



## E&P – EAST COAST

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## 1.0 INTRODUCTION

In 1997 the Terra Nova Project, then under development by Petro Canada<sup>1</sup>, received an approval to proceed by virtue of Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) Decision 97.02 subsequent to a Canadian Environmental Assessment Act Panel Review of the project.

This Environmental Assessment (EA) Update considers the following activities that will be carried out in the Terra Nova Field during 2017-18:

- The ongoing drilling campaign using a 'New-To-Field' mobile offshore drilling unit (MODU)
- Installation of mudmats to mitigate wellhead fatigue
- A subsea maintenance program which will:
  - pro-actively replace water injection riser #5 and a seabed tee junction to address predicted fatigue life considerations; and,
  - reconfigure selected pipe jumpers to contribute to improved reserve recovery.

The purpose of this EA Update is to determine if there are any potential environmental effects arising from either of these programs that were not addressed in:

- the original environmental assessment approved pursuant to Decision 97.02 as part of the Terra Nova Development Plan; and
- the subsequent Environmental Assessment Updates.

## 2.0 PROJECT DESCRIPTION

### 2.1 Drilling Program

As part of its ongoing drilling program, Suncor will employ a mobile offshore drilling unit (MODU), the Transocean Barents. During the 2017-18 drilling program Suncor intends to:

- drill two new production wells, L-98 14 (C6) {K-07S} and L-98 15 (C7) {I-97S}, in its southwest drill center (SWDC),
- abandon and side track an existing production well, F-100 3 (A2) {C09S}, in the northwest drill center (NWDC),
- suspend an existing water injector, F-88 2 (E1), in the southeast drill center (SEDC),
- abandon and sidetrack an existing water injector, F-88 1 (E2) {H99S} in the SEDC drill center,

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<sup>1</sup> In 2009, as a result of a merger with Petro Canada, Suncor Energy became the operator of Terra Nova.

- conduct a work over L-98 5 (D3), complete and install a new tree on an existing water injector in the SWDC drill center; and
- replace two (2) gas lift valves: one (1) in the northeast drill center (NEDC), and one (1) in the SWDC.

### **2.1.1 Drill Center Clean-Up**

Prior to undertaking the planned drilling program described in Section 2.1, routine drill center clean-up may be required to remove accumulated drill cuttings and sediments from around the well head(s) in the drill centers. The work will involve the redistribution of approximately 680 cubic metres of sediment and drill cuttings, approximately 50 cubic meters of which will be moved to facilitate the replacement of jumpers (see Section 2.2.4). This soft material will be excavated to a depth of approximately one (1) meter and redistributed laterally within the glory holes using a subsea pump mounted on a remotely operated vehicle (ROV). This work was initiated in mid-February and will be completed in advance of the summer drilling program.

### **2.1.2 Management of Discharges: 2017-18 Drilling Program**

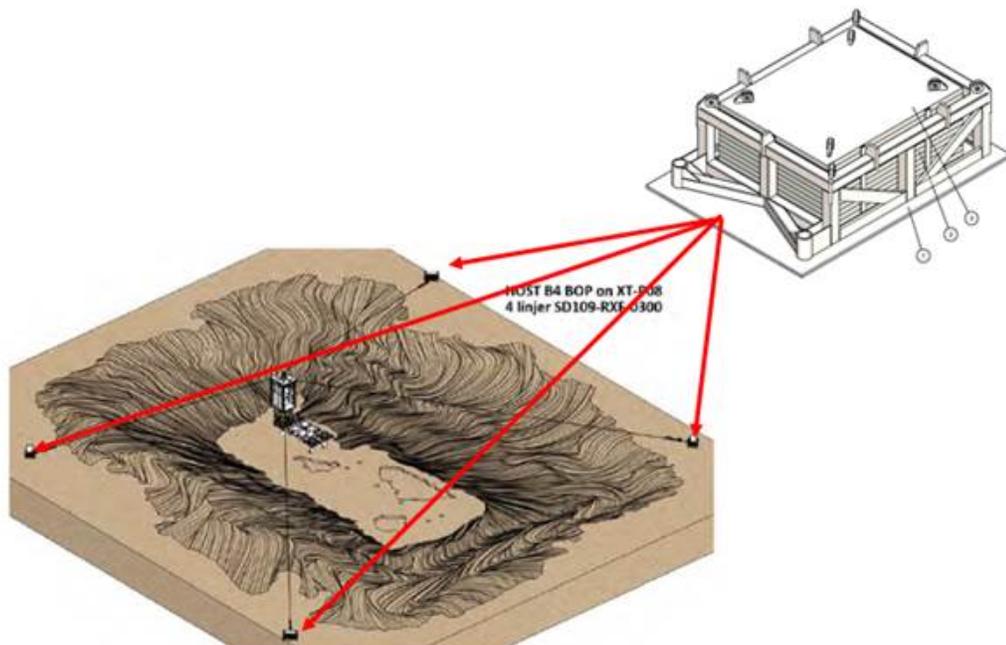
Consistent with current practice, the chemicals used in the drilling program that may be discharged to the marine environment will be screened for toxicity in accordance with Suncor's East Coast Chemical Screening and Approval Process (TN-IM-EV03-X00-003). This Process was developed to meet the requirements of the *Offshore Chemical Selection Guidelines for Drilling & Production Activities on Frontier Lands, 2009*. In addition, the operation of the drill rig and the management of its normal, approved operational discharges is subject to Suncor's Environmental Protection Plan - Drilling, Completion and Interventions (TN-IM-EV03-X00-009).

### **2.1.3 Mitigation of Wellhead Fatigue**

In recent years, wellhead fatigue has been identified as a potential concern for oil production fields. Rig motions, riser tension and environmental loads induce cyclic axial, shear and bending stresses in the wellhead. Stresses may be magnified in harsh, shallow water environments and where modern, larger blow-out preventers (BOPs) are used. While there is no evidence of wellhead fatigue in the Terra Nova Field (Field), based on the Wellhead Fatigue Study (FMC Norway, 2016) and supporting Terra Nova data, Suncor is proposing pro-active measures to minimize and mitigate any potential future fatigue issues in the Field.

In order to mitigate against potential wellhead fatigue, Suncor plans to install mudmats around each of the drill centers in the Field, which will be supplemented with BOP monitoring. The mudmats would function as anchor points within a system that will stabilize the wellheads, and instrumentation on

the BOP would monitor and provide data regarding fatigue on the wellheads. Each mudmat will be approximately 3.5 by 4.7 meters in dimension and when installed will weigh approximately 60 metric tons. There will be a maximum of six (6) mudmats required at each glory hole. The mudmats will be connected to the wellheads by means of cables (tethers). Figure 1 shows a typical mudmat and a possible installation diagram around a glory hole.



**Figure 1: Schematic of typical mudmat and arrangement around glory hole**

The current plan (base case) is to use a vessel and ROV to install the mudmats and associated tethers. The mudmats will be transported offshore on the vessel deck, and lifted and lowered to the seabed by the vessel's crane. The vessel's survey system and transponders will be used to accurately position the mudmats. A mudmat consists of a painted steel frame with cathodic protection (as illustrated in the Figure below) that contains ballast material (steel plates). Each mudmat has a 30 cm skirt around the base that sinks into the seafloor (due to the 60 metric ton weight). While the installation plan has not yet been finalized, the current installation plan contains two options. The first option would be to install the mudmat in one single 60 metric ton lift. The second option would be to install the mudmat with two lifts - one 40 metric ton lift followed by a 20 metric ton lift.

If six (6) mud mats are required for each glory hole the total seabed foot print for all four (4) glory holes will be 395 m<sup>2</sup> or 98.7 m<sup>2</sup> per glory hole. The mudmats would be positioned on the seafloor until the Terra Nova Field decommissioning

and abandonment, at which time they would be removed and disposed of in accordance with applicable regulations and the terms and conditions of the decommissioning operations authorization issued by the C-NLOPB at that time.

## **2.2 Subsea Program**

The purpose and scope of the 2017 Subsea Program is to replace a flexible water injection riser, conduct a pipe jumper reconfiguration at one of the subsea manifolds, and replace a rigid tee piece at one of the flowline junctions. This program will require the in-Field support of a diving support vessel. Figure 2 shows the general layout of the Terra Nova Field and the locations of the specific subsea work planned for 2017 and discussed in this EA update.

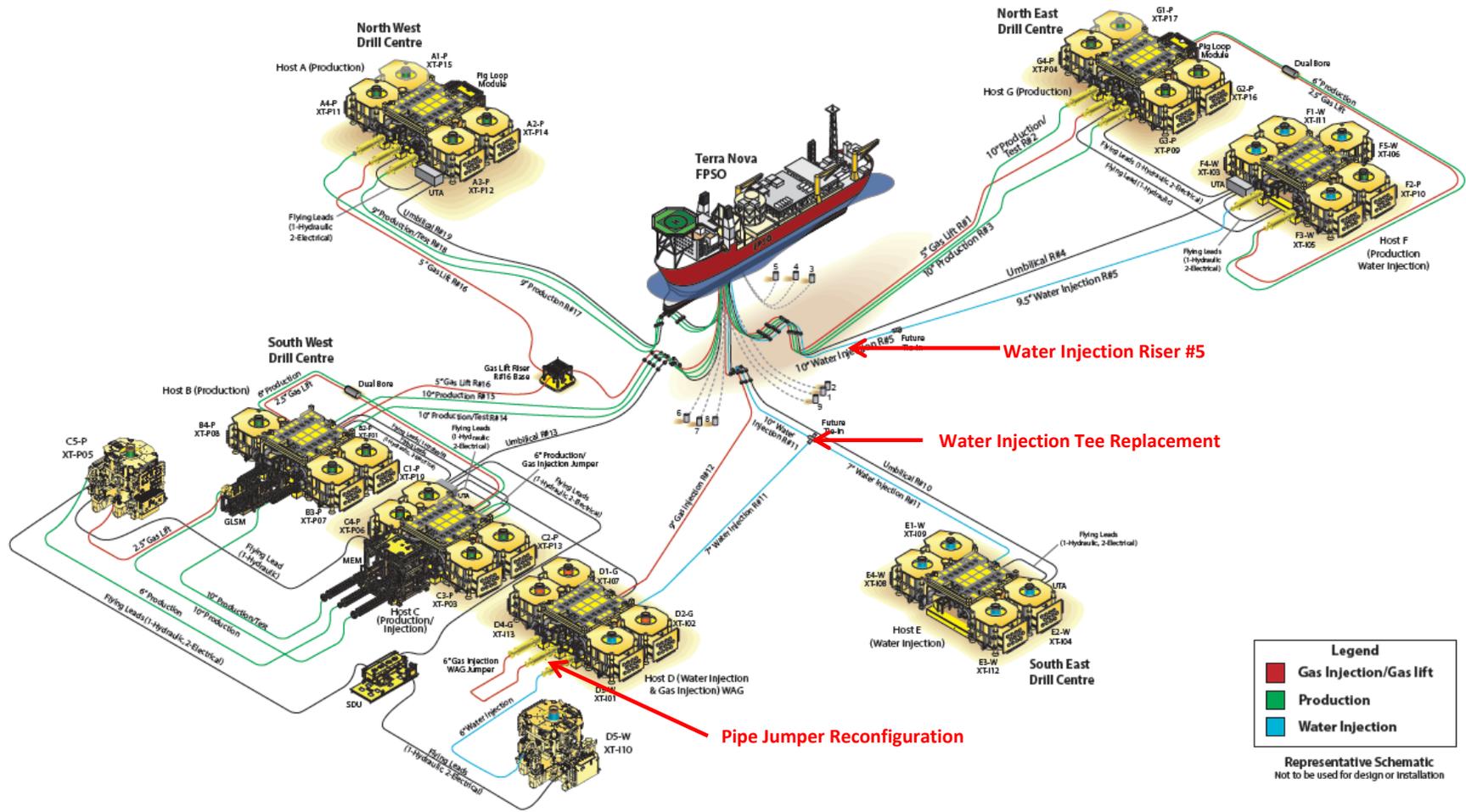


Figure 2: Terra Nova Subsea Layout with Specific Work Locations Highlighted

### 2.2.1 Replacement of Subsea Water Injection Riser #5

Following the suspension of oil production activities, the contents of water injection flowline #5 and its associated riser and jumper (Figure 2) will be recovered to the FPSO.

The end flange of the flowline will be fitted with a temporary cap to prevent damage and entry of debris while preparations are made to install the new riser. The old riser will be filled with treated seawater and capped in preparation for transport to the temporary disposal area described below. The new riser will be installed and pressure tested with treated seawater and placed in service. The treated seawater will be injected down hole as the new riser is brought into service.

The riser connects to the spider buoy of the FPSO and to flowline #5, and is 10" in diameter and 310 metres in length (c.f., Figure 2). The riser will be disconnected from the seabed flowline as described above, recovered and transported to temporary seabed storage at one of two existing Terra Nova waste spoils disposal areas. These disposal areas were originally established for the disposal of marine sediments excavated during initial drill center construction and permitted through the Environment Canada Ocean Disposal and the Fisheries and Oceans Canada Fish Habitat Protection and Compensation processes. Each disposal area measures 750 m by 750 m and are located approximately two kilometres to the north and south of the Terra Nova Field respectively.

Consistent with previous subsea maintenance operations conducted in 2012 and 2014, Suncor has consulted with Environment Canada and Climate Change and it was determined that the subsea equipment can be stored on the ocean floor pending final Field abandonment operations in the future, and that a Disposal at Sea Permit was not required.

During the recovery of the riser, the attached buoyancy modules that maintain its pliant S-curve configuration, will be removed and placed on a supply vessel for disposal onshore. Marine growth on both the riser and the buoyancy modules will be removed prior to their recovery to the supply vessel. The supply vessel will transport the riser to the spoils disposal area for seabed storage and transport the buoyancy modules to shore for disposal. As per previous subsea maintenance programs, materials brought to shore for disposal will be the subject of consultation with the Department of Municipal Affairs and Environment (Waste Management Division) of the Government of Newfoundland and Labrador. Where necessary, required permits have been or will be obtained from the applicable Department.

As noted previously, the riser will be stored in one of the spoils disposal areas pending the final decommissioning and abandonment of the Terra Nova Field (i.e., including the recovery and/or disposal of subsea equipment). Final decommissioning and abandonment which will be conducted in accordance the Terra Nova development plan approval (C-NLOPB Decision 97.02) and other regulatory requirements at the time.

### 2.2.2 Replacement of Subsea Tee on Riser #11

Suncor will be replacing the existing tee junction on the seabed that connects the base of Water Injection Riser #11 to flowlines to the South East and South West Drill Centers (see Figure 2). Figure 3 shows the “as-left” condition of this tee at the end of the last subsea maintenance program in August 2014.

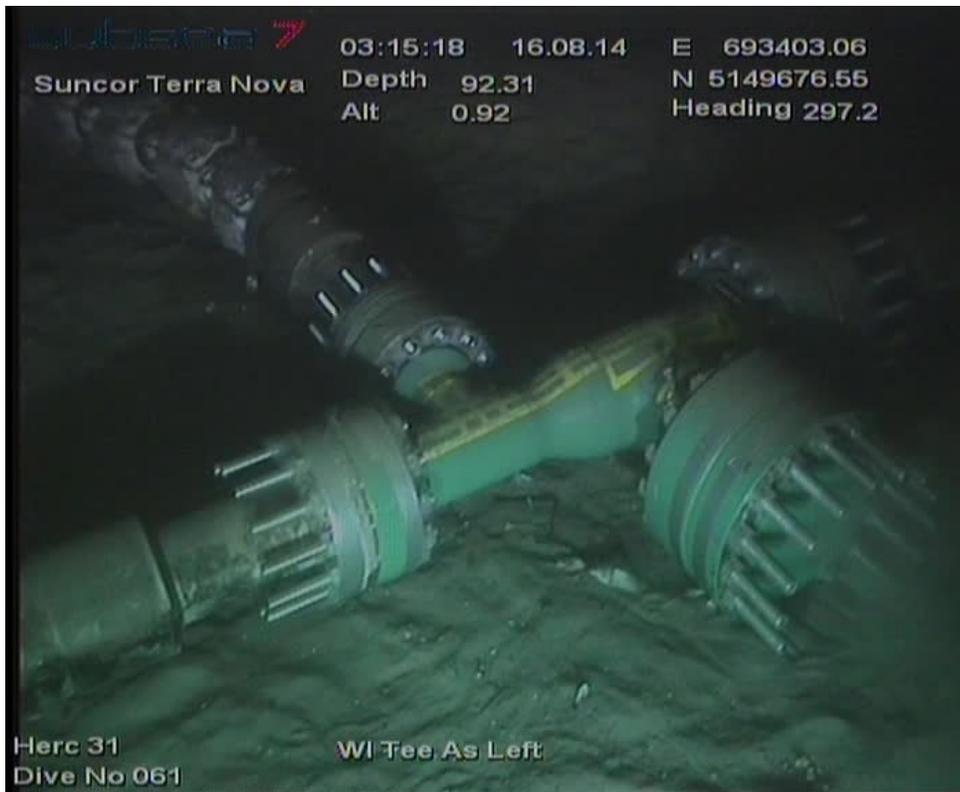


Figure 3: As-left condition of Subsea Tee (August 2014)

Following the suspension of production activities, replacement of this tee will begin with the draining of the lines that are filled with treated seawater back to the FPSO. The old tee will be disconnected and the new tee connected and the system pressure tested with treated seawater. As described for the replacement of riser #5 in Section 2.2.1, the treated seawater will be injected downhole as the system is brought back into service. The old tee will be retrieved to the surface and transported to shore for proper disposal in accordance with regulatory requirements (c.f. Section 2.2.1).

### **2.2.3 Equipment Associated with Riser and Subsea Tee replacements**

During the process of replacing riser #5 and the subsea tee associated with riser #11, other equipment and materials will also be removed or replaced and recovered including, but not necessarily limited to, end fittings, riser buoyancy modules (see also Section 2.2.1), dropped object protection, bend restrictors and stiffeners, and stabilization materials and mattresses.

With the exception of the stabilization mattresses and bend stiffeners, all ancillary equipment and materials will be recovered and transported to shore for disposal in accordance with applicable legislation and in consultation with the Government of Newfoundland and Labrador.

There will be approximately ten (10) concrete mattresses that will be relocated during the subsea program. Each mattress is 5 m x 3 m x 0.5 m and weighs 23 tonnes in air and 16 tonnes in water. These mattresses are typically located between the riser touchdown point and the riser / flowline connection point. Most of the relocated mattresses will be reused; however, final and specific placement of these mattresses will depend on final engineering design.

### **2.2.4 Reconfiguration of Subsea Jumper**

Suncor will conduct a reconfiguration of the pipe jumper arrangement on Host D in the South West Drill Center (SWDC). The existing configuration, which incorporates a flexible gas injection jumper, will be replaced with a rigid pipe jumper configuration (Figure 2).

As described in Section 2.1.1, the accumulated soft material (i.e., drill cuttings and sediments) will have been cleared, to the extent necessary, from the vicinity of the jumper lines to allow the divers to disconnect the old and connect the new jumpers.

Consistent with the riser and tee replacement operations described previously, the jumper replacement will take place after suspending oil production and recovery of the jumper contents to the FPSO. The old jumper will be flushed, filled with suspension medium and capped, and stored at its current location in

the SWDC). A new, rigid pipe jumper six inches in diameter and two meters in length will then be installed on Host D (Figure 2).

### **2.2.5 Management of Discharges: 2017 Subsea Maintenance Program**

During the 2017 Terra Nova subsea program, there will be discharges of treated seawater and chemicals as new equipment is installed and commissioned.

While completing reconfiguration of the pipe jumper arrangement on Host D in the SWDC, the Subsea Pressure and Monitoring Manifold (SPAMM) will be monitored. If the manifold and tree pressures are found to be outside criteria for diver safety, trace amounts of hydrocarbon gas may be vented to ensure diver safety.

Discharges from the subsea maintenance program including any discharges from the FPSO itself will be conducted in accordance with the Terra Nova Environmental Protection Plan - Production (TN-IM-EV03-X00-011). In addition, a discharge request associated with the planned discharges of the 2017 Terra Nova Subsea Program will be submitted to the C-NLOPB for review and approval.

The chemicals used during the program (e.g., oxygen scavengers, corrosion inhibitors, biocides, etc.) will be screened and approved per Suncor's East Coast Chemical Screening and Approval Process (TN-IM-EV03-X00-003). This Process was developed to meet the requirements of the *Offshore Chemical Selection Guidelines for Drilling & Production Activities on Frontier Lands, 2009*.

### **2.2.6 Handling of Naturally Occurring Radioactive Material (NORM)**

There is the potential to encounter deposition of NORM in production piping when undertaking pipe replacement activities such as those described herein. However, to date no NORM scaling has been detected in Terra Nova wells. In the event that NORM is identified, it will be managed in accordance with Suncor's Naturally Occurring Radioactive Material (NORM) Control Procedure (TN-PE-OP03-X00-129) which includes safe and proper storage on shore and final disposal in accordance with regulatory requirements.

### **3.0 REVIEW OF ENVIRONMENTAL ASPECTS**

#### **3.1 Approach to Review**

The original Terra Nova Environmental Impact Statement, part of the Development Plan for the Terra Nova Project, was reviewed in light of the currently planned scope of work involving the:

- ongoing production drilling program using a 'New-to-Field' (MODU);
- the use of mudmats/tethers for wellhead fatigue mitigation; and
- replacement of a subsea riser and water injection tee and reconfiguration of a jumper within an existing glory hole that contains the Terra Nova southwest drill center.

In addition, the approach to and conclusions of recent environmental assessments for the Jeanne d'Arc Basin were considered to determine if they contained information that needed to be considered given the age of the original environmental assessment (Stantec, 2010; Stantec 2009; LGL, 2006b). The currently planned scope of work described above and the Valued Ecosystem Components used in the original assessment were reviewed in the context of current environmental assessment practice for offshore oil and gas projects in the Newfoundland and Labrador Offshore Area.

The review focused on determining if the proposed drilling campaign and 2017 subsea program (and associated work activities) engender environmental effects that may not have been considered by the original environmental assessment or subsequent environmental assessment updates that have addressed similar work scopes.

#### **3.2 2017–18 Drilling Program and Mudmat Installation – Scope and Nature of the Work**

The drilling campaign as proposed for 2017-18 is geographically and temporally consistent with the original environmental assessment as are the specific drilling activities.

The area within which the mudmats will be installed is confined to the Terra Nova Field and hence, from a geographic perspective, entirely consistent with the original environmental assessment. Similarly, it is within the temporal scope of the original assessment, which was sanctioned for Life of the Field estimated at 15 to 18 years.

### 3.3 Riser, Water Injection tee & Jumper Replacements – Scope and Nature of the Work

The area within which this work will occur in 2017 is confined to the Terra Nova Field and hence, from a geographic perspective, entirely consistent with the original environmental assessment. Similarly, it is within the temporal scope of the original assessment, which was sanctioned for Life of the Field estimated at 15 to 18 years. Furthermore, with the exception of vessel traffic to and from the Field, the currently planned scope of work for 2017 will be wholly confined to the Terra Nova Project Safety Zone, a controlled access area with no ongoing fishing or non-project related vessel traffic activities.

The scope and nature of the proposed subsea maintenance work is a smaller scale repeat of the original subsea infrastructure construction activities considered in the original environmental assessment. Furthermore, the proposed 2017 activities are similar to those undertaken in a recent, 2014, subsea program described in Suncor's EA update document (TN-PE-EV01-X00-002) submitted and approved at the time.

### 3.4 Valued Ecosystem Components

The valued ecosystem components (VECs) evaluated in the original assessment included the following:

- the fishery and commercial fish species,
- seabirds,
- marine mammals,
- rare or threatened species or habitats; and,
- species or habitats unique to an area, or valued for their aesthetic properties.

Benthic species, although discussed in the original assessment, were not defined as a VEC. However, as part of the sediment component of the Terra Nova Environmental Effects Monitoring (EEM) Program, which has been conducted since 2000, benthic species and community structure are assessed for effects as related to the Terra Nova Development.

Since Suncor's last environmental assessment update in 2014, which also dealt with subsea maintenance and equipment replacement activities, an evaluation of the results of Suncor's environmental effects monitoring program was published in the peer-reviewed literature (see Section 6.3 of this document for the specific citation). In summary, the conclusions drawn from seven (7) rounds of sampling over the course of a decade found that:

- the dispersion of drill cuttings at the Field was consistent with a priori model estimates,
- sediment contamination decreased in direct response of reduced drilling,

- sediment quality Triad results (contamination, toxicity and benthic biota effects) indicated reduced sediment quality at one station less than 150 meters from a drill center in some sampling years,
- effects on some benthic invertebrate biota (abundance, biomass, richness, diversity, toxicity to laboratory amphipod cultures) were detectable 1-2 kilometers from drill centers in some sampling years but such effects were weak or absent beyond less than 150 meters from drill centers,
- barium and hydrocarbon contamination was detected in Icelandic scallop visceral tissue, and also reduced in association with reduced drilling activity, but, at no time was scallop edible tissue (adductor muscle tissue) subject to taint,
- with the exception of one instance in 2000, of detection of liver contamination with hydrocarbons in one fish, American Plaice demonstrated no evidence of tissue contamination nor was taint detected at any time, and
- bioindicator analysis of American Plaice demonstrated no differences between fish taken at the Terra Nova site versus fish taken at a reference site 20 kilometers southeast of the Field.

The findings of the project EEM program (as summarised above) support the preliminary general conclusion that the activities listed below are not likely to result in environmental effects that were not contemplated by the original assessment and subsequent environmental assessment updates:

- the 2017-18 drilling campaign,
- the installation of mudmats,
- the replacement of a riser, a subsea tee connection and jumpers,
- the redistribution of sediment and drill cuttings within the confines of the drill center glory holes; and,
- the discharges of chemicals pre-screened for toxicity.

Since the original assessment was conducted, the VECs for oil and gas projects in the Jeanne d'Arc Basin have been refined but still encompass those defined for the purposes of the original assessment. Table 1 provides a concordance between the Terra Nova Project VECs and VECs currently used for projects similar to the Terra Nova flowline replacement and well intervention work.

**Table 1: VEC comparison between original Terra Nova Assessment and Recent Comparable Assessments**

<b>Terra Nova VECs</b>	<b>Current VECs for Comparable Projects</b>
Fishery and Commercial Fish Species	Marine Fish and Fish Habitat
	Commercial Fisheries
Seabirds	Marine Birds
Marine Mammals	Marine Mammals and Sea Turtles
Rare or Threatened Species or Habitats Species or Habitats	Species At Risk
	Sensitive or Special Areas

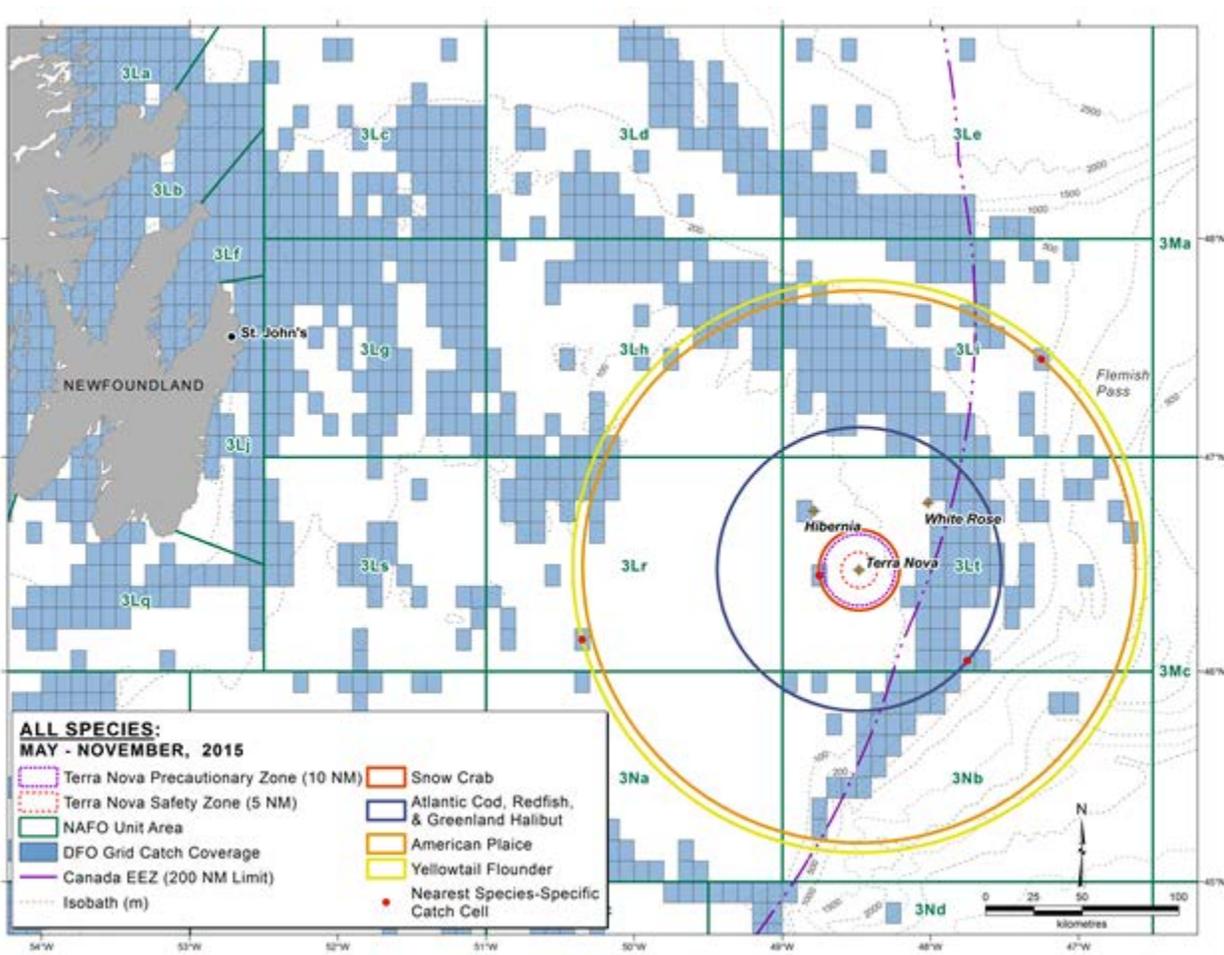
The VECs considered for the Terra Nova assessment are comparable to current assessments with the variation being one of emphasis. Specifically, there is a clear emphasis on fish habitat in recent assessments, as well as, the specific focus on species-at-risk arising from the promulgation of the federal Species at Risk Act (SARA). The other VECs have readily recognizable parallels. Currently, air quality has been defined as a VEC for new production project assessments but this was not done for the original Terra Nova assessment. For the scope of work considered in this update, which is a short term in nature and involving just one new vessel in the Field for less than one month, air quality effects are not of the same significance as compared to a long-term production project like Terra Nova.

The foregoing does not indicate that a new VEC needs to be defined and assessed for the purposes of either the drilling campaign or 2017 subsea program. For the purposes of this document, the implications of the proposed activities for 2017-2018 within the Terra Nova Field will be considered in the context of the current formulation of VECs keeping in mind the above-noted concordance with the original assessment.

### 3.4.1 Commercial Fisheries

No commercial fishery is prosecuted in the area where the proposed drilling program or the subsea maintenance work will physically take place i.e., the five nautical mile Safety and 500 meter Exclusion Zones of the Terra Nova Field.

With respect to fishing activity Figure 3 shows that the closest 2015 catch record, specifically snow crab, is just outside the Terra Nova ten nautical mile Precautionary Zone. All other 2015 catch records are remote from the proposed area of subsea maintenance activity at the center of the Terra Nova Field (Figure 2). The only other commercial species not mapped but appearing in the 2015 Fisheries & Oceans database are eight catch records for Atlantic Halibut and two records for Witch Flounder recorded 85 kilometers from the Terra Nova FPSO between the 200 and 500 meter isobaths.



**Figure 4: Pattern of Fishing Activity around Terra Nova Field based on 2015 Data**

There will be no impact on commercial fisheries in the area, as the mudmats will be installed within the Field exclusion zone.

The nature of supply vessel traffic to and from the Terra Nova Field in support of the drilling activities in 2017-18 will not change. Furthermore, since only one new vessel will be associated with the subsea maintenance work for approximately one month in 2017 which will remain within the Terra Nova Safety Zone, the incremental effect of vessel traffic on commercial fishing activities will be negligible.

Only the long term fate of the flowlines to remain in situ in the Field and the risers and jumpers to be replaced and put in long-term but temporarily storage on one of the existing dredge spoil disposal piles potentially pose an issue for commercial fishing. However, the final decommissioning and abandonment of the Field will be consistent with the Terra Nova Development Plan approval (C-

NLOPB Decision 97.02) and other applicable C-NLOPB requirements (e.g., to leave a production site in fishable condition upon project abandonment).

Ongoing coordination with fishing interests will be handled through both One Ocean and Suncor's regular liaison with fishing industry organizations such as the Fish Food and Allied Workers Union, Ocean Choice International, the Association of Seafood Producers and the Groundfish Enterprise Allocation Council. Suncor provides regular operational updates to the fishing industry through One Ocean whose members include these and other fishing industry groups.

During the conduct of the drilling and subsea maintenance work, fisheries and other marine interests will be kept informed of the commencement, progress and completion of the construction project through Notices to Shipping as necessary. In the event that unexpected circumstances arise that require operations outside the Terra Nova Safety Zone (e.g. the need to move the drill rig), then the protocols developed between the oil and gas and fishing industries through the One Ocean mechanism will be followed (see [www.oneocean.ca](http://www.oneocean.ca) ).

While this update was in preparation, organizations representing fishing industry interests were consulted by telephone and provided with a summary description of the proposed subsea maintenance activities contemplated in this update, including the information presented in Figure 3. Those organizations were:

- One Ocean,
- the Fish, Food and Allied Workers/Unifor Union,
- the Association of Seafood Producers,
- Ocean Choice International; and,
- the Ground fish Enterprise Allocation Council

Apart from a request for a clarification as to the location of the Terra Nova sediment disposal areas by the FFAW, none of the organizations listed above indicated that they had any concerns with the subsea maintenance activities addressed in this update nor did they indicate a need to meet to discuss the proposed activities in more detail.

It should also be noted both in this (the fishery) context and also with respect to the environmental aspects discussed in the following sections that Nature NL was also contacted in the same fashion as were the fishing industry stakeholders described above. Like the other stakeholders consulted, Nature NL did not indicate they had any concerns nor did they request a meeting for a more detailed discussion.

Given the foregoing, it is concluded that the environmental effects of the 2017-18 drilling program and the 2017 subsea maintenance program on the commercial fishery are deemed to be **not significant**.

### 3.4.2 Marine Fish and Fish Habitat

As noted previously the 2017-18 drilling program is consistent with the kind of drilling program contemplated in the original environmental assessment. The results of the past decade of environmental effects monitoring work carried out for the Terra Nova Project and summarized in Section 3.4 do not suggest that the project has had significant effect on marine fish and fish habitat as predicted in the original environmental assessment.

Similarly, the physical disturbance, discharges and long term but temporary storage of subsea piping on the seafloor within the Terra Nova Safety Zone are unlikely to result in a significant effect on marine fish or fish habitat. Indeed, the subsea infrastructure, and the pipe and associated components in place and to be placed in storage on the seafloor offer potentially increased habitat diversity to the marine fish and benthic species that populate the local area. This perspective is further supported in the context of the subsea maintenance campaign discussion with Fisheries and Oceans Canada. As a result, Fisheries and Oceans Canada concluded that the proposed program was not likely to result in impact to fish and fish habitat (DFO letter to Suncor on May 23, 2017).

The effects of sediment and drill cutting redistribution and placement within and adjacent to the existing drill center glory holes will have a negligible incremental effect on local fish and fish habitat as compared to the original construction work and ongoing drilling discharges. This view is supported by the results of the overall Terra Nova environmental effects monitoring program described in Section 3.4.

Construction noise and the physical placement of subsea infrastructure was addressed in the original assessment and its conclusion that fish might be displaced several tens to hundreds of meters is still valid in the context of this update.

If six (6) mud mats are required for each glory hole the total seabed foot print for all four (4) glory holes will be 395 square meters. Alienation of approximately 395 square meters of seabed fish habitat will have no significant effect on fish species known to inhabit the area. The mudmats themselves would provide attachment habitat for benthic organisms, including marine algae, which exploit hard surfaces. Fish would be attracted to the shelter habitat provided by the mudmats and it is anticipated that snow crab would also use the mud mat surfaces as they do subsea pipelines and similar equipment.

As noted in Sections 2.1.2 and 2.2.5 chemicals to be used in the 2017-18 drilling program and the 2017 subsea maintenance work that may be discharged to the marine environment will be screened and approved by Suncor in accordance

with its East Coast Chemical Screening and Approval Process (TN-IM-EV03-X00-003).

Discharges arising from the drilling program will be conducted in accordance with the *Terra Nova Environmental Protection Plan - Drilling, Completion and Interventions (TN-IM-EV03-X00-009)* (see Section 2.1.2). Planned discharges arising from the subsea maintenance programs will be documented in the 2017 Terra Nova Subsea Program – Discharge Request, which will be submitted to the C-NLOPB for review and approval. Furthermore, these discharges will also be subject to the *Terra Nova Environmental Protection Plan – Production (TN-IM-EV03-X00-011)* (see Section 2.2.5).

Given the foregoing it is concluded that the environmental effects of the 2017-18 drilling program and the 2017 subsea maintenance program on marine fish and fish habitat are deemed to be **not significant**.

### 3.4.3 Marine Birds

The conduct of the 2017-18 drilling program, mudmat installation and the 2017 subsea maintenance program will pose no significant additional risk to marine birds as compared to normal operations at Terra Nova. The drilling program will be no different than previous drilling operations and even the presence of a diving support vessel in the Field for one month during the subsea maintenance program is negligible since there are routinely a variable number of supply vessels in the Field.

The effects on marine birds will be limited to the risk of a hydrocarbon spill from a the MODU, diving support vessel or supply vessel in the Field, or the risk of seabirds “pitching” on vessel decks either as resting places or due to attraction to lights at night.

The original Terra Nova environmental assessment predicted the potential effects of a hydrocarbon spill on seabirds as negligible to major, contingent on the volume and duration of the spill scenario. However, since that time all environmental assessments for the Newfoundland Offshore Area have deemed the effect of a spill of any magnitude on marine birds as significant.

Notwithstanding the unlikely event of a spill during the proposed program, Suncor plans to maintain its Tier 1 vessel spill response capabilities on site in the Field during the program as per direction from the C-NLOPB. Furthermore, as part of its Environmental Protection Plans, Suncor has policies, procedures and permits in place to deal with stranded or oiled seabirds and has been implementing these procedures for a number of years successfully.

It should also be noted that during the subsea maintenance work, production will be shut down, thus reducing the risk of a spill from these operations.

While the nature of the operations described in this update support a conclusion that there is a risk of a crude spill it is not incrementally greater than that engendered by normal operations especially since normal operations will be stopped during subsea maintenance work and subsea lines will have been flushed prior to being removed as described elsewhere in this update. The ongoing drilling operations described offer no incremental risk of a spill than the drilling operations described in the original Terra Nova Environmental Assessment.

Notwithstanding the foregoing, current environmental assessment practice would conclude that a spill would produce a significant effect on the marine bird VEC. However, apart from the effects of a crude oil spill, the effects of the specific activities described in this update on marine birds are deemed to be **not significant**.

#### **3.4.4 Marine Mammals and Sea Turtles**

Since the activities involved in the 2017-18 drilling program and the 2017 subsea maintenance work and mudmat installation are of the same nature but lesser intensity than envisaged for the original construction and operation of the Terra Nova Project, the risks to marine mammals and sea turtles have not changed. No blasting will be undertaken and, as noted for marine birds, there is no incremental increase in the risk of a significant crude oil spill during the conduct of either program. The noise generated by subsea activities will be within what was described in both the original and subsequent environmental assessments for similar kinds of offshore oil and gas operations on the Grand Banks and is deemed to be **not significant**.

#### **3.4.5 Sensitive Areas and Species at Risk**

The Terra Nova Field, in which the 2017-18 work scopes described herein will take place, does not contain nor is it close to any formally or informally recognized sensitive or special areas. Furthermore, the nature of the activities to be undertaken does not pose a risk to such areas that are remote from the Terra Nova Field.

The Species at Risk Act (SARA), which is the means to both designate and provide protection to rare, endangered and threatened species, was not promulgated at the time of the original assessment of the Terra Nova Project. Appendix 1 provides an up-to-date tabular summary of those species both designated under SARA and by COSEWIC (Committee on the Status of Endangered Wildlife in Canada) whose ranges include the area within which the 2017-18 drilling and 2017 subsea maintenance activities will take place. None of the species listed in Appendix 1 have SARA designated critical habitats designated within or near the Terra Nova Field.

Since the last Environmental Assessment Update was filed for the Terra Nova Field, the following changes in the status of SARA and/or COSEWIC designated species listed in Appendix 1 have taken place.

Pursuant to SARA:

- Ivory Gull critical habitat designated on Seymour Island, Nunavut- 28 February 2015,
- Loggerhead Sea Turtle proposed for SARA Schedule - 1 August 2016,
- Humpback whale NW Atlantic – Not at risk; and
- Hooded and Ringed Seals - Not at risk.

Under COSEWIC:

- Cusk has changed from threatened to endangered,
- Blue Shark changed to not at risk by as of November 2016,
- American Shad, , Capelin and Haddock are no longer candidate species,
- Sei Whale has been designated a high priority candidate,
- Cuvier's Beaked Whale changed to high priority candidate,
- Harp Seal changed to low priority candidate, and
- Winter Skate added as endangered.

The foregoing indicates that there is no significant change to the potential effects on a species at risk since the last environmental assessment update for the Terra Nova Field which contemplated activities similar to those addressed here. However, as described for the marine birds VEC, there is the risk of a spill associated with the work program, albeit low and not incrementally greater than for normal Field operations. Therefore there is a potential for a **significant effect** on the one avian Schedule 1 Species at Risk identified for program area – the Ivory Gull (c.f. Appendix 1).

#### **4.0 SUNCOR'S OPERATIONAL EXCELLENCE MANAGEMENT SYSTEM**

The execution of the 2017 Program will be conducted in a manner consistent with Suncor's Operational Excellence Management System (OEMS), which is Suncor's enterprise-wide management system that organizes and links all standards, systems and processes required to manage operational risks, prevent and mitigate environmental impacts and deliver safe, reliable operations. OEMS is based on the Plan-Do-Check-Act continual improvement cycle and follows the internationally recognized management system standards and specifications ISO 14001 and 9001.

The OEMS sets high-level, company-wide mandatory management system requirements with respect to the foundational non-financial risk management

processes necessary for a business to achieve operational excellence. Each element of Suncor's OEMS describes the company-wide requirements and expectations for managing operational and asset integrity risks inherent in the business.

Each business area within Suncor accepts responsibility for managing the impact of its activities and products on people, the environment, property and corporate assets. To accomplish this, senior leaders in each organizational and functional unit must:

- develop, implement and maintain appropriate systems, processes, procedures and tools to enable organizational units to meet the OEMS requirements;
- understand the operational risks associated with its activities and products;
- regularly report performance against defined objectives and specific performance measures;
- seek input and feedback from internal and external stakeholders;
- self-assess and audit the integrity and effectiveness of its systems against OEMS requirements; and
- identify opportunities for continual improvement.

Risk factors and business requirements within some of Suncor's organizational units will require the development and implementation of issue-specific, dedicated systems, programs and models such as:

- Process Safety Management (PSM) Program - systems and controls that ensure process hazards are identified, understood and controlled;
- Suncor's Asset Development and Execution Model (ADEM) - a framework for consistent development, and sustainment of physical assets consisting of an integrated 5-stage gate process supported by solid project governance;
- Suncor's Well Delivery Model (WDM) - the end-to-end process that takes well planning developed as part of the Evaluate Exploration Acreage (EEA) or Evolve Life of Field Concepts (ELC) processes and delivers either a new or modified or abandoned well.
- business unit or business area specific management systems (e.g., East Coast Management System Manual (OD-PE-QM04-X00-001); and
- programs to ensure the effective implementation of Operational Excellence during non-routine projects.

Through OEMS, Suncor has implemented numerous measures intended to minimize the environmental, health, safety, navigational and aesthetic impacts. Examples of these programs include but are not limited to:

- completion of regulatory consultations to ensure regulatory expectations and requirements are understood and implemented into project planning, including obtaining necessary regulatory authorizations and permits;
- development and implementation of Environmental Protection Plans and Production Suspension Plan for Suncor's East Coast operations that include procedures relating to chemical management, effluent discharges, waste management, seabird handling/release and rehabilitation, oil spill response, fisheries liaison and compensation and environmental effects monitoring;
- development and implementation of a Safety Plan that outlines organizational structure, roles and responsibilities, risk management procedures, legal and other requirements, environmental and health and safety commitments, goals and targets, management of change, learning and competence, contractor management including vessel selection and audit process, emergency management and response procedures, quality management processes, bridging processes to contractor management systems, diving procedures, vessel mobilization procedures and safety meetings;
- completion of risk management processes such as Process Hazard Analyses (PHA) and Hazard Identification and Risk Assessment (HIRA) before the project mobilizes for the offshore phase;
- implementation of emergency management procedures relating to oil spill response, crisis management, operational emergencies, security and business continuity;
- implementation of simultaneous operations (SIMOPS) procedures to ensure identification of Terra Nova Field control and coordination of vessels working in and around the Field; and
- placement of Suncor Company Representatives on project vessels to ensure project oversight and effective implementation of Suncor policies and procedures, including OEMS.

## 5.0 CONCLUSION

Based on the project description and the review of the original environmental assessment and more recent assessments that considered similar activities, Suncor has concluded that:

- the temporal and geographic scope of the 2017-18 Drilling Campaign, mudmat installation and 2017 Subsea Program is consistent with the scope of the original environmental assessment and subsequent environmental updates,

- there is no reason or new information to conclude that, given the nature and location of the proposed work and the season within which it will occur, that the potential effects on the established VECs have materially changed nor is there a need to consider new VECs; and,
- no new mitigations beyond those contemplated in the original environmental assessment or subsequently implemented in response to regulatory requirements, Suncor initiatives and/or engagements with stakeholders (e.g., the fishing industry) are required.
- No new SARA species at risk or critical habitats have been designated within the area of proposed activities that require changes in Suncor's plans or mitigation measures.

## 6.0 REFERENCES

### 6.1 Original Suncor Environmental Assessments and Updates

- Christian, John R. 2008. Environmental Assessment of Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2009-2017. LGL Rep. SA993. Prepared by LGL, St. John's, NL prepared for Petro-Canada, St. John's, NL 258 p. + Appendix.
- Christian, John R. 2009. Environmental Assessment of Petro-Canada Jeanne d'Arc Basin Exploration Drilling Program, 2009-2017 Addendum. LGL Rep. SA993. Prepared by LGL, St. John's, NL prepared for Petro-Canada, St. John's, NL 22 p.
- LGL Limited. 2006a. Environmental assessment of Petro-Canada's vertical seismic profiling program at the Terra Nova Development. LGL Rep. SA890a. Rep. by LGL Limited, St. John's, NL, for Petro-Canada, St. John's, NL. 92 p + appendix.
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- Petro-Canada. 1996. Terra Nova Development Application - Terra Nova Development Environmental Impact Statement.
- Stantec. 2010. Hebron Project Comprehensive Study Report. Prepared by Stantec Ltd. on behalf of ExxonMobil Canada Properties
- Stantec. 2009. Screening Report Hibernia Drill Centres Construction and Operations Program Hibernia Management and Development Company (HMDC) (December 16, 2008), and the revised final report "Screening Report Hibernia Drill Centres Construction and Operations Program Hibernia Management and Development Company (HMDC)" (July 24, 2009).
- Suncor, 2010. Suncor I&O East Coast Operations Newfoundland & Labrador Offshore Area Environmental Assessment Review for 2010. Doc. No. TN-PE-EC15-X00-155.
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- Suncor, 2012. Terra Nova Field Environmental Assessment Update for 2012. Doc. No. TN-PE-EV01-X00-001\_M1.
- Suncor, 2014. Terra Nova Field Environmental Assessment Update for 2014. Doc. No. TN-PE-EV01-X00-002\_M1.

### 6.2 Species at Risk Recovery Strategies & Action Plans By Species

Documents referenced in this section are available on the [Species at Risk website](#)

**Leatherback Turtle (*Dermochelys coriacea*)**

- Atlantic Leatherback Turtle Recovery Team 2006. Recovery Strategy for Leatherback Turtle (*Dermochelys coriacea*) in Atlantic Canada. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, vi + 45 pp.
- Fisheries and Oceans Canada. 2013. Report on the Progress of Recovery Strategy Implementation for the Leatherback Sea Turtle (*Dermochelys coriacea*) in Canada for the Period 2007-2012. Species at Risk Act Recovery Strategy Report Series. Fisheries and Oceans Canada, Ottawa.

**Wolffish (*Anarhichas denticulatus*, *Anarhichas minor*, *Anarhichas lupus*)**

- Kulka, D., C. Hood and J. Huntington. 2007. Recovery Strategy for Northern Wolffish (*Anarhichas denticulatus*) and Spotted Wolffish (*Anarhichas minor*), and Management Plan for Atlantic Wolffish (*Anarhichas lupus*) in Canada. Fisheries and Oceans Canada: Newfoundland and Labrador Region. St. John's, NL. x + 103 pp.
- DFO. 2013. Report on the Progress of Implementation of the Recovery Strategy for Northern Wolffish (*Anarhichas denticulatus*) and Spotted Wolffish (*Anarhichas minor*), and Management Plan for Atlantic Wolffish (*Anarhichas lupus*) in Canada for the Period 2008-2013. Species at Risk Act Recovery Strategy Report Series. Fisheries and Oceans Canada, Ottawa. vi + 16 pp.

**Atlantic Walrus (*Odobenus rosmarus rosmarus*)**

- DFO (Fisheries and Oceans Canada). 2008. Recovery Strategy for the Atlantic walrus (*Odobenus rosmarus rosmarus*), Northwest Atlantic population, in Canada. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa, ON. x + 11 pp.

**Blue Whale (*Balaenoptera musculus*)**

- Beauchamp, J., Bouchard, H., de Margerie, P., Otis, N., Savaria, J.-Y., 2009. Recovery Strategy for the blue whale (*Balaenoptera musculus*), Northwest Atlantic population, in Canada [FINAL]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa. 62 pp.
- Fisheries and Oceans Canada. 2016. Report on the Progress of Recovery Strategy Implementation for the Blue Whale (*Balaenoptera musculus*), Northwest Atlantic population, in Canada for the Period 2009 – 2014. Species at Risk Act Recovery Strategy Report Series. Fisheries and Oceans Canada, Ottawa. ii+ 14 pp.

**Fin Whale (*Balaenoptera physalus*)**

- DFO. 2017. Management Plan for the fin whale (*Balaenoptera physalus*), Atlantic population in Canada, Species at Risk Act Management Plan Series, DFO, Ottawa, iv +38 p.

**North Atlantic Right Whale (*Eubalaena glacialis*)**

- Brown, M.W., Fenton, D., Smedbol, K., Merriman, C., Robichaud-Leblanc, K., and Conway, J.D. 2009. Recovery Strategy for the North Atlantic Right Whale (*Eubalaena glacialis*) in Atlantic Canadian Waters [Final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada. vi + 66p.
- Fisheries and Oceans Canada. 2014. Recovery Strategy for the North Atlantic Right Whale (*Eubalaena glacialis*) in Atlantic Canadian Waters [Final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa. vii + 68 pp.
- Fisheries and Oceans Canada. 2016. Report on the Progress of Recovery Strategy Implementation for the North Atlantic Right Whale (*Eubalaena glacialis*) in Canadian Waters for the Period 2009-2014. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa. iii + 48 pp.
- Fisheries and Oceans Canada. 2016. Action Plan for the North Atlantic Right Whale (*Eubalaena glacialis*) in Canada: Fishery Interactions **[Proposed]**. Species at Risk Act Action Plan Series. Fisheries and Oceans Canada, Ottawa. v + 35 pp.

**Northern Bottlenose Whale (*Hyperoodon ampullatus*)**

- Department of Fisheries and Oceans Canada. 2010. Recovery Strategy for the Northern Bottlenose Whale, Scotian Shelf population, in Atlantic Canadian Waters. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada. vi + 61p.
- Fisheries and Oceans Canada. 2016. Recovery Strategy for the Northern Bottlenose Whale, (*Hyperoodon ampullatus*), Scotian Shelf population, in Atlantic Canadian Waters [Final]. Species at Risk Act Recovery Strategy Series. Fisheries and Oceans Canada, Ottawa. vii + 70 pp.
- Fisheries and Oceans Canada. 2017. Action Plan for the Northern Bottlenose Whale (*Hyperoodon ampullatus*), Scotian Shelf population, in Atlantic Canadian waters. Species at Risk Act Action Plan Series. Fisheries and Oceans Canada, Ottawa. iv + 37 pp.

**Sowerby's Beaked Whale** (*Mesoplodon bidens*)

- Fisheries and Oceans Canada. 2017. Management Plan for the Sowerby's Beaked Whale (*Mesoplodon bidens*) in Canada. Species at Risk Act Management Plan Series. Fisheries and Oceans Canada, Ottawa. iv + 46 pp.

**Ivory Gull** (*Pagophila eburnea*)

- Environment Canada. 2014. Recovery Strategy for the Ivory Gull (*Pagophila eburnea*) in Canada. Species at Risk Act Recovery Strategy Series. Environment Canada, Ottawa. iv+ 21 pp.

**6.3 Other Relevant Literature**

- DFO. 2011. Using Satellite Tracking Data to Define Important Habitat for Leatherback Turtles in Atlantic Canada. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2012/036.
- O'Boyle, R. 2012. Assessment of Leatherback Turtle (*Dermochelys coriacea*) Fisheries and Non-Fisheries Related Interactions in Atlantic Canadian Waters. DFO Can. Sci. Advis. Sec. Res. Doc. 2012/063. iii + 99 p.
- Neff, J., K. Lee, E.M. DeBlois (Eds.). 2014. Environmental Effects of Offshore Drilling in a Cold Ocean Ecosystem: A Ten Year Monitoring Program at the Terra Nova Offshore Development off the Canadian East Coast. Deep-Sea Research Part II, Vol. 110, December 2014, 91 pp.

**7.0 APPENDICIES**

Appendix 1: Current Listing of SARA and COSEWIC Listed Species relevant to the Terra Nova Field

Appendix 1 - Current Listings<sup>2</sup> of SARA and COSEWIC Listed Species Relevant to the Terra Nova Field

Species		SARA Status noted as Schedules 1, 2 or 3			COSEWIC Status			
Common Name	Scientific Name	Endangered	Threatened	Special Concern	Endangered	Threatened	Special Concern	Candidate <sup>3</sup>
<b>Birds</b>								
Ivory Gull	<i>Pagophila eburnean</i>	1			X			
<b>Marine Fish</b>								
Northern wolffish	<i>Anarhichas denticulatus</i>		1			X		
Spotted wolffish	<i>Anarhichas minor</i>		1			X		
Atlantic wolffish	<i>Anarhichas lupus</i>			1			X	
Atlantic cod (Newfoundland & Labrador population)	<i>Gadus morhua</i>				X			
Porbeagle shark	<i>Lamna nasus</i>				X			
White shark	<i>Carcharodon carcharias</i>	1			X			
Roundnose Grenadier	<i>Coryphaenoides rupestris</i>				X			
Cusk	<i>Brosme brosme</i>				X			
Shortfin mako shark	<i>Isurus oxyrinchus</i>					X		
American Eel	<i>Anguilla rostrata</i>					X		
White Hake (Atlantic and Northern Gulf of St. Lawrence population)	<i>Urophycis tenuis</i>					X		
Thorny Skate	<i>Amblyraja radiata</i>						X	
Roughhead grenadier	<i>Macrourus bergla</i>						X	
Atlantic Bluefin Tuna	<i>Thunnus thynnus</i>				X			
Atlantic Mackerel	<i>Scomber scombrus</i>							MPC
Pollock	<i>Pollachius virens</i>							MPC
Winter Skate (Eastern Scotian Shelf - Newfoundland Population)	<i>Leucoraja ocellata</i>				X			

<sup>2</sup> SARA: May 2017; COSEWIC: May 2017; SARA or COSEWIC status codes highlighted indicate a change since the last EA Update. Species dropped are noted in the text of the EA Update.

<sup>3</sup> Candidate species listings are not available on the new COSEWIC website <http://www.cosewic.gc.ca/default.asp?lang=en&n=258BE9F5-1>

Species		SARA Status noted as Schedules 1, 2 or 3			COSEWIC Status			
Common Name	Scientific Name	Endangered	Threatened	Special Concern	Endangered	Threatened	Special Concern	Candidate <sup>3</sup>
American Plaice (Newfoundland & Labrador Population)	<i>Hippoglossoides platessoides</i>					X		
Acadian Redfish (Atlantic Population)	<i>Sebastes fasciatus</i>					X		
Alewife	<i>Alosa pseudoharengus</i>							MPC
Deepwater Redfish (Northern Population)	<i>Sebastes mentella</i>					X		
Lumpfish	<i>Cyclopterus lumpus</i>							HPC
Spiny Dogfish	<i>Squalus acanthias</i>						X	
Basking Shark	<i>Cetorhinus maximus</i>						X	
Greenland Shark	<i>Somniosus microcephalus</i>							MPC
<b>Marine Mammals</b>								
Blue whale	<i>Balaenoptera musculus</i>	1			X			
North Atlantic right whale	<i>Eubalaena glacialis</i>	1			X			
Sei Whale								HPC
Fin whale (Atlantic population)	<i>Balaenoptera physalus</i>			1			X	
Killer Whale (NW Atlantic & Eastern Arctic Populations)	<i>Orcinus orca</i>						X	
Cuvier's Beaked Whale	<i>Ziphius cavirostris</i>							HPC
Sowerby's beaked whale	<i>Mesoplodon bidens</i>			3			X	
Northern Bottlenose whale (Davis Strait/Baffin Bay/Labrador Sea)	<i>Hyperoodon ampullatus</i>						X	
Harbour porpoise	<i>Phocoena phocoena</i>		2				X	
Harp seal	<i>Phoca groenlandica</i>							LPC
Hooded seal	<i>Cystophora cristata</i>							MPC
Bearded seal	<i>Erignathus barbatus</i>							MPC
<b>Reptiles</b>								
Leatherback sea turtle	<i>Dermochelys coriacea</i>	1			X			

Species		SARA Status noted as Schedules 1, 2 or 3			COSEWIC Status			
Common Name	Scientific Name	Endangered	Threatened	Special Concern	Endangered	Threatened	Special Concern	Candidate <sup>3</sup>
Loggerhead sea turtle (Atlantic Population)	<i>Caretta caretta</i>	X <sup>5</sup>			X			
Kemp's Ridley sea turtle	<i>Lepidochelys kempii</i>							LPC

<sup>5</sup> This species has been proposed for SARA Schedule 1 status in August 2016 with formal designation still pending.