# PARSONS POND OIL EXPLORATION & ACCESS ROAD

## Environmental Preview Report

Submitted by:
Nalcor Energy Oil and Gas Inc.
Hydro Place, 500 Columbus Drive, PO Box 12800
St. John's, Newfoundland and Labrador
Canada A1B 0C9

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# 1.0 INTRODUCTION AND NAME OF THE UNDERTAKING

This Undertaking is referred to as the "***Parsons Pond Oil Exploration & Access Road***".

It comprises an approximately 5 km long access road and development of a single drill site - referred to as the Darcy well site (Figure 1-1) - to be located in northwestern Newfoundland, on the Northern Peninsula to the northeast of Parsons Pond.

The Undertaking was originally registered for environmental assessment under the *Newfoundland and Labrador Environmental Protection Act* (Part X) (NLEPA) by Leprechaun Resources Ltd. in February 2009 (see Appendix A). Following public and governmental review of that Registration, on July 15, 2009 the Minister of Environment and Conservation announced that an Environmental Preview Report (EPR) was required for the Undertaking.

The requirement for an EPR pertains solely to the Undertaking as described above. Other components and activities associated with the proponent's overall planned exploration drilling program in this area, such as up-grading and surfacing of the existing Five Mile Road, the development of a drill site adjacent to that road, as well as development and re-drilling of the old Contact drill site south of Parsons Pond, were permitted to proceed, subject to obtaining any other necessary permits and approvals (Appendix A). These are therefore not included within the scope of this EPR. The Undertaking itself has also evolved since the February 2009 Registration, and now has a reduced scope and footprint. The Registration was originally for an approximately 10 km long access road and development of two drill sites, as compared currently to a 5 km access road and one drill site. The proposed Undertaking is described in Section 3.0.

This EPR is intended to provide further information on the Undertaking and its existing environment and potential environmental interactions, in order to address the various questions and issues raised during governmental and public review of the Registration. An Environmental Assessment Committee was appointed to provide advice to the Minister on the EPR on August 6, 2009, and on August 21, 2009 Guidelines for the preparation of the EPR were issued to the proponent (Appendix B). A Table of Concordance indicating where each of the requirements of the EPR Guidelines are addressed in this document is included in Appendix B.

In August 2009, Nalcor Energy announced that it had acquired an average 67 percent working interest in three onshore exploration permits in the Parsons Pond area, including that related to the Undertaking which is the subject of this EPR. Nalcor Energy acquired its working interest from Leprechaun Resources Ltd., and together with its joint venture partners, has taken an operating role in the exploration drilling program. This has included responsibility for the preparation and submission of this EPR.

This EPR has been developed and is being submitted by Nalcor Energy in relation to this proposed Undertaking, and in accordance with the NLEPA and associated regulations and the above noted EPR Guidelines. It will be subject to governmental and public review, and eventually, a decision by the Minister of Environment and Conservation as to whether the Undertaking may proceed, subject to any terms and conditions, or whether further environmental review may be required.

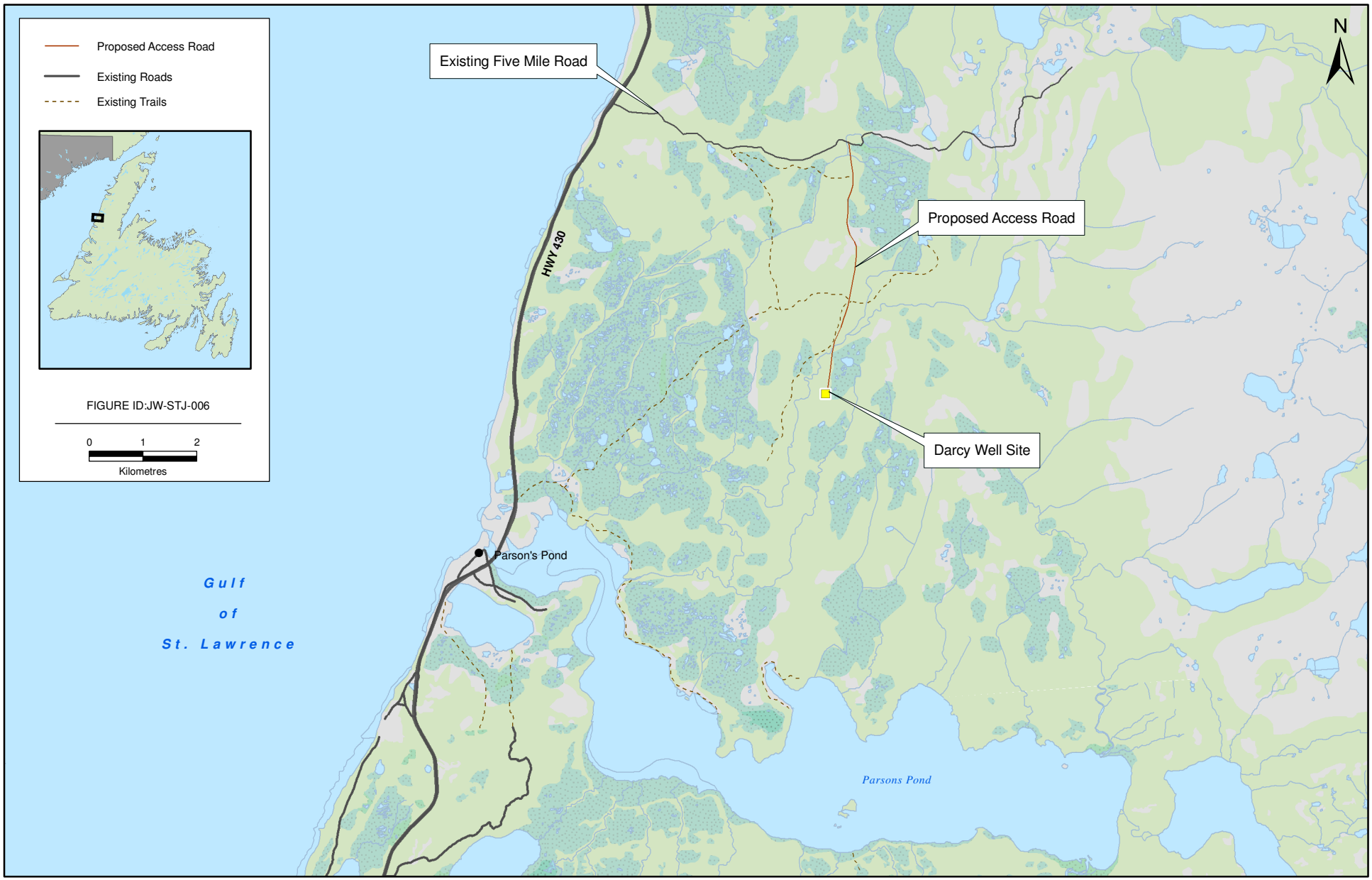



**FIGURE 1.1**

## The Proposed Undertaking

## 2.0 PROPONENT

Newfoundland and Labrador has an immense and diverse energy warehouse. In 2007, guided by a long-term *Energy Plan* to manage these energy resources, the Government of Newfoundland and Labrador created a new provincial energy corporation - *Nalcor Energy*.

Nalcor Energy has assumed an operating role in this exploration drilling program in the Parsons Pond area, and is therefore the proponent for this Undertaking.

**Name of Corporate Body**: Nalcor Energy

**Address**:
Hydro Place, 500 Columbus Drive
P.O. Box 12800
St. John's, Newfoundland and Labrador, Canada A1B 0C9
t. 709.737.1440, f. 709.737.1800
e. *oilandgas@nalcorenergy.com*

**President and Chief Executive Officer**:
Edmund J. Martin
Contact information is as provided above

**Principal Contact Persons for the Purposes of Environmental Assessment**:
Steve Bonnell
Environmental Assessment Lead
t. 709.737.1365, f. 709.737.1985
e. *sbonnell@nalcorenergy.com*

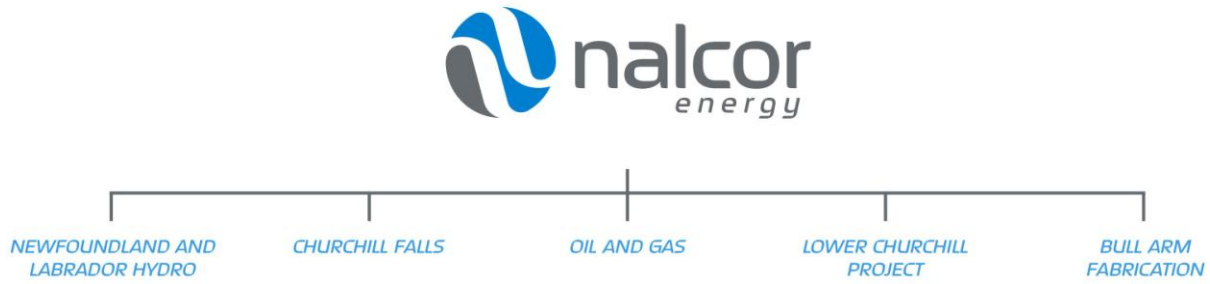
Ian Atkinson
Chief Geophysicist – Oil and Gas
t. 709.737.4863, f. 709.737.1416
e. *ianatkinson@nalcorenergy.com*

Nalcor Energy's foundation is built on its base business: the generation and transmission of electrical power. The company has a strong commitment to provide safe, reliable and dependable electricity to its utility, industrial, residential and retail customers.

Beyond that base business, Nalcor Energy has expanded into the broader energy sector, including oil and gas, wind energy, and research and development. The company is leading the development of the province's energy resources, and is focused on environmentally responsible and sustainable growth.

Nalcor Energy has five lines of business: Newfoundland and Labrador Hydro, Churchill Falls, Oil and Gas, Lower Churchill Project and Bull Arm Fabrication (Figure 2-1).

**Figure 2-1 Nalcor Energy: Organizational Structure and Business Units**




Nalcor Energy's Oil and Gas Division holds and manages oil and gas interests in the Newfoundland and Labrador onshore and offshore. The company is currently a partner in two offshore developments, the Hebron oil field and the White Rose Growth Project, and in June 2009 signed the Hibernia Southern Extension Memorandum of Understanding which will guide the completion of its third offshore equity acquisition in 2010.

Nalcor Energy - Oil and Gas is also the operator of this onshore exploration drilling program in the Parsons Pond area.

Nalcor Energy - Oil and Gas continues to assess growth opportunities for the province's oil and gas resources. Committed to marketing these opportunities around the world, this division will maximize benefits from these resources to help build a stronger economy in Newfoundland and Labrador.

Additional information can be obtained at Nalcor Energy's website at *www.nalcorenergy.com*

# 3.0 DESCRIPTION OF THE UNDERTAKING

The proposed Undertaking involves the construction, maintenance and use of a proposed 5 km access road connecting the proposed Darcy well site to an existing road, known locally as Five Mile Road (see Figure 1-1). It also includes site development and drilling activities for the single proposed well at the Darcy well site.

## 3.1 Scope, Context and Evolution

Drilling at the Darcy well site is part of a larger exploration program planned by Nalcor Energy that will involve drilling at a total of three locations in the Parsons Pond area – the Darcy well site, Finnegan well site and Seamus well site (Figure 3.1).

Before choosing these well site locations, Nalcor Energy's geoscientists created structure maps of the Ordovician platform using the existing seismic dataset. Six structures were identified and a geological risk analysis was performed. The well locations were chosen to evaluate the area's potential by assessing different structural features. Each of the well sites is distinctive in structural style and basin setting, and all are required to provide the geological information sought by this exploration program. An interpretation of the shallow structures was also performed to assess the potential for petroleum trapped in overlying sediments.

As the drilling programs planned for both the Finnegan and Seamus sites require no infrastructure development, they are not included within the scope of the Undertaking and they are therefore not discussed further herein. The Undertaking being assessed in this EPR is for the construction and use of the access road and infrastructure associated with the Darcy well site only, as specified in the Minister of Environment and Conservation's July 2009 decision and associated EPR Guidelines (Appendices A and B).

Access to the drilling site is necessary for the transportation of drill rigs, construction materials (such as fill), other equipment and personnel. For this Undertaking, such access is only possible via air or land. A discussion of both of these alternatives is included in Section 3.7, which also provides the rationale for the selection of road access as the means of transporting personnel, equipment and materials to the Darcy well site.

As is very often the case with proposed development projects and activities, the Undertaking has continued to evolve and become further defined as planning and design work has progressed. This has included updates and modifications to the proposal based on technical and environmental requirements and considerations, the objective being to design and implement a program that meets exploration objectives while at the same time avoids or reduces potential environmental interactions. As stated above in Section 1.0, the Undertaking has changed somewhat since the original submission of the Registration, and specifically, now has a reduced scope and footprint. Figure 3-1 illustrates these changes and identifies the currently proposed Undertaking.

The environmental assessment Registration submitted by Leprechaun Resources Ltd. in February 2009 (Appendix A) included an approximately 10 km long access road required to access two new drill sites. That Undertaking also included the development of both of these drill sites.

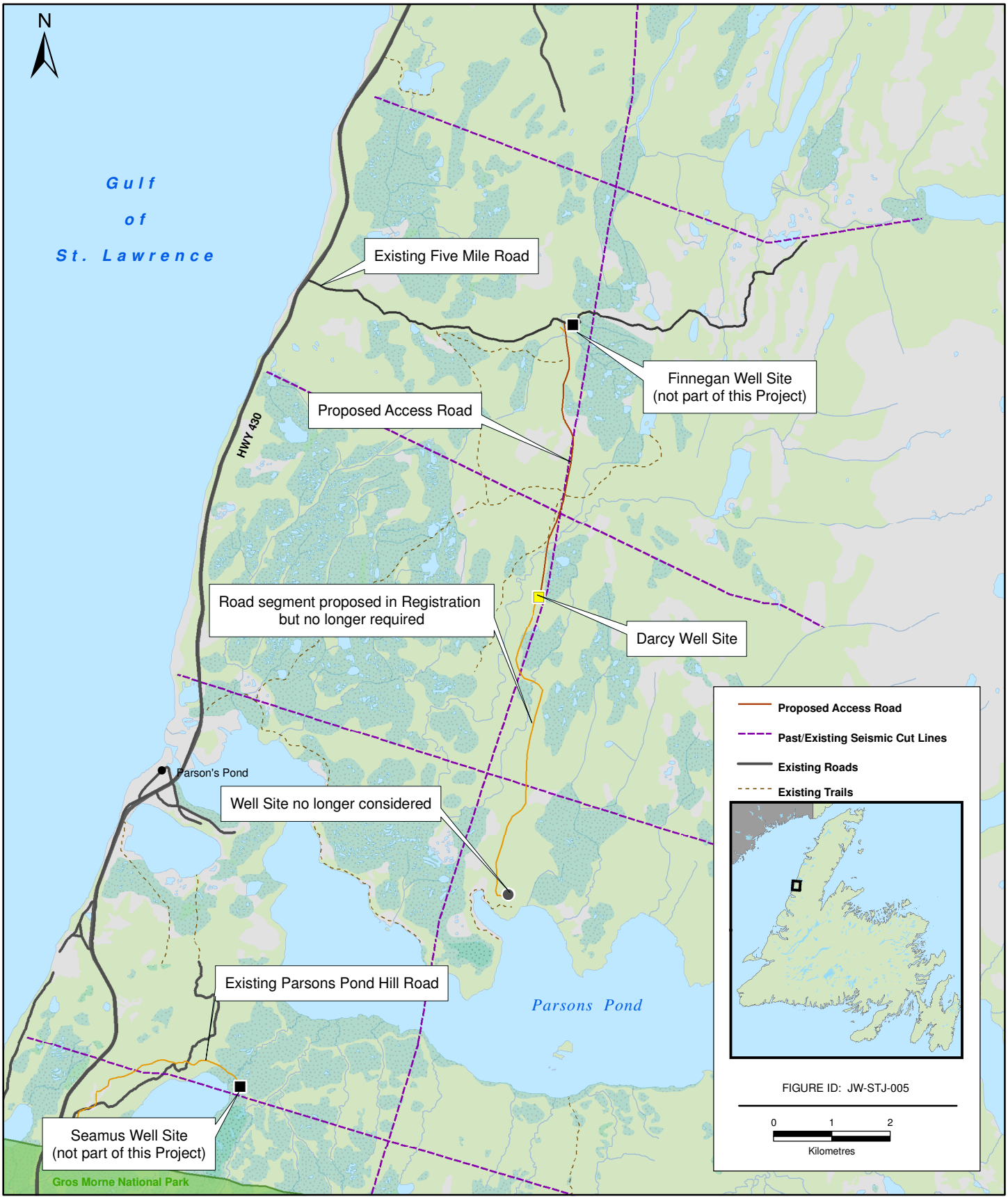



**FIGURE 3.1**

## Modifications in the Undertaking from the Original EA Registration

The proposed access road ran south from Five Mile Road to Parsons Pond, with the two proposed drill sites being located along the access road at about the 5 and 10 km points (Figure 3-1).

The previously proposed drill site located at the end of the 10 km access road (i.e., that located furthest south and immediately north of Parsons Pond, see Figure 3-1) is now no longer being considered. It has been replaced by a drill site (the Seamus site) that was previously drilled and has the required infrastructure and access already in place, and which is therefore not subject to environmental assessment. Similarly, the Finnegan drill site is located on the existing Five Mile Road, and is therefore not part of this Undertaking.

The proposed drill site located at the mid–way point of the originally proposed access road (i.e., the 5 km point) has been retained, and is therefore included and referred to in this EPR as the Darcy well site.

## 3.2 Purpose, Need, Rationale, and Potential Future Development Activities

The proposed Undertaking comprises the development of a road to provide access to a proposed drilling site near Parsons Pond in northwestern Newfoundland, in order to facilitate the completion of an exploration drilling program in that area in 2010. This is therefore the direct, and immediate, purpose of and rationale for this proposed Undertaking.

As described later in this EPR, the construction and maintenance of this access road and its use in the proposed exploration drilling program will result in the creation of various employment opportunities for local residents, as well as opportunities for local businesses in the supply of required goods and services to the Undertaking and other possible "spin off" economic benefits during this period.

Exploration drilling activities such as those proposed here are a necessary initial step in confirming the potential existence of commercially viable hydrocarbon reserves at any site. While seismic programs and the resulting data can be used to plan and justify a drilling program, it cannot on its own confirm the hydrocarbon potential of a site. Access to, and drilling at, the Darcy well site is part of a larger drilling program (a total of three well sites) that will be undertaken on *Oil and Gas Exploration Permits No. 03–102 and 03-103* to evaluate the hydrocarbon potential of the Ordovician platform sediments. The selected well locations will provide good information to further evaluate this potential within the Parsons Pond Exploration Permits. The Darcy well site is considered the highest priority site from a geological perspective, as it will enable the testing of both the shallow and deep plays with a single well.

In facilitating the above described exploration activity, the larger objective of the activities associated with this Undertaking is to seek to identify commercially viable hydrocarbon reserves in this area. A successful exploration program leading to the location of such resources could eventually lead to significant additional economic activity in this area related to further delineating, and possibly developing, any such oil and/or gas reserves. Local residents, communities and stakeholder groups in the area have expressed considerable interest around potential oil and gas development as a means of facilitating further economic development and growth in this area of the Northern Peninsula (RED Ochre Regional Board Inc. 2006; 2009; Hudson 2009).

An exploration drilling program therefore could, if successful, eventually lead to the future development of a production facility and associated construction and operational activities. This could result in significant

economic benefits, both in terms of revenue and returns to the developer and its shareholders, as well as contributing to the local, regional, provincial and federal economies. Such future development would provide employment and business opportunities, training and technology transfer, and generate tax and royalty revenues to government that would benefit the people of Newfoundland and Labrador in general.

Any such future potential oil and/or gas development in this area is outside the scope of the present Undertaking. Moreover, the specific nature and characteristics of these potential future activities cannot currently be known or defined, and will obviously depend on the type and quantity of any hydrocarbons found, the location, area, depth and other characteristics of any such reserves, etc. – questions which the proposed exploration program are intended to help answer. These and numerous other technical and economic factors will determine the requirement for, and specific characteristics of, any future exploration or development activities and associated infrastructure. As a result, the nature of any potential future development scenarios cannot currently be defined or described with any degree of accuracy or certainty. Any attempt to do so at this point would be purely conjecture, and is therefore not likely to be particularly informative or meaningful.

In the event that the results of this planned exploration program are positive, however, any additional exploration and/or production activities will be planned and implemented in an environmentally acceptable manner, in accordance with relevant legislation, regulations and applicable permits and approvals, and will be subject to environmental regulatory review. Any such future development activities would therefore comprise a future and separate Undertaking, which would be presented for environmental assessment review under the provincial and/or federal processes (as applicable) by the relevant proponent(s) of those developments as they are determined and become defined.

## 3.3 Geographic Location

The proposed access road and well site are located on Crown Lands in northwestern Newfoundland, on the Island's Northern Peninsula to the northeast of the Town of Parson's Pond. The access road and drill site are depicted in Figure 3-2.

The Darcy drill site location is located at Easting 455629.24 Northing 5544736.19 (Longitude-57.621366; Latitude-50.05039). The site will be approximately 150 m x 150 m in size, covering an area of approximately 2.25 hectares. It is approximately 8 km northeast of the community of Parson's Pond.

Access to the beginning (north end) of the proposed road is via an existing resource road known locally as Five Mile Road, which leaves Highway 430 south of the Arches Provincial Park and continues to the east (Figures 3-1 and 3-2). The new access road will commence from a point on this existing road about 5 km from the intersection of Highway 430 and Five Mile Road, and from there will run southward for approximately 5 km to the proposed well site. The proposed access road route has been selected through site investigations on the ground and from the air. The access road follows along existing trails and higher, dry ground in order to help to reduce erosion and any potential effects on water quality and surface hydrology. A small watercourse (Watercourse 2) is located approximately 0.3 km south of Five Mile Road and another (Watercourse 1) is located 4.0 km south along the proposed access road (Figure 3-2).

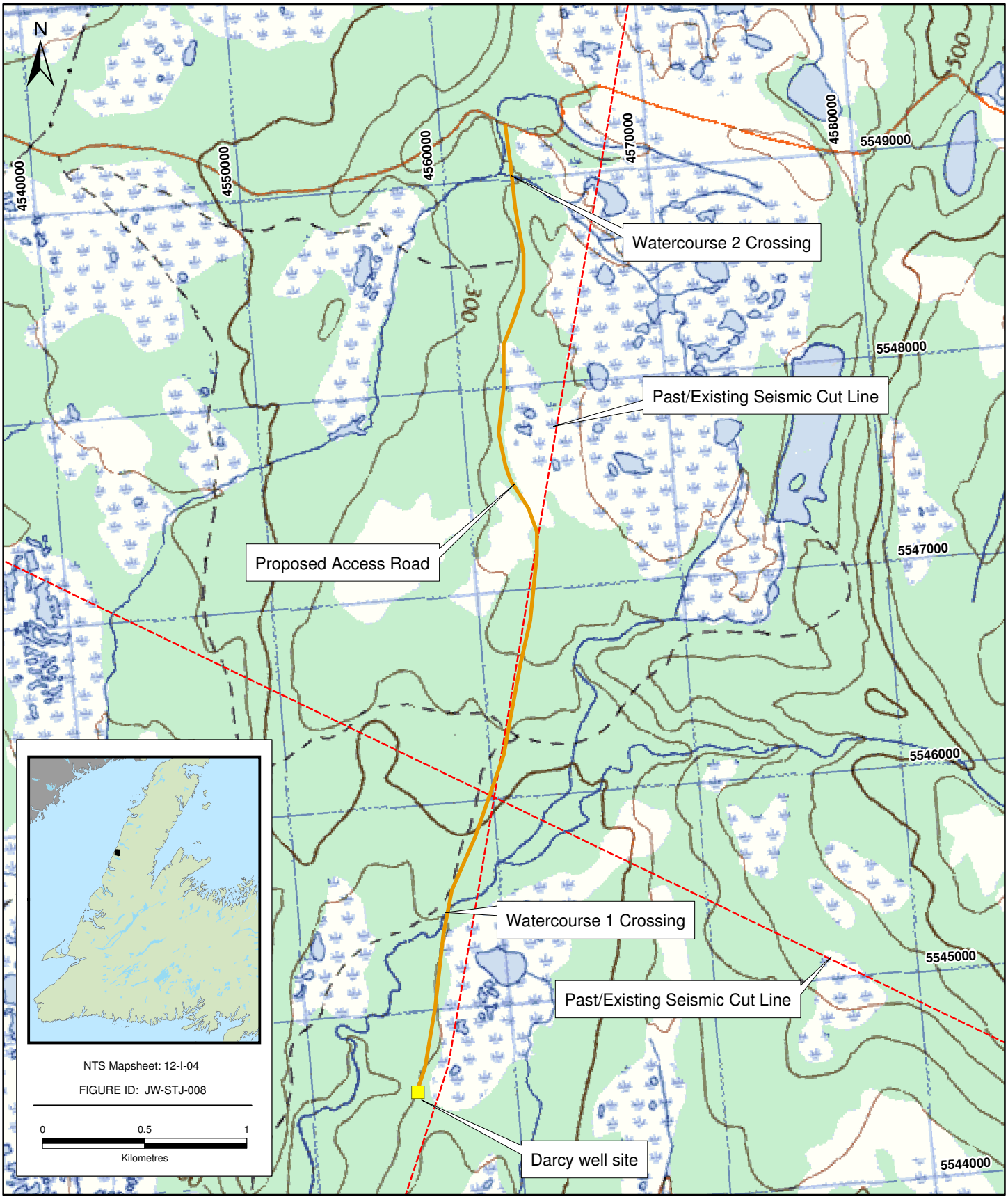



**FIGURE 3.2**

## Proposed Access Road and Darcy Well Site

## 3.4 Project Schedule

Pending receipt of required environmental regulatory approvals, the proposed Undertaking is planned to commence in early 2010 with on-going site investigation, logistics and procurement and some initial project preparation activities.

In April or May 2010, site development (construction) activity will commence (depending upon weather and site conditions). This initial construction activity will consist of some preliminary road clearing activities such as tree and brush cutting. The majority of road work will be subject to spring run-off and dependent upon local ground conditions. Road construction is estimated to take approximately five to six weeks to complete with most, if not all, construction activities occurring during daylight hours.

Development activities at the Darcy drill site itself will be dependent on completion of the access road to allow transportation of required construction equipment and materials to the site. Development activities at the Darcy well site will likely commence in late May 2010.

Drill rig mobilization to the site is scheduled for June 2010. Drilling at the Darcy well site is scheduled from June to August 2010, with an estimated duration of 70 days. During this time, drilling activities will occur on a 24-hour per day, seven days per week basis.

The drilling results from the well will be evaluated in August and September 2010. Depending on the results, demobilization of the drill rig and associated activities could be initiated in October 2010, although the access road could be in place for several years to support additional periodic well testing (see Section 6.0).

## 3.5 Development

The new road will be a temporary access road built to accommodate heavy highway loads. It will be approximately 5 km long by approximately 6 m wide, comprising a 4 m wide gravel surfaced roadbed with 1 m on each side for drainage ditches.

During initial site preparations for the proposed access road and drill site trees will be removed manually using brush saws and chain saws. Trees range in size from potential saw logs and firewood, which will be salvaged, to scrub that is not considered merchantable for any purpose. The area will be grubbed and stripped, with any topsoil stockpiled appropriately on the side of the lease for future use, including eventual site rehabilitation work (Section 6.0).

Road construction through the dry sections will require digging drainage ditches on the sides of the road with an excavator. Through the wetter sections, equipment will be used to push down any shrubs and cover them with the material from the ditches to establish the road. It may be necessary to haul fill material to the lower sections. As part of planning and design work for the Undertaking, the road route has been selected so as to avoid wetlands (Figure 3-2) and other environmentally sensitive areas.

The first 2 km of the proposed access road will be constructed along a forested ridge. A culvert estimated to be approximately 1.2 m in diameter will be installed at Watercourse 2. Standard and accepted practices will be

followed for this installation, including DFO's *Guidelines for Protection of Freshwater Fish Habitat* (Gosse et al. 1998) and other relevant environmental protection measures. These methods include measures to minimize instream disturbance, to control erosion and sedimentation and to stabilize streambanks. Once installed, the culvert will be inspected regularly by site personnel to ensure that it is functioning properly.

At approximately km 2.0, a wet section approximately 500 m in length is to be crossed. The use of prefabricated mats is currently proposed for use in road construction in this area. If this approach is eventually not determined to be feasible in this environment by civil design engineers at the start of construction, standard access road construction practices will be employed, as described above. The next 2 km of road will be constructed over forested ground.

At approximately km 4.0 a bridge structure will be required to cross Watercourse 1 (Figure 3-2). A Bailey bridge or similar structure is being considered for this location, and construction of this structure will not require any in-watercourse activities. Again, the above-cited DFO guidelines and other standard mitigation measures will be followed as applicable.

Preliminary site investigations indicate that the southern half of the proposed access road is located along a previous seismic line cut-over from 1992, which has been kept open by local ATV and snowmobile traffic. For this portion of the right-of-way, it may only be necessary to clear any vegetation that has regenerated since the area was originally cleared, which will be widened to approximately 6 m. Fill and surfacing materials for access road and drill site construction will be obtained either from directly within the developed footprint of the Undertaking itself, or from nearby existing and approved quarries in the general area. Following clearing and site preparation of the roadbed and drill site, the locally-sourced gravel will be transported to the worksite and distributed, spread and compacted using standard construction methods.

Equipment required for road construction is estimated to include 2 tracked excavators, 2 dozers, 5-8 dump trucks and 1 loader. There will be standard fuel requirements and emissions associated with this equipment. A supply of hydrocarbon spill response materials will be maintained at the well site and along the access road sufficient for the volume and type of products stored and used on site for equipment re-fuelling.

The Darcy well site is located approximately 100 m to the west of a shallow wet bog (Figure 3-2). This bog area has been avoided for both technical and environmental reasons.

The Darcy drill site itself will be approximately 150 m x 150 m in size, covering an area of approximately 2.25 hectares. The drill site will be bermed to ensure that no fluids can escape from the site. The berm will be built of clay approximately three feet high surrounding the lease. No liner will be used for drill site construction. The local construction material is a mixture of pit run and clay which will be worked to compaction, and sloped slightly towards the centre to facilitate the collection of fluids within.

Photographs of an existing oil and gas exploration drilling site in the Parsons Pond area (from mid-November 2009) are provided in Figure 3-3, for illustrative purposes.

**Figure 3-3 Photographs of Existing Exploration Drilling Site in the Parsons Pond Area (Generally Illustrating the Existing Environment and Typical Site Construction)**

## 3.6 Operation

### 3.6.1 Drilling Program

The drill rig used at the site will be a modern conventional oil well drilling rig (Figure 3-4). Detailed specifications on the drill rig are provided as Appendix C. The general site layout is shown in Figure 3-5.

It is currently planned to transport the drilling rig to the site in modules. Once on site, the rig will be assembled. Typical drilling rig modules will include the drilling platform, derrick (tower), drill mud handling equipment, power generators, cementing equipment and tanks for fuel and water.

The proposed drilling program is designed to seal off the shallow ground water from the drilling fluids and any possible hydrocarbon contamination. A water well rig will set a conductor pipe to a depth of 10-30 meters (into hard, competent bedrock). The conductor casing will be cemented in place and will seal off the ground water from contact with the drilling operations.

The estimated well depth is approximately 3,000 m. The well type will be a normal pressure sweet oil well. Completion and testing will be conducted with a service rig. Details on the anticipated requirements and use of blow-out preventers (BOPs), drill muds and fluids, as well as proposed waste disposal procedures and standards to be followed are included in Appendix D. The planned pre-drilling and drilling procedures are proven methods and technologies and have been used successfully at other exploration drilling sites throughout Canada and elsewhere.

During drilling operations, crews of 10-12 will work 12 hour shifts, 24 hours per day. In addition, a senior drilling supervisor will be on site at key periods of the operation. A safety supervisor and environmental coordinator will visit the rig site every two to three days as required (more often at critical times like start up) (see Section 7.0).

No on-site accommodations will be required, as workers will travel to and from the site for each shift. Non-resident employees and contractors will be housed in existing accommodations in the local area. Trailers will be placed on site containing a lunch room and office space, but there will be no cooking facilities. Self-contained sanitary facilities will also be available on site with all sewage wastes being contained and transported off site for appropriate disposal.

Drilling operations will require fresh water for several purposes. The majority of water will be used in the makeup of the drilling fluid and for rig wash. Total water usage at the site is predicted to be in the range of 2,100 – 2,400 $m^3$ over the life of the Undertaking. A flow meter on the water line will monitor water usage.

As there are no major surface water sources in the vicinity of the Darcy drill site, water for drill rig operations and emergency purposes will be provided by one or potentially two artesian wells drilled at the site (with a capacity of approximately 40 gallons / minute) and/or by water supply trucks. Water well(s) and associated infrastructure will be established at the site by a certified drilling contractor, using standard methods and in accordance with all applicable permits. One or more water supply trucks may also be maintained at the site during operations to provide an alternative water source as required and for emergency purposes.

**Figure 3-4 Photograph of a Typical Drilling Rig (Example of an Operating Rig and Well)**

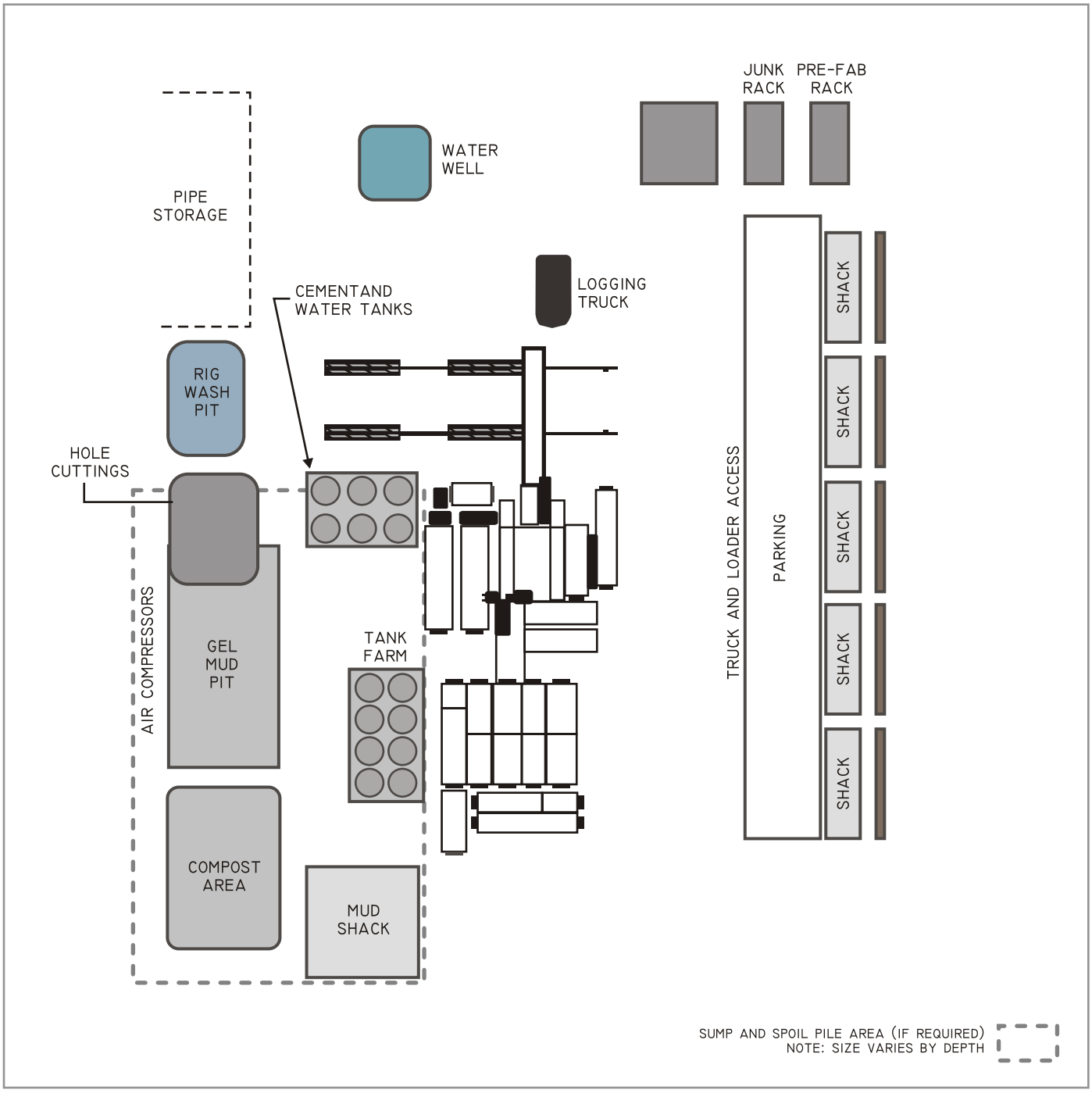



Figure 3-5

General Site Plan and Drill Rig Layout

Management of wastewater on site is addressed in the proposed Waste Management Plan provided as Appendix D.

### 3.6.2 Use and Maintenance of the Access Road

Vehicle traffic on the access road will be limited to the transportation of employees, equipment and materials to and from the well site. During site development the access road will have a locked gate and "no access" signs posted at the beginning of the road (Five Mile Road turnoff), to restrict use to authorized personnel only. During rig mobilization and drilling operations, site security officers will be in place, and only personnel and vehicles involved in the Undertaking will be allowed on the road and site during the 24 hour / day operations. Truck traffic will be radio-controlled to one vehicle at a time since the narrow width will not permit two trucks to pass. Speed limits appropriate to this size and class of access road will also be posted and adhered to.

Rig mobilization and demobilization will each require approximately 35 truck loads. At these times, a crane will also be brought to the drill site for rig assembly (i.e., for rig up and rig down). During drilling operations a crew of approximately 10-12 persons will work 12 hour shifts so that each shift will travel the road twice a day (about 20 two-way trips). A senior drilling supervisor (in addition to the two drilling supervisors) will be on site at key periods of the operation. A safety supervisor and environmental inspection supervisor will visit the rig every two to three days as required (more often at critical times like start up). Limited additional truck traffic (less than one per day) will be required to deliver supplies to the rig during drilling. These include diesel fuel, sacks of drilling fluid additives, pipe, etc. Waste disposal vehicles will be brought in as required.

### 3.6.3 Potential Emissions and Waste Materials and Their Management

The primary sources of potential atmospheric emissions from the Undertaking include:

- combustion processes such as diesel engines and generators;
- fugitive gases from fuelling and process equipment;
- airborne particulates from soil disturbance during site preparation and from vehicle traffic; and
- particulates from other burning sources, such as well clean-up.

The principal emission gases include carbon dioxide, carbon monoxide, methane, volatile organic carbons (VOCs) and nitrogen oxides. The magnitude of these emissions depends on several factors including fuel type and engine efficiency and the nature and relative amounts of any hydrocarbons encountered. Well testing is generally only conducted if there is a discovery, and if required, may involve short-term flaring (3-4 hours). Any emissions produced by exploration activities will not exceed applicable regulatory air quality standards.

On-site noise will be produced by engines, generators, ventilation systems, and other operating machinery on the rig and elsewhere on the site. As noted above, the Undertaking will utilize a modern, conventional diesel-electric drilling rig (see Figure 3-4 and detailed specifications in Appendix C), which is approximately 3 years old and therefore, is in a very good state of repair and operates efficiently and relatively quietly. Data gathered from within 1 m of the rig indicate that the average noise level is approximately 89 dBA at that point. As noise levels

dissipate rapidly with distance from the source, the noise level at the end of the lease will be well below this average, and will be less than 55 dBA (i.e., normal conversation levels) within 100 m of the drill rig.

Commercial and domestic waste generated during the construction and operations phases of the Undertaking will be collected and stored at the site, for regular transport to an existing and approved waste disposal facility. Waste materials will be reused and recycled where possible and appropriate.

The Waste Management Plan to be implemented at the Darcy Well Site is included with this EPR as Appendix D. The Waste Management Plan has been discussed with the applicable government agencies, and Nalcor Energy will continue discussions with these departments as required during planning and implementation of the Undertaking.

In addition, site-specific Safety and Health and Environmental Emergency Response Plans will also be prepared and in place prior to the commencement of the Undertaking, in accordance with Nalcor Energy's policies and procedures and the applicable government drilling regulations.

As described in Section 3.5, the site will be bermed so as to contain any contaminated effluents on site. Washing of equipment will be conducted in dedicated areas only. All water which has or has likely been exposed to hydrocarbons or other pollutants will be collected, tested, and if necessary, treated to comply with regulatory standards prior to release. Self-contained sanitary facilities will be provided on site with all sewage wastes being contained and transported off site for appropriate disposal.

Fuel and oils will be stored on site in approved storage containers. All relevant hydrocarbon storage at the site will be approved by the Government Services Centre prior to installation at the site. Fuel transfer operations will follow procedures as designed by the fuel distributor and the drilling contractor and will comply with all regulatory requirements for such activities. Personnel responsible for the transport, storage and handling of hydrocarbon products will be appropriately trained in the requirements associated with the use of these products and the response and reporting requirements of an incident prior to commencing work at the site.

A suitable supply of hydrocarbon spill response equipment and materials will be maintained at the site. In the unlikely event that fuels or oils are spilled at site, they will be recovered and transported to an approved site for disposal. Any such incidents will be reported to environmental authorities as applicable.

Drilling muds generated at the site will be managed as per the Undertaking's Waste Management Plan (Appendix D). The drilling fluids will be biodegradable and recycled within steel tanks during the drilling operation. In general, water used in the drilling muds will be separated and re-used. General mud management procedures to be followed include the following.

- all solids control equipment will be checked and monitored for maximum efficiency;
- consumption of mud will be controlled and monitored;
- sand traps will be cleaned regularly;
- the shale shaker screens used will be as fine as possible for each hole section. Shakers will not be by passed;

- any mud losses (surface and down hole) will be monitored and reported; and
- drilling detergent will be used as required for possible bit balling problems.

Drilling fluid waste will be managed in accordance with the applicable provincial government drilling regulations, as well as the rigorous standards established for the Alberta oil and gas industry (*Directive 50* of the Alberta Energy and Utilities Board). In general, the following principles will be implemented:

- reduce the volume of waste created;
- reuse, rather than discard;
- recycle waste into a useable product;
- recover waste from waste streams; and,
- responsible disposal.

After drilling, the fluids will be tested for approval for onsite disposal, or prior to transportation to an existing and approved disposal site. Process water will be recycled for use in the next drilled well section. Waste water will ultimately be tested and treated as necessary to comply with regulatory standards prior to release.

Drilling muds separated at the site and requiring disposal will be disposed of at-site through a mix, bury and cover process, or disposed of at an existing and approved waste management and/or disposal facility. Further details are provided in the Waste Management Plan (Appendix D).

The method of disposal selected and subsequently approved at site will be based on the analysis of samples collected from the drilling operations at site in accordance with the *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (2009) and *the Salt Contamination Assessment and Remediation Guidelines* (2001) (Alberta Environment, 2001; 2009).

## 3.7 Evaluation of Potential Access Alternatives (Approach, Route and Design)

As described in Section 3.1, exploration drilling is a necessary step in confirming the hydrocarbon potential of an area. The selection of the drill site is based on analysis of seismic data, geological data and, given the cost associated with any drilling program, is carefully selected to optimize the potential success of the program. The specific siting and planning of the Darcy well site has also included the consideration of potential environmental issues, through, for example, an attempt to avoid known environmentally sensitive areas and times.

With respect to potential alternative means of accessing the site, options are limited to constructing an access road or slinging materials and transporting people to the well site by helicopter. The aerial option is, however, not considered to be technically and economically viable due to the significant costs, logistical challenges and possible safety risks involved. The Undertaking requires the transportation of not only personnel and large equipment, but also a significant quantity of construction materials (e.g., fill for the drill pad) for which aerial transport would not be possible. Once operational, the drilling activity will (and must) be continuous, with constant access to the site for personnel, materials and equipment. The potential for weather and other interruptions in helicopter access to the site further contributes to this not being a feasible alternative. There

are also potential safety risks associated with not only the aerial transport of this equipment and materials to the site, but also with only having aerial access in the event of an accident or malfunction.

Similarly, a winter road is also not considered to be a viable alternative as continuous access to the site is required to support the planned exploration program in the summer of 2010.

As access to the Darcy drill site by air, water, or winter road is, for the reasons outlined above, not considered to be technically and/or economically feasible, these are not subject to further analysis and evaluation here.

As part of on-going planning and design for the proposed exploration program, alternative routes for the access road were also investigated. This included a possible straight east-west route from Highway 430 just north of Parsons Pond.

This potential alternative routing option would, however, be approximately 6.2 km in length, and require construction through significant wetland areas. In comparison, the proposed (preferred) access road route is considerably shorter (5 km) and would be established primarily on forested mineral soil that avoids wetlands and provides good construction materials in the immediate area, thereby enabling sound and environmentally acceptable road construction practices to be employed.

In terms of financial comparisons, the estimated cost to construct the proposed access road using the preferred route is approximately 5.0 km X $120,000 / km, for a total of about $600,000. The alternative route from the west would, again, require construction through several large bog and wetland areas and require numerous watercourse crossing structures be installed. The cost estimate to construct this alternative is approximately 6.2 km X $175,000 / km for a total of about $1,085,000. As a result of the potential environmental implications of these wetland and watercourse crossings, as well as the increased cost of this construction, this alternative route was not considered to be preferable or feasible. Discussions with relevant regulatory agencies also confirmed this.

In terms of the road's specific design characteristics, it will comprise an approximately 5 km long and approximately 6 m wide gravel-surface temporary access road (including ditches). It will be established and maintained to relevant standards using standard and proven construction methods, materials and equipment, as outlined above. The required width and other characteristics of the road are determined by the size, scale and type equipment and materials (including the drill rig, etc) and traffic levels that will be required to be transported over the road during the drill program. As described in Section 3.5, in combination with the standard roadbed construction approach outlined above, the use of prefabricated mats is also currently proposed for use in road segments in wet areas where feasible. In other areas, where the access road overlaps poorly drained sites, wooden matting will be laid down and used in advance of any fill materials and/or vehicles.

A further overview of potential environmental issues, and Nalcor Energy's proposed means of avoiding or reducing any such interactions, is provided in Section 5.0.

# 4.0 ENVIRONMENTAL DESCRIPTION

The Undertaking is located on the Northern Peninsula of the Island of Newfoundland, north of Parsons Pond and approximately 5-6 km inland from the coast. The closest community to the proposed well site is the Town of Parson's Pond, which is approximately 8 km to the southwest.

The following sections provide an overview description of the existing biophysical and socioeconomic environments in the general area of the proposed access road and well site. The information provided in these sections has been compiled from various existing and available sources.

The overview focuses primarily on those environmental components and potential issues that are highlighted in the EPR Guidelines, although other relevant aspects of the existing natural and human environments are also included for background and completeness.

## 4.1 Biophysical Environment

The description of the biophysical environment in the area of the proposed Undertaking is based on discussions and consultation with provincial regulatory agencies and stakeholders in the local area, as well as a review of available literature and datasets.

### 4.1.1 Ecological Setting

The proposed Undertaking occurs within the *Northern Peninsula Forest Ecoregion* as described by Meades (1990). This ecoregion includes lower elevation areas (less than 200 m above sea level) that have a flat to undulating topography. Bell et al. (1997) described this area as a broad coastal plain underlain by sedimentary rocks (carbonate platformal and pre-platformal). Soils are comparable to those of western Newfoundland, with limestone underlying most of the region (Meades 1990).

The area differs from most other forested parts of the Island of Newfoundland by the shortness of the vegetation season. The climate is characterized by cool short summers with cold long winters. The frost-free period is similar to other areas, although somewhat longer than central Newfoundland. Precipitation is lower than elsewhere in Newfoundland but because of the lower temperatures and short growing season, there is no moisture deficiency.

Balsam fir (*Abies balsamea)* is the dominant tree in the forest stands, except at high elevations on the eastern side of the peninsula, where it is replaced by black spruce (*Picea mariana)*. Limestone barrens are common along the west coast, with dwarf shrub and barrens on the east coast. Plateau bogs cover extensive areas of the coastal lowlands.

Within this larger *Northern Peninsula Forest Ecoregion*, the proposed access road and drill site are located within the *Coastal Plain Subregion*, which encompasses the western side of the Northern Peninsula to the lower slopes

of the Long Range Mountains. This area is dominated by bogs and scrub forest, adjacent to the much higher terrain of the Long Range Mountains (Meades 1990).

### 4.1.2 Vegetation

The environment to the north and south of the drill site is comprised primarily of typical boreal forest with a mix of conifer trees and low growing brush species. Trees range from potential harvestable saw logs in places to firewood and non-merchantable vegetation in other areas. The environment to the east and west of the drill site is comprised primarily of large to small wetland and bog areas where black spruce is common. These areas provide potential waterfowl breeding and nesting areas interspersed with small areas of mixed boreal forest.

As forest fires are infrequent, balsam fir is the dominant tree in the forest stands in this general area. Other forest species such as white pine (*Pinus strobes*), yellow birch (*Betula lutea*), red maple (*Acer rubrum*) trembling aspen (*Populus tremuloides*) and over 100 species of herbaceous plant found immediately to the south, do not occur in this ecoregion (Meades 1990; Bell et al. 1997). Oval-leaved bilberry (*Vaccinium ovalifolium*) is common in moist forested sites on limestone soils.

Extensive plateau bogs occur over marine deposits and dominate vegetation cover (Meades 1990) including in the vicinity of the proposed Undertaking (although the proposed access road route and drill site generally avoid these). Heath moss (*Rhacomitrium lanuginosum*) is prominent in these bogs. Scrub forest is also common.

### 4.1.3 Woodland Caribou

Woodland caribou (*Rangifer tarandus*) are native to Newfoundland and Labrador, and are part of the Boreal Population, which is subdivided into two distinct groups: *migratory forest tundra* and *sedentary forest-dwelling caribou*. Caribou in insular Newfoundland belong to the latter group (NL Wildlife Division 2009). They are distributed in approximately 13 different herds or aggregations, across the Island, of which most exhibit some degree of seasonal range overlap (Mahoney and Virgl 2003).

Unlike Labrador's woodland caribou herds, those on the Island of Newfoundland are not listed as threatened under the provincial *Endangered Species Act* or the federal *Species at Risk Act*, and woodland caribou on the Island occur at a much higher density than similar herds in Labrador (NL Wildlife Division 2009). Recent years have, however, seen a decline in caribou numbers on the Island, and in February 2008, the provincial government announced a five-year research program and management strategy for the Island's woodland herds (NLDEC 2008a).

Caribou in the vicinity of the proposed Undertaking are associated with the seasonal movements of the Gros Morne Herd (formerly referred to as the Humber River Herd (Bergerud 1971)). In September 2008 the provincial Department of Environment and Conservation announced the results of its caribou census for the northern portion of the Island of Newfoundland, which indicated a current population estimate for the Gros Morne Herd of 837 animals (NLDEC 2008b).

It has been observed that caribou tend to occur in the open high country to the east (vicinity of the Long Range Mountains) during periods of calving and post calving in the spring and summer seasons. They also occur in the

low lands between the mountain foothills west to the ocean shoreline during the fall and winter seasons when ice and snow cover in the high country may hinder foraging. Old growth (> 80 years) spruce forest and open shrub and lichen habitats tend to be particularly attractive during spring and summer, and fall and winter periods respectively (P. Saunders, pers. comm.). Strong preference for both of these habitats was also identified for woodland caribou in the vicinity of Corner Brook (i.e., immediately south of this herd) (Snow and Mahoney 1995).

Woodland caribou exhibit seasonal preferences for food in Newfoundland from broad-leaved evergreen and deciduous shrubs and sedges in spring; deciduous shrubs, reindeer lichens and fungi in summer; reindeer lichen (*Cladonia spp.)* in fall; and arboreal lichens and evergreen shrubs during winter (Bergerud 1972). Both old growth spruce forest and barrenland habitats may provide the main winter forage items: ground lichens, ericaceous shrubs and arboreal lichen; the latter habitat being used more by females (Snow and Mahoney 1995; Mahoney and Virgl 2003).

The provincial Wildlife Division has mapped core habitat for woodland caribou herds in Newfoundland using a Geographic Information System that comprised a percentage (70 percent for calving/post-calving and 50 percent for wintering) of satellite telemetry data and other locations of caribou (Morgan and Doucet 2007). The core area for the Gros Morne Herd, as determined through that analysis, is illustrated in Figure 4-1, and is used during calving/post-calving (15 May to 30 June) and wintering (1 December to end of April). These core habitat areas and periods form the basis for the current Forest Management Guidelines for Woodland Caribou on the Island of Newfoundland (Morgan and Doucet 2007).

As illustrated in Figure 4-1, the identified core area for the Gros Morne herd is located outside of the footprint of the proposed Undertaking, with its boundary occurring approximately 5 km to the southeast. The proposed Undertaking likewise does not overlap with the migration corridor used by the Gros Morne herd for seasonal movements between calving/post-calving areas and wintering grounds (as defined by Morgan and Doucet 2007), which is located considerably to the south near the southeastern boundary of Gros Morne National Park. Recent caribou research on the Island is, however, suggesting a possible change in the distribution and movement patterns of woodland caribou in this area, which is discussed further below and in Section 5.1.

Caribou throughout the Northern Peninsula and other areas of the Island of Newfoundland appear to be demonstrating shifts in their range and core areas in recent years as well as greater separation at calving. Preliminary indications from recent and on-going research on caribou in this area are suggesting that there appears to be a less of a pattern in, and distinction between, the use of different areas and habitat types by woodland caribou for specific times and activities. In particular, woodland caribou in this area of the Northern Peninsula appear to be using a much larger core area for calving and post-calving and wintering activities (J. Fenske, pers. comm.; P. Saunders, pers. comm.). Preliminary results also suggest that animals now appear to be in a somewhat healthier state (based on morphometric and fat content measurements), and are exhibiting higher survival rates compared to elsewhere on the Island (P. Saunders, pers. comm.).

An overview of the distribution, habitat use and seasonal movement patterns of woodland caribou in this area of the Northern Peninsula in relation to the proposed Undertaking is provided in Section 5.1.

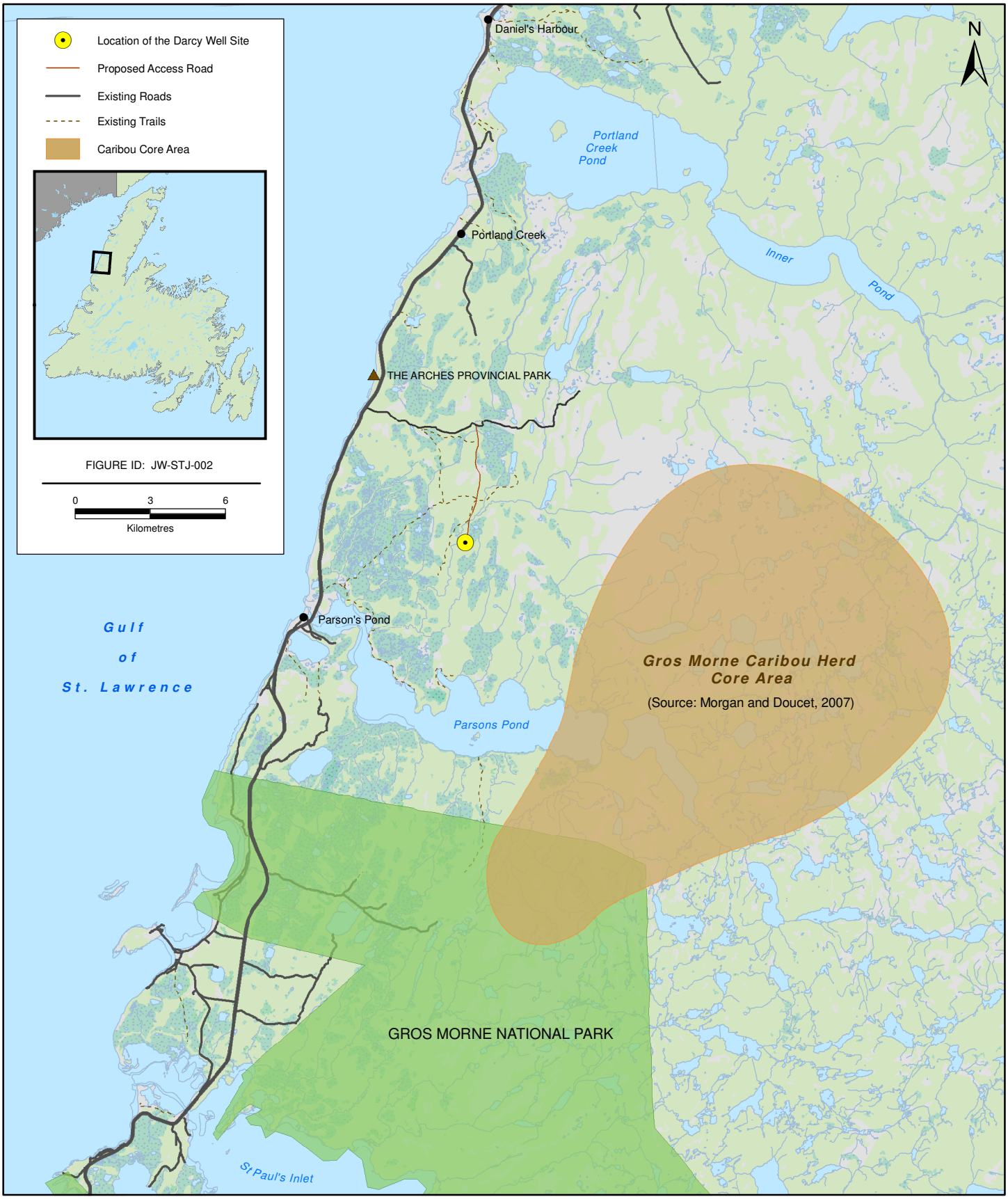



**FIGURE 4.1**

# Gros Morne Caribou Herd Core Area

### 4.1.4 Other Wildlife

Moose (*Alces alces*) are common in the vicinity of the proposed access road and drill site, given the habitat types present in this area, and particularly, as a result of the presence of the nearby National Park. Studies in Gros Morne National Park (Burzynski et al. 2005) have indicated high numbers of moose in and adjacent to the Park, and that the number of moose within the Park (estimated at 7,700 individuals) is having a negative effect on regeneration potential of vegetation. Mawhinney and Mahoney (1994) also investigated the total moose population in the management areas of the Western Newfoundland Model Forest, where an estimated 10,000 individuals occur. Densities in the Forest range from approximately 1.42-2.08 moose/km$^2$ (Mawhinney and Mahoney 1994).

Other mammals associated with the *Northern Peninsula Forest Ecoregion* include lynx (*Lynx Canadensis)*, mink (*Mustela vison)* and snowshoe hare (*Lepus americanus)* in forest and shrub habitats; black bear (*Ursus americanus)*, red fox (*Vulpes vulpes)*, and coyote (*Canis latrans)* in a variety of habitats; and beaver (*Castor Canadensis)*, muskrat (*Ondatra zibethicus)* and otter (*Lontra Canadensis)* in aquatic habitats (Meades 1990).

Surveys for waterfowl in the *Northern Peninsula Forest Ecoregion* (and *Long Range Barrens Ecoregion*) have found overall lower numbers of waterfowl in these areas compared to other Ecoregions in Newfoundland (Goudie 1987; AGRA Earth and Environmental Ltd. and Harlequin Enterprises 1999). The most frequently encountered species were American Black Duck (*Anas rubripes)*, Common Goldeneye (*Bucephala clangula)* and Common Merganser (*Mergus merganser)*, however relative abundances varied between years. The Harlequin Duck (*Histrionicus histrionicus)* is not known to breed in the vicinity of the proposed Undertaking (Thomas 2008; Gilliland et al. 2008).

Recent field surveys for passerine species as part of the environmental assessment of the proposed Labrador Island-Transmission Link indicated a total of 47 species in the *Northern Peninsula Forest Ecoregion* (Nalcor Energy, forthcoming). Passerine abundance and species richness was higher than average in the *Northern Peninsula Forest* compared to other ecoregions on the Northern Peninsula and across the Island of Newfoundland.

At least 13 species of raptor are suggested to breed or migrate through the Northern Peninsula. While Osprey (*Pandion haliaetus)* are considered the most common of these, they occur at much lower densities than observed in Labrador and none are known to nest in the vicinity of the proposed Undertaking.

### 4.1.5 Aquatic Environment

The proposed access road will cross two unnamed watercourses that flow to Parsons Pond (see Figure 3-2). Watercourse 1 will be crossed by a Bailey bridge (or equivalent structure) at a location 4 km from the start (north end) of the access road. Watercourse 2 will have a culvert installed approximately 250 m from the start of the road.

Watercourse 1 originates in the Long Range Mountains and flows through one large pond and then across the coastal plain in a generally southwestern direction. From the proposed bridge crossing location, this stream

flows through a series of large bog and wetlands for approximately eight to ten km to where it discharges into Parsons Pond. Parsons Pond River and tributaries are scheduled salmon rivers. The average gradient from the bridge location to Parsons Pond is less than two percent, with no known barriers to any fish migration. The river at the proposed bridge crossing site is approximately 15 m wide and 30 cm deep. The substrate is a mixture of boulder, cobble, rubble, bedrock and gravel pockets.

Exposed bedrock located on both banks will provide foundations for the bridge abutments, and so no work will be required in water or below the high water mark. There will therefore be no interaction between the Undertaking and this watercourse.

The nature of Watercourse 2 at the proposed culvert location has not been investigated in detail, but it drains a local wetland area and has no major headwater ponds. Based on observations during site visits to date, it appears that the watercourse at this crossing may be reduced to intermittent flows in the summer and brief "flashy" responses to rainfall events.

For the purposes of this Undertaking, however, a precautionary approach will be utilized, and Watercourse 2 will be treated as if it were fish habitat during the installation and use of the proposed culvert at this site. Standard and accepted practices will be followed for installing the culvert, as outlined in DFO's *Guidelines for Protection of Freshwater Fish Habitat* (Gosse et al. 1998). As a result, any interaction at this location will be minor, localized and short-term in nature.

## 4.2 Socioeconomic Environment

The proposed Undertaking is located in the west-central portion of the Island of Newfoundland's Northern Peninsula. The following provides an overview summary of the existing socioeconomic environment in the vicinity of the proposed Undertaking, as well as in the larger region in which it will occur.

### 4.2.1 Population and Economy

The Northern Peninsula constitutes the largest distinctive geographical region on the Island of Newfoundland (RED Ochre Regional Board Inc. 2006), and is home to approximately 18,000 residents in 70 communities. Its population has been steadily declining and aging in recent years, similar to the situation for much of rural Newfoundland and Labrador (Statistics Canada 2006). The largest community in the region is St. Anthony, which provides key services to other communities throughout the area, as do other centres such as Port au Choix, Roddickton, Rocky Harbour and others.

A highway (Route 430 – the "Viking Trail") extends from Deer Lake along the western coastline of the peninsula and north to the Straits, and across to communities on the northeast side.

The area has a longstanding linkage to the fishery. The collapse of the groundfish sector and subsequent closure of many of the fish processing plants in the area had a significant social and economic impact on the region. However, recent years have seen transition, diversification and growth as a result of the harvesting and processing of alternative species such as shellfish.

Tourism has also become a key component of the local economy, as a result of world class tourism attractions such as Gros Morne National Park, as well as various historic sites and other attractions, activities and services. Collectively, the fishery and the tourism industry, together with the forestry sector, currently comprise the principal economic drivers and opportunities within the region's economy. Other private sector enterprises and government services also employ a significant proportion of the local labour force (Great Northern Peninsula Fisheries Task Force 2006; RED Ochre Regional Board Inc. 2006; Nordic Economic Development Corporation 2008).

The Undertaking area itself falls within Regional Economic Zone 7 - the RED Ochre Regional Board Inc. – which covers the area from Trout River north to St. Barbe (Figure 4-2). There are some 36 communities in Economic Zone 7 (RED Ochre Regional Board Inc. 2006), with a combined population of 9,251 persons (Statistics Canada 2006).

The closest community to the Undertaking area is Parson's Pond, an incorporated municipality (12.63 $km^2$) with a population of approximately 387 persons and 194 dwellings in 2006 (Statistics Canada 2006). The communities of Portland Creek, Daniel's Harbour and Belburns are located to the north of the site, with Three Mile Rock, Cow Head, St. Pauls and others located to the south. These and other local communities offer a range of goods and services, with some 372 businesses currently operating in the region (RED Ochre Regional Board Inc. 2006).

Information provided through the recent Annual General Meeting and associated 2009 Chairperson's Report for the RED Ochre Regional Board Inc. indicates that this region of the province is currently experiencing the same economic trends that have been seen both nationally and internationally. The region has experienced a decrease in population from 12,390 in 1986 to 9,060 in 2009. It has also documented a nine percent decline in business activity over the two-year period from 2006 to 2008 (RED Ochre Regional Board Inc. 2009).

In response, the RED Ochre Regional Board is continuing to promote economic growth in several key target areas. These include fisheries, tourism, agrifoods, energy and oil and gas. A Business Opportunities Study has been completed for the energy and oil and gas sector, with work focusing on connecting potential stakeholders with this emerging sector.

### 4.2.2 Land and Resource Use (including Outfitters)

A range of land and resource use activities are undertaken throughout this general region, including recreational, subsistence and commercial pursuits. These include hunting, angling, forestry and firewood cutting, snowmobiling, boating, hiking and other activities at various times of the year.

Five Mile Road is suitable for vehicles in the summer and fall to access a number of cabins and for saw log and firewood removal. In winter it is used by snowmobile or all-terrain vehicles only. The only existing development in the area of the proposed access road and drill site is a cabin in the vicinity of the road (presently for sale) and a small saw mill operation to the southwest. There is an existing ATV trail along the first 1.5 km of the forested ridge where the access road is to be constructed.


**FIGURE 4.2**

# Regional Socioeconomic Context

There are also snowmobile trails over the bog and wetland areas to the west of the access road route, as well as a few old seismic trails (see Figures 3.1 and 3.2). There is, therefore, a degree of existing public access throughout this general area for both vehicular and ATV / snowmobile traffic.

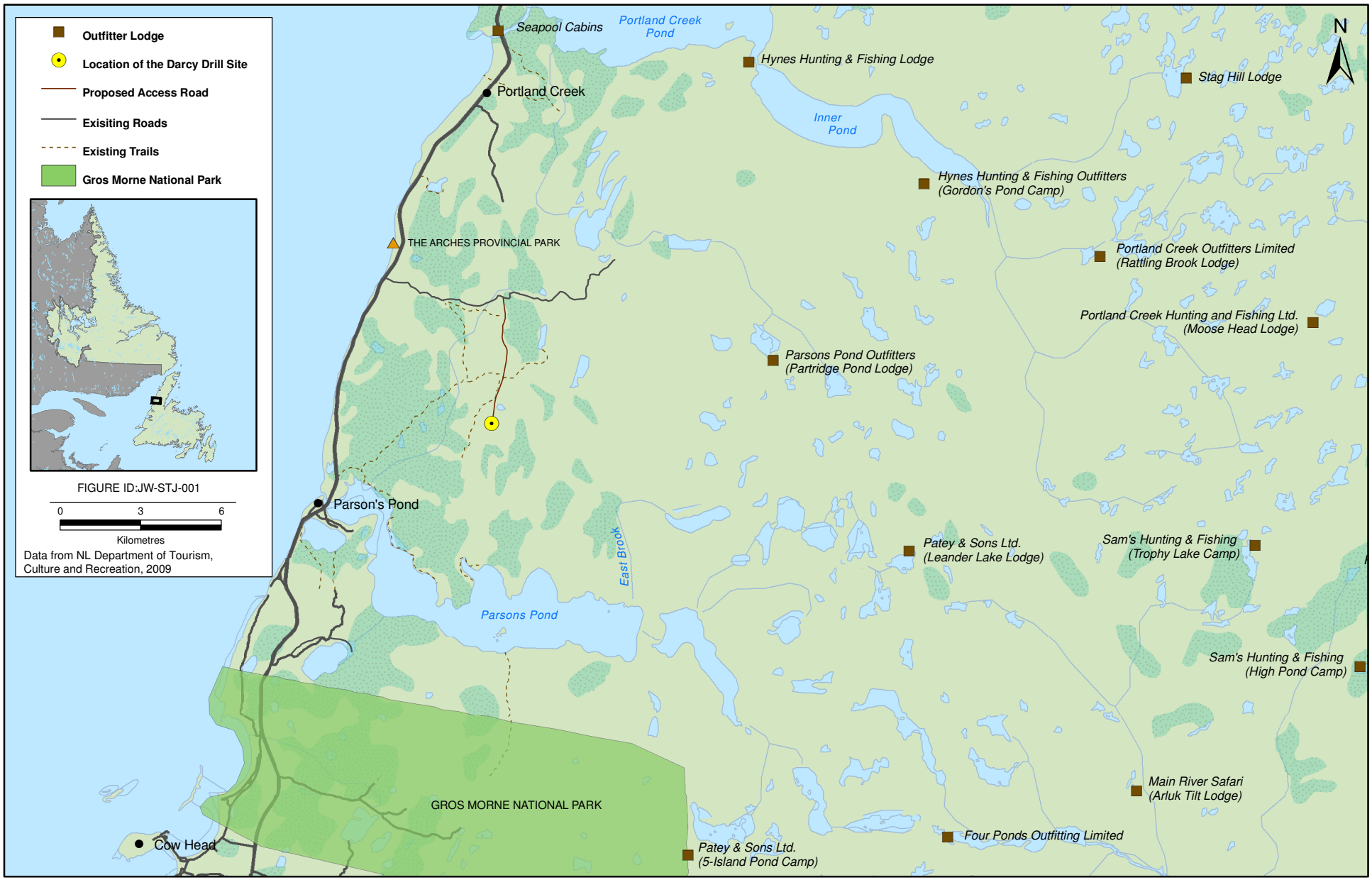
As stated above, tourism, including outfitting, is a key component of the economy of the Northern Peninsula. Outfitters refer to the owner/operator of a camp site, lodge, cabin or related facilities constructed and used solely as a base for sport fishing (angling), hunting, or other commercial recreational activities, and which are licensed under the provincial *Tourist Establishment Regulations.* Outfitting operations are typically seasonal in nature, with angling available during the summer months, and hunting services provided during the big game hunting seasons between early September and mid December. The outfitting industry has been identified by the provincial Department of Tourism, Culture and Recreation as a key focus area for making Newfoundland and Labrador a year-round tourism destination (NLDTCR 2008).

Outfitters operating in the general vicinity of the Undertaking provide lodging and guide services to visitors from across Newfoundland and Labrador, Canada, and internationally to participate in hunting of big game (moose, caribou, and black bear) and angling (NLDEC 2009).

There are currently 11 licensed outfitters with 13 lodges/camps in the general region (Table 4-1; Figure 4-3). All of these existing camps are located more than approximately 10 km away from the proposed Undertaking.

**Table 4-1 Licensed Outfitters in the General Region**

| Outfitter | Hunting | Angling | Fly-in Access |
|---|---|---|---|
| Four Ponds Outfitting Limited | Black Bear<br>Caribou<br>Moose | Trout<br>Salmon | Required |
| Hynes Hunting and Fishing Lodge | Black Bear<br>Caribou<br>Moose | Trout<br>Salmon | Not Required |
| Hynes Hunting and Fishing Outfitters (Gordon's Pond Camp) | Black Bear<br>Caribou<br>Moose | Trout<br>Salmon | Not Required |
| Main River Safari (Arluk Tilt Lodge) | Black Bear<br>Caribou<br>Moose | Trout<br>Salmon | Required |
| Parsons Pond Outfitters (Partridge Pond Lodge) | Caribou<br>Black Bear | N/A | Required |
| Patey & Sons Ltd (Leander Lake Lodge and 5-Island Pond Camp) | Black Bear<br>Caribou<br>Moose | Trout<br>Salmon | Required |
| Portland Creek Hunting and Fishing Ltd (Moose Head Lodge) | Black Bear<br>Caribou<br>Moose | Trout<br>Salmon | Not Required |
| Portland Creek Outfitters Limited (Rattling Brook Lodge) | Black Bear<br>Caribou<br>Moose | Trout<br>Salmon<br>Arctic Charr | Required |




nalcor energy

**FIGURE 4.3**

## Location of Outfitter Lodges

**Table 4-1 Licensed Outfitters in the General Region cont.**

| Outfitter | Hunting | Angling | Fly-in Access |
|---|---|---|---|
| Sam's Hunting and Fishing (High Pond Camp and Trophy Lake Camp) | Black Bear<br>Caribou<br>Moose | N/A | Required |
| Seapool Cabins | N/A | Trout<br>Salmon | Not Required |
| Stag Hill Lodge | Black Bear<br>Caribou<br>Moose | Trout<br>Salmon | Required |
| Sources: NLDTCR 2009; NLOA 2009 + Websites of Individual Outfitters where available. | | | |

Of these 13 outfitting lodges, most offer caribou hunting services. While the particular areas used by these outfitters varies, and detailed information is not publicly available, it is possible that their activities could overlap on occasion with the area of the proposed Undertaking. The hunting season for caribou typically extends from early September through to November or early December.

International Appalachian Trail - Newfoundland and Labrador (IATNL) has an extensive network of existing and planned hiking trails in this general area of the Northern Peninsula. Although the organization makes use of the existing Five Mile Road to access a number of its existing trails to the east, the proposed drill site and access road associated with this Undertaking do not overlap with either of the current or planned trails (the closest point being approximately 3 km to the west) (IATNL 2009).

### 4.2.3 Historic and Heritage Resources

The cultural history of the Island of Newfoundland is interesting and complex, and encompasses a period of up to 9,000 years. There are approximately 4,300 known archaeological sites in the province, which range in age from nearly 9,000 years ago to sites dating to the 20th century. Different parts of the Island of Newfoundland have varying degrees of historic resources potential, with a great many of the known sites located along the coast, and with other concentrations in the north-central and eastern portions of the Island including along major watercourses (PAO 2009).

This general region of the Island's Northern Peninsula has seen discoveries of various historic resources, including Palaeoeskimo, Maritime Archaic Indian, Recent Indian and European sites, almost all of which are located on the coast (PAO 2009).

The potential for historic resources in the immediate area of the proposed Undertaking is considered to be relatively low, as it is inland from the coast and because there are no major watercourses present.

Nalcor Energy will, however, implement standard precautionary and reporting procedures during the development and operational phases of the Undertaking. In the event of an accidental discovery of historic resources, all work would cease in the immediate area of the discovery until authorization is given for the resumption of the work. Any archaeological materials that are encountered will be reported to the Provincial Archaeology Office.

# 5.0 POTENTIAL PROJECT / ENVIRONMENT INTERACTIONS

The following identifies and discusses potential environmental interactions that may occur as a result of the development and operations phases of the proposed Undertaking, as well as measures that will be taken to avoid or reduce any such issues.

As directed by the EPR Guidelines, this analysis focuses primarily upon two environmental components - Woodland Caribou and Outfitters. A number of other potential environmental interactions that may be associated with the Undertaking, and Nalcor Energy's planned approach to mitigating these (such as culvert and bridge installation in or near the aquatic environment, or the possible accidental discovery of historic resources) have been discussed and addressed as part of the earlier description of the Undertaking and/or its Existing Environment (Sections 3.0 and 4.0, respectively).

## 5.1 Woodland Caribou

Nalcor Energy recognizes that there has been increased emphasis on, and concern over, the status of woodland caribou in Newfoundland and Labrador in recent years, and that this species is an important environmental consideration for any proposed development activity in the province which is located near areas where caribou are known to occur.

The proponent met with Provincial Wildlife Division personnel in early September 2009 to discuss the Undertaking, including potential issues related to caribou and associated outfitter concerns, as well as current caribou research on the Island and the available results and findings from this on-going work. In late November and early December 2009, follow-up conversations occurred with Wildlife Division personnel (i.e., Ms. Jana Fenske, Mr. Paul Saunders) to discuss the Division's current understanding of the ecology of caribou on the Northern Peninsula of Newfoundland. The information and insight received through these discussions have been incorporated into the planning of the Undertaking, and in this EPR.

### 5.1.1 Development

Development activities such as access road construction and exploration drilling have the potential to affect caribou in a number of ways, such as through the noise, human presence, clearing and ground disturbance associated with construction, as well as eventual increased harvesting made possible by improved access.

The key approach to avoiding or reducing potential interactions between the Undertaking and woodland caribou in this area stems from the nature and timing of its associated components and activities. As described earlier, the Undertaking has changed considerably since the original Registration, with the current access road being approximately one-half of its original length, and the removal of a previously proposed drilling site further south.

As also discussed previously, caribou in the vicinity of the proposed Undertaking are associated with the seasonal movements of the Gros Morne Herd, which have traditionally been observed to occur in the open higher country to the east during periods of calving and post-calving in the spring and summer seasons, and then the low lands between the mountain foothills west to the ocean shoreline during the fall and winter

seasons. The currently defined core area for the Gros Morne Caribou Herd (Figure 4-1, Morgan and Doucet 2007) does not overlap the area of planned surface disturbance and other activities that are associated with this Undertaking. Moreover, road construction is planned to commence in April to May 2010, with drilling scheduled from June to August 2010. During this spring and summer period, the caribou have traditionally tended to occur further east and away from the site of the proposed Undertaking. These activities are therefore planned to occur outside of the key time when caribou usually occur in the vicinity of the Undertaking, namely the fall and winter seasons.

However, preliminary indications from on-going caribou research in this area of the Northern Peninsula (Section 4.1.3) are suggesting that animals appear to be using a much larger core area for calving and post-calving and wintering activities, and there appears to be a less of a pattern in, and distinction between, the use of different areas and habitat types at specific times and for particular activities. Although there remains uncertainty around the reason for, and significance of, these recent findings, the suggestion that caribou may be utilizing a larger area in different ways and at different times than previously observed may have implications for the potential that they will occur in the area of the Undertaking during the spring and summer periods.

In general, however, the use of a much larger core area by the less than 840 animals that comprise the Gros Morne Herd, and their apparently less specialized locational / habitat requirements during calving and post-calving, will likely serve to further reduce the potential for any such interactions. This is particularly the case given the relatively small size of the Project area and its zone of influence – especially as compared to the overall size of the core area being used by caribou, and thus, the alternative habitat available in the area - and the short-term duration of the proposed Undertaking.

In any event, a precautionary approach will be adopted for this Undertaking in order to further avoid or reduce any potential interactions with woodland caribou and the other wildlife that may occur in the area. Standard mitigations, such as those typically associated with resource road construction in the Province (Government of Newfoundland and Labrador, ND), would help to address most issues. The following planned mitigation measures are therefore relevant:

- the access road will be as short as possible and clearing will be carried out only within the approved right-of-way to minimize the physical footprint of the Undertaking and the amount of wildlife habitat that may be disturbed;
- no clearing activity is to occur within 800 m of any active Osprey nest that may be found in the area to reduce disturbance in the event that this species is breeding there;
- in the event that pre-fabricated road matting is found to not be feasible for use in wet areas, brush will be spread on the right-of-way before fill is placed to assist with the stability of the site and later decommissioning to natural conditions;
- hunting and other harvesting activities by employees on-site will be strictly prohibited;
- although the timing and location of the Undertaking reduces the potential for interaction with caribou, especially during sensitive periods, there is a possibility of encounters with individual animals. If encountered, there will be no hunting, harassment or other disturbance by Project personnel, who will report any and all wildlife sightings to the site and/or environmental supervisor; and

- a locked gate and "no access" signs will be installed at the beginning of the access road (Five Mile Road turnoff) at the commencement of the development phase, that will limit access to authorized personnel and vehicles only.

Information on any caribou sightings during the exploration program will be maintained by Nalcor Energy, and information and updates will be provided to the Wildlife Division. This will include periodic observations during the regular ground and/or aerial reconnaissance surveys undertaken by Project personnel, including the on-site environmental monitor, throughout the course of the exploration program (development, operation and decommissioning).

Once initiated, drilling activity at the site will occur 24 hours per day until the conclusion of the program. As a result of this requirement, and given the nature, localized extent, and short-term duration of the development and operational phases of the Undertaking, further procedures in the event of a wildlife encounter - such as an operational "shut-down" which is sometimes used during projects with extensive blasting or other high disturbance activities - are not being proposed for this Undertaking. In the event that caribou or other wildlife are encountered in the general area, the above mitigation measures will be implemented and strictly adhered to.

Should the results of the on-going reconnaissance monitoring and wildlife reporting procedures described above indicate a greater than expected frequency of wildlife encounters in the area, the proponent will immediately notify and consult with the provincial Wildlife Division on this issue and possible additional means of addressing it and the potential for effects.

Given the nature and timing of the proposed Undertaking, and with the incorporation of these proposed mitigation measures, any potential interactions with caribou (or any other wildlife) are likely to be infrequent, and would be of a minor, short-term and localized nature. Any such interaction with caribou in the area is not expected to result in any measurable change to the herd's numbers, abundance, productivity, distribution or health, and no mortality is expected. Based on the past and recent use of the area by caribou and other wildlife, and the likely limited interaction of the undertaking with caribou and their sensitive habitat, any effect on woodland caribou or other wildlife will therefore not be significant.

### 5.1.2 Operation

With the completion of road construction and site development activities, no further ground disturbance would occur during drilling operations. The primary potential interaction with caribou that may be associated with operations may be a possible avoidance of the access road and drill site by caribou or other wildlife during the drilling program.

As discussed above, the proposed drilling activities at the Darcy site will occur during an estimated 70-day period during the summer of 2010.

Similar to construction, there are various general mitigation measures designed to reduce or eliminate the potential for disturbance of woodland caribou and other wildlife during such activities. These include:

- all staff will be instructed to not hunt, harass or otherwise disturb caribou or other wildlife if encountered, and to report any such sightings;
- speed limits appropriate to this size and class of access road will be posted and strictly adhered to by staff to reduce any possibility of vehicle collisions or other disturbance; and
- during rig mobilization and drilling operations, site security officers will be in place, and only personnel and vehicles involved in the Undertaking will be allowed on the road and site during the 24 hour operation. Truck traffic will be radio-controlled to one vehicle at a time since the narrow width will not permit two trucks to pass.

Based on the nature of the planned Undertaking, and with the incorporation of these mitigation measures, the potential for interactions with caribou and other wildlife is low, and any that may occur will again be minor, short-term and localized during the approximately 70-day operation phase. As a result of the low levels of anticipated use of the area by caribou during this period, and the limited interactions during operation (there will be no further alteration or loss of habitat), the operation of the Undertaking will not result in significant environmental effects on caribou or other wildlife.

## 5.2 Outfitting

There are a number of outfitting operations in this general area that provide hunting and/or angling adventures (Figure 4-3). The closest of these existing camps is approximately 10 km from the proposed access road and drill site, and most have fly-in access, so the potential for direct interaction with the proposed Undertaking is considered very low.

It is recognized, however, that the guides and hunters based at these camps may move throughout the general area while hunting. Moreover, the outfitters depend on the woodland caribou in this area for their livelihood, and are concerned about any potential for the herd to be negatively affected by this or any other proposed or future development activity in the area.

The potential for interaction between the Undertaking and woodland caribou in the region is discussed and assessed above in Section 5.1.

Construction of the proposed access road will have minimal interaction with the operations of outfitters in the region. All activities related to road construction are scheduled to take place in the spring and summer period, outside the usual caribou hunting season of early September through to November or early December. The proposed road route will not intersect with the currently defined core caribou areas and habitat, which are also likely popular areas for caribou hunting.

Operation of the proposed road and the exploration drilling program will also have minimal negative interaction with the outfitters operating in the region. Only authorized vehicles will be permitted to travel on the access road. Hunting and fishing by employees on site will be prohibited. In addition, drilling is scheduled for June through August 2010, finishing before the 2010 hunting season opens in early September.

In summary, therefore, given the relatively small area and footprint covered by the proposed access road and drill site, the overall size of the region as a whole (and thus, alternative hunting areas available), and the timing

and relatively short duration of the development and operations phases, potential interactions with outfitters are not anticipated, and therefore no significant negative effects on outfitter operations will occur.

Nalcor Energy will, however, continue to consult with and provide information to local outfitters on its planned activities, and will receive and respond to any questions raised by outfitters over the life of the Undertaking.

Further information on plans to decommission and rehabilitate the access road and well site are provided in Section 6.0.

# 6.0 REHABILITATION AND DECOMMISSIONING

Eventual decisions pertaining to potential additional exploration, delineation and/or development activities (Section 3.2) or to the demobilization and rehabilitation of the well site will be made based on the results of the drilling program. The specific nature and timing of any eventual decommissioning and rehabilitation activities pertaining to this Undertaking are therefore unknown at present. The following section, however, provides an overview discussion of several potential approaches and scenarios.

*Scenario A: Period from Completion of Planned Exploration Drilling to Review of Results and Associated Decisions*

The drilling results from the well will be evaluated in August and September 2010. During that period, the infrastructure and equipment associated with this Undertaking will likely be kept in place at the site. The drill rig and other equipment will be appropriately secured, maintained and regularly inspected. Access to the site will continue to be restricted to authorized persons only, with the gate on the access road being kept in place and locked.

*Scenario B: Unsuccessful Drilling Program - Decommissioning and Rehabilitation of the Site*

If the results of the exploration drilling program indicate that the well does not contain commercial quantities of hydrocarbons, and if further exploration activities at this location are not planned, the site will be decommissioned to a safe and stable condition.

Demobilization of the drill rig and rehabilitation of the site could be initiated as early as October 2010. The rig and associated infrastructure will be disassembled and removed from the site and wastes will be treated and/or disposed of in accordance with the waste management plan and environmental protection measures outlined previously. Open rock formations will be sealed with cement plugs to prevent upward migration of wellbore fluids. The top of the wellhead will be left in the cellar with at least two pressure barriers, capped with a steel plate and buried to a minimum of five feet below the surface. The artesian water well(s) will likewise be decommissioned in accordance with permit requirements. The drill site will be graded to even (pre-Undertaking) grades, with a view to restoring the surface location to its pre-development conditions.

Should no further exploration or development be planned at the Darcy site, the access road will also be appropriately decommissioned and rehabilitated. The installed culvert and bridge structure will be removed, and the roadbed will be re-instated to even grades.

The access road can also be cross-ditched at its start and at regular intervals along the route to prevent future unauthorized use, should that be deemed necessary and appropriate by government regulatory agencies. The drill site can also be revegetated using native plant species through hydroseeding, placement of lime, fertilizer and grass seed manually, planting of alder beds in sections along the road and drill site, or a combination of the above. If the road is required to be completely decommissioned and rehabilitated, as per the above, these revegetation activities can be extended to the roadbed as well.

Any such site rehabilitation work will be undertaken during the summer period. Specific decommissioning and rehabilitation plans will be discussed with the Newfoundland and Labrador Department of Environment and Conservation and other relevant agencies and organizations prior to being undertaken at the site.

*Scenario C: Successful Drilling Program - Further Exploration and/or Development Planned*

If the exploratory well is successful, a wellhead valve assembly will likely be installed allowing the well to be temporarily suspended until future activities are defined and planned. During this period the well and associated site infrastructure will be regularly maintained, monitored and inspected, in accordance with applicable regulations. Access to the site will continue to be restricted to authorized persons only, with the gate on the access road being kept in place and locked.

As discussed in Section 3.2, any further exploration or delineation activity or possible oil and/or gas development that may eventually result from this exploration program are outside the scope of the present Undertaking. The specific nature and characteristics of these potential activities will obviously depend on the type and quantity of any hydrocarbons found, the location, area, depth and other characteristics of the reserves, etc. These and numerous other technical and economic factors will determine the requirement for and specific characteristics of any such future exploration or development and the associated infrastructure (such as additional potential seismic work, exploration and/or delineation drilling, access roads, etc.).

In the event that the results of this planned exploration program are positive, any additional exploration and/or production activities (and their eventual decommissioning) will be planned and implemented in an environmentally acceptable manner, in accordance with relevant legislation, regulations and applicable permits and approvals.

Any such future exploration or development would therefore comprise a future and separate Undertaking, which will be presented for environmental assessment review under the provincial and/or federal processes (as applicable) by the relevant proponent(s) of those developments once they are determined and defined.

# 7.0 OCCUPATIONS

The proposed Undertaking, including the construction and maintenance of the access road and its use in the proposed exploration drilling program, will result in the creation of various employment opportunities for local residents, as well as opportunities for local and other businesses in the supply of required goods and services to the Undertaking and other possible "spin off" economic benefits during this period.

It is currently estimated that during the approximately 1-2 month access road and site construction phase, there will be an estimated 16 workers. During the water well drilling, there will be an estimated seven workers on the site. The mobilization and use of the drilling rig during the operations phase will employ an estimated 21 workers (on 12 hour shifts). A summary of the forecasted employee requirements during various aspects and phases of the Undertaking is provided in Table 7-1. The majority of the required workforce is anticipated to be sourced from the local region.

**Table 7-1 Occupations Required for the Undertaking**

| Project Phase | Number | Description | Occupational Code |
|---|---|---|---|
| Development, including Road and Site Construction | 1 | Supervisor | NOC 7217 |
| | 2 | Heavy Equipment Operators | NOC 7421 |
| | 1 | Truck Driver | NOC 7411 |
| | 10 | Brush Cutter | NOC 8422 |
| | 1 | Site Security Officer | NOC 6651 |
| | 0.5 | Site Safety Officer (part time) | NOC 2263 |
| | 0.5 | Environmental Monitor (part time) | NOC 2263 |
| Water Well Drilling Operation | 1 | Supervisor | NOC 8222 |
| | 2 | Drillers | NOC 7373 |
| | 2 | Assistants | NOC 7373 |
| | 1 | Site Security Officer | NOC 6651 |
| | 0.5 | Site Safety Officer (part time) | NOC 2263 |
| | 0.5 | Environmental Monitor (part time) | NOC 2263 |
| Drilling Rig Operation | 2 | Drilling Foreman | NOC 8222 |
| | 2 | Drilling Supervisor | NOC 8222 |
| | 2 | Mud Engineer | NOC 2145 |
| | 2 | Well Site Geologist | NOC 2113 |
| | 1 | Rig Manager | NOC 8222 |
| | 2 | Drillers | NOC 8232 |
| | 8 | Roughnecks | NOC 8412 |
| | 1 | Site Security Officer | NOC 6651 |
| | 0.5 | Site Safety Officer (part time) | NOC 2263 |
| | 0.5 | Environmental Monitor (part time) | NOC 2263 |

# 8.0 PROJECT-RELATED DOCUMENTS

Along with this Environmental Preview Report and the associated Waste Management Plan (Appendix D), the following public document has been produced in relation to the proposed Undertaking to date:

*Leprechaun Resources Ltd. Access Roads and Drill Sites for Two Exploration Wells. Registration pursuant to the NL Environmental Protection Act. 2009.*

# 9.0 SUMMARY AND CONCLUSION

Nalcor Energy and its joint venture partners are carrying out an onshore oil and gas exploration drilling program in the Parsons Pond area of the Island of Newfoundland's Northern Peninsula. Aspects of this exploration program are subject to review under the Newfoundland and Labrador environmental assessment process.

This EPR has been prepared and submitted by the proponent in relation to the proposed Parsons Pond Oil Exploration & Access Road, which comprises an approximately 5 km long access road and the development of the associated Darcy Well Site to the northeast of Parson's Pond. The purpose of this document has been to provide further information on this proposed Undertaking and its existing environment and potential environmental interactions, for review and consideration by government agencies, stakeholder groups and the interested public, and an eventual environmental assessment decision by the Minister.

Regulatory and public review of the Undertaking to date have identified Woodland Caribou and Outfitting as two key potential (and interrelated) environmental considerations, and the EPR therefore focuses primarily on these. Nalcor Energy is confident that any potential environmental issues that may be associated with the proposed Undertaking can be addressed through the use of sound construction, drilling and environmental protection procedures during the development, operations and eventual decommissioning phases, including the various measures outlined in this document.

The timing and required duration of the various activities associated with this Undertaking (access road development, drill site preparation and drilling activity - approximately 4 months) do not permit the scheduling of all planned work within the time period from approximately mid-summer (the end of caribou post-calving) to early fall (the beginning of the hunting / outfitting season). However, as discussed in the preceding sections, potential environmental interactions will be avoided or reduced as a result of the nature, short-term duration and localized extent of the proposed Undertaking, especially with consideration of the movements and relatively large ranges of the woodland caribou herd and the location and timing of outfitting operations in this area. Various other mitigations measures to avoid or reduce any potential for these and other possible environmental interactions have also been identified and proposed in this EPR. No significant adverse environmental effects are therefore anticipated.

Eventual decisions pertaining to the decommissioning of the Undertaking will be made based on the results of the drilling program. Should no further hydrocarbon exploration or production activities be planned, the drilling equipment will be demobilized, and the well site and access road will be appropriately rehabilitated, in accordance with applicable regulations and standards and the terms and conditions of the environmental assessment approval and other relevant permits.

The exploration drilling program of which the proposed Undertaking is a part has and will result in a number of direct and indirect economic benefits, including employment and business opportunities for local residents over the course of its planning, development and operational phases in 2009 and 2010. Should the exploration program be successful in locating commercially viable oil and/or gas resources in this area, it may also eventually

lead to significant additional economic activity in this area related to further exploration, and possibly, development and production. The overall objective of the proposed exploration program and its associated components and activities - including those addressed in this EPR - is therefore to help facilitate potential future economic development and growth in the local area, region and province as a whole.

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