Agency notes that the proponent would be required to take all reasonable measures to reduce the probability of an accidental event and ensure that it is 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 proponent has developed an Indigenous Fisheries Communication Plan, which includes procedures to communicate with fishers in the event of routine operations and accidental events. Indigenous groups would be notified in the development of spill response plans, and provided with the approved version (see effects of accidents and malfunctions, Section 7.1 for additional details). The Plan would include sharing results of environmental monitoring and appropriate feedback mechanisms for the concerns of Indigenous groups, fishers and other ocean users.

8.3. 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 MODU into the marine environment are in accordance with the *Offshore Waste Treatment Guidelines* and the MARPOL*;*
- plan and conduct VSP 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 EA 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;
- consider views of Indigenous groups during the development of the Spill Response Plan. Provide the approved version to Indigenous groups prior to drilling. Include a procedure to communicate with all Indigenous fishers in the event of an accident or malfunction in the Fisheries Communication Plan; 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*.

8.4. Issues to be Addressed During the Regulatory Approval Phase

The regulatory approval phase, during which federal permits or authorizations would be considered, would be completed after the EA is complete. In order to proceed, the Project requires authorization by the C-NLOPB under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation* Act. The proponent may also require *Fisheries Act* authorization and a *Species at Risk Act* permit from DFO. 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 EA.

8.5. 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 Project. 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 Project and the related mitigation measures outlined in Section 6.1, Section 6.2, Section 6.3, Section 6.6, and Section 7.1, the Agency concludes that the potential impacts of the Project 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 in Section 6.1, Section 6.6, and 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 proponent's EIS and responses to information requirements from the Agency. Information requirements reflected the views of the public, government agencies, and Indigenous groups. The Agency also considered the measures that would be implemented to mitigate the Project effects, as well as the follow-up (monitoring) measures to be implemented by the proponent.

The environmental effects of the Project and their significance have been determined using assessment methods and analytical tools that reflect current accepted practices of environmental assessment practitioners, including consideration of the effects of potential accidents and malfunctions.

The Agency concludes that the proposed Newfoundland Orphan Basin Exploration Drilling Project is 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 statement. 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 Project is 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 proponent must meet with respect to mitigation and follow-up program requirements in the event that the Project is permitted to proceed.

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11.Appendices

Appendix A Key Mitigation and Follow-Up Measures Identified by the Agency

Valued Component	Mitigation	Follow-up
Fish and Fish Habitat (Section 6.1)	• prepare a pre-drill seabed investigation plan for each well site and submit to DFO and the C-NLOPB for review and approval prior to implementing the survey. The plan should be designed to: ◦ collect high-definition visual data to confirm the presence or absence of sensitive environmental features, including aggregations of habitat-forming corals or sponges; ◦ identify the equipment used for the surveys, to be operated by a qualified individual; and ◦ include information on survey transect length and pattern around each well site, which should be based on applicable drill cutting dispersion model results; • based on approved plans, undertake a seabed investigation survey at each well location prior to commencing drilling a well. Retain a qualified independent marine scientist to provide advice in real-time; • provide the results of the seabed investigation survey to the C-NLOPB and DFO prior to commencing drilling. In addition, provide a description of additional mitigation and monitoring based on the results of the survey and predicted areas of sedimentation and disturbance.	• 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 the seabed investigation survey to be sensitive benthic habitat, conduct specific follow-up monitoring, including: ◦ measurement of sediment deposition extent and thickness (e.g., core samples and/or high definition visual data) 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 DFO; and ◦ results should be provided to Indigenous groups and posted online for public access; • participate in or support research on the presence and distribution of Atlantic Salmon in the Eastern Canadian offshore regions and update the C-NLOPB annually on research activities. Research initiatives can be explored

Valued Component	Mitigation	Follow-up

	Results of the surveys should be provided to Indigenous groups and posted online for public access;
	• if aggregations of habitat-forming corals or sponges or other environmentally sensitive features are identified when undertaking the survey:
	  ○ relocate the well and/or redirect cuttings discharges to ensure that the MODU or drilling muds and cuttings discharges would not affect them, if technically feasible. No drilling should occur before a decision is made by the C-NLOPB and DFO regarding appropriate mitigation and monitoring; or
	  ○ if 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 DFO prior to drilling to determine the for non-compliance with the fish and fish habitat protection provisions of the *Fisheries Act* with respect to coral and sponge aggregations and related options for mitigation to reduce any identified risk;
	• select chemicals to be used during the Project 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 the MODU 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 MARPOL;
		through organizations such as the ESRF and through input from and collaboration with Indigenous groups; and
		• implement the follow-up measures listed in Section 6.2 related to the verification of underwater sound as a result of the Project.

Valued Component	Mitigation	Follow-up
	• 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; and • implement mitigation listed in Section 6.2 related to the conduct of VSP surveys.	

Marine Mammals and Sea Turtles (Section 6.2)	• conduct VSP 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 60 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
		• record and report the activities, observations, and results of the Marine Mammal and Sea Turtle Monitoring Plan to the C-NLOPB and DFO. 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, DFO 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 DFO in advance of drilling, and the monitoring results after well suspension or abandonment, as directed by the C-NLOPB and DFO; and
		• provide follow-up program results to Indigenous groups and post online for public access.

Valued Component	Mitigation	Follow-up
	◦ 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 marine mammal or sea turtle is observed or reported within 400 metres of the vessel; • in consultation with DFO, 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 DFO for review and approval 30 days prior to initiating activities. The plan would describe: ◦ monitoring during VSP 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; • implement mitigation listed in Section 6.1 and Section 6.3 which may also benefit marine mammals and sea turtles.	
Migratory Birds (6.3)	• follow ECCC's (2016) *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, conduct formation testing while tripping, or utilize a similar technology, rather than formation testing with flaring;	• prepare a follow-up program in consultation with ECCC 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 migratory birds from the MODU using a trained observer following ECCC's Eastern Canada Seabirds at Sea Standardized Protocol for Pelagic Seabird Surveys from Moving and Stationary Platforms;

Valued Component	Mitigation	Follow-up

	• if formation testing while flaring is required, notify the C-NLOPB to request an authorization at least 30 days in advance of flaring to:
	  ◦ determine whether the flaring would occur during a period of migratory bird vulnerability (identified in consultation with ECCC) along with a description of how the proponent plans to prevent harm to migratory birds; and
	  ◦ identify how adverse environmental effects on migratory birds would be avoided, including opportunities to reduce nighttime flaring;
	• operate a water curtain barrier around the flare during flaring; and
	• implement all mitigation listed in Section 6.1 related to chemical selection, waste discharge and the disposal of spent synthetic-based muds, as well as those in Section 6.4 related to the maintenance of buffers for supply and support vessels and helicopters over active bird areas and special areas for birds.
		◦ develop, in consultation with ECCC, and implement a protocol for systematic daily monitoring of the MODU and supply vessels for the presence of stranded birds. The protocol would include information on the frequency of searches, reporting procedures, and training requirements, including qualifications of those delivering the training;
		◦ if stranded birds are observed, follow ECCC's (2016) *Procedures for Handling and Documenting Stranded Birds Encountered on Infrastructure Offshore Atlantic Canada*;
		◦ document and report the results of any monitoring activities, including information on level of effort when no birds are found and 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 ECCC. Results should be provided to Indigenous groups and posted online for public access.

Valued Component	Mitigation	Follow-up
Special Areas (Section 6.4)	• restrict helicopter flying altitude to a minimum altitude of 300 metres (except during take-off and landing) over 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 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 a level above the biological effects threshold. Monitoring would 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 DFO; ◦ results should be provided to Indigenous groups and posted online for public access; and ◦ implement all mitigation listed in Section 6.1, Section 6.2, Section 6.3, and Section 6.6.
Federal Species at Risk (Section 6.5)	The Agency determined that the measures to mitigate potential effects on Section 6.1, Section 6.2, and 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 Section 6.1, Section 6.2, and 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 and further exchange of information on specific aspects of interest;	• report annually to the C-NLOPB on whether there have been incidents of lost or damaged fishing gear associated with the Project, including supply vessels. In addition, the Fisheries Communication Plan would provide a means of identifying potential issues should they arise.

Valued Component	Mitigation	Follow-up
	◦ 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 MODU 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 DFO, regarding planned project activities, including timely communication of drilling locations, safety exclusion zones and suspended or abandoned wellheads; and	

Valued Component	Mitigation	Follow-up
	• implement all mitigation listed in Section 6.1 related to providing the results of the seabed investigation survey, wellhead abandonment procedures, selection of chemicals, disposal of spent synthetic-based muds and the discharge of waste. The Agency also notes that the proponent has committed to developing a Fishing Gear Damage or Loss Compensation Program, based on best practices, precedents and industry guidelines, as well as in accordance with applicable C-NLOPB requirements, to address any unplanned interactions between the Project and commercial fishing equipment.	
Current Use of Lands and Resources for Traditional Purposes and Health and Socioeconomic Conditions of Indigenous Peoples (Section 6.7)	The Agency determined that measures to mitigate effects on Section 6.1, Section 6.2, Section 6.3, and Section 6.6 would also mitigate effects on the current use of lands and resources for traditional purposes and the health and socioeconomic 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 socioeconomic conditions of Indigenous peoples and notes that there are related measures proposed in Section 6.1, Section 6.2, Section 6.3 and 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 Project; • submit a Source Control Plan, which includes strategies and measures for well capping, containment of fluids lost form the well, and the drilling of a relief well, as well as options to reduce overall response timelines. The Source Control Plan must include procedures to provide up-to-date information to the C-NLOPB prior to drilling and at regular intervals during drilling related to the availability of appropriate capping stacks and vessels,	• 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 recreational, commercial and traditionally harvested fish species with results integrated into a human health risk

Valued Component	Mitigation	Follow-up

	and appropriate drilling rigs capable of drilling a relief well at the project site;
	• 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 (e.g., synthetic-based mud or cuttings spill);
	  ◦ 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 ECCC; and
	  ◦ specific role and responsibility descriptions for offshore operations and onshore responders;
	• consider views of 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. Provide results of the exercise to Indigenous groups following its review by the C-NLOPB;
	• 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
		assessment to determine the fishing area closure status;
		  ◦ monitoring for marine mammals, sea turtles, and birds for signs of contamination or oiling and reporting results to the C-NLOPB, DFO and ECCC; 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	Mitigation	Follow-up
	possible use of dispersants) that would provide 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 ECCC Environmental Emergency Science Table. Publish the spill impact mitigation assessment on the Internet; • in the event of an uncontrolled blowout from the well, begin immediate mobilization of a capping stack and associated equipment to the site of the uncontrolled blowout. Simultaneously, commence the mobilization of a relief well MODU; • if drilling is anticipated in water depths in excess of 2500 metres, undertake further analysis to confirm the capping stack technology selected can be operated safely at the proposed depth and submit this analysis to the C-NLOPB for approval; • 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 provided to Indigenous groups and fishers needs to present a realistic estimation of potential health risks associated with 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.	

Valued Component	Mitigation	Follow-up
Effects of the Environment on the Project (Section 7.2)	• in consultation with the C-NLOPB and ECCC, implement a physical environment monitoring program in accordance with the *Newfoundland Offshore Petroleum Drilling and Production Regulations* and meet or exceed 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, severe 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 of icebergs and • in consultation with the C-NLOPB , implement measures to ensure that the MODU has the ability to quickly disconnect the riser from the well in event of an emergency or severe 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 severe 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, unauthorized discharge or impairment to critical equipment would be posted on the C-NLOPB's website as part of its incident disclosure policy.
Cumulative Environmental Effects (Section 7.3)	Mitigation, follow-up, and monitoring for this Project would contribute to the mitigation or monitoring of cumulative environmental effects. Additional measures have not been identified at this time, but could be recommended following completion of the regional assessment.	

Appendix B Summary of Proponent's Proposed Mitigation Measures and Follow-up

Valued Component	Mitigation	Follow-up
Fish and Fish Habitat (Section 6.1)	• Conduct an imagery-based seabed survey at the proposed well site(s) to confirm the absence of shipwrecks, debris on the seafloor, unexploded ordnance, and sensitive environmental features, such as habitat-forming corals or species at risk. The survey will be carried out prior to drilling and will encompass an area within a 500-m radius from the well site. If any environmental or anthropogenic sensitivities are identified during the survey, the proponent will notify the C-NLOPB immediately to discuss an appropriate course of action. This may involve further investigation and/or moving the well site if it is feasible to do so. This survey will also provide baseline data for coral and sensitive benthic habitat that may be present and be used to inform discussions on potential follow-up and monitoring with respect to drill waste discharges. • Reduce lighting to the extent that worker safety and safe operations are not compromised. Reduction of light may include avoiding use of unnecessary lighting, shading, and directing lights towards the deck. • Plan and conduct VSP activities in consideration of the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment* (SOCP; DFO 2007). A ramp-up procedure (i.e., gradually increasing seismic source elements over a period of approximately 30 minutes until the operating level is achieved) will be implemented before any VSP activity begins. This measure is aimed at reducing the potential for auditory impairment to marine animals (including fish) in close proximity to the source at the onset of activity. It is based on the assumption that the gradual increase in emitted sound	• Conduct a visual survey of the seafloor using a remotely operated vehicle after drilling activities to confirm the sea floor is cleared of any material or equipment that could interfere with commercial uses of the sea and to assess the visual extent of sediment dispersion and validate drill waste modelling predictions. The specific details of the follow-up program will be determined in consultation with the C-NLOPB and DFO in consideration of the pre-drill survey results. • Results of monitoring and follow-up programs for fish and fish habitat will be published on the Internet and the proponent will notify Indigenous groups and One Ocean of the availability of these documents.

Valued Component	Mitigation	Follow-up
	levels will provide an opportunity for marine animals to move away from the sound source before potentially injurious sound levels are achieved close to the source. • Select and screen chemicals to be discharged, including drill fluids, in accordance with the *Offshore Chemical Selection Guidelines* (NEB et al. 2009). Where feasible, lower toxicity drilling muds and biodegradable and environmentally friendly properties within muds and cements will be used. The chemical components of drilling fluids, where feasible, will be those that have been rated as being least hazardous under the *Offshore Chemical Notification Scheme* and Pose Little or No Risk to the Environment by the *Convention for the Protection of the Marine Environment of the North-East Atlantic*. • Treat operational discharges prior to release in accordance with the *Offshore Waste Treatment Guidelines* and other applicable regulations and standards such as MARPOL, of which Canada has incorporated provisions under the *Canada Shipping Act*. Waste discharges that do not meet regulatory requirements will not be discharged and will be brought back to shore for disposal. The development and implementation of a Project-specific environmental protection plan and waste management plan will be designed to prevent unauthorized waste discharges. • Return synthetic-based mud drill cuttings to the MODU and treat in accordance with the *Offshore Waste Treatment Guidelines* before being discharged into the marine environment. The concentration of synthetic-based mud on cuttings will be monitored onboard the MODU, and in accordance with *Offshore Waste Treatment Guidelines*, no excess or spent synthetic-based mud will be discharged, and any of this excess or spent synthetic-based mud that cannot be reused will be brought back to shore for disposal. Water-based mud drill cuttings will be discharged without treatment.	

Valued Component	Mitigation	Follow-up
	• Dispose of putrescible solid waste, specifically food waste generated offshore on the MODU and platform supply vessels, according to *Offshore Waste Treatment Guidelines* and MARPOL requirements. In particular, maceration of kitchen waste will be conducted in accordance with MARPOL and *Offshore Waste Treatment Guidelines*. There will be no discharge of macerated food waste within three nautical miles from land. • Transfer of hazardous wastes will be conducted in accordance with the *Transportation of Dangerous Goods Act*, and any applicable approvals for the transportation, handling, and temporary storage of hazardous waste will be obtained, as required.	

Marine Mammals and Sea Turtles (Section 6.2)	• Be consistent, as required in the Geophysical, Geological, Environmental and Geotechnical Program Guidelines, with mitigation measures outlined in the *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment* during VSP surveys. Key mitigation measures that will be employed during VSP surveys include:
	  ○ use Marine Mammal Observers to monitor and report on marine mammal and sea turtle sightings during VSP surveys to advise shut-down and ramp-up procedures;
	  ○ implement a ramp-up procedure (i.e., gradually increasing seismic source elements over a period of approximately 30 minutes until the operating level is achieved) before any VSP activity begins. This measure is aimed at reducing the potential for auditory impairment to marine animals in close proximity to the source at the onset of activity. It is based on the assumption that the gradual increase in emitted sound levels will provide an opportunity for marine animals to move away from the sound source before potentially injurious sound levels are achieved close to the source. This procedure will include a pre-ramp up observation period.
		• Results of monitoring and follow-up programs for marine mammals and sea turtles will be published on the Internet and the proponent will notify Indigenous groups and One Ocean of the availability of these documents.
		•

Valued Component	Mitigation	Follow-up
	Ramp-up will be delayed if any marine mammal or sea turtle is detected within 500 metres of the air gun array; ◦ implement a pre-ramp up watch of 60 minutes prior to ramp-up. The longer 60-minute pre-ramp up watch versus the minimum 30-minute period required in the *Statement of Canadian Practice with respect to the Mitigation of Seismic Sound in the Marine Environment* will be used to account for the longer dive times of beaked whales (and other deep-diving marine mammal species) expected to occur in the project area; ◦ implement shut-down procedures (i.e., shut-down of source array) if any marine mammal or sea turtle is observed within 500 metres of the air gun array; and ◦ use passive acoustic monitoring to detect vocalizing marine mammals during conditions of low visibility (e.g., fog and darkness). • Use existing shipping lanes as practicable; where these do not exist, supply vessels shall follow a straight-line approach to and from the project area; and • Vessel speeds not to exceed 22 kilometres per hour (12 knots), except as needed in the case of an emergency during transit by supply vessels to/from the project area. In the event that a marine mammal or sea turtle is detected in proximity to the vessel (e.g., within 400 metres), vessel speed shall be reduced to avoid the marine mammal or sea turtle. In the event that a marine mammal or sea turtle is detected in proximity to the vessel, vessel speed will be reduced. Marine mammal and sea turtle sightings will be recorded opportunistically during platform supply vessel transit. In the unlikely event of a vessel collision with a marine mammal or sea turtle, the proponent will contact the Canadian Coast Guard within 24 hours following the collision.	

Valued Component	Mitigation	Follow-up
	• If platform supply vessel crews are observing congregations of whales along the platform supply vessel routes, the captain may use their discretion to change the transit route to avoid congregating whales. Mitigation measures that apply to fish and fish habitat (above) would also apply to marine mammals and sea turtles.	
Migratory Birds (Section 6.3)	• Migratory birds stranded on the MODU and platform supply vessels will be recovered using the methods from *Procedures for Handling and Documenting Stranded Birds Encountered on Infrastructure Offshore Atlantic Canada* (ECCC, 2016) and associated permit conditions under the *Migratory Birds Convention Act*, 1984. Results of the monitoring program will be shared publicly; • If flaring is required, the proponent would discuss flaring plans with the C-NLOPB including steps to reduce adverse effects on migratory birds. This may involve restricting flaring to the minimum required to characterize the wells' hydrocarbon potential and as necessary for the safety of the operation, at least 30 days in advance to minimizing flaring during periods of migratory bird vulnerability, and the use of a water curtain to deter birds from the general vicinity of the flare. Flaring could be planned such that it does not commence during periods of poor visibility including at night and during inclement weather; • Helicopters transiting to and from the MODU will avoid transiting near migratory bird nesting colonies and will comply with provincial *Seabird Ecological Reserve Regulations, 2015* and ECCC's *Avoidance Guidelines* for seabird and waterbird colonies. Appropriate flight altitudes and horizontal buffer zones will be established to minimize disturbance to colonies in accordance with the *Seabird Ecological Reserve Regulations, 2015* and the ECCC's *Avoidance Guidelines*. Specific details will be provided in the environmental protection plan;	• Results of monitoring and follow-up programs for migratory birds will be published on the Internet and the proponent will notify Indigenous groups and One Ocean of the availability of these documents.

Valued Component	Mitigation	Follow-up
	• Platform supply vessels transiting to and from the MODU will be planned to avoid passing within 300 metres of migratory bird nesting colonies during the nesting period and will comply with provincial *Seabird Ecological Reserve Regulations, 2015* and the federal guidelines in order to minimize disturbance to colonies. Specific details will be provided in the environmental protection plan Mitigation measures that apply to fish and fish habitat and marine mammals and sea turtles (above) would also apply to migratory birds.	
Special Areas (Section 6.4)	• Once wells have been drilled and evaluation programs completed (if applicable), the wells would be plugged and abandoned in line with applicable company practices and C-NLOPB requirements; • If Bay Bulls is selected as a supply base port, platform supply vessels entering and exiting Bay Bulls will approach the Witless Bay Ecological Reserve no closer than two kilometres; and • Proposed mitigation measures related to fish and fish habitat, marine mammals and sea turtles, migratory birds (above) and commercial fisheries (below) would mitigate potential effects on special areas.	The proposed follow-up related to fish and fish habitat would also apply to special areas.
Species at Risk (Section 6.5)	Proposed mitigation measures related to fish and fish habitat, marine mammals and sea turtles, and migratory birds (above) would mitigate potential effects on species at risk.	No follow-up and monitoring are proposed for routine Project activities.
Commercial Fisheries (Section 6.6)	• Continue to engage commercial fishers through Fish, Food and Allied Workers - Unifor, Ocean Choice International, One Ocean, Association of Seafood Producers, and Groundfish Enterprise Allocation Council regarding project details including the safety (exclusion) zone, and determine the need for a fisheries liaison officer during mobilization and demobilization of	No follow-up and monitoring are proposed for routine Project activities.

Valued Component	Mitigation	Follow-up
	the MODU. A Fisheries Communication Plan will be used to facility the coordinated communication with fishers; • Maintain ongoing communication with the NAFO Secretariat, through DFO as the Canadian representative, regarding planned Project activities, including drill locations, safety zones, and decommissioned well sites; • Provide details of the safety zone to the Marine Communication and Traffic Services for broadcasting and publishing in the Notices to Shipping and Notices to Mariners. Details of the safety (exclusion) zone will also be communicated during ongoing engagement activities with commercial and Indigenous fishers; • Develop and implement a compensation program for damages resulting from Project activities. This compensation program will be developed in consideration of C-NLOPB guidelines, including the *Compensation Guidelines Respecting Damages Relating to Offshore Petroleum Activities* (C-NLOPB and CNSOPB 2017). • Establish a safety zone around the MODU in accordance with the Newfoundland Offshore Petroleum Drilling and Production Regulations; • Contact DFO regarding timing and locations of planned DFO research surveys. • Contact DND regarding timing of planned offshore military exercises. • To maintain navigational safety at all times during the Project, obstruction lights, navigation lights and foghorns will be kept in working condition on board the MODU and platform supply vessels. Radio communication systems will be in place and in working order for contacting other marine vessels as necessary. • Communicate locations of suspended and/or abandoned well site locations to the appropriate authorities for inclusion on	

Valued Component	Mitigation	Follow-up
	nautical charts for use by commercial fishers and other mariners. Proposed mitigation measures related to fish and fish habitat (above) would also apply to commercial fisheries.	
Current Use of Lands and Resources for Traditional Purposes and Health and Socioeconomic Conditions of Indigenous Peoples (Section 6.7)	• Continue to engage Indigenous communities to share Project details as applicable and facilitate coordination of information sharing. An Indigenous Fisheries Communication Plan will be used to facilitate coordinated communication with fishers. • Funding ESRF research on Atlantic Salmon in offshore Eastern Newfoundland. • Project-related damage to fishing gear, if any, will be compensated in accordance with the *Compensation Guidelines with Respect to Damages Relating to Offshore Petroleum Activity* (C-NLOPB and CNSOPB 2017). Proposed mitigation measures related to fish and fish habitat, marine mammals, migratory birds and commercial fisheries (above) would mitigate potential effects on the current use of lands and resources for traditional purposes and health and socioeconomic conditions of Indigenous peoples.	No follow-up and monitoring are proposed for routine Project activities.
Accidents and Malfunctions (Section 7.1)	• Implement multiple preventative and response barriers to manage risk of incidents occurring and mitigate potential consequences. The Project will operate under an Incident Management Plan which will include contingency plans for responding to specific emergency events, including potential spill or well control events. The Incident Management Plan and supporting specific contingency plans, such as a Spill Response Plan, will be submitted to the C-NLOPB prior to the start of any drilling activity as part of the Operations Authorizations process. The Spill Response Plan will specify tactical response methods, procedures and strategies for safely responding to different spill scenarios and identify and contain contact information for	In the unlikely event of a spill, specific monitoring (e.g., environmental effects monitoring) and follow-up programs may be required and will be developed in consultation with regulatory agencies, Indigenous groups, and fisheries stakeholders, as applicable.

Valued Component	Mitigation	Follow-up
	nations and jurisdictions that could be impacted by a release event. The Spill Response Plan will outline options and procedures necessary to respond outside of the Canadian exclusive economic zone. Tactical response methods that will be considered following a spill incident include but are not limited to: offshore containment and recovery; surveillance and tracking; dispersant application; in-situ burning; shoreline protection; shoreline clean up; and oiled wildlife response. A copy of the Spill Response plan will be posted on the Internet and the proponent will inform Indigenous groups and fisheries stakeholders of its availability. • Undertake a Spill Impact Mitigation Assessment/Net Environmental Benefit Analysis as part of the Operations Authorizations process with the C-NLOPB. The Spill Impact Mitigation Assessment is a structured process that will qualitatively evaluate the risks and trade-offs of all feasible and effective response options, when compared to no action. The Spill Impact Mitigation Assessment process will inform the selection of an overall spill response strategy for the Project. • If identified as a preferred response option, use of chemical dispersants would not occur without first obtaining regulatory approval. The proponent will consult with the C-NLOPB to identify other appropriate stakeholders/rights-holders and determine how to involve them within the development and/or review of the Spill Impact Mitigation Assessment. • In the event that oil threatens or reaches the shoreline, shoreline protection measures, including deflection from sensitive areas, will be implemented as practical. Shoreline Clean-up Assessment Technique teams will be mobilized to the affected areas to conduct shoreline surveys to document the type and degree of any shoreline oiling, and inform shoreline clean-up and remediation as applicable. Shoreline Clean-up Assessment Technique teams will also be used to monitor and evaluate the effectiveness of the clean-up operations	

Valued Component	Mitigation	Follow-up
	• Develop a Wildlife Response Plan and, for incidents where wildlife is threatened, engage specialized expertise to implement the Plan, including the recovery and rehabilitation of wildlife species as needed. • Prepare a Capping and Containment Response Plan for the C-NLOPB describing the roles, responsibilities and processes to be undertaken and address resource and logistic requirements for a capping and containment response.	
Effects of the Environment on the Project (Section 7.2)	**General** • Develop well-specific operating guidelines to manage operational risk and determine when alerts should be given and what action is appropriate. If conditions are deemed unsafe or pre-set limits have been reached or are suspected of being reached due to weather or rig movement, the Offshore Installation Manager on the MODU has the authority to modify, suspend, or delay operations before the operating limits are reached. • Obtain daily weather forecasts for the area of operations from a contracted third-party. • Radio communications systems will be in place to contact other marine vessels. • MODU, platform supply vessels, and shore bases will have systems in place for communication. • Comply with Canadian regulations for engineering design, and adhere to international standards, where applicable. • Engineering design of a MODU will consider the type and magnitude of loads imposed by ice, snow, waves, tides, currents, wind and operating ambient temperatures. • MODU selected will be a deep-water, all-weather MODU that is specifically designed to operate in extreme environments.	No follow-up and monitoring are proposed.

Valued Component	Mitigation	Follow-up
	• A Certificate of Fitness will be obtained for the MODU from an independent third-party Certifying Authority prior to the commencement of drilling operations in accordance with the *Newfoundland Offshore Certificate of Fitness Regulations*. • MODU will have capability to disconnect the riser from the well in a short period of time, to reduce the risk of damage to the well, riser, and MODU. • Platform supply vessels used for the Project will be equipped for safe all-weather operations, including increased stability in rough seas. • Platform supply vessels will undergo the proponent's marine assurance process, and external inspections/ audits by the C-NLOPB as part of the pre-authorization inspection process. • Adequate food and water supplies will be stored on the MODU to accommodate delays. • Collect detailed site-specific information on climatic, meteorological, and oceanographic conditions as part of the planning and design of an offshore program and its associated regulatory review and approval requirements (e.g., *Offshore Physical Environment Guidelines*; NEB et al. 2008). **Reduced visibility** • If the set visibility requirements for helicopter flights are not met, flights will not occur. There are also specific navigational lighting requirements on the MODU's helipad and exterior. • While platform supply vessels can operate in most weather conditions, slower speeds may be required during periods of reduced visibility. **Extreme weather conditions/events** • Platform supply vessel captains, helicopter pilots, and the MODU's Offshore Installation Manager will have the authority to suspend or modify operations in the case of adverse weather	

Valued Component	Mitigation	Follow-up
	that could compromise the safety of platform supply vessel, helicopter, or MODU operations. • If required due to extreme weather, the riser will be disconnected from the well, and the MODU will be moved to reduce the risk of damage or injury. **Lighting** • Platform supply vessels and the MODU will have lightning protection systems to ground lightning electrical charges and transfer the energy to the sea water where it can be dissipated • Safe work practices will be implemented to reduce the risk of lightening to Project personnel, such as restricting access to external areas of the platform supply vessels and MODU. **Currents** • MODUs and platform supply vessels will incorporate water current loads into their design. • Implement a physical environment monitoring program, including met-ocean monitoring, onsite weather observation, and ice management, as required by the *Offshore Physical Environment Guidelines* (NEB et al. 2008). **Extreme oceanographic events (e.g., tsunamis)** • A Certificate of Fitness will be obtained for the MODU from an independent third-party Certifying Authority prior to the commencement of drilling operations in accordance with the Newfoundland Offshore Certificate of Fitness *Regulations*, considering the potential environmental loads imposed by naturally-occurring phenomena. **Sea ice/icebergs and superstructure icing** • Prepare and submit an Ice Management Plan as part of the application for Drilling Program Authorization as per the *Offshore Physical Environment Guidelines* (NEB et al. 2008). This Plan will include details on sea ice/ iceberg monitoring and	

Valued Component	Mitigation	Follow-up
	detection, and risk assessment, mitigation, and contingency procedures. **Earthquake** • MODU will have capability to disconnect the riser from the well in a short period of time, to reduce the risk of damage to the well, riser, and MODU.	
Cumulative Environmental Effects (Section 7.3)	• Only drill with one MODU in an exploration licence at a time; • Only conduct one VSP survey in an exploration licence at a time. Proposed mitigation measures that apply for fish and fish habitat, marine mammals and sea turtles, migratory birds, special areas, commercial fisheries, accidents and malfunctions, and effects of the environment on the Project (above) would also apply to cumulative effects.	No follow-up and monitoring are proposed for cumulative effects.

Appendix C Summary of Indigenous Concerns

The table below provides a summary of concerns raised by Indigenous groups as well as the proponent's and Agency's responses. Most of these concerns were raised during comment periods and other opportunities for input that occurred during the EA. However, the Indigenous groups have been and are being consulted on several offshore exploratory drilling project EAs, and these projects have similar key components, activities, and related potential effects. Although this table is not intended to be a cumulative collection of all concerns raised across all these different projects, there is a significant amount of overlap, and in certain cases comments submitted on other proposed offshore exploratory drilling projects may have been used to identify and characterize concerns which clearly apply across all of these types of projects in the eastern Newfoundland and Labrador offshore area.

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
Fish and Fish Habitat				
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 of American Eel. This species has particular cultural importance for Indigenous communities.	The proponent provided additional information related to American Eel. It recognized that American Eel may migrate through the project area during migrations to or from spawning areas. The proponent indicated that Indigenous group representatives shared their concerns during October 2018 workshops regarding potential impacts of proposed activities on American Eel and that information presented had previously been considered by the proponent. The proponent stated that general mitigation measures for fish and fish habitat would avoid or reduce	The Agency requested additional information from the proponent regarding the potential effects of the Project on American Eel. 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 Guidelines* and ensuring that all discharges from a

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
			potential adverse effects on American Eel.	drilling installation meet the *Offshore Waste Treatment Guidelines*.
Conseil des Innus de Ekuanitshit Elsipogtog First Nation Innu Nation KMKNO Miawpukek First Nation Mi'kmaq Confederacy of Prince Edward Island (Lennox Island First Nation and Abegweit First Nation) Millbrook First Nation MMS MTI NunatuKavut Community Council Qalipu First Nation WNNB	Effects on Atlantic Salmon	Concern about potential impacts of the Project on migrating salmon populations. Effects may include those related to project-related sound and light. The proponent should consider the precautionary principle in its 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 proponent stated that the project area may serve as a summer marine feeding area for the Outer Bay of Fundy population of Atlantic Salmon. The Inner Bay of Fundy Atlantic Salmon are not known to inhabit North Atlantic Ocean waters near the Orphan Basin or the Grand Banks. The presence of the Inner Bay of Fundy Atlantic Salmon is considered to be unlikely. The proponent stated that with the application of the precautionary principle, all of the Atlantic Salmon populations have the potential to occur in the project area; however the presence of the Inner Bay of Fundy salmon is considered unlikely. The proponent discussed the biological and behavioural response of marine fish to light and noise in the EIS and responses can include attraction and/or avoidance behaviours and indirectly may affect risk of predation or reduction of feeding opportunities. If Atlantic Salmon are migrating through the project area and exposed to light and sound emissions from project activities, effects are expected to be	The Agency requested additional information from the proponent 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 proponent to consider. This information has been incorporated into the Agency's analysis. DFO 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. The Agency is of the view that a complete ban on activities between January and August would be impractical and unnecessary. DFO has advised that potential effects of the Project on Atlantic Salmon are

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
Woodstock First Nation			low in magnitude, medium term, and reversible.	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 installation meet the *Offshore Waste Treatment Guidelines*.
Conseil des Innus de Ekuanitshit Elsipogtog First Nation KMKNO Miawpukek First Nation Première Nation des Innus 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 proponent should provide funding for tracking studies of Atlantic Salmon (e.g., using satellite pop-up tags) to be completed before any exploration activities	The proponent contributes to a mandatory industry-wide research fund through the ESRF and have recommended priority be placed on designating funds for Atlantic Salmon research offshore Eastern Newfoundland and that Indigenous groups be involved in the research. The proponent also noted that there are other research initiatives related to Atlantic Salmon currently underway or proposed including a salmon tagging program being carried out by the Atlantic Salmon Federation and the placement of acoustic receivers to detect signals	The Agency requested additional information from the proponent related to any updates on research collaborations and agreements that are in place to improve understanding of the presence of Atlantic Salmon in the project area and their migratory routes and behaviours. The Agency notes that, to address knowledge gaps regarding Atlantic Salmon migration identified during this and other environmental assessments of exploration projects in offshore Newfoundland and Labrador, in May 2019 the ESRF issued a call for proposals for environmental and social studies related to Atlantic Salmon.

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
		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.	from tags in the Flemish Pass and/or the Grand Banks.	
Elsipogtog First Nation Innu Nation KMKNO Miawpukek First Nation Millbrook First Nation MTI NunatuKavut Community Council Qalipu First Nation	Atlantic Salmon - Indigenous knowledge	Indigenous knowledge about Atlantic Salmon populations has not been factored into into the environmental assessment process (e.g., valued components baseline information or environmental effects analysis).	The proponent engaged Indigenous groups over the course of the EA through face-to-face meetings, phone calls, emails, and reports. In April 2018, the proponent participated in workshops organized by the Agency with Indigenous groups. Proponents organized additional workshops in October 2018 to solicit discussion and feedback on offshore exploration drilling projects from Indigenous groups. The proponent considered Indigenous knowledge and updated data and analysis on population declines of Atlantic Salmon. The proponent stated that it would continue its engagement efforts throughout the life of the Project.	The Agency required the proponent to provide additional information and analysis on the effects of the Project on Atlantic Salmon, including considering additional 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 notes that, to address knowledge gaps regarding Atlantic Salmon migration identified during this and other environmental assessments of exploration projects in offshore Newfoundland and Labrador, in May 2019 the ESRF issued a call for proposals for environmental and social studies related to Atlantic Salmon.

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
				The Agency also considered Indigenous knowledge presented in its analysis.
KMKNO Miawpukek First Nation Qalipu First Nation	Effects on corals and sponges	It is unclear how the proponent 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) at each well site and mooring location, and not only in areas where coral gardens or sponge grounds are known or likely to be present.	The proponent indicated that it would conduct an imagery-based survey using a remotely operated vehicle prior to spudding each well in the drilling program. A 500-metre radius would be surveyed during pre-drill surveys and would identify potential corals and sponges which may be sensitive to drilling with a focus on coral/sponge density and habitat-forming corals/sponges. Given the proponent's water depths, it indicated that the MODU would not be anchored but instead use dynamic positioning and therefore, there would be no moorings or chains associated with the drilling program. If any environmental or anthropogenic sensitivities are identified during the survey, the proponent would notify the C-NLOPB immediately to discuss an appropriate course of action. This may involve further investigation and/or moving the well site if it is feasible to do so.	The Agency requested additional information from the proponent related to pre-drill seabed investigation plans. 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 proponent to prepare a pre-drill seabed investigation for each well site and submit to DFO 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 well sites. If aggregations of habitat-forming corals, sponges, or other environmentally sensitive features are identified, the proponent 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

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				and DFO 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 proponent would be required to conduct a comprehensive assessment of the potentially-affected benthic habitat in consultation with DFO 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 pre-drill seabed investigations to be sensitive benthic habitat, the proponent would also be required to conduct follow-up to verify drill waste deposition modelling predictions. Results of pre-drill seabed investigations and follow-up monitoring would be provided to Indigenous groups and posted online for public access.
KMKNO	Drill waste dispersion modelling	The proponent should verify and validate the drill cuttings dispersion modelling predictions. Such a follow-up program should not be dependent on specific	The proponent indicated that if any environmental sensitivities are identified during the pre-drill survey that it would notify the C-NLOPB immediately to discuss an appropriate course of action. The	The Agency requested additional information from the proponent related to their pre-drill seabed investigations and the subsequent mitigation and follow-up measures. This information has been incorporated into its analysis.

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		circumstances. The monitoring program should be conducted via seabed video and/or benthic sampling to determine, among other things, infaunal recolonization rates following drilling.	proponent proposed follow-up measures that involve conducting a visual survey of the seafloor using a remotely operated vehicle after drilling activities. The visual survey would be to assess the visual extent of sediment dispersion and validate drill waste modelling predictions. The specific details of the follow-up program would be determined in consultation with the C-NLOPB and DFO in consideration of the pre-drill survey results. The proponent estimated drill cuttings sedimentation to be relatively low for the Project. This, combined with mitigation to reduce potential effects on corals and sponges indicates that effects would not likely result in permanent habitat loss. Beyond the pre-drill and post-drill well site surveys, environmental effects monitoring for recovery rates for infaunal organisms is not required for exploration drilling programs.	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: • providing the results of pre-drill seabed investigations to DFO 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 pre-drill seabed investigations 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.
KMKNO	Effects of Sound on Fish	Concerns related to the effects of underwater sound on invertebrates. The	The proponent indicated that there is some evidence of physical, behavioural and physiological	The Agency requested additional information from the proponent related to the potential adverse environmental

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		proponent should assess potential adverse effects on sessile/sedentary and slower moving fish species.	effects to lower motility invertebrate species from underwater pressure levels and/or particle motion from sound. However, gaps in understanding the effects of sound on fish and invertebrates remain and therefore threshold sound exposure levels for sound pressure or particle motion have not been developed for these marine fish. The proponent the threshold levels for these species are consistent with existing recommendations for fish, recognizing that these organisms are likely to be impacted by sound from project activities to a greater extent than fish that can respond more quickly. However, given the small footprint exposed to sound, it is not expected that low motility organisms would be affected by the Project at a population level.	effects of underwater sound from project activities to sessile/sedentary epifauna and slower moving lower motility invertebrate and fish species. 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 fish species. These are described in Sections 6.1.3, 6.2.3, and Appendix A, and include: • conducting VSP surveys in accordance with the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment*; and • verifying predicted underwater sound levels with field measurements during the first well per exploration licence.
Marine Mammals and Sea Turtles				
KMKNO Miawpukek First Nation	Effects of VSP	Concerns related to the effects of VSP surveys on marine mammals and sea turtles. The proponent should implement measures to minimize impacts on marine mammals and sea turtles during VSP.	The proponent committed to follow the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment* during VSP. The ramp-up of the VSP sound source would be delayed if any marine mammal or sea turtle	The Agency requested additional information from the proponent related to the potential effects of VSP 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

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		Observers able to identify sensitive or protected species should be posted on watch during surveys.	species were detected within the 500-metre safety zone. This is more precautionary than current mitigation measure included in the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment*. Marine Mammal Observers receive technical training in species identification to allow them to identify marine mammals and sea turtles to species level. If a Marine Mammal Observer were to detect a marine mammal or sea turtle within the 500-metre safety zone that is determined to possibly be a Species at Risk, a precautionary shut-down of the VSP sound source would be implemented independent of a positive species identification.	conditions that would mitigate the potential effects of VSP 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 VSP 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 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 proponent would be required to provide monitoring and follow-up program results to Indigenous groups and post online for public access.

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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 Project, including cumulative effects from other projects. The proponent should conduct follow-up monitoring studies to evaluate the effects of noise on marine wildlife, with results of these shared with Indigenous groups.	The proponent 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. It however indicated that underwater sound from project activities is not expected to result in marine mammal mortality. The proponent acknowledged that it is possible that multiple seismic surveys may occur near the project area during the drilling program. However, marine mammals would have to occur within 10s to 100s of metres of a seismic sound source to potentially experience injury. Marine mammals have been shown to exhibit at least localized avoidance of an active seismic survey. In addition, seismic programs would use mitigation measures such as ramp-ups, delayed start-ups, and shut-downs of the sound source, as well as spatial separation between seismic surveys (typically a minimum of 30 kilometres). There would also be limited potential for cumulative effects between the Project Area and existing production facilities due to	The Agency requested additional information from the proponent related to the potential cumulative 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 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 VSP 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

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			distances separating them (i.e., greater than 200 kilometres). There is some potential for cumulative effects from underwater sound from fishing vessels and Project activities. However, this potential is reduced because fishing activities mainly occur in the western portion of the project area, primarily outside of the exploration licences and the number of fishing vessels active in the area at a given time is limited. Safety zones around the MODU where fishing vessels are not expected to occur would limit potential for overlap, and thus, cumulative behavioural effects. The proponent would conduct a marine mammal and sea turtle mitigation and monitoring program during VSP surveys that follows the requirements in the *Statement of Canadian Practice with Respect to the Mitigation of Seismic Sound in the Marine Environment.* There have been several recent acoustic monitoring studies conducted to characterize underwater sound levels and to verify predictive modelling. The EIS also concluded that there is low potential for interaction with marine mammal species at risk as well as	• verifying predicted underwater sound levels with field measurements during the first well per exploration licence. The proponent would be required to provide monitoring and follow-up program results to Indigenous groups and post online for public access.

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			effects on marine mammals are expected to be short-term, localized and negligible to low in magnitude therefore a follow-up program to verify sound predictions is not proposed.	
KMKNO MTI	Vessel speeds	Project-related vessels should be required to reduce speeds (ten 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. This is particularly important given the recent deaths of North Atlantic Right Whales attributable to blunt force trauma, although they are considered rare in the regional assessment area. 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 proponent stated that supply vessels would use existing shipping lanes as practicable; where these do not exist, supply vessels would follow a straight-line approach to and from the project area. The proponent committed to: • during transit to/from the project area, supply vessels would travel at vessel speeds not exceeding 22 kilometres per hour (12 knots), except as needed in the case of an emergency; • marine mammal and sea turtle sightings would be recorded opportunistically by vessel crew during supply vessel transit on each Project supply vessel; and • in the event that a marine mammal or sea turtle is detected in proximity to the vessel (e.g., within 400 metres), vessel speed would be reduced	The Agency requested additional information from the proponent and incorporated it into its analysis. The Agency notes that North Atlantic Right Whales are considered rare in the regional assessment area. Following consultation with DFO, the Agency is of the opinion that the slight increase in vessel traffic due to the Project would be unlikely to substantially increase the probability of collisions. As a precautionary measure, the proponent would be required to limit vessel speeds when a whale or sea turtle is observed or reported in the vicinity of a supply vessel. DFO has advised that it would support the requirement for supply vessel speed to be reduced to seven knots (approximately 13 kilometres per hour) when within 400 metres of a marine mammal or sea turtle. The Agency has identified key mitigation measures and proposed EA conditions that would mitigate the potential effects of vessels on marine

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			to avoid the marine mammal or sea turtle. Supply vessel routes transiting to and from the MODU would avoid transiting near known migratory bird nesting colonies and would comply with provincial *Seabird Ecological Reserve Regulations, 2015* and ECCC's *Avoidance Guidelines for Seabird and Waterbird Colonies*. If Bay Bulls is selected as a supply base port, supply vessels entering and exiting Bay Bulls would approach the Witless Bay Ecological Reserve no closer than two kilometres. The proponent recognized that there could potentially be marine birds foraging within potential supply vessel routes. When travelling to and from the project area, supply vessels would travel at speeds of 12 knots or less and supply vessel traffic is expected to cause only a brief, temporary displacement of seabirds that could potentially be foraging within the supply vessel path. Commitments regarding buffer zones and vessel speed would be included in the Project Environmental Protection Plan and included in contractor training.	mammals, sea turtles, and migratory birds. These are described in Section 6.2.3, 6.3.3, and Appendix A. The proponent would be required, except during an emergency, to: • limit supply vessels' movement to common 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 species at risk is observed or reported within 400 metres of the vessel.

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Migratory Birds				
Conseil des Innus de Ekuanitshit KMKNO MTI Qalipu First Nation WNNB	Effects on migratory birds	The Project 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 proponent should document the presence of hydrocarbons on the surface of the water and any subsequent impacts on seabirds following the drilling work. 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 proponent should implement monitoring, and should consider the use of acoustic and/or camera based monitoring to document bird sightings and interactions with the drilling	The proponent provided additional information related to the Project's potential effects on migratory birds. It indicated that although unlikely to occur, if a sheen was observed during normal operating conditions (i.e., discharges within approved operational criteria with no hydrocarbon spill), the proponent would immediately notify the Canadian Coast Guard and C-NLOPB for informational purposes. During project operations, for each well, systematic deck searches would be conducted daily for stranded birds by trained observers on the MODU and the supply vessels. These systematic searches would be conducted in accordance with ECCC's *Procedures for Handling and Documenting Stranded Birds Encountered on Infrastructure Offshore Atlantic Canada* and associated permit conditions under the *Migratory Birds Convention Act, 1994* authorizing the capture and handling of migratory birds. Search efforts would be documented and observations recorded (including notes of whether birds show any	The Agency requested additional information from the proponent related to the potential effects of the Project 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 ECCC's protocol. The proponent would be required to provide monitoring and follow-up 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 6.2) would also mitigate potential effects on migratory birds.

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		installation and project vessels. The proponent should provide quantifiable targets (e.g., number of bird standings/deaths) which would be used to determine the effectiveness of mitigation measures and to serve as adaptive management thresholds.	sign of oiling). The proponent would consult ECCC in the process of preparing the monitoring protocol and permit application. Results of the monitoring program would be shared publicly to help further improve the understanding of bird strandings and mortality in the Newfoundland and Labrador offshore area.	
KMKNO MTI Nunatukavut Community Council	Flaring	The proponent 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 proponent should be required to notify ECCC in advance of planned flaring to determine whether the flaring 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	The proponent indicated that it would notify the C-NLOPB of plans to flare associated with formation flow testing at least 30 days in advance of non-emergency flaring to determine whether flaring is proposed during a period of migratory bird vulnerability. When flaring, the proponent would use a water curtain to protect personnel and equipment on the MODU by limiting the transfer of radiated heat from the flare, thereby mitigating risk of fire and as a potential deterrence of birds from the general vicinity of the flare based on the positioning of the water curtain. The proponent stated that an additional mitigation option could be to manage the timing of flaring activity (e.g., flaring could be	The Agency requested additional information from the proponent 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 proponent to: • restrict flaring to the minimum required to characterize a well's 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

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		alternative poses less of an impact on the environment, then the alternative must be used.	planned such that it does not commence during periods of poor visibility including at night and during inclement weather to reduce light generated during flaring). However, once the well test with flaring begins, data gathered during the well test could be compromised if the well flow was restricted during this test period (i.e., restricted to certain weather conditions). The proponent would discuss the proposed well testing methods as part of the C-NLOPB authorization process, including formation testing while tripping which is an alternative testing method that doesn't require flaring, to ensure that testing can be conducted safely and fulfill well information requirements, while reducing potential adverse environmental effects on migratory birds. Flaring, if required, is expected to be brief and intermittent in nature (lasting two to three days at a time), which could occur multiple times in the well flow test period.	least 30 days in advance of planned flaring to determine if flaring would occur during periods of migratory bird vulnerability (in consultation with ECCC) and to identify how to avoid adverse effects; and • operate a water curtain barrier around the flare during flaring.
KMKNO	Helicopter traffic	Concern regarding potential effects of helicopter traffic on birds. The proponent should adhere to the minimum	The proponent indicated that project helicopters would fly at a lateral distance of two kilometres from known active bird colonies during	The Agency requested additional information from the proponent related to helicopter operations and incorporated it into its analysis.

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		altitude and distance for helicopter flight to minimize disturbance to birds .	routine operations. In the event of the requirement for an emergency response, there may be circumstances where helicopter use could impinge on the two kilometre buffer. In such cases, ECCC would be consulted and would require that flights be made aware of any special circumstances that may require reduction of the two kilometre buffer zone.	The Agency has identified the following mitigation measure to mitigate effects of helicopters on 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).
Special Areas				
KMKNO Première Nation des Innus de Nutashkuan WNNB	Impacts on special areas	Concerns related to potential effects of the Project on special areas. Specifically if additional mitigation measures would be proposed if a well site is proposed within the Northeast Newfoundland Slope Closure marine refuge or other special areas. Indigenous groups requested additional information regarding the ecosystem within the Northeast Newfoundland Slope Closure marine refuge, to update the effects	The proponent committed to develop criteria to determine the feasibility of well site relocation to avoid or minimize impact on corals, sponges, and sensitive areas in consultation with DFO and the C-NLOPB. The potential criteria are expected to be focused on habitat forming coral and sponges. Should any environmental sensitivities be identified, the proponent would notify the C-NLOPB immediately to discuss an appropriate course of action or move to an alternate well site. If it is not technically feasible to move the well site, the proponent would	The Agency requested additional information from the proponent regarding potential effects of the Project 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 proponent to conduct follow-up monitoring when drilling in special areas, or adjacent to or near a

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		assessment for each valued component, and describe how project activities could result in habitat loss or degradation. Indigenous groups also requested additional information on the importance of the Orphan Spur Ecologically and Biologically Significant Area and to update the effects assessment on the Orphan Spur Ecologically and Biologically Significant Area, the Orphan Knoll Seamount Closure Vulnerable Marine Ecosystem, and the special areas within the predicted zone of influence from project activities.	consult with the C-NLOPB prior to commencing drilling to determine an appropriate course of action, which may include identifying additional mitigation measures. No incremental mitigation measures are proposed to be implemented if operating in the Northeast Newfoundland Slope Closure marine refuge or other special areas, unless the survey reveals aggregations of habitat-forming corals and sponges. The proponent provided additional information on the Northeast Newfoundland Slope Closure marine refuge, the Orphan Spur Ecologically and Biologically Significant Area and the Orphan Knoll. The effects assessment was updated to include effects from the zone of influence of drill cuttings, underwater sound and light. The proponent noted that environmental effects monitoring programs conduced in the Newfoundland offshore area indicate that the effects would not likely result in permanent habitat loss.	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: • An imagery-based seabed survey at the proposed well sites would be conducted to confirm the absence sensitive environmental features, such as habitat-forming corals or species at risk. The survey would be carried out prior to drilling and would encompass an area within a 500 metre radius from the well site. If any environmental sensitivities are identified during the survey, the proponent would notify the C-NLOPB immediately to discuss an appropriate course of action. • measuring sediment deposition extent and thickness after drilling is complete and prior to departing the location to 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 DFO.

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				The proponent would be required to provide monitoring and follow-up program results to Indigenous groups and post online for public access.
Commercial Fisheries				
KMKNO MTI Nunatsiavut Government	Effects on commercial fisheries and communication with fishers	Indigenous groups requested additional information on the Indigenous Fisheries Communications Plan, including how to raise issues, whether an adaptive approach would be used, frequency if updates and the role of Indigenous fishers in the development of the Indigenous Fishers Communications Plan.	The proponent committed to engage with Indigenous groups and fisheries stakeholders through the life of the Project and be guided by the Indigenous and Fisheries Communication Plans. A draft communication plans would be developed for discussion with those groups. The proponent noted that it would model its Indigenous Communication Plan on the Scotian Basin Exploration Project, as this method is already known and accepted by Indigenous groups. The Indigenous Communication Plan would include a section outline the process for conflict resolution and claims management. Proponent contacts would be included. It may also contain an outline of consultation or engagement responsibilities as a result of a decision statement that may be issued. Indigenous groups would be consulted on the frequency and formation of communications, as	The Agency requested additional information from the proponent 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, including: • in consultation with Indigenous groups and commercial fishers, develop and implement Indigenous and Fisheries Communication Plans to address communications prior to and during drilling, testing and abandonment of each well. In addition, in all cases where spills, debris, or other project-related activities cause damage to fishers, the C-NLOPB would expect the proponent 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*

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			well as preferred organization contacts for communication. Results of monitoring and follow-up programs would be published on the internet and the proponent would notify Indigenous groups of their availability.	*Offshore Petroleum Activity*, and to act in good faith to resolve claims from fishers. If the proponent 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.
KMKNO Nunatsiavut Government	Compensation	Concerns regarding how Indigenous groups and Indigenous fishers would be engaged in the development of the proposed compensation program.	The proponent stated that engagement would occur during the development of the Indigenous Fisheries Communication Plan. The proponent committed to adhere to the C-NLOPB's Compensation Guidelines with Respect to *Damages Related to Offshore Petroleum Activity*. Should a spill event occur, an emergency response claims process would be activated. The claims management process would include establishing a Claims Call Centre with a toll-free claims reporting telephone number.	The Agency requested additional information from the proponent 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 Indigenous and Fisheries Communication Plans. In addition, in all cases where spills, debris, or other project-related activities cause damage to fishers, the C-NLOPB would expect the proponent 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 proponent and a fisher were unable to resolve such a claim, the fisher could seek relief through a

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				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				
KMKNO MTI Première Nation des Innus 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. Indigenous knowledge can also contribute to providing an ecosystem perspective in EAs and follow-up. More specifically, and in relation to this EA there are concerns regarding the lack of Indigenous knowledge in the proponent's valued components baseline information or environmental effects analysis (e.g., on interactions with Atlantic Salmon, Bluefin Tuna and swordfish) in the EIS and whether primary information was used in preparing the EIS.	The proponent engaged Indigenous groups over the course of the EA through face-to-face meetings, phone calls, emails, and reports. It also coordinated a series of workshop for interested communities to discuss the Project, including potential impacts and mitigation measures. The proponent noted that it (along with other operators) agreed to co-fund an Indigenous knowledge study with an Indigenous community; however, they chose not to pursue the study. The proponent noted that given the location of the Project, and the absence of potential impacts to human health, socioeconomic conditions or resource use, additional traditional land use studies, socioeconomic studies, or heritage surveys were conducted.	The Agency directed the proponent to engage Indigenous communities in the preparation of the EIS and consider Indigenous knowledge in the analysis. The Agency has considered comments received from Indigenous groups following their reviews of the EIS, and asked the proponent 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. 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 proponent also participated.

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
Accidents and Malfunctions				
KMKNO Première Nation des Innus de Nutashkuan WNNB	Icebergs and spill events in the offshore environment	Describe lessons learned from previous events in Nova Scotia and Newfoundland and Labrador offshore	The proponent noted that the operator involved in an iceberg incident did not follow their Ice management Plan. The proponent would ensure that its Ice Management Plan would be fully incorporated into emergency response plans and that specific duties and scenarios are clearly defined and understood by key personnel. The proponent noted that two investigations are still ongoing for spill events. The proponent would include lessons learned from these incidents as well as lessons shared by the C-NLOPB from past unauthorized discharge of synthetic-based mud events in the Newfoundland and Labrador offshore.	The Agency has identified key mitigation measures and proposed EA conditions to reduce the potential for iceberg collisions. These are described in Sections 7.1.3, 7.2.3, and Appendix A.
Conseil des Innus de Ekuanitshit MTI	Capping stack location and response times	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.	For previous projects, proponents have stated that while a capping stack system in Eastern Canada 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	The Agency relied on the C-NLOPB's expertise and advice in reviewing the proponent's 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

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
			installation, including 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 proponent plans to access the capping stack stored in Stavanger, Norway and estimates that a well could be capped between nine and 17 days after an incident. Depending on local conditions specific to the incident, the proponent would assess the most expedient route for capping the well. This would involve the assessment of aircraft and vessel locations and availability. The proponent stated that options include the mobilization of an air-freightable capping stack in combination with a supply vessel for final transport to the well location, or direct transport via marine transporation.	information presented by the proponent. The Agency notes that the C-NLOPB's authorization of drilling activities is contingent on its confidence that the proponent has a satisfactory approach to risk management. The proponent would also be required to demonstrate their preparedness to appropriately respond in the event of an accident or malfunction, including preparation of a detailed spill response plan and well capping and containment plan, which would include discussion of any potential options to reduce overall response timelines. The Agency has identified key mitigation measures that would ensure the proponent fulfil these commitments (refer to Section 7.1.3 and Appendix A), which include the requirement to prepare Spill Response Plan 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.
KMKNO	Impacts of hypoxia as a result of a spill	Concern raised that the biodegradation of hydrocarbons could lead to hypoxia in areas near spills.	Regarding hypoxic conditions in the Western North Atlantic Ocean where the project area is located, the proponent stated that it has	The Agency requested additional information from the proponent on the details of the hypoxia resulting from a spill.

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
			some of the highest deep water dissolved oxygen levels in the world. The proponent noted that organisms may be more sensitive to reductions in dissolved oxygen in the Western North Atlantic Ocean. Modelling exercises conducted on lower deep water dissolved oxygen levels than those found in the project area suggested that a spill is unlikely to create a substantial hypoxic zone. Based on the model, hypoxic conditions tend to form in deeper waters as the oil is broken down and the hypoxic area is smaller than the overall oil spill plume.	The Agency 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 Project is not likely to cause significant adverse environmental effects as a result of accidents and malfunctions.
KMKNO MTI	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 proponent should ensure that information about accidental events would be shared with Indigenous groups, including	The proponent committed to consulting with Indigenous groups during the development of the Indigenous and Fisheries Communication Plans and the Oil Spill Response Plan. The proponent would also meet with Indigenous groups to discuss emergency preparedness and response measures. The proponent would also post the approved Oil Spill Response Plan on the internet and inform Indigenous groups of its availability.	The Agency requested additional information from the proponent on the details of the 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: • consider views of Indigenous groups during the development of the Spill Response Plan. Provide the approved version to Indigenous

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
		consultation in relation to the findings of the dispersion modelling and to the scope of emergency preparedness and response planning.		groups and make it publicly available on the Internet; • include procedures to communicate with fishers in the event of an accident or malfunction in the Fisheries Communications Plan; and • develop procedures to communicate monitoring results to Indigenous groups.
Conseil des Innus de Ekuanitshit KMKNO MTI MMS Première Nation des Innus 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, swordfish, and Bluefin Tuna)	The proponent provided information about potential effects of a spill, including on species of importance to Indigenous groups such as Atlantic Salmon, swordfish and Bluefin Tuna. The proponent noted that laboratory studies have shown that effects of an oil spill on marine fish, including salmon, have resulted in effects on feeding, food conversion, or changes to enzyme levels. Fish returned to baseline conditions in two to eight weeks. The proponent stated that concentrations used in these studies would be expected to be higher from an accidental spill due to dilution from the ocean. Other studies have shown that Pacific salmon avoided	The Agency requested additional information from the proponent regarding a spill's potential effects on migratory species, including Atlantic Salmon. The Agency notes that the C-NLOPB's authorization of drilling activities is contingent on its confidence that the proponent have a satisfactory approach to risk management. The proponent 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

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
			hydrocarbons in the water at certain concentrations. The proponent stated that in the event of a spill, swordfish would likely avoid exposure through temporary migration from affected areas because they can readily metabolize petroleum hydrocarbons. If swordfish are exposed to hydrocarbons via respiration, direct contact, or through diet, these hydrocarbons would be metabolized and generally would not pose a risk through bioaccumulation. For Bluefin Tuna, the proponent indicated that acute oil exposure has been predicted to cause defects in heart development, which may result in mortality of Bluefin eggs and larvae. Similar to swordfish, tuna are a migratory species and effects may be reduced through temporary migration away from the affected areas of an accidental event. The proponent stated that the results of the effects assessment on marine fish and fish habitat applied generally and are consistent with the potential effects on Atlantic Salmon, swordfish and Bluefin Tuna.	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 socioeconomic 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 Project is not likely to cause significant adverse environmental effects as a result of accidents and malfunctions.

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
Conseil des Innus de Ekuanitshit KMKNO MMS NunatuKavut Community Council	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 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.	The proponent stated that the probability of a blowout would be very low and response measures would likely reduce the duration and extent of the spill. The proponent would engage with Indigenous groups to determine appropriate communication protocols to be implemented in the unlikely event of an emergency and would also meet with Indigenous groups to discuss emergency preparedness and response measures that would be included in the Oil Spill Response Plan. The proponent committed to posting its final oil spill response plan on the internet to share with Indigenous groups. The proponent also stated that it would continue to engage with Indigenous communities throughout the life of the Project. This could take the form of face-to face meetings, information bulletins, workshops, and the sharing of plans. The proponent would develop and implement a compensation program for any economic damages suffered by fish harvesters caused by any unauthorized discharge, emission or escape of petroleum, or the escape of debris. This program would serve	The Agency acknowledges that current use and health and socioeconomic 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 the Fisheries Communication Plan 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 socioeconomic conditions of Indigenous peoples. 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 considering potential effects on endangered or threatened populations of Atlantic Salmon and their recovery, as well as the context

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
			as a means of mitigation for any residual economic effects on the fisheries that could not be prevented or fully mitigated by other measures.	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 socioeconomic 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 Project is not likely to cause significant adverse environmental effects as a result of accidents and malfunctions.
Cumulative Effects				
Première Nation des Innus de Nutashkuan	Cumulative effects of offshore drilling	Concern regarding conclusion that cumulative environmental effects on fish and fish habitat are predicted to be not significant and a lack of additional mitigation measures.	The proponent indicated that the cumulative effects on fish and fish habitat are predicted to be not significant with the application of proposed Project-related mitigation measures. The proponent noted that the overall confidence level in the conclusion of significance is considered to be medium to high given the decades of experience studying environmental effects of offshore drilling and production.	The Agency is of the view that the mitigation, follow-up, and monitoring proposed for the Project 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

Source	Subject	Comment or Concern	Summary of Proponent's Responses	Agency Response
				aim to examine the effects of existing and anticipated offshore oil and gas exploratory drilling, including cumulative environmental effects.
Conseil des Innus de Ekuanitshit MTI	Regional assessment	A regional EA or a more comprehensive cumulative effects assessment for the Project 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 a Regional Assessment being completed, operators, including the proponent, are working together in conducting effects analyses (including for this Project), 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.

Appendix D Species at Risk and COSEWIC-listed Species that May be Found in the Eastern Newfoundland Offshore Area, Including the Project Area

The Agency has taken a conservative approach to identifying potential species at risk by including all species that were identified by the proponent in the EIS and additional species the Agency believes may occur in the eastern Newfoundland offshore based on other sources, including other EAs and input from federal authorities. The likelihood of a species occurring in the area and the time of year it may be present can vary greatly from one species to another.

Information has been updated in accordance with the Species at Risk Registry and reviewed by DFO and ECCC.

Species	*Species at Risk Act* Status (Schedule 1)	COSEWIC Assessment
Fish		
Acadian Redfish (*Sebastes fasciatus*) – Atlantic population	Not listed	Threatened
American Eel (*Anguilla rostrata*)	Not listed	Threatened
American Plaice (*Hippoglossoides platessoides*) – Newfoundland and Labrador population	Not listed	Threatened
Atlantic Bluefin Tuna (*Thunnus thynnus*) – Western Atlantic population	Not listed	Endangered
Atlantic Cod (*Gadus morhua*) - Newfoundland and Labrador population	Not listed	Endangered
Atlantic Salmon (*Salmo salar*) - Inner Bay of Fundy population	Endangered	Endangered
Atlantic Salmon (*Salmo salar*) - Outer Bay of Fundy population	Not listed	Endangered

Species	*Species at Risk Act* Status (Schedule 1)	COSEWIC Assessment
Atlantic Salmon (*Salmo salar*) - Eastern Cape Breton population	Not listed	Endangered
Atlantic Salmon (*Salmo salar*) - Nova Scotia Southern Upland population	Not listed	Endangered
Atlantic Salmon (*Salmo salar*) - South Newfoundland population	Not listed	Threatened
Atlantic Salmon (*Salmo salar*) - Quebec Eastern North Shore population	Not listed	Special concern
Atlantic Salmon (*Salmo salar*) - Quebec Western North Shore population	Not listed	Special Concern
Atlantic Salmon (*Salmo salar*) - Anticosti Island population	Not listed	Endangered
Atlantic Salmon (*Salmo salar*) - Inner St. Lawrence population	Not listed	Special concern
Atlantic Salmon (*Salmo salar*) - Gaspe-Southern Gulf of St. Lawrence population	Not listed	Special concern
Atlantic Wolffish (Striped Wolffish) (*Anarhichas lupus*)	Special concern	Special concern
Basking Shark (*Cetorhinus maximus*) – Northeast Atlantic population	Not listed	Special concern
Cusk (*Brosme brosme*)	Not listed	Endangered
Deepwater Redfish (*Sebastes mentalla)* – Northern population	Not listed	Threatened
Lumpfish (*Cyclopterus lumpus*)	Not listed	Threatened
Northern (Broadhead) Wolffish (*Anarhichas denticulatus*)	Threatened	Threatened

Species	*Species at Risk Act* Status (Schedule 1)	COSEWIC Assessment
Porbeagle Shark (*Lamna nasus*)	Not listed	Endangered
Roundnose Grenadier (*Coryphaenoides rupestris*)	Not listed	Endangered
Shortfin Mako Shark (*Isurus oxyrinchus*) – Atlantic population	Not listed	Endangered
Smooth Skate (*Malacoraja senta*) - Funk Island Deep population	Not listed	Endangered
Spiny Dogfish (*Squalus acanthias*) - Atlantic population	Not listed	Special concern
Spotted Wolffish (*Anarhichas minor)*	Threatened	Threatened
Thorny Skate (*Amblyraja radiata*)	Not listed	Special concern
White Hake (*Urophycis tenuis*) – Atlantic and Northern Gulf of St. Lawrence population	Not listed	Threatened
White Shark (*Carcharodon carcharias*) – Atlantic population	Endangered	Endangered
Winter Skate (*Leucoraja ocellata*) – Eastern Scotian Shelf - Newfoundland population	Not listed	Endangered
Marine Mammals		
Atlantic Walrus - Central/Low Arctic population	Not listed	Special concern
Beluga Whale (*Delphinapterus leuca*) – St. Lawrence Estuary population	Endangered	Endangered
Blue Whale (*Balaenoptera musculus*) – Atlantic population	Endangered	Endangered

Species	*Species at Risk Act* Status (Schedule 1)	COSEWIC Assessment
Bowhead Whale (*Balaena mysticetus*) – Eastern Canada-West Greenland population	Not listed	Special concern
Fin Whale (*Balaenoptera physalus*) – Atlantic population	Special concern	Special concern
Harbour Porpoise (*Phocoena phocoena*) - Northwest Atlantic population	Not listed	Special concern
Killer Whale (*Orcinus orca*) - Northwest Atlantic/Eastern Arctic population	Not listed	Special concern
North Atlantic Right Whale (*Eubalaena glacialis*)	Endangered	Endangered
Northern Bottlenose Whale (*Hyperoodon ampullatus*) - Scotian Shelf population	Endangered	Endangered
Northern Bottlenose Whale (*Hyperoodon ampullatus*) - Davis Strait-Baffin Bay-Labrador Sea population	Not listed	Special concern
Sei Whale (*Balaenoptera borealis*) – Atlantic population	Not listed	Endangered
Sowerby's Beaked Whale (*Mesoplodon bidens*)	Special concern	Special concern
Sea Turtles		
Leatherback Sea Turtle (*Dermochelys coriacea*) – Atlantic population	Endangered	Endangered
Loggerhead Sea Turtle (*Caretta caretta*)	Endangered	Endangered
Birds		
Bank Swallow (*Riparia riparia*)	Threatened	Threatened

Species	*Species at Risk Act* Status (Schedule 1)	COSEWIC Assessment
Barrow's Goldeneye (*Bucephala islandica*)	Special concern	Special concern
Bobolink (*Dolichonyx oryzivorus*)	Threatened	Threatened
Buff-breasted Sandpiper (*Tryngites subruficollis*)	Special concern	Special concern
Common Nighthawk (*Chordeiles minor*)	Threatened	Threatened
Harlequin Duck (*Histrionicus histrionicus*)	Special concern	Special concern
Ivory Gull (*Pagophila eburnea*)	Endangered	Endangered
Olive-sided Flycatcher (*Contopus cooperi*)	Threatened	Special concern
Peregrine Falcon (*Falco peregrinus*)	Special concern	Not at risk
Piping Plover (*Charadrius melodus melodus*)	Endangered	Endangered
Red Knot (*Calidris canutus rufa*) – Rufa subspecies	Endangered	Endangered
Red-necked Phalarope (*Phalaropus lobatus*)	Not listed	Special concern
Roseate Tern (*Sterna dougallii*)	Endangered	Endangered
Ross's Gull (*Rhodostethia rosea)*	Threatened	Threatened
Short-eared Owl (*Asio flammeus*)	Special concern	Special concern

Sources: CNOOC 2018; Equinor Canada Ltd. 2017; ExxonMobil Canada Ltd. 2017; BP 2018; Husky 2018; and proponents' information requirement responses, 2018-2019. 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 Assessment Area and their Proximity to the Exploration Licences and Transit Routes

Special Area	Distance to Nearest Exploration Licence (kilometres)	Distance to Proposed Transit Route (kilometres)
Marine Protected Areas		
Eastport – Duck Island Marine Protected Area	279	132
Eastport – Round Island Marine Protected Area	325	130
Newfoundland and Labrador Shelves Ecologically and Biologically Significant Areas		
Sea Pens	Overlaps	Overlaps
Large Gorgonian Corals	31	12
Small Gorgonian Corals	14	73
Canadian Ecologically or Biologically Sensitive Areas		
Northeast Slope	41	Overlaps
Virgin Rocks	331	112
Lilly Canyon-Carson Canyon	386	303
Southeast Shoal	505	330
Eastern Avalon	328	Overlaps
Southwest Slope	623	256
Placentia Bay	391	75
Smith Sound	308	79

Special Area	Distance to Nearest Exploration Licence (kilometres)	Distance to Proposed Transit Route (kilometres)
Labrador Slope	223	299
Labrador Marginal Trough	306	371
Fogo Shelf	215	127
Grey Islands	288	234
Notre Dame Channel	166	119
Orphan Spur	Overlaps	Overlaps
Haddock Channel Sponges	539	173
St. Mary's Bay	412	49
Bonavista Bay	246	101
Baccalieu Island	245	Overlaps
Marine Refuges		
Northeast Newfoundland Slope Closure	Overlaps	Overlaps
Funk Island Deep Closure	167	116
Division 3O Coral Closure	670	333
Hawke Channel	298	357
Gooseberry Island Lobster Area Closure	356	92
Gander Bay Lobster Area Closure	326	305
Lobster Area Closures		
Gander Bay	326	216
Gooseberry Island	356	92

Special Area	Distance to Nearest Exploration Licence (kilometres)	Distance to Proposed Transit Route (kilometres)
Snow Crab Stewardship Exclusion Zones		
Crab Fishing Area 5A	224	63
Crab Fishing Area 6A	249	42
Crab Fishing Area 6B	277	Overlaps
Crab Fishing Area 6C	298	Overlaps
Crab Fishing Area 8A	383	44
Crab Fishing Area 8X	252	171
Crab Fishing Area 9A	464	96
Migratory Bird Sanctuaries		
Terra Nova	325	139
Coastal Ecological Reserves		
Witless Bay	370	5
Baccalieu Island	301	38
Funk Island	223	161
Cape St. Mary's	477	115
United Nations Convention on Biological Diversity Ecologically and Biologically Significant Areas		
Seabird Foraging Zone in the Southern Labrador Sea	16	118
Orphan Knoll	61	118
Slopes of the Flemish Cap and Grand Banks	16	Overlaps
NAFO Fisheries Closure Areas		

Special Area	Distance to Nearest Exploration Licence (kilometres)	Distance to Proposed Transit Route (kilometres)
Tail of the Bank (1)	523	429
Flemish Pass/Eastern Canyon (2)	195	198
Beothuk Knoll (3)	291	310
Eastern Flemish Cap (4)	228	304
Northeast Flemish Cap (5)	175	259
Sackville Spur (6)	52	104
Northern Flemish Cap (7)	113	193
Northern Flemish Cap (8)	100	185
Northern Flemish Cap (9)	85	164
Northwest Flemish Cap (10)	95	160
Northwest Flemish Cap (11)	162	184
Northwest Flemish Cap (12)	96	152
Beothuk Knoll (13)	329	340
3O Coral Closure	670	305
Orphan Knoll Seamount	64	138
Newfoundland Seamounts	551	535
Fogo Seamounts (1)	823	532
Fogo Seamounts (2)	785	335
Important Bird Areas		
Quidi Vidi Lake	339	Overlaps

Special Area	Distance to Nearest Exploration Licence (kilometres)	Distance to Proposed Transit Route (kilometres)
Witless Bay Islands	369	4
Cape St. Francis	322	14
Baccalieu Island	300	36
Grates Point	303	43
Mistaken Point	441	78
The Cape Pine and St. Shotts Barren	461	92
Placentia Bay	426	78
Terra Nova National Park	312	121
Funk Island	218	156
Cape Freels Coastline and Cabot Island	258	139
Cape St. Mary's	471	110
Wadham Islands and Adjacent Marine Area	267	184

Source: BP Energy Canada Group ULC 2018; proponent's information requirement responses