Tilt Cove Exploration Drilling Program

Chapter 4: Methods

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4.0 ENVIRONMENTAL EFFECTS ASSESSMENT AND METHODS

This Chapter describes the scope of the EA and outlines the methods used to assess the effects of routine Project activities and accidental events, as well as the potential cumulative effects of the Project. In consideration of the requirements of CEAA 2012 and guidance issued by IAAC, Stantec has developed these EA methods for the preparation of this EIS. Previous offshore exploration EIS documents for projects within the Newfoundland and Nova Scotian offshore areas that have been reviewed and approved by IAAC were prepared using the same methods. Feedback provided by regulators, rights holders and stakeholders through the technical review process of these previous offshore exploration EIS documents have also been considered and incorporated.

In general, the methods follow the guiding principles as set out in the Project-specific EIS Guidelines (CEA Agency 2019) (Appendix A), issued by the IAAC on June 28, 2019. The importance of EA as a planning and decision-making tool, is emphasized in the guiding principles, with an emphasis on the early identification of mitigation and follow-up programs. In addition to what is already well known about the potential environmental effects of offshore exploration activities, this EIS identifies Project-specific sensitivities mitigation strategies, including environmental design features.

Meaningful public participation and engagement with Indigenous groups is also an important aspect of the guiding principles. As outlined in Chapter 3, Suncor recognizes the importance of early and ongoing Indigenous and stakeholder engagement that continues over the life of the Project and acknowledges the value in building relationships with Indigenous groups and key stakeholders when operating in Newfoundland and Labrador. To build long-term trusting and mutually beneficial relationships based on the principles of inclusion, transparency, respect and accountability, Suncor is committed to collaborating with Indigenous peoples of Canada.

4.1 Scope of Assessment

This EIS has been prepared in accordance with the requirements of CEAA 2012, the Project-specific EIS Guidelines (Appendix A), and other generic EA guidance documents issued by IAAC. The specific requirements of the EIS Guidelines and location within the EIS where these requirements have been addressed is provided in the table of concordance included in the Executive Summary. The remaining sections of this Chapter provide detail on the scope of the Project, scope of the factors to be considered, the selection of VCs to be considered, and the spatial and temporal boundaries for the assessment.

4.1.1 Scope of the Project

The scope of the Project is defined in the Project Description submitted by Suncor to IAAC on May 23, 2019, and is further discussed in Chapter 2 of this EIS. Suncor proposes to drill up to 12 to16 exploration and appraisal wells on EL 1161 of various lengths lasting up to 120 days during the term of the EL; the temporal scope of the EIS extends to 2029.

The scope of the Project to be assessed under CEAA 2012 and pursuant to the Accord Acts includes the following Project activities and components (refer to Chapter 2 for details):

- Geophysical (including VSP), geological, geotechnical, and environmental surveys
- MODU mobilization and drilling
  - mobilization, operation (i.e., drilling), and demobilization of the MODU
  - establishment of a safety zone associated with MODU presence and operation
  - light and sound (atmospheric and underwater) emissions associated with MODU presence and operation
  - waste and water management, including discharge of drill muds and cuttings and other discharges and emissions
- Well evaluation and testing
- Well decommissioning, suspension and abandonment
- Supply and servicing operations
  - loading, refueling, and operation of supply vessels (for re-supply and transfer of materials, fuel, and equipment; on-site safety during drilling activities; and transit between the onshore supply base and the MODU)
  - helicopter support (for crew transport and delivery of supplies and equipment)

The assessment focuses on the potential environment effects associated with these activities and components, which reflect the scope of the Project as described in the EIS Guidelines (CEA Agency 2019) (Appendix A) that will take place throughout the life of the Project and are considered routine activities. Potential environmental effects that could occur in the event of an accidental event or malfunction (non-routine events) are also identified and considered within the scope of the Project. This includes blowouts (uncontrolled release of hydrocarbons during drilling), and MODU and vessel batch spills and releases (e.g., hydraulic fluid, diesel), which have the potential to occur in the offshore (e.g., during drilling) or nearshore (e.g., during supply vessel transit) environment.

4.1.2 Factors to be Considered

In accordance with Section 19 of CEAA 2012 and the EIS Guidelines, the EIS is required to address the following factors:

- The environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the Project and any cumulative environmental effects that are likely to result from the Project in combination with other physical activities that have been or will be carried out
- The significance of the effects referred to in the bullet above
- Comments from the public
- Mitigation measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project
- The requirements of the follow-up program in respect of the Project
- The purpose of the Project
- Alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means
- Any change to the Project that may be caused by the environment

- The results of any relevant study conducted by a committee established under section 73 or 74 [of CEAA 2012]
- Any other matter relevant to the EA that the responsible authority requires to be taken into account.

This EIS addresses the applicable factors outlined in Section 19 of CEAA 2012 and the EIS Guidelines (Appendix A). The VCs identified in Section 4.2.2 will be the focus of the assessment in relation to Section 5 of CEAA, 2012, as required by the EIS Guidelines. The scope of the factors to be considered focuses the assessment on relevant issues and concerns. Under Section 5(1) of CEAA 2012, the environmental effects that are to be addressed in relation to an act or thing, a physical activity, a designated project, or a project are:

a) a change that may be caused to the following components of the environment that are within the legislative authority of Parliament:
    i. fish as defined in section 2 of the *Fisheries Act* and fish habitat as defined in subsection 34(1) of that Act
    ii. aquatic species as defined in subsection 2(1) of the *Species at Risk Act* (SARA)
    iii. migratory birds as defined in subsection 2(1) of the *Migratory Birds Convention Act*, *1994* (MBCA)
    iv. any other component of the environment that is set out in Schedule 2 [of CEAA 2012]
b) a change that may be caused to the environment that would occur
    i. on federal lands
    ii. in a province other than the one in which the act or thing is done or where the physical activity, the designated project or the project is being carried out
    iii. outside Canada
c) with respect to Indigenous peoples, an effect occurring in Canada of any change that may be caused to the environment on:
    i. health and socio-economic conditions
    ii. physical and cultural heritage
    iii. the current use of lands and resources for traditional purposes
    iv. any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance.

Certain additional environmental effects must be considered under Section 5(2) of CEAA 2012 when carrying out a designated project, which requires a federal authority to exercise a power or perform a duty or function conferred on it under any Act of Parliament other than CEAA 2012. This applies to the Project since Suncor will require authorizations from the C-NLOPB under the *Canada-Newfoundland and Labrador Atlantic Accord Implementation Act* in order for the Project to proceed. No other authorization requirements are known. Therefore, the following environmental effects have also been considered:

a) a change, other than those referred to in paragraphs 5(1)(a) and (b), that may be caused to the environment and that is directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function that would permit the carrying out, in whole or in part, of the physical activity, the designated project or the project; and

b) an effect, other than those referred to in paragraph 5(1)(c), of any change referred to in paragraph (a) on:
   i. health and socio-economic conditions,
   ii. physical and cultural heritage, or
   iii. any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance.

These categories of direct and indirect environmental effects have been considered in defining the scope of the EA, including the scope of factors to be considered.

4.2 Methods

4.2.1 Overview of Approach

The method used to conduct the EA for the Project is based on a structured approach consistent with international best practices and with the method used by Stantec for EAs of projects assessed by IAAC. Projects assessed using the same method include Flemish Pass Exploration Drilling Project Environmental Impact Statement (Statoil 2017), Eastern Newfoundland Offshore Exploration Drilling Project Environmental Impact Statement (EMCP 2017), Husky Energy Exploration Drilling Project 2018-2025 Environmental Impact Statement (Husky Oil Operations Limited 2018), and Newfoundland Orphan Basin Exploration Drilling Program Environmental Impact Statement (BP 2018), West Flemish Pass Exploration Drilling Project 2021-2030: Environmental Assessment (Chevron 2020), and BHP Canada Exploration Drilling Project (2019-2028) Environmental Assessment (BHP 2020). The EA method is structured to:

- Identify the issues and potential effects that are likely to be important
- Consider key issues raised by Indigenous communities, stakeholders, and the public
- Incorporate engineering design and programs for mitigation and follow-up into a comprehensive environmental planning process.

VCs are environmental attributes associated with the Project that are of value or interest because they have been identified to be of concern to Indigenous peoples, regulatory agencies, Suncor, resource managers, scientists, key stakeholders, and/or the public. The identification and assessment of potential adverse environmental effects of the Project on VCs is the focus of this method.

A standard framework is used in this EIS to facilitate the assessment of the potential environmental effects of Project activities and components on each VC which is documented in evaluation tables. Specific analysis criteria (i.e., magnitude, geographic extent, duration, frequency, reversibility, and context) is used to characterize residual Project-related environmental effects (i.e., those environmental effects that remain after application of mitigation measures) for each individual VC. The significance of residual Project-related environmental effects is then determined based on pre-defined standards or thresholds (i.e., significance rating criteria). In planning and designing the Project and throughout the EA process, a precautionary approach has been applied to assessing and reducing environmental effects. This includes using standard equipment, methods, and technologies in Project design for which potential environmental interactions are well understood and managed through the use of proven mitigation. Using a precautionary approach and assuming that each VC is present in the Project Area and therefore there is potential for Project-VC interaction, effects predictions and implementation of recommended mitigation are conservative in nature.

The characterization of range of magnitude considers the reasonable worst-case scenario and is therefore considered to provide a conservative indication of effects.

Using the same methods as those described for routine activities, Chapters 16 and 17 consider the environmental effects associated with potential accidental events as well as the effects of the environment on the Project, respectively.

Chapter 15 considers cumulative environmental effects by assessing whether there is potential for the residual Project-related environmental effects to interact cumulatively with the residual environmental effects of other past, present, and future (i.e., certain or reasonably foreseeable) physical activities in the vicinity of the Project. The significance of any identified cumulative environmental effects is also assessed in Chapter 15.

Drill waste modelling completed in support of the Project is presented in Appendix A (and summarized in Section 2.9.1); acoustic modelling is presented in Appendix D (and summarized in Section 2.9.4) and cross-referenced where applicable throughout the EIS. Spill fate and behaviour modelling is presented in Appendix E and summarized in Section 16; potential environmental effects associated with an accidental event are assessed in Section 16.

4.2.2 Selection of Valued Components

In addition to the Section 5 requirements of CEAA 2012, the selection of VCs considered:

- Regulatory guidance and requirements, including the Project-specific EIS Guidelines provided by the CEA Agency (2019) (Appendix A)
- Technical knowledge of the Project (i.e., the nature and extent of Project components and activities) (refer to Chapter 2)
- Discussions with regulatory agencies, key stakeholders, the public, and Indigenous peoples (refer to Chapter 3)
- Baseline conditions for the physical (Chapter 5), biological (Chapter 6) and socio-economic (Chapter 7) conditions in the Project Area
- Experience and lessons learned from similar exploration drilling EAs such as Equinor's (formerly Statoil Canada Ltd.) Flemish Pass Exploration Drilling Program (Statoil 2017), EMCP's Eastern Newfoundland Offshore Exploration Drilling Project (EMCP 2017), CNOOC's (formerly Nexen Energy ULC) Flemish Pass Exploration Drilling Project (Nexen Energy ULC 2018), Husky's Exploration Drilling Project (Husky 2018), BP's Newfoundland Orphan Basin Exploration Drilling Project (BP 2018), Chevron's West Flemish Pass Exploration Drilling Project (Chevron 2020), and BHP's Exploration Drilling Project (BHP 2020), as well as the Regional Assessment of Offshore Oil and Gas Exploratory Drilling East of Newfoundland and Labrador (IAAC 2021)
- Professional judgment of the Tilt Cove EA Project Team

Table 4.1 outlines the VCs assessed in this EIS and the rationale for their selection or exclusion. Sections of the EIS where VCs are addressed are also referenced.

To facilitate a focused and effective environmental effects assessment the following VCs were selected:

- Atmospheric Environment, specifically Greenhouse Gas (GHG)
- Marine Fish and Fish Habitat
- Marine and Migratory Birds
- Marine Mammals and Sea Turtles
- Special Areas
- Indigenous Peoples
- Commercial Fisheries and Other Ocean Users

Specific candidate VCs identified in the EIS Guidelines that were not selected as VCs in this EIS include marine plants (addressed, as relevant, in the Marine Fish and Fish Habitat VC), federal species at risk (SAR) (assessed in the Marine Fish and Fish Habitat VC, Marine and Migratory Birds VC, and the Marine Mammals and Sea Turtles VC, rather than a stand-alone VC), and the human environment.

In relevant biological VCs (e.g., receptors), light and sound emissions are assessed. Chapter 8 of this EIS describe air emissions (Section 8.1), including GHG emissions (Section 8.4.1). Project activities are expected to have a very minor, localized effect on ambient air quality through the production of air emissions. However, given the importance of climate change, Atmospheric Environment, specifically GHGs has been included as a VC.

Human environment was not selected as a VC due to the lack of predicted Project interactions with most aspects of the human environment (as demonstrated in Table 4.1). However, Chapter 7 and relevant environmental effects assessed in the Indigenous Peoples VC (Chapter 13), and Commercial Fisheries and Other Ocean Users VC (Chapter 14) includes aspects of the human environment which are described and assessed in the context of the existing socio-economic environment.

Table 4.1 Selection of Valued Components

Environmental Components Specified in Final EIS Guidelines	VC Determination	Basis for Inclusion or Exclusion as a VC	Relevant EIS Section Reference(s)
Biophysical Environment			
Atmospheric Environment (including , Sound, Light and GHG, excluding Air Quality	Given the importance of climate change, a dedicated VC has been selected for GHGs.	There is limited atmospheric emissions predicted related to the Project. Project-related vessel operations will take place in Canada's portion of the North American Emission Control Area, which was established under amendments to the *Dangerous Chemicals Regulations* pursuant to the *Canada Shipping Act* that were adopted in 2013 under Annex VI to MARPOL. On January 1, 2015, the sulphur limit in fuel in the Emission Control Areas in large marine diesel engines was reduced from 1.0% to 0.1% in accordance with the *Vessel Pollution and Dangerous Chemicals Regulations* under the *Canada Shipping Act*. These new standards have been implemented for the Emission Control Area, which are designed to reduce allowable emissions of key air pollutants by ships such that, by 2020, emissions of sulphur oxides will be reduced by 96% and nitrogen oxides by 80% (Government of Canada 2013). Exhaust emissions will comply with the Newfoundland and Labrador *Air Pollution Control Regulations, 2004*, Ambient Air Quality Objectives under the *Canadian Environmental Protection Act*, and relevant regulations under MARPOL. Flaring, if determined to be required, will be conducted in accordance with the Drilling and Production Guidelines (C-NLOPB and CNSOPB 2017). Sound and light are assessed in the context of the relevant biological VCs (i.e., receptors).	*Section 5.6:* Changes related to ambient sound levels *Section 5.5:* Ambient air quality in the Project Area *Section 5.2:* Existing conditions regarding the atmospheric environment and climate *Chapter 8:* Project-related environmental effects on GHGs VC *Section 11.3:* Project-related changes to atmospheric sound levels and associated effects on the Marine Mammals and Sea Turtles VC *Section 10.3:* Project-related changes to atmospheric sound and lighting levels and associated effects on the Marine and Migratory Birds VC *Section 12.3:* Project-related changes to atmospheric sound and lighting levels and associated effects on the Special Areas VC *Chapter 15.2:* Cumulative environmental effects *Chapter 17:* Effects of the environment on the Project
Marine Environment	No dedicated VC has been selected for the marine environment. To reduce redundancy and promote EA efficiency, environmental effects on the marine environment are assessed in the context of more specific marine VCs (i.e., Marine Fish and Fish Habitat, Marine Mammals and Sea Turtles, Marine and Migratory Birds, Special Areas, and Commercial Fisheries and Other Ocean Users), where the analysis of effects and mitigation can be more specific, rather than as a stand-alone VC.	Aspects of the marine environment have potential to be affected by Project activities and components as well as accidental events associated with the Project. Potential changes to the benthic environment are assessed in the context of the Marine Fish and Fish Habitat VC. Potential changes to marine water quality are assessed in the context of the Marine Fish and Fish Habitat, Marine Mammals and Sea Turtles, Marine Birds, Special Areas, and Commercial Fisheries and other Ocean Users VCs. Potential changes to underwater ambient noise and vibration levels are assessed in the context of the Marine Fish and Fish Habitat, Marine Mammal and Sea Turtles, Marine and Migratory Birds, Special Areas, and Commercial Fisheries and Other Ocean Users VCs. Potential changes to important and critical habitat for marine species are assessed in the context of the relevant biological VC.	*Chapters 5, 6, and 7:* Description of biophysical and socio-economic aspects of the marine environment *Chapter 9*: Project-related environmental effects on the Marine Fish and Fish Habitat VC *Chapter 10*: Project-related environmental effects on the Migratory Birds VC *Chapter 11*: Project-related environmental effects on the Marine Mammals and Sea Turtles VC *Chapter 12*: Project-related environmental effects on the Special Areas VC *Chapter 14*: Project-related environmental effects on the Commercial Fisheries and Other Ocean Users VC *Chapter 15:* Cumulative environmental effects *Chapter 16.5:* Environmental effects of potential accidental events
Fish and Fish Habitat	Environmental effects on fish (including applicable SAR and species of conservation concern [SOCC]) and fish habitat are assessed within the Marine Fish and Fish Habitat VC. The scope of this VC includes corals, sponges, and marine plants. This VC is included in consideration of its ecological importance, the socio-economic importance of commercial fisheries resources (i.e., target fish species), the legislated protection of fish and fish habitat and applicable SAR and SOCC, and the nature of potential Project-VC interactions.	Several species of fish and associated habitat have potential to be affected by Project activities and components as well as accidental events associated with the Project. Project effects on fish and fish habitat, including SAR and species of importance to commercial and subsistence fisheries (e.g., Atlantic salmon, Atlantic bluefin tuna, American eel) have been identified as an issue of concern during Indigenous and stakeholder engagement (refer to Chapter 3). Fish and fish habitat are protected under the *Fisheries Act*. Section 5(1)(a) of CEAA 2012 requires consideration of project-related environmental effects associated with a change to a component of the environment within the legislative authority of Parliament (e.g., fish and fish habitat as defined in the *Fisheries Act*, which includes corals, and aquatic species as defined in SARA, which includes marine plants).	*Section 6.1:* Existing conditions regarding fish and fish habitat *Chapter 9:* Project-related environmental effects on the Marine Fish and Fish Habitat VC *Chapter 13*: Project-related environmental effects on the Indigenous Peoples VC *Chapter 14:* Project-related environmental effects on the Commercial Fisheries and Other Ocean Users VCs *Chapter 15.3:* Cumulative environmental effects *Chapter 16.5.1:* Environmental effects of potential accidental events

Table 4.1 Selection of Valued Components

Environmental Components Specified in Final EIS Guidelines	VC Determination	Basis for Inclusion or Exclusion as a VC	Relevant EIS Section Reference(s)
Marine Plants	No dedicated VC has been selected for marine plants. In consideration of the environmental setting and mitigation referred to in the next column, it has been determined that environmental effects on marine plants do not warrant focused assessment as a dedicated VC. Potential changes to marine plants are assessed, as applicable, in the context of the Marine Fish and Fish Habitat and Special Areas VCs.	Much of the Project Area contains soft substrates that are not conducive to marine plants (IAAC 2021). Marine plants are an important component of fish habitat. Mitigation measures for the protection of fish and fish habitat and special areas are also protective of marine plants. It is therefore anticipated that mitigation proposed for the Marine Fish and Fish Habitat VC are sufficient to mitigate environmental effects on marine plants.	*Section 6.1.1.2:* Existing conditions for marine plants (phytoplankton) *Section 6.4:* Existing conditions for Special Areas
Migratory Birds and their Habitat	Environmental effects on migratory birds (including applicable SAR and SOCC and migratory bird habitat) are assessed within the Marine and Migratory Birds VC. This VC is included in consideration of its ecological importance, the legislated protection of marine and migratory birds and other applicable SAR and SOCC, concerns raised during Indigenous and stakeholder engagement, and the nature of potential Project-VC interactions.	Several species of marine and migratory birds (including SAR and SOCC) are known to occur within the RAA and have potential to be affected by Project activities and components as well as accidental events associated with the Project. Project effects on marine and migratory birds (and their eggs) have been identified as an issue of concern during Indigenous and stakeholder engagement (refer to Chapter 3). Migratory birds are protected under the MBCA, and Section 5(1)(a) of CEAA 2012 requires consideration of project-related environmental effects associated with a change to a component of the environment within the legislative authority of Parliament (e.g., migratory birds as defined in the MBCA).	*Section 6.2:* Existing conditions regarding marine and migratory birds *Chapter 10:* Project-related environmental effects on the Marine and Migratory Birds VC *Chapter 15.4:* Cumulative environmental effects *Chapter 16.5.2:* Environmental effects of potential accidental events
Species at Risk	No dedicated VC has been selected for SAR and SOCC. To reduce redundancy and promote EA efficiency, environmental effects on SAR and SOCC are assessed as part of the Marine Fish and Fish Habitat, Marine Mammals and Sea Turtles, and Marine and Migratory Birds VCs, where the analysis of effects and mitigation can be more specific, rather than as a stand-alone VC. Effects and/or mitigation specific to SAR and SOCC will be highlighted, as applicable.	SAR and SOCC include the following: • federally protected species listed as “endangered”, “threatened”, or of “special concern” on Schedule 1 of SARA, and their critical habitat • species assessed as “endangered”, “threatened”, or of “special concern” by the federal COSEWIC • species listed as “endangered”, “threatened”, or “vulnerable” under the *Endangered Species List Regulations* pursuant to the NL ESA, which are provincially protected Several SAR and SOCC are known to occur within the RAA, including fish, marine mammals, sea turtles, and marine and migratory birds, and have potential to be affected by routine Project activities as well as accidental events associated with the Project. Project effects on SAR and SOCC (particularly blue whale, North Atlantic right whale, Atlantic salmon, and American eel) have been identified as an issue of concern during Indigenous and stakeholder engagement (refer to Chapter 3). SAR and SOCC can be more vulnerable to changes in their habitat or population levels than secure species and therefore require special consideration. However, in general, potential environmental effects and mitigation measures taken to protect SAR and SOCC are also protective of secure species. Furthermore, where several of the species found in the RAA are considered SAR or SOCC (e.g., Marine Mammals and Sea Turtles), a separate VC to assess secure species and SAR / SOCC would be redundant. Potential changes to SAR / SOCC for these species are therefore assessed in the context of their respective biological VC.	*Sections 6.1.3.5, 6.2.4, 6.3.7:* Summary of marine SAR and SOCC (including applicable species of fish, mammals, turtles, and birds) with potential to be affected by the Project *Chapter 9:* Assessment of project-related environmental effects on fish and coral SAR and SOCC *Chapter 10:* Project-related environmental effects on marine and migratory bird SAR and SOCC *Chapter 11:* Assessment of project-related environmental effects on marine mammal and sea turtle SAR and SOCC *Chapter 15.3.4.3, 15.4.4.3 and 15.5.4.3:* Cumulative environmental effects *Chapter 16.5.1, 16.5.2 and 16.5.3:* Environmental effects of potential accidental events
Marine Mammals	Environmental effects on marine mammals (including applicable SAR and SOCC) are assessed in the Marine Mammals and Sea Turtles VC. This VC is included in consideration of its ecological importance, the legislated protection of applicable SAR, concerns raised during Indigenous and stakeholder engagement, and the nature of potential Project interactions. Marine mammals and sea turtles are considered within the same VC due to the similarities in their potential interactions with the Project.	Several species of marine mammals (including SAR and SOCC) are known to occur in the RAA and have potential to be affected by Project activities and components as well as accidental events associated with the Project. Project effects on marine mammals (particularly blue whale, North Atlantic right whale, and harp seal), have been identified as an issue of concern during Indigenous and stakeholder engagement (refer to Chapter 3). Section 5(1)(a) of CEAA 2012 requires consideration of project-related environmental effects associated with a change to a component of the environment within the legislative authority of Parliament (e.g., aquatic species as defined in SARA).	*Section 6.3.3, 6.3.4 and 6.3.5:* Existing conditions regarding marine mammals *Chapter 11:* Project-related environmental effects on the Marine Mammals and Sea Turtles VC *Chapter 15.5:* Cumulative environmental effects *Chapter 16.5.3:* Environmental effects of potential accidental events

Table 4.1 Selection of Valued Components

Environmental Components Specified in Final EIS Guidelines	VC Determination	Basis for Inclusion or Exclusion as a VC	Relevant EIS Section Reference(s)
Sea Turtles	Environmental effects on sea turtles (including applicable SAR and SOCC) are assessed within the Marine Mammals and Sea Turtles VC. This VC is included in consideration of its ecological importance, the legislated protection of applicable SAR, and the nature of potential Project-VC interactions. Marine mammals and sea turtles are considered within the same VC due to the similarities in their potential interactions with the Project.	Sea turtles (including SAR and SOCC) are known to occur in the Project Area and have potential to be affected by Project activities and components as well as accidental events associated with the Project. Section 5(1)(a) of CEAA 2012 requires consideration of project-related environmental effects associated with a change to a component of the environment within the legislative authority of Parliament (e.g., aquatic species as defined in SARA).	*Section 6.3.6:* Existing conditions regarding sea turtles *Chapter 11:* Project-related environmental effects on the Marine Mammals and Sea Turtles VC *Chapter 15.5:* Cumulative environmental effects *Section 16.5.3:* Environmental effects of potential accidental events
Special Areas	Environmental effects on Special Areas are assessed within the Special Areas VC. This VC is included in consideration of its ecological and/or socio-economic importance, the legislated protection of applicable Special Areas, and the nature of potential Project-VC interactions.	Several special areas (i.e., areas designated as being of special interest due to their ecological and/or conservation sensitivities, including those protected under federal legislation) are known to occur in the RAA. There are no special areas within EL 1161 and with the exception of a small SBA near the western boundary of the Project Area, there are no sensitive areas within the Project Area. Effects on special areas from routine Project activities and components will likely be limited; however, accidental events associated with the Project could have the potential to affect special areas. Special Areas provide important habitat for certain SAR / SOCC.	*Section 6.4:* Existing conditions regarding Special Areas *Chapter 12:* Project-related environmental effects on the Special Areas VC *Chapter 15.6:* Cumulative environmental effects *Chapter 16.5.4:* Environmental effects of potential accidental events
Indigenous Peoples	Environmental effects on Indigenous Peoples are assessed with respect to the Indigenous Peoples VC. This VC is included in consideration of Indigenous peoples that reside in Newfoundland and Labrador, the Maritimes, and Quebec whose asserted or established Aboriginal or Treaty rights could potentially be affected by changes in the environment as a result of the Project.	There are several Indigenous groups residing in Newfoundland and Labrador, the Maritimes, and Quebec; many of these groups have expressed concerns about potential adverse environmental effects of the Project (see Section 3). Although there here is minimal commercial fishing activity (including commercial communal) occurring within the Project Area, commercial-communal fishing does occur throughout the RAA and has potential to be affected by Project activities and components (including accidental events). Project activities also have potential to interact with species traditionally harvested for food, social and ceremonial (FSC) purposes, particularly migratory species that may transit through the Project Area and be harvested elsewhere. Indigenous groups also expressed concern about potential adverse effects on Aboriginal rights and cultural, social, health, and economic changes that could affect the quality of life within their communities. Section 5(1)(c) of CEAA, 2012 requires consideration of project-related environmental effects, with respect to Indigenous peoples, associated with a change to the environment health and socio-economic conditions, physical and cultural heritage, the current use of lands and resources for traditional purposes and any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.	*Section 7.3:* Context for Indigenous organizations (including locations of reserves and communities); existing conditions regarding Indigenous resource use *Chapter 13:* Project-related environmental effects on Indigenous Peoples VC *Chapter 15.7:* Cumulative environmental effects *Chapter 16.5.5:* Environmental effects of potential accidental events
Commercial Fisheries	Environmental effects on commercial fisheries are assessed in the Commercial Fisheries and Other Ocean Users VC. This VC is included in consideration of its economic importance and the potential for Project-VC interactions.	Although there here is minimal commercial fishing activity occurring within the Project Area, commercial fishing does occur throughout the RAA and has potential to be affected by Project activities and components (including accidental events). Potential effects on commercial fisheries (particularly cumulative effects) have been raised during stakeholder engagement.	*Chapter 7.2:* Existing conditions regarding commercial fisheries *Chapter 14:* Project-related environmental effects on the Commercial Fisheries and Other Ocean Users VC *Chapter 15.8:* Cumulative environmental effects *Chapter 16.5.6:* Environmental effects of potential accidental events

Table 4.1 Selection of Valued Components

Environmental Components Specified in Final EIS Guidelines	VC Determination	Basis for Inclusion or Exclusion as a VC	Relevant EIS Section Reference(s)
Human Environment (e.g., recreational activities, other ocean uses, socio-economic conditions, human health, physical and cultural heritage, and rural and urban settings)	No dedicated VC has been selected for human environment. In consideration of the environmental setting and the mitigation referred to in the next column, environmental effects on recreational activities, human health and socio-economic conditions, physical and cultural heritage, rural and urban settings do not warrant focused assessment. However, in consideration of potential interactions between the Project and other ocean users (e.g., shipping, research, oil and gas, military activities, ocean infrastructure), other ocean users are assessed in the Commercial Fisheries and Other Ocean Users VC.	Other ocean uses, including shipping, oil and gas activity, military activities, and research, occur within the Project Area and RAA and have the potential to interact with Project components during routine and/or accidental events. Recreational fisheries and other forms of recreation are not known to occur in the vicinity of the Project Area. These activities are generally located closer to the nearshore. However, mitigation measures for the Marine Fish and Fish Habitat VC, the Indigenous Peoples VC, and the Commercial Fisheries and Other Ocean Users VC would be sufficient to mitigate environmental effects on recreational fisheries if applicable. Potential accidental events (i.e., spills) associated with the Project could result in contamination of fish species commonly harvested for human consumption through commercial, Indigenous, and/or recreational fisheries. However, in the event of an accidental spill that could potentially affect human health, measures would be taken (e.g., fisheries closures, exclusion zone) would be imposed, thereby preventing contact with spilled oil and/or exposure to contaminated food sources. These potential effects are assessed in the context of the Indigenous Peoples VC, and the Commercial Fisheries and Other Ocean Users VC. Due to its distance offshore, the Project is not expected to interact with rural and urban settings along the NL coastline. Project activities and components are not anticipated to result in changes to the environment that would affect human health. Emissions and discharges will be in accordance with allowable concentrations stated in the OWTG. Potential indirect Project effects with respect to Indigenous health are addressed in the Indigenous Peoples VC. Project activities and components are not anticipated to result in changes to the environment that would have an effect on physical and cultural heritage. There are no known shipwrecks or legacy sites within the Project Area. Information gathered from pre-drill ROV site surveys in the Project Area will confirm the presence / absence of geohazards (including potential cultural heritage resources on the seabed) before any seabed disturbance takes place. Supply vessel and helicopter transport activities will not result in ground / seabed disturbance. Therefore, they will not affect heritage resources. The Project is expected to have economic benefits, including economic and contracting opportunities. Socio-economic benefits associated with the Project are discussed in Section 1.4.	*Section 1.4:* Benefits of the Project *Section 2.9:* Routine waste discharges and emissions associated with the Project *Chapter 7* Existing conditions regarding human environment *Chapter 14:* Project-related environmental effects on the Commercial Fisheries and Other Ocean Users VC *Chapter 15.8:* Cumulative environmental effects *Chapter 16.5.6:* Spill response measures and environmental effects of potential accidental events

4.2.3 Effects Assessment Framework

The following sections describe the purpose and structure of the effects assessment for each VC in Chapters 8 to 13.

4.2.3.1 Regulatory and Policy Setting

This section helps to establish key aspects of the scope of assessment, including relevant definitions under legislation, measurable parameters, and significance thresholds, where applicable. The regulatory context is described for each VC, including an overview of applicable regulations, policies, and/or administrative mechanisms.

4.2.3.2 The Influence of Consultation and Engagement on the Assessment

This section summarizes specific issues that were raised during stakeholder and Indigenous consultation and engagement activities, including the extent to which identification and consideration of these issues influenced the scope of the assessment for the VC.

4.2.3.3 Potential Effects, Pathways, and Measurable Parameters

Each VC has a corresponding chapter in which potential environmental effects arising from interactions between the Project are identified and one or more measurable parameters are selected to facilitate quantitative or qualitative assessment of those effects. Measurable parameters for biophysical VCs include measures of ecosystem health and integrity. Reference is also given to regional, provincial and/or national objectives, standards or guidelines, where applicable, when discussing measurable parameters.

4.2.3.4 Boundaries

Spatial and temporal boundaries are defined to evaluate environmental effects. The geographic range over which the Project's potential environmental effects may occur are reflected in the spatial boundaries, recognizing that some environmental effects may extend beyond the Project Area. The temporal boundaries identify when an environmental effect may occur and are based on the timing and duration of Project activities and the nature of the interactions with each individual VC. Spatial and temporal boundaries are developed in consideration of:

- Timing / scheduling of Project activities for all Project phases
- Known natural variations of each VC
- Information gathered on land and resource use
- Recovery time from an environmental effect
- Potential for cumulative environmental effects
- Oil spill modelling conducted for the Project

Spatial Boundaries

With respect to Project activities and components, the spatial boundaries for the Project to be assessed are:

- **Project Area:** The Project Area (Figure 4-1) encompasses the immediate area of the EL within which Project drilling activities will occur. Specific well locations have not been identified but will occur within the EL. A 40 km buffer around the perimeter of EL 1161 defines the Project Area. The Project Area applies to all VCs.
- **Local Assessment Area (LAA):** The LAA (Figure 4-1) is the maximum area within which environmental effects from routine Project activities and components can be predicted or measured with a reasonable degree of accuracy and confidence. It consists of the Project Area and the transit route to and from the Project Area.
- **Regional Assessment Area (RAA):** The RAA (Figure 4-1) is 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 (i.e., certain or reasonably foreseeable) physical activities as well as to account for the larger movements and distributions of the various biological and socio-economic components. Although the RAA is intended to be much broader than the LAA, which focuses on the extent of potential effects associated with routine Project activities for each VC, it is possible that effects from larger scale unplanned events (e.g., blowout) could extend beyond the RAA. The RAA is consistent for all VCs, except for the Indigenous Peoples VC. TheRegional Assessment Area – Indigenous Peoples has a larger area to encompass the various Indigenous communities and activities that have the potential to be affected by Project-related activities.
- **Global (GHGs only):** Because GHGs are long-lived in the atmosphere and the environmental effects related to GHGs are global and cumulative in nature, the spatial boundary for purposes of assessment is the global area under the Earth's atmosphere.

Temporal Boundaries

All Project phases, including well drilling, testing, and abandonment are included in the temporal boundaries for the Project. Based on the current schedule, the temporal boundaries for assessment are:

- Suncor proposes to commence exploration drilling with an initial well as early as Q2 2024, pending regulatory approval. Up to 12 to 16 wells could be drilled over the term of the EL (2019 to 2028), contingent on the drilling results of the initial well; the temporal scope of the EIS extends to the end of 2029 to allow project activities to conclude.
- It is anticipated that the length of drilling associated activities may be up to 120 days for each well with the potential to occur year-round. Drilling may occur year-round if conducted using an anchored semi-submersible rig.
- Well testing (if required, dependent on drilling results) could also occur at any time during the temporal scope of this EIS. VSP operations will take approximately one day per well, and well testing, where required, would occur over a one-month period.
- Well abandonment will be conducted following drilling and/or well testing. Wells may be designed for suspension and re-entry, but this will be determined through further prospect evaluation and well planning.

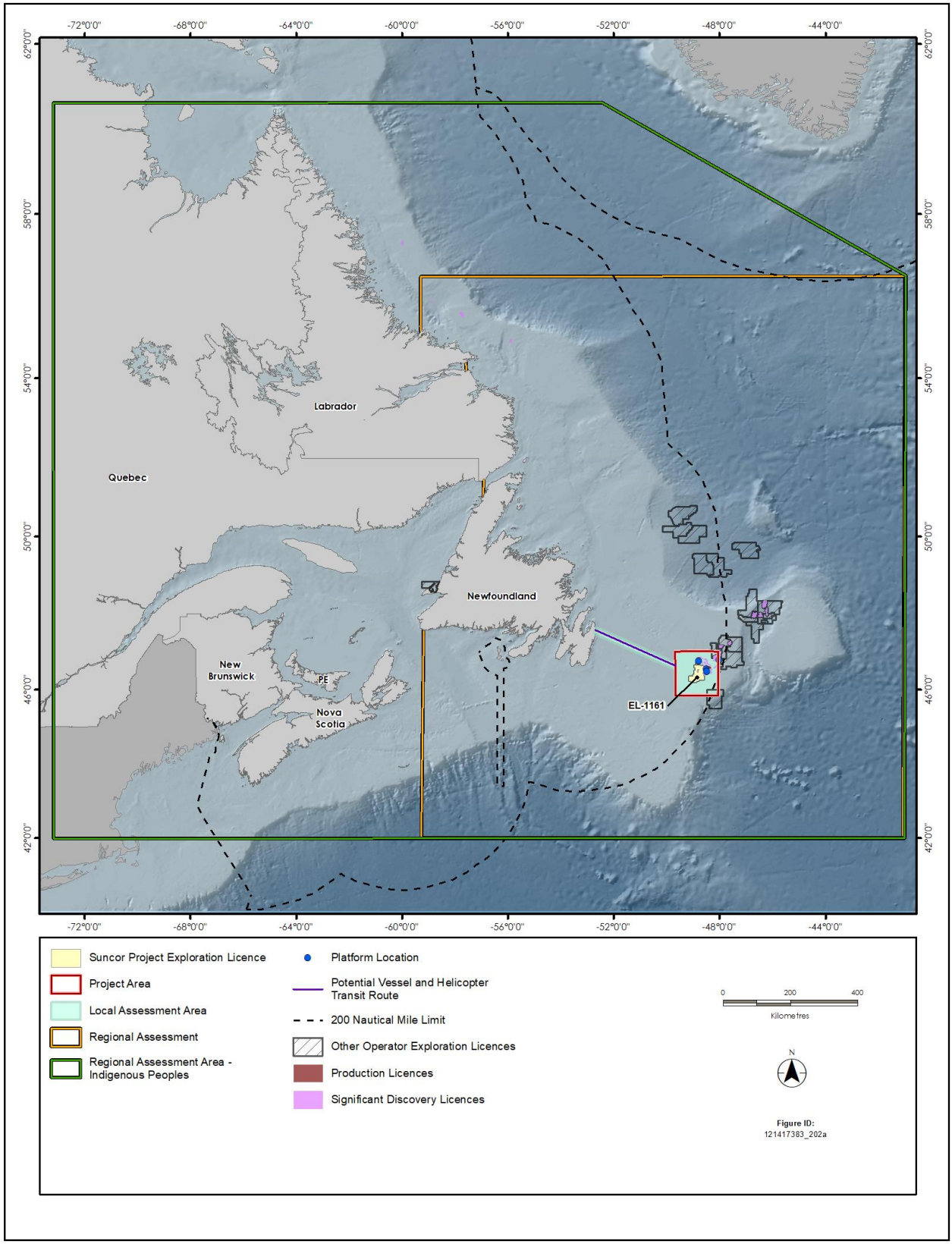

Figure 4-1 Project Area, Local Assessment Area and Regional Assessment Areas

4.2.3.5 Residual Effects Characterization

The criteria provided in Table 4.2 are used to support characterization of the nature and extent of residual environmental effects on each VC.

Table 4.2 Criteria Used to Support Environmental Effects Assessment

Criteria	Description	Quantitative Measure or Definition of Qualitative Categories
Direction	The long-term trend of the residual environmental effect relative to baseline	**Positive** – a residual environmental effect that moves measurable parameters in a direction beneficial to [VC] relative to baseline **Adverse** – a residual environmental effect that moves measurable parameters in a direction detrimental to [VC] relative to baseline
Magnitude	The amount of change in measurable parameters or the VC relative to existing conditions	**Negligible** – no measurable change Biophysical VCs: **Low** – a detectable change but within the range of natural variability **Moderate** – a detectable change beyond the range of natural variability, but with no associated adverse effect on the viability of the affected population. **High** – measurable change that exceeds the limits of natural variability, with an adverse effect on the viability of the affected population. Socio-economic VCs: **Low** – A detectable change that is within the range of natural variability, with no associated adverse effect on the overall nature, intensity, quality / health or value of the affected component or activity. **Moderate** - A detectable change that is beyond the range of natural variability, but with no associated adverse effect on the overall nature, intensity, quality / health or value of the affected component or activity. **High** - A detectable change that is beyond the range of natural variability, with an adverse effect on the overall nature, intensity, quality / heath or value of the affected component or activity.
Geographic Extent	The geographic area in which a residual environmental effect occurs	**Project Area** – residual environmental effects are restricted to the Project Area **LAA** – residual environmental effects extend into the LAA **RAA** – residual environmental effects extend into the RAA
Frequency	Identifies how often the residual effect occurs and how often during the Project	**Unlikely event** – effect is unlikely to occur **Single event** – effect occurs once **Multiple irregular event** – effect occurs at no set schedule **Multiple regular event** – effect occurs at regular intervals **Continuous** – effect occurs continuously

Table 4.2 Criteria Used to Support Environmental Effects Assessment

Criteria	Description	Quantitative Measure or Definition of Qualitative Categories
Duration	The period of time required until the measurable parameter or the VC returns to its existing condition, or the residual effect can no longer be measured or otherwise perceived	**Short term** - for duration of the activity, or for duration of accidental event **Medium term** - beyond duration of activity up to end of Project, or for duration of threshold exceedance of accidental event – weeks or months **Long term** - beyond Project duration of activity, or beyond the duration of threshold exceedance for accidental events - years **Permanent** - recovery to baseline conditions unlikely
Reversibility	Pertains to whether a measurable parameter or the VC can return to its existing condition after the project activity ceases	**Reversible** – will recover to baseline conditions before or after Project completion **Irreversible** – permanent
Ecological or Socio-economic Context	Existing condition and trends in the area where residual environmental effects occur.	**Undisturbed** – The VC is relatively undisturbed in the RAA, not adversely affected by human activity, or is likely able to assimilate the additional change **Disturbed** – The VC has been previously disturbed by human development or human development is still present in the RAA, or the VC is likely not able to assimilate the additional change

4.2.3.6 Significance Definition

Criteria or established thresholds were developed for each VC for determining the significance of residual adverse environmental effects and included in the corresponding sections in the VC chapters (Chapters 8 through 13). This involved consideration of whether the predicted residual environmental effects of the Project are adverse, significant, and likely. Guidance provided by the Operational Policy Statement, Determining Whether a Designated Project is Likely to Cause Significant Environmental Effects Under the *Canadian Environmental Assessment Act, 2012* (CEA Agency 2015) was used to define significance and thresholds for this Project. These criteria or thresholds are also defined using:

- Available information on the status and characteristics of each VC
- Scientific literature to assess and qualify significance of an effect (e.g., Southall et al. 2007; French McCay 2009)
- Applicable regulatory documents, environmental standards, guidelines, or objectives where available
- The professional judgment of the EA Study Team

These criteria or thresholds establish a level beyond which a residual environmental effect would be considered significant (i.e., an unacceptable change). Where pre-established standards or thresholds do not exist, significance criteria have been defined qualitatively and justifications for the criteria are provided.

4.2.4 Assessment of Project-Related Environmental Effects

A sequential process is followed during the assessment of Project-related environmental effects whereby potential interactions between each VC and the Project are identified, and where such interactions may exist, a more detailed assessment of those effects is completed to further characterize the effects.

For each VC, potential interactions from Project activities and components with the VC are identified and presented in a table. The table lists all Project activities and components and indicates interactions with a checkmark. Interactions are then discussed in the context of effects pathways, standard and Project-specific mitigation, and residual effects.

The assessment of potential environmental effects includes:

- Identification of environmental effects pathways (i.e., identification of means by which the Project could result in an environmental effect on the VC).
- Description of the mitigation proposed to reduce or eliminate potential environmental effects, including industry standards, best management practices, and environmental protection measures that Suncor will implement.
- Identification and characterization of the nature and extent of residual environmental effects (i.e., those effects that remain after the mitigation measures have been applied) through application of the specific criteria (i.e., magnitude, geographic extent, duration, frequency, reversibility, and context) introduced in Section 4.2.3.5.
- Application of VC-specific significance definition thresholds (Section 4.2.3.6) to determine the significance of the residual effects.

The level of confidence, typically based on professional judgment, prior experience, and scope and quality of available information, is provided for each determination of significance. Probability and certainty are used to determine likelihood, where a significant effect is predicted to occur.

4.2.5 Follow-up and Monitoring

Each VC Chapter also includes an overview discussion of environmental monitoring and/or follow-up programs, where necessary. Follow-up programs are used to verify predictions of environmental effects identified during the EA and to determine the effectiveness of mitigation measures. Compliance monitoring verifies whether required mitigation measures were implemented. If follow-up is recommended, the following preliminary and high-level overview of the program is provided:

- Objectives
- Planning and design
- Key areas of focus
- Implementation and schedule
- Program format
- Use and sharing of study results
- Potential adaptive management approaches based on the results and findings of such programs.

4.2.6 Project-specific Modelling

Suncor conducted Project-specific modelling studies to understand the fate and behavior of discharges and emissions from the Project. Effects assessment of various VCs in the EIS are based on the models which are summarized below.

4.2.6.1 Drill Cuttings Dispersion Modelling

To assess the effects of operational discharge of cutting and muds from the drilling platform, drill cuttings dispersion modelling on the seabed characterizes the release of drill cuttings associated with drilling activities during the Project. Modelling completed by RPS simulates the dispersion of these discharges using RPS's MUDMAP modelling system. MUDMAP is a highly advanced three-dimensional plume model, used to evaluate potential environmental effects caused by marine discharges, such as drill cuttings, drilling muds, and produced water. The model is discussed in Section 2.9.1 and additional detail is provided in Appendix C.

4.2.6.2 Underwater Sound Modelling

JASCO completed underwater sound modelling for drilling activity, VSPs and support vessels to determine the potential zone of influence on protected marine mammals, sea turtles, and fish species from exposure levels of sound received in the marine environment (see Section 2.9.4). Sound associated with the operation of the drilling installation using DP assist (continuous sound) and from a VSP survey (impulsive sound) was included in the model. The results from the underwater sound modelling are provided in Appendix D.

4.2.6.3 Spill Trajectory Modelling

RPS also conducted the spill trajectory modelling, which considers the credible worst case (i.e., unmitigated) scenario release of crude oil from hypothetical subsurface blowouts and batch surface release scenarios (e.g., marine diesel from bunkering accidents) (see Section 16). Prior to initiating the model runs, RPS conducted a validation of the metocean data available within the Project Area as a comparison against the HYCOM data used in the model.

The OILMAPDeep model and SIMAP model were developed to complete this analysis. Near-field blowout dynamics for a subsurface release of oil are characterized in the OILMAPDeep model. The output from OILMAPDeep is then used as an input to the SIMAP model to simulate far-field oil trajectory and fate. Based on discussions with IAAC and other regulatory departments, the eastern boundary of the modelling domain was expanded, encompassing Canadian, US, and international waters, including the Azores. This modelled extent is much larger than the Project Area, as hypothetical releases of oil were to be tracked for long periods of time (160 days). The results from the spill trajectory modelling are provided in Appendix E.

4.2.7 Assessment of Accidental Events

The Project may result in potential accidental events, and the associated environmental effects are assessed in Chapter 15. As a precautionary approach, this assessment of accidental events focuses on worst credible case scenarios that could result in significant environmental effects. Interactions with VCs are identified for these scenarios and potential environmental effects are assessed. Mitigation and contingency plans are discussed, and a conclusion regarding the significance of potential residual environmental effects and their likelihood of occurrence is given.

4.2.8 Assessment of Effects of the Environment on the Project

Effects of the environment on the Project are assessed in Chapter 16. This section considers how local environmental conditions and natural hazards (e.g., extreme weather) can potentially affect the Project, including scenarios where these effects may cause accidental events which could affect the environment. Potential adverse effects of the environment on a project are typically a function of environmental conditions (e.g., geology, ice conditions) that could affect the project and project design. Mitigation of these effects generally involves engineering and environmental design criteria, industry standards and best practices, and environmental monitoring.

4.2.9 Assessment of Cumulative Environmental Effects

Pursuant to Section 19(1) of CEAA 2012, cumulative environmental effects that are likely to result from the Project in combination with other physical activities that have been or will be carried out near the Project, as well as the significance of these potential effects, are assessed. The cumulative effects assessments for the VCs and a detailed description of the methods used, are provided together in Chapter 14, which are in accordance with the Operational Policy Statement, Assessing Cumulative Environmental Effects Under *CEAA 2012* (CEA Agency 2018).

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