Bay d'Espoir Unit 8

150 MW (Nominal) Hydroelectric Generating Unit

Environmental Assessment Registration

July 28, 2025

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Acronyms and Abbreviations	
ACCDC	Atlantic Canada Conservation Data Centre
AQHI	Air Quality Health Index
ASL	At Sea Level
ATV	All-terrain vehicle
BDE	Bay d'Espoir
CO	Carbon Monoxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
DFO	Department of Fisheries and Oceans
EA	Environmental Assessment
ECCC	Environment and Climate Change Canada
EERP	Environmental Emergency Response Plans
EIS	Environmental Impact Statement
EMS	Environmental Management System
EOI	Expression of Interest
EPCM	Engage Engineering, Procurement, and Construction Management
EPP	Environmental Protection Plan
EPR	Environmental Preview Report
ESA	Endangered Species Act
FEED	Front End Engineering Design
FRI	Forest Resource Inventory
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GWh	Gigawatt hour
Ha	Hectare
HTGS	Holyrood Thermal Generating station
IAA	Impact Assessment Act
IAAC	Impact Assessment Agency of Canada
IBA	Important Bird Area
in	Inch

Acronyms and Abbreviations	
ISO	International Organization for Standardization
km	Kilometer
km^2	Square kilometer
kV	Kilovolt
Lpm	Litre per minute
m	Meter
m/s	Meters per second
m^3/s	Cubic meters per second
MFN	Miawpukek First Nation
MW	Megawatt
NL	Newfoundland and Labrador
NL Hydro	Newfoundland and Labrador Hydro
NLECC	Newfoundland and Labrador Department of Environment and Climate Change
NLEPA	Newfoundland and Labrador *Environmental Protection Act*
NLESA	Newfoundland and Labrador *Endangered Species Act*
NLFFA	Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture
NOC	National Occupation Classification
NO_x/NO_2	Nitrogen Oxides
NRCAN	Natural Resources Canada
O_3	Ozone
PAO	Provincial Archaeology Office
PM_{10}	Particulate Matter 10 micrometers
$PM_{2.5}$	Particulate Matter 2.5 micrometers
PPWSA	Protected Public Water Supply Area
Resource Plan	2024 Resource Adequacy Plan
ROW	Right of Way
RPM	Rotation per minute
SAR	Species at risk
SARA	*Species at Risk Act*

Acronyms and Abbreviations	
SO_2	Sulfur Dioxide
SOCC	Species of conservation concern
the Project	Bay d'Espoir hydroelectric generating facility
TLs	Transmission Lines
VEC	Valued Environmental Component
WERAC	Wilderness and Ecological Reserves Advisory Council

1.0 Introduction

1.1 Name of Undertaking

Bay d'Espoir Unit 8 – 150 Megawatt (Nominal) Hydroelectric Generating Unit.

1.2 Proponent

Newfoundland and Labrador Hydro (NL Hydro) is the people's Crown utility – providing safe, cost-effective, reliable electricity that its customers can count on. The company has operations across the province with major power generation assets in Churchill Falls, Muskrat Falls, Bay d'Espoir and Holyrood. NL Hydro's provincial transmission system spans thousands of kilometers and includes dozens of high-voltage terminal stations and lower-voltage distribution stations. The utility provides power to people in over 200 communities across Newfoundland and Labrador, with more than 90 percent of the province's energy coming from clean hydroelectric generation.

1.3 Proponent Information

Corporate Body		
Name:	Newfoundland and Labrador Hydro	
Address:	Hydro Place, 500 Columbus Drive, St. John's NL. A1B 4K7	
Company Representative:	Scott Crosbie, Vice President Operations	
Website:	nlhydro.com	
Principal Contact(s) for Environmental Assessment		
Name:	Trent Carter	John Walsh
Title:	Environmental Specialist	Sr. Manager – Major Projects
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1.4 Project Overview

Since 1967, NL Hydro has owned and operated an electrical generation and transmission system in Newfoundland and Labrador, which includes a 604 megawatt (MW) hydroelectric generation station at Bay d'Espoir in the south-central portion of the province (Figure 1-1). The facility currently produces an average of 2,650 gigawatt hours (GWh) of energy annually, making it the largest hydroelectric plant on the island portion of Newfoundland and Labrador.

NL Hydro is proposing the construction and operation of an additional 150 MW (nominal) generating unit (herein referred to as Unit 8) at the Bay d'Espoir hydroelectric generating facility (the Project). The proposed Project is an extension to an existing facility and subject to the provincial Environmental Assessment (EA) Registration process as it will involve modifications to the existing infrastructure. The proposed Project will include the following components:

1. Generating Facility;
2. Water Conveyance System; and
3. Transmission Facilities.

The proposed generating facility will be an extension of the existing Powerhouse 2, with a 150 MW Francis turbine generator, main step-up transformer, isolated phase bus, auxiliary mechanical/electrical equipment, control and protection equipment, fire protection system, hydro-mechanical equipment, and other features. Construction of this extension will require minimal disturbance to the existing environment, as Unit 8 will be built in an existing excavation located immediately upstream of the Unit 8 Draft Tube Outlet. The area proposed for the powerhouse extension was proactively excavated as part of the construction of the original powerhouse in the late 1960's/early 1970s, as it was always part of NL Hydro's expansion plans (refer to Section 2.3 for additional project description details).

The proposed water conveyance system will consist of a new headrace channel, a new unit intake, a new buried steel penstock, widening of a segment of the tailrace, and installation of erosion protection in the tailrace channel. The new generating unit does not require the construction of any new dams or modification of any existing dams or the reservoir.

The proposed transmission facilities will consist of a new 950 m long 230 Kilovolt (kV) transmission line from the Unit 8 step-up transformer at Powerhouse 2 to the existing Terminal Station No 2, along with associated modifications to the terminal station.

Additional information on the various components and activities being proposed as part of this Project is provided in Chapter 2 – Project Description.

Figure 1-1: Overview of the Existing Bay d'Espoir Hydroelectric Generating Facility

1.5 Existing Bay d'Espoir Hydroelectric System

The headwaters of the Bay d'Espoir system begin at Victoria Lake at an elevation of approximately 320 m. Through an array of dams and canals, this water is directed to generating plants at Granite Canal, Upper Salmon, and finally, 150 km from Victoria Lake to its final tidewater destination at Bay d'Espoir. Water is collected, stored, and diverted from several drainage areas between Victoria Lake and Long Pond, which is the reservoir for the Bay d'Espoir hydroelectric generating facility.

The existing Bay d'Espoir facility consists of a series of embankment dams which impound the reservoir, a spillway and two powerhouses, as follows:

- **Powerhouse 1** has six generating units of 75 MW nominal capacity each and three individual intakes and penstocks each supplying two units through a bifurcation near the powerhouse.
    - The first four units were commissioned in 1967 (Phase 1), and the last two units were commissioned in 1970 (Phase 2).
    - A single headrace channel provides water to the three intakes and the powerhouse discharges via a 4.5 km long tailrace channel which flows into Bay d'Espoir.
- **Powerhouse 2** includes a single unit of 150 MW nominal capacity (Unit 7).
    - Water is provided by a separate headrace channel, intake, and penstock.
    - This powerhouse discharges into its own tailrace channel connecting Powerhouse 2 to the tailrace channel of Powerhouse 1.
    - This powerhouse was commissioned in 1977 (Phase 3) and was constructed with provision for the future installation of a second 150 MW unit (Unit 8).

The seven existing generating units at Bay d'Espoir utilize approximately 176 m of head to produce a rated output of 604 MW with a rated flow of 397 m^3/s.

The proposed Project that is the subject of this EA Registration includes the planned construction and operation of an additional 150 MW unit (Unit 8) at the existing Bay d'Espoir hydroelectric generating facility. Some key characteristics of the proposed Project include:

1. Unit 8 was always planned to be built, and certain infrastructure is already in place from the original Powerhouse 2 construction. This includes the bulk rock excavation and concrete infrastructure for draft tube gates leading to the existing tailrace (see Section 2.3.1).
2. No new dams will be built or modified, nor waters diverted to operate Unit 8.
3. The addition of Unit 8 provides unit flexibility, meaning other units can be off-line for planned or un-planned maintenance, meanwhile the system will still have enough generation to supply power to customers.
4. As electricity use in our province continues to grow, Unit 8 will provide more capacity to supply power during times of peak demand (e.g., cold winter days), while reducing reliance on fossil energy sources.
5. Unit 8 will provide greater grid stability through additional "spinning reserve".

6. NL Hydro has completed front end engineering design (FEED) that included constructability analysis and mitigations to reduce potential water quality and fish habitat effects during construction.
7. NL Hydro has participated in extensive engagement activities.
8. NL Hydro has conducted a hydraulic study to better understand downstream water flow in the tailrace during operations.
9. The extents of the Project are situated on the existing Bay d'Espoir Generating Facility property, which minimizes the footprint of the proposed Unit 8 project.

1.6 EA Processes and Requirements

In Newfoundland and Labrador, proposed development projects may be subject to provincial and/or federal EA processes.

The Newfoundland and Labrador *Environmental Protection Act* (NLEPA, Part X) requires anyone who plans a project that could have a significant effect on the natural, social or economic environment (an "undertaking") to present it for examination through the provincial EA process.

Under the NLEPA (definitions), an undertaking "includes an enterprise, activity, project, structure, work or proposal **and a modification**, abandonment, demolition, decommissioning, rehabilitation **and an extension** of them that may, in the opinion of the minister, have a significant environmental effect". (emphasis added).

The associated Environmental Assessment Regulations (Part 3) list those projects that require registration and review. These include, for example:

> *34(1) An undertaking that will be engaged in electric power generation and the provision of structures related to that power generation, including… (d) the construction of hydroelectric power developments with a capacity of more than one megawatt.*
>
> *34(2) An undertaking that will be engaged in the construction of new electric power transmission lines or the relocation or realignment of existing lines where a portion of a new line will be located more than 500 metres from an existing right of way…*

Other components and activities associated with the proposed Project may also be relevant for EA purposes.

For projects that are subject to the Newfoundland and Labrador EA process, project proponents are required to prepare and submit an EA Registration document describing the proposed undertaking. Following public and governmental review of the Project's EA Registration, the provincial Minister of Environment and Climate Change will determine whether the Project may proceed, subject to any terms and conditions and other applicable legislation, or whether further assessment is required – an Environmental Preview Report (EPR) and/or an Environmental Impact Statement (EIS) (Figure 1-2).

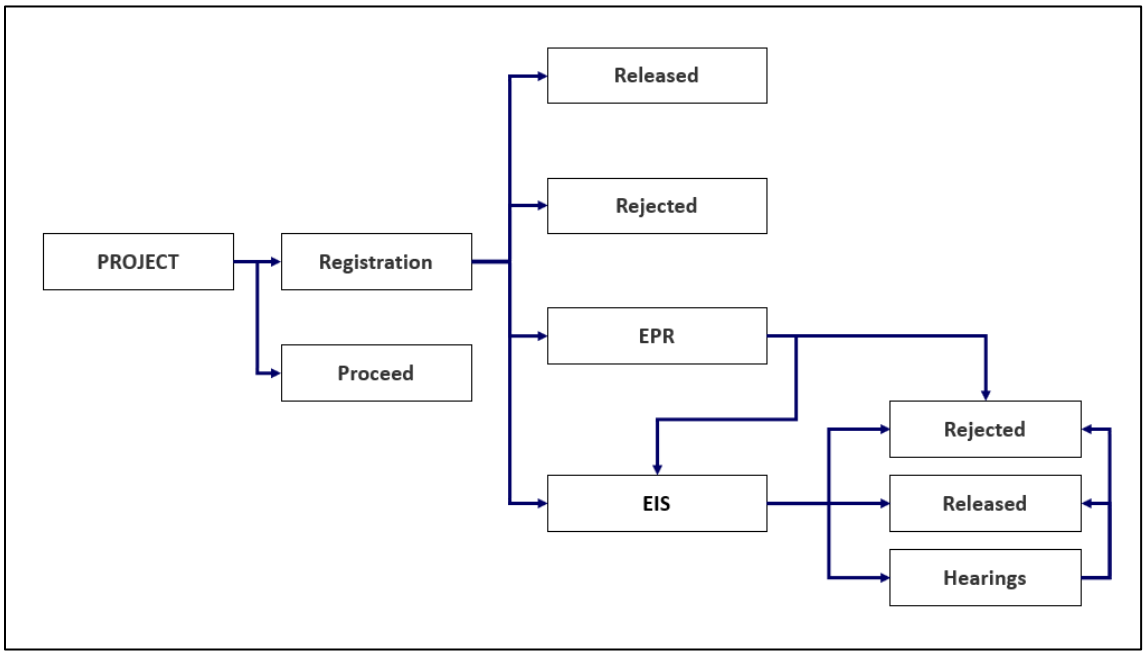

Figure 1-2: Overview of the Newfoundland and Labrador EA Process

The proposed Project is not subject to federal review under the Canadian Impact Assessment Act (IAA), as it does not include physical activities that constitute the "designated projects" that require federal impact assessment, as listed in the associated "Physical Activities Regulations". This has been confirmed by NL Hydro through discussions with the Impact Assessment Agency of Canada (IAAC), and in subsequent written correspondence from IAAC dated July 31, 2023.

In addition to review and approval under the provincial EA process, the Project may also require other provincial and federal permits, authorizations and approvals. These are identified and discussed further in **Appendix A**.

1.7 Purpose of the EA Registration

As summarized above, the proposed Project is subject to provincial EA review and approval, pursuant to the requirements of the NLEPA (Part X) and its associated Environmental Assessment Regulations, as it is an extension of an existing facility that will require some additional modifications to the surrounding, associated infrastructure.

This document is intended to initiate the provincial EA review, and in doing so it:

- Describes the proposed Project, including its overall purpose and rationale, location and layout, and alternatives, as well as its key components and planned construction and operational activities.
- Provides an overview of the existing environmental setting, including relevant aspects of the biophysical and socioeconomic environments in the Project Area and surrounding region.
- Describes several recent Project-related engagement activities undertaken by NL Hydro, as well as the main outcomes of these initiatives and where and how these have been addressed in the EA Registration.

- Identifies and assesses the potential environmental effects that may be associated with the Project, as well as NL Hydro's planned approaches for addressing these in Project planning, design and eventual implementation.

This EA Registration document has been prepared and submitted by NL Hydro, as the Proponent of the Project, with assistance from supporting environmental and/or engineering consulting firms.

2.0 Project Description

The following sections provide a description of the Project, including an overview of its various planned components and activities.

It should be reiterated that the proposed undertaking that is the subject of this EA Registration - and for which EA approval is being sought - includes only the planned installation and operation of a new 150 MW unit and associated infrastructure at the existing Bay d'Espoir Generating Facility, which has been in operation since 1967. Once the planned extension activities are completed, the existing generating infrastructure will continue to operate in the same manner as at present. The scope of the Project for EA purposes does not include the overall, continued operation of these existing and long-standing generation facilities by NL Hydro.

2.1 Project Purpose, Rationale and Need

As the primary generator and transmitter of power throughout Newfoundland and Labrador, NL Hydro plays a critical role in the province - reliably powering homes, businesses, and key industries. This Crown corporation prioritizes its responsibility for the delivery of cost-conscious electricity to customers while ensuring the maintenance and expansion of an efficient electricity system - both for today's needs and the rapidly growing electrical requirements associated with the transition to a green economy. As electricity becomes increasingly integral to daily life - including through the continued electrification of fossil fuel-based transportation, space heating, and industrial processes to assist in decarbonization - it is essential for NL Hydro to make informed, justified, and timely decisions.

Net-zero Greenhouse Gas (GHG) emission targets for the electricity sector, for the overall economy, and other policy changes to mitigate the impacts of climate change are having a transformational impact on the global electricity industry, increasing the demand for clean electricity at a speed not seen in decades. Newfoundland and Labrador is facing the same increase in demand and associated challenges, while also starting from a highly renewable grid. As the province's Crown utility and main generator of electricity, NL Hydro is legislatively required to provide safe, reliable, least-cost, and environmentally responsible electricity to customers. NL Hydro's *2024 Resource Adequacy Plan* (2024 Resource Plan[1]), which was filed with the Public Utilities Board (the Board) in July 2024, focused on both capacity and energy requirements for the Island Interconnected System. The 2024 Resource Plan is a continuation of the planning process and provides an in-depth analysis of how much electricity customers will need over the next 10 years and the best resource options to meet the growing need. The analysis highlights that, in all modelled scenarios, urgent investment in increased electrical supply is essential and justified to maintain a reliable power supply for customers. It is imperative to action new resource options now, as

[1] The information provided in this section is a summary of the more detailed information and analysis contained in NL Hydro's *2024 Resource Adequacy Plan*, which is available at https://nlhydro.com/power-the-province/

the Island Interconnected System is currently capacity-constrained, there is a need to retire aging thermal assets and there is an extensive timeframe required to construct new assets.

In the 2024 Resource Plan, the Reference Case Expansion Plan scenario (the scenario most likely to occur), determined that approximately 525 MW of new generation is required by 2034 to address the additional Island demand and to allow for the retirement of aging thermal assets, including the Holyrood Thermal Generating station (HTGS). The requirement for additional on-Island capacity is driven by a variety of factors including load growth, the retirement of aging assets and system reliability. Hydro's strategy in the 2024 Resource Adequacy Plan, with consideration of feedback from customers, recommends an expansion plan that meets reliability criteria under the Minimum Investment scenario while balancing cost and environmental considerations. **Appendix B** contains a summary of the expansion plan.

After filing its 2024 Resource Plan, NL Hydro and its experts participated in a series of technical conferences in the fall of 2024 with the Board and intervening parties, along with their experts. The parties agreed that NL Hydro analyzed an appropriate range of scenarios and sensitivities in the analysis to support NL Hydro's recommendation regarding the minimum investment required being an additional 150 MW unit at the Bay d'Espoir Generating Facility and a new 150 MW combustion turbine with renewable fuel capabilities on the Avalon Peninsula (Figure 2-1).

NL Hydro submitted its application for further review and approval of these projects to the Board on March 21, 2025. Wind does not form part of NL Hydro's application. Rather, NL Hydro will continue ongoing analysis and will proceed with an Expression of Interest (EOI) to identify potential wind developers and development opportunities later this year.

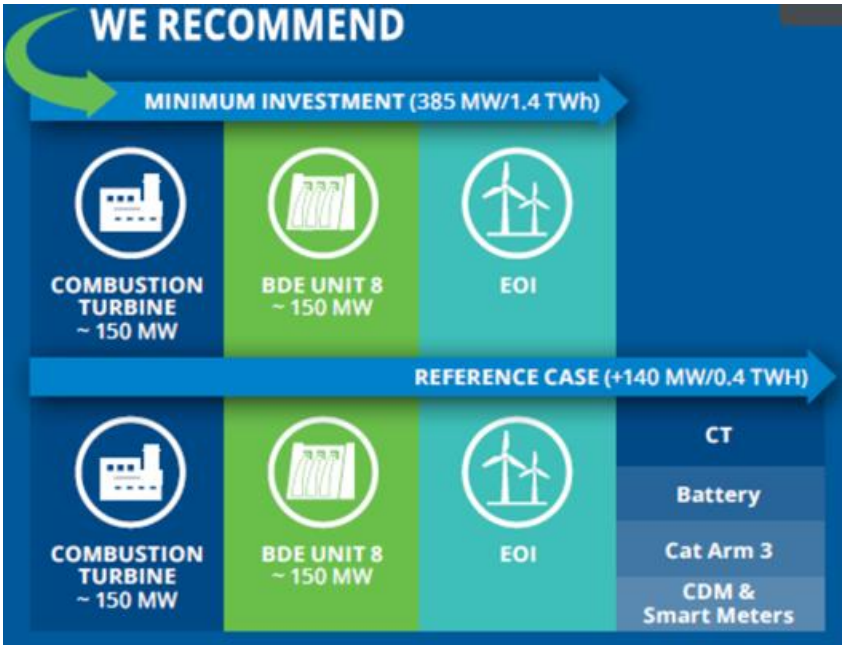

Figure 2-1: Expansion Plan Reference case and Minimum Investment Scenario

2.2 Project Planning and Alternatives

As a planning tool, EA review is intended to help inform and influence project design and in doing so, to proactively address potential environmental issues and concerns. The EA process allows for the identification, analysis, and evaluation of possible or alternative project concepts and approaches at an early stage, thereby helping to proactively incorporate environmental considerations into development planning and design. This includes identifying and considering potential alternatives to a project, as well as possible alternative means of carrying out a project that are technically and economically feasible.

The consideration of environmental issues from the earliest stages of project planning and mitigation through design is an integral part of NL Hydro's approach to its development activities and operations throughout Newfoundland and Labrador.

2.2.1 Alternatives to the Project

In the context of an EA review, "alternatives to" a project refers to functionally different ways of meeting a project's needs and purpose.

As part of its overall system planning, NL Hydro identified and evaluated several potential options for addressing the additional electricity generation requirements described above. This was based, initially, on the preferred approach of addressing these forecasted energy requirements through the development of additional clean, renewable energy for Newfoundland. This led to the analysis of the following previously identified potential hydroelectric generation sites on the Island (Figure 2-2):

1. Addition of a new unit (Unit 8) in Bay d'Espoir (150 MW) (as proposed and described herein).
2. Addition of a new unit (Unit 3) at Cat Arm (68.4 MW).
3. Island Pond Hydroelectric Development (36 MW).
4. Round Pond Hydroelectric Development (18 MW).
5. Portland Creek Development (23 MW).

Developments on the Exploits (Red Indian Falls and Badger Chute) were not included in the recommendation due to environmental and public acceptance concerns.

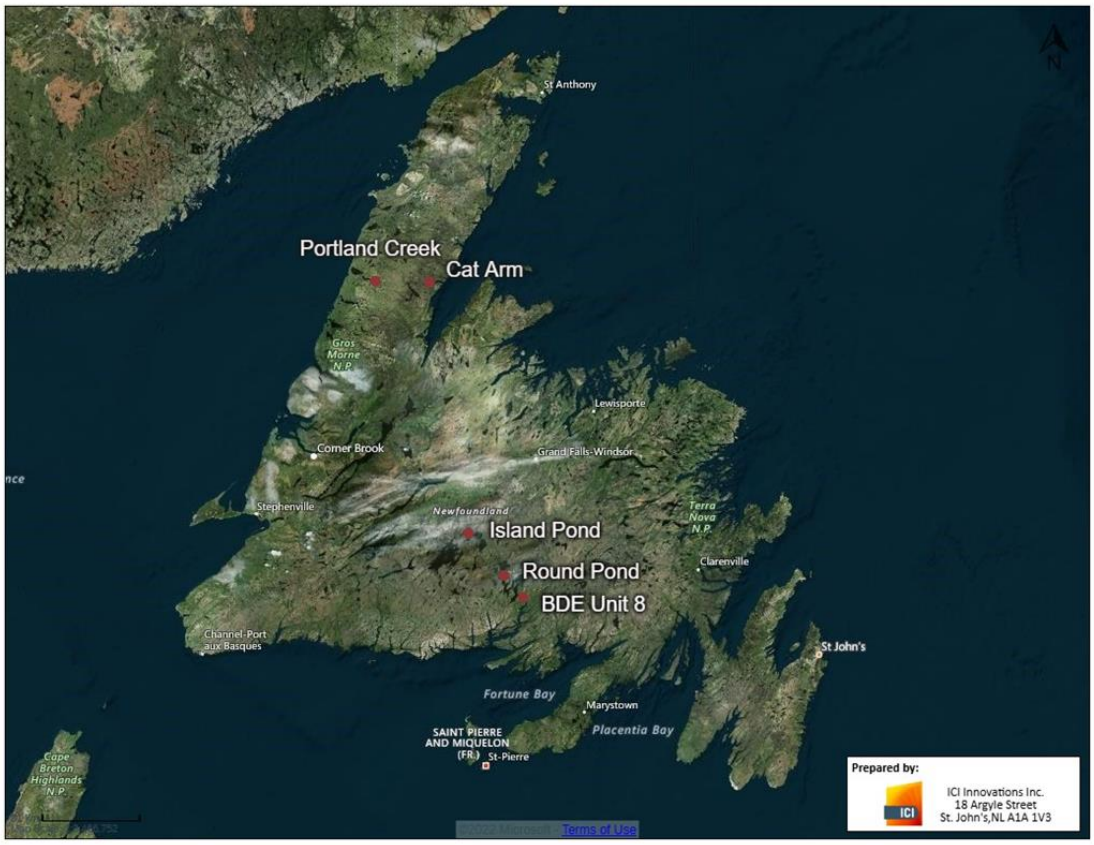

Figure 2-2: Alternative Hydroelectric Generation Sites Considered by NL Hydro

NL Hydro's evaluation of these options involved several technical, economic and environmental considerations, including development costs (both in total, and per unit of output), as well as a preference (if possible) to undertake an expansion of an existing hydroelectric facility, rather than construction and operation of a new (greenfield) facility at a currently undeveloped river system.

Based on this evaluation by NL Hydro and its engineering consultant, Bay d'Espoir Unit 8 was identified as the preferred alternative, both because it would involve the expansion of an existing, operational facility, and because it was determined to provide the lowest cost per unit (MW) of capacity. The expansion of an existing brownfield site typically involves less impact than altering a greenfield area. This alternative also uses infrastructure that was designed in anticipation of expansion in the 1970s and only requires some additional infrastructure (refer to Section 2.3 - Project Components for additional details).

As illustrated throughout this EA Registration, the proposed Project provides a technically feasible, economically viable, and environmentally and socially responsible means of addressing the identified need for and purpose of the development. The Project can and will be planned and implemented in a manner that avoids or reduces potential adverse environmental effects and optimizes local, regional, and provincial socioeconomic benefits.

2.2.2 Alternative Means of Carrying Out the Project

The provincial EA review process requires the identification and evaluation of potential alternative project concepts and approaches, to directly incorporate environmental considerations into project planning at an early stage. As part of this EA Registration NL Hydro has taken into consideration alternative means of carrying out the Project that were deemed technically and economically feasible. As part of this evaluation NL Hydro also took into consideration the potential environmental effects of any such alternative means. In doing so, it also highlights the rationale for the proposed mitigations through design options that are the focus of this EA Registration, and thus, for which EA approval is being sought. These evaluations were completed early in Project planning to allow for a focused and thorough EA review of a feasible Project. The following sections describe the preferred (and thus proposed) components of the Project.

2.2.2.1 Utilization of existing Bulk Excavation and Downstream Draft Tube Wall

A key mitigation through design for the Project includes tailoring the engineering design and construction plan for the Unit 8 extension and the downstream portion of the draft tube into the boundaries of the existing excavation work that was completed as part of the original Unit 7 facility construction. With the bulk rock excavation and downstream draft tube wall and gate guides already constructed this allows NL Hydro to minimize in stream works in the tailrace site.

2.2.2.2 Tailrace and Downstream Draft Tube Construction Timing

The Project will share a tailrace with the existing Unit 7 generating unit. Modifications to the existing tailrace to accommodate the new Project will include excavation and expansion of a segment of tailrace to accommodate the additional unit. The options for tailrace construction for the Project include completing the work while Unit 7 is operational versus non-operational. During operations high water volumes flow through the generating unit into the tailrace and then downstream.

NL Hydro can control the timing of operations and scheduled maintenance of Unit 7. Additional engineering planning work has been completed to time the construction and expansion of the tailrace for the Project to coincide with a scheduled extended maintenance period for Unit 7 when it will be non-operational. This will reduce the potential for water quality effects both locally within the tailrace and for any downstream conveyance of water from the construction site.

2.2.2.3 Headrace Channel location – Water Quality Protection

The Project requires the creation of a new headrace channel to convey water from the reservoir to the new intake structure and associated penstock for Unit 8. Two options were considered for the final optimized headrace channel route including:

1. Option 1: Expansion and bifurcation of the existing headrace channel that conveys water to Unit 7 (Figure 2-3).
2. Option 2: Excavation of a new Unit 8 headrace channel (Figure 2-4).

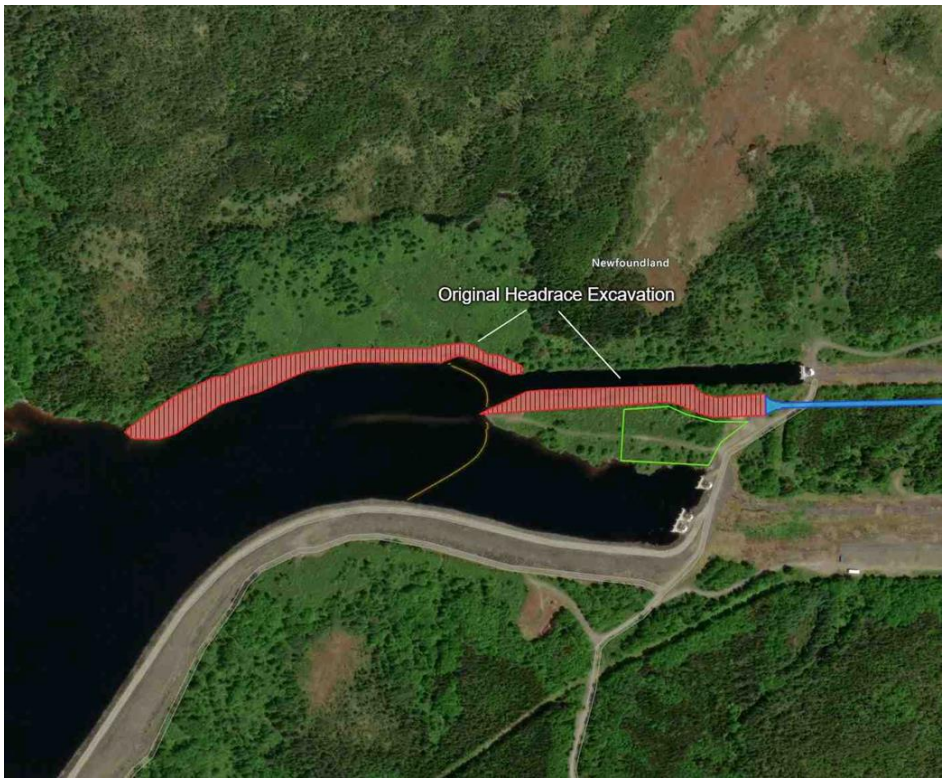

Figure 2-3: Expansion and Bifurcation of Existing Headrace Channel (Option 1)

Figure 2-4: New Headrace Channel (Option 2)

Option 2 was selected as the preferred design as it includes several features that will minimize environmental effects to water quality including:

- Large portions of excavation can be completed in the dry, thereby reducing the potential for suspended solids to be introduced into the water of the reservoir during construction.
- The existing geology will allow for a section of bedrock (temporary rock plug) to remain in place acting as a natural rock barrier while the bulk of the headrace channel is excavated, and the intake structure is constructed in the dry. Once completed, the headrace channel will be flooded, and the rock plug removed (blast and excavate) to open the headrace to the forebay.
- Working in the dry will also reduce the potential for uncontrolled release of silt laden water during construction of the channel.
- This option will minimize the duration of in water work thereby minimizing the potential for silt laden water from construction activities from entering the headrace channel of other generation units.

2.2.2.4 Minimizing Transmission Line Construction

The primary component of the Project for which the identification and evaluation of design options was possible is the proposed transmission line from Unit 8 to the existing terminal station at Bay d'Espoir. As a linear development with only its required start and end points established, a range of alternative approaches, designs and routings can typically be identified for these types of developments based on technical, economic and environmental considerations and constraints.

The initial stages of transmission line planning included the preliminary identification of various potential routings, which were screened based on overall technical and environmental factors. These included the following considerations and objectives:

- minimizing the overall length of the new transmission line to the extent possible to minimize construction impacts, such as clearing requirements.
- avoiding difficult terrain, waterbodies, and other unfavourable landscape conditions.
- consideration of any associated requirements to cross existing transmission lines in the area, and associated implications for Project design and system reliability.
- avoiding or minimizing requirements for new access for Project construction and future maintenance activities.
- attempting to avoid interactions with identified environmentally sensitive features and areas, if present and known.

This preliminary analysis and screening process resulted in two potential transmission line routings being considered: Route 1 - an Eastern Route, and Route 2 - a Western Route (Figure 2-5).

The identified Western Route was eventually selected, due to its shorter length, avoidance of water crossings, need for less transmission tower structures, and the ability to cross existing transmission lines (TLs 204, 231, 234, and a 25 kV distribution line) using existing tower designs and standards as compared to the Eastern Route. This also reduced the requirement for clearing in most areas along the route.

Figure 2-5: Transmission Line Alternatives

2.3 Project Components

The proposed Project includes the construction and operation of the following components:

- Construction of a new generation facility (adjacent to existing Unit 7):
  - Powerhouse construction (expansion of existing); and
  - Installation of new turbine and generator.
- Construction of a new water conveyance system:

  - Creation of new headrace channel;
  - New intake structure;
  - New buried steel penstock from the intake to the powerhouse; and
  - Widening a segment of the existing tailrace channel.

- Construction of new transmission facilities:

  - Installation of a new 920 m long 230kV transmission line between Unit 8 and the existing Terminal Station 2; and
  - Expansion of and modifications to the existing Terminal Station 2.

A full overview of project components is provided in Figure 2-6. Some of the main parameters of the new generating unit are as follows:

- Installed Nominal Capacity - 150 MW;
- Rated Flow - 102 m^3/s;
- Gross Head Design - 179.75 m;
- Net Design Head - 173.5 m;
- Rotating Speed - 225 rotation per minute (rpm); and
- Estimated Efficiency - 94%.

The Bay d'Espoir (BDE) Unit 8 addition is a capacity only project that will utilize the existing Long Pond Reservoir without modification. The Project will therefore not require the construction of any new dams or modifications to existing dams. This was a key feature supporting the rationale for selecting this option from the alternatives considered (Section 2.2.1).

The proposed Project Area, which encompasses the planned physical works associated with the development of the components in Figure 2-6, is approximately 1.2 km^2 in size, and within or immediately adjacent to the existing footprint of the BDE Hydroelectric Generating Facility and its Crown Lease Area (Figure 2-7). Any associated activities that may occur outside the Crown Land Lease area will be compliant with applicable provincial permits. Figure 2-8 illustrates the location of Powerhouse 2 and associated Unit 8 location.

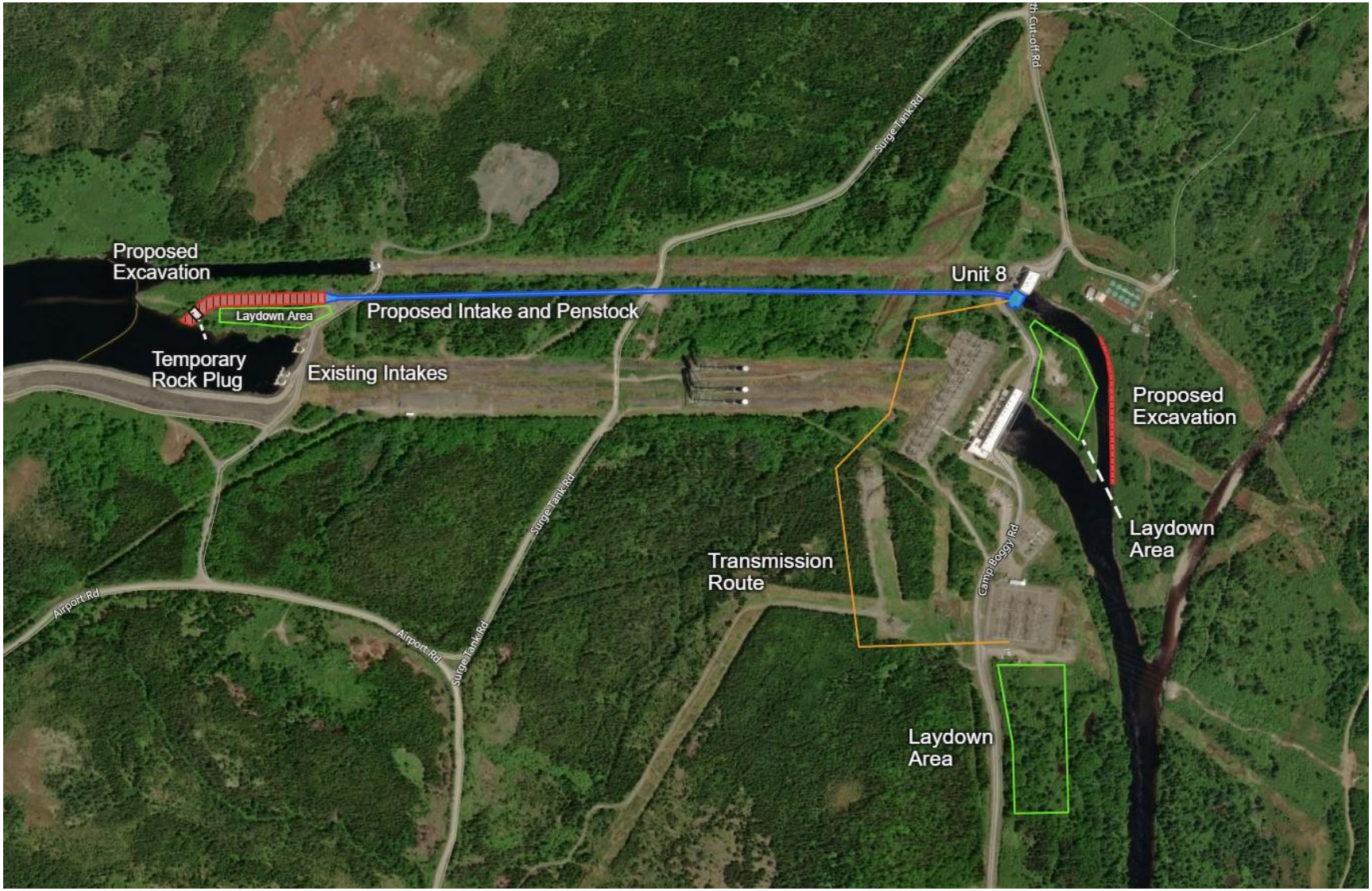

Figure 2-6: Overall Project Components

Figure 2-7: NL Hydro Bay D'Espoir Hydroelectric Generating Facility Project Area (Red) and Crown Land Lease area (Yellow)

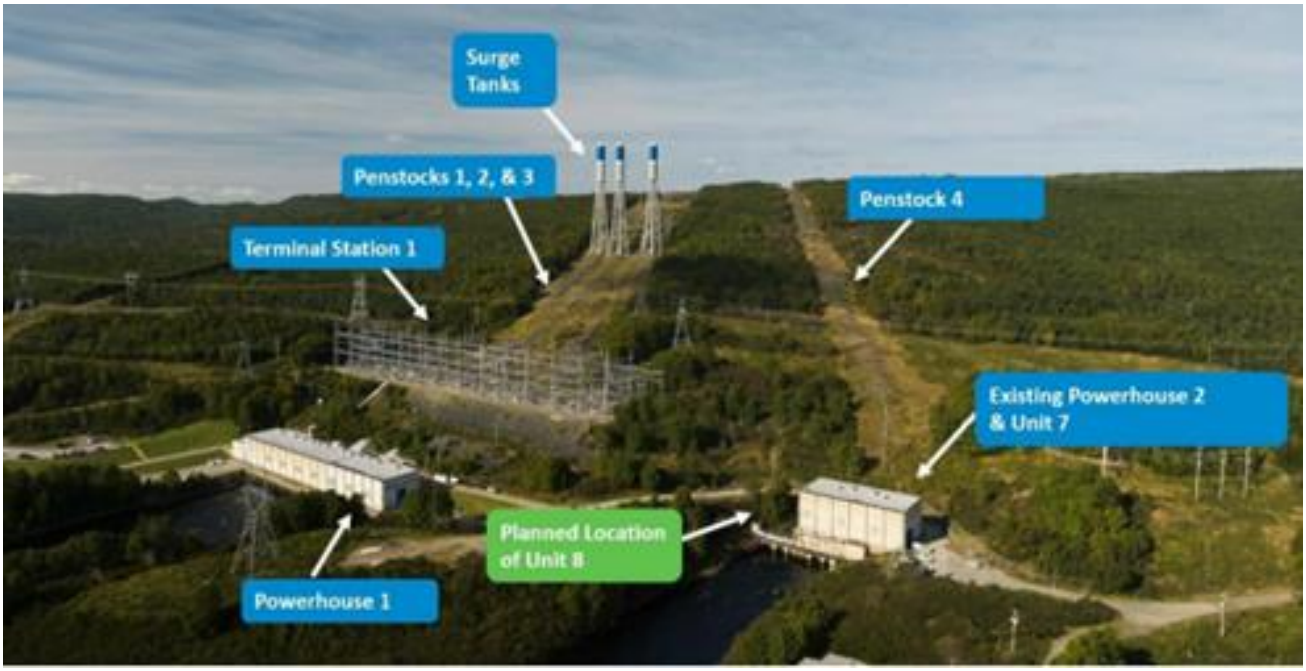

Figure 2-8: Location of Powerhouse 2 and associated Unit 8 location

2.3.1 New Generation Facility

Figure 2-9 is an original Unit 7 construction photo showing the existing Unit 7, the Tailrace Wall, and Draft Tube Outlet for Unit 8, which were constructed by NL Hydro in the 1970's and illustrates the boundaries of the proposed Unit 8 will comprise of an extension of Powerhouse 2, which will house a new 150 MW Francis Turbine Generator (Figure 2-10). Other components associated with the expansion of Powerhouse 2 will include:

- a main transformer;
- isolated phase bus;
- auxiliary mechanical/electrical equipment;
- control and protection equipment;
- fire protection system; and
- hydro-mechanical equipment.

The extension to Powerhouse 2 will be approximately 36m by 25m in size and comprised of a steel structure with concrete foundation.

The new unit will be constructed upstream of the Unit 8 draft tube outlet wall, which was constructed as a part of the original Powerhouse 2. Building services such as electricity, water and sewer services will be extended and connected to the existing powerhouse services. There will be laydown, storage, and service areas that may be needed for standard operations of the powerhouse.

Figure 2-9: Existing Tailrace and the Draft Tube Outlet (Blue) for the Proposed Unit 8 Powerhouse 2 Extension (Green) at the Bay d'Espoir Hydroelectric Generating Facility

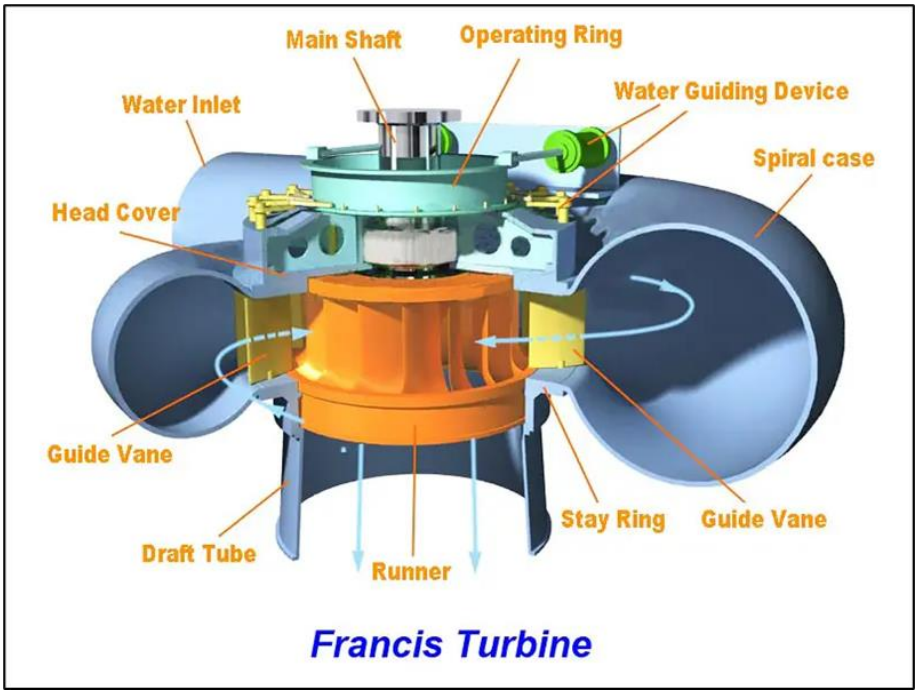

Figure 2-10: Typical Francis Turbine Generator (Source: Eternoo Machinery Co. Ltd [2022])

2.3.2 Water Conveyance System

The proposed water conveyance system will consist of a new headrace channel, a new water intake, a new buried steel penstock (Figure 2-11), and widening of a segment of the existing tailrace channel.

- The new headrace channel will be approximately 19 m wide and 240 m long.
- Constructing a new concrete intake structure at the end of the new headrace channel to control water supply to Unit 8.

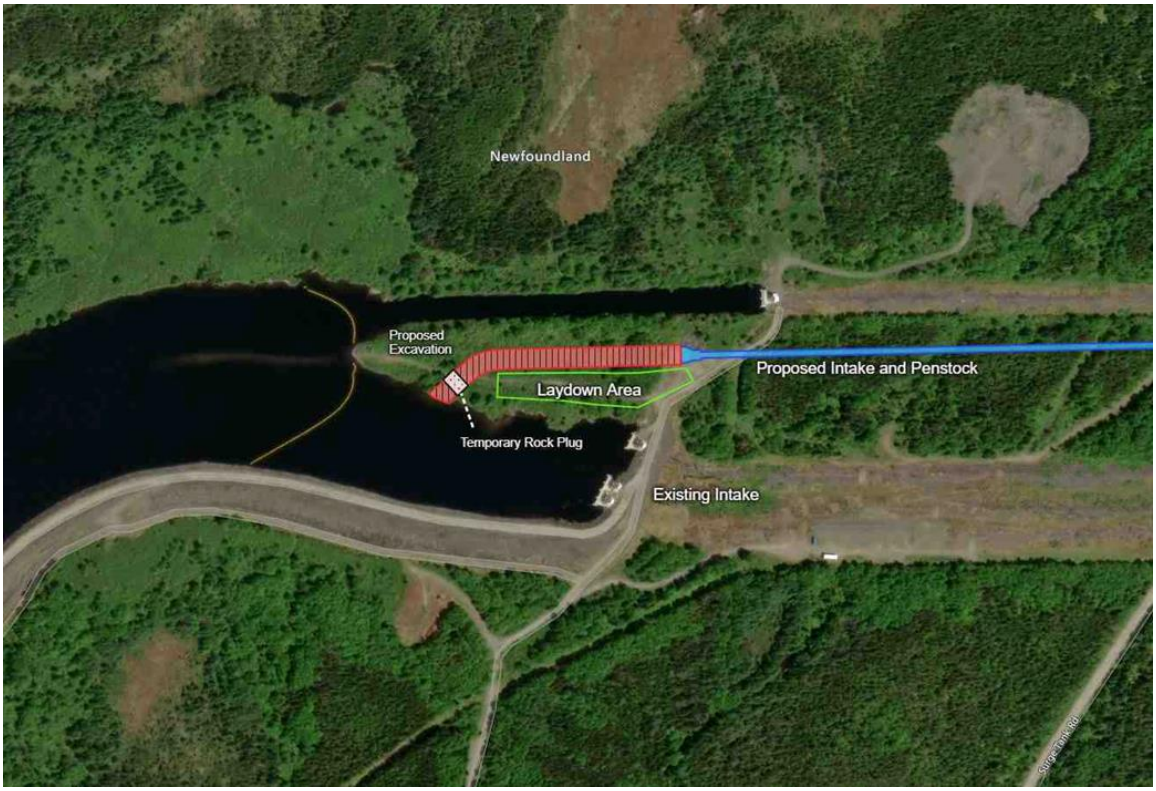

Figure 2-11: Proposed Headrace Channel (shown in red)

As part of the development of these new components, a temporary rock plug will remain upstream of the proposed intake location, to allow for the construction of the new headrace channel and intake in dry conditions. This will also help avoid disruptions to the continued operation of the existing generating units. Trash racks will be installed at the intake gate to prevent debris from entering the penstock and eventually reaching the powerhouse itself.

The new penstock will be like the Unit 7 penstock and will extend for approximately 1,020 m from the intake location to the powerhouse (Figure 2-12). It will have diameters ranging from approximately 5.18 m at the intake to 3.76 m at the powerhouse and will be designed to accommodate a flow of approximately 102 m^3/s, with internal velocities of 4.85 m/s at the intake and 9.2 m/s at the powerhouse. The expansion of the tailrace channel is planned to occur during scheduled maintenance for Unit 7 (Figure 2-13).

Figure 2-12: Proposed Penstock Route

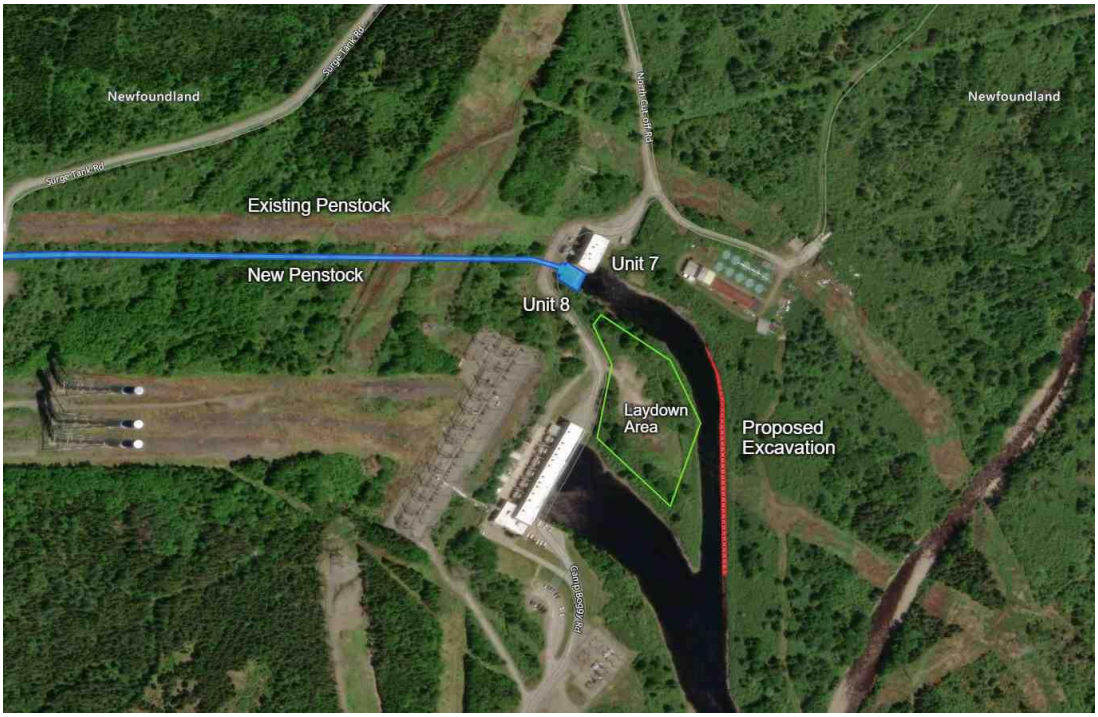

Figure 2-13: Proposed Tailrace Channel Widening (shown in red)

2.3.3 Transmission Facilities

The Project will include the development of new transmission infrastructure to transmit electricity from the new Unit 8 to the grid.

This will involve the installation of a new 920 m long, 230 kV transmission line and associated infrastructure from a step-up transformer installed at Unit 8 to the existing Terminal Station 2. Terminal Station 2 will be extended to accept the new transmission line interconnection. (Figure 2-14 and Figure 2-15).

The transmission line will be comprised primarily of wooden H-frame structures, with steel H-frame structures used in locations that require increased structural strength and height, such as at crossings over existing transmission lines. Anchors will consist of 1.5 m by 3 m treated logs buried approximately 2 m deep as per NL Hydro engineering standards. Wood poles will be treated in accordance with NL Hydro specifications. The height of the H-frame structures will range from 15.24 m to 30.48 m with an approximate conductor spacing of 6.5 m. It is estimated that 10 structures will be required with a cleared right of way (ROW) of 40 m.

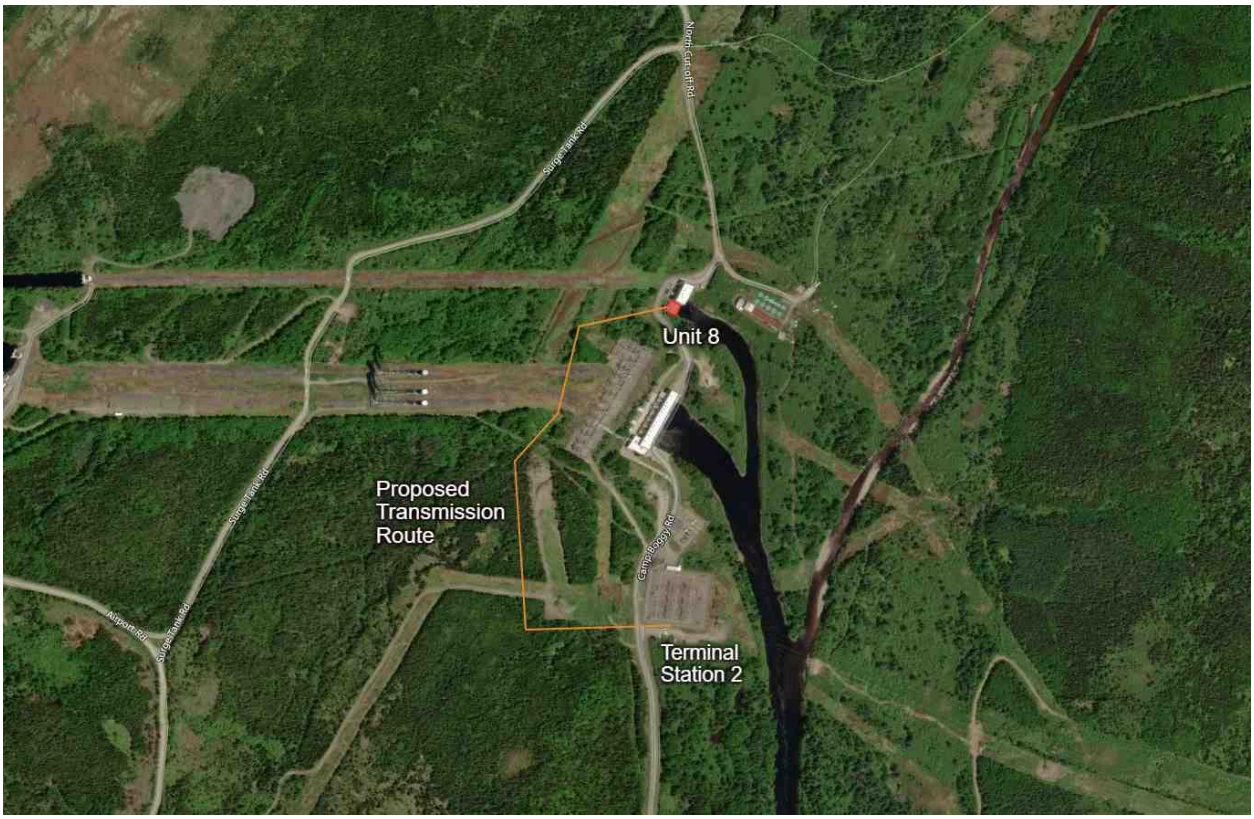

Figure 2-14: Transmission Route

Figure 2-15: Typical H-Frame Transmission Structure (Wood and Steel)

2.3.4 Other Components and Infrastructure

The Project is located adjacent to the existing hydroelectric generation facility which has been in operations for decades and is therefore already fully accessible via existing roads. It is not anticipated that new access will be required for the construction or operation of the Project, although some modifications to sections of existing access roads may be required to accommodate construction traffic.

It is not expected that additional sources of power or permanent water and sewer infrastructure will need to be put in place to accommodate the new infrastructure that comprises this Project.

A temporary batch plant has been proposed at the northern portion of the Project area, at a site that has been cleared and used previously as a laydown area during past construction activities. There would be a low amount of activity needed to prepare the site for the proposed batch plant, and a small new access road may be constructed between that area and Surge Tank Road (see Figure 2-16).

A temporary accommodations camp is being proposed for the Project, located between Intake Road and Surge Tank Road south of the existing Penstocks for Powerhouse 1 (See Figure 2-17). This camp will

serve to house temporary workers from outside the region, with an anticipated capacity of approximately 200 workers. The camp is described in further detail in section 2.4.2, and will require temporary access to electricity, wastewater disposal (septic system) and water during the construction phase of the Project. Water required for the batch plant will come from either Long Pond Reservoir or from the existing intake on Bear Brook. Water for the temporary accommodations camp will likely require a drilled well. NL Hydro recognizes that permits may be required for temporary water use and sewage disposal pursuant to NL Water Resources Act and the Environmental Control Water and Sewage Regulations and is committed to continued engagement with Water Resources Management Division during the planning and construction of the BDE Project.

2.4 Construction

A general overview of the primary activities that will be associated with the construction phase of the Project is provided in the following sections. The Project will be constructed with commonly used construction practices and in accordance with standard procedures and applicable regulatory requirements.

2.4.1 Construction Activities and Sequence

The Project schedule would see planned Project construction activities completed in various phases over an approximately 4-to-5-year period, with overall project activities occurring in a 6-to-8-year period. A preliminary project schedule is provided in Section 2.7, which discusses the major milestones provided in each year of Project.

Specific construction approaches and methodologies will be determined and proposed by the construction contractors that will be eventually retained by NL Hydro to complete this work. The following sections therefore provide an overall and conceptual overview of likely and potential construction methods, which may be subject to further refinement as Project design and planning move forward.

All construction techniques and activities will, however, be in full compliance with applicable environmental legislation, regulations and authorizations (EA and permitting) and in accordance with relevant NL Hydro policies, plans and other requirements.

2.4.2 Site Access and Preparation

Access to the Project Area will be provided by existing roads, including Camp Boggy Road which extends off Route 361. Other roads that lead to the Project site include North Cut-off Road, Surge Tank Road, Intake Road, and Airport Road. These roads provide access to all areas of the proposed Project. There may be an additional access road created between Surge Tank Road at the Northern portion of the Project Area to connect to the existing laydown area that may be used for a batch plant during construction activities.

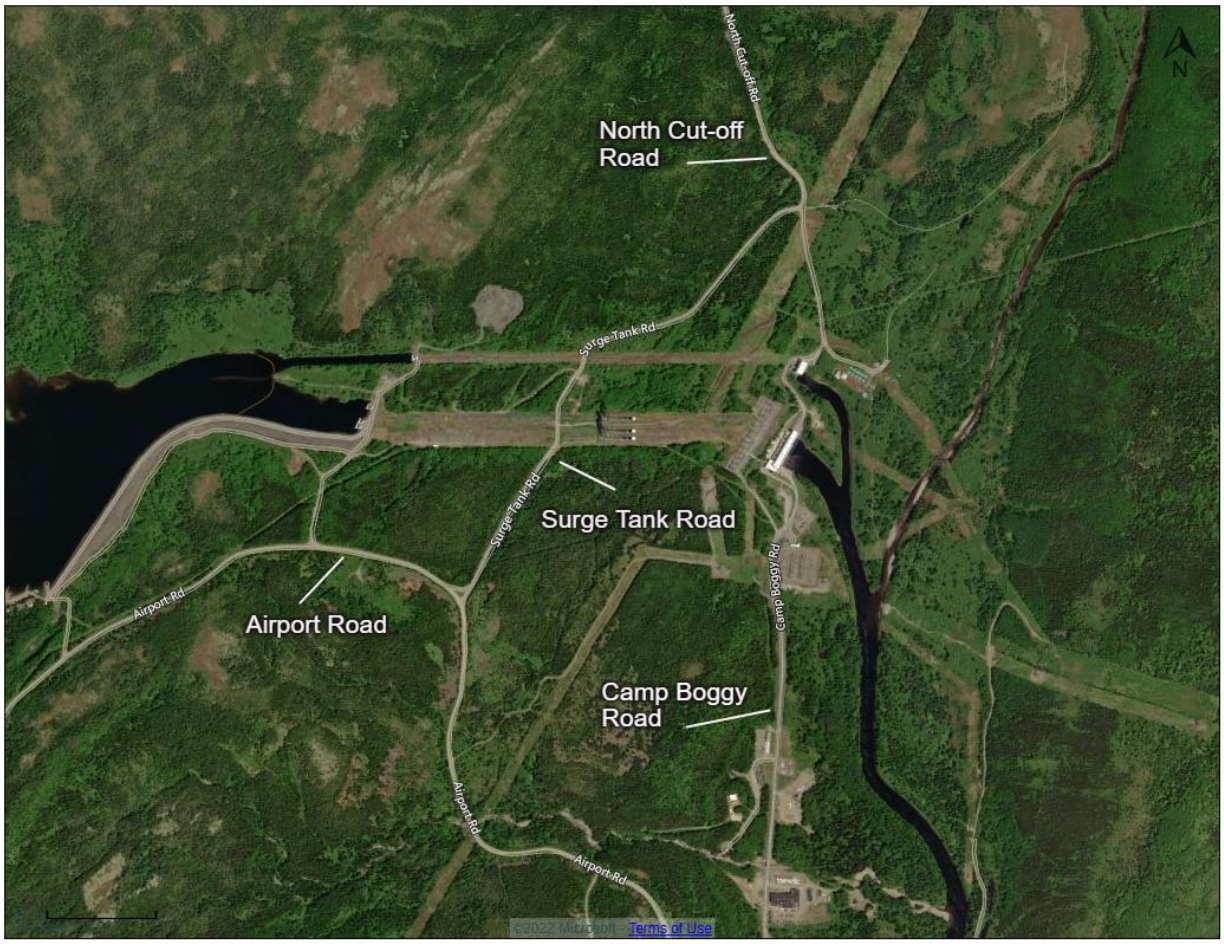

Figure 2-16: Existing Roads within the Project Area

Site preparation will initially involve delineating all areas that require clearing and other earthworks necessary for the installation of equipment and infrastructure. Vegetation clearing will only occur where necessary, with site clearing, excavation, and other site preparation activities being completed in accordance with standard practices and in compliance with required permits and approvals. Measures will be taken to avoid or reduce potential environmental interactions, including procedures for sediment and erosion control. Excavated soils will be stockpiled for reuse, and all waste materials will be stored and removed in accordance with applicable regulations and approvals. NL Hydro's Environmental Protection plan (EPP) document is provided in **Appendix C**.

One or more laydown areas will be established within the Project Area for use during the construction phase. These include potential laydown areas located adjacent to the existing headrace channel, along the proposed penstock route, and down toward the powerhouses (Figure 2-17). These would be used to store equipment as well as excavated materials and are accessible by existing roads and would not require new or enhanced access to them. There will likely need to be some clearing and placement of gravel materials at these locations to prepare them for use, but there is relatively little overburden within these areas at present as they are within the existing footprint of the Bay d'Espoir facility.

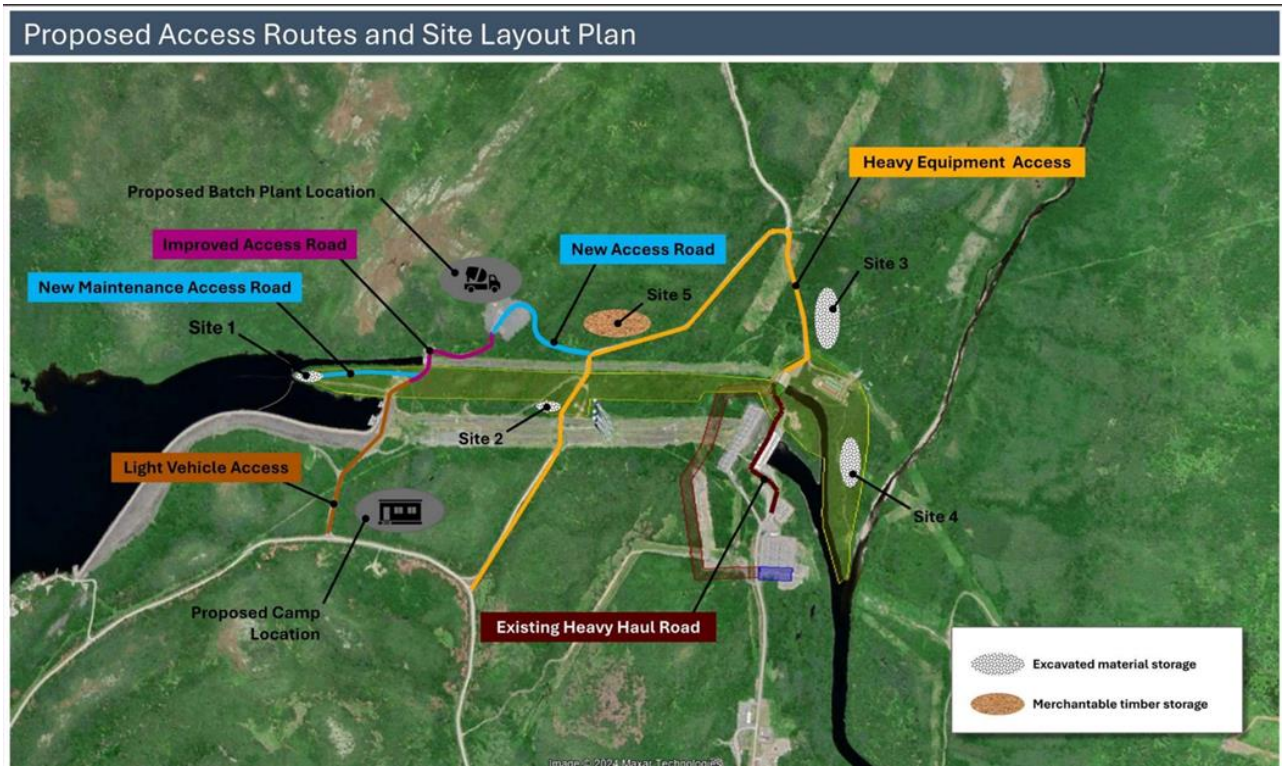

Figure 2-17: Overview of Conceptual Site Layout for Construction

As described in Section 2.4.1, the Project's construction phase will involve a workforce of approximately 200 hundred persons, which will be comprised of both residents as well as temporary construction workers from other areas of Newfoundland and Labrador and elsewhere. Non-resident workers will commute to and from the region according to their roles and work rotations and will be housed at a temporary work camp to be established on or near the Project site. The work camp will be designed to accommodate most non-resident construction personnel (up to 200 people), and will provide meals, laundry services, medical care (first aid) and other accommodations services to those housed there. Community accommodations may be utilized to house some managerial positions and during periods of especially high construction activity. The temporary camp will be in place throughout the construction phase and will likely be comprised of modular temporary building(s) installed after initial site preparation, with associated electricity, water, and sewer services provided. The camp will be constructed in compliance with all applicable permits required from the Government of Newfoundland and Labrador and NLH, alongside the contractor for the camp, will engage with the Government of Newfoundland and Labrador to identify and gain approval for these relevant permits. Once construction has been completed and the new unit is in operation, the temporary facility will be removed, and appropriate reclamation processes will be undertaken at the camp site.

2.4.3 Powerhouse Construction

The powerhouse extension will be like the existing powerhouse and will be of concrete construction below the main floor level. Above the main floor level, the building will be a steel superstructure covered by concrete precast cladding and a roof constructed on a steel deck.

Most of the bulk rock excavation for the powerhouse was completed in the 1970's during the construction of Unit-7; however, the excavation was subsequently backfilled with common fill that will have to be removed during the powerhouse construction. As a mitigation through design, the previously constructed downstream draft tube gate structure will act as a barrier so excavation works can be completed in the dry. Once concrete works have been completed, mechanical and electrical work will begin. Equipment will be brought in via heavy machinery and placed at the identified laydown area. Depending on the equipment, machinery and labour will be used to assemble and install the needed components.

Once the powerhouse has been constructed, installation of the turbine and generator will begin. This will involve the use of the existing powerhouse overhead crane. The existing crane rails which service Unit 7 will be extended into the powerhouse extension, which will allow the crane to service both units in the future. Once the turbine and generator are installed and inspected, testing and commissioning activities will occur, which will include testing all equipment within the powerhouse to confirm all are functioning correctly.

2.4.4 Excavation of Headrace and Tailrace Channels

The excavation of the headrace and tailrace channel will involve near-water earthworks operations using heavy machinery such as excavators, dump-trucks, and other large vehicles and equipment to loosen, remove, and dispose of excavated material. Blasting activities will also be required to remove bedrock within some areas of excavation for the headrace, intake and penstock. Blasting activities will be done in accordance with relevant permits and other legislated requirements. A blasting management plan will be developed and approved by relevant regulatory agencies before blasting activities commence.

During the excavation of the headrace channel, a temporary rock plug will remain between the existing channel and the location of the new headrace channel and intake structure, to facilitate dry working conditions for excavating much of the headrace channel. This rock plug would only be removed once other components have been constructed and ready to accept water.

The expansion of the tailrace channel is planned to occur during scheduled maintenance for Unit 7. This will result in the shutdown of Powerhouse 2 and the creation of a low-flow environment within the channel. Heavy machinery will work from the shoreline and riparian areas to remove rock and organic material to widen the downstream portion of the channel by approximately 9 m (Figure 2-13). This would result in the narrowest portion of the channel being widened to accommodate any increased flows in scenarios where Unit 7 and Unit 8 are operating simultaneously. Once the channel has been excavated to its desired width, riprap will be installed to protect and stabilize the excavated portion of the channel.

For all excavation activities, common mitigation measures for sediment control will be implemented. This will include the use of silt fences, turbidity curtains, and placement of riprap where necessary to reduce potential erosion or sedimentation events.

2.4.5 Penstock Construction

A new buried steel penstock will be constructed from the new intake to the powerhouse, adjacent to the existing penstock route for Unit 7 (Figure 2-12). Construction will involve excavation along the penstock route, including clearing, grubbing, and excavation.

A temporary retaining wall will be placed between the Unit 7 and Unit 8 penstocks, near where the powerhouse will be constructed, so that construction activities do not affect the functionality of Unit 7.

It is anticipated that prefabricated penstock sections will be delivered by barge to St. Joseph's Cove, then by road to Project Area. The existing Surge Tank Road crosses through the existing penstock routes and would likely be used to bring the new penstock segments to the site. Heavy machinery will then be used to lift, transport and place these sections along the penstock route, where they will then be installed and connected to form the full penstock structure leading from the intake down to the powerhouse. Once construction activities are completed for the penstock, reclamation activities would begin to provide some overgrowth over the penstock route.

2.4.6 Transmission Line

Construction activities for the transmission infrastructure will include clearing of a 40 m wide ROW along the planned transmission line route, which will be carried out in accordance with standard practices. Clearing will consist of cutting tree trunks parallel to and within 15 cm of the ground or lower and properly disposing of all standing trees, as well as the removal of all shrubs, debris and other such materials. Clearing methods will include both mechanical and manual means, with most vegetation being cleared using mechanical harvesters to remove the timber but with chainsaws being used for small scale clearings, as required. Brush and slash will be neatly piled along the right of way, with regular breaks in slash windrows to allow surface water flow and wildlife passage. Any merchantable timber that is not used for Project related reasons (such as crossing sites) will be salvaged, limbed and stacked.

As the right of way for the transmission line is cleared, the next phase of construction involves the distribution of structure materials to the selected and surveyed structure locations. Materials will be distributed to work areas by rubber-tired or tracked vehicles, as dictated by the terrain or other environmental considerations. At each structure location, the foundations and anchors will then be assembled and installed. Structure foundation and anchor installation will require the excavation of material at each of the structure locations. The structure foundations will be a combination of direct embedment, grillage and/or concrete depending on the engineering analysis and soil conditions. Rock anchors will be required in areas of bedrock. To prepare the foundations and anchors, borrow materials may be required which will be acquired from within the right of way when possible.

Once the structure foundations are in place, the components (wooden or steel) will be distributed to each structure location. The components include poles, cross-braces, knee-braces, and associated hardware. The poles will be installed first, and the other components will then be installed on the structures. As required, guy wires will be attached to the structure, anchored to the ground using direct embedment rock anchors, and tensioned to keep the structure in place. Other hardware such as insulators will then be attached to the towers in preparation for the installation of the conductor.

The next stage in transmission line construction is distribution of conductor reels to specific locations. Stringing of conductor and attaching it to the structures can be accomplished with tracked equipment.

The conductor will be rolled onto the line using travelers, which are pullies or stringing blocks used to facilitate stringing from structure to structure and attached by line crews. The conductor is then tensioned and sagged to ensure that the correct design tension is applied, and the necessary ground clearance is maintained. A tensioner holds the wire to set the sag, and the wire is then marked, cut, equipped with hardware and installed.

Once the above-described installations are completed, transmission line crews from will conduct an inspection of each structure. Structures are inspected for any deficiencies, and these are corrected as required. Upon completion of these inspections the line will be commissioned and energized.

At the end of construction activity, final clean up and restoration of the right of way and other work sites will occur. This could include grading and back-blading of any heavily disturbed areas, removal of any temporary structures, and revegetation of any erodible or unstable soils. Any infrastructure that is not required for Project operation and maintenance will be decommissioned upon completion of construction.

2.4.7 Construction Workforce

Project construction will be carried out on a contractual basis, with workers hired at the discretion of the Contractor(s) and in accordance with their own hiring practices and policies.

An initial estimate of the Project's required construction labor force, by estimated number, occupation and National Occupational Classification (NOC 2021) code) is provided in Table 2-1. All of the positions listed in Table 2-1 will be contractors, and most if not all of these will be full-time in nature.

Table 2-1: Summary of Estimated Construction Phase Employment

Occupation	NOC 2021 Code	Number (Approximate)
Project Manager	00015	1
Planning/Scheduling	14405	1
Procurement/Contracts Manager	10019	2
Construction Manager	70010	1
Site Lead Engineer	20010	1
Site Engineers (Civil/Structural)	21300	2
Site Engineers (Mechanical)	21301	2
Site Engineers (Electrical & Instrumentation)	21310	1
HS&E Manager	21120	2
Geotechnical Engineer	21331	1
Surveyor	21203	10
Site Supervisor	82020	12
Heavy Equipment Operator	73400	30
Crane Operator	72500	4
Truck Operator	73300	25
Industrial/Power System Electrician	72201/72202	20
Concrete Forming Operators	94103	10
Concrete Finisher	73100	4
Steel Erector	72010	10
Roofer	73110	4

Occupation	NOC 2021 Code	Number (Approximate)
Plumber	72300	4
Pipefitter	72012	20
Carpenter	72310	20
Ironworker	72105	5
Welder	72106	8
Electrical Power Line Worker	72203	10
Heavy Equipment Mechanic	72401	6
Painter	73112	5
Driller/Blaster	73402	2
Labourer	75110	30
Administrative Assistant	1214	*2*
Camp Manager	70012	*2*
Cook/Baker	63200/63202	*4*
Millwright	72400	*15*
Boilermaker	72103	*10*
Housekeeping	65312	*8*
Lab Technician	22101/22310	*4*
Environmental Specialist	21110	*1*
Quality Assurance	22231	*4*
Paramedic/Nurse	32102	*4*
TOTAL		**307**
Note: These numbers are based on estimate only at the time of writing. These numbers and positions are subject to change as additional construction planning begins and advances through the identified construction schedule.		

Worker shift lengths and duration/rotation arrangements will be defined at a later stage of Project planning and development and will likely vary somewhat between occupations and employers. In general, however, it is expected that most on-site construction will occur during 12-hour day shifts. Night shifts are not planned during construction, but if required will be undertaken in accordance with applicable regulation and best practice with regards to health and safety. Details on crews, shifts, and rotations have yet to be finalized, and will be part of the future engineering design phase.

Construction activity by the contractor(s) will be overseen by several NL Hydro employees, including engineering and planning (NOCs 20010, 12013, 10010) and administrative (NOC 13100) personnel.

2.5 Operation and Maintenance

Once construction is completed, the above new components of the Bay d'Espoir facility will continue be operated as per NL Hydro's current operating practices and processes. Project maintenance activities will include regular inspection and on-going repair, and maintenance of the facility as required.

Transmission line maintenance activities will include regular inspection, repair of the system as required and the management of vegetation along the right of way. Activities associated with the operation of the new transmission line will be integrated into NL Hydro's overall inspection and maintenance program for its transmission system, including the existing transmission line infrastructure associated with the Bay D'Espoir facility.

The various components that comprise this Project, and the Bay d'Espoir generation station overall, will be operated for an indeterminate time, and decommissioning is not contemplated. Should decommissioning activities eventually be considered for some or all the facility, these will be planned and conducted in accordance with the relevant standards and regulatory requirements of the day, and in consultation with relevant regulatory agencies.

2.6 Potential Accidental Events and Malfunctions

In the construction and operation of any development project, an accident or other unplanned event is an unlikely, but unfortunately possible, outcome. Some of the potential accidental events or malfunctions that may be associated with this Project, and which are relevant for EA purposes include:

- An accidental release of fuels, sediment/material, or other deleterious substances into the environment;
- A fire at the Project site, potentially extending into adjacent areas; and
- The failure or loss of structural integrity of one of more of Project components.

The resulting environmental effects of such an incident would clearly depend upon the nature, magnitude, location and timing of any such event.

To undertake this Project in a safe and environmentally responsible manner, various environmental protection and emergency response plans will be developed and implemented throughout the various phases, each of which will be adhered to and regularly reviewed and updated throughout the life of the Project. All on-site Project personnel, including NL Hydro employees, contractors and visitors, will be required to understand and adhere to the provisions of these plans.

2.7 Project Schedule and Capital Cost

Commencing in 2024 with FEED studies, the current Project schedule at the time of writing would see early works activities like utility re-routes beginning in 2026/2027 and the primary construction activities commencing in 2028. The primary construction activities will continue year-round until completion, over an estimated 4- to 5-year construction phase. Commissioning of Unit 8 and transitioning into operations is currently planned for 2031. A further breakdown of the preliminary sequence of the Project schedule is provided in Table 2-2.

Table 2-2: High-Level Project Schedule for Unit 8

Year	Associated Activities
2024	• Front-end planning and FEED completed
2025	• Environmental Assessment registration • Public Utilities Board application • Engage turbine manufacturers • Engage Engineering, Procurement, and Construction Management (EPCM) consultant • Begin early execution works • Geotechnical investigations and surveys • Begin procurement for long-lead equipment
2026	• Begin some early works activities like utility re-routes to prepare for project

Year	Associated Activities
	• Detailed execution planning • Detailed design • Procurement of long-lead items
2027	• Follow on engineering in support of procurement and construction • Turbine and generator manufacturing • Award contracts for major construction
2028	• Start of major construction • Temporary facilities (e.g., work camp, batch plant, access road work) • Headrace channel, intake, penstock, tailrace widening, powerhouse excavation
2029	• Powerhouse construction • Begin installing mechanical and electrical components • Expansion of terminal station and transmission line construction
2030	• Completion of Powerhouse construction • Complete turbine generator installation
2031	• Commissioning complete and turn over into operations phase • Project close out
Note: The following provides a high-level overview of the planned Project schedule at the time of writing. These dates and overall project schedule are subject to change due to several factors that may fall outside the control of NL Hydro or its associated contractors. Therefore, this should only be interpreted as a general reference and not a binding timeline.	

Detailed design, construction methodology, and associated environmental mitigation measures for the various proposed Project components and activities will be reflected in NL Hydro's future (post-EA) applications for the various permits, authorizations and approvals that will be required for the Project (**Appendix A**).

2.8 Environmental Management and Protection

The number and diversity of environmental challenges facing large companies, and their development projects and operations require a structured and consistent management approach. NL Hydro has chosen the ISO 14001 Environmental Management System (EMS) standard developed by the International Organization for Standardization (ISO) to manage environmental aspects. This decision has resulted in continual improvement of environmental performance, while fulfilling the corporation's mandate to provide customers with cost-effective and reliable power. Existing NL Hydro facilities have been registered by an external auditor (Intertek) as compliant with the ISO 14001 standard. This Project will be incorporated into NL Hydro's EMS.

2.8.1 Environmental Protection Planning

Environmental protection planning is an integral part of NL Hydro's construction, operations and maintenance programs. NL Hydro has considerable experience with environmental protection planning procedures. For this Project NL Hydro has expanded its Environmental Protection Plan to include recent government guidelines including the Department of Fisheries and Oceans Canada's (DFO) "Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador" issued in 2022. The full EPP for the Project is included in **Appendix C**.

An EPP is an important tool for consolidating environmental information in a format that provides sufficient detail for the implementation of environmental protection measures in the field during construction. An EPP provides concise instructions to personnel regarding protection procedures and descriptions of techniques to reduce potential environmental effects associated with any construction activity. The main objectives are to:

- Consolidate information for planning;
- Ensure that environmental standards are current and complied with;
- Provide details of corporate commitments to environmental protection and planning; and
- Provide guidelines for field activities and decision-making on environmental issues relevant to construction, operations and maintenance activities.

2.8.2 Safety, Health and Environmental Emergency Response Plan

In the construction, operation and maintenance of any development project, an accidental release or other unplanned event is an unlikely, but unfortunately possible, event. NL Hydro proactively identifies potential emergency situations and develops response procedures, including Environmental Emergency Response Plans (EERP)

The purpose of a EERP is to identify responsibilities in the event of an unplanned incident, including the accidental release of fuel or other hazardous material, on-site or during transportation, and to provide the information required for the effective response and reporting of such an incident. NL Hydro will conform to both provincial and federal legislation with the intent of meeting both its legal and corporate responsibilities.

The establishment and maintenance of emergency response procedures addresses the:

- Protection and maintenance of human health and safety;
- Identification of the potential for accidents and emergency situations;
- Planned response to accidents and emergency situations; and
- Prevention and mitigation of potential environmental effects associated with accidents and emergency situations.

During construction planning a Master Environmental Spill Response Management Plan will be prepared and implemented for the Project. The plan will address roles and responsibilities, regulatory reporting, response equipment, incident investigation, and associated training/awareness. Construction contracts will be required to develop work scope specific EERP's.

2.9 Environmental Permits and Approvals

In addition to approval under the provincial EA process, the Project will also require several other provincial and federal permits and authorizations. NL Hydro is committed to obtaining, and complying with the conditions of, these required permits and approvals during Project construction and operations and will require the same of contractors that are involved in this Project.

Some of the key environmental permits and approvals that may be required in relation to the Project include those listed in **Appendix A**.

2.10 Project Documents

In addition to this Registration Document, NL Hydro has also developed a Project-specific EPP to support the Project (**Appendix C**). Additional plans (e.g., blasting plans, etc.) will be developed and implemented as required to support the Project throughout its life cycle. Once operational, the new Unit 8 will fall under NL Hydro's existing operational policies and procedure for the Bay d'Espoir Facility.

3.0 Existing Environmental Setting

This chapter provides a description of the existing biophysical and socioeconomic environments in the vicinity of the Project, based on existing and available information sources.

3.1 Biophysical Environment

This overview of the existing environmental setting focuses on the following biophysical components:

- Atmospheric Environment;
- Geology and Topography;
- Vegetation and Soils;
- Water Resources;
- Fish and Fish Habitat;
- Wildlife;
- their Habitats; and
- Listed and Rare Species.

3.1.1 Atmospheric Environment

3.1.1.1 Regional Climate

The climate in Newfoundland varies greatly depending on the location. The southern coast of Newfoundland typically has relatively mild winters and snow cover can vary. Heavy rainfall occurs from October through December. Summer heat is moderated by low cloud cover and fog near coasts; weather is clearer and warmer further inland (Newfoundland and Labrador 2024). The Project Area itself is located within Bay D'Espoir, which is characterized by having relatively long, warm summers and cool winters with the majority of the annual precipitation occurring as rain (Table 3-1 and Figure 3-1).

The Environment and Climate Change Canada (ECCC) meteorological station at Bay d'Espoir Generation presents a thirty-year climate norm (1981-2010) (Figure 3-1). July and August are the warmest months of the year with the highest precipitation occur in the fall and winter.

Table **3-1** shows that the mean annual temperature is 4.9°C and ranges from -6.6°C (February) to 16.5°C (August).

Table 3-1: Climate Normals (1981-2010): Bay d'Espoir

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Bay d'Espoir													
Mean Temperature (°C)	-6.4	-6.6	-2.9	2.7	8.0	12.1	16.0	16.5	12.5	7.3	2.4	-2.6	4.9
Precipitation (mm)	161	145	133	108	105	112	124	103	132	149	153	146	1,569
Rainfall (mm)	92	85	88	94	103	112	124	103	132	148	137	99	1,318
Snowfall (cm)	75	69	46	14	2	0	0	0	0	1	16	52	275
Source: Environment Canada (2015)													

3.1.1.2 Regional Air Quality

The closest ECCC Air Monitoring station is located approximately 105 km to the northwest of the Project Area in Grand-Falls-Windsor. The Air Quality Health Index (AQHI) is a national program and is broken into four health risk groups: Low Risk (1-3), Moderate Risk (4-6), High Risk (7-10) and Very High Risk (10+). https://weather.gc.ca/airquality/pages/provincial_summary/nl_e.html.

The ECCC Grand Falls-Windsor Air Monitoring station also records ambient levels of Sulfur Dioxide (SO_2), Nitrogen Oxides (NO_x/NO_2), Carbon Monoxide (CO), ozone (O_3), Particulate Matter 2.5 micrometers ($PM_{2.5}$) and Particulate Matter 10 micrometers (PM_{10}) on a continuous basis. During the 2022 monitoring period (most recent available publicly available data), ozone (O_3) was shown to exceed the 8-hour air quality standard on six occasions in both April and May (2022). The airborne particulate PM10 24-hour air quality standard was exceeded once in June, and $PM_{2.5}$ 24-hour air quality standard was exceeded once in July. The air quality standard for all other pollutants were not exceed in 2022 (Newfoundland and Labrador 2023).

3.1.2 Geology and Topography

The surficial geology of the Project Area is based on regional scale compilation by Liverman and Taylor (1990). Till is the predominant surficial geological material occurring mainly as hummocky and lineated moraine deposits with local thicknesses up to 20 m. The moraine till comprises a stony, loamy sand derived from the underlying volcaniclastic rocks. Sand and gravel deposits of glacial outwash and fluvial origin also occur locally in the Project Area and are generally confined to stream and river valleys, with the most significant occurrences of these deposits present along the lower reaches of the Wood Cat Pond drainage system located northeast of the Project Area. Organic (peat and bogs) deposits and exposed bedrock outcrops occur rarely in the Project Area.

The bedrock geology of the Project Area is based on the regional 1:1,000,000 scale compilation mapping by Colman-Sadd, et al., (1990), as well as a description of bedrock geology provided in Colman-Sadd (1976). The Project Area lies within the Dunnage tectonostratigraphic zone and is underlain by Lower to Middle Ordovician interbedded marine mudstones and siltstones belonging to the St. Joseph's Cove Formation (Bay d'Espoir Group). These rocks have undergone two major periods of deformation and are

complexly folded with a southwest-trending penetrative cleavage sub-parallel to bedding and are metamorphosed to the amphibolite facies.

The Project Area is located within the physiographic region referred to as the South Coast Highlands and is situated in an area of relatively higher elevation along the south coast of Newfoundland. Locally, the Project Area is located within a sheltered, low-lying valley and is surrounded by upland regions to the east, west and south. Topography in the vicinity of the Project Area slopes towards Long Pond Reservoir and the Head of Bay d'Espoir. The highest elevation at sea level (ASL) is 183 m near the headrace, intake, and penstock, and the lowest elevation is approximately 7 m (ASL) near the powerhouse.

3.1.3 Vegetation & Soils

3.1.3.1 Vegetation Communities

Publicly available data from the Newfoundland and Labrador Department of Fisheries Forestry and Agriculture's (NLFFA) Forest Resource Inventory (FRI), historical aerial photography, Natural Resources Canada's (NRCAN) 1:50,000 topographic mapping, and the Newfoundland and Labrador ecoregion assessment were used to characterize the vegetation and soils of the Project Area. Field surveys were not conducted as part of this assessment.

The Project Area is located within the Central Barrens Subregion of the Maritime Barrens Ecoregion. This area is characterized as barren dominated by dwarf shrub heaths and small pockets of stunted balsam fir (*Abies balsamea*). Balsam fir dominates the forests with black spruce (*Picea mariana*) being considered common. The forest floors are dominated by mosses. Rhodora (*Rhododendron canadense*) is another common species within the Central Barrens Subregion, as well as sheep laurel (*Kalmia angustifolia*), low-bush blueberry (*Vaccinium angustifolium*), dogberry *(Sorbus americana*), and mountain holly *(Ilex mucronata*) (https://www.gov.nl.ca/ecc/files/natural-areas-pdf-island-6d-central-barrens.pdf).

The FRI database was reviewed to identify and characterize forest stands within and immediately adjacent to the Project Area. The Project Area is primarily balsam fir dominant forests and shrublands. There are areas of coniferous scrub communities located between the existing penstocks, alongside stocked balsam fir forests and non-stocked forests. In the northern part of the Project Area, commercial non-stocked forests are present, with a stocked balsam fir forest extending beyond the property line. The FRI database also identifies areas of stocked and non-stocked forests, dominated by balsam fir, black spruce, and white birch surrounding the Project Area.

The NRCan 1:50 000 topographic mapping and FRI database were reviewed to identify the presence of mapped wetlands within and immediately adjacent to the Project Area. Review of the FRI and NRCan databases indicates that there are no mapped wetlands within the Project Area. Beyond the property limits, the nearest wetland is located approximately 30 meters directly north of the property and is mapped as having an area of 10.7 ha. Numerous other wetlands, including bogs, wet bogs, and treed bogs, are situated around the property. It is important to note FRI and NRCan data is limited by lack of field verification, which may affect the accuracy of the information.

3.1.3.2 Rare Plants

A desktop Species at Risk (SAR) study was completed as part of the vegetation assessment. The Atlantic Canada Conservation Data Centre (ACCDC) data highlighted two SAR/Species of Conservation Concern (SOCC) plant records within the Project Area, lake quillwort (*Isoetes lacustris*) and grass-leaved arrowhead (*Sagittaria graminea*) (Table 3-2). This species is listed under the NL *Endangered Species Act* (ESA; 2001) as Vulnerable.

Table 3-2: ACCDC SAR Identified within 5 km of the PROJECT AREA

Common Name	Scientific Name	SARA	NL ESA	Potential to occur
Lake Quillwort	*Isoetes lacustris*	Apparently Secure	Vulnerable	Habitat possible within study area
Grass-leaf Arrowhead	*Sagittaria graminea*	Secure	Vulnerable	Habitat possible within study area
ACCDC 2024 Data Request				

The ACCDC data search identified a potentially occurring SAR with the Project Area (Table 3-3). Boreal felt lichen (*Erioderma pedicellatum*) is an epiphytic lichen that grows primarily on balsam fir trees (https://www.gov.nl.ca/ffa/files/wildlife-endangeredspecies-boreal-felt-lichen.pdf).This species is listed under the NL ESA (2001) as Vulnerable. The range of this species falls directly within the Project Area.

Table 3-3: Potentially Occurring Flora SAR within 5 km of PROJECT AREA

Common Name	Scientific Name	SARA	NL ESA	Potential to occur
Boreal Felt Lichen	*Erioderma pedicellatum*	Special Concern	Vulnerable	Habitat present within study area – potential habitat within region
ACCDC 2024 Data Request				

3.1.3.3 Soils

The Project Area occurs in the Central Barrens Subregion of the Maritime Barrens Ecoregion. The soils in this subregion are mostly Humo-Ferric Podzols (https://www.gov.nl.ca/ecc/files/natural-areas-pdf-island-6d-central-barrens.pdf). Humo-Ferric Podzols are soils common under coniferous, mixed, and deciduous forests, and occasionally under shrub and grass vegetation. They have a thick, bleached Ae horizon overlying a brownish Bf horizon enriched with iron and aluminum but with lower organic matter content than Ferro-Humic Podzols. These soils lack well-developed Bh or Bhf horizons, although a thin Bhf subhorizon may be present. The Bf horizon exhibits higher color values and chromas compared to Ferro-Humic Podzols (https://sis.agr.gc.ca/cansis/taxa/cssc3/PZ/HFP/index.html). These characteristics are typical of soils formed from coarse-textured till in Central and Atlantic Canada.

3.1.4 Surface Water Resources (Quantity and Quality)

3.1.4.1 Overview

This section presents the hydrological conditions, surface water flow, and surface water quality for the Project Area to establish the baseline conditions for the Site. This section was prepared based on a desktop review of existing site information and the available flow and water quality data.

The Bay d'Espoir Hydroelectric system consists of seven reservoirs (Victoria Lake, Burnt Pond, Granite Lake, Meelpaeg Reservoir, Great Burnt Lake, Upper Salmon Reservoir, and Long Pond) and three generating plants (Granite Canal, Upper Salmon, and Bay d'Espoir) (Hatch 2020) (Figure 3-1). Victoria Lake is the most upstream reservoir, and Long Pond is the most downstream reservoir of the Bay d'Espoir Hydroelectric system. Through a series of dams and canals, water is directed to generating plants across several diverted watersheds and is finally discharged from the Bay d'Espoir generating plant to the Atlantic Ocean. The system has a total live storage of more than 3,660 million m3 of water and a total drainage area of 5,903 km^2 (Hatch 2020).

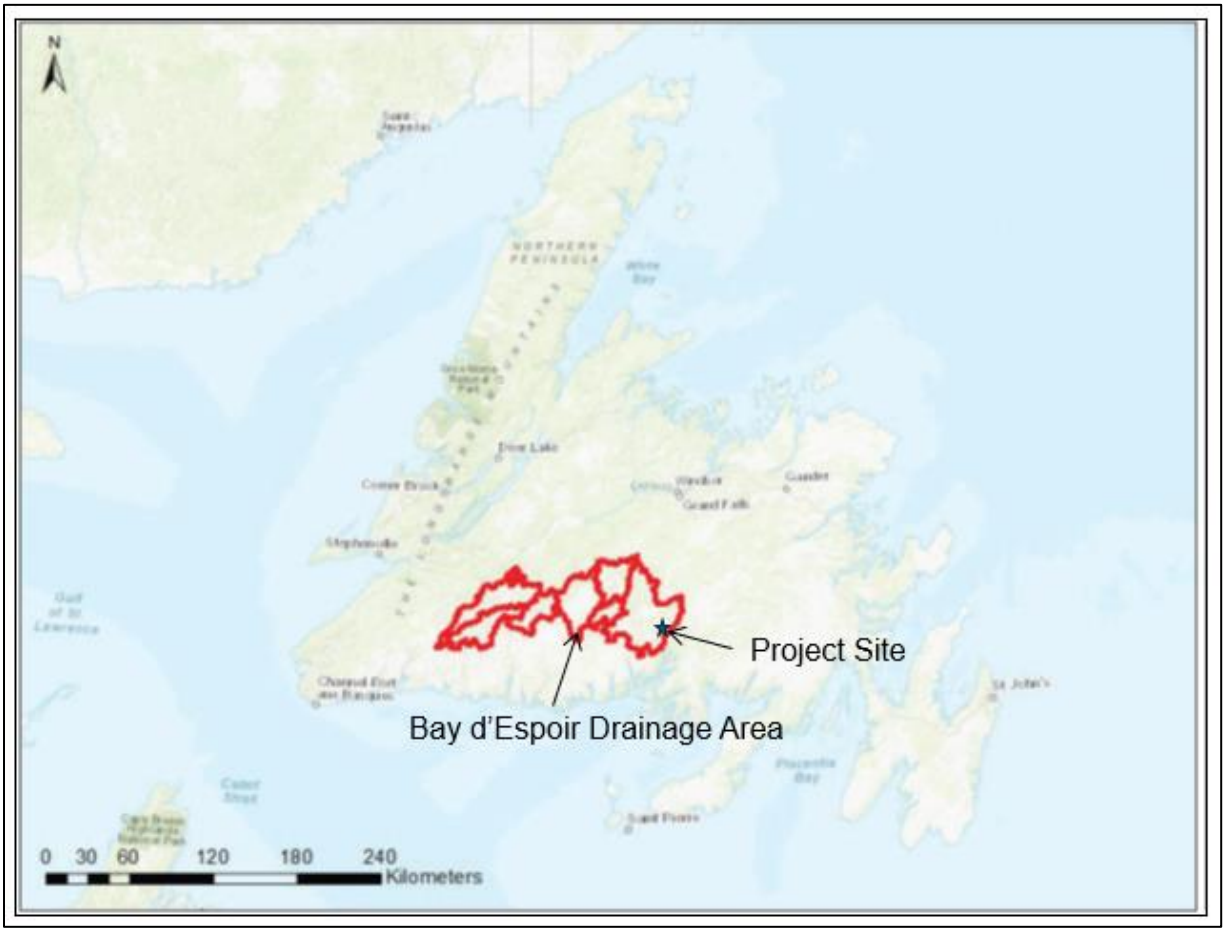

Figure 3-1: The Bay d'Espoir Drainage Area (Source: Hatch [2020])

3.1.4.2 Climate and Hydrologic Data Sources

The desktop hydrologic assessment used long-term regional climate and hydrologic records to characterize local conditions in the Project Area. The primary sources of climate and hydrological data sets are listed below.

- Historical climate data was obtained from Environment and Climate Change Canada. This includes detailed records of temperature, precipitation, and climate normals for the meteorological station near the Project Area.
- Synthesized inflows for seven sub-basins (Victoria Lake, Burnt Pond, Granite Lake, Meelpaeg Lake, Great Burnt Lake, Cold Spring Pond, and Long Pond) of the Bay d'Espoir drainage system for the period of 1950 to 2019 (70 years) obtained from Hatch (2020) were analyzed to establish the existing flow conditions at the Project site.
- Hydrometric data available through Water Survey of Canada (wateroffice.ec.gc.ca) for streamflow gauging stations near the Project Area were analyzed to establish the existing flow conditions in the Project region. Four hydrometric stations as shown in Figure 3-2 and Table 3-4 were analyzed for the Project Area. The hydrometric data include historical water quantity data (flow and water level).
- The Water Resources Atlas of Newfoundland (NLDEACC 1992) provides mean annual estimates of various climatic and water quantity/quality parameters, including temperature, precipitation, ice conditions, runoff and evaporation. Although this is not a recent document, it is considered to provide reasonable estimates of various climatic and water quantity/quality parameters for the purposes of the desk-top hydrologic assessment.

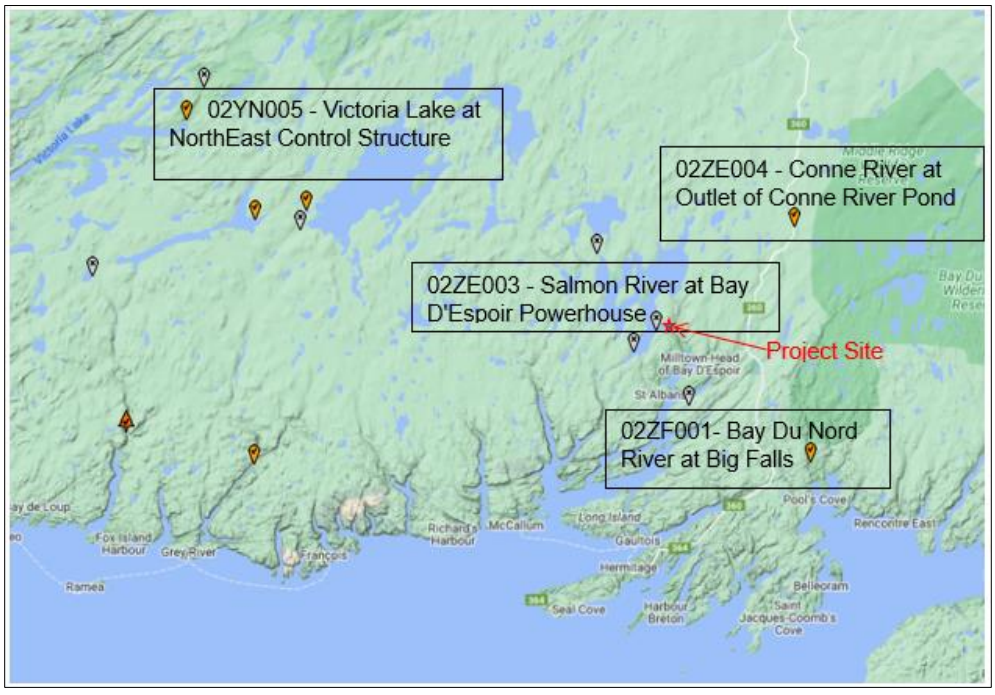

Figure 3-2: Hydrometric Stations near the Project Area

Table 3-4: Hydrometric Station Data Analyzed for the Project

Hydrometric Station	Latitude	Longitude	Type/Status of Station	Drainage Area (km^2)	Type of Data	Period of Record	Length of Record
02ZE003 - Salmon River at Bay D'Espoir Powerhouse	47°59' N	55°51'12"W	Regulated/ Discontinued	5,910	Flow	1967-2010	44
02ZE004 - Conne River at Outlet of Conne River Pond	48°10'07"N	55°28'58"W	Natural/ Active	99.5	Flow	1989-2023	35
02ZF001- Bay Du Nord River at Big Falls	47°44'48" N	55°26'24" W	Natural/ Active	1,170	Flow	1950-2022	73
02YN005 - Victoria Lake at NorthEast Control Structure	48°21'26"N	57°06'54"W	Regulated/ Active	n/a	Water Level	2004-2023	13

3.1.4.3 Maximum Precipitation Accumulation

The historical daily precipitation data at Bay D'Espoir Station (ECCC Station ID: 8400413) were analyzed to produce annual maximum 1-, 3-, and 5-day precipitation accumulation at the Project Area. Table 3-5 presents the average annual maximum 1-, 3, - and 5-day precipitation accumulation for the period of 1981-2010 at the Project Area, while Table 3-6 presents the maximum 1-, 3-, and 5-day precipitation accumulation record for the period of 1967-2018 at the Project Area.

Table 3-5: Average Annual 1, 3, 5 Day Maximum Precipitation Accumulation

Time Period	Average Annual Maximum Precipitation Accumulation (mm)		
	1-Day	3-Day	5-Day
1981-2010	71.1	99.2	125.1

Table 3-6: 1, 3, 5 Day Maximum Precipitation Accumulation Record

	Record of Maximum Precipitation Accumulation (mm)		
	1-Day	3-Day	5-Day
Precipitation	198	277	277
Date	Oct 10, 2016	Jan 13, 1983	Jan 13, 1983

3.1.4.4 Inflows to Bay D'Espoir Generating Station

Hatch (2020) analyzed the synthesized daily inflow data obtained from NL Hydro in each sub-basin area of the Bay d'Espoir System and produced the time series of annual inflow volumes at seven sub-basin areas and at Bay d'Espoir generating station. The headwaters of the Bay d'Espoir system begin at Victoria Lake. The time series plot of annual total inflow to Bay d'Espoir generating station is presented in Figure 3-3. No notable trend was identified for annual total inflow at Bay d'Espoir system (Hatch

2020). The period of 1970 to present includes the operational period of the Bay d'Espoir Hydroelectric generating station. The mean, maximum, and minimum annual inflows to seven sub-basin areas and to the Bay d'Espoir generating station are summarized in Table 3-7.

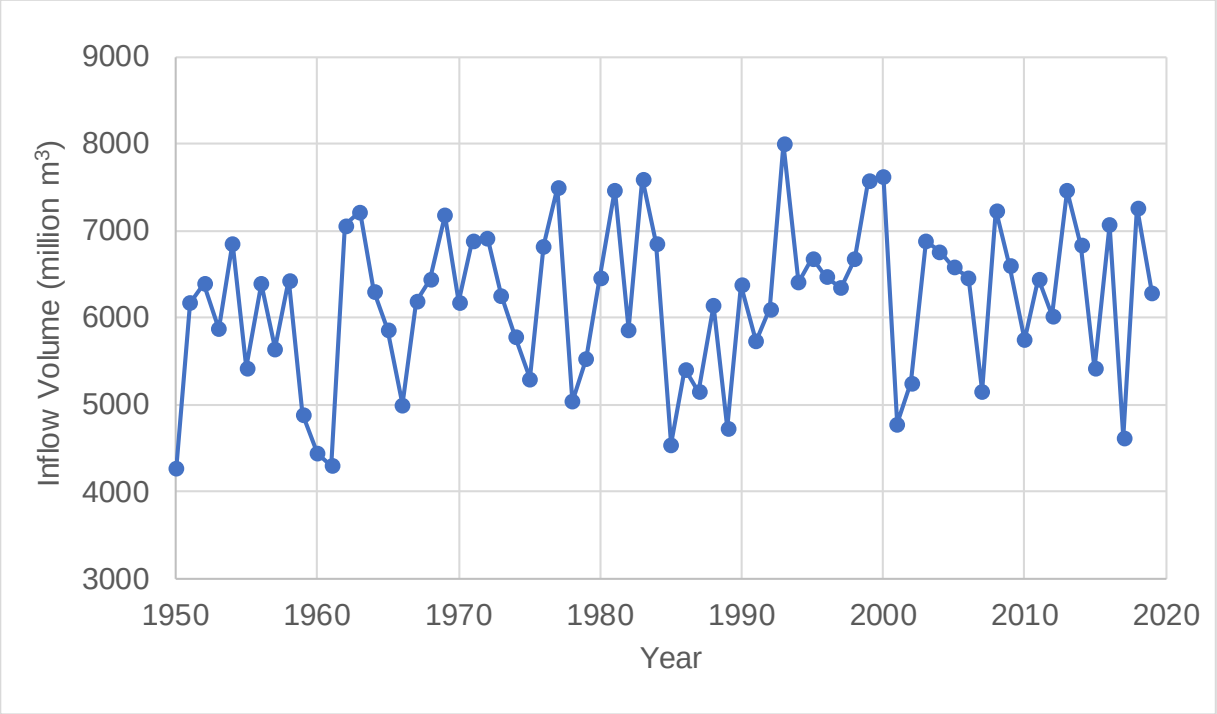

Figure 3-3: Annual Total Inflow to Bay d'Espoir Generating Station (Source: Hatch [2020])

Table 3-7: Mean, Maximum, Minimum Annual Inflows to Bay D'Espoir Hydroelectric System

Parameters	Sub-basins							Bay D'Espoir Generating Station
	Victoria Lake	Burnt Pond	Granite Lake	Meelpaeg Lake	Great Burnt Lake	Cold Spring Pond	Long Pond	
Drainage Area (km^2)	1058	679	503	969	630	290	1774	5903
Mean Annual Inflow (million m^3)	1193	760	579	1047	612	282	1722	6195
Maximum Annual Inflow (million m^3)	1589	1085	897	1734	912	420	2465	7995
Minimum Annual Inflow (million m^3)	788	498	369	627	293	135	1077	4272
Source: Hatch (2020)								

3.1.4.5 Hydrometric Station Data

Monthly and annual runoff depth for three nearby hydrometric stations were estimated and are presented in Table 3-8. The runoff depths at unregulated regional hydrometric stations are higher than precipitation during the spring snow-melt period of April and May. Runoff depths at unregulated regional hydrometric stations are lowest during the summer months of July and August due to higher evaporation rates.

Table 3-8 also presents monthly and annual water level at 02YN005 (Victoria Lake at Northeast Control Structure) hydrometric station along with monthly and annual precipitation at Bay d'Espoir Gen Stn (ECCC Station ID: 8400413). The headwater of the Bay d'Espoir system is at Victoria Lake and has an approximate elevation of 320 m (Hatch 2020). The annual time series of runoff depth at Bay d'Espoir generating station and at three regional hydrometric stations are presented in Figure 3-4. The annual time series of runoff depth at Bay d'Espoir generating station is consistent with those at two regional unregulated hydrometric stations.

Table 3-8: Runoff Depth and Water Level for Regional Hydrometric Stations

Station Name	Mean Runoff Depth (mm)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
02ZE003 - Salmon River at Bay d'Espoir Powerhouse (Regulated)	95.9	90.1	95.4	89.7	83.5	70.1	69.7	68.7	67.3	74.7	83.5	93.8	988.4
02ZE004 - Conne River at Outlet of Conne River Pond (Natural)	76.7	71.7	90.7	192.9	97.6	48.9	38.6	37.2	68.6	103.4	121.2	103.7	1056.5
02ZF001- Bay Du Nord River at Big Falls (Natural)	101.0	87.6	97.3	152.1	128.0	63.0	46.1	42.8	49.1	78.4	108.4	120.0	1074.6
Mean Water Level (m)													
02YN005 - Victoria Lake at NorthEast Control Structure (Regulated)	324.2	323.7	323.2	323.3	324.6	324.9	324.7	324.5	324.2	324.1	324.2	324.5	324.1
Mean Precipitation (mm)													
Bay d'Espoir Gen Stn (Station ID: 8400413).	160.5	144.5	133	108.1	105	112.2	123.9	102.8	131.7	149	152.5	145.8	1569

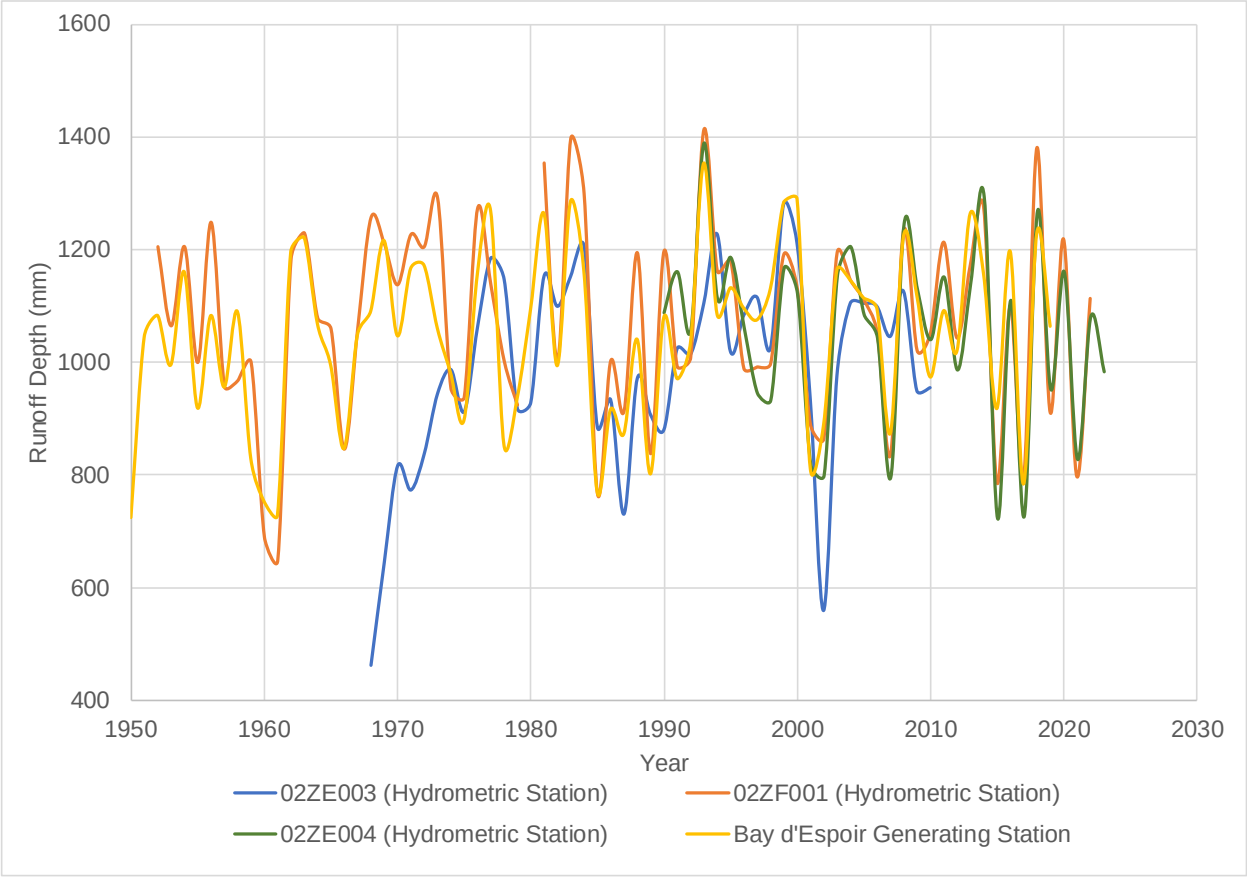

Figure 3-4: Annual Runoff Depth at Regional Hydrometric Stations and at Bay d'Espoir Generating System

3.1.4.6 Operational Water Level for Bay d'Espoir Hydroelectric System

The headwaters of the Bay d'Espoir system begin at Victoria Lake. Long Pond is the immediate upstream reservoir of the proposed generating unit (Unit 8). Hatch (2020) recommended the following end-of-November water levels to optimize Bay d'Espoir system generation in the winter months while allowing room for possible early winter high flow.

- Victoria Lake Reservoir - 324.18 m to 325.44 m;
- Meelpaeg Lake Reservoir - 271.46 m to 272.11 m; and
- Long Pond Reservoir - 181.70 m to 182.25 m.

3.1.4.7 Evapotranspiration

Mean annual potential evapotranspiration in the Project Area ranges between 475 and 510 mm.

3.1.4.8 Ice Conditions

The mean annual number of ice days in the Project Area range between 85 to 93 days.

3.1.4.9 Water Quality

Surface water quality parameters in the Project Area ranges from <5.8 to 6.1 for pH, while total alkalinity ranges from 2 to 3 mg/L.

3.1.4.10 Groundwater

Groundwater yield in the Project Area ranges from low [mean value – 12 Litre per minute (lpm)] to moderate yield (mean value – 27 lpm).

3.1.5 Fish and Fish Habitat

Fish habitat and fish assemblage composition were investigated using desktop resources. Existing available mapping and satellite imagery were reviewed to identify surface water features present within and immediately adjacent to the Project Area. This information was used to determine the potential for aquatic species migration between surface water features and to evaluate local drainage patterns. Desktop SAR screening was carried out using data acquired from ACCDC and DFO aquatic SAR mapping.

Fish species known to reside in this subregion include Atlantic salmon (*Salmo salar*), brook trout (Salvelinus fontinalis), brown trout (*Salmo trutta*), American eel (*Anguilla rostrata*), three-spine stickleback (*Gasterosteus aculeatus*), and nine-spine stickleback (*Pungitius pungitius*). (https://www.gov.nl.ca/ecc/files/natural-areas-pdf-island-6d-central-barrens.pdf).

A brief description of the fish species and associated habitat that are confirmed to reside in the Central Barrens Subregion of the Maritime Barrens Ecoregion including Atlantic salmon, brook trout, brown trout, American eel, three-spine stickleback, and nine-spine stickleback are discussed below.

3.1.5.1 Atlantic Salmon (*Salmo salar*)

The Atlantic salmon is an anadromous member of the salmonid family, native to the Atlantic coast of North America. The North American group of Atlantic Salmon have a historical range from northern Quebec to Newfoundland. Atlantic salmon are sensitive to temperature changes and prefer freshwater habitat that features clean, cool streams and rivers with rocky substrates.

Atlantic salmon tend to reside in calm portions of riffles and runs, as well as deepwater pools. Spawning occurs in the fall months, and through the winter, eggs develop into alevin. During spring, Atlantic salmon alevin feed from their attached yolk sac in freshwater riverbed gravel and develop into fry and subsequently, the parr life stage. Parr will then age into smolts in the early spring, in preparation for their first migration to a marine setting. Smolts then migrate to the ocean where they remain for up to two years, maturing into adults. Atlantic salmon adults will return to their home rivers to spawn, then return to the ocean, continuing this cycle.

3.1.5.2 Brook Trout (*Salvelinus fontinalis*)

The brook trout is a member of the salmonid family, native to eastern North America from the Great Lakes to the Atlantic Ocean. Preferred habitat for this species includes small, spring fed streams and ponds with sand or gravel bottoms and dense riparian vegetation, although Brook trout are capable of inhabiting coastal areas with saltwater influence. Brook trout may migrate within a watershed depending on environmental conditions such as water level and temperature.

They spawn between September and October in areas that feature gravel substrate, groundwater percolation, or spring fed areas. Fry emerge between February and April and typically inhabit areas with submerged aquatic vegetation or shallow water near the shoreline. Young brook trout feed on plankton and insects until they mature. Adult trout primarily feed on insects and other small invertebrates, depending on the size of the individual. (U.S Fish and Wildlife Service, https://www.fws.gov/species/brook-trout-salvelinus-fontinalis).

3.1.5.3 Brown Trout (*Salmo trutta*)

Brown trout are members of the Atlantic trout and salmon subgroup of the salmonid family and are a non-native species in North America, originating from Eurasia. The first introduction in Newfoundland occurred in 1883 from a Scottish hatchery. Brown trout occupy a range of aquatic systems and habitats including coldwater streams, large rivers, ponds, and lakes.

Brown trout spawn from October through November, occasionally extending into December, with preferred water temperature ranging from 6.5°C to 9°C. Redds are spawing grounds created by females in transition zones between pool and riffle habitats that are dominated by gravel substrate. Brown trout feeding strategies and diet differ with respect to their size. Typically, brown trout less than 12 inches (in) feed on insects, while trout above 12 inches prefer larger prey such as crayfish, mollusks, salamanders, frogs, and small mammals. (National Park Service, https://www.nps.gov/shen/learn/nature/brown-trout.htm).

3.1.5.4 American Eel (*Anguilla rostrata*)

American eel is listed as a "Vulnerable" species under the Newfoundland Endangered Species Act and have been recognized federally by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as "Threatened".

American eel inhabits a variety of habitats including streams, rivers, and silt-bottomed lakes during their freshwater stage, as well as oceanic waters, coastal bays and estuaries. Eels will occasionally migrate between fresh, salt, and brackish water habitats. American eels spawn once during their life span, with the entire population spawning in the Sargasso Sea, south of Bermuda. The larvae metamorphose into a life stage called glass eels, where they leave the open ocean, entering salt-water bays, brackish estuaries, or freshwater rivers, becoming elvers. Once elvers enter their rearing habitat, they become yellow eels.

3.1.5.5 Three-spine Stickleback (*Gasterosteus aculeatus*)

The three-spine stickleback has a large range, extending from the drainages of the Arctic and Atlantic oceans to as inland as Lake Ontario. This species can be found in almost all types of water bodies but prefers shallow vegetated areas, usually over mud or sand.

Three-spine sticklebacks reach sexual maturity in one year and spawn in freshwater in June or July, in nests built on shallow, sandy substrates. Three-spine sticklebacks are opportunistic feeders and will consume many different food sources, including worms, small insects, fish eggs, crustaceans, and larvae. (Newfoundland and Labrador Gov, https://www.gov.nl.ca/ffa/wildlife/all-species/animals/inland-fish/three-spined-stickleback/).

3.1.5.6 Nine-spine Stickleback (*Pungitius pungitius*)

The nine-spined stickleback is a common species that has an expansive range through all provinces in Canada. This species is commonly found in the shallow vegetated areas of lakes, ponds, and the deeper pools of slow-moving streams. The marine inhabiting populations live close to shore, moving into freshwater areas to spawn.

Males and females move into shallow, weedy areas in freshwater to begin spawning in June and July, where a single female will lay 20 to 30 eggs. Nests can have up to 7 females deposit eggs in a single spawning season (Newfoundland and Labrador Gov., https://www.gov.nl.ca/ffa/wildlife/all-species/animals/inland-fish/nine-spined-stickleback/).

3.1.5.7 Aquatic Species at Risk and Species of Conservation Concern

Review of available desktop data indicates that there are no historical records of aquatic SAR or SOCC within 5 kilometres of the Project Area. This does not suggest that aquatic SAR and SOCC are absent from the area, only that these species historically have not been detected. While no historical observations of aquatic SAR exist within 5 Kilometer (km) of the Project Area, the Expert Opinion Maps suggest that banded killifish (*Fundulus diaphanous*) may be present.

Banded killifish is listed under the Federal *Species at Risk Act* (SARA; 2003) as a Species of Special Concern and provincially under the NL ESA (2001) as Vulnerable. The species is distributed throughout Newfoundland with currently 10 known populations of banded killifish reported on the island: Indian Bay Watershed, Garnish Pond, Freshwater Pond, Winterland, Ramea Island, Grand Bay West, Loch Leven, Stephenville Crossing, St. George's, York Harbour. This species is tolerant of a variety of saltwater concentrations but usually inhabit freshwater ecosystems including streams and lakes. Their ideal habitat is described as shallow quiet areas of clear lakes and ponds with a sand and gravel bottom and presence of submergent vegetation (https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/4057006x.pdf).

The south Newfoundland population of Atlantic salmon (*Salmo salar*), which spans from the Avalon Peninsula to Cape Ray, is listed by COSEWIC as Threatened but is not registered under SARA. American eel (*Anguilla rostrata*) is listed by COSEWIC as Threatened and is not registered under SARA; however, it is provincially listed as Vulnerable under the Newfoundland and Labrador *Endangered Species Act* (NLESA). Both species have potential to occur within the Project Area.

DFO mapping of aquatic SAR and critical habitat was reviewed to determine if critical habitat is present within or adjacent to the Project Area and to further investigate the potential presence of aquatic SAR (https://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html).

The mapping indicates that spotted wolffish and northern wolffish may be present in the unnamed watercourse to the Head of Bay D'Espoir east of Project Area.

3.1.6 Wildlife and Wildlife Habitat

3.1.6.1 Mammals

Wildlife that occupy the Central Barrens subregion include: Moose (*Alces Alces*), Mink (*Neovision vision*), Snowshoe hare (*Lepus americanus*), Lynx (*Lynx Canadensis*), Black Bear (*Ursus Americanus*), Caribou (*Rangifer tarandus*), red fox (*Vulpes vulpes*), short tailed weasel (*Mustela erminea*), Beaver (*Castor Canadensis*), Muskrat (*Ondatra zibethicus*) and Otter (*Lutrinae*) (https://www.gov.nl.ca/ecc/files/natural-areas-pdf-island-6d-central-barrens.pdf).

There are two endangered species of myotis that are found within Newfoundland and Labrador, northern myotis (*Myotis septentrionalis*) and little brown myotis (*Myotis lucifugus*). Big brown bat (*Eptesicus focus*), hoary bat (Lasiurus cinereus), and silver-haired bat (*Lasionycteris noctivagons*) have been detected but are not currently listed as SAR. Both endangered myotis species typically hibernate in caves, mines, and occasionally in basements while their roosting habitat is cavities in large trees. Myotis species are typically found roosting within 1 km of a water source and are primarily forest dwelling gleaners. The ACCDC did not identify any known populations of these endangered species within the 5 km of the Project location.

Published resources (McBurney and Segers 2021) identified the potential for two additional SAR in the region, little brown bat and northern long-eared bat (Table 3-9).

Table 3-9: Potentially Occurring SAR within 5 km of the Project

Common Name	Scientific Name	COSEWIC	NL ESA
Little brown bat	*Myotis lucifugus*	Endangered	Endangered
Northern long-eared bat	*Myotis septentrionalis*	Endangered	Endangered
Source: Guide for Bat Monitoring in Atlantic Canada, March 2021 (McBurney and Segers 2021)			

ACCDC expert opinions from nearby sites identified the potential for one additional mammal SAR in the region: the Newfoundland marten (Table 3-10). There are no historical records of mammal SAR or SOCC within 5 kilometres of the Project Area available from ACCDC. This does not suggest that mammal SAR and SOCC are absent from the area, only that these species historically have not been detected.

Table 3-10: ACCDC Potentially Occurring Mammal SAR within 5 km of the Project Area

Common Name	Scientific Name	SARA	NL ESA	Potential to Occur
Newfoundland marten	*Martes americana atrata*	Apparently Secure	Vulnerable	Unlikely – Lack of habitat

3.1.6.2 Herptiles

Four amphibian species are present in Newfoundland. All of the species are listed as exotic and include the American Toad (*Anaxyrus americanus*), Mink Frog (*Lithobates septentrionalis*), Green Frog (*Rana*

clamitans) and Wood Frog (*Lithoboates sylvaticus)* (https://www.gov.nl.ca/ffa/wildlife/all-species/amphibians/). Within the Central Barrens subregion, no species of amphibians or reptiles are reported to inhabit the subregion (https://www.gov.nl.ca/ecc/files/natural-areas-pdf-island-6d-central-barrens.pdf).

3.1.6.3 Avifauna

To characterize the baseline avifauna within and adjacent to the Project Area, a SAR desktop study was completed. Background data from sources including eBird, the Newfoundland Breeding Bird Atlas (Square 21TWP81, 21TWP91), and ACCDC were reviewed. These resources were used to determine historical presence of SAR/SOCC as well as identify common species historically found in the area. A summary of findings from each data source is presented below.

eBird

eBird is among the world's largest biodiversity-related science projects, with more than 100 billion bird sightings contributed annually. The eBird database provides data on the abundance and distribution of birds at various spatial and temporal scales. eBird data from 1987, 2019, 2021, and 2023 was reviewed for information on seasonal distribution of birds proximal to the Study Area. The dataset used for this assessment includes records of 34 different species historically observed at Milltown, Trout Hole Falls Municipal Park approximately 9 km south-east of the Project Area (Table 3-11).

Table 3-11: Reported eBird observations

Common Name	Scientific Name	NL S-Rank
American crow	*Corvus brachyrhynchos*	S5
Black-capped chickadee	*Poecile atricapillus*	S5
Boreal chickadee	*Poecile hudsonicus*	S4
Ruby-crowned kinglet	*Regulus calendula*	S5B
Swainson's thrush	*Catharus ustulatus*	S5B
American robin	*Turdus migratorius*	S5B
Purple finch	*Haemorhous purpureus*	S5
Fox sparrow	*Passerella iliaca*	S5B
White-throated sparrow	*Zonotrichia albicollis*	S5B
Northern waterthrush	*Parkesia noveboracensis*	S5B
Black-and-white warbler	*Mniotilta varia*	S5B
American redstart	*Setophaga ruticilla*	S5B
Yellow-rumped warbler	*Setophaga coronata*	S5B
Black-throated green warbler	*Setophaga virens*	S5B
Golden-crowned kinglet	*Regulus satrapa*	S5B
Red-breasted nuthatch	*Sitta canadensis*	S5
Hermit thrush	*Catharus guttatus*	S5B
Magnolia warbler	*Setophaga magnolia*	S5B
Northern saw-whet owl	*Aegolius acadicus*	S3B

Common Name	Scientific Name	NL S-Rank
Northern flicker	*Colaptes auratus*	S4
Yellow-bellied flycatcher	*Empidonax flaviventris*	S5B
Blue-headed vireo	*Vireo solitarius*	S3S4B
Pine siskin	*Spinus pinus*	S4S5
American goldfinch	*Spinus tristis*	S5
Lincoln's sparrow	*Melospiza lincolnii*	S5B
Mourning warbler	*Geothlypis philadelphia*	S4B
Yellow warbler	*Setophaga petechia*	S5B
Wilson's warbler	*Cardellina pusilla*	S5B
Wilson's snipe	*Gallinago delicata*	S5B
American goshawk	*Accipiter gentilis*	S3
Blue jay	*Cyanocitta cristata*	S5
Common raven	*Corvus corax*	S5
Blackpoll warbler	*Setophaga striata*	S5B
Red Crossbill	*Loxia curvirostra percna*	S1S2

Majority of the species observed are considered common within Newfoundland. However, one SAR, red crossbill (*Loxia curvirostra percna*) is listed as endangered in Newfoundland with 2 observations in 2021 (Table 3-12). This species of finch is associated with conifer forests, typically mature stands, and often found throughout Western Newfoundland.

Table 3-12: eBird Records of SAR within 5 km of the Project

Common Name	Scientific Name	SARA	NL SAR	ACCDC
Red Crossbill	*Loxia curvirostra percna*	Endangered	Endangered	S1S2

Newfoundland Breeding Bird Atlas

The Newfoundland Breeding Bird Atlas was reviewed to identify historical observance of species within Squares 21TWP81 and 21TWP91 where the Project Area is situated. The Newfoundland Breeding Bird Atlas identified a total of 53 species as displaying possible, probable, or confirmed breeding activity within these survey squares. Data indicates that 23 birds have confirmed breeding evidence within Squares 21TWP81 and 21TWP91 while 20 birds were identified as possible breeders and 10 were identified to be probable breeders. Data from both squares is summarized in Table 3-13. Where multiple observances were recorded, the highest breeding code was displayed.

Table 3-13: Newfoundland Bird Breeding Atlas Confirmed Breeding Species

Common Name	Scientific Name	NL S-Ranks	*Breeding Code	Confirmed, Probable, Possible
Ruffed Grouse	*Bonasa umbellus*	SNA	FY	Confirmed
Spruce Grouse	*Falcipennis canadensis*	SNA	FY	Confirmed
Canada Jay	*Perisoreus canadensis*	S5	FY	Confirmed
Common Raven	*Corvus corax*	S5	CY	Confirmed
Black-capped Chickadee	*Poecile atricapillus*	S5	CY	Confirmed
Boreal Chickadee	*Poecile hudsonicus*	S4	CY	Confirmed
Ruby-crowned Kinglet	*Regulus calendula*	S5B	CF	Confirmed
Swainson's Thrush	*Catharus ustulatus*	S5B	CF	Confirmed
Fox Sparrow	*Passerella iliaca*	S5B	CF	Confirmed
Dark-eyed Junco	*Junco hyemalis*	S5	FY	Confirmed
White-throated Sparrow	*Zonotrichia albicollis*	S5B	CF	Confirmed
Lincoln's Sparrow	*Melospiza lincolnii*	S5B	CF	Confirmed
Northern Waterthrush	*Parkesia noveboracensis*	S5B	CF	Confirmed
Black-and-white Warbler	*Mniotilta varia*	S5B	CF	Confirmed
Mourning Warbler	*Geothlypis philadelphia*	S4B, SUM	CF	Confirmed
American Redstart	*Setophaga ruticilla*	S5B	CF	Confirmed
Magnolia Warbler	*Setophaga magnolia*	S5B, SUM	CF	Confirmed
Yellow Warbler	*Setophaga petechia*	S5B	CF	Confirmed
Yellow-rumped Warbler	*Setophaga coronata*	S5B	CF	Confirmed
Black-throated Green Warbler	*Setophaga virens*	S5B	CF	Confirmed
Wilson's Warbler	*Cardellina pusilla*	S5B	CF	Confirmed
Hermit Thrush	*Catharus guttatus*	S5B	CF	Confirmed
American Robin	*Turdus migratorius*	S5B	CF	Confirmed
Blue Headed Vireo	*Vireo solitarius*	S3S4B, SUM	S	Possible
Wilsons Snipe	*Gallinago delicata*	S5B	D	Probable
Greater Yellowlegs	*Tringa melanoleuca*	S3B, S4M	A	Probable
Common Loon	*Gavia immer*	S5B, S4N, SNRM	H	Possible
Belted Kingfisher	*Megaceryle alcyon*	S4B, S3N, SUM	H	Possible
Black-backed Woodpecker	*Picoides arcticus*	S4	H	Possible
Northern Flicker	*Colaptes auratus*	S4	S	Possible
Yellow-bellied Flycatcher	*Empidonax flaviventris*	S5B	S	Possible
Alder Flycatcher	*Empidonax alnorum*	S4B, SUM	S	Possible
Red-eyed Vireo	*Vireo olivaceus*	S3S4B, SUM	S	Possible
Blue Jay	*Cyanocitta cristata*	S5	H	Possible
American Crow	*Corvus brachyrhynchos*	S5	P	Probable
Tree Swallow	*Tachycineta bicolor*	S4B, SUM	P	Probable
Golden-crowned Kinglet	*Regulus satrapa*	S5B, S4N, SUM	S	Possible
Gray Catbird	*Dumetella carolinensis*	SUB	S	Possible
Cedar Waxwing	*Bombycilla cedrorum*	S4B, SUM	P	Probable
Pine Grosbeak	*Pinicola enucleator*	S5	P	Probable
Purple Finch	*Haemorhous purpureus*	S5	S	Possible
Red Crossbill	*Loxia curvirostra*	S1S2	P	Probable
Pine Siskin	*Spinus pinus*	S4S5	P	Probable

Common Name	Scientific Name	NL S-Ranks	*Breeding Code	Confirmed, Probable, Possible
American Goldfinch	*Spinus tristis*	S5	S	Possible
Savanah Sparrow	*Passerculus sandwichensis*	S5B	A	Probable
Swamp Sparrow	*Melospiza georgiana*	S5B	S	Possible
Ovenbird	*Seiurus aurocapilla*	S3B, SUM	S	Possible
Nashville Warbler	*Leiothlypis ruficapilla*	S2B, SUM	H	Probable
Common Yellowthroat	*Geothlypis trichas*	S5B	D	Probable
Bay-breasted Warbler	*Setophaga castanea*	S2B, SUM	S	Possible
Blackpoll Warbler	*Setophaga striata*	S5B	S	Possible
Palm Warbler	*Setophaga palmarum*	S4B	S	Possible

Most of these species are considered to be relatively common throughout the Island of Newfoundland. Red crossbill (S1S2) was identified historically within the area and is a designated SAR, as discussed above. Habitat for these common species and the red crossbill are likely to be present throughout the Bay d'Espoir region.

ACCDC

There are no historical records of avifauna SAR or SOCC within 5 kilometres of the Project Area available from ACCDC. This result does not indicate that avifauna SAR and SOCC are absent from the area, only that these species historically have not been detected.

The ACCDC data did identify 4 SAR species with the potential to occur in the Project Area. These species are presented in Table 3-14.

Table 3-14: ACCDC Potentially Occurring Avifauna SAR within 5 km of the Project Area

Common Name	Scientific Name	SARA	NL ESA	Potential to Occur
Red Crossbill	*Loxia curvirostra percna*	Endangered	Endangered	Possible – Habitat may be present
Rusty Blackbird	*Euphagus carolinus*	Special Concern	Vulnerable	Possible – marginal habitat present
Short-eared Owl	*Asio flammeus*	Special Concern	Vulnerable	Possible, marginal habitat present
Barrow's Goldeneye (Eastern population)	*Bucephala islandica*	Special Concern	Vulnerable	Unlikely – Lack of habitat (summer) Possible – Habitat may be present (winter)

3.1.7 Summary of Species at Risk and Species of Conservation Concern

SAR include species listed under the Newfoundland and Labrador Endangered Species Act and the federal Species at Risk Act as being either Endangered, Threatened, Vulnerable, or Special Concern.

SOCC may not yet be listed under provincial or federal legislations but may have been classified by the COSEWIC as Extirpated, Endangered, Threatened, or Special Concern. SAR and SOCC also includes taxa ranked by the ACCDC as S1 or S2. S1 ranked species are critically imperilled due to extreme rarity or other vulnerability factors. S2 species are imperilled due to rarity or steep declines, making them very vulnerable. The species listed in the ACCDC report were referenced according to the rankings outlined by COSEWIC, SARA, and NLESA. The potential for each SAR to occur is based on the habitat data available at the time of the assessment. Results of the ACCDC data search noted that there was a total of 2 SAR/SOCC plant records Table 3-15).

Table 3-15: ACCDC SAR Identified within 5 km of the Project

Common Name	Scientific Name	SARA	NL ESA	Potential to Occur
Lake Quillwort	Isoetes lacustris	Apparently Secure	Vulnerable	Possible - Habitat may be present within study area
Grass-leaf Arrowhead	Sagittaria graminea	Secure	Vulnerable	Possible - Habitat may be present within study area

Results of ACCDC data search and published resources (McBurney and Segers, 2021) noted the potentially occurring SAR within the Project Area in Table 3-16.

Table 3-16: Potentially Occurring SAR within 5 km of the Project

Common Name	Scientific Name	SARA	NL ESA	Potential to Occur
Boreal Felt Lichen	*Erioderma pedicellatum*	Special Concern	Vulnerable	Possible - Habitat may be present – potential habitat within region
Banded Killifish	Fundulus diaphanus	Special Concern	Vulnerable	Possible - Habitat may be present
Little brown bat	*Myotis lucifugus*	Endangered	Endangered	Possible – Habitat may be present
Northern long-eared bat	*Myotis septentrionalis*	Endangered	Endangered	Possible – Habitat may be present
Newfoundland marten	*Martes americana atrata*	Apparently Secure	Vulnerable	Unlikely – Lack of habitat
Red Crossbill	*Loxia curvirostra percna*	Endangered	Endangered	Possible – Habitat may be present
Rusty Blackbird	*Euphagus carolinus*	Special Concern	Vulnerable	Possible – marginal habitat present
Short-eared Owl	*Asio flammeus*	Special Concern	Vulnerable	Possible, marginal habitat present
Barrow's Goldeneye (Eastern population)	*Bucephala islandica*	Special Concern	Vulnerable	Unlikely – Lack of habitat (summer) Possible – Habitat may be present (winter)

3.2 Socioeconomic Environment

The objective of this section is to summarize the existing socioeconomic conditions in the area that could be affected by the Project.

As outlined in Section 2.0 (Project Description), the proposed Project is located at the existing Bay d'Espoir hydroelectric generating station in the south-central region of the Island of Newfoundland. For the purposes of this initial socioeconomic assessment, the social study area is defined as the Bay d'Espoir Area (Local Area 30)—a provincial socioeconomic subdivision that includes the communities of Milltown-Head of Bay d'Espoir, St. Joseph's Cove-St. Veronica's, St. Alban's, Morrisville, Samiajij Miawpukek (Conne River), and McCallum.

This area encompasses the communities that may be directly or indirectly affected by Project activities. It serves as the geographic context for establishing the social baseline and for identifying, predicting, and assessing potential socioeconomic impacts (see Section 5.6).

The following subsections provide an overview of the existing socioeconomic environment, focusing on:

- People and Communities (including housing, community access, public services, and infrastructure);
- Economy, Employment, and Key Industries;
- Land and Resource Use (including historic resources); and
- Protected and Special Areas.

The socioeconomic data presented in this report were primarily sourced from the 2021 and 2016 Canadian Censuses, as well as the Newfoundland and Labrador Community Accounts.

3.2.1 People and Communities

The Bay d'Espoir Area (Local Area 30) is a provincial socioeconomic subdivision that includes the communities of Milltown-Head of Bay d'Espoir, St. Joseph's Cove-St. Veronica's, and St. Alban's, as well as the communities of Morrisville, Samiajij Miawpukek (Conne River) and McCallum. This geography is equivalent to Statistics Canada Census Consolidated Subdivision 3D (NL Community Accounts 2024) (Figure 3-5).

To support the socioeconomic assessment, the following indicators were analyzed for Local Area 30 as a whole and compared to provincial benchmarks:

- Age distribution and population trends; and
- Educational attainment (e.g., high school diploma, major fields of study).

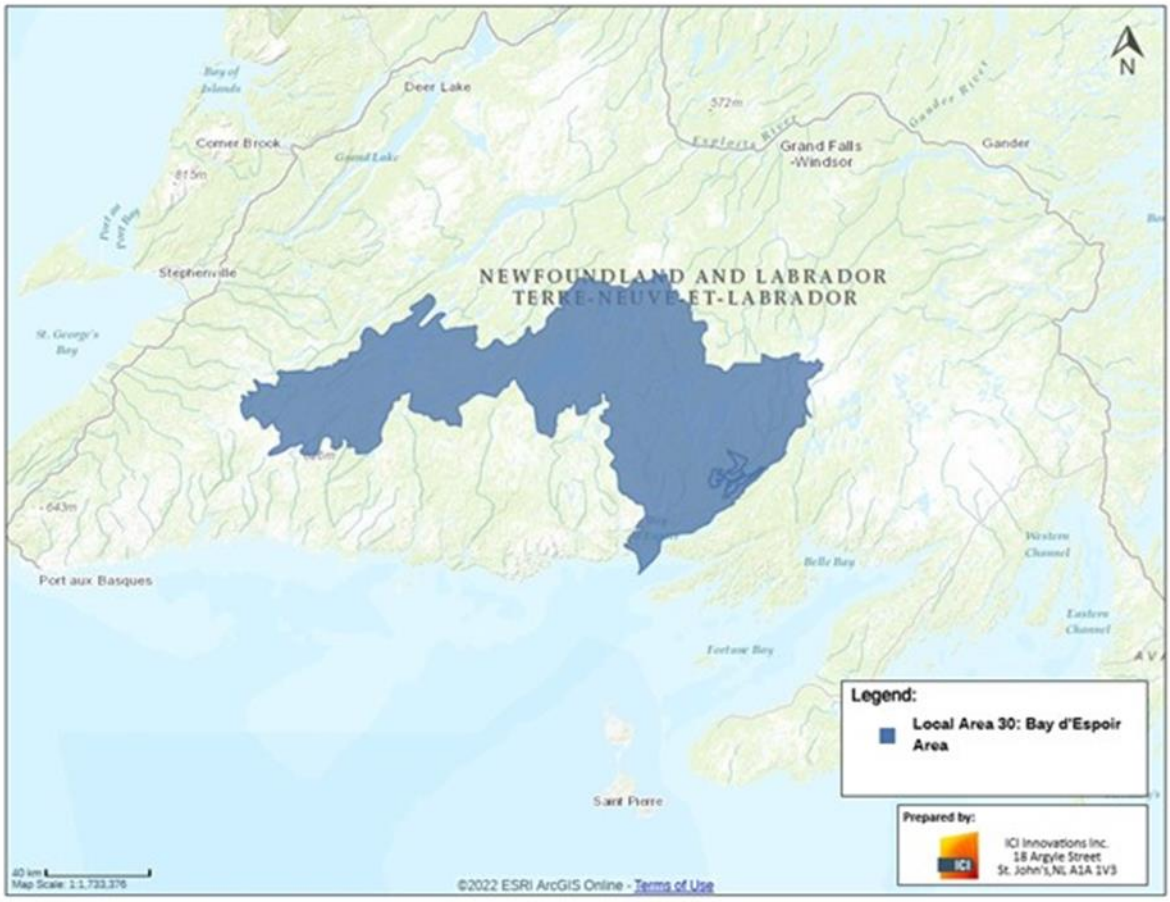

Figure 3-5: Bay d'Espoir Area (NL Local Area 30, CCSD 3D)

Age and Population

According to the 2021 Census, the population of Local Area 30: Bay d'Espoir Area was 3,090, reflecting a 4.5% decrease from 3,235 in 2016. In comparison, the overall population of Newfoundland and Labrador declined by 1.8% during the same period, from 519,715 in 2016 to 510,550 in 2021. The median age in the Bay d'Espoir Area was 52 in 2021, compared to 48 for the province of Newfoundland.

As shown below, many residents in the Local Area 30: Bay d'Espoir Area are middle-aged to senior, with most falling within the 45 - 70 age range. This represents an aging population, which has significant implications for the region's workforce availability, service needs, and long-term community sustainability. With fewer younger residents to replace retirees, the area may face challenges in maintaining essential services, supporting local economies, and sustaining school enrollments.

The population of the Local Area 30: Bay d'Espoir Area exhibits a balanced gender divide amongst male and female residents. Figure 3-6 shows a detailed breakdown of the 2021 census data on population by age and gender in the Bay d'Espoir Area.

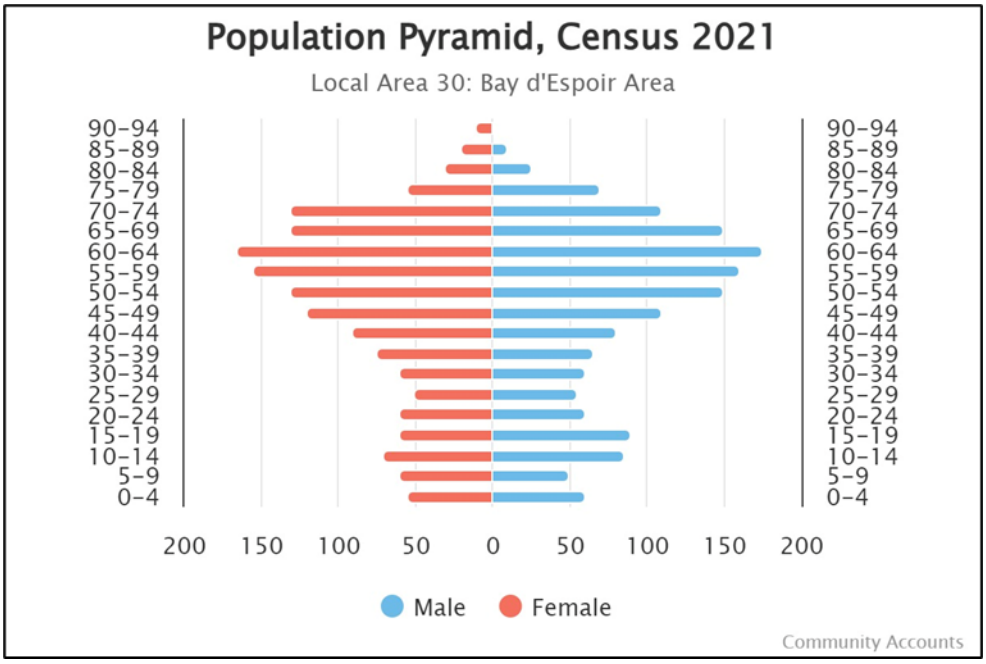

Figure 3-6: Bay d'Espoir Area (Local Area 30): Population by Age and Gender (2021) (Source: NL Community Accounts [2024])

Births

In 2022, there were 25 births in the Local Area 30: Bay d'Espoir Area, representing a 25.0% increase compared to 2021, when there were 20 births. While this increase may seem modest, it marks a positive trend amidst the broader population decline in the region. Additionally, in 2022, the total birth rate for the Local Area 30: Bay d'Espoir Area was 8.1, which is the ratio of live births to the population, expressed per 1,000 residents. This is notably higher than the provincial total birth rate for the same year, which was 6.9.

Deaths

In 2022, there were 30 deaths in the Local Area 30: Bay d'Espoir Area, which is consistent with the number recorded in the previous year. The median age of death in the area was 72, compared to the provincial median age of 77 in Newfoundland and Labrador for the same year.

Educational Attainment

According to the 2021 Census, 32.9% of individuals aged 15 and over in Local Area 30: Bay d'Espoir Area did not have a high school diploma, compared to 20.4% provincially. Approximately 67.1% had at least a high school diploma, compared to 79.6% across Newfoundland and Labrador. Furthermore, only 6.7% held a bachelor's degree or higher, significantly lower than the provincial rate of 16.6%. Further information on educational attainment for the Local Area 30 compared to the province of Newfoundland is included in Table 3-17.

Table 3-17: Level of Education

Highest Level of Education				
	15 Years of Age and Over		25 to 64 Years of Age	
	Area 30	NL	Area 30	NL
High School Diploma	67.10%	79.60%	79.30%	87.40%
No High School Diploma	32.90%	20.40%	20.70%	12.60%

As shown in Table 3-18 for the Local Area 30, there have been significant declines in enrollment across all school-age levels - from primary to senior high - when comparing data from 1989 to 2023–2024.

Table 3-18: School Enrollment

School Enrollment		
School Year	1989-1990	2023-2024
Total Students	1,055	184
Primary	276	39
Elementary	250	33
Junior High	264	44
Senior High	246	68

In addition to declining enrollment trends, the Local Area 30 has experienced a series of school closures over the years, reflecting broader demographic and population shifts. The closures span multiple communities and educational levels, highlighting the impact of long-term population decline.

Operating and Closed Schools in the Local 30 Area:

- Bay d'Espoir Academy – Milltown;
- St. Anneway Kegnamogwom – Conne River;
- St. Peter's All Grade – McCallum;
- Greenwood Central High – Milltown (Closed);
- Greenwood Elementary – Milltown (Closed);
- Holy Cross Community School Inc. – St. Alban's (Closed);
- Holy Cross Elementary – St. Alban's (Closed);
- Holy Cross High School – St. Alban's (Closed);
- Holy Cross Primary School – St. Alban's (Closed); and
- Holy Cross School – St. Alban's (Closed).

Indigenous Ancestry

Province-wide, approximately 6% of Newfoundland and Labrador residents identified as having Indigenous ancestry in the 2021 Census. Of this group, 4.4% identified as First Nations, while Métis and Inuit each accounted for approximately 1.5% of the population.

The Local Area 30 is home to both Indigenous and non-Indigenous communities. Notably, Samiajij Miawpukek (Conne River) is a recognized First Nation reserve and the primary settlement of the Miawpukek Mi'kamawey Mawi'omi. According to the 2016 Census, approximately 38% of the population in Local Area 30 identified as Indigenous, with 97% of these individuals identifying as First Nations. This is significantly higher than the provincial Indigenous population, which stands at approximately 6% in 2021.

Miawpukek Mi'kamawey Mawi'omi is a First Nation Reserve located at the mouth of the Conne River on the south coast of the Island of Newfoundland, approximately 10 km southeast of the Project Area (and nearly 40 km by road). It became a permanent community around 1822, prior to which it was one of many semi-permanent camping sites used by Mi'kmaw throughout their traditional territory. The community was officially designated as Samiajij Miawpukek Indian Reserve under the federal Indian Act in 1987. Miawpukek First Nation members number 822 persons living on-Reserve with an additional 2,238 members living off-Reserve as of February 2022. Since being established as a reserve in 1987, Miawpukek has become a vibrant community with nearly 100 percent employment and a strong and diverse economic base. The Reserve is governed by a Chief and Council and provides a variety of programs and services for Miawpukek First Nation members (MFN 2024).

Community Health

An important indicator of personal and community health and well-being is how residents rate their own health status. In 2015-2016, 65.2% (+/- 5.3%) of individuals aged 12 and over in the overall Grand Falls-Windsor - Baie Verte - Harbour Breton Rural Secretariat Region rated their health status as excellent or very good (NL Community Accounts 2024).

3.2.2 Housing and Community Access

Housing

According to the 2021 Census, Newfoundland and Labrador has 223,255 occupied private dwellings, with 161,410 (72.3%) being single-detached houses. A significant portion of these homes (68.6%) have low occupancy, meaning they house two or fewer residents.

In Local Area 30: Bay d'Espoir Area, the number of occupied private dwellings increased slightly from 1,355 in 2016 to 1,370 in 2021. According to the 2021 Census, approximately 90% of homes in the Bay d'Espoir Area were owner-occupied, compared to a smaller proportion of rental properties.

Community Access

Highway access to this portion of south-central Newfoundland is via Route 360 (also known as the Bay d'Espoir Highway) which begins near Bishop's Falls in Central Newfoundland and extends southward to Bay d'Espoir and Harbour Breton, with various intersections leading to secondary roadways that connect

to other communities throughout the region. This includes Route 361, which runs south and west to the communities of Milltown-Head of Bay d'Espoir, St. Veronica's (from which Camp Boggy Road extends to the hydroelectric facility), St. Joseph's Cove and onwards to St. Albans (Figure 3-7).

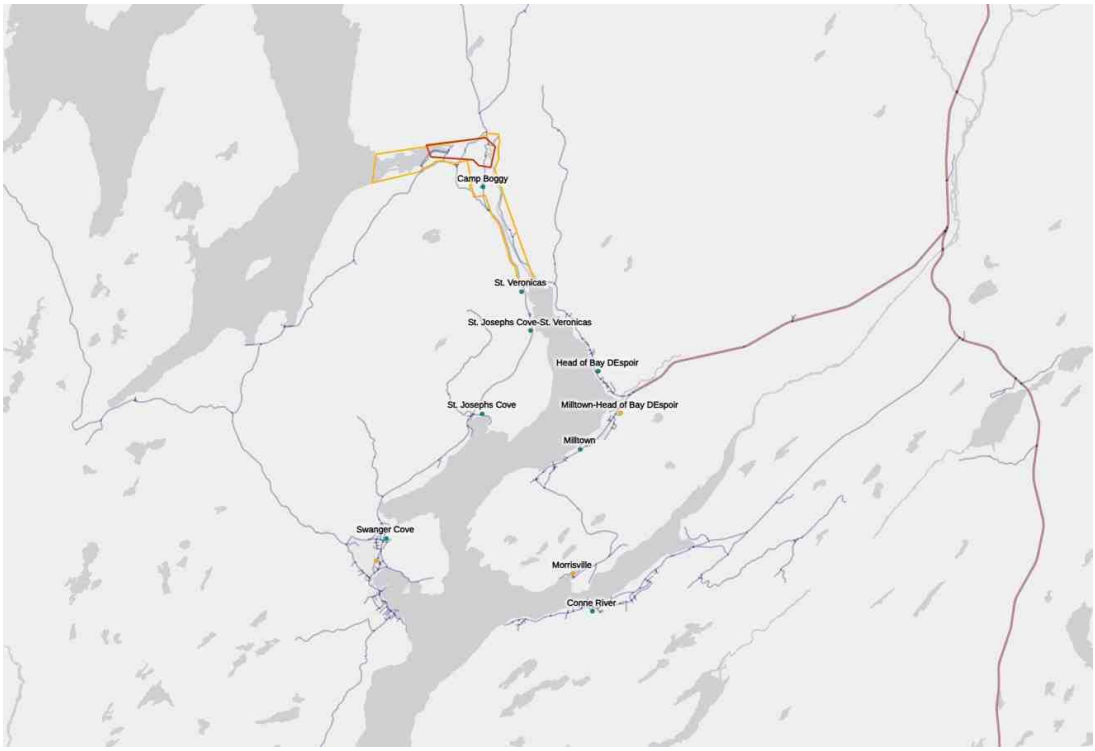

Figure 3-7: Communities and Road Access

3.2.3 Public Services and Infrastructure

The Local Area 30 is served by a foundational network of public infrastructure that supports the social, educational, and emergency service needs of its residents. Healthcare is primarily delivered through the Bay d'Espoir Community Health Centre in St. Alban's, which provides 24/7 emergency services, diagnostic imaging, laboratory work, telehealth and urgent care. Education is centralized at Bay d'Espoir Academy, a K-12 school that accommodates students from multiple surrounding communities. Emergency services are provided through a combination of local fire departments, the Bay d'Espoir RCMP detachment, and regional emergency medical services coordinated through the health centre. This infrastructure framework is essential to community functioning and resilience, though future investment may be required to address capacity, aging assets, and gaps in accessibility.

3.2.4 Economy, Employment, and Key Industries

Labor Force

The 2021 labour force profile for Local Area 30: Bay d'Espoir Area reveals several key insights about the region's workforce demographics and participation (Table 3-19).

Out of a total population of 2,705 individuals aged 15 and over, 1,315 were actively engaged in the labour force, with 665 males and 650 females contributing to this total. The labour force participation rate for the area stood at 48.6%, with males slightly higher at 49.4% compared to females at 47.8%. This indicates that a similar proportion of both genders are engaged in the workforce, although there is a slight male majority.

The employment rate for the Bay d'Espoir Area was 39.0%, with both males and females showing almost identical rates at 39.0% and 38.6%, respectively. However, the unemployment rate revealed some differences, with the overall rate for the area being 20.2%. Males experienced a higher unemployment rate of 21.1%, while females had a lower unemployment rate of 18.5%.

These figures highlight the relatively low employment rates in the area, particularly for males, while indicating a somewhat higher unemployment rate compared to provincial averages. At the time, the employment rate in the Bay d'Espoir Area was 39%, compared to 47.5% for the province. Additionally, the area's unemployment rate was 20.2%, while the provincial rate stood at 15.2%. An overview of the labour force by occupational category is provided in Figure 3-8 below.

Table 3-19: Bay d'Espoir Area (Local Area 30): Labour Force Profile (2021)

Labour Force Indicator	Total	Male	Female
Total population aged 15 years of age and over	2,705	1,345	1,360
In the labour force	1,315	665	650
Participation rate (%)	48.6	49.4	47.8
Employment rate (%)	39.0	39.0	38.6
Unemployment rate (%)	20.2	21.1	18.5

Notes:
Participation rate: Total labour force expressed as a percentage of the population aged 15 years and over.
Employment rate **(employment/population ratio)**: Number of employed persons expressed as a percentage of the population 15 years of age and over.
Unemployment rate: Number of unemployed persons expressed as a percentage of the labour force.
Source: NL Community Accounts (2024)

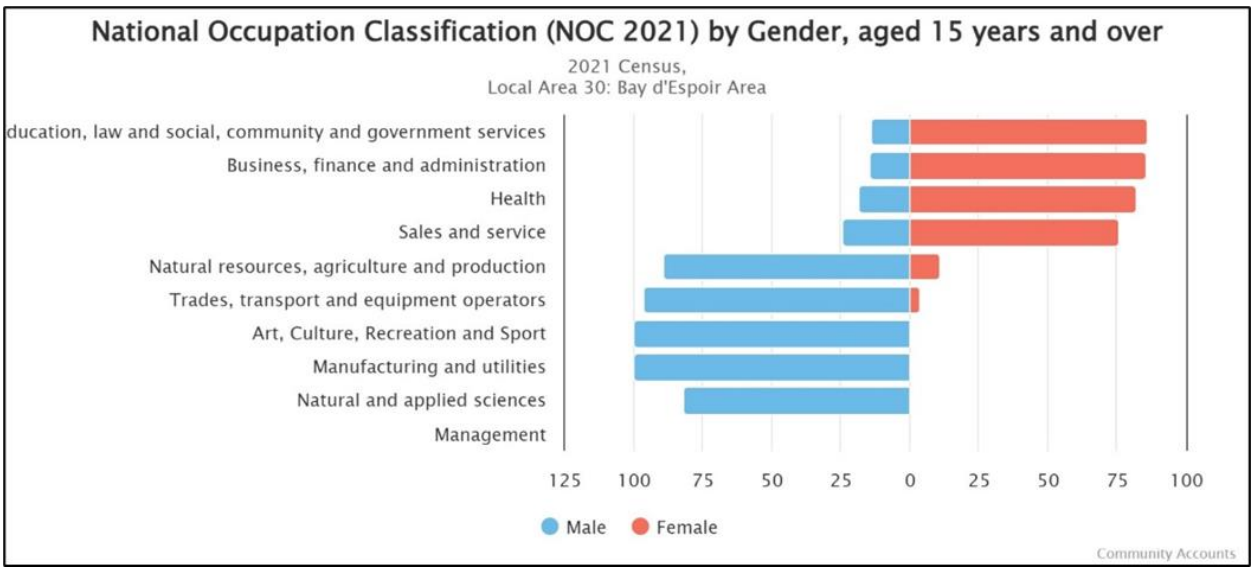

Figure 3-8: Bay d'Espoir Area (Local Area 30): Labor Force by Occupational Group (2021) (Source: NL Community Accounts [2024])

In the education, law, and social, community, and government services sector, females made up a large majority, accounting for 86% of employed individuals, with only 14% being males. A similar trend was observed in business, finance, and administration, where females represented 85.7% of the workforce, compared to 14.3% males.

The health sector also reflected a predominantly female workforce, with 81.8% of employed individuals being female and 18.2% male. Similarly, in sales and service, females made up 75.6% of the employed population, while males accounted for 24.4%.

On the other hand, sectors like natural resources, agriculture, and production and trades, transport, and equipment operators had a far more male-dominated workforce. In natural resources, agriculture, and production, males made up 88.9% of employed individuals, with females representing just 11.1%. This trend was even more pronounced in trades, transport, and equipment operators, where males accounted for a striking 96.2% of the workforce, with only 3.8% females.

The art, culture, recreation, and sport sector, though less populated in terms of numbers, had a workforce composed entirely of females, while manufacturing and utilities and natural and applied sciences had male-dominated workforces - 81.8% and nearly 100%, respectively.

Overall, the employment patterns in Local Area 30 in 2021 showcase a distinct gender division across different industries, with females predominantly employed in education, health, business, and service-related roles, and males overwhelmingly represented in sectors such as trades, transport, and natural resources.

Earnings

In 2020, tax records showed that 1,590 individuals in Local Area 30 reported earnings from employment. That year, the gross personal income per capita for the area was $32,000, while the after-tax personal income per capita, adjusted for inflation, was $19,800. In comparison, the provincial averages were higher, with gross personal income per capita at $39,900 and after-tax personal income per capita at $23,000 (NL Community Accounts 2024).

3.2.5 Land and Resource Use

The proposed Project site is located within and encompasses to an existing and long-standing hydroelectric generation facility and associated infrastructure at Bay d'Espoir. This has helped shape the nature, intensity and distribution of existing land and resource use activities in this region.

As noted previously, road access to this portion of south-central Newfoundland is via Route 360, which extends from Central Newfoundland southward to Bay d'Espoir, with various intersections to secondary roadways that connect to communities throughout the larger region including Route 361, which runs south and west to the community of Milltown-Head of Bay d'Espoir and beyond, including the community of St. Veronica's. From here, Camp Boggy Road extends to the Bay d'Espoir hydroelectric facility as well as connecting to other existing resource road networks that extend to the southwest and northwards for considerable distances (Figure 3-9). Residents and visitors have a long tradition of participating in a wide range of outdoor pursuits throughout the region, including recreational and traditional activities such as hunting, fishing, wood cutting and berry picking, as well as snowmobiling, All-terrain vehicle (ATV) use, boating and other activities.

The proposed physical works that are associated with this Project will take place on land that is currently owned by NL Hydro (Crown Lease # 130482).

Municipal and commercial land uses in the overall region include protected water supply areas and regional waste disposal sites, as well as lands designated as forestry/silviculture and agricultural areas, existing mineral rights, crown land titles and licences and others, neither of which overlap with or are immediately adjacent to the Project Area itself (Figure 3-10 and Figure 3-11).

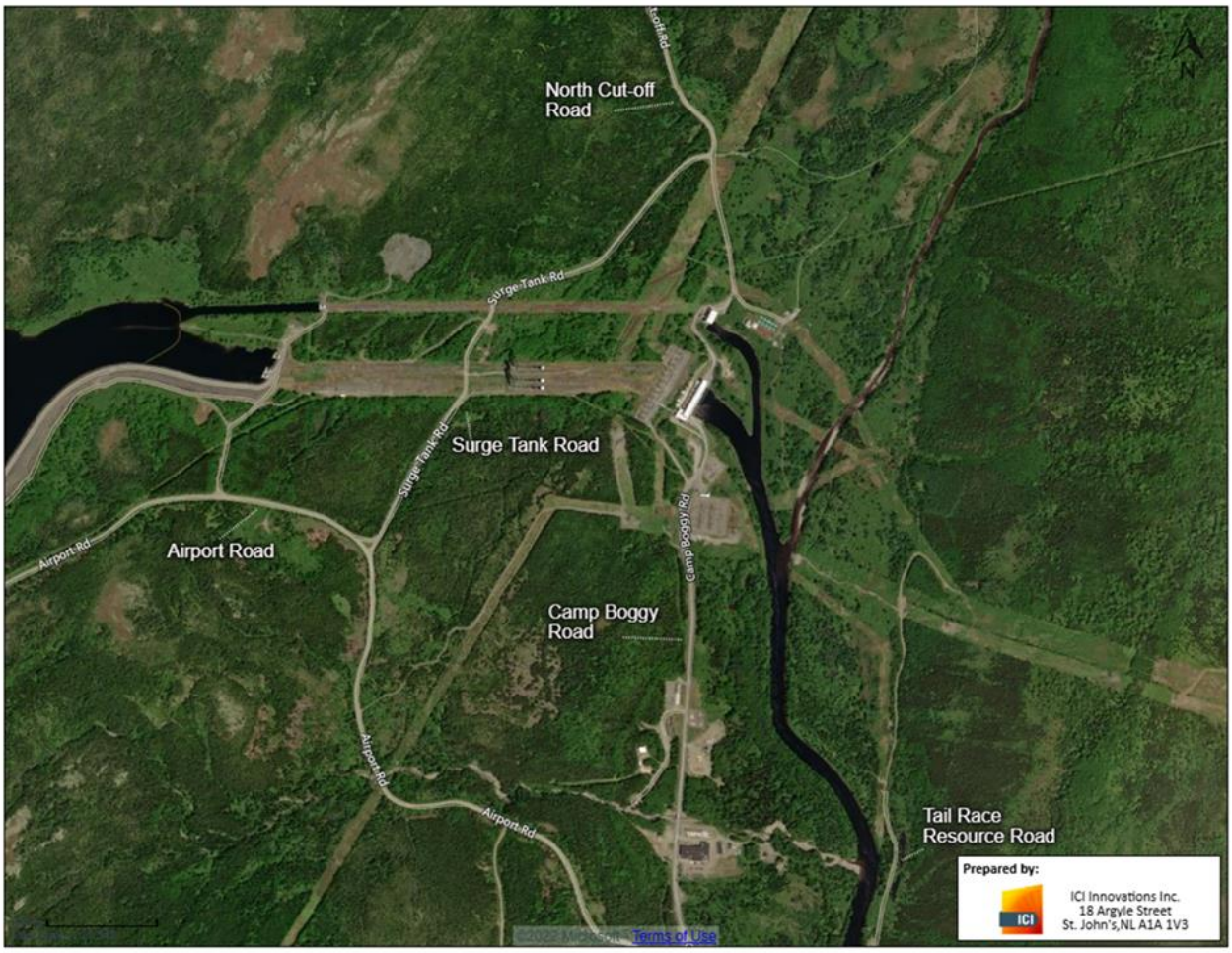

Figure 3-9: Existing Road Networks

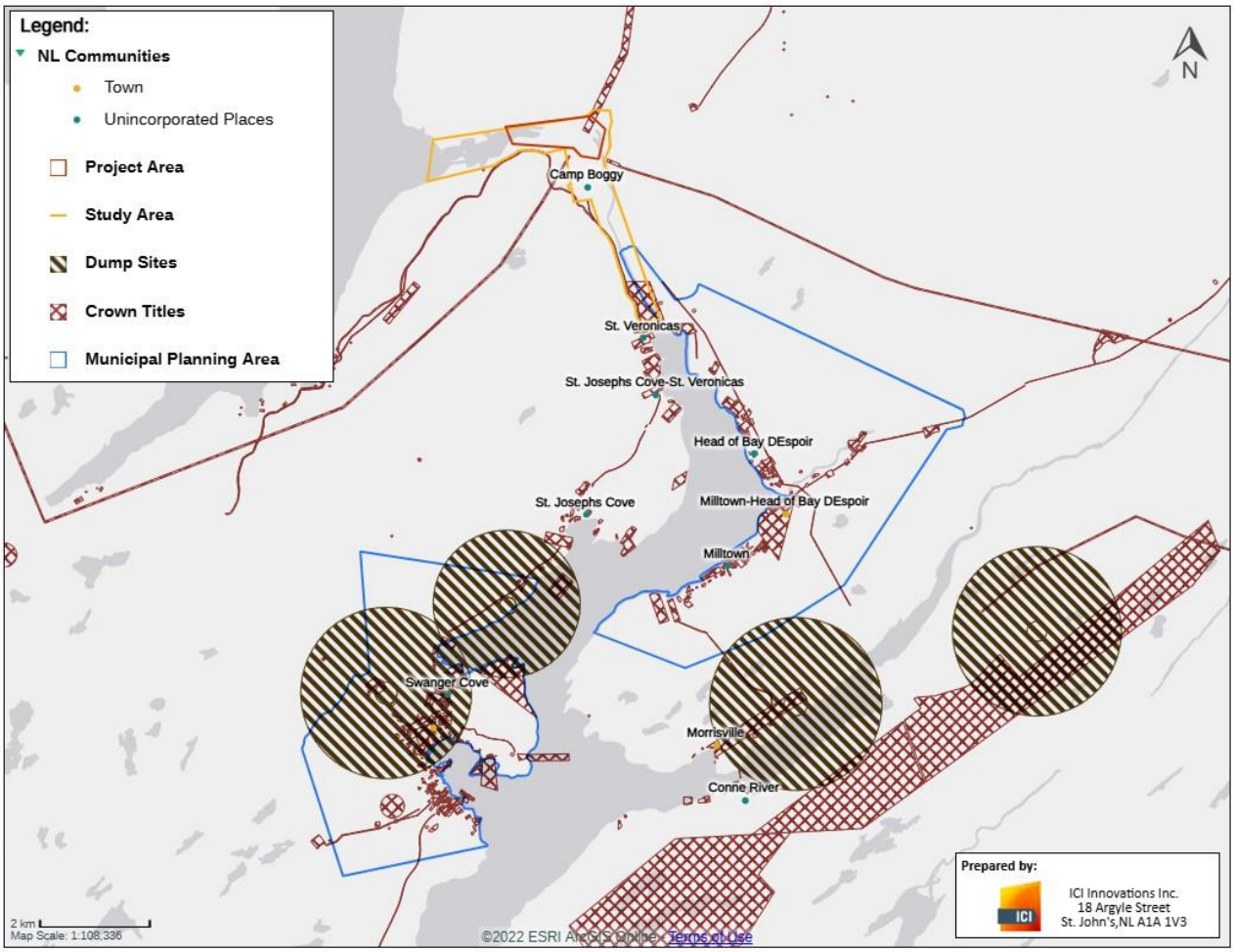

Figure 3-10: Existing Municipal and Commercial Land Uses

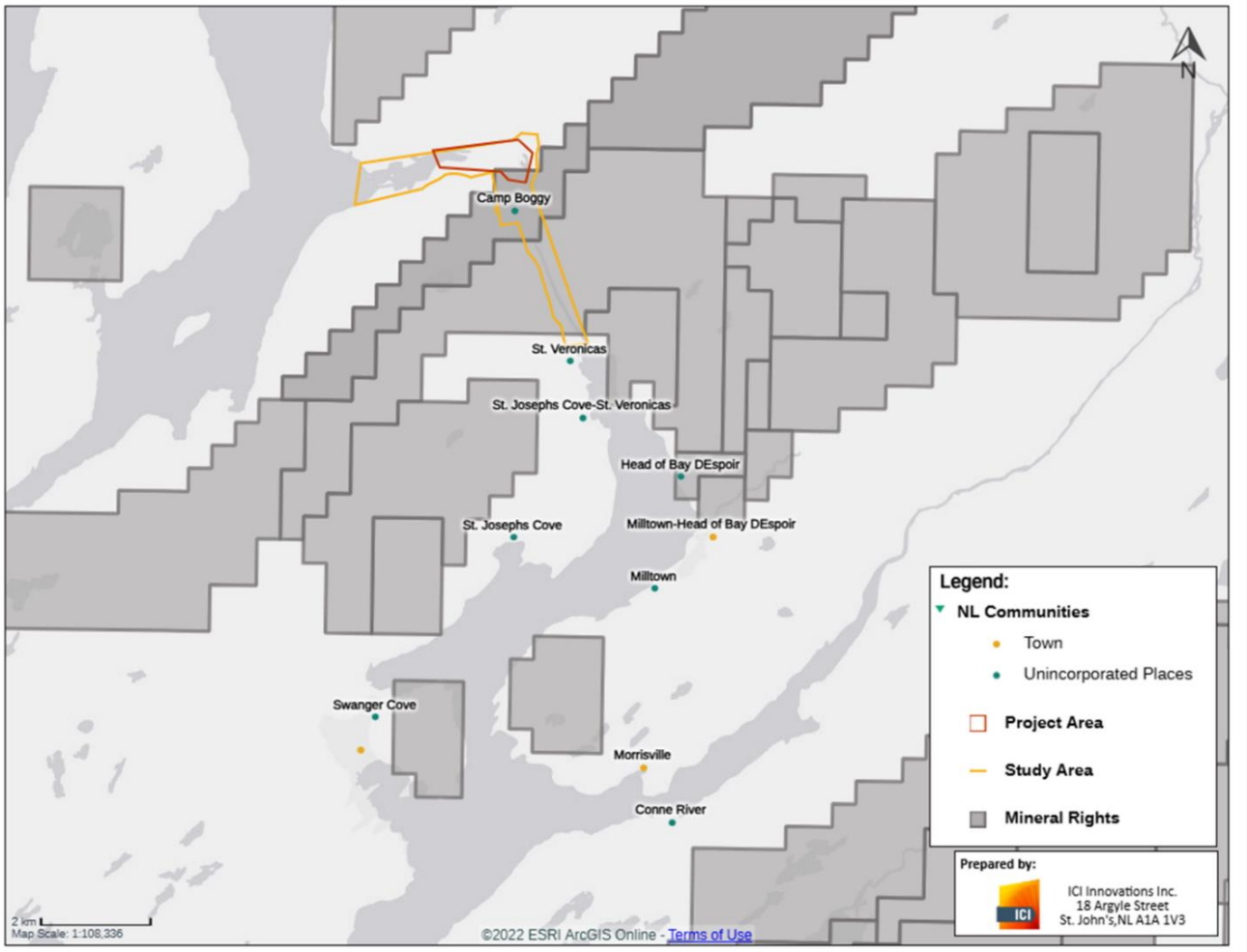

Figure 3-11: Existing Mineral Rights Near the Project Area

There are existing commercial outfitting camps in the general areas as well, neither of which is closer than 20 km from the proposed Project site (Figure 3-12). The region is also home to a significant aquaculture industry, including existing and operational facilities that produce salmon, trout and other species downstream of the hydroelectric facility where freshwater inflows from the upper Bay d'Espoir region funnels into the salt water environments of the bays and fiords along the southern coastline of the Island of Newfoundland (Figure 3-13).

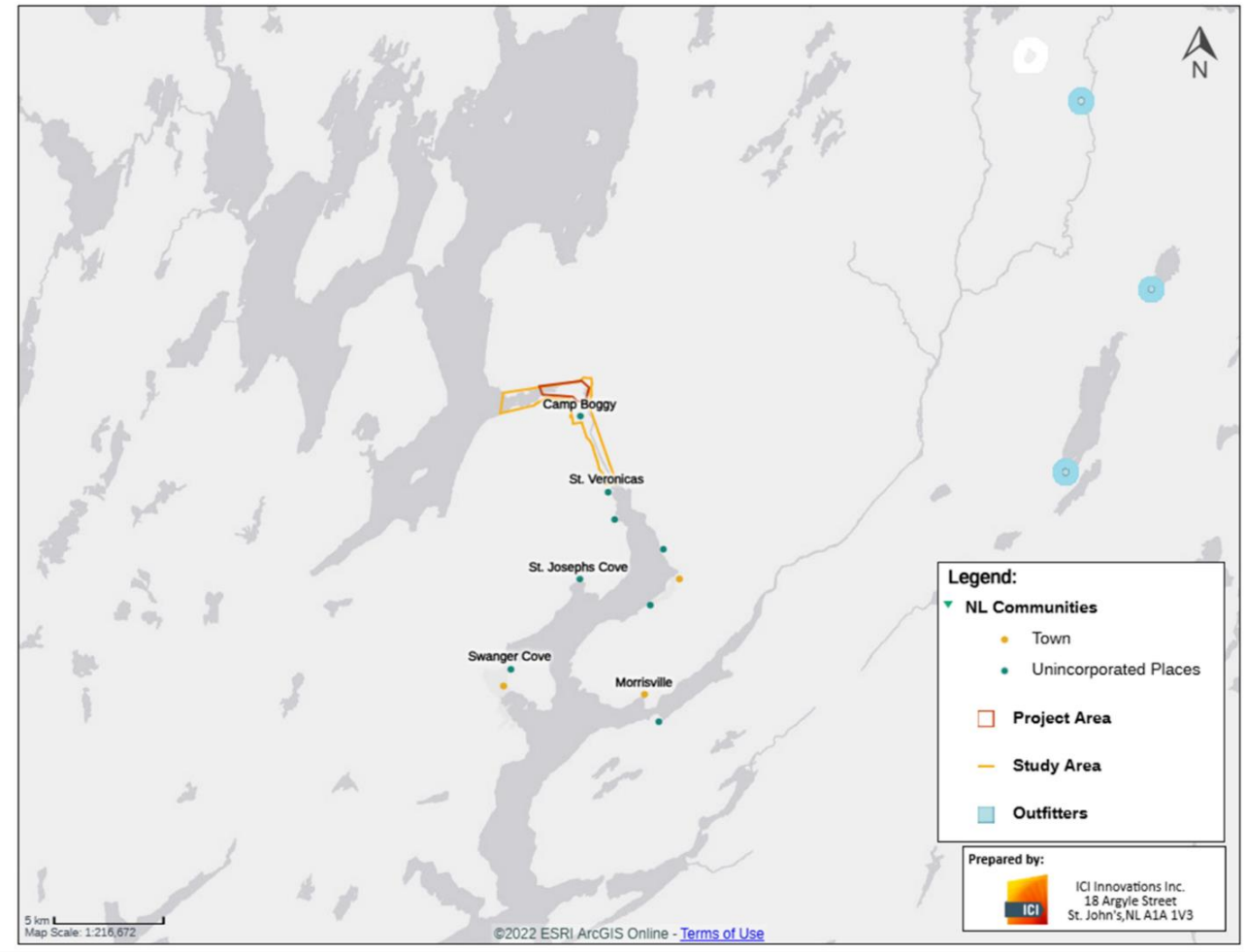

Figure 3-12: Existing Commercial Outfitting Operations

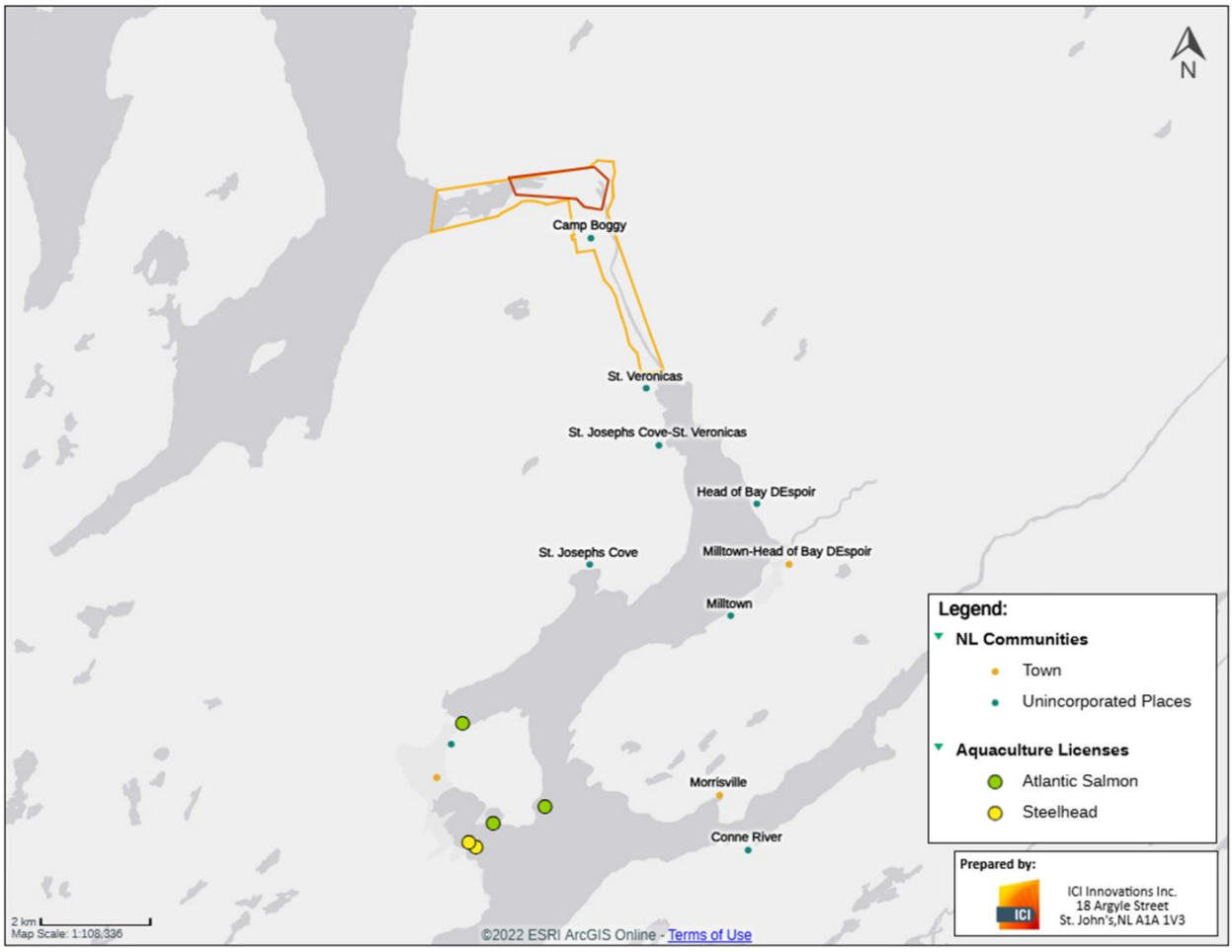

Figure 3-13: Existing Aquaculture Facilities

3.2.6 Historic Resources

Historic resources are works of nature or by humans that are primarily of value for their archaeological, prehistoric, historic, cultural, natural, scientific or aesthetic interest. These may include archaeological, prehistoric, historic or natural sites, structures or objects. Such resources are identified and protected under the NL Historic Resources Act (1990) administered by the Provincial Archaeology Office (PAO) of the Newfoundland and Labrador Department of Tourism, Culture, Arts and Recreation. Development activities that involve the clearing of vegetation and other ground disturbance may disturb or destroy historic resources if they are present within the eventual project "footprint".

Based on information available from the PAO database, there are no known historic resources located within or near (within 5 km of) the Project Area itself (S. Hull, pers com), and little in the way of areas with archaeological potential have been identified in the area in previous studies (e.g., GPA 2015).

3.2.7 Protected and Special Areas

A few areas in south-central Newfoundland have been designated as protected under legislation or have been otherwise identified through relevant forums and processes as being special or sensitive due to their ecological, historical and/or socio-cultural characteristics and importance.

A desktop review of known protected and special areas was completed using existing and available mapping and other sources of information. This review identified the following located within an approximately 50 km radius of the proposed Project Area (Figure 3-14):

Provincial Parks/Park Reserves

- Newfoundland and Labrador features a network of 32 provincial parks that conserve natural beauty and biodiversity and provide opportunities for residents and visitors to explore nature.
- Provincial parks facilitate camping and outdoor recreation, scientific research and monitoring, outdoor education, and sustainable tourism activities (NL DTCAR 2024).
- Provincial Park reserves are former provincial camping parks (pre-1997) where the campground area was deproclaimed and privatized while the remainder of the provincial park was retained to protect natural features.
    - Jipujijkuei Kuespem: Located on Route. 360, near Bay d'Espoir on the south coast, this park reserve is part of the traditional hunting grounds of the Mi'kmaq people. This reserve was created to protect examples of forested ecoregions (Parks NL 2024).

Wilderness and Ecological Reserves (existing and proposed)

- The Government of Newfoundland and Labrador designates wilderness and ecological reserves under the Wilderness and Ecological Reserves Act, with 20 such reserves created in the province since this legislation was passed in 1980.
- These reserves are administered by the Natural Areas Program, Policy, Planning and Natural Areas Division within the Department of Environment and Climate Change.
- The Wilderness and Ecological Reserves Advisory Council (WERAC) is an independent group of government-appointed volunteers from across the province that advises government on the establishment of new reserves and the management of existing ones.
    - Bay du Nord Wilderness Reserve: One of the last major unspoiled areas remaining on the Island of Newfoundland. Its 2,895 Square kilometer (km^2) of wilderness environment encompass: the largest protected river system in the province; the Canadian Heritage River-nominated Bay du Nord River; spectacular topographic features that include Mount Sylvester in the east, the Tolt in the west, and Smokey Falls on the Bay du Nord river; much of the range of the Middle Ridge caribou herd, which extends into the adjacent Middle Ridge Wildlife Reserve; and the largest Canada goose habitat in Newfoundland.
    - Conne River North (Proposed Ecological Reserve): Approximately 22 km^2 in size, located east of the Bay d'Espoir highway (Route 360), northeast of Conne River. Representative of the Central Newfoundland Forest – Twillick Steady Natural Region.

- Facheaux Bay (Proposed Ecological Reserve): Approximately 900 km^2 in size, located on the south coast of Newfoundland (north of McCallum). Representative of the Maritime Barrens – South Coast Barrens Natural Region (NL DECC 2024).

Wildlife Reserves

- Wildlife Reserves are established under the relevant provisions of the Newfoundland and Labrador *Wild Life* Act.
  - Middle Ridge Wildlife Reserve: This 618 km^2 Reserve was established in 1990, for the purposes of protecting the Middle Ridge caribou herd, which is the largest herd on the Island (approx. 8,000 animals) and has its calving grounds throughout Middle Ridge and the neighbouring Bay du Nord Wilderness Reserve. The Reserve is also an Important Bird Area (IBA) due to the presence of the Newfoundland subspecies of Rock Ptarmigan, Willow Ptarmigan and several species of waterfowl, such as Canada Goose, American Black Duck and Common Merganser which are also present in the Reserve. Harlequin Duck have also been observed in the area (NL Wildlife Division 2024).

Heritage Rivers

- The Canadian Heritage Rivers System was established in 1984 to conserve and protect the best examples of Canada's river heritage, to give special rivers national recognition, and to encourage the public to enjoy and appreciate them.
- Newfoundland and Labrador is home to two Canadian Heritage Rivers – 1) the Main River, and 2) the Bay du Nord River.
  - The Bay du Nord River system was nominated in 1992, and designated in 2005, and is the province's second Canadian Heritage River. Flowing through the pristine landscape of the Bay du Nord Wilderness Reserve, it sweeps paddlers past wide barrens where caribou roam, through whitewater rattles and quiet pools where trout and salmon swim, and then down to the salt waters of Fortune Bay on Newfoundland's south coast (NL DECC 2024).

Protected Waterbody (Domestic Water Supply Areas)

- A Protected Public Water Supply Area (PPWSA) is an area of land around a source of public drinking water that has been protected under Section 39 of the Water Resources Act. (NL WRMD 2024).
  - The following PPWSAs are located within a 50 km radius of the proposed Project Area: 1) St. Albans, 2) Milltown - Head of Bay D'Espoir, 3) Morrisville, 4) Conne River, 5) Gaultois, 6) Pool's Cove, 7) Hermitage – Sandyville, 8) McCallum.

The proposed Project does not interact directly with any of these on-land protected and special areas.

There are no known protected or special areas in the marine environment immediately adjacent to the Project and specifically, the downstream outflow into Bay d'Espoir/Hermitage Bay (DFO 2024).

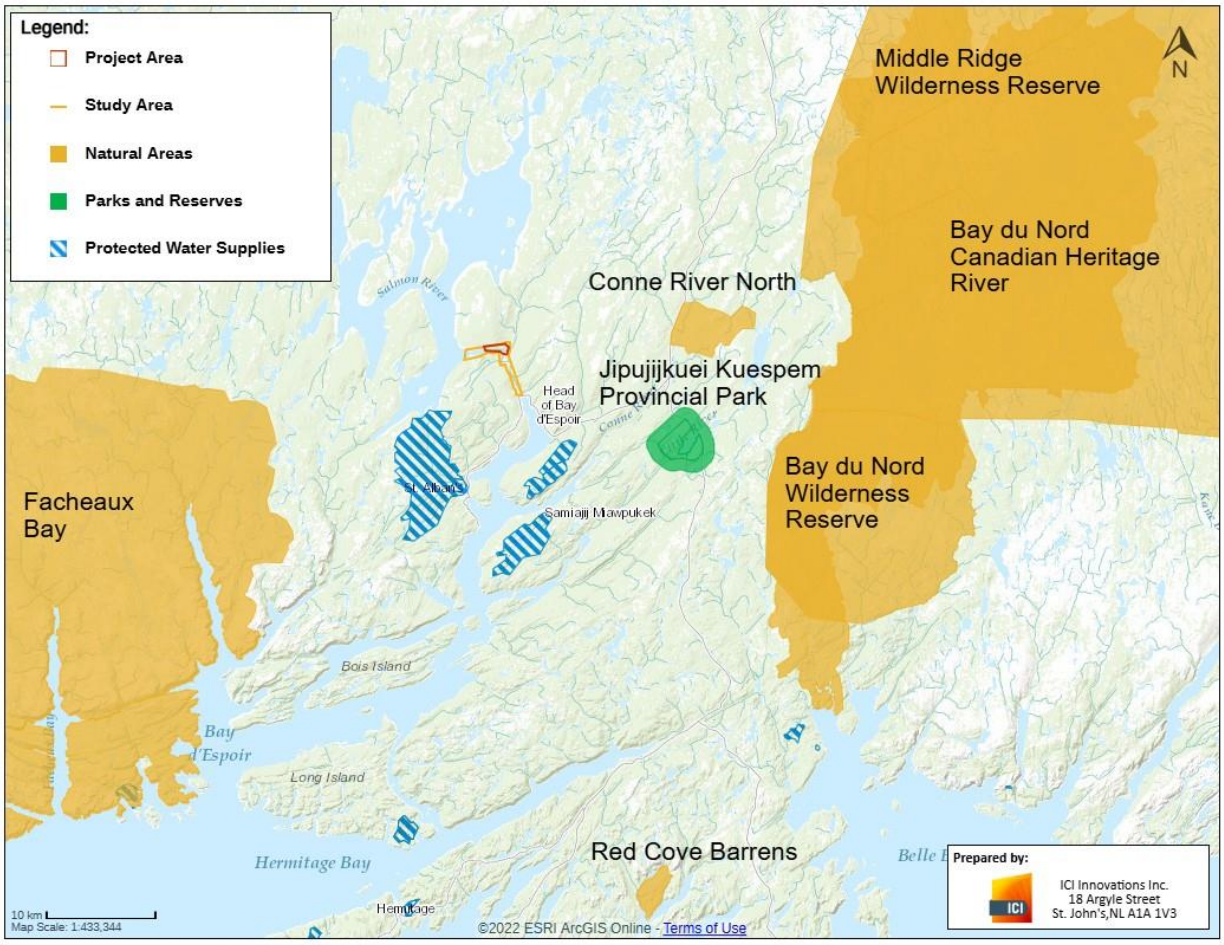

Figure 3-14: Protected and Special Areas

4.0 Engagement

Public and Indigenous participation is an integral component of the EA process, and a key aspect of NL Hydro's approach to the planning and implementation of its development projects and operational activities. Allowing opportunities for interested parties to bring forward their views, identify issues, and ask questions about a project allows for more constructive dialogue, and better overall project planning and design to alleviate potential concerns.

NL Hydro is committed to full and open engagement, and to facilitating meaningful dialogue with people and groups that have an interest in the Project. This has included meeting with local communities, Miawpukek First Nation, government departments, and other stakeholder organizations in advance of preparing and submitting this EA Registration document. These engagement activities have been designed and implemented to provide accurate, timely and meaningful information to interested stakeholders. They have also given participants an opportunity early in the project planning stage to ask questions, identify issues and concerns, and share knowledge and perspectives about the Project and its surrounding environment for consideration in on-going Project planning.

The various engagement activities and key outcomes are summarized in this chapter, along with an indication of where and how the various questions and issues raised are addressed in the EA Registration.

4.1 Government Engagement

NL Hydro recognizes that various provincial and federal government departments and agencies may have responsibilities or interests related to the proposed Project and its potential environmental effects because of associated legislation, regulations, policies, and other relevant mandates and programs.

As a result, NL Hydro has met in advance with various provincial and federal departments prior to the submission of this registration document. This was done to provide initial Project information and receive initial feedback from relevant regulatory authorities on potential issues of concerns that could be addressed proactively. A summary of NL Hydro's governmental engagement activities is provided in Table 4-1. This includes information on the specific department or agency consulted, meeting time and location, and the general purpose and focus of each discussion.

Table 4-1: Engagement with Government Departments and Agencies

Date (dd/mm/yyyy)	Department/Agency	Location	Purpose/Focus
15/08/2024	Newfoundland and Labrador Department of Environment and Climate Change (NLECC) EA Division and Water Resources Management Division	Virtual	Provide the Government of NL with an overview of the project and receive feedback on any points of interest for the eventual registration of the project with the EA Division.
10/09/2024	Fisheries and Oceans Canada	Virtual	Provide DFO staff with overview of the project and receive feedback on issues specific to DFO.
18/06/2025	NLECC Pollution Prevention and Climate Change Divisions	Virtual	Provide Division staff with overview of the project and receive feedback on issues specific to the Divisions.
19/06/2025	NLECC EA Division	Virtual	Provide Division with an update on project status and anticipated timing for submission of Registration.
25/06/2025	NLECC Water Resources Management Division	Virtual	Provide Division with overview of the project and receive feedback related to water resources and water use in relation to the Project.

4.2 Indigenous Engagement

NL Hydro's 2023-25 Strategic Plan highlights the importance of meaningful engagement with local Indigenous Communities in the province. As part of this Strategic Plan, Goal 3 aims to recognize Indigenous history and to build respectful, sincere, and meaningful relationships with Indigenous Peoples that may be potentially affected by or interested in NL Hydro's operations.

Consistent with the Strategic Plan, NL Hydro has engaged with Miawpukek First Nation (MFN) respecting the Project since late 2023. NL Hydro met with representatives of Band Council and staff in June and November 2024 to provide overviews of the proposed project and gather feedback. In coordination with MFN, two community meetings have been scheduled for August 14 in Conne River for interested residents to attend and receive more information about the proposed project. (In-person Project information sessions for residents were originally scheduled to be held in Conne River in the first week of June 2025; however, these sessions were postponed at the suggestion of the Project Coordinator for community-related reasons.) NL Hydro is also planning to hold other community sessions in Conne River as the Project progresses.

Based on the input and feedback from the meetings and follow-up correspondence from Chief Benoit in November 2024, NL Hydro is aware of issues of interest as well as concerns on the part of MFN membership related to the original Bay d'Espoir hydro development, and the importance of ongoing engagement respecting the proposed Project to MFN membership. After these meetings, to facilitate dialogue and information exchange respecting the proposed Project, NL Hydro has provided funding to MFN for a community-based Project Coordinator. NL Hydro has committed to holding at least four community information sessions with MFN membership throughout the life of the Project to provide information related to the Project, regulatory processes, and to continue to discuss issues and concerns. In addition, as requested by MFN, NL Hydro has offered to conduct a dedicated technical session, which could include topics such as flow modeling in the tail race channel, and comparisons of expected outputs and discharge with Unit 8 to historical outputs and associated flow volumes.

Active engagement with MFN has continued since 2024 through correspondence, telephone calls and virtual meetings.

NL Hydro are committed to continuing engagement with MFN as the Project progresses and working with MFN staff to share project employment and procurement information. A summary of key engagement activities to date is provided in Table 4-2.

Table 4-2: Summary of Dedicated Indigenous Engagement Activities

Date (dd/mm/yyyy)	Indigenous Group	Location/Activity	Purpose/Focus
18/06/2024	Miawpukek First Nation	In person – Conne River	Provide an overview of the Project to MFN and hear feedback and potential issues or concerns
06/11/2024	Miawpukek First Nation	Virtual / Ta'n Etl-Mawita'mk Community Center	Provide an overview of the Project to MFN and hear feedback and potential issues or concerns.
21/11/2024	Miawpukek First Nation	Correspondence from Chief Benoit	Identifying Project related concerns and potential engagement initiatives
31/03/2025	Miawpukek First Nation	Correspondence from NL Hydro	Outlining proposed engagement strategy
01/01/2025 to Present	Miawpukek First Nation	Regular virtual meetings with Project coordinator	To provide Project updates, discuss regulatory process, community issues and concerns and to plan engagement activities

Date (dd/mm/yyyy)	Indigenous Group	Location/Activity	Purpose/Focus
21/05/2025	Miawpukek First Nation	Correspondence to Project Coordinator	Provision of Project-related information and link to web-based materials for circulation to residents
09/07/2025	Miawpukek First Nation	Correspondence from Chief Benoit	Reiterating Project-related concerns and funding to support a number of consultation initiatives

4.3 Stakeholder Engagement

NL Hydro recognizes that the communities of St. Alban's, Milltown - Head of Bay d'Espoir, St. Veronica's – Saint Joseph's Cove, and others are in general proximity to the proposed Project and need to be informed on the Project as it progresses. Engagement activities with municipalities began in late 2023 in the form of initial high-level meetings with town councils. In addition to these municipalities being invited to the public open house sessions in 2025 (Section 4.4), dedicated meetings were held between NL Hydro and the Towns of St. Alban's and Milltown – Head of Bay d'Espoir in 2023 and 2024 to discuss the Project in detail. A summary of key engagement activities to date is provided in Table 4-3.

Table 4-3: Summary of Stakeholder Engagement Activities

Date (dd/mm/yyyy)	Stakeholder	Location/Activity	Purpose / Focus
16/10/2023	Town of St. Alban's	Town office/In person meeting	To provide information on the proposed Project plan, and gather any early feedback from Council
17/10/2023	Town of Milltown-Head of Bay d'Espoir	Town office/In person meeting	To provide information on the proposed Project plan, and gather any early feedback from Council
05/11/2024	Town of St. Alban's/Town of Milltown	Virtual	To provide more details on the proposed Project Design and Plan, and to gather feedback from communities on any potential issues / concerns

Aquaculture operators in the region were also contacted and notified about the proposed Project and the upcoming public information sessions that all stakeholders could attend.

In addition to dedicated meetings regarding the Project, additional meetings were held in September and October of 2024 with the Municipal Councils Committee (a collection of representatives from St. Alban's and Milltown) to discuss NL Hydro's overall operations in the Bay d'Espoir region. The Project was a discussion point in these meetings, so it was another method of engagement to inform the municipalities around the Project and its associated activities.

4.4 Public Engagements

NL Hydro conducted a series of public meetings in adjacent communities in March of 2025 to provide information on the Project and to record any associated questions or concerns that local residents and

other interested members of the general public may have. An overview summary of these public information sessions is provided in Table 4-4.

Table 4-4: Public Information Sessions

Community	Venue	Date (dd/mm/yyyy)	Time
St. Alban's	St. Alban's Lion's Club	04/03/2025	6-9 pm
Milltown – Head of Bay d'Espoir	Milltown Lion's Club	05/03/2025	6-9 pm

4.4.1 Notifications and Advertisements

Public notifications were issued in advance of these information sessions, which included advertisements in local venues, radio ads, and social media postings to raise local awareness of the Project. Table 4-5 provides an overview of how awareness was raised for the 2025 open house sessions.

Table 4-5: Public Engagement Notification Methods

Notification Method	Summary
Social Media	
NLH Facebook	Four (4) posts, beginning on February 21st
X/Twitter	Four (4) posts, beginning on February 21st
Town of St. Alban's Facebook Page	Cross-promotional posting on the Town's Facebook page
Town of Milltown Facebook Group	Cross-promotional posting on the Town's Facebook Page
Radio Ads	
CHCM, CKCM, and CKXG	February 21st to March 5th (50 commercials) to promote awareness
Other Communications	
Information sessions and Emails to Hydro's Bay d'Espoir employees (who are also area residents)	Two information sessions were held with NL Hydro's local employees about the project. Email was sent notifying them of the public open houses
Bulletins at local venues	Notices / Bulletins were provided at the local Lions Club for the Town of St. Albans and Milltown (where sessions occurred)

The public notice (Figure 4-1) was also sent by email to local Town Offices as well as to the Miawpukek First Nation and to all NL Hydro employees in the region. It was also posted in public locations throughout these communities (Figure 4-2).

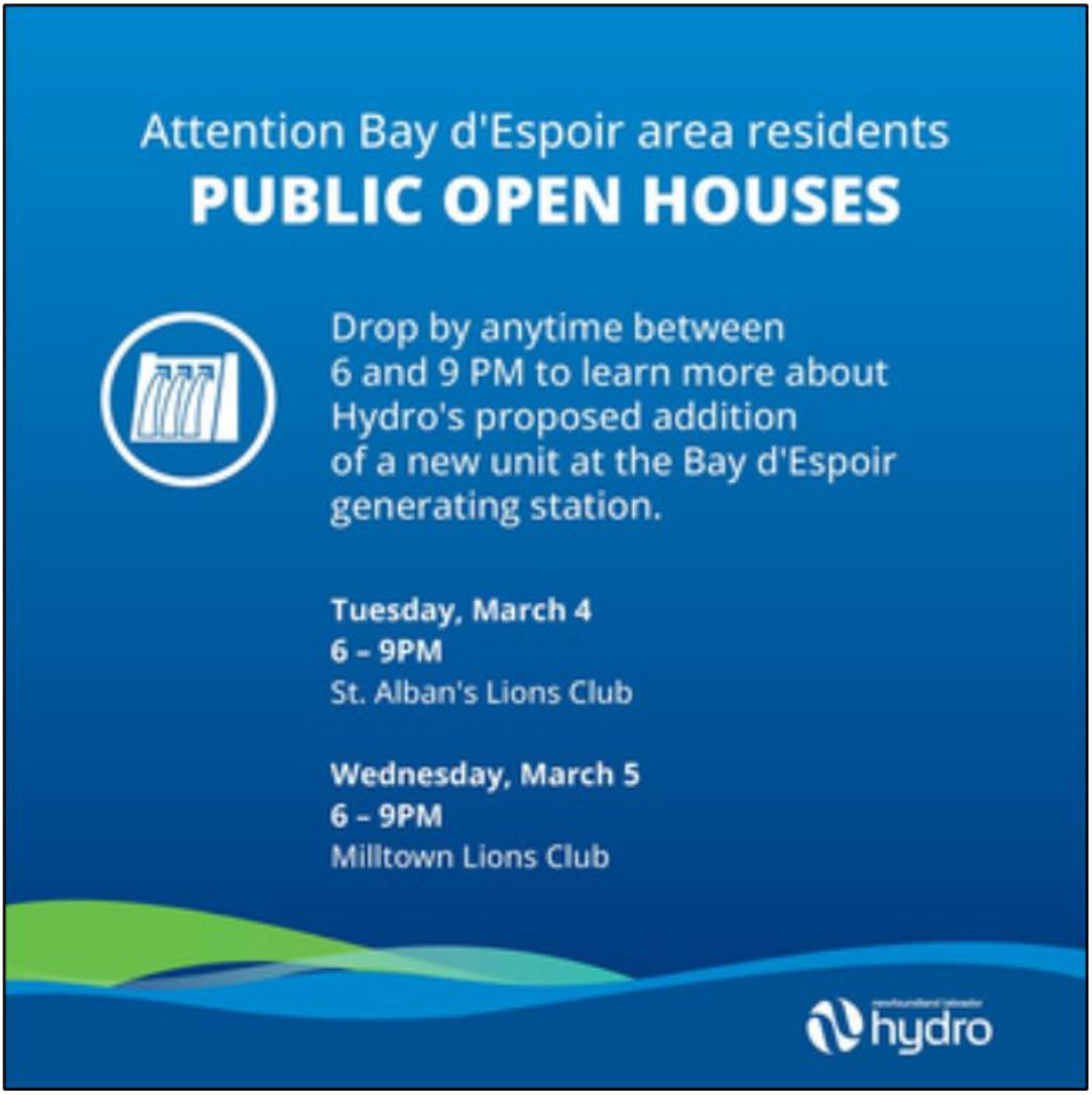

Figure 4-1: Bulletin for Planned Open House Sessions Included in Social Media Posts and Provided to Local Communities

Figure 4-2: Example of Facebook Posting on NL Hydro Facebook Page for Public Sessions

If people were unable to attend the open houses, they were encouraged to contact NL Hydro directly at projectfeedback@nlh.nl.ca with any questions or input, and all public notices and advertisements included contact information for stakeholders to provide feedback. This dedicated email was shared on all initial and ongoing notifications and project materials inviting stakeholders to send questions, concerns, and all related feedback for record and response.

4.4.2 Format and Information Materials

The public information sessions in 2025 were conducted as "drop in" open house sessions, held at the communities and venues summarized above. This format allowed interested stakeholders to come to the sessions on their own time, and to receive information, ask questions and provide input in whatever manner and format that they felt most comfortable. By adopting this open house format, the NL Hydro Team attempted to establish a relatively informal and relaxed environment, where participants could provide input and ask questions through one-on-one conversations, and/or in small groups as they preferred. NL Hydro representatives were present at each session to provide information, answer questions and to record questions, issues and perspectives raised about the Project.

Upon arrival, participants were greeted by a NL Hydro representative at a sign-in table, who provided an overview of the open house purpose and information "circuit" type format. Information sheets were also provided to attendees, which provided some basic information on the Project, and complimented the additional information stations in the session. The session included several theme-specific information stations arranged throughout the open house venue, consisting of large information panels (Figure 4-3; Figure 4-4) that focused on the following topics: 1) NL Hydro and the existing Bay d'Espoir generating facility; 2) the proposed Unit 8 Project – key components and layout; 3) planned Project construction and operations; 4) economic and employment activity; and 5) the EA process and proposed environmental management and protection measures.

Figure 4-3: Open House Session Format Showing Welcome Station and Additional Stations in the Venue

Figure 4-4: Open House Attendees Speaking with NL Hydro Representatives at one Information Station

The purpose of these information panels was to provide general background information, and to serve as a basis for prompting dialogue and the sharing of information and input by participants. At the public open houses, NL Hydro personnel were clearly identified and were positioned at the stations to discuss the Project and answer questions. Information sheets were also available, and before leaving, participants were encouraged to complete a feedback form or email NL Hydro with comments or questions.

A key focus of the information sessions and associated discussions was on obtaining and recording information and input related to:

- Questions, issues or concerns regarding Project and its potential environmental or socioeconomic effects;
- Local knowledge regarding the existing biophysical or socioeconomic environment in or near the Project Area; and
- Suggestions for any mitigation measures or other means through which any identified issues could be addressed in future Project planning and decisions/actions.

The engagement team members took notes and recorded input received throughout the sessions, and also met as a group to debrief, record and compile all information and input received. Feedback forms were also provided to attendees to take home and send in should they wish, rather than providing immediate feedback in the sessions.

A total of 52 participants attended the public open house sessions. The overall summary of feedback is provided in Section 4.5 and **Appendix D**.

4.5 Overview of Identified Public Stakeholder and Indigenous Community Questions and Concerns

Several key topics and themes were identified and noted during the above-described engagement with Stakeholders, communities and Miawpukek First Nation. These topics are summarized in Table 4-6, along with a general indication of where each is addressed in this EA Registration document.

Table 4-6: Summary of Environmental Questions and Considerations Raised During the EA Engagement Program

Question/Concern Raised	Where Addressed in EA Registration
Project Design and Operation	
Some concern about this project being planned, along with a penstock refurbishment scheduled for 2025 as well. Residents would benefit from a description and schedule for each project.	• Section 2.7 – Project Schedule and Capital Cost
Concern over whether additional damming of water needs to take place	• Section 1.4 – Project Overview • Section 2.3 – Project Components
Want to know whether there would be a change in flooding or water levels with the new unit in place	• Section 5.4.2.2 – Effects Assessment of Operations on Aquatic Environment • Appendix E – 2D Tailrace Modelling
Biophysical Environment	
Concern over changes in water quantity and quality associated with the new Unit 8, and its potential effects on the marine environment	• Section 5.4.2.2 – Effects Assessment of Operations on Aquatic Environment • Appendix E – 2D Tailrace Modelling
Socioeconomic Environment	
Local Communities would like to see increased investment and benefits from NL Hydro (e.g., improving local infrastructure)	• Section 4.2 and 4.3 – commitments to provide project updates and Section 5.6.2.2

Question/Concern Raised	Where Addressed in EA Registration
Local roads, culverts, etc. are in poor condition. Would like to see some commitment to help with that	• Section 4.2 and 4.3 – commitments to provide project updates and Section 5.6.2.2
Local hoteliers would like to be notified in advance whether contractors will be setting up a work camp or availing of local accommodations	• Section 5.6.2.2.1 – Effects Assessment of Economy, Employment and Key Industries
General support for the project and the long-term investment within the region	• Section 5.6.2.2.1 – Effects Assessment of Economy, Employment and Key Industries
Optimism for local employment and business activity and opportunities. Local qualified residents should be prioritized for hiring	• Section 5.6.2– Economy, Employment, and Key Industries
Concern over potential for local medical and emergency response personnel to be strained by an influx of construction workforce and the increased potential for accidents occurring on site	• Section 5.6.1 – People and Communities
Concern with landscape changes, including the widening of the tailrace and associated sediment that would be pushed downstream	• Section 5.4.2.2 – Effects Assessment of Operations on Aquatic Environment • Section 5.6.3 – Land and Resource Use
Wondering if the Project would impact overall utility costs	• Section 2.1 – Project Purpose, Rationale and Need
Questions on whether Project activity would temporarily or permanently alter access to local ATV trails in the area	• Section 5.6.3 – Effects Assessment of Land and Resource Use
Indigenous Concerns (MFN)	
Concern respecting potential negative impacts upon food, social and ceremonial fisheries	• Section 5.4.2.2 – Effects Assessment of Operations on Aquatic Environment • Appendix E – 2D Tailrace Modelling Study for Unit 8
Concern respecting potential negative impacts upon culturally important species – salmon, eels and elvers, salmon grass	• Section 5.4.2.2 – Effects Assessment of Operations on Aquatic Environment • Appendix E – 2D Tailrace Modelling Study for Unit 8
Potential impacts on human health	• Section 5.4.2.2 – Effects Assessment of Operations on Aquatic Environment • Appendix E – 2D Tailrace Modelling
Concern that impacts of Unit 8 may impair progress in restoring biodiversity of Bay d'Espoir and salmon counts in Conne River and associated river systems	• Section 5.4.2.2 – Effects Assessment of Operations on Aquatic Environment • Appendix E – 2D Tailrace Modelling
Need for adequate resourcing to participate in EA process and consultation	• Section 4.2 - Indigenous Engagement
Process for disposition of any accidental finds of historic or archaeological resources	• Section 5.6.3 – Land and Resource Use
Potential interference with traditional harvesting practices	• Section 5.4.2.2 – Effects Assessment of Operations on Aquatic Environment • Section 5.6.3 – Land and Resource Use

Question/Concern Raised	Where Addressed in EA Registration
The absence of baseline data on the potential effects of discharging additional freshwater into Bay d'Espoir on marine life, habitats, and ecosystems	• Section 3.14 – Surface Water Resources (Quantity and Quality), specifically subsections 3.1.4.2 to 3.1.4.6 • Section 5.4.2.2 – Operations and Maintenance, including Table 5-12 and Figure 5-2 • Appendix E – 2D Tailrace Modelling Study for Unit 8
The lack of downstream environmental monitoring to assess impacts from the Hydroelectric Generating Station on Bay d'Espoir.	• Section 3.14 – Surface Water Resources (Quantity and Quality), specifically subsections 3.1.4.2 to 3.1.4.6 • Section 5.4.2.2 – Operations and Maintenance, including Table 5-12 and Figure 5-2 • Appendix C – Environmental Protection Plan • Appendix E – 2D Tailrace Modelling Study for Unit 8
The absence of long-term planning and consistent environmental data collection	• Sections 2.1 – Project Purpose, Rationale and Need • Section 2.2 – Project Planning and Alternatives • Section 2.7 – Project Schedule and Capital Cost • Section 3.1 – Biophysical Environment, subsections 3.1.1 to 3.17

5.0 Potential Environment Effects and Management

This chapter provides an assessment and evaluation of the Project's potential environmental effects. It is focussed on the Project components and activities described in Chapter 2 and considers the description of the existing environment within and adjacent to the Project Area provided in Chapter 3 and the results of NL Hydro's public, Indigenous and governmental engagement activities as described in Chapter 4. The analysis includes the associated identification of measures to avoid or reduce potential adverse effects, and to create and maximize potential benefits resulting from the Project.

5.1 Environmental Assessment Approach

This section outlines the scope and focus of the EA, as well as providing an overview of the approach and methods used to conduct the environmental effects assessment.

5.1.1 Scope and Focus

An EA requires an initial scoping exercise to define the key components and activities of the proposed project that is being assessed, as well as to establish the spatial and temporal boundaries for the assessment and identify the primary environmental components and issues to be considered. The scope of an EA should be established early in the process to ensure that the analysis remains focused, manageable and meaningful.

5.1.2 Project Components and Activities

A comprehensive overview of the Project, including each of its associated components and activities, was included in Chapter 2 – Project Description. As a summary, the key aspects of the Project that are particularly relevant to an evaluation of the potential environmental and social effects on the surrounding environment include the following:

Construction

- Movement/use of equipment and materials;
- Site preparation/staging (i.e., temporary accommodations camp, temporary batch concrete plant);
- Excavation of headrace channel;
- Installation of new intake and penstock;
- Construction and commissioning of powerhouse (Unit 8);
- Widening a segment of existing tailrace channel;
- Installation of transmission infrastructure; and
- Employment and expenditures.

Operations and Maintenance

- Operation of new generation facilities;
- Operation of new transmission infrastructure;
- Water flow/management (upstream and downstream); and
- Employment and expenditures.

Potential Accidental Events

- Infrastructure malfunctions;
- Spills; and
- Infrastructure fire.

These Project aspects and the associated components or activities of each are considered in this EA registration and their potential impacts are discussed further in this section. Their potential impacts were assessed against:

- **Air Quality**: changes in GHGs, dust, light, noise and vibrations associated with the use of on-site equipment, installation of infrastructure and other activities during construction and operations, and the potential for these changes in air emissions to affect fish, wildlife, and people.
- **Terrestrial and Aquatic Habitats**: potential effects due to clearing and excavation, and other construction and operations activities.
- **Water Quantity**: changes in surface water conditions (quantity, distributions, flows) and quality due to Project components and activities, including associated water use and management.
- **Land Use**: potential interference with people and their activities due to changes in land accessibility, or through Project-related noise, traffic (vehicular and vessel), personnel, or other disturbances.

- **Historic Resources**: potential alteration or destruction of historic resources as a result of clearing and excavating activity and other ground disturbance (if they are present).
- **Socio-economics**: such as the creation of Project-related employment and business opportunities, and associated economic effects at the local, regional and provincial scales.

5.1.3 Organization and Focus

An EA focuses on components of the environment that are of particular ecological and/or social importance, and which have the potential to be materially affected (either adversely or positively) by the proposed project under assessment. These may include both biophysical and socioeconomic aspects of the environment.

The environmental effects assessment is organized by, and focussed on, the following Valued Components (VC), the rationale for which is further outlined in Table 5-1:

1. Atmospheric Environment;
2. Aquatic Environment;
3. Terrestrial Environment; and
4. Socioeconomic Environment.

Table 5-1: Environmental Components Focussed on in the EA

Component	Overview and Rationale for Inclusion
Atmospheric Environment	• Development activities can interact with the atmospheric environment through the mobilization and use of equipment, the development and operation of other infrastructure, and other associated components and activities. • This includes potential air emissions (including GHGs), dust, noise, light and vibrations which may result from these activities. • The atmospheric environment can act as a 'pathway' for other effects, as there are clear inter-relationships between it and other components of the natural and socioeconomic environments, including several of the other components described below.
Aquatic Environment	• Fish resources and their habitats are important considerations in the EA of any proposed activities that occur within or adjacent to the aquatic environment. • This includes consideration of fish species, as well as relevant components of their habitats (such as water and sediment), given the clear interrelationships between these environmental components. • Any known species at risk are identified and considered within the existing environment description and in the environmental effects assessment • Potential impacts to fish and fish habitat from a food and social perspective.
Terrestrial Environment	• The inland and coastal areas of south-central Newfoundland are home to a variety of wildlife, including large and small mammals, various resident and migratory species of birds, and other species. • Wildlife can be found in or near the Project site at various times of the year, often moving in and out of the area at different times according to their life histories, habitat requirements and seasonal activities. • Many are an integral component of the local and regional environments and have important ecological and/or socio-cultural roles and value.

Component	Overview and Rationale for Inclusion
	• This includes consideration of wildlife species, as well as relevant components of their habitats given the clear interrelationships between these environmental components. • Any known species at risk (vegetation and wildlife) are identified and considered within the existing environment description and in the environmental effects assessment.
Socioeconomic Environment	Given the number and diversity of components and potential effects for the socioeconomic environment, individual effects assessments are provided for each of the following:
	People and Communities • The proposed Project will be adjacent to several communities in this region of south-central Newfoundland. • The physical health and social well-being of people and communities is of paramount importance, and the planning and eventual implementation of the Project will be very much focused on preventing any adverse implications for residents, as well as maximizing the socioeconomic benefits of the Project during its various phases.
	Economy, Employment and Business • The Project will create employment and business opportunities and other direct, indirect and induced economic benefits throughout its various phases. • Residents, communities and organizations have expressed interest in seeing the social and economic benefits of the Project maximized.
	Land and Resource Use • The lands and resources of this area are used for a variety of municipal, commercial, recreational and/or traditional purposes, by both residents and visitors. • Land and resource use is an important component of the human environment and overall cultural landscape, and reflects the characteristics, traditions and values of its people, the communities they live in, the way they make a living or supplement their incomes, and the outdoor activities that they partake in and enjoy for recreational and/or traditional reasons.
	Protected and Special Areas* • Several locations in south-central Newfoundland have been designated as protected under legislation and other processes, due to their ecological, historical or socio-cultural characteristics and importance. In addition to areas that may have existing and formal protection, several other locations have been identified as being special or sensitive to disturbance for ecological reasons, or for their associated human activities and values.
*Protected and special areas may be identified as such due to their natural and/or human environments and importance. They are included here under the "Socioeconomic Environment" only because they are often designated through public (societal) initiatives/processes.	

5.1.4 Study Areas

EA study areas (spatial and temporal boundaries) have been established to direct and focus the environmental effects assessment:

1. Spatial Boundaries: Two types of spatial boundaries have been identified and considered in conducting the environmental effects assessment:

- **Project Area**: which is an area that encompasses the planned Project components and activities (Chapter 2) and represents the "footprint" of the development as defined at the current stage of Project planning and design (Figure 5-1).
- **Study Area**: which encompasses the Project Area identified above and extends beyond it to include the possible zone of influence of any Project-related emissions and other disturbances and their potential environmental effects. For the purposes of the EA, this area has been conservatively set at approximately 2.5 km upstream from the existing intake gates, and approximately 4 km downstream from the powerhouse to the outflow into Bay d'Espoir at St. Veronica's (Figure 5-1).

In addition to the Project Area and Study Area, the environmental effects assessment also considers the characteristics and larger spatial and temporal distributions of the individual components under consideration. This includes the nature and movement patterns of any potentially affected fish or wildlife, as well as the overall extent and distribution of human components and activities, including adjacent communities, in the region. Although these are not specifically "mappable" per se, key aspects of the locations, distributions and/or movements of each environmental component (as they relate to the Project and Study Areas) are as presented in Chapter 3.

2. Temporal Boundaries: In all cases, the temporal boundaries include and encompass the planned timing of Project phases and activities, as well as the likely duration of any resulting environmental effects. In conducting the effects assessment, consideration is also given to the relevant temporal characteristics of the environmental components under consideration, including the timing of their presence within the Project and Study Areas, any particularly sensitive or critical periods, likely response and recovery times to potential effects, and any known and applicable natural (without-Project) variation in that environmental component.

The Project's potential environmental effects are assessed, and their significance is evaluated, within the above described spatial and temporal boundaries.

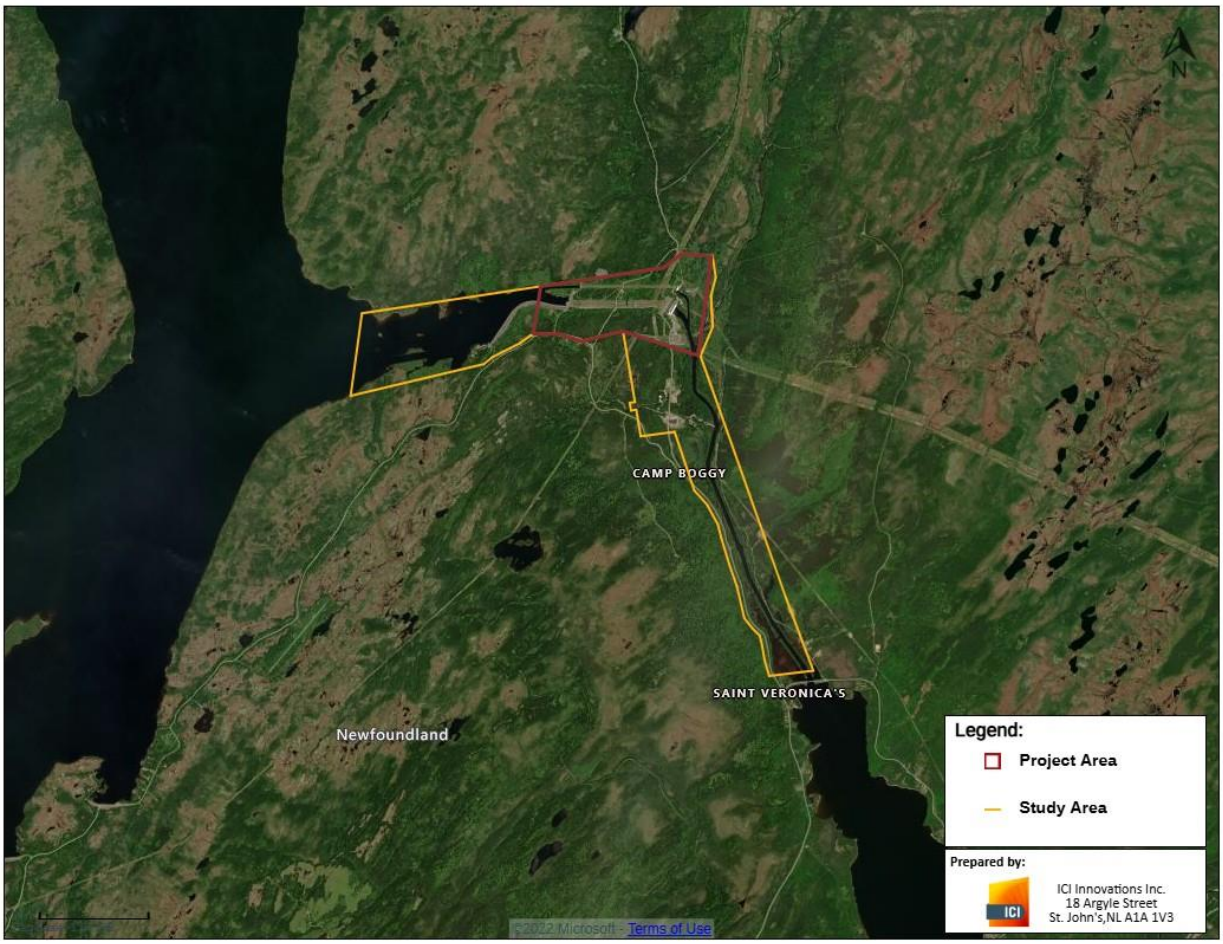

Figure 5-1: Identified Project Area (Red) and Study Area (Yellow)

5.2 Environmental Assessment Methodology

Environmental planning, management and mitigation measures are considered in a fully integrated manner in the environmental effects assessments that are presented in this Chapter. This includes those approaches and measures that have been incorporated into the Project as mitigation(s) through design to proactively avoid or reduce potential environmental impacts (as presented and discussed in detail within Chapter 2 of this projects EA Registration), as well as the other general and issue-specific environmental protection measures, which are presented and described in this section.

5.2.1 Potential Environmental Issues and Interactions

Based on the description of the existing environment (Chapter 3) and NL Hydro's engagement program (Chapter 4), the environmental effects assessment for each component identifies and focuses on a number of Key Indicators and Parameters, which are generally defined as an important aspect of the component which, if changed as a result of the Project, may result in an adverse effect (and to which such changes could potentially be detected and measured).

Table 5-2 (sample, for illustration purposes only) was then used to summarize the potential interactions between each of the main Project components and activities and each of these identified indicators and parameters.

Table 5-2: Potential Environmental Interactions

Project Component / Activity	Key Indicators and Parameters *				
	1	2	3	4	#
Construction					
Movement/use of equipment and materials					
Site preparation/excavation					
Construction of the headrace channel					
Construction of new intake					
Installation of penstock					
Construction of Unit 8					
Widening of tailrace channel segment					
Installation of transmission infrastructure					
Employment and expenditures					
Operations and Maintenance					
Operation of new generation facilities					
Operation of new transmission infrastructure					
Water flow/management (upstream and downstream)					
Employment and expenditures					
Potential Accidental Events					
Infrastructure malfunction					
Spills					
Fires					
*These indicators / parameters are identified and listed on a component-specific basis in the relevant table/section					

This matrix is used to guide and inform the subsequent assessment and evaluation of environmental effects and the associated identification of mitigation.

5.2.2 Environmental Effects Assessment Descriptors

This section provides an analysis (prediction) and description of the likely environmental effects of the Project on the environmental component. The environmental effects assessment considers the nature, degree, extent and timing of potential Project-induced change from the existing (baseline) environment (as described in Chapter 3).

Within this section, potential environmental effects are assessed and evaluated for both planned Project components and activities, as well as for any potential accidental events that may occur because of the Project. The environmental effects assessment for each component is presented for each Project phase, each of which is addressed in a separate subsection as follows:

1. Construction;
2. Operations and Maintenance; and
3. Potential Accidental Events.

Environmental effects management (including mitigation) measures are considered in a fully integrated manner in the effects assessment, which is therefore focused upon identifying and describing the likely residual environmental effects of the Project.

These predicted (residual) effects of the Project are described based on several standard and widely accepted environmental effects criteria or "descriptors", as listed and defined in Table 5-3.

Table 5-3: Environmental Effects Descriptors and Associated Ratings

Effects Descriptor	Definition and Ratings
Nature (Direction) of the Effect	*Adverse*, *Neutral* or *Positive* (as compared to baseline environmental conditions).
Magnitude	The degree of change from existing (baseline) conditions • **Negligible**: Although there is potential for interaction, there would be no likely detectable effect that would differ from current conditions or be outside natural variability. For the Atmospheric Environment: • **Low**: A minor, but detectable change to existing conditions, but one that is within the range of normal variability, or which does not change overall availability or quality of the environmental component or parameter; • **Medium**: A detectable change to existing conditions, but one that is within applicable regulatory standards and guidelines, or which does not change overall availability or quality of the environmental component or parameter; and • **High**: A detectable change to existing conditions that results in measurable and prolonged exceedances of applicable regulatory standards and guidelines or changes in overall availability or quality of the environmental component or parameter. For the Aquatic and Terrestrial Environments: • **Low**: Materially affects 0 to 10 percent of the population that occurs in the Study Area; • **Medium**: Materially affects 10 to 25 percent of the population that occurs in the Study Area; and • **High**: Materially affects over 25 percent of the population that occurs in the Study Area. For the Socioeconomic Environment: • **Low**: Affects 0 to 5 percent of individuals/users in the Study Area or is otherwise detectable, but does not change overall availability, quality or value of the environmental component or parameter; • **Medium**: Affects 5 to 25 percent of individuals/users in the Study Area or is otherwise detectable, but is within applicable regulatory standards and guidelines and/or does not change overall availability, quality or value of the environmental component or parameter; and

Effects Descriptor	Definition and Ratings
	• **High**: Affects over 25 percent of individuals/users in the Study Area or is otherwise detectable, and results in measurable and prolonged exceedances of applicable regulatory standards and guidelines and/or changes the overall availability, quality or value of the environmental component or parameter.
Geographic Extent	The spatial area within which an effect will likely occur and be detectable: • **Site**: Effect is confined to the Project Area or a portion thereof; • **Local**: Effect is confined to the Study Area or a portion thereof; and • **Regional**: Effect will likely extend beyond the Study Area.
Duration	The period over which an environmental effect will likely occur and be evident (in months).
Frequency	How often an environmental effect will likely occur: • **Once**: Occurs once during the Project; • **Sporadic**: Occurs sporadically during the Project; • **Regular**: Occurs on a regular basis throughout the Project; and • **Continuous**: Occurs repeatedly and continuously throughout the Project.
Reversibility	The likely ability of an environmental component to return to an equal or improved condition once the disturbance(s) has ended.
Certainty	The level of confidence in the environmental effect prediction.

The current condition of an environmental component because of natural and/or anthropogenic factors, and thus, its resulting resiliency or sensitivity to further change (ecological/socioeconomic context) was also considered as part of the assessment and evaluation of environmental effects.

Table 5-4 (sample, for illustration purposes only) was then used to summarize the predicted residual environmental effects of the Project on the environmental component in question.

Table 5-4: Residual Environmental Effects Assessment Summary Table

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Construction							
Potential Effect 1							
Potential Effect 2							
Potential Effect #							
Operations and Maintenance							
Potential Effect 1							
Potential Effect 2							
Potential Effect #							
Potential Accidental Events							
Potential Effect 1							
Potential Effect 2							
Potential Effect #							
Overall, Resulting Effect(s) of Project				**Evaluation of Significance**			

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Nature/Direction: A = Adverse N = Neutral or No Effect P = Positive **Reversibility:** R = Reversible I = Irreversible	**Magnitude:** N = Negligible L = Low M = Medium H = High **Certainty in Prediction:** L Low M Moderate H High		**Geographic Extent:** S = Site L = Local R = Regional	**Duration:** 1 = < 1 month 2 = 1-12 months 3 = 13-36 months 4 = 37-72 months 5 = > 72 months	**Frequency:** O = Once S = Sporadic R = Regular C = Continuous		

5.2.3 Criteria for Evaluation of Significance

Evaluating the significance of the predicted environmental effects of a proposed project is one of the most important steps in any EA. This typically involves: 1) defining what a significant environmental effect is, and based on that definition, 2) evaluating whether a project's potential environmental effects are significant or not significant. The determined significance of a project's potential environmental effects is then a primary consideration in eventual EA decisions by regulatory authorities about whether, and if so how, the project in question may proceed.

Significant environmental effects are those adverse effects that will cause a change in in an environmental component that will alter its status or integrity beyond an acceptable and sustainable level. An environmental effect that does not meet these criteria is considered not significant.

For the purposes of this EA, significant environmental effects are defined as those that are likely to cause one or more of the outcomes outlined in Table 5-5.

Table 5-5: Environmental Effects Significance Criteria

Component	Definitions
Atmospheric	• A detectable decrease in existing air quality conditions (availability, quality) that results in measurable, repeated and prolonged exceedances of applicable regulatory standards and guidelines, and/or associated, detectable and sustained changes in local air quality; • A detectable increase in noise (sound pressure levels) and vibration conditions that results in measurable, repeated and prolonged exceedances of applicable standards and guidelines at nearby residential areas or other sensitive points of reception, and/or which otherwise causes detectable and prolonged disturbance effects; or • A detectable increase in light levels that results in measurable, repeated and prolonged exceedances of applicable guidelines at nearby residential areas and/or other sensitive receptors, and/or which otherwise cause detectable and prolonged disturbance effects.
Aquatic and Terrestrial	• Mortality or life-threatening injury to one or more individuals of a designated (protected) species at risk, or destruction or alteration of the critical habitat of any such species. • Effects to any species within the Study Area, such that size, health, ecological function or sustainability of a population would be measurably and adversely affected; or • Destruction of, or displacement of marine biota from, important feeding or reproduction areas, migratory routes or other essential habitats, during time periods and for durations over which the size, health, ecological function and/or sustainability of a population would be measurably and adversely affected.
Socioeconomic	• An adverse change in one or more of the important and defining ecological and socio-cultural characteristics of such an area, resulting in an associated, detectable and sustained decrease in its overall integrity, value or use. • An adverse effect on the health, safety or well-being of affected individuals or communities, such that there are associated, detectable and sustained decreases in these characteristics and the resulting health or quality of life of a population. • A detectable reduction in commercial activity levels and overall economic revenues over several years for one or more existing and active enterprises, which challenges their on-going operations and overall economic viability; or • A decrease in overall recreational / traditional activity levels or the enjoyment or cultural value of these pursuits for a community or region over multiple seasons or years.

For the environmental effects assessments that follows, these criteria and definitions are used to describe and evaluate the significance of both Project-specific as well as cumulative effects.

5.2.4 Cumulative Effects Assessment

The EA also assesses and evaluates any cumulative effects assessment that might result from the Project in combination with other projects or activities that have been or will be carried out. The cumulative

effects assessment considers the overall (total) effect on the environmental component as a result of the Project's likely residual environmental effects (as summarized above) and those of other relevant projects and activities, using the following approach:

1. Past and on-going projects and activities and their effects are reflected in the existing (baseline) environmental conditions (Chapter 3). The current condition of the environmental component as a result of these natural or anthropogenic factors, and thus its overall sensitivity or resiliency to further disturbance or change, has been considered throughout the environmental effects assessment.
2. The cumulative effects assessment considers whether and how this existing condition could be changed by the introduction of the Project and its residual (with mitigation) environmental effects.
3. Other likely future projects and activities that are relevant to this environmental component and its cumulative effects assessment are then identified and considered. These comprise any reasonably foreseeable future projects or activities whose effects on the component would likely overlap or otherwise accumulate in space and time with those of the Project (e.g., overlap with the Project area or its zone of influence, or affecting the same populations/communities as the Project).
4. In any cases where the predicted residual environmental effects of the Project on the component will likely accumulate or interact with those of one or more other future projects and activities, the potential cumulative effects of the Project in combination with those of these other relevant future developments are assessed and evaluated (using the same significance definition and approach as was used for the Project-specific effects assessment, as described above).

5.2.5 Project Specific Mitigations

NL Hydro is committed to implementing and adhering to these mitigation measures to avoid or minimize potential negatively adverse effects to the environment, and to create positive impacts and maximize benefits for the surrounding communities. Key Project-related mitigations are summarized in Table 5-6, by each environmental component.

Table 5-6: Summary of Key Mitigation Measures

Component	Planned Mitigation Measures
Mitigation Through Design	• Change to headrace excavation design and use of rock plug to facilitate work in dry conditions and reduce in-water work. • Timing of tailrace widening works will be planned during scheduled maintenance outage of Unit 7. This will result in work being completed during a period of low-flow conditions since there will be no outflow from Unit 7. • Reduced construction effort for Unit 8, as certain infrastructure (draft tube outlet, etc.) was already constructed for the anticipated Unit 8 during the 1970s as part of Unit 7 construction. Implementation of Environmental Protection Plan(s) and Master Environmental Spill Response Management Plan.
Environmental Components	

Component	Planned Mitigation Measures
Atmospheric	• Compliance with relevant and/or required environmental legislation, regulations and permits. • Regular, preventive maintenance and inspection of vehicles and heavy equipment. • On-site lighting will be minimized and directed downwards wherever possible, based on Project requirements and safety considerations. • Implementation of dust control measures as required. • When required, blasting will occur infrequently during construction and will be carried out in accordance with applicable regulations and approvals. • Development and implementation of a Blasting Management Plan designed to minimize air emissions, and noise and vibration levels and to ensure adequate clearance areas/evacuations and public communications/notifications.
Aquatic	• Compliance with relevant and/or required environmental legislation, regulations and permits. • Maintaining natural buffers around waterbodies and watercourses wherever possible and practical. • Implementation of runoff controls and erosion and sediment control measures. • Implementation of a water quality monitoring program for construction activities in or near water. • Implementation of waste management and fuel use / storage plans and procedures. • Scheduling tailrace channel excavation during planned maintenance of Unit 7, resulting in work conducted in low flow environment. • Conducting headrace channel excavation in dry conditions. • No additional water being used annually for Project during operations. Total annual output of water from Bay d'Espoir will stay the same as there are no increases to the upstream reservoir.
Terrestrial	• Minimization of Project footprint and clear delimitation of clearing limits and work areas. • Work is being conducted on an existing and operating industrial site. Low level of overall terrestrial land impact as the land is already developed. • Maintaining natural buffers around waterbodies and watercourses wherever possible and practical. • Implementation of runoff controls and erosion and sediment control measures. • Minimizing contaminants (airborne or runoff) through dust and runoff control measures. • Avoiding/minimizing the use of artificial lighting, and other associated lighting control measures as described above. • Conduct nest searches during the breeding season in advance of vegetation clearing and avoiding any identified active nests during that time. • Establish suitable buffer zones around any active raptor nests. • Avoid wildlife-vehicle collisions by ensuring safe driving practices, including speed limits, and by yielding right of way to wildlife.

Component	Planned Mitigation Measures
	• Prohibiting the hunting or harassment of wildlife species by on-site Project personnel. • Appropriately disposing of all waste to avoid attracting wildlife to work areas. • Any nuisance animals will be dealt with in consultation with the provincial Wildlife Division.
Socioeconomic Components	
Protected and Special Areas	• Planned Project location and layout maintains significant distance between planned Project components and activities and existing protected and special areas in the region. • Implementation of other mitigation measures outlined in this table will help avoid or reduce adverse effects on key aspects of the environment, and thus, the potential for effects to extend into or otherwise adversely affect protected and special areas.
People and Communities	• Dust, light, noise and vibration control measures and water management, as outlined above. • The Project is located four (4) km away from residential areas. • Access restrictions and signage around active work areas for safety and operational purposes. • Blasting will occur infrequently during construction and will be carried out in accordance with applicable regulations and approvals. • Development and implementation of a Blasting Management Plan designed to minimize air emissions, and noise and vibration levels and to ensure adequate clearance areas/evacuations and public communications/notifications. • Coordination, scheduling and communications regarding the transportation of large equipment and other loads to address potential traffic or safety concerns. • Continue to engage with communities, Indigenous groups and other organizations to provide Project information and updates on on-going and planned activities, as well as discussion of any issues and potential means of addressing them. • Implementation of environmental protection and emergency response plans and personnel/equipment.
Land and Resource Use	• The Project is kept within the current permitted boundaries of the existing site and property boundary. • Dust, light, vibration control measures and water management as outlined above. • Measures to reduce potential impacts on aquatic and terrestrial environmental components, as listed above. • Temporary access restrictions and signage around active work areas for safety and operational purposes. • Development of blasting protocols, addressing timing, frequency, clearance areas/evacuation and public communications/notifications. • Should an accidental discovery of historic resources occur, all work will cease in the immediate area of the discovery until authorization is given for the resumption of the work.

Component	Planned Mitigation Measures
	• Any archaeological materials encountered will be reported to the PAO, including information on the nature of the material discovered and the location and date of the find. • Continue to engage and communicate with communities, Indigenous groups and other organizations to provide Project information and updates on on-going and planned activities, as well as discussion of any issues and potential means of addressing them.
Economy, Employment and Business	• Implementation of hiring, procurement and human resources related policies, plans and procedures throughout the various phases of the Project. • Continue to engage and communicate with communities, Indigenous groups and other organizations to provide Project information and updates on on-going and planned activities and associated opportunities. • Provide supplier information sessions during construction planning, to inform local businesses.

The Project's potential environmental effects are assessed, and their significance is evaluated, with consideration of the various mitigation measures outlined above, and within the above described spatial and temporal boundaries. The effects assessment is therefore focused upon identifying and describing the likely residual environmental effects of the Project.

5.2.6 Environmental Monitoring and Follow-up

This EA also identifies and describes any proposed environmental monitoring or follow-up activities. This includes any such measures that may be required or appropriate to meet regulatory requirements, to demonstrate compliance to relevant environmental requirements or EA commitments, or to address any EA-related issues of uncertainty, such as to verify the environmental effects predictions or the effectiveness of mitigation measures outlined in this EA.

The remainder of this Chapter provides an assessment and evaluation of the potential environmental effects of the Project on the identified environmental components, each of which is covered in a separate subsection that follows the overall EA structure and methodology outlined above.

5.3 Atmospheric Environmental Assessment

The environmental effects assessment for this VEC includes consideration of all Project-related air emissions including GHGs, contaminants, noise, vibration and light levels. Elements discussed within the Atmospheric Environment Effects Assessment are based on anticipated conditions using available resources, for which this area is limited, and may not reflect actual conditions.

5.3.1 Potential Environmental Issues and Interactions

The construction phase of the Project will involve the use of heavy equipment and some blasting which will create noise, vibrations and air emissions at a local scale within the Project area. Once construction is complete, the Project will be integrated into NL Hydro's existing operations and maintenance activities at Bay d'Espoir.

An overview of the potential interactions between each of the main Project components and activities and the various key indicators and parameters that have been identified for this component is presented in Table 5-7.

Table 5-7: Atmospheric Environment: Potential Interactions

Project Component/Activity	Key Indicators and Parameters				
	Air Quality	GHG Emissions	Noise Levels	Light Levels	Vibration Levels
Construction					
Movement/use of equipment and materials	•	•	•	•	•
Site preparation / excavation	•	•	•	•	•
Construction of the headrace channel	•	•	•	•	•
Construction of new intake	•	•	•	•	•
Installation of penstock	•	•	•	•	•
Construction of Unit 8	•	•	•	•	•
Expansion of tailrace channel	•	•	•	•	•
Installation of transmission infrastructure	•	•	•	•	•
Employment and expenditures					
Operations and Maintenance					
Operation of new generation facilities	-	-	-	-	-
Operation of new transmission infrastructure	-	-	-	-	-
Water flow/management (upstream and downstream)	-	-	-	-	-
Employment and expenditures	-	-	-	-	-
Potential Accidental Events					
Infrastructure Malfunction	-	-	-	-	-
Spills	-	-	-	-	-
Fires	•	-	-	-	-

5.3.2 Environmental Effects Assessment

As illustrated above, the main potential interactions between Project components and activities and this environmental component relate to the use of heavy equipment, the blasting that will be required during construction, and the installation of infrastructure. The Project's potential effects on the atmospheric environment during each of its phases are described below.

5.3.2.1 Construction

The main potential interactions between the Project and the atmospheric environment relate to the use of equipment, primarily during Project construction, and the noise, dust and engine emissions that may be associated with these activities. Construction will include various activities associated with

equipment mobilization and set-up, site preparation, excavation, movements of construction materials, the construction of buildings and other site infrastructure, and other activities, which will result in some minor, temporary and localized air emissions due to project-related dust and emissions from vehicles and equipment.

Project construction will, however, be characterized by standard and routine activities and practices and will occur within a localized area. It will take place within a previously developed area that has existing and long-standing industrial infrastructure and activity in place, and which is somewhat removed from adjacent residents and communities.

5.3.2.1.1 Air Emissions (including GHGs)

Diesel equipment will be used during the construction phase including, excavators, mobile crane, cement trucks, haul trucks, air drillers and loaders. Atmospheric contaminant emissions associated with the use of diesel fired equipment include particulates, carbon monoxide, nitrous oxide, and sulphur dioxide. An equipment maintenance program will be implemented to ensure vehicles and equipment will be maintained in good repair and inspected regularly, and any associated air emissions from equipment and vehicles will conform to applicable regulations and guidelines.

Fugitive dust from construction activities will be controlled as necessary using dust control agents, particularly water. Any potential air emissions or interactions with the atmospheric environment during these initial phases of Project implementation are therefore likely to be negligible (and within existing regulations or standards), localized, short-term and intermittent in nature.

Table 5-8 and Table 5-9 provide initial estimates of the various anticipated sources of GHGs during this phase of the Project, as well as the total estimated amounts of GHG emissions during Project construction. These estimates are based on, and reflect, the current stage of Project planning and design. As indicated, total GHG emissions during construction are estimated at 10,589 tonnes CO_2e including 3,872 tonnes CO_2e for Scope 1 emissions, 239 tonnes CO_2e for Scope 2 emissions, and 6,478 tonnes CO_2e for Scope 3 emissions.

The NL *Management of Greenhouse Gas Act* and *Regulations* have two thresholds that apply to large industrial facilities: one for any regulated facility that emits 15,000 to 25,000 tonnes of GHG emissions in any year; and a second for any regulated facility that emits 25,000 tonnes of GHG emissions in any year. Based on the analysis and estimates developed for this EA registration, the Project will not reach either threshold during construction and would not be subject to this Act and its regulations.

Table 5-8: Scopes of GHG Emissions During Construction

Scopes	Sources	Construction
Scope 1	Direct GHG Emissions	• Stationary combustion • Mobile equipment combustion • Transportation of aggregate to site
Scope 2	Indirect GHG Emissions	• Electricity use from the NL electrical grid
Scope 3	Other Indirect GHG Emissions	• Transportation sources (based on the assumption of shipping equipment to site during construction)

Table 5-9: Summary of GHG Emissions During Construction

Phase	Activity	GHG Emissions (t CO_2e)			
		Scope 1 (Direct)	Scope 2 (Indirect)	Scope 3 (Other Indirect)	Total
Total Construction (Project Life)		**3,872**	**239**	**6,478**	**10,589**

5.3.2.1.2 Light

Construction activities are planned to occur over 12-hour day shifts, which in some cases may require artificial lighting in active work areas for both practical and safety reasons. Depending on the specific location and intensity of such lighting requirements, the light emitted during the time of work may extend beyond the Project footprint itself. Light emissions from construction activities will be minimized by having lighting only for planned work areas and by directing construction lights downwards. The nearest residential areas are 4 km from the Project site and are separated from the site by a wooded area that will provide screening from nighttime lighting. This, in combination with the measures that will be implemented to limit light direction, will ensure that any potential disturbances are negligible, and in any event, these will be short-term and intermittent in nature. There is potential for adverse effects of lighting during the construction phase on birds and mammals if construction is proposed within sensitive windows (i.e., migration, breeding, rearing, etc.).

5.3.2.1.3 Noise and Vibration

Construction activities will include ground excavation, which will require the use of heavy equipment and some blasting. Blasting will emit noise and vibration levels that have the potential to extend beyond the Project footprint. It is anticipated that construction activities related to both the Headrace excavation and potentially Penstock route (depending on engineering design) will require blasting activities at different depths below the surface.

Any potential effects of noise and vibration from blasting can and will be mitigated where feasible. Blasting is a regulated activity, and the contractor will develop and implement its blasting program in collaboration with municipal stakeholders and government regulators. The blasting program will include the following measures to address potential effects to the atmospheric environment:

- Engineered blast designs will minimize vibrations by utilizing several blasting techniques, where appropriate including:
    - blasting mats;
    - minimizing charge weight per delay;
    - optimizing drill hole diameter, depth;
    - spacing and burden;
    - stemming;
    - pre-charge;
    - decoupling within boreholes;

- timing;
- pre-splitting;
- perimeter blasting; and
- explosive and detonator selection.

- Pre-blasting surveys to identify receptors and to document existing structural conditions and ambient noise levels. Where feasible, no blasting will occur within 300 m of an identified receptor. Blasting activities occurring as part of the Project will follow procedures outlined in DFO's Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador (DFO 2022). All blasting will be performed in accordance with the NL Occupational Health and Safety Act and Regulations and DFO Guidelines for the Use of Explosives in or Near Canadian Fisheries Waters (Wright and Hopky 1998).
- Local municipalities will be notified in advance of blasting activities occurring, and signage will be placed around the Project site to notify workers that activities are taking place.

5.3.2.2 Operations and Maintenance

During Project operations, the nature and degree of on-site activity will be considerably less than that during the construction phase and will be characterized primarily by the continued operation of the facility and periodic maintenance.

Once construction is complete, the Project will be fully integrated into NL Hydro's existing operations and maintenance activities at Bay d'Espoir. These operational activities are not particularly noisy, nor are they characterized by significant air emissions or other planned environmental discharges.

5.3.2.3 Potential Accidental Events

During the various phases and activities that will be associated with this (or any) Project, an accidental or unplanned event is an unlikely but unfortunately possible outcome. Some of the potential accidental events or malfunctions that may be associated with this Project, and which are relevant for the environmental effects assessment for the atmospheric environment include a fire at the site, potentially extending into adjacent areas, and an accidental spill of fuels or other deleterious substance into the environment. Either of these events could potentially occur during the Project, the potential environmental effects of which would clearly depend upon the nature, magnitude, location and duration of the event.

A major fire at the Project site could pose a health and safety concern, as well as resulting in a temporary reduction of air quality in the surrounding area. Given the relatively small footprint of the site and the small volumes of volatile chemicals that will be stored on site, potential emissions of GHGs and other air pollutants from a fire or spill of volatile chemicals to the atmospheric environment are anticipated to be relatively low and would be unlikely to extend into adjacent areas and communities.

Should an accident or malfunction resulting in a spill or fire occur at the site, NL Hydro's approved operational emergency response plan will be implemented.

5.3.3 Residual Environmental Effects Summary

A summary of the predicted (residual) environmental effects of the Project on the atmospheric environment is provided in Table 5-10 below.

Table 5-10: Atmospheric Environment: Residual Environmental Effects Assessment Summary

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Construction							
Change in air quality	A	N-L	S-L	4	R	R	H
Change in GHG emissions	A	N-L	S-L	4	R	R	H
Change in noise levels	A	N-L	S-L	4	R	R	M
Change in light levels	A	N-L	S-L	4	R	R	M
Change in vibration levels	A	N-l	S-L	4	S	R	M
Operations and Maintenance							
Change in air quality	N	-	-	-	-	-	H
Change in GHG emissions	N	-	-	-	-	-	H
Change in noise levels	N	-	-	-	-	-	H
Change in light levels	N	-	-	-	-	-	H
Change in vibration levels	N	-	-	-	-	-	H
Potential Accidental Events							
Change in air quality	A	L-M	L	2	O	R	M
Change in GHG emissions	A	L-M	L	2	O	R	M
Change in noise levels	N	-	-	-	-	-	H
Change in light levels	N	-	-	-	-	-	H
Change in vibration levels	N	-	-	-	-	-	H
Overall, Resulting Effect(s) of Project Although planned Project components and activities may result in some small, localized and short-term emissions and disturbances, these will be negligible and within applicable regulations and standards.				**Evaluation of Significance** The proposed Project is not likely to result in significant adverse environmental effects on the atmospheric environment.			
Nature/Direction: A = Adverse N = Neutral or No Effect P = Positive	**Magnitude:** N = Negligible L = Low M = Medium H = High	**Geographic Extent:** S = Site L = Local R = Regional	**Duration:** 1 = < 1 month 2 = 1-12 months 3 = 13-36 months 4 = 37-72 months 5 = > 72 months	**Frequency:** O = Once S = Sporadic R = Regular C = Continuous			

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Reversibility: R = Reversible I = Irreversible	**Certainty in Prediction:** L Low M Moderate H High						

5.3.4 Cumulative Environmental Effects

Any Project-related air, noise or vibration emissions are, for the most part, expected to be low in magnitude, limited to the Project Area itself, and will decrease quickly with distance from the source. The Project will be in a rural area with a low level of current (and planned) industrial activity, and its emissions are therefore not likely to interact or overlap with any others in the region. There are currently additional planned works to occur within the existing Bay d'Espoir Facility that may overlap with some of the identified construction activities for the Project. This includes planned penstock refurbishments (2025-2027) and the planned maintenance of Unit 7 in 2028. It should be noted that the construction of the Unit 8 powerhouse is also planned to occur in sequence with Unit 7 maintenance, to facilitate construction in a low-flow state and reduce potential sedimentation and downstream impacts.

While there is the potential for additional noise, air, or vibration emissions from overlapping activities on the site, this can be mitigated through construction planning and resourcing. NLH will continue to coordinate internally and with contractors to explore opportunities to have equipment on site that can work on multiple jobs, as opposed to bringing multiple heavy equipment and machines on site for each job. This will reduce the overall amount of machinery on site and reduce the potential for air and noise emissions. These construction windows also fall within the planned schedule for the Project, so there wouldn't be extended periods of noise beyond what is already expected for the Project.

Given the information above, the Project is therefore not likely to result in significant, adverse cumulative environmental effects on the atmospheric environment, in combination with other projects or activities that have been or will be carried out within the Study Area.

5.4 Aquatic Environmental Assessment

For the purposes of this effects assessment, the Aquatic Environment includes surface water (quantity and quality) and fish and fish habitat, which are considered together in a single Valued Environmental Component (VEC) given the clear interrelationships between these environmental components.

An overview of the existing environment for this component was provided in Chapter 3, including information on surface water resources as well as the likely presence, abundance and distribution of fish and their habitats. This information has been used to identify and evaluate the key potential interactions of the Project with this VEC and any resulting environmental effects and required mitigations.

5.4.1 Potential Environmental Issues and Interactions

The key potential environmental interactions between the Project and the aquatic environment include:

- Changes in water quantities (volumes, timing, locations) resulting from the alternation of water flow patterns due to Project development and associated water management.
- Changes in water quality due to the introduction of additional sedimentation or other materials into local watercourses/waterbodies, potentially due to changes in surface water patterns and associated alterations in bank stability and increased erosion.
- Possible effects on fish (presence, abundance, health) and habitat availability or quality through direct disturbance, or resulting from changes in water quantities (flow patterns) or quality (such as increased sedimentation).
- Possible accidental spills of fuel or other materials during their planned transportation, storage or use, and associated interactions with the aquatic environment.

An overview of the potential interactions between each of the main Project components and activities and the various key indicators and parameters that have been identified for this component is presented in Table 5-11.

Table 5-11: Aquatic Environment: Potential Interactions

Project Component/Activity	Key Indicators and Parameters					
	Surface Water Quality	Surface Water Quantity	Fish Presence and Abundance	Fish Health	Fish Habitat (Availability and Quality)	Species at Risk *
Construction						
Movement/use of equipment and materials	•	-	-	-	•	-
Site preparation/excavation	•	-	-	•	•	•
Construction of the headrace channel	•	•	•	•	•	•
Construction of new intake	•	•	•	•	•	•
Installation of penstock	•	•	•	•	•	•
Construction of Unit 8	-	-	-	-	-	-
Widening of the tailrace channel	•	•	•	•	•	•
Installation of transmission infrastructure	•	-	-	-	-	-
Employment and expenditures	-	-	-	-	-	-
Operations and Maintenance						
Operation of new generation facilities	•	•	•	•	•	•
Operation of new transmission infrastructure	•	-	-	-	-	-

Project Component/Activity	Key Indicators and Parameters					
	Surface Water Quality	Surface Water Quantity	Fish Presence and Abundance	Fish Health	Fish Habitat (Availability and Quality)	Species at Risk *
Water flow/management (upstream and downstream)	•	•	•	•	•	•
Employment and expenditures	-	-	-	-	-	-
Potential Accidental Events						
Infrastructure Malfunction	•	•	•	•	•	•
Spills	•	-	-	•	•	•
Fires	•	-	-	•	•	•
* If present within or near the Project Area						

5.4.2 Environmental Effects Assessment

As illustrated above, potential interactions between the Project and the aquatic environment may result from both planned components and activities (such as site development, and the eventual installation and operation of new generation facilities) and unplanned events (such as accidental spills or fires).

5.4.2.1 Construction

The main potential interactions between the Project and the aquatic environment are related to the changes in surface water quality during construction activities. Any potential effects of changes in water quality resulting from excavation, installation of new infrastructure, and movement of equipment/ materials will be mitigated. The potential effects of construction activities of the Project on aquatic environment and the mitigation measures to reduce or avoid the effects are presented below:

- Movement/use of equipment and materials – Existing access roads (Camp Boggy Road, Tail Race Resource Road, North Cut-off Road, Surge Tank Road, and Airport Road) will be used in the Project for the movement of construction equipment and materials at the site. Soil erosion during the movement of construction equipment and materials may cause movement of sediments into surface water. This may result in changes in surface water quality during construction period. Standard mitigations for this will include:

    - Erosion and sediment control measures (e.g., placement of riprap, silt fencing, turbidity curtains) will be developed and implemented at the site to mitigate these effects.
    - Appropriate buffers will be maintained where feasible between Project Activities and identified bodies of water.

- Site preparation/excavation –Site clearing, and excavation will be required for the construction of the new intake, headrace, and penstock infrastructure. Clearing of vegetation and excavation activities could cause increased movement of sediments into surface water and may result in

changes in water quality if not properly mitigated. The following measures will be taken to mitigate the potential effects of site preparation activities on surface water quality:

  - Vegetation clearing will only occur where necessary and site clearing, and excavation activities will be completed in accordance with standard practices and in compliance with required permits and approvals.
  - Excavated soils will be stockpiled in the Project laydown area for reuse, and all waste materials will be stored and removed in accordance with applicable regulations and approvals.
  - Sediment control measures such as turbidity or silt curtains will be implemented at the site to avoid movement of sediments into surface water.

- Excavation of headrace and tailrace channels, and construction of new intake – Construction of new headrace channel and widening of a segment of the tailrace channel will involve near-water earthworks operations and concrete works. These include excavation of soils, blasting of rock, and removal of excavated materials from the site. It also includes the pouring and forming of concrete for the new intake. These activities may cause erosion of soils and movement of sediments into surface water and may result in changes in water quality. These effects will be mitigated by implementing the following measures:

  - Erosion and sediment control measures (e.g., placement of riprap, silt fencing, turbidity curtains) will be developed and implemented at the site to avoid movement of sediments into surface water.
  - A temporary existing rock-plug will be used to allow for excavation and concrete work to be carried out in dry conditions and reduce the potential for sediment entering the reservoir and interactions with fish species. The plug will be removed only once excavation has been completed and the new intake has been built.

- Installation of penstock – Installation of penstock will be carried out in a dry construction condition. Any impact on water quality and aquatic environment is not anticipated during the installation of penstock.

- Sediment and erosion control measures will be implemented at the site to avoid any unexpected erosion and sediment movement into surface water.

- Construction of Unit 8 – Excavation of soils and concrete works will be required for establishing the building foundations of the powerhouse. This may cause movement of sediments into surface water and may impact the water quality. To mitigate these potential interactions following measures will be undertaken:

- As a mitigation through design, excavation within the tailrace in the immediate area of the existing powerhouse is not required for the installation of Unit 8.
- Where feasible, construction of powerhouse and installation of turbine will be carried out in a dry environment following the best engineering practices and in accordance with regulatory permits and requirements.
- Erosion and sediment control measures (e.g., placement of riprap, silt fencing, turbidity curtains) will be developed and implemented at the site.

- Installation of transmission infrastructure – Installation of transmission infrastructure will require site clearing, removal of trees, shrubs, and other debris. Blasting of rock may be required for establishing tower foundation and anchoring. These activities may result in movement of wastes and sediments into surface water and may cause changes in surface water quality. To mitigate these effects, following measures will be undertaken:

  - Natural buffers around waterbodies and watercourses will be maintained as per regulatory requirements.
  - Site waste management plans and procedures will be developed and implemented to prevent any waste disposal to the waterbodies.
  - A blasting management plan will be developed and approved by relevant regulatory agencies before blasting activities commence.

The construction phase has potential to effect fish and fish habitat within the local region of the Project including for species such as American eel, Atlantic salmon, Banded killifish, and Brook trout. These species can be affected because of construction activities through flow changes in surface water, sedimentation into the watercourse, and barriers to fish passage.

Additionally, in-water works can pose a direct threat to fish and fish habitat. Any in-water works should consider the timing window to protect fish, which in Newfoundland and Labrador, occurs in estuaries and main stems of scheduled salmon rivers from May 1 to September 30. NLH will work with the appropriate regulatory bodies to conduct any required in-water work in a way that is compliant with relevant best-practices.

5.4.2.2 Operations and Maintenance

Potential interactions between the Project and the aquatic environment during operations of the Bay d'Espoir facility are related to changes in water quantity and water quality in the headrace and tailrace channels and in the upstream reservoirs. The potential interactions of the Project on aquatic environment during operations and maintenance are presented below along with the mitigation measures to reduce or avoid those effects:

- Operation of new generation facilities – Operation of new generation facilities may cause potential changes in flow patterns and changes in surface water quality resulting from erosion and sedimentation of the channels. These effects will be mitigated by following standard operating procedures and practices of NL Hydro, which include but limited to:

  - Once construction is completed, Unit 8 of the Bay d'Espoir facility will continue to be operated as per NL Hydro's current operating practices and processes. Project maintenance activities will include regular inspection and on-going repair, and maintenance of the facility as required and will be in compliance with regulatory requirements and permits.
  - As presented in Section 3.1.4, there were no notable changes identified for annual total inflow at Bay d'Espoir generating station during the operation of the Bay d'Espoir hydroelectric generating station from 1970s. The pattern of time series of annual runoff depth at Bay d'Espoir generating station are also consistent with the time series of annual runoff depth at three regional hydrometric stations.

- Operation of new transmission infrastructure – Transmission line maintenance activities will include regular inspection, repair of the system as required and the management of vegetation along the right of way. These activities may cause potential changes in surface water quality due to the movement of sediments into water and may impact the quality of aquatic life. Any potential effects will be mitigated by following standard operating procedures and practices of NL Hydro and following the regulatory permits.

- Activities associated with the operation of the new transmission line will be integrated into NL Hydro's overall inspection and maintenance program for its transmission system, including the existing transmission line infrastructure associated with the Bay D'Espoir facility.

- Water flow/management (upstream and downstream) – Upstream and downstream flow management due to operations of the Bay d'Espoir facility with addition of the new components may cause potential changes in flow velocities in headrace and tailrace channels and may cause potential changes in water levels in the upstream reservoir. Changes in flows and velocities may cause erosion and sedimentation in the channels and may impact water quality for aquatic life in the headrace and tailrace channels. Following measures will be undertaken to mitigate the potential effects of changes in water quality and water quantity resulting from operations of Unit 8:

  - Trash rack will be installed at new intake gate to prevent debris from entering the penstock.
  - Excavation of headrace and tailrace channels and placement of riprap protection along the tailrace channel will mitigate the effects of changes in hydraulic conditions (e.g., changes in velocities and changes in flows) of the channels.

As part of Project planning and design, NL Hydro contracted Atkins Réalis (**Appendix E**) to complete a 2-dimensional hydraulic study to compare potential flow depth and velocity increases downstream (roughly 4.6 km downstream to the bridge at St. Veronica's) under operating conditions both with and without Unit 8. This includes modelling scenarios for both normal operations and a flood scenario, at both high and low tide. These scenarios are presented below.

Table 5-12: Aquatic Environment: Residual Environmental Effects Assessment Summary

Operation Regime	Condition	Scenario	Units 1-7 Discharge (Historical Peak)	Unit 8 Discharge	Stream Inflows	Low Tide	High Tide
Normal	Without Unit 8	1	1:10 yr	-	1:2 yr	Yes	-
		2	1:10 yr	-	1:2 yr	-	Yes
	With Unit 8	3	1:10 yr	102 m^3/s	1:2 yr	Yes	-
		4	1:10 yr	102 m^3/s	1:2 yr	-	Yes
Flood	Without Unit 8	5	1:10 yr	-	1:1000 yr	Yes	-
		6	1:10 yr	-	1:1000 yr	-	Yes
	With Unit 8	7	1:10 yr	102 m^3/s	1:1000 yr	Yes	-
		8	1:10 yr	102 m^3/s	1:1000 yr	-	Yes

These scenarios were designed to a) identify potential existing water flow and inundation potential both during existing operating conditions, and b) identify what changes could potentially occur to downstream water levels with the addition of Unit 8 and if/when it would be operating at full capacity. Full details on the results are available in **Appendix E.** Flow depths and velocities were extracted from the model at five locations of interest downstream of the powerhouse along the tailrace channel. The largest impact on flow depths and velocities from the installation of Unit 8 occur during high tide conditions under both normal operation and flood scenarios at the point of interested called "Tailrace Road Bridge". At this location some flooding of the tailrace road near the tailrace road bridge currently occurs during normal operations with high tide. Flooding also would currently occur during flood operations with high tide. The tailrace road near the tailrace road bridge does not appear to flood during normal or flood operations for a low tide for both the current unit configuration and with the installation of Unit 8. Overall modeling results indicate a general increase in flow velocity and depth with the addition of Unit 8, which is expected. With the installation of Unit 8, the depth of flooding in the tailrace channel can increase by as much as 0.49 m while the velocity can increase by as much as 0.4 m/s. During high tide conditions, the tailrace road at various locations and in the vicinity of tailrace road bridge is flooded for both normal operation and flood operations scenarios, with and without Unit 8.

Concerns raised in open house sessions and through engagement with local stakeholders (Section 4.0) included those around increased water volumes through the generating station with the addition of a new unit. While a new unit is being installed in Powerhouse 2, there are no new diversions directing additional water to the upstream reservoir. Therefore, annual total flow amounts from Bay d'Espoir will remain the same. Unit 8 allows for Increased flexibility as by having more available units allows other units to be shut off at times (e.g., for maintenance) while allowing the system will still have enough generation to supply power to customers. It also increases capacity as electricity use in our province continues to grow, NLH will have more capacity to supply power during times of peak demand (e.g., cold winter days), while reducing reliance on fossil energy sources. In addition, it allows for increased stability as it will provide greater grid stability through additional "spinning reserve". So although some months may see increased flows due to the need for more electricity to the grid and decreased flows in later months to replenish water used in these peak periods, it is anticipated that overall annual flow volumes will be within historical norms from the facility (Figure 5-2).

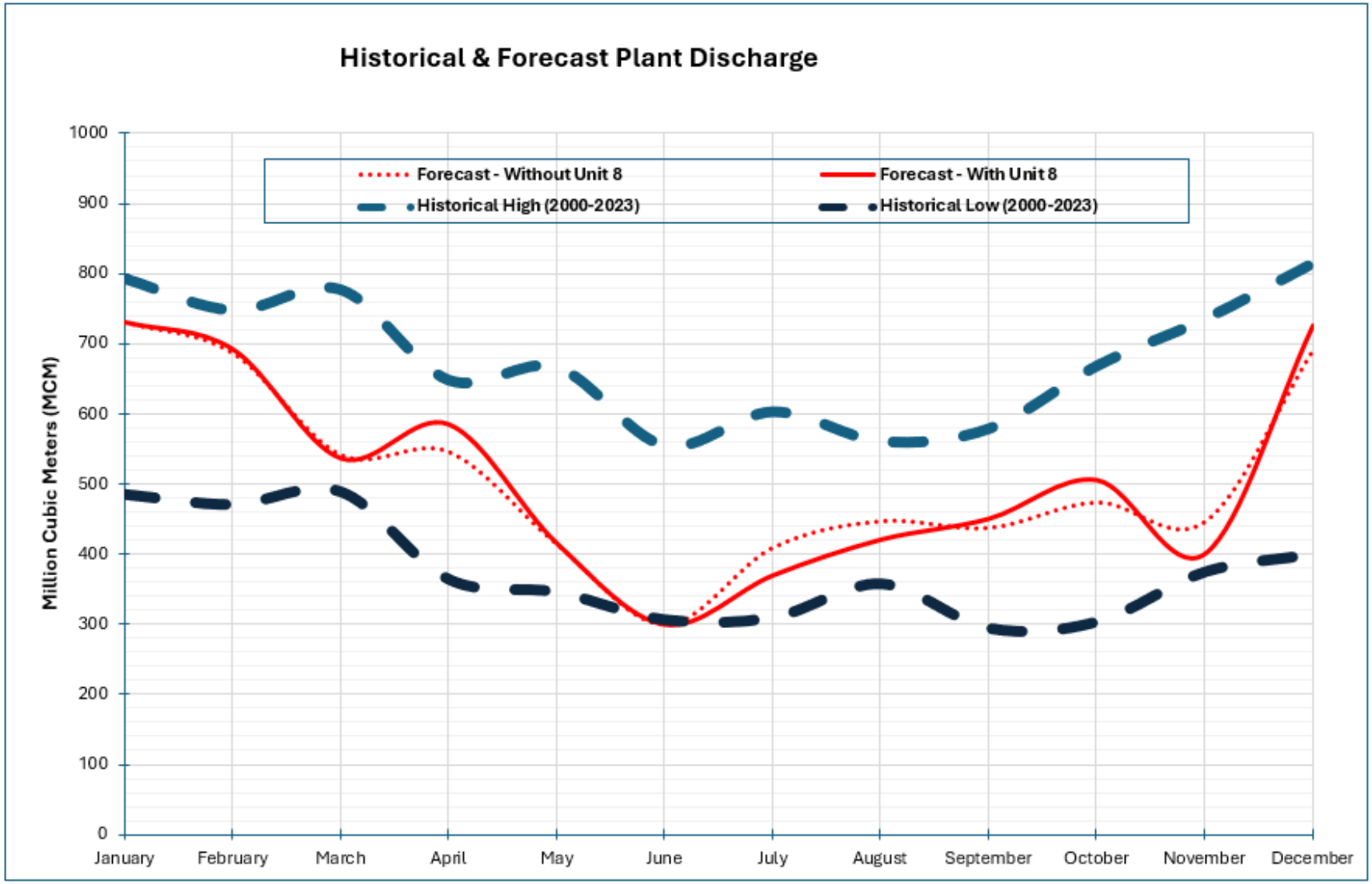

Figure 5-2: Forecast of Bay d'Espoir Discharge Compared to Historical volumes (2000-2023)

5.4.2.3 Potential Accidental Events

Potential accidental events that could conceivably occur and affect the aquatic environment in or around the Project site include a spill of fuel or other deleterious substances. NL Hydro's planned measures and approaches for helping prevent accidental spills during planned Project activities, such as fuel and chemical handling and use at the site, will be as described previously. As noted in **Appendix C**, a supply of spill response equipment and materials will be maintained at the site in an accessible location, and personnel working on the Project will be appropriately trained and knowledgeable about these spill response procedures, and any such incidents will be reported to environmental authorities as applicable.

As also indicated in Section 2.10 several environmental protection and response plans have been or will be developed in relation to the Project, including contingency plans related to a spill event or fire, and other accidental and emergency events, each of which will be implemented and adhered to throughout the life of the Project. All on-site Project personnel, including NL Hydro employees, contractors, and others, will be required to understand and adhere to the provisions of these documents.

5.4.3 Residual Environmental Effects Summary

A summary of the predicted (residual) environmental effects of the Project on the aquatic environment is provided in Table 5-13 below.

Table 5-13: Aquatic Environment: Residual Environmental Effects Assessment Summary

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Construction							
Change in surface water quality	A	N	S-L	2	S	R	H
Change in surface water quantity	N	N	L	2	C	R	H
Change in fish presence/abundance	N-A	N	L	2	O	R	M
Change in fish health	N-A	N	L	2	O	R	M
Change in fish habitat (availability/quality)	N-A	N	L	2	O	R	M
Change in aquatic species at risk	N	-	-	-	-	-	M
Operations and Maintenance							
Change in surface water quality	A	N	S-L	5	S	R	M
Change in surface water quantity	N-A	N	L	5	C	R	H
Change in fish presence/abundance	N-A	N	L	5	R	R	M
Change in fish health	N-A	N	L	5	R	R	M
Change in fish habitat (availability/quality)	N-A	N	L	5	R	R	M

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Change in aquatic species at risk	N	-	-	-	-	-	M
Potential Accidental Events							
Change in surface water quality	A	N	S-L	1	S	R	M
Change in surface water quantity	N	-	-	-	-	-	H
Change in fish presence /abundance	A	L	L	5	S	R	M
Change in fish health	A	L	L	5	S	R	M
Change in fish habitat (availability / quality)	A	L	L	5	S	R	M
Change in aquatic species at risk	N	-	-	-	-	-	M

Overall, Resulting Effect(s) of Project

- Planned Project components and activities will have some potential to interact with and affect surface water and fish and fish habitat in the area through erosion/ sedimentation and associated implications for water volumes and flow patterns.
- Annual water flows will be within normal historic levels, however some months may experience higher discharge amounts (e.g., peak demand)
- Potential accidental events (such as spills) will be prevented due to Project equipment and procedures, with appropriate response plans and procedures in place.

Evaluation of Significance

- The proposed Project is not likely to result in significant adverse environmental effects on the aquatic environment.

Nature/Direction:
A = Adverse
N = Neutral or No Effect
P = Positive

Magnitude:
N = Negligible
L = Low
M = Medium
H = High

Geographic Extent:
S = Site
L = Local
R = Regional

Duration:
1 = < 1 month
2 = 1-12 months
3 = 13-36 months
4 = 37-72 months
5 = > 72 months

Frequency:
O = Once
S = Sporadic
R = Regular
C = Continuous

Reversibility:
R = Reversible
I = Irreversible

Certainty in Prediction:
L Low
M Moderate
H High

5.4.4 Cumulative Environmental Effects

The current (baseline) environmental conditions for the aquatic environment (Section 3.1) reflect the effects and influences of other natural conditions and processes and past and on-going human developments and activities on the area and elsewhere, including the on-going and long-standing hydroelectric generating facility at Bay d'Espoir. As also described above, the proposed Project is not

expected to significantly affect water resources of fish and fish habitat in the area. Maintenance work for Unit 7 is currently planned for 2028, which would overlap with the construction schedule for Unit 8 and tailrace widening in this Project. While there is overlap with these two planned activities, the scheduling of Unit 8 construction and tailrace widening during Unit 7 maintenance work is done as a mitigative measure for the project. Unit 7 maintenance requires the shutdown of Unit 7, resulting in a low-flow state within the tailrace channel. Therefore, with Unit 7 shut down it reduces the potential occurrence and effect of Unit 8 construction and tailrace expansion. It also reduces the potential disturbance period than if the two projects were planned at different times. Activities for both this Project and Unit 7 maintenance can be done concurrently, reducing the overall window for potential impacts into the aquatic environment.

The Project is therefore not likely to result in significant, adverse cumulative environmental effects on the aquatic environment in combination with other projects or activities that have been or will be carried out.

5.5 Terrestrial Environmental Assessment

The terrestrial environment is comprised of relevant components of the "on-land" biophysical environment which may interact with the Project, including both vegetation and wildlife.

5.5.1 Potential Environmental Issues and Interactions

The proposed Project will be located immediately adjacent to existing and long-standing hydroelectric operations at Bay d'Espoir, on lands that can therefore be characterized as at least partially disturbed. The Project will see a limited amount of new ground/vegetation disturbance, and will result in some additional environmental disturbances, particularly during its construction phase, which may interact with and affect wildlife that are in or near the Project area.

The key potential environmental interactions between the Project and the terrestrial environment (including both vegetation and wildlife) therefore include:

- Removal of vegetation and soils within the Project area due to clearing and excavation activities, which may include any listed or regionally rare species if they are present in the immediate footprint.
- Possible effects on wildlife (presence, abundance, health) and the availability or quality of their habitats due to site clearing and preparation, and other construction or operational activities and associated disturbances (e.g., lights and noise, waste management, traffic, human presence).
- Possible accidental events, such as spills of fuel or other materials or fires, which may affect the present, abundance, health or quality of terrestrial resources.

An overview of the potential interactions between each of the main Project components and activities and the various key indicators and parameters that have been identified for this component is presented in Table 5-14.

Table 5-14: Terrestrial Environment: Potential Interactions

Project Component/Activity	Key Indicators and Parameters				
	Vegetation and Soils	Wildlife Presence and Abundance	Wildlife Health	Wildlife Habitat (Availability and Quality)	Species at Risk *
Construction					
Movement/use of equipment and materials	•	•	•	•	•
Site preparation/excavation	•	•	•	•	•
Expansion of the headrace channel	•	•	•	•	•
Construction of new intake	•	•	•	•	•
Installation of penstock	•	•	•	•	•
Construction pf Unit 8	•	•	•	•	•
Expansion of tailrace channel	•	•	•	•	•
Installation of transmission infrastructure	•	•	•	•	•
Employment and expenditures	-	-	-	-	-
Operations and Maintenance					
Operation of new generation facilities	-	-	-	-	-
Operation of new transmission infrastructure	-	•	•	•	•
Water flow/management (upstream and downstream)	•	•	•	•	•
Employment and expenditures	-	-	-	-	-
Potential Accidental Events					
Breach of infrastructure	•	-	•	•	•
Spills	•	•	•	•	•
Fires	•	•	•	•	•
*If present within or near the Project Area					

5.5.2 Environmental Effects Assessment

As illustrated above, potential interactions between the Project and the terrestrial environment may result from both planned components and activities (such as site clearing and development) and unplanned events (such as accidental spills or fires). Elements discussed within the Terrestrial Environment Effects Assessment are based on anticipated conditions using available resources and may not reflect actual conditions.

5.5.2.1 Construction

5.5.2.1.1 Vegetation

The Project includes the intake laydown, powerhouse laydown, and a secondary laydown area. Collectively, although this will result in ground disturbance, it is still within the previously developed Project area. A new localized transmission line from Unit 8 will also require some clearing.

As stated previously, the construction phase will mostly impact lands at least partially disturbed by previous construction activities with a limited amount of new ground/vegetation disturbance. These areas could contain a mix of early succession species such as grasses, shrub and deciduous varieties, as well as small areas of the dominant forest types in the area such as balsam fir and black spruce. It's not expected that this clearing will result in the removal of any critical habitat for any SAR. However, since this general area is known to be a location for the Boreal Felt Lichen, if any mature balsam fir is to be removed, it's recommended those stands/individual trees be searched by a qualified person for the occurrence of this SAR.

A desktop assessment including a review of aerial imagery indicate that construction related activities including clearing is not expected to directly impact any regulated wetlands or associated rare plants, if present within the area. The ACCDC has indicated that two rare plants – lake quillwort and grass-leaf arrowhead – can be found in the general area. Lake quillwort can be found submerged in cold water lakes or in slow moving streams while grass-leaf arrowhead is found in lacustrine habitats. Desktop review of the area does not suggest suitable habitats possibly containing these species will be impacted in the construction of laydowns, offices, or the transmission line. Any downstream changes in water levels or flows due to hydroelectric activities associated with the establishment and operation of this new unit is not expected to impact any possible occurrences of these species in the direct or associated freshwater habitats.

5.5.2.1.2 Wildlife and Their Habitats

Certain wildlife species can likely be found in or near the Project site at various times of the year, often moving in and out of the area at different times according to their life histories, habitat requirements and seasonal activities.

Moose, mink, snowshoe hare, lynx, black bear, caribou, red fox, short-tailed weasel, beaver, muskrat, and otter are some notable wildlife species likely found in or near the Project site. While there are no historical records of mammal SAR or SOCC in the area, this means only that mammals with these conservation classifications haven't been reported and doesn't indicate absence of these species from the area.

Two mammal SAR potentially occurring in the Project area (McBurney and Segers 2021) are little brown bat and northern long-eared bat, both of which are classified as endangered under NLESA. Newfoundland marten, classified as Vulnerable, are unlikely to occur in the Project Area based on the anticipated habitat conditions. A variety of bird species including passerines, waterfowl, owls, raptors, etc. have been also documented using the general area of the Project as breeding habitat (Section 3.1.6). Red crossbill has been historically identified in the region within the Newfoundland Breeding Bird Atlas and has potential to occur within the Bay d'Espoir area. Rusty blackbird, short-eared owl, and barrow's goldeneye, all of which are designated as Vulnerable under the NLESA, were identified within

the region within the ACCDC reporting but are expected to have marginal habitat within the Project Area.

The proposed Project site occurs within an already developed area, and Project construction will involve limited additional vegetation clearing, grubbing, excavation or other on-land site preparation activities, with routine and localized construction activities planned. The longstanding presence and on-going operation of the existing hydroelectric generation facility at this location has somewhat limited the use of the site itself by most wildlife. Any wildlife (such as avifauna) that do use the area have likely habituated somewhat to on-going human activity.

During the construction phase of the Project, any wildlife that are present within or immediately adjacent to the Project area may be affected due to site clearing and the associated removal or alternation of terrestrial and aquatic habitats. This includes both avifauna (birds and bats), large or small mammals and other species. However, vegetation clearing, and other ground disturbance activities will be confined to only those areas where it is necessary to do so, limits of clearing will be marked in advance, and only designated areas will be cleared. The surrounding landscape contains similar vegetation types to those found within the Project footprint, and so alternate habitat is available in the adjacent area. This, and the relatively small size of the Project's proposed development footprint already within an existing industrial site, means that any potential effects – while long term in nature – will be localized and are not likely to have overall effects on the size or health of wildlife populations in the region.

The potential effects of vegetation clearing and grubbing are often of most concern when these activities take place during time periods when wildlife may be denning/breeding/nesting, as they may result in direct mortality of eggs, unfledged nestlings, and young mammals. The killing of birds or the destruction of their nests, eggs, or young is in contravention of the Migratory Bird Convention Act. Standard mitigations to avoid or minimize adverse effects to wildlife because of clearing activities during construction. If, for example, clearing is required during the known bird breeding season in this area, the following mitigation measures will be implemented, as outlined in the EPP for construction (**Appendix C**).

With respect to birds, it's most appropriate to clear vegetation outside of the nesting season. In instances when this is not possible, measures listed below must be followed for compliance with regulatory protections acts.

- Monitoring for bird nests will be conducted in advance of any planned site clearing during the breeding season (May 1 - August 31), and efforts will be made to avoid trees with nests during that time. Non-intrusive surveys for nests will be conducted in accordance with Section 2.2.3.1, "Specific Considerations Related to Determining the Presence of Nests" of the document Incidental Take of Migratory Birds in Canada (Canadian Wildlife Service, EC 2014).
- Should a nest of a migratory bird be found, the following steps will be taken (in accordance with guidelines outlined in the MBCA).
- All activities in the nesting area will be halted until nesting is completed and the young have left the vicinity of the nest.

- Any nest found will be protected with a buffer zone appropriate for the species and the surrounding habitat until the young have left their nest.
- Nests will not be marked using flagging tape or other similar material as these increase the risk of nest predation.

Similarly, any wildlife that may be present in the immediate area that may be disturbed by Project-related noise, human presence or other interactions may temporarily avoid the immediate vicinity of such works during the short-term period of construction. Any such avoidance and disturbance associated with the Project is not expected to affect the overall presence or health of any wildlife population in the area, and there is similar habitat available throughout the larger, surrounding area.

The following mitigative measures will be implemented to further reduce the potential for interactions between Project construction activities and any wildlife that may be present in the area:

- Work areas will be kept clear of garbage and all waste materials will be stored and disposed of properly and regularly.
- Project personnel will not hunt or harass wildlife, and pets will not be permitted on the Project site;
- Equipment and vehicles will yield the right-of-way to wildlife.
- Any nuisance animals will be dealt with in consultation with the provincial Wildlife Division.

A particular concern regarding development activities is the potential attraction of night-flying birds, including their lights or other emissions, which can result in possible injury or mortality due to strikes, strandings, disorientation, and energy expenditure. The frequency and associated distance at which Project-related lighting will be visible (and thus, its likely zone of influence) can vary considerably based on site and time specific factors. To prevent or reduce the potential for any associated adverse effects on avifauna, the use of artificial lighting will be avoided or minimized wherever possible with consideration of safety and associated regulatory requirements. As mentioned previously, construction activities are anticipated to take place during the daytime, which will reduce the reliance on lighting requirements. This does not mean that lighting will not be needed during certain portions of the Project, but that it will not be a frequent occurrence. Overall, the presence of construction equipment at this site will be a small, highly localized and short-term source of lighting in the region. Routine checks of the Project equipment and site will be undertaken, however, and protocols for the collection and release of any birds that become stranded will be implemented, in accordance with applicable governmental guidance, requirements and permits.

Indirect effects to surrounding habitats may also occur during construction, including possible changes to surface hydrology or sedimentation which could adversely alter adjacent aquatic habitats. Erosion protection and encroachment prevention procedures as described in the EPP will be followed to prevent indirect effects to wetlands and terrestrial habitats in and around the Project area.

As discussed in Section 5.3, Project related air emissions from equipment use and other sources will be negligible and quickly dispersed, and so will not result in health-related effects to any wildlife. Increase in fugitive dust and pollutants can cause impacts to wildlife health and result in a reduction of the quality of habitat. At this time, substantially high levels of emissions are not expected, and mitigations for fugitive dust control will be implemented and detailed in the EPP including regular road watering.

Waste materials generated because of Project construction activities will be removed from the site and disposed of at an approved facility. Non-hazardous refuse will be stored in covered metal receptacles and will be transported to and disposed of on a regular basis at an existing landfill site. Waste materials will be reused/recycled where possible. Any hazardous wastes will be stored in sealed, labelled containers and disposed of according to applicable regulations and NL Hydro practices. These include procedures for the characterization/identification, storage, inspection, labelling and transportation of hazardous wastes produced at the site, as well as emergency preparedness/prevention and training. There will therefore be no adverse interaction between waste materials and the environment. As described earlier, the use, storage, handing and transportation of fuel and other chemicals will be undertaken by trained personnel using approved facilities and equipment, and in accordance with applicable regulations, guidelines and environmental protection procedures.

5.5.2.2 Operations and Maintenance

During the operations phase of the Project there will be no soil or vegetation disturbance, and therefore, little or no potential for effects to these aspects of the terrestrial environment. Wastes, fuels and other such materials and substances will continue to be handled, used and disposed of properly throughout the life of the Project, as outlined earlier. None of the facility's operational activities are or will be particularly noisy or otherwise disruptive to the surrounding environment.

No additional interactions with or adverse effects on the terrestrial environment are therefore anticipated during this phase of the Project.

5.5.2.3 Potential Accidental Events

Potential accidental events resulting from planned Project activities that could affect vegetation and wildlife, and their habitats include a spill of fuel or other materials or a fire. The resulting environmental effects of such an incident would clearly depend upon the nature, magnitude, location and timing of the accidental event.

A localized fuel or chemical spill could have implications for exposed terrestrial habitats and any birds or mammals that utilize it, although the likely effect on overall habitat availability and function and on the health of any wildlife populations in the area would likely be negligible. NL Hydro's planned measures (equipment and procedures) to help prevent any such spills and to respond to one in the unlikely event of its occurrence were described previously and are equally applicable to preventing or reducing potential effects. These measures will be applied throughout the various phases of this Project, and further reinforced through the various provincial and/federal government permits, other authorizations and regulations and compliance standards that will be relevant to the Project.

A large-scale fire originating from the Project could alter terrestrial or aquatic habitat availability, quality and composition across some area and extent, as well as directly affecting wildlife through direct injury or mortality, although most wildlife would have the ability to avoid or move out of areas affected which would reduce the potential for effects. Project-specific environmental and emergency response plans will be prepared and implemented for the various phases of the Project, which will include identifying and establishing measures to respond to any potential accidental events or emergency situations, such as a fire or the accidental release of fuel or other materials.

5.5.3 Residual Environmental Effects Summary

A summary of the predicted (residual) environmental effects of the Project on the terrestrial environment is provided in Table 5-15 below.

Table 5-15: Terrestrial Environment: Residual Environmental Effects Assessment Summary

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Construction							
Change in vegetation and soils	A	N	S-L	4	R	R	H
Change in wildlife presence and abundance	A	N	S-L	4	R	R	H
Change in wildlife health	A	N	S-L	4	R	R	M
Change in wildlife habitat (availability/ quality)	A	N	S-L	4	R	R	M
Change in terrestrial species at risk	N	-	-	-	-	-	M
Operations and Maintenance							
Change in vegetation and soils	N-A	N	S-L	4	R	R	H
Change in wildlife presence and abundance	N-A	N	S-L	4	R	R	H
Change in wildlife health	N-A	N	S-L	4	R	R	M
Change in wildlife habitat (availability/ quality)	N-A	N	S-L	4	R	R	M
Change in terrestrial species at risk	N	-	-	-	-	-	M
Potential Accidental Events							
Change in vegetation and soils	A	L	L	2	O	R	M
Change in wildlife presence and abundance	A	L-M	L	2	O	R	M
Change in wildlife health	A	L	L	2	O	R	H
Change in wildlife habitat (availability/ quality)	A	L	L	2	O	R	H
Change in terrestrial species at risk	N	-	-	-	-	-	M

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Overall, Resulting Effect(s) of Project • Planned Project components and activities have potential to interact with and affect vegetation and wildlife through site clearing (habitat removal/ alteration) and associated disturbances such as noise, lighting, etc. The implementation of planned mitigations will help avoid or reduce any potential adverse effects. • Potential accidental events (such as spills or fires) will be prevented due to Project equipment and procedures, with appropriate response plans and procedures in place.				**Evaluation of Significance** • The proposed Project is not likely to result in significant adverse environmental effects on the terrestrial environment.			
Nature/Direction: A = Adverse N = Neutral or No Effect P = Positive **Reversibility**: R = Reversible I = Irreversible	**Magnitude:** N = Negligible L = Low M = Medium H = High **Certainty in Prediction**: L Low M Moderate H High	**Geographic Extent:** S = Site L = Local R = Regional	**Duration:** 1 = < 1 month 2 = 1-12 months 3 = 13-36 months 4 = 37-72 months 5 = > 72 months	**Frequency:** O = Once S = Sporadic R = Regular C = Continuous			

5.5.4 Cumulative Environmental Effects

The current (baseline) environmental conditions for wildlife and their habitats in the region (Section 3.1) reflect the effects and influences of other natural conditions and processes and past and on-going human developments and activities the area and elsewhere, in both the terrestrial and aquatic environments.

As noted above, the proposed Project site occurs within an already developed area, and the longstanding presence and on-going operation of the existing hydroelectric generation facility at this location has somewhat limited the use of the site itself by most wildlife. Any wildlife (such as avifauna) that do use the area have likely habituated somewhat to on-going human activity. As also described above, the proposed Project is not expected to significantly affect wildlife and their habitats in the area. While there are additional planned activities within the construction timeline of the Project, they all occur within the existing Bay d'Espoir site, and do not require the disturbance of new land that has not already been industrialized and exposed to construction activity.

The Project is therefore not likely to result in significant, adverse cumulative environmental effects on the terrestrial environment in combination with other projects or activities that have been or will be carried out.

5.6 Socioeconomic Environmental Assessment

This initial socioeconomic assessment considers the potential positive and negative socioeconomic impacts associated with the Project. The socioeconomic factors summarized in Section 3.2 (People and Communities; Economy, Employment, and Key Industries; Land and Resource Use and Protected and Special Areas) form the basis for assessing the initial potential socioeconomic impacts of the Project.

5.6.1 People and Communities

The proposed Project will occur in the Bay d'Espoir area of south-central Newfoundland, adjacent to an existing and long-standing hydroelectric generating facility in the area, and in proximity to various communities and human activities that are in the surrounding region. Development projects may affect people and communities in several ways, as a result of their associated components, activities, emissions and requirements, which may have both positive and negative socioeconomic consequences.

5.6.1.1 Potential Environmental Issues and Interactions

Potential interactions between the various phases of the proposed Project and people and communities in the Study Area and beyond may include disturbances due to Project-related noise, dust, light and other emissions, the presence of Project personnel, and Project-related demands for community services and infrastructure.

Human health and well-being are influenced by, and reflected in, the physical, social, emotional and mental characteristics and conditions of individuals, families and communities, including personal wellness, quality of life, and residents' perceptions of these factors. This section includes an analysis of whether, and how, the health and well-being of persons who live in local communities and surrounding regions may interact with, and be affected by, the proposed Project, including the following considerations: 1) physical human health; 2) social health and well-being; and 3) community services and infrastructure.

It will be important to ensure that the various phases of the Project do not have negative implications for human health and safety because of possible injuries or accidents, as well as any environmental exposure pathways that may affect human health. Project planning and its eventual implementation will place a high degree of emphasis on ensuring that it does not negatively affect social health and well-being, including residents' (real or perceived) quality of life.

An overview of the potential interactions between each of the main Project components and activities and the various key indicators and parameters that have been identified for this component is presented in Table 5-16.

Table 5-16: Atmospheric Environment: Potential Interactions

Project Component/Activity	Key Indicators and Parameters		
	Physical human health	Social health and well-being	Community services and infrastructure (availability, quality, cost)
Construction			
Movement/use of equipment and materials	•	•	•
Site preparation/excavation	•	•	•
Construction of the headrace channel	•	•	•
Construction of new intake	•	•	•
Installation of penstock	•	•	•
Construction of Unit 8	•	•	•
Widening of tailrace channel segment	•	•	•
Installation of transmission infrastructure			
Employment and expenditures	•	•	•
Operations and Maintenance			
Operation of new generation facilities	•	•	•
Operation of new transmission infrastructure	•	•	•
Water flow/management (upstream and downstream)	•	•	•
Employment and expenditures	•	•	•
Potential Accidental Events			
Infrastructure malfunction	•	•	•
Spills	•	•	•
Fires	•	•	•

5.6.1.2 Environmental Effects Assessment

As illustrated above, potential interactions between the Project and people and communities may result from both planned components and activities in either of the Project's phases, as well as potential unplanned (accidental) events.

5.6.1.2.1 Construction

Project construction will be characterized by standard and non-intrusive activities and practices, will occur within localized areas over a relatively short period. The proposed Project site is located within an existing and long-standing hydroelectric facility at Bay d'Espoir, on NL Hydro property, with access restrictions already in place around key infrastructure. Project activities are not expected to interact negatively with local communities or their residents either directly (it does not overlap with any municipal infrastructure, with the nearest community being ~4 km away) or indirectly (on-site Project activities will not likely be seen or heard by adjacent residents or others).

During the construction phase of the Project, public safety will continue to be protected through site access restrictions around active work locations. NL Hydro will also engage in regular communications with the local communities and other authorities and organizations throughout this phase of the Project, including when mobilizing large equipment along public roadways, or when planning to undertake work near existing facilities or infrastructure. Through on-going engagement with community officials, organization and residents, NL Hydro will ensure that residents are informed of the nature and planning timing of key Project works to prevent negative interactions and any associated safety concerns.

Atmospheric emissions during Project construction will include those resulting from the use (exhausts) of on-site equipment, which will be maintained in good repair and regularly inspected, as well as dust which will be controlled as necessary using water or other dust control agents. While construction may require artificial lighting in active work areas during certain scenarios, the amount and intensity of lighting used will be minimized and directed downwards where feasible. Construction will include excavation activities which will require some blasting that will emit noise and vibrations. An overview of planned measures to reduce and otherwise address potential blasting effects was provided in Section 5.2.5 and will help prevent the potential for associated effects on nearby residents.

Overall, Project construction activities are not expected to have negative implications for people and their health and safety. Most Project activities and any associated disturbances will not likely be seen or heard by residents or others, which limits the potential for nuisance effects, and there is low likelihood that any planned environmental emissions would reach, and negatively affect, human receptors. The Project is therefore not expected to have any negative implications for human health and well-being in the local communities or elsewhere.

Construction activity can also affect residents through the presence of project personnel within these communities and associated social interactions. Construction projects can also place demands on local services and infrastructure, thereby affecting the availability, quality or cost of these for the local population. This can include both direct, project-related requirements, such as the planned use of local transportation systems, water and sewage systems, waste disposal facilities, and others, as well as demands from construction workers and possibly their families. These requirements, and any resulting issues, can vary in nature and magnitude according to the type and level of demand, and the capacities of these services and infrastructure to accommodate additional use.

As described in Section 2.4, the Project's construction phase will involve a workforce of several hundred persons that is comprised of Southern Newfoundland residents, as well as temporary construction workers which are drawn from other areas of Newfoundland and Labrador and elsewhere. Non-resident workers will commute to and from the region according to their roles and work rotations and will be transported to the work area by bus to a work camp established by the construction contactor on or near the Project site. The temporary camp will be designed to accommodate all non-resident construction personnel, and will provide meals, laundry services, medical care (first aid) and other accommodations services to those housed there. The relatively short-term nature of the Project's construction phase means that workers are unlikely to relocate to the area with their families, and the planned use of an on-site construction work camp, work rotations and transportation systems during this phase of the Project will help to minimize any negative social issues and interactions with local communities, as well as preventing significant new demands on local housing and health, education, social and other services.

In terms of direct Project-related demands for local services and infrastructure, waste generated during Project construction will be transported to, and disposed of in an approved manner at, the regional waste disposal site.

5.6.1.2.2 Operations and Maintenance

Once the construction phase is completed, Project-related activity levels will decrease significantly, and temporary infrastructure such as the construction camp will be removed. Following Project commissioning, the Project will be operated on a continuous basis, and Project maintenance activities will include regular inspection of Project components and repairs to the system as required (Chapter 2), which will be fully integrated into NL Hydro's overall operations and maintenance activities at Bay d'Espoir.

Once the construction phase of the Project is completed, there will therefore be little or no additional environmental disturbance or associated emissions. Throughout the operations and maintenance phase of the Project, public safety will continue to be protected through site access restrictions, signage and communication protocols. Again, NL Hydro will coordinate, schedule and communicate the planned transportation of any large equipment and other loads to address potential traffic and safety concerns.

Project operations will be carried out by NL Hydro's existing workforce at Bay d'Espoir, and so no associated in migration of Project workers and their families to the region is anticipated.

5.6.1.2.3 Potential Accidental Events

Potential accidental events or malfunctions such as a fire, a spill of fuel or other materials, or infrastructure failure could affect people and communities in or around the Study Area and possibly beyond, either directly or indirectly through any resulting biophysical effects and associated pathways. Although such an event could conceivably occur during either phase of the Project, they are unlikely to do so, and in any case the resulting effects of such an incident would clearly depend upon the nature, magnitude, location and timing of the event.

An accidental spill of fuels or other deleterious substances has the potential to adversely affect the quality of water, soils, vegetation, fish and wildlife or other components of the biophysical environment, as well as the health of any users and consumers of same. Similarly, a large-scale forest fire that originated within the Project Area could affect air and water quality, wildlife and other environmental components and resources, and could also potentially pose direct risks to human health and safety. Such an accidental event may also place associated demands on local safety and security services, including fire, emergency response and policing, as well as medical facilities and others. An accidental event such as a Project-related fire could also affect community infrastructure such as buildings and transportation routes.

NL Hydro's planned measures and procedures to help prevent any such accidental events and to respond in the unlikely event of their occurrence were described previously (Section 5.3.2.3) and will help to prevent adverse effects upon the various aspects of the socioeconomic environment that are included in this component. NL Hydro plan to have medical, fire, emergency response services provided by the Project and reliance on the local community services is not anticipated. Should an accidental event occur at the Project site that is beyond the capabilities of on-site equipment and personnel, only

then will assistance be sought from nearby community services, as per NL Hydro's existing protocols and arrangements.

5.6.1.3 Residual Environmental Effects Summary

A summary of the predicted (residual) environmental effects of the Project on People and Communities is provided in Table 5-17 below.

In addition to the avoidance or reduction of any potential adverse effects of the Project on people and communities, it is also important to highlight that, from an economic perspective, the Project will create direct, indirect and induced employment and business opportunities and other economic benefits. These will positively affect residents and communities and in doing so, help contribute to the well-being and quality of life of people and communities in the region and beyond.

Table 5-17: People and Communities: Residual Environmental Effects Assessment Summary

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Construction							
Changes in physical human health	N-A	N	L	4	S	R	H
Changes in social health and well-being	A-P	N	L	4	S	R	H
Changes in community services and infrastructure (availability, quality, cost)	N	-	-	-	-	-	H
Operations and Maintenance							
Changes in physical human health	N-A	N	L	5	S	R	H
Changes in social health and well-being	A-P	N	L	5	S	R	H
Changes in community services and infrastructure (availability, quality, cost)	N	-	-	-	-	-	H
Potential Accidental Events							
Changes in physical human health	A	L	L	2	O	R	M
Changes in social health and well-being	A	L	R	2	O	R	M
Changes in community services and infrastructure (availability, quality, cost)	A	L	R	2	O	R	M

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Overall, Resulting Effect(s) of Project • The Project is not expected to have adverse effects upon public safety or the physical or social health and well-being of local residents and communities. • It will create positive economic benefits for the region which will contribute to residents' quality of life. • Potential accidental events (such as a fire or spills) will be prevented through planned Project equipment and procedures, with appropriate response plans and procedures in place				**Evaluation of Significance** • The proposed Project is not likely to result in significant adverse social effects on People and Communities.			

Nature/Direction: A = Adverse N = Neutral or No Effect P = Positive	**Magnitude:** N = Negligible L = Low M = Medium H = High	**Geographic Extent:** S = Site L = Local R = Regional	**Duration:** 1 = < 1 month 2 = 1-12 months 3 = 13-36 months 4 = 37-72 months 5 = > 72 months	**Frequency:** O = Once S = Sporadic R = Regular C = Continuous
Reversibility: R = Reversible I = Irreversible	**Certainty in Prediction:** L Low M Moderate H High			

5.6.1.4 Cumulative Environmental Effects

The characteristics of the existing (baseline) socioeconomic environment in the Study include, and have been shaped and influenced by, the effects (both positive and negative) of past and on-going human activities in the area, as well as other influences.

The proposed Project will be characterized by known construction/operations activities, occurring within a localized area, and will not adversely affect human safety or the health and quality of life of residents, visitors or their associated activities, infrastructure or other aspects of the socioeconomic environment. Although there are examples of past and current human developments and activities and around the Study Area and throughout the larger region, this area is not one with future large scale industrial development proposed, and particularly, any whose environmental effects would overlap in space and time with any that may result from this Project. While other issues and occurrences (such as the COVID-19 pandemic) have had implications for health and well-being in the overall region and the province, the self-reported health and quality of life of the regional population is generally high (Section 3.2), and the Project is not likely to negatively affect this.

The Project is therefore not likely to materially contribute to adverse cumulative effects on People and Communities, and will therefore not result in significant, adverse cumulative environmental effects in combination with other projects that have been or will be carried out.

5.6.2 Economy, Employment and Key Industries

The following sections assess and evaluate the potential implications of the Project for the economy of, and associated employment and business activity in, the Study Area, larger Southern Newfoundland region, and in the province of Newfoundland and Labrador as a whole. For the purposes of this assessment:

- **Economy** refers to a system consisting of the production, distribution or trade, and consumption of goods and services by individuals, businesses or other organizations within a particular geographic region.
- **Employment** refers to the activities of those persons in the labour force who are engaged in the production, distribution and servicing of those goods and services.
- **Business** refers to the presence, characteristics and activities of the companies or other entities that are involved in organizing those production, distribution and service activities, and which employ the labour force referenced above.

5.6.2.1 Potential Environmental Issues and Interactions

The proposed Project will provide a range of important economic benefits at the local, regional and provincial scales. This will include the creation of employment and business opportunities during its construction phase, and associated income, taxation and gross domestic product (GDP) benefits through direct, indirect and induced economic effects. Conversely, new resource developments in rural areas, and the resulting availability of new and often relatively high paying jobs, can create problems for existing businesses and organizations through labor force competition and wage inflation.

An overview of the potential interactions between each of the Project components and activities and the various key indicators and parameters that have been identified for this component is presented in Table 5-18.

Table 5-18: Economy, Employment and Business: Potential Interactions

Project Component/Activity	Key Indicators and Parameters			
	Change in Economy	Change in Employment	Change in Business	Interference with Other Economic Sectors
Construction				
Movement/use of equipment and materials	-	-	-	-
Site preparation/excavation	-	-	-	-
Construction of the headrace channel	-	-	-	-
Construction of new intake	-	-	-	-
Installation of penstock	-	-	-	-
Construction of Unit 8	-	-	-	-
Widening of tailrace channel segment	-	-	-	-
Installation of transmission infrastructure	-	-	-	-

Project Component/Activity	Key Indicators and Parameters			
	Change in Economy	Change in Employment	Change in Business	Interference with Other Economic Sectors
Employment and expenditures	•	•	•	•
Operations and Maintenance				
Operation of new generation facilities	-	-	-	-
Operation of new transmission infrastructure	-	-	-	-
Water flow/management (upstream and downstream)	-	-	-	-
Employment and expenditures	•	•	•	•
Potential Accidental Events				
Breach of infrastructure	•	•	•	•
Spills	•	•	•	•
Fires	•	•	•	•

5.6.2.2 Environmental Effects Assessment

5.6.2.2.1 Construction

The proposed Project will represent millions of dollars in capital investment for the region. Project construction will occur over several years, during which employment opportunities in a wide variety of occupations will be created.

As described in Section 2.4, the construction phase of the Project will require approximately 200 on-site workers in a variety of occupations (Table 2-1). Most, if not all these positions, will be full-time in nature. Project construction will be carried out on a contractual basis, with workers hired at the discretion of the contractor(s) and in accordance with their own hiring practices and policies. It is therefore not known at this stage what proportion of these positions will be filled locally, as this depends on such factors as local labour availability and interest, the location and specific hiring practices of the contractor, unionization and other factors. However, it is anticipated that local hiring will be preferred wherever possible to help minimize costs, especially given the skilled and experienced workforce that is currently available in the Southern Newfoundland area.

As part of its Project planning activities to date, NL Hydro has developed a labour force estimate for the Project at the National Occupational Classification (2021) level (Section 2.4). These data will be made available to appropriate agencies and organizations to help identify employment needs and opportunities, as well any key labour supply gaps so that the responsible authorities can take appropriate planning actions.

During this phase of the Project, a variety of business opportunities will also be created through Project-related requirements for equipment, materials and other goods and services. Newfoundland and Labrador businesses will have full and fair opportunity to provide supplies and services to the Project, some of the key requirements for which will include, for example, various services such as clearing,

earth moving and excavation, equipment supply, infrastructure supply and installation, blasting services, hotel accommodations others. In terms of accommodations, NL Hydro are committed to consulting with local hotels to confirm availability during the planned construction phase. The nature and magnitude of these business benefits will be a function of the degree to which local, regional and provincial companies secure contracts to provide goods and services to the Project. The awarding of contracts will be based on commercial and technical requirements, while also considering factors such as experience, creditworthiness, price, quality, service, safety and delivery. It is the responsibility of local and provincial businesses to identify and respond to the opportunities generated by the Project in an effective and timely manner.

NL Hydro's procurement and contracting policies and procedures will provide for full and fair opportunity for participation by qualified and competitive Newfoundland and Labrador companies.

In summary, the construction phase of the Project will provide important opportunities for Newfoundland and Labrador workers and businesses. These direct and indirect economic benefits will be supplemented by "spin-off" benefits as these incomes and revenues move through the regional, provincial and national economies.

5.6.2.2.2 Operations and Maintenance

Project operations will be undertaken by NL Hydro's existing workforce at Bay d'Espoir. The requirement for goods and services during Project operations will provide business opportunities in a number of areas. NL Hydro's procurement and contracting policies and procedures during this phase of the Project will likewise provide for full and fair opportunity for participation by qualified and competitive Newfoundland and Labrador companies, in keeping with the principles and approaches described in the preceding section.

In addition to the employment and business opportunities and associated economic benefits that are often associated with a development project, there is also the potential for local companies and organizations to be adversely affected through labour force competition, and potential wage inflation. As described in Section 3.2.4, the current labour force statistics for the region indicate that there is available capacity in the local labour force.

5.6.2.2.3 Potential Accidental Events

An accidental event such as a Project-related fire, fuel or chemical spill or a vehicle/equipment accident may have negative effects on employment and business activity in the Study Area and surrounding region, depending on the nature, scale, location and timing of the incident. This is especially so if an event results in the destruction and/or closure of any businesses or other infrastructure in the region (such as transportation routes) and subsequent loss of employment and revenues. If construction or operations activities are halted, Project workers and firms supplying goods and services may also be negatively affected.

Human health and safety and environmental protection have been paramount considerations by NL Hydro in the planning and design of the Project, and these will continue to be the main priorities during the construction and operation of the development. NL Hydro has comprehensive systems, plans and procedures in place for the various phases of the Project, to help prevent, and respond to as required, any such accidental event.

5.6.2.2.4 Residual Environmental Effects Summary

A summary of the predicted (residual) environmental effects of the Project on this component is provided in Table 5-19 below.

Table 5-19: Economy, Employment and Business: Residual Environmental Effects Assessment Summary

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Construction							
Change in economy	P	L-M	R	4	C	R	H
Change in employment	P	L-M	R	4	C	R	H
Change in business	P	L-M	R	4	C	R	H
Interference with other economic sectors	N	N	R	4	O-S	R	M
Operations and Maintenance							
Change in economy	P	L-M	R	5	C	R	H
Change in employment	N	-	-	-	-	-	H
Change in business	P	L-M	R	5	C	R	H
Interference with other economic sectors	N	-	-	-	-	-	H
Potential Accidental Events							
Change in economy	A	N	L-R	2	O	R	H
Change in employment	A	N	L-R	2	O	R	H
Change in business	A	N	L-R	2	O	R	H
Interference with other economic sectors	A	N	L-R	2	O	R	H

Overall, Resulting Effect(s) of Project	**Evaluation of Significance**
• The proposed Project will result in important, positive socioeconomic effects in Southern Newfoundland and throughout the province as a whole, including construction employment as well as business opportunities during its various phases. • These direct and indirect economic benefits will be supplemented by "spin-off" benefits as these incomes and revenues move through the regional, provincial and national economies.	• The proposed Project is not likely to result in significant adverse environmental effects on the Economy, Employment and Business.

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Nature/Direction: A = Adverse N = Neutral or No Effect P = Positive	**Magnitude:** N = Negligible L = Low M = Medium H = High		**Geographic Extent:** S = Site L = Local R = Regional		**Duration:** 1 = < 1 month 2 = 1-12 months 3 = 13-36 months 4 = 37-72 months 5 = > 72 months	**Frequency:** O = Once S = Sporadic R = Regular C = Continuous	
Reversibility: R = Reversible I = Irreversible	**Certainty in Prediction:** L Low M Moderate H High						

5.6.2.2.5 Cumulative Environmental Effects

The proposed Project will result in important, positive economic effects. This will include creating some direct employment (especially during its construction phase), as well as business opportunities for local and provincial businesses in the supply of goods and services. These direct and indirect economic benefits will be supplemented by "spin-off" economic outcomes, as these incomes and revenues move throughout the regional, provincial and national economies.

Other on-going and future development projects in Newfoundland and Labrador and elsewhere may have similar, positive effects on the economy, employment and business throughout the region and province. These will contribute further to the regional and provincial economies by providing important employment and business benefits for the next several decades. The direct result will be the generation of higher individual and business income levels and government revenues, increased employment and training opportunities and opportunities for business activity and growth. These cumulative outcomes will generate immediate benefits to the economy but may also lead to longer-term indirect changes. For example, a labour force with higher skills and experience levels can command better wages and positions. Similarly, project experience can help local businesses to become more competitive locally, nationally and internationally.

5.6.3 Land and Resource Use

The proposed Project site is located within an existing and long-standing hydroelectric generation facility and associated infrastructure at Bay d'Espoir.

5.6.3.1 Potential Environmental Issues and Interactions

Development activities may interact with, and potentially negatively affect, nearby lands and resources and their use for municipal, commercial, recreational or traditional purposes. These interactions may occur through required access restrictions, which may make certain locations unavailable for such purposes, or because of associated ground disturbance, noise, traffic, light, visual intrusions or other emissions and disturbances which may change the nature, distribution, value or quality of land and resource use by local residents or visitors.

An overview of the potential interactions between each of the main Project components and activities and the various key indicators and parameters that have been identified for this component is presented in Table 5-20.

Table 5-20: Land and Resource Use: Potential Interactions

Project Component/Activity	Key Indicators and Parameters			
	Municipal land use	Commercial land and resource use	Recreational/ traditional land and resource use	Historic resources
Construction				
Movement/use of equipment and materials	•	•	•	•
Site preparation/excavation	-	•	•	•
Construction of the headrace channel	-	•	•	•
Construction of new intake	-	•	•	•
Installation of penstock	-	•	•	•
Construction of Unit 8	-	•	•	•
Widening of tailrace channel segment	-	•	•	•
Installation of transmission infrastructure	-	•	•	•
Employment and expenditures	-	-	-	-
Operations and Maintenance				
Operation of new generation facilities	-	•	•	-
Operation of new transmission infrastructure	-	•	•	-
Water flow/management (upstream and downstream)	-	•	•	-
Employment and expenditures	-	-	-	-
Potential Accidental Events				
Infrastructure malfunction	•	•	•	-
Spills	•	•	•	-
Fires	•	•	•	•

5.6.3.2 Environmental Effects Assessment

As illustrated above, potential interactions between Project components and activities and local land and resource use may be both direct and indirect in nature, and occur through direct interference with such activities, as well as by adversely affecting the land areas and resources that are used for these purposes. They may also result from both planned components and activities during either phase of the Project, and due to possible unplanned (accidental) events.

5.6.3.2.1 Construction

The Project will not occur within the municipal boundaries of either community and is located approximately 4 km from any municipal features or facilities, including local protected water supply areas, the regional waste disposal area and others. Although there are a few commercial establishments in the general area, as well as land areas designated for commercial and industrial purposes (such as forestry/silviculture, agriculture, and others) none of these occur directly within or immediately adjacent to the Project Area itself. Although there are existing commercial outfitting camps in the general areas as well, neither of which is closer than 20 km from the proposed Project Area.

A variety of recreational and traditional land and resource use activities occur throughout the overall region, including hunting, trapping, fishing, cabins, wood cutting, boating and berry-picking, and others. However, the existing and available information (Section 3.2) and the public engagement activities completed by NL Hydro as part of this EA (Chapter 4) do not indicate local land and resource use activities in the immediate vicinity of the Project (i.e., within the Project Area). Indeed, the long-standing presence of the Bay d'Espoir hydroelectric generating facility, and its significance as a key part of the local landscape, has inevitably shaped the nature and distribution of such activities in the area. In any event, given the overall size of the region, and the number of alternative locations available in which to undertake such activities, no measurable adverse effect on the nature, intensity, value or enjoyment of these activities is anticipated because of the Project. NL Hydro will regularly communicate with local communities and other applicable individuals and organizations to keep them informed of the nature, location and planned timing of key Project works, and to ensure that adverse interactions and any associated effects are avoided.

While there are no known activities occurring within the footprint of the site, the existing Surge Tank Road and North Cut-off Road is used by residents as well as operators (e.g., guides, outfitters, etc.) to access local cabins north of the site. As construction activities occur, including the installation of the new Penstock, there will likely be some temporary loss of access of these roads for residents who would typically go through the existing facility footprint to access them. Any disruptions associated with this are anticipated to be very short in duration, so that continuous access is generally maintained. As mentioned previously, NLH will continue to communicate with local towns and residents, Indigenous communities, and others to provide signage and notifications during construction on when access to these roads will be restricted, and when it will be re-opened. These closures would likely occur throughout the construction phase of the Project, with varying durations depending on the activities taking place.

Downstream of the Project, past St. Veronica's, Bay d'Espoir and its associated tributaries are used for several commercial, recreational and traditional uses. This includes aquaculture locations within the bay for species such as Atlantic salmon and steelhead trout. Locals also fish recreationally, and Atlantic Salmon is both a cultural and traditionally important species in the region. There have been concerns raised (Section 4.0) related to potential downstream impacts on recreational and traditional land uses due to increased water flows and reduction in water quality that may have certain impacts on identified fish and fish habitats. During construction, the main pathway for downstream impacts would be increased sedimentation in the water from activities, which would result in local impact to water quality, and subsequent impacts to species health and abundance. As mentioned in Section 5.4.2.1 a series of mitigation measures associated with construction activities will be put in place to avoid or reduce sedimentation events into the tailrace and subsequently downstream. It is also anticipated that

sediment transport events would not move as far downstream as St. Veronica's and out into the greater Bay d'Espoir.

Historic resources include sites and objects of historic and archaeological, cultural, spiritual and paleontological importance, which may be protected under the Newfoundland and Labrador Historic Resources Act administered by the PAO. Ownership of all archaeological objects is vested in the Crown. Construction activities and associated ground disturbance have the potential to disturb or destroy archaeological sites and other historic resources if these are present within a development project's footprint.

There are no known historic resources within or near the Project area. The proposed Project site itself is relatively small, and it is unlikely that the Project will result in the disturbance or destruction of historic resources. During Project site development, however, standard precautionary and reporting procedures will be implemented. Should a discovery of historic resources occur, all work will cease in the immediate area of the discovery until authorization is given for the resumption of the work. Any archaeological materials encountered will be reported to the PAO, including information on the nature of the material discovered and the location and date of the find.

5.6.3.2.2 Operations and Maintenance

Once the construction phase is completed, Project-related activity levels will decrease significantly, and Project operation and maintenance activities will be fully integrated into NL Hydro's overall activities at Bay d'Espoir.

As mentioned in Section 5.4.2.2 (Table 5-12), 2-D hydrodynamic modelling conducted for the project showed that certain scenarios such as peak operations with Units 1-8 at max capacity during low and high tide, as well as in the event of a 1:1,000 flood event both at low and high tide can result in flooding events. Flooding / inundation areas included the eastern side of the tail race, including along Tailrace Resource Road, which is used for local traffic and for some businesses. It should be noted that flood events currently do occur at some points during the year under current operations, which affect the use of Tailrace Resource Road, so this is not a new issue. If flooding does occur, it could mean a temporary loss of access to Tailrace Resource Road. This has the potential to reduce access to land in and around the tailrace channel and could have direct or indirect impacts on the community, including individuals and businesses that may use that road.

To address any emerging or ongoing concerns regarding the Project's effects on land and resource use, NL Hydro will continue to communicate regularly with communities, Indigenous groups, other organizations and the public throughout the life of the Project. This will include the provision of Project information and regular updates on on-going and planned activities, as well as discussion of any issues and potential means of addressing them.

Once construction is completed, there will be no additional ground disturbance during operations and maintenance and therefore little or no potential for effects to historic resources. The precautionary and reporting procedures described above will, however, continue to be in place throughout the life of the Project.

5.6.3.2.3 Potential Accidental Events

Potential accidental events or malfunctions could affect land and resource use either directly, by rendering areas unavailable for such pursuits, or indirectly through any resulting biophysical effects and associated pathways. A fire at the Project site spreading into adjacent areas could affect land areas and resources, making them unsuitable for certain uses and activities. Similarly, an accidental spill of fuel or other deleterious substances into adjacent waterbodies or land areas may prevent their use for certain (particularly consumptive) activities for periods of time. Although either of these accidental events could conceivably occur during either phase of the Project, they are unlikely to do so, and in any event the resulting environmental effects of such an incident would clearly depend upon the nature, magnitude, location and timing of the event.

NL Hydro's planned measures (equipment and procedures) to help prevent any such events, and to respond to one in the unlikely event of its occurrence, were described previously and will further help to prevent adverse effects upon the various aspects of the socioeconomic environment that are included in this component.

5.6.3.2.4 Residual Environmental Effects Summary

A summary of the predicted (residual) environmental effects of the Project on Land and Resource Use is provided in Table 5-21 below.

Table 5-21: Land and Resource Use: Residual Environmental Effects Assessment Summary

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Construction							
Change in municipal land use	N	-	-	-	-	-	H
Change in commercial land and resource use	N-A	N	L	4	S	R	H
Change in recreational/ traditional land and resource use	N-A	N	L	4	S	R	H
Change in historic resources	N	-	-	-	-	-	H
Operations and Maintenance							
Change in municipal land use	N	-	-	-	-	-	H
Change in commercial land and resource use	N-A	N	L	5	S	R	H
Change in recreational/ traditional land and resource use	N-A	N	L	5	S	R	H

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Change in historic resources	N	-	-	-	-	-	H
Potential Accidental Events							
Change in municipal land use	A-N	N	L	3	O	R	H
Change in commercial land and resource use	A-N	N	R	3	O	R	H
Change in recreational/ traditional land and resource use	A-N	N	R	3	O	R	H
Change in historic resources	N	-	-	-	-	-	M

Overall, Resulting Effect(s) of Project

- Planned components and activities are not expected to have material adverse effects land and resource use in the Project or Study Areas during any phase of the Project.
- Potential accidental events (such as a fire or spills) and their possible effects will be prevented and mitigated through planned Project equipment and procedures, with appropriate response plans and procedures in place

Evaluation of Significance

- The proposed Project is not likely to result in significant adverse environmental effects on Land and Resource Use.

Nature/Direction:
A = Adverse
N = Neutral or No Effect
P = Positive

Magnitude:
N = Negligible
L = Low
M = Medium
H = High

Geographic Extent:
S = Site
L = Local
R = Regional

Duration:
1 = < 1 month
2 = 1-12 months
3 = 13-36 months
4 = 37-72 months
5 = > 72 months

Frequency:
O = Once
S = Sporadic
R = Regular
C = Continuous

Reversibility:
R = Reversible
I = Irreversible

Certainty in Prediction:
L Low
M Moderate
H High

5.6.3.3 Cumulative Environmental Effects

The characteristics of the existing (baseline) socioeconomic environment in the Study include, and have been shaped and influenced by, the effects (both positive and negative) of past and on-going human activities, as well as other influences.

The proposed Project will be characterized by relatively straightforward and localized activities that will not interfere significantly with local land and resource use activities, including municipal, commercial or recreational/traditional pursuits, and it will not likely interact with historic resources. Although there are examples of past and current human developments and activities around the Study Area – including the

Bay d'Espoir hydroelectric facility which has been in operation since the 1960s - it is not one that is currently proposed to be subject to future large scale industrial development to date. There is planned refurbishment activities for the existing Penstocks on site, that would occur within 2025-2027/2028. This may result in very short disruption to some road access associated with the Surge Tank Road; however, since this work overlaps with the planned construction window for the Project, it is not anticipated that any road closures of the Surge Tank Road would extend beyond what is already anticipated. NL Hydro will continue to coordinate with contractors, the municipalities within the region, and residents to plan and inform of temporary road closures in a way that reduces potential impacts to land and resource use.

The Project is therefore not likely to result in significant, adverse cumulative environmental effects in combination with other projects that have been or will be carried out.

5.6.4 Protected and Special Areas

A few locations in south-central Newfoundland have been designated as protected under legislation or other processes or have been formally identified as being otherwise special or sensitive due to their ecological, historical and/or socio-cultural characteristics and importance.

5.6.4.1 Potential Environmental Issues and Interactions

Development activities can adversely affect protected and special areas through direct disturbance, such as when activities occur within such areas, or where the environmental emissions or other disturbances from development activities extend or "spread" to nearby protected or specific areas through atmospheric or hydrological conditions, species movements, or other factors. Any resulting decrease in the real or perceived integrity of these sites in the short or long term may, in turn, affect their ecological or socio-cultural value and (where applicable) the use and enjoyment of these areas.

An overview of the potential interactions between each of the Project components and activities and the various key indicators and parameters that have been identified for this environmental component is presented in Table 5-22.

Table 5-22: Protected and Special Areas: Potential Interactions

Project Component/Activity	Key Indicators and Parameters *	
	Biophysical Features and/or Processes	Human Use and/or Value
Construction		
Movement/use of equipment and materials	•	•
Site preparation/excavation	•	•
Construction of the headrace channel	•	•
Construction of new intake	•	•
Installation of penstock	•	•
Construction of Unit 8	•	•
Widening of tailrace channel segment	•	•
Installation of transmission infrastructure	•	•
Employment and expenditures	-	

Project Component/Activity	Key Indicators and Parameters *	
	Biophysical Features and/or Processes	Human Use and/or Value
Operations and Maintenance		
Operation of new generation facilities	•	•
Operation of new transmission infrastructure	•	•
Water flow/management (upstream and downstream)	•	•
Employment and expenditures	-	-
Potential Accidental Events		
Infrastructure malfunction	•	•
Spills	•	•
Fires	•	•
*Where project activities occur within or may otherwise extend to existing protected or special areas		

5.6.4.2 Environmental Effects Assessment

A description of areas in south-central Newfoundland that have been designated as protected or otherwise identified as special or sensitive was provided in Section 3.1. The following provides an assessment and evaluation of any potential effects of the Project on these areas, including each of the components and activities that will be associated with the Project during its various phases.

5.6.4.2.1 Planned Project Components and Activities (All Phases)

The proposed Project Area is not located within, or immediately adjacent to, any identified and designated protected or sensitive area in south-central Newfoundland. As shown in Table 5-23, the closest that the proposed Project will be to any such area is approximately seven km, with most being well over 15 km away.

Table 5-23: Protected and Special Areas and their Distance from the Project

Protected/Special Area	Minimum Distance from Project (km)
Jipujijkuei Kuespem Provincial Park	15.3
Bay du Nord Wilderness Reserve	25.9
Conne River North (Proposed Ecological Reserve)	15.3
Facheaux Bay (Proposed Ecological Reserve)	20.6
Middle Ridge Wildlife Reserve	27.5
Bay du Nord River (Heritage River)	25.9
Protected Waterbody (Domestic Water Supply Areas)	
• St. Albans	6.8
• Milltown, Head of Bay D'Espoir	10
• Morrisville	10
• Conne River	15.3
• Gaultois	42.2

Protected/Special Area	Minimum Distance from Project (km)
• Pool's Cove	42
• Hermitage – Sandyville	49.3
• McCallum	49.5

As described for the various preceding components and those which follow, the Project is not expected to result in significant adverse effects upon any aspect of the environment, due to the overall nature, location and extent of the various components and activities that comprise it and given the various planning and mitigation measures that have been identified and committed to by NL Hydro (Table 5-23). It will therefore not adversely affect the key ecological features, processes and integrity of any inland, coastal or marine areas, including the protected and special areas that are the subject of this section.

5.6.4.2.2 Potential Accidental Events

Potential accidental events resulting from the Project, such as a fire, a fuel spill, or a spill of other materials into the environment could, depending upon the nature, magnitude and location of the event, affect protected or sensitive areas in the region. However, as illustrated and discussed above, all the currently identified areas are located over approximately 15 km from the proposed Project. It is therefore considered very unlikely that, in the event of such an incident during this Project, its effects would extend into one or more of these locations.

NL Hydro's planned measures (equipment and procedures) to help prevent any such accidental events, and to respond to one in the unlikely event of its occurrence and will further help to prevent any adverse effects upon this environmental component.

5.6.4.3 Residual Environmental Effects Summary

A summary of the predicted (residual) environmental effects of the Project on Protected and Special Areas is provided in Table 5-24 below.

Table 5-24: Protected and Special Areas: Residual Environmental Effects Assessment Summary

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Construction							
Change in biophysical features and/or processes	N	-	-	-	-	-	H
Change in human use and/or value	N	-	-	-	-	-	H
Operations and Maintenance							
Change in biophysical features and/or processes	N	-	-	-	-	-	H
Change in human use and/or value	N	-	-	-	-	-	H

Potential Effect	Environmental Effect Descriptors						
	Nature	Magnitude	Extent	Duration	Frequency	Reversibility	Certainty
Potential Accidental Events							
Change in biophysical features and/or processes	N	-	-	-	-	-	H
Change in human use and/or value	N	-	-	-	-	-	H
Overall, Resulting Effect(s) of Project • The Project is not anticipated to have adverse effects upon this environmental component.				**Evaluation of Significance** • The proposed Project is not likely to result in significant adverse environmental effects on Protected and Special Areas.			

Nature/Direction: A = Adverse N = Neutral or No Effect P = Positive	**Magnitude:** N = Negligible L = Low M = Medium H = High	**Geographic Extent:** S = Site L = Local R = Regional	**Duration:** 1 = < 1 month 2 = 1-12 months 3 = 13-36 months 4 = 37-72 months 5 = > 72 months	**Frequency:** O = Once S = Sporadic R = Regular C = Continuous
Reversibility: R = Reversible I = Irreversible	**Certainty in Prediction:** L Low M Moderate H High			

As described above, the proposed Project is not likely to result in significant adverse environmental effects on protected and special areas.

5.6.4.4 Cumulative Environmental Effects

As the proposed Project will not result in adverse effects upon protected or special areas, it will not result in or contribute to any cumulative environmental effects on this environmental component in combination with other projects and activities that have been or will be carried out.

5.7 Environmental Monitoring and Follow-up

NL Hydro is committed to obtaining all required permits, approvals and authorizations for the proposed Project, and the company and its contractors will comply with these and all relevant regulations and guidelines in planning and implementing the proposed Project that is the subject of this EA Registration. This includes the various mitigations identified and committed to in the preceding sections, the implementation and effectiveness of which will be planned, managed and tracked in accordance with NL Hydro's internal plans and procedures.

As part of the EA, NL Hydro has also identified and committed to on-going communication with local communities, Indigenous groups, other organizations and the public throughout this Project, as a key approach to managing any adverse effects and maximizing benefits. This is intended to allow for continued discussion of Project activities and any issues as they may arise during its implementation, as well as to cooperatively and collaboratively plan and implement any required management measures that may be required to address these throughout the life of the Project.

NL Hydro and its contractor(s) will also apply for, receive, and adhere to the terms and conditions of, any subsequent (post EA) regulatory approvals and authorizations that are required for specific Project components and activities in its construction and operations and maintenance phases. These subsequent regulatory review processes will facilitate the provision of more detailed information on key Project components, activities and potential environmental interactions to the various applicable regulatory authorities for review and approval, as such information becomes progressively available through on-going engineering work.

6.0 Summary and Conclusion

NL Hydro owns and operates an extensive electrical generation and transmission system in Newfoundland and Labrador, which includes a 604 MW hydroelectric generation station at Bay d'Espoir. The facility began operations in 1967, and currently produces an average of 2,650 GWh annually, making it the largest hydroelectric plant on the Island of Newfoundland.

The proposed development project that is the subject of this EA Registration includes the construction and operation of an additional 150 MW unit (Unit 8) at the existing Bay d'Espoir hydroelectric generating facility. This document is intended to initiate the provincial EA process for the Project, which will undergo review in accordance with the requirements of the NLEPA (Part X).

The Project will be planned, designed and implemented to avoid or reduce potential adverse environmental effects and to create and maximize its benefits. Given the nature, scale and characteristics of the proposed Project, including its location within, and planned integration into, the existing and long-standing hydroelectric generation facilities at Bay d'Espoir it is not likely to have significant environmental issues or effects associated with it. It will be constructed and operated in accordance with NL Hydro's environmental policies, plans and practices – and well as the various mitigation measures identified and committed to in this EA Registration - to help ensure that it is undertaken in a safe and environmentally-responsible manner. The Project will contribute to local and provincial economies because of the employment and business activity that it will create, as well as over the long-term by helping to ensure a continued secure and reliable electricity supply in the province.

As proponent, NL Hydro is confident that any environmental considerations that may be associated with the proposed Project can be addressed through sound planning, design and implementation, supported by on-going communication and cooperation with local communities, Indigenous groups and key stakeholders.

7.0 Closure

Company Representative, Scott Crosbie **Date :** July 29, 2025

Vice President, Operations

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Bay d'Espoir Unit 8

Environmental Assessment Registration

Appendix A: Environmental Permits, Approvals and Authorizations

Appendix B: Project Need - Power the Province

Appendix C: Environmental Protection Plan

Appendix D: Engagement Summary – What We Heard

Appendix E: 2D Tailrace Hydraulic Modelling

Appendix A: Environmental Permits, Approvals and Authorizations

Appendix A

Preliminary List of Environmental Permits, Approvals and Authorizations

Appendix D Preliminary List of Environmental Permits, Approvals and Authorizations

Permit / Approval Potentially Required	Legislation / Regulation	Project Component / Activity Requiring Authorization or Compliance	Regulatory Authority	Summary of Requirements
GOVERNMENT OF NEWFOUNDLAND AND LABRADOR				
Environmental Assessment Approval	Environmental Protection Act (Part X) and EA Regulations	Project (all components and activities)	Environmental Assessment Division, NL Department of Environment and Climate Change	Anyone who plans a project that could have a significant effect on the natural, social or economic environment (an "undertaking") must present it for examination through the provincial EA process. The *EA Regulations* (*Part III - Designated Undertakings and Exceptions*) list those projects that require registration and review under the provincial EA process.
Submission, Review and Approval of Various Environmental Plans, including: • Environmental Protection Plan(s) • Water/Air Quality Monitoring Plans • Environmental Emergency Response Plan	Environmental Protection Act	Various	EA Division, Pollution Prevention Division, Water Resources Management Division, NL Department of Environment and Climate Change Others (as applicable)	Various environmental plans may be required for aspects of the Project, either pursuant to legislative / regulatory requirements, as conditions of EA approval, or as requirements of specific permits and authorizations.

Permit / Approval Potentially Required	Legislation / Regulation	Project Component / Activity Requiring Authorization or Compliance	Regulatory Authority	Summary of Requirements
Permit for Alterations to a Body of Water	Water Resources Act	Any activities which may alter a water body: • Culverts • Bridges • Dams • Fording • Pipe Crossing / Water Intake • Stream Modification • Small Bridges • Infilling, Dredging and Debris Removal • Development in Flood Risk Areas • Miscellaneous Works	Water Resources Management Division, NL Department of Environment and Climate Change	Permits are required under Section 48 of the Act for development activities which may alter any water body. An application form is required for each alteration.
Compliance Standard	Water Resources Act, Environmental Control Water and Sewage Regulations	Any liquid waste materials discharged from the Project	Water Resources Management Division, NL Department of Environment and Climate Change	A person discharging sewage and other materials into a body of water must comply with the standards, conditions and provisions prescribed in these regulations for the constituents, contents or description of the discharged materials.
Approval to Occupy Crown Land (Grant, License, Lease, Easement, Assignment – as applicable)	Lands Act	Any development on Crown Lands in the province	Crown Lands Division, NL Department of Fisheries, Forestry and Agriculture	Approval is required for Project activities and infrastructure on Crown Land.
Cutting Permit	Forestry Act, Cutting of Timber Regulations	Clearing land for Project infrastructure	Forestry Branch, NL Department of Fisheries, Forestry and Agriculture	A permit is required for the commercial or domestic cutting of timber on crown land.
Operating Permit	Forestry Act, Forest Fire Regulations	Any planned cutting or industrial activities to be undertaken during the	Forestry Branch, NL Department of Fisheries, Forestry	A permit issued in accordance with the Forest Fire Regulations giving permission to carry out a logging or industrial operation

Permit / Approval Potentially Required	Legislation / Regulation	Project Component / Activity Requiring Authorization or Compliance	Regulatory Authority	Summary of Requirements
		forest fire season	and Agriculture	during the Forest Fire Season on Crown or private land at a specified site
Permit to Burn	Forestry Act, Forest Fire Regulations	Any burning required during Project construction	Forestry Branch, NL Department of Fisheries, Forestry and Agriculture	During the forest fire season a permit to burn must be obtained to ignite a fire on or within 300 meters of forest land.
Permits under Endangered Species Legislation	Endangered Species Act	Any Project activities that may adversely affect species protected under the Act	Wildlife Division, NL Department of Fisheries, Forestry and Agriculture	Under this Act (Section 19), permits may be issued in certain situations and under specific conditions.
Quarry Permit or Lease	Quarry Materials Act and Regulations	Extracting borrow material	Mineral Lands Division, NL Department of Industry, Energy and Technology	Approval is required to dig for, excavate, remove and dispose of any Crown quarry material. Forms are also required to be submitted to report the volume of material extracted in each calendar year, and to demonstrate the required rehabilitation and closure work has been completed. Separate applications are also required to obtain approval to operate within an approved quarry permit held by another party, and to conduct exploration for quarry materials.
Certificate of Approval for Storing and Handling Gasoline and Associated Products Storage Tank System Test Certification Form	Environmental Protection Act, Storage and Handling of Gasoline and Associated Products Regulations	Storage of fuel and associated products	Service NL	A Certificate of Approval is required for storing and handling gasoline and associated products.
Fuel and Associated Products Storage Tank Registration	Environmental Protection Act, Storage and Handling of Gasoline and Associated Product Regulations	Storage of fuel and associated products	Service NL	All fuel storage tank systems must be registered.
Fuel Cache Permit	Environmental	Temporary fuel storage	Service NL	A permit is required for any temporary fuel

Permit / Approval Potentially Required	Legislation / Regulation	Project Component / Activity Requiring Authorization or Compliance	Regulatory Authority	Summary of Requirements
(Remote Sites) Fuel Cache Permit (Non-Remote Sites)	Protection Act			storage in a remote location.
Mobile Fuel Storage Tank Relocation	Environmental Protection Act	Any planned relocation of a mobile fuel storage tank	Service NL	A request form is provided and must be completed and submitted for this activity
Approval for Used Oil and Used Glycol Storage	Environmental Protection Act, Used Oil and Used Glycol Control Regulations	Any proposed storage of used oil or glycol	Service NL	Under the Regulations, Sections 7 and 8, any new or altered storage tank system requires registration prior to the installation or alteration of tanks and associated piping. Subsection 11(4) requires approval where greater than 205 liters of used oil or used glycol is to be stored in one or more containers. Subsection 11(6) requires registration of an oil separator.
Compliance standards; permits may be required.	National Building Code	On-site structures (temporary or permanent)	Service NL	Compliance / approval is required for all building plans.
Compliance standards; permits may be required.	National Fire Code	On-site structures (temporary or permanent)	Service NL	Compliance / approval is required for fire prevention systems in all approved buildings.
Compliance Standard Notice to Minister	Occupational Health and Safety Act and Regulations	Project-related employment	Service NL	Outlines minimum requirements for workplace health and safety. Workers have the right to refuse dangerous work. Proponents must notify Minister of start of construction for any project greater than 30 days in duration.
Blasters Safety Certificate	Occupational Health and Safety Act	Blasting activities	Service NL	
Food Establishment License or Food Establishment Permit (Temporary Premises)	Health and Community Services Act, Food and Drug Act and Food Premises Regulations Food Premises Act	Establishing and operating a temporary camp and kitchen facility, or using/upgrading existing facilities	Service NL	A Food Establishment License may be issued to any premises involved with the sale, production, manufacturing, preparation, storage and/or distribution of food subject to compliance with all pertinent legislation. Any individual or group proposing to organize / establish a temporary food operation service must have a permit to operate.
GOVERNMENT OF CANADA				

Permit / Approval Potentially Required	Legislation / Regulation	Project Component / Activity Requiring Authorization or Compliance	Regulatory Authority	Summary of Requirements
Letter of Advice or Authorization	Fisheries Act	Any Project component or activity that may adversely affect fish and fish habitat	Fisheries and Oceans Canada (DFO)	Subsection 34.4(1) of the Act prohibits the carrying on of a work, undertaking or activity, other than fishing, that results in the death of fish, and Subsection 35(1) prohibits the carrying on of a work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat. Under paragraphs 34.4(2)(b) and 35(2)(b) of the Act, the Minister may issue an authorization for such activities, with terms and conditions. If a project has the potential to affect fish or fish habitat, Proponents must submit a Request for Project Review to DFO. DFO will determine if the Project triggers any requirements under the Fisheries Act. Letters of Advice are non-regulatory tools currently issued to provide advice to proponents on the implementation of appropriate measures to avoid and mitigate harm to fish and fish habitat, to assist them in complying with the Act. Authorizations may be required where serious harm to fish or fish habitat cannot be avoided. This depends on nature of any required in water work, and potential for fish / fish habitat in those waterbodies. An offsetting plan is required for any project that will cause death of fish or will harmfully alter, disrupt or destroy fish habitat, including aquatic species at risk and their habitat.
Compliance Standard	Fisheries Act, Section 36(3), Deleterious	Any discharge to receiving waters	Environment and Climate Change Canada, Fisheries	Subsection 36(3) prohibits the deposit of deleterious substances into water frequented by fish, or to any place, under any conditions,

Permit / Approval Potentially Required	Legislation / Regulation	Project Component / Activity Requiring Authorization or Compliance	Regulatory Authority	Summary of Requirements
	Substances		and Oceans Canada	where they may enter waters frequented by fish. A deleterious substance can be any substance that, if added to any water, would degrade or alter the water quality such that it could directly or indirectly harm fish, fish habitat, or the use of fish by humans.
Permits Authorizing an Activity Affecting Listed Wildlife Species	Species at Risk Act	Any Project activities that may adversely affect species protected under the Act	Environment and Climate Change Canada, Fisheries and Oceans Canada	Permits are required for any activities that may affect species listed on Schedule 1 of SARA, as extirpated, endangered, or threatened and which contravene the Act's general or critical habitat prohibition Under section 73 of the Act, the competent minister may enter into an agreement or issue a permit authorizing a person to engage in an activity affecting a listed wildlife species, any part of its critical habitat, or the residences of its individuals.
Compliance Standard (permits may be required) Migratory Bird Permit Nest Removal Permit	Migratory Birds Convention Act and Regulations	Any activities which could affect migratory birds	Canadian Wildlife Service, Environment and Climate Change Canada	The Act protects migratory birds, their nests and eggs anywhere they are found in Canada, except when authorized by a permit.
Disposal at Sea Permit	Canadian Environmental Protection Act, Disposal at Sea Permit Application Regulations	Any required disposal of materials into the marine environment	Environment and Climate Change Canada	Required if waste or other matter, including dredged material, or any structures will be disposed of at sea during construction, operation, or decommissioning of the project.

Permit / Approval Potentially Required	Legislation / Regulation	Project Component / Activity Requiring Authorization or Compliance	Regulatory Authority	Summary of Requirements
License to Store, Manufacture, or Handle Explosives Temporary Magazine License Explosives Purchase and Possession Permit Explosives Transportation Permit Temporary Blasters License/Blaster's Permit	Explosives Act and Regulations	Purchase, possession, storage, transportation, use of explosives	Natural Resources Canada	Licenses and approvals are required for the purchase, possession, storage, transportation, use of explosives
Approval for Construction of Works in Navigable Waters	Navigable Waters Act and Regulations	Construction of watercourse crossings and other in water works	Transport Canada	Under the Act, owners of works who propose to construct, place, alter, rebuild, remove or decommission works that are in, on, over, under, through or across any navigable water may be required to apply for approval / authorization. An exception is when a project is considered a "minor work" and meets criteria set in the Minor Works Order.
MUNICIPALITIES				
Approval for Waste Disposal	Urban and Rural Planning Act, 2000, and Relevant Municipal Plan and Development Regulations	Waste disposal	Relevant Municipal Council(s)	The use of a community waste disposal site in Newfoundland and Labrador by proponents/contractors to dispose of waste requires municipal approval. Restrictions may be in place as to what items can be disposed of a municipal disposal site.
License to Operate a Temporary Work Camp	Urban and Rural Planning Act, 2000, and Relevant Municipal Plan and Development Regulations	Establishment and operation of a temporary work camp within municipal boundary / planning area	Relevant Municipal Council(s)	A permit is required for any development or building within municipal boundaries / planning areas

Appendix B: Project Need - Power the Province

newfoundland labrador hydro

POWER THE PROVINCE

BUILDING A FUTURE WITH SAFE, LEAST-COST, AND RELIABLE POWER SOLUTIONS

THE POWER OF PLANNING

We're planning for the future and working hard to power the province with safe, reliable electricity at the lowest possible cost for our customers. It's something we all need—and we will need more. Our customers have been clear. The cost of living, including electricity rates, is a concern—they prioritize lower electricity costs before investment in increased reliability or renewable technologies.

With lessons of the past in mind, and with the oversight of the Public Utilities Board, we are moving forward with what absolutely and urgently must be done to support system reliability and have supply in place to meet load growth.

TIME TO BUILD

In 2024, Hydro filed our 2024 Resource Adequacy Plan (2024 Plan) with the Public Utilities Board. This was a continuation of our planning process, which addresses our long-term approach to providing continued lowest cost, reliable service for our customers.

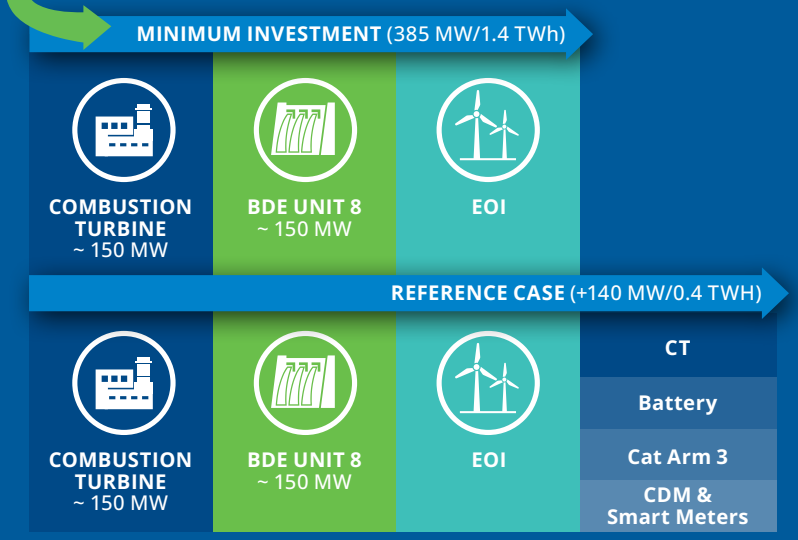
The 2024 Plan assessed the integration of new assets, system reliability, and the effects of electrification and decarbonization across various scenarios.

Our analysis demonstrated that, in all modeled scenarios, urgent investment is required to ensure continued reliability of our electrical system and to prepare for load growth.

As a first step, and in recognition that our customers are counting on us to invest wisely and prudently, we recommended a Minimum Investment Required Expansion Plan. The plan proposed an additional 150 megawatt (MW) unit at the Bay d'Espoir Hydroelectric Generating Facility ("BDE Unit 8") and a new 150 MW combustion turbine with renewable fuel capabilities located on the Avalon Peninsula ("Avalon CT") as the preferred, least-cost, environmentally responsible resource options to address our capacity needs. Our plan also identified wind energy to meet our energy needs.

We are also working to ensure that plans are in place for scenarios with more aggressive load growth. While such cases may require additional supply, BDE Unit 8, Avalon CT, and wind energy represent the minimum investment required across all scenarios.

WE RECOMMEND

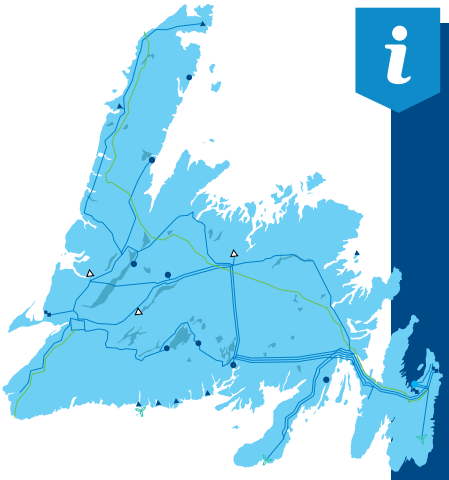


We have now gathered all the evidence required to support our submission of the 2025 Build Application to the Public Utilities Board for these capacity-focused solutions.

Wind does not form part of Hydro's 2025 Build Application. Rather, we will continue our ongoing analysis and will proceed with an Expression of Interest (EOI) to identify potential wind developers and development opportunities later this year. As wind requirements are confirmed, we will issue a request for proposals (RFP).

This summary presents an overview of the application.

The full application with documentation is available at PowerTheProvince.ca.



HOW MUCH DOES THE ISLAND NEED?

The 2024 Resource Plan determined we need capacity and energy.

Capacity is the maximum amount our electricity system can produce at any given time, measured in megawatts.

Energy is the amount of electricity produced over a specific period of time, measured in watt-hours.

In 2024, Island demand reached 1691 MW and is expected to grow to 1928 MW by 2035—a 14% increase. We need to add capacity to meet this demand.

In 2024, we used 7.8 TWh of energy on the Island and use is expected to grow to 9.0 TWh by 2035—that's 17% more energy.

HYDRO'S 2025 BUILD APPLICATION IS THE FIRST STEP TO ADDRESSING OUR CAPACITY NEEDS.

LISTENING TO OUR CUSTOMERS

Hydro values the perspectives of everyone who may be impacted by decisions about the delivery of safe, reliable, environmentally responsible electricity. Through a province-wide digital engagement, we engaged our customers to gather opinions about our next big decisions. Customers were very clear. The cost of living, including electricity rates, is a concern and they have a strong preference to prioritize lower electricity costs before investment in increased reliability or renewable technologies.

With this is mind, Hydro is moving forward with what absolutely and urgently must be done to support system reliability and have supply in place to meet load growth – the Avalon CT and BDE Unit 8. These proposed projects continue to be the least-cost options to provide reliable, electricity in an environmentally responsible manner.

We are also engaging and sharing information with the public and other interested groups as we plan these projects. Through various digital, phone, and in person meetings, we have engaged elected officials and senior staff from the communities that will be home to the new projects. We have also held public information sessions for area residents, and have met and shared information with other interested groups.

As we move forward, Hydro is committed to ongoing engagement and keeping the public, interested groups, and our own employees informed. We will continue to gather input as we advance though Environmental Assessment, Public Utilities Board application processes, planning, and construction.

APPROACH TO MAJOR PROJECTS

Recognizing the criticality of project oversight in the success of major projects, Hydro has taken measures to ensure the effective planning, execution, and delivery of major projects, including the two in this application. Our ability to execute these projects is supported by highly qualified project teams and a governance framework that reflects lessons learned from past projects, industry standards and good utility practice.

Hydro has built a team of experienced, subject matter experts from across the organization and representing a variety of professional and corporate services.

This team will be supplemented by external experts as necessary, and with oversight from our Executive and Board of Directors. We are leveraging insights gained from Hydro's Internal Audit & Advisory Services group, the Muskrat Falls Inquiry, other utilities such as members of the Canadian Electric Utility Project Management Network and lessons learned from previous projects. Further, our investment decisions will be tested and approved as part of a public, transparent regulatory process through the Public Utilities Board.

We are working closely with the Government of Newfoundland and Labrador (GNL) to ensure customers in this province continue to pay some of lowest electricity rates in Canada.

While GNL's Rate Mitigation Plan provides for predictability and stability of Hydro's rates out to 2030, both GNL and Hydro have expressed a commitment to continued rate mitigation post 2030.

BUILDING FOR OUR FUTURE

The Island Interconnected System is currently capacity-constrained. Given the timeframe to construct new assets, it is imperative to action new resource options now. BDE Unit 8 and the Avalon CT are the first steps to reliably serving customers on the Island as system demand grows in the coming decade. By focusing on foundational capacity supply options in the minimum investment case, we are addressing the immediate need to build and bring additional supply options online to meet the growing demand for electricity in Newfoundland and Labrador. In doing so, we also set the stage for the eventual retirement of Holyrood's thermal generating units.

While many supply options were explored, these two supply solutions were the least-cost, technically viable and reliable options for the Island Interconnected System and are supported by data, experience, expertise, and customer feedback.

Our 2025 Build Application includes all the evidence to support this decision, including an updated 2024 load forecast and refined cost estimates for both BDE Unit 8 and Avalon CT.

We need to get started so we can see both new assets brought online by 2031, as well as manage project costs.

(see project timelines on the next page)

WHY A COMBUSTION TURBINE ON THE AVALON?

The 150 MW combustion turbine facility, which will be able to use renewable fuels, will serve as an important backup power source to support system stability and energy reliability during periods when demand for electricity is at its highest. It will primarily be used when needed to help meet peak demand—this is how such assets are used across Canada today.

Several locations were considered. Evaluation criteria identified that building on the existing Holyrood site is best to meet future demand at the lowest cost. Additionally, it allows for connection on the Avalon Peninsula, where demand for electricity is the highest. This unit can be connected to existing transmission infrastructure and represents the lowest capital cost.

In December 2024, the Government of Canada finalized the Clean Electricity Regulations ("CER"). These regulations were a key consideration in Hydro's evaluation of potential new sources of generation during the 2024 Resource Adequacy Plan. The Avalon CT would be compliant with the CER, based on its use as a peaking unit or for providing backup generation in the event of high demand periods or during contingency events.

PROPOSED BUDGET ~$891M

WHY AN ADDITIONAL UNIT AT BAY D'ESPOIR?

The Bay d'Espoir generating station has been a central part of our province's electricity system for more than 50 years, and it will continue operation well into the future.

Analysis has determined that adding an eighth generating unit at the Bay d'Espoir facility will help meet growing demand for electricity, while supporting the reliability of service for customers. The addition of a new 150 MW hydroelectric unit represents the next investment required to serve customer demand now and into the future. The Bay d'Espoir facility was originally designed for the eventual addition of an eighth unit. Now that our system needs additional capacity—that future is here.

Investment in BDE Unit 8, combined with the Avalon CT, also supports the eventual retirement of Holyrood, which is currently being kept online to support the reliable operation of the power system.

PROPOSED BUDGET ~$1.08B

Proposed budgets for the new projects were determined using the confidence levels recommended by the Muskrat Falls Inquiry.

PROGRESS TO DATE

2018

Initial Reliability and Resource Adequacy Study (RRA) filed with Public Utilities Board, with updates filed in 2019, 2021, and 2022

2024

2024 Resource Adequacy Plan

Front End Engineering Design completed

Early engagement with key parties

2025

Early execution work planning

Public engagement ongoing

Build application submitted

MILESTONES*

- Environmental assessment
- Regulatory review
- Early site preparation
- Procurement begins
- Detailed engineering design
- Detailed construction planning

2025

AVALON COMBUSTION TURBINE

2026

- On site construction begins

2028

- On site construction begins

2029

- Facilities completed
- Project commissioning
- Ready for operation

2030

- Powerhouse completed

2031

- Project commissioning
- Ready for operation

2033

WIND

Hydro expects to bring on the first wave of new energy in 2030, with incremental amounts as required in subsequent years.

BDE UNIT 8

**Schedule reflects regulatory approvals in 2025*

Appendix C: Environmental Protection Plan

ENVIRONMENTAL PROTECTION PLAN

Bay d'Espoir Unit 8
150 MW (Nominal) Hydroelectric Generating Unit8

Newfoundland and Labrador Hydro
Hydro Place, 500 Columbus Drive
P.O. Box 12400
St. John's, NL
A1B 4K7

July 18, 2025

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1.0 INTRODUCTION AND PURPOSE

An Environmental Protection Plan (EPP) is a critical component to large resource projects and serves as an on-site guide for project staff (including contractors) to implements and adhere to the various health, safety, and environmental procedures laid out for the development of a project. This includes general mitigative measures, as well as contingency plans in the case of unplanned or unexpected events.

The purpose of this EPP is to:

- Ensure potential interactions related to the Project (Section 9.0) will be prevented or minimized.
- Document environmental concerns and appropriate protection measures.
- Provide a monitoring and revision system to review and improve EPP implementation.
- Provide instruction to all project personnel, including Newfoundland and Labrador Hydro (NL Hydro) staff, consultants and sub-consultants, contractors, and sub-contractors regarding procedures for protecting the environment and preventing or reducing environmental interactions.
- Provide a reference document for personnel when planning and/or conducting field work, which also includes published environmental guidelines of various federal and provincial regulatory bodies.
- Provide a reference to applicable legislative requirements, including all permits (**Appendix A**) acquired in support of the Scope of Work.

2.0 SCOPE

The EPP provides instruction regarding both routine activities and unplanned events associated with project activities. The scope of the EPP is to:

- Outline NL Hydro’s environmental policies for project development.
- Assess potential environmental concerns.
- Describe general environmental protection procedures for anticipated field work, and additional specific measures where appropriate.
- Provide response plans (contingency plans) for unplanned events (accidents and/or malfunctions).

The scope of activities covered under this EPP includes the construction and commissioning activities related to the addition of Unit 8 to the existing Bay d’Espoir facility. Once commissioned, activities related to operations and maintenance of Unit 8 will fall under NL Hydro’s existing registered ISO 14001 Environmental Management System for the Bay d'Espoir Hydroelectric Generating Station.

3.0 ABBREVIATIONS AND ACRONYMS

EPP	Environment Protection Plan
EEM	Environmental Effects Monitoring
DFO	Department of Fisheries and Oceans
GAP	Storage and Handling of Gasoline and Associated Products Regulations
GHG	Greenhouse Gases
HSE	Health, Safety & Environment
NLH	Newfoundland and Labrador Hydro
NLFFA	Newfoundland & Labrador Department of Fisheries, Forestry, and Agriculture
NLGMSD	Newfoundland & Labrador Department of Government Modernization and Service Delivery
NLIET	Newfoundland & Labrador Department of Industry, Energy, and Technology
NLECC	Newfoundland & Labrador Department of Environment and Climate Change
PAO	Provincial Archaeology Office
SDS	Safety Data Sheet

4.0 REFERENCE DOCUMENTS AND/OR ASSOCIATED FORMS

4.1 Provincial

- Environmental Protection Act;
- Environmental Control Water and Sewage Regulations, 2003;
- Fire Protection Services Act;
- Fire Protection Services Regulations;
- Forestry Act;
- Forest Fire Regulations;
- Water Resources Act SNL 2002;
- Historic Resources Act;
- Mines Act;
- Occupational Health and Safety Act;
- Occupational Health and Safety Regulations;
- Storage and Handling of Gasoline and Associated Products Regulations, 2003 NLR 58/03;
- Provincial Environmental Guidelines for Drum-Based Petroleum Products Storage & Operation;
- Used Oil and Used Glycol Regulations;
- Waste Management Regulations;
- Waste Diversion Regulations; and

- Environmental Guidelines for Construction and Mineral Exploration Companies (NDOEL & NDOME).

4.2 Federal

- Transportation of Dangerous Goods Act and Regulations;
- Canadian Environmental Protection Act and Regulations;
- DFO Fact Sheets;
- Migratory Birds Convention Act and Regulations;
- Fisheries Act and Regulations;
- Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador (DFO);
- Timing Windows to Conduct work in and near water (DFO); and
- Established or interim DFO Codes of Practice for certain activities (e.g., in-water site isolation).

5.0 RESPONSIBILITIES

Project Manager

The Project Manager will be responsible for the overall acceptance and implementation of the EPP, including the multiple aspects of its management. They will also be consulted on environmental compliance monitoring processes such as regular field reports, environmental audits, and annual performance reviews. Environmental monitoring is the responsibility of the Environment Team and the Project Manager will be accountable. The Project Manager will be supported in this function by the Manager, Environmental Operations and Environmental Services Specialist.

Manager, Environmental Operations (EO)

The EO Manager will be accountable for the development, implementation and management of this EPP, as well as all environmental compliance monitoring. The EO Manager is responsible for implementation and management of the EPP, along with associated contractors. The EO Manager will be informed of all activities that are the responsibility of the environment team such as acceptance of this EPP and associated environmental monitoring and management.

Environmental Services (ES) Specialist

The ES Specialist is responsible to review and verify the commitments and requirements of EA release are included in this EPP as it relates to their work, and their implementation. This person is responsible to ensure legislative and permit conditions are reflected in this EPP. They are also responsible for communicating results of the environmental monitoring program to the Environment Team.

The ES Specialist is also responsible for:

- Providing support for the development and implementation of the EPP and will be consulted on management or revisions of the EPP.
- Providing project environmental awareness to project staff through orientation.
- Providing support and consultation for several aspects of environmental compliance monitoring.
- Consulting on the review of the EPP to ensure compliance with condition of applicable permits.

On-Site Environmental Monitor (OSEM)

The OSEM is responsible for:

- Monitoring on-site activities and evaluate environmental performance with respect to requirements established in the EPP.
- Evaluating the performance of designed/constructed environmental mitigation systems and track on-site compliance with regulatory requirements and conditions of all permits and approvals.
- Producing daily field reports as part of environmental compliance monitoring and will provide support for managing the opportunity for improvements, corrective action and non-conformance registries.
- Reporting directly to the ES Specialist.
- Interacting with the Contractors on environmental procedures and requirements, participating in Project team meetings, toolbox meetings, conduct environmental reviews of drawings, and assisting in the revision and update of the EPP as necessary.
- Ensuring the Employees, Visitors and Contractors travelling to the Site receive the appropriate orientation and training before going on site.

Construction Managers

The Construction Manager is responsible for:

- Overseeing construction management, including management of on-site environmental issues through implementation of the EPP.
- Acceptance and implementation of EPP, and for revisions to this document.

- Reporting directly to the Project Manager and for certain aspects of environmental compliance monitoring and compliance tracking.
- Ensuring visitors, contractors and employees travelling to the Project site receive the appropriate orientation and training required.

Contractors

Contractors will build, supply and/or install various components of the Project or be involved in provision of services to support construction and/or procurement. The Contractors are accountable and responsible for the following:

- Implementing environmental protection procedures as outlined in the EPP.
- Holding toolbox meetings at the start of each shift to discuss health, safety and environmental issues.
- Developing their own orientation and training package to deliver to individuals entering the Sites on their behalf in addition to the Project training noted above.
- Ensuring EPP conditions are reflected in their proposals and bids, and shall comply with all relevant regulations, guidelines, permits, approvals and authorizations.
- Contractors may be consulted, as required, on aspects of environmental monitoring.

5.1 Revisions

EPP holders and readers may initiate proposed revisions by forwarding recommended revisions to NLH on the Revision Request Initiation Form (**Appendix B**) which provides the revision instructions and lists the sections being superseded. The Environmental Services Specialist will review and accept revisions prior to being incorporated.

5.2 Revision Procedure

Once accepted by NLH, revisions will be updated within the EPP and then issued to all EPP holders. Each revision must be documented on the Revision Control Record (**Appendix C**).

An updated Table of Contents will be included with each revision. This table of contents will indicate current status of each section contained in the plan.

When EPP holders receive a revision, they are responsible to:

- Read the text of the revision;
- Check the control record to ensure all the listed pages have been received;
- Remove and discard the superseded pages;
- Insert the revised pages in the proper places;
- Check the pages of the plan using the updated table of contents to ensure the plan is complete and current;

- Enter the revision number and date on the Revision Control Record;
- Incorporate the revision into the area of responsibility, as appropriate;
- Ensure personnel are familiar with the revisions; and
- Sign and return acknowledgment of receipt slip to NLH

6.0 EPP COMPLIANCE

6.1 Environmental Compliance Monitoring

To ensure that appropriate and effective environmental mitigation measures are employed during construction, the Project will have a full-time OSEM dedicated to the Project. This individual shall continuously inspect worksites and activities for conformance with the EPP, engineered mitigation measures required by design; and compliance with government regulations and permits.

This EPP establishes the basis for environmental compliance monitoring at the work fronts, i.e., monitoring for regulatory compliance to verify that conditions of all permits and approvals are satisfied, and that all environmental regulatory requirements are met.

Non-conformance with this EPP and/or non-compliance with permits, approvals, and regulatory requirements will be documented. Corrective action will be identified, target dates will be agreed upon, and responsibilities will be assigned to appropriate Personnel. This documentation will be distributed to other members of the Project team and written notice of agreed corrective action will be forwarded to the Contractor so that issues are resolved to the satisfaction of the Project's team.

If non-conformance items are noted that require immediate attention, or if agreed corrective action is not implemented in a timely and effective manner, then appropriate resources will be contracted by the Project to immediately undertake the required action.

Daily Field Reports will be prepared by the OSEM and approved by the ES Specialist. These reports will include a description of work being undertaken by the Contractor and document incidents of non-conformance with environmental requirements.

6.2 Environmental Effects Monitoring

The intent of Environmental Effects Monitoring (EEM) is to confirm predictions made as part of the Environmental Assessment. A formal EEM program is not required for the project however monitoring will be carried out by the OSEM and results will be communicated to the ES Specialist.

Should effects deviate from predicted, the Environment Team will determine the cause and appropriate action. Should this information be linked to work practices, the EPP will be revised, and updates provided to contractors and staff. It is noted that there may be additional

requirements for approvals and communication with the regulators related to the EEM Plans and regulatory guidelines.

6.3 Environmental Performance Review

Regular audits will be conducted to evaluate compliance and effectiveness of the EPP and to identify opportunities for continual improvement. Auditing will consist of daily field reports, risk based and semi-annual environmental compliance audit reports, and if applicable, annual performance reviews.

The daily field reports will be completed by the OSEM, who review daily activities of the Contractors. The risk based and semi-annual environmental compliance audit reports will be completed by the ES. The reports will document all incidents of non-compliance with the EPP and their causes. The environment team will distribute the environmental compliance audit reports to relevant Project participants.

At the end of construction, the project will convene an environmental performance workshop to review all work activities that relate to environmental concerns, issues and/or mitigations. The annual performance review will be completed by the key members of the environment and construction teams. This audit will include a review of all work activities that relate to environmental concerns, issues and/or mitigations, and will include a review of environmental audits carried out by the environment team during the year. The review process will give all parties a chance to evaluate overall environmental performance and compliance with government regulations, permits, this EPP.

7.0 NL HYDRO PROJECT POLICIES

7.1 Environmental Policy

The NLH Team views environmental protection planning as an important component of overall project planning and development. Environmental Protection Plans (EPPs) are a practical way in which important environmental protection and safety information related to project activities can be collected and distributed to personnel in the field.

The NLH Team is committed to a high level of environmental protection in its work areas and activities associated with the proposed development.

An EPP is a working document for use in the field for both project personnel and environmental and engineering field teams. An EPP is also important at the corporate level for ensuring the commitments made in policy statements are implemented and monitored. The corporate Environmental Policy can be found in **Appendix D**. EPPs provide a quick reference for project personnel including contractors, subcontractors and regulators to monitor compliance and to make suggestions for improvements.

7.2 Hunting and Fishing Policy

Project personnel are not permitted to hunt, trap or fish, whether on or off duty, at any time during their work term at any NLH work site and support infrastructure.

Firearms are not permitted at any work site, unless authorized by government regulators and the NLH Team for use in protection against wildlife.

7.3 Anti-Idling Policy

Hydro recognizes that the idling of motor vehicles and equipment has a negative impact on human health and the environment by way of Greenhouse Gases (GHGs), particulates, and other emissions released during the combustion process.

This policy applies to all employees who operate vehicles or equipment owned, leased, or rented by NLH. The policy also applies to contractors working directly or indirectly for NLH and to contractors working on NLH owned property.

All operators of vehicles must ensure that when vehicles or equipment are not required to be running for operational purposes every effort is made to reduce or eliminate engine idling. Specific idling times are permitted to provide safe and efficient warm-up of vehicles and equipment. Exceptions apply to emergency vehicles engaged in operational activities such as public safety, fire services, police services, or responding to medical emergencies. Exceptions also apply to vehicles without an auxiliary power supply being used to power auxiliary equipment or other power needs including hydraulics, lifts, emergency lights, compressors, generators, or any other equipment requiring electric power.

7.4 Wildlife Encounters Policy

Wildlife encounters pose a risk of stress or injury to project personnel and wildlife. Control measures and protection procedures established by the NLH Team must be followed by all Project Personnel, to minimize the risk to both wildlife and humans. Under the Wildlife Act, a permit to destroy problem animals must be obtained from the Newfoundland and Labrador Department of Fisheries, Forestry, and Agriculture's (NLFFA) Forestry Services Branch in order to destroy moose, black bears, or other wildlife that interfere with operations or dwellings.

7.5 Environmental Orientation

The NLH Team is committed to engaging field workers in an active environmental orientation and ongoing environmental awareness program. All project personnel undertaking activities in the field must receive an EPP orientation prior to initiating work. The orientation will focus on the environmental protection procedures associated with the field work that will be completed.

7.6 Permits and Approvals

Appendix A contains a list of potential permits and approvals that may be required to complete field work. An assessment should be completed of all required permits and approvals, and no field work requiring permits or approval should commence until the required permits have been obtained. **Appendix A** is to be used as a reference.

8.0 PROJECT DESCRIPTION

The proposed Project includes the planned construction and operation of an additional 150 MW unit (Unit 8) at the existing Bay d'Espoir hydroelectric generating facility. The Project includes the construction and operation of the following components:

- Development of a new generation facility as an extension of Powerhouse 2;
- Installation of new generating turbine within the powerhouse;
- Construction of a new water conveyance system;
- New intake channel and gate, similar to the existing intakes;
- New buried steel penstock from intake to powerhouse;
- Excavation of a new headrace channel for Unit 8;
- Widening of existing tailrace channel at Powerhouse 2 to accommodate Unit 8;
- Installation of a new 950 m 230 Kv line and associated infrastructure from Unit 8 to the existing Terminal Station 2; and
- Associated expansion of and modifications to the Terminal Station 2 to accommodate additional transmission from Unit 8.

Some of the main parameters of the new generating unit are as follows:

- Installed Capacity - ~150 MW;
- Rated Flow - 102 m^3/s;
- Gross Head Design - 179.75 m;
- Net Design Head - 173.5 m;
- Rotating Speed - 225 rpm; and
- Estimated Generator Efficiency - 94%.

The new facility will utilize the existing powerhouse forebay and does not require the construction of any new dams.

The proposed Project Area, which generally encompasses all of the planned physical works associated with the development of the components listed above, is approximately 1.2 km^2 in size, and within or immediately adjacent to the existing footprint of the Bay d'Espoir Hydroelectric facility.

Figure 8-1: NL Hydro Bay D'Espoir Hydroelectric Generating Facility Project Area (Red) and Crown Land Lease area (Yellow)

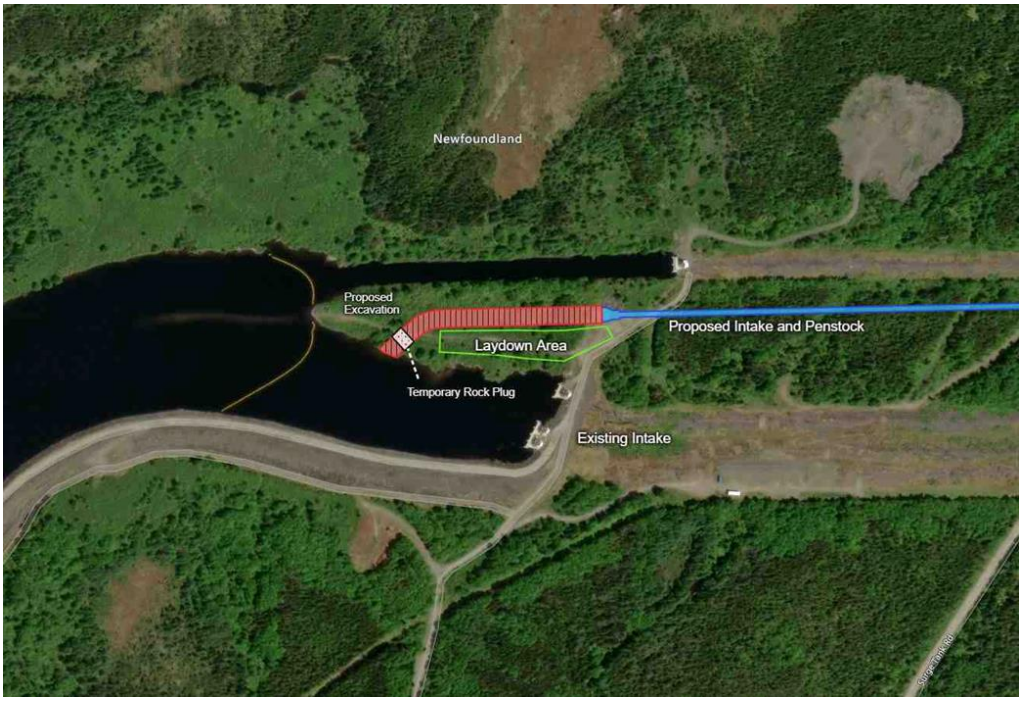

Figure 8-2: Proposed Upstream Components – Headrace Channel (shown in red), laydown area (shown in green boundary), and proposed Intake and Penstock (shown in blue)

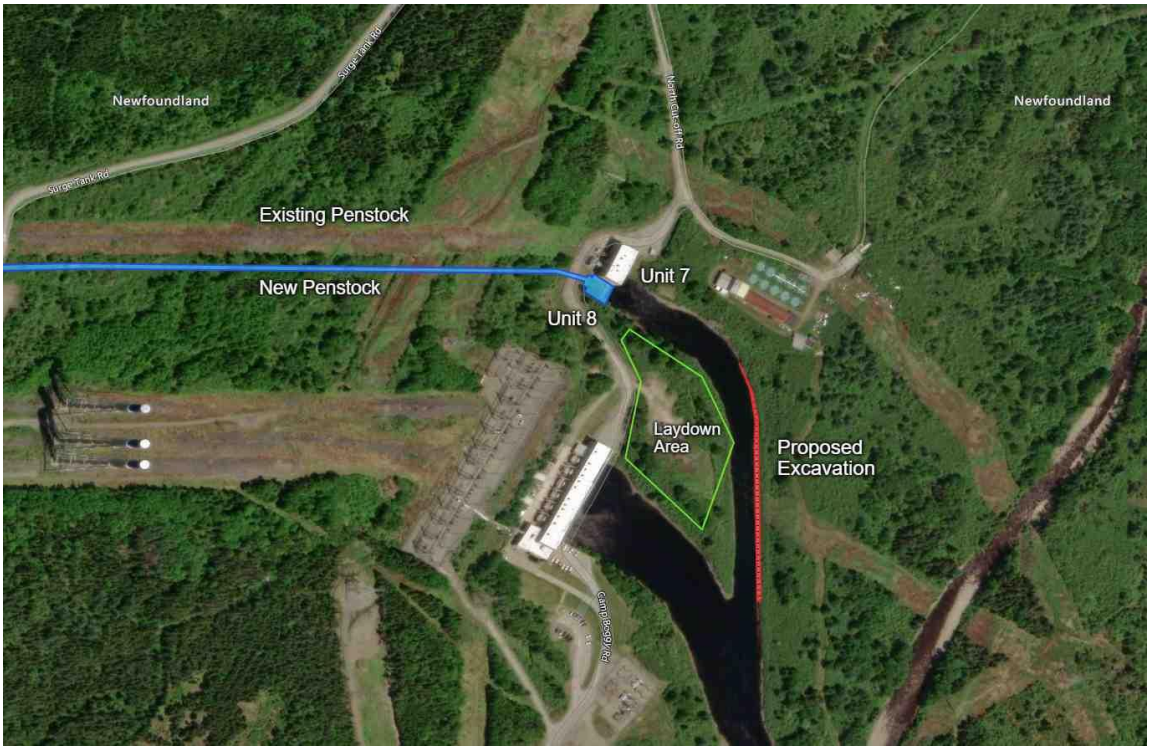

Figure 8-3: Proposed Downstream Components – Tailrace Channel Widening (shown in red), laydown area (shown in green boundary), and location of Unit 8 (shown as blue box)

9.0 GENERAL ENVIRONMENTAL PROTECTION PROCEDURES

This section provides general environmental protection procedures for anticipated activities routinely associated with fieldwork and associated support services.

9.1 Sensitive Time Periods

Environmental Concerns

An important part of project planning and avoiding interactions and impacts to the local environment is to design and plan construction to avoid sensitive time periods for various receptors. This may not always be achievable, but the sensitive periods outlined below will be considered in Project planning, where practical.

The general environmentally sensitive time periods include:

- Freshwater Fish (including Atlantic Salmon): May 1 – September 30;

- Avifauna (Migratory Birds) – April 1 to August 31;
- Avifauna (Raptors) – March 15 to August 15;
- Caribou – Spring Migration (April 1 to May 19); Fall Migration (November 1 to December 15);
- Newfoundland Marten – Natal and Maternal Denning (April 1 to June 30); and
- Myotis species -Maternity Roosting (April 15 to August 31); Hibernation (October 1 to April 30).

Environmental Protection Procedures

Where activities are being planned or carried out the below additional mitigations shall be considered:

1. A complete schedule of activities, provided by the Contractor and accepted by the OSEM, will be completed prior to commencement of any construction task and restrictions on timing will be noted on the schedule.

2. While the ideal time of year for construction located near a body of water is typically in early June through to late October (lower flow and lower rainfall period), construction may be occurring at other times where flows may be higher. Mitigations will be implemented where feasible to reduce potential for interaction during those times.

3. Where feasible, construction activities in or around waterbodies will be reduced or avoided between May 1 and September 30 to accommodate DFO's timing windows to avoid potential impacts to fish habitat (including Atlantic Salmon). If work is to be performed within this timeframe, it will be done so in accordance with DFO's Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador.

4. Stripping, grading, excavating and/or rehabilitation activities will be scheduled to reduce the amount of time the soil is exposed to elements.

5. Activities will be conducted in such a way as to reduce the amount of time spent in or around a stream or waterbody.

6. Clearing of vegetation will be conducted outside of the breeding season for birds (March 15 to August 31). If it is not possible, clearing activities that will need to take place will be targeted, and in accordance with relevant federal and provincial regulations.

7. Currently, the project schedule sees the expansion of the tailrace channel taking place at the same time as Unit 7 that is scheduled to be shut down for maintenance. This will largely reduce outflow from the powerhouse as well as water velocities

downstream and reduce the potential for sediment transport from works in or near water.

9.2 Vegetation Clearing

Environmental Concerns

Vegetation clearing (e.g., trees, shrubs) may be required as part of construction activities (e.g., laydown areas, additional transmission Right-of-Way, penstock route, etc.). This will include a mix of both manual and mechanical methods of clearing. The primary concern during clearing is to prevent ground disturbance that may result in the sedimentation of watercourses and wetlands, and to avoid impacts to nesting birds and damage to adjacent vegetation.

Environmental Protection Procedures

Appropriate measures will be implemented to minimize potential negative effects of vegetation removal. A policy of minimum disturbance will be maintained at all times. Clearing activities will comply with the requirements of all applicable permits, including the *Commercial Cutting Permit* and the *Operating Permit* provided through the provincial Department of Fisheries, Forestry and Agriculture (NLFFA). Approval must be obtained before any clearing may begin.

1. A cutting permit will be obtained from the NLFFA Forestry Services Branch prior to the start of any required site clearing. Clearing or removal of trees, shrubs and ground cover will be restricted to the minimum areas needed for the site and stockpiles.

2. Limits of clearing will be shown on all drawings issued for construction. Only those areas designated on drawings will be cleared. Trees will be identified (blazed/flagged) at intervals in advance of clearing to demarcate the limits of the work. Clearing activities will not remove trees outside the authorized clearing limits.

3. Clearing shall consist of cutting parallel to and within 15 cm or less of the ground, and properly disposing of all standing trees, as well as the removal of all shrubs, slash, and debris from the area. All trees and brush will then be cut into lengths to ensure neat piling. Brush will not be piled higher than 3 m. Slash shall be piled so as not to cause unnecessary disfigurement of vegetation outside the cleared area. A 6.5 m break in slash piles will be made every 200 m to allow for drainage and animal access.

4. Merchantable timber is defined within the provincial *Forestry Act* as any and all species cut down to an 8 cm top and suitable for use as saw logs or firewood. This wood will be cut into lengths of 2.5 m and 1.22 m to ensure use down to the required

8 cm top diameter. A *Timber Purchase License*, issued under the *Forestry Act*, is required to purchase or acquire timber cut on crown or public land for subsequent sale or barter. This permit must be obtained from the NLFFA.

5. All merchantable or forest product timber may be salvaged. The disposition of salvaged timber should be determined by the OSEM in consultation with the Project Manager.

6. Open fires are not permitted during construction.

7. Slash will not be permitted to enter any watercourse and will instead be piled above spring flood levels.

8. Chain saws or other hand-held equipment shall be used in clearing vegetation, except where alternative methods or equipment are approved. The use of mechanical clearing methods, such as heavy equipment, shall not occur without prior approval of the OSEM.

9. If clearing is required within the vicinity of a waterbody, a buffer zone of natural vegetation of 30 m or more from the high-water mark of the waterbodies will be maintained. A buffer zone of less than 30 m will be considered by the OSEM upon the request. See Section 9.12 (Buffer Zones) for more information.

10. Where possible, timber will be felled inward toward the work area to avoid damaging any standing trees within the immediate work area.

11. Any features such as tent frames consisting of cut poles placed in a rectangular arrangement to hold a tent cover, or rocks piled or placed in an irregular or symmetrical fashion (e.g., circle) shall not be disturbed. Such features are indicative of cultural or archaeological sites and shall be avoided. Project personnel should follow procedures outlined in Section 9.22.

12. A person shall not use a power saw during the forest fire season unless the exhaust is fitted in accordance with the manufacturer's original specifications with muffler and proper screening or baffling devices to prevent the escape of sparks or particles of burnt carbon.

13. Firefighting tools and water delivery systems must be available, as required, by the Operating Permit for clearing activities. Members of the cutting crew shall be equipped with a fire extinguisher on his or her person containing a minimum of 227 grams of ABC class dry chemical.

14. Gasoline and chainsaw oil shall be stored in sealed secondary containment. Gasoline containers shall be clearly identified stating containers contents as well as the appropriate UN number.

15. Absorbent pads shall be placed underneath the chain saw during refuelling/re-oiling operations.

16. No clearing will take place within 800 m of an active raptor nest. If an active nest is encountered during clearing activities, a buffer will be established by the OSEM and remain in place for the duration of the breeding season. Active nests will be identified as per the Avifauna Management Plan and appropriate buffers applied.

17. If a tree containing an inactive raptor or corvid nest is encountered during clearing of construction sites (other than transmission lines), the nest will be assessed for viability. If the nest is deemed viable, a platform will be established as approved by the NLFFA Wildlife Division. For other raptors such as hawks and owls.

18. If a tree containing an inactive raptor nest is encountered during transmission line clearing, a platform will not be required as the transmission structure shall provide an alternative nesting site.

19. Clearing activities between from April 1-August 31 in Newfoundland (on the island), and from May 1-August 31 in Labrador will be in compliance with NLH-ENV-SOP-01.

20. Work areas shall be assessed for the presence of active nests containing birds and/or eggs prior to commencing work. If an active nest is discovered, a minimum 10m buffer shall be applied and adhered to. Work in the vicinity of the nest is to be minimized, breaks will occur outside the buffer, and the area is to be vacated directly upon completion of work. The Bird Nest Form for Vegetated Areas shall be completed for each pre-work assessment to document the findings. The completed forms shall be submitted to Owner on a regular basis. Owner must provide direction prior to removing a bird nest buffer and commencing work. If an active nest is discovered outside of the main nesting period, a buffer must still be applied and documented.

9.3 Marshalling and Laydown Areas

Environmental Concerns

Environmental concerns associated with marshalling and laydown areas include physical disturbance to land, noise and dust from activities, and potential runoff or impacts to surrounding area from equipment and materials within the laydown area.

Environmental Protection Procedures

The following precautions should be taken to prevent and minimize concerns associated with marshalling and laydown areas:

1. Any equipment and material storage yards are located at least 100 metres from any water body or wetland, unless there are no fuel concerns then 30 metres is the required buffer from a water body. Equipment and material storage yards shall be located at least 30 metres from any watercourse.

2. A Permit to occupy may be required for marshalling and laydown areas.

3. Previously disturbed areas are the preferred location for marshaling yards and lay down areas. Any site must be located as to minimize traffic hazards or barriers.

9.4 Hazardous or Controlled Products

Environmental Concerns

Concerns regarding the use of hazardous or controlled products include the potential for uncontrolled release to the environment through spillage and subsequent adverse effects on terrestrial, aquatic and marine habitat and species, soil, groundwater quality, and human safety and health.

Environmental Protection Procedures

In addition to the procedures below, see also Section 9.6 (Fuel Storage, Handling, and Disposal).

1. Approval from the owner is required prior to the use or delivery a hazardous or controlled product, as defined by Applicable Laws.

2. Hazardous or controlled products are not used, stored, or handled for the purposes of the Construction Work unless all of the requirements of the Applicable Laws and regulations in respect of labels, identifiers, safety data sheets, and worker education are complied with.

3. All persons who work with a hazardous or controlled product or work in proximity to a hazardous or controlled product are informed about all hazard information received from the supplier of the said product as well as any other hazard information concerning the use, storage and handling of the hazardous or controlled product.

4. Prior to delivery of a hazardous or controlled product to the Worksite, it shall be labelled with the supplier's label or with a label in accordance with requirements of all applicable Laws along with all hazard information pertaining to the hazardous or controlled product.

9.5 Pumps, Generators, Heavy equipment and other Mobile Equipment

Environmental Concerns

During construction various portable pumps, generators and equipment may be used. Concerns regarding the use of such equipment include the potential for uncontrolled release to the environment through spillage and subsequent adverse effects on terrestrial, aquatic and marine habitat and species, soil, groundwater quality, and human safety and health.

Environmental Protection Procedures

The following precautions should be taken to prevent and minimize spillage, misplacement or loss of fuels and other hazardous materials:

1. Drip pans are placed underneath pumps, generators, heavy equipment (when parked) and other mobile equipment containing fuels and oils. Absorbent material shall be kept at all Sites where pumps, generators, heavy and other mobile equipment are in use.

2. Spill kits accompany all pumps, generators, heavy and other mobile equipment at the Site.

3. Pumps and generators are located, and heavy mobile equipment parked as far as practical from all waterbodies. Pumps and generators are located on a level, stable surface.

4. Hoses and connections on equipment located near water bodies are inspected routinely for leaks and drips.

5. All leaks are reported immediately. Upon detection of a leak, the equipment (i.e., pump, generator, heavy and other mobile equipment, etc.) shall be shut down immediately and corrective action taken to repair the leak and clean up any contaminated soil and/or water (Refer to the master environmental spill response management plan).

6. Repairs to equipment are conducted a minimum of 100 meters from any water course or wetlands, unless otherwise approved or in the event of an emergency

repair. All debris, waste oils, filters, grease cartridges and replaced parts shall be collected and disposed of in a manner that is outlined in the site-specific environmental waste management plan. Equipment must be in state of good repair for Construction Work in and near water or wetlands, or within any protected water supply area.

7. All equipment shall be regularly maintained and inspected. Inspections must be documented. If problems are identified the equipment shall be taken out of service and repaired to prevent release of hydrocarbons into the environment. Any field maintenance should be completed with appropriate spill containment and mitigation to prevent contamination to the environment.

9.6 Fuel Storage, Handling, and Disposal

Environmental Concerns

During construction a number of fuels and other potentially hazardous materials may be used during various activities. This includes fuels, lubricants, and other fluids for heavy machinery. Concerns regarding the use of fuel include the potential for uncontrolled release to the environment through spillage and subsequent adverse effects on terrestrial, aquatic and marine habitat and species, soil, groundwater quality, and human safety and health.

Environmental Protection Procedures

The following precautions should be taken to prevent and minimize spillage, misplacement or loss of fuels and other hazardous materials:

1. The delivery, storage, use and disposal of fuels and other hazardous materials will be handled only by trained personnel in accordance with government laws and regulations.

2. Contracted fuel suppliers are required to comply with this EPP and the Master Environmental Spill Response Management Plan for the Project.

3. Fueling of heavy equipment should only be carried out at the loading/unloading areas (adjacent to major roadways) or at designated areas.

4. Operators shall be in attendance for the duration of all refuelling operations. Refuelling of equipment shall be monitored at all times to enable immediate shut down of fuel transfer and appropriate response in the event of a spill or leak being identified.

5. All equipment to be used will be mechanically sound, with no oil or gas leaks. Equipment will be inspected frequently by the contractor. Equipment working in the

placement of materials in the waterbody shall be inspected at least twice daily. Any leaks will be repaired immediately.

6. All fuel storage and handling shall be conducted in accordance with the Storage and Handling of Gasoline and Associated Products Regulations (GAP). Handling and fuelling procedures shall also comply with the WHMIS, applicable sections of the National Fire Code and Fire Prevention Act, and any additional requirements brought forth by Newfoundland and Labrador Department of Government Modernization and Service Delivery (NLGMSD) to limit potential contamination of soil or water.

7. Slip/tidy tanks must comply with the Transportation of Dangerous Goods Regulations which requires intermediate containers to comply with the requirements of CAN/CGSB-43.146-2002. Slip/tidy tanks must be secured to the vehicle and are not permitted off the vehicle for the purposes of temporary or stationary storage.

8. Mobile fuel tanks (e.g. tank truck and tank truck trailer) used at the worksite are for refueling purposes only. Mobile tanks are not permitted for temporary or stationary storage.

9. Fuel (diesel and gasoline) will be transported to the work site by vehicle in approved tanks; all fuel transported will have secondary containment.

10. All fuel consuming equipment will have spill kits, drip pans/quick berms surrounding the fuel tank, and a supply of absorbent material stored with or within them, replaced as needed.

11. Fuel shall be stored in appropriate and approved storage containers up to a maximum capacity of 20 L.

12. Helicopter refuelling (if required) will take place at an approved existing fueling station on site.

13. Servicing or refuelling of mobile equipment on land shall not be performed within 30 m of a watercourse.

14. Refuelling may be required within 30 m of a water body such as for water intake pumps used for dewatering. All water pumps will be equipped with a drip pan and lined with absorbent material to collect any leaks or spills that may occur.

15. Fuel storage areas and fuel transfer lines will be clearly marked or barricaded to ensure they are not damaged by moving vehicles. The markers shall be visible under all weather conditions and barriers should be constructed in compliance with the GAP Regulations.

16. Hoses or pipes used for fuel transfer will be equipped with properly functioning and approved check valves, spaced to prevent backflow of fuel in the case of failures.

17. Used oils shall be collected, stored, transported, and disposed of as per requirements outlined in the Used Oil and Used Glycol Control Regulations. Companies involved in the collection, transportation, and storage of used oil must obtain a certificate of approval from NLECC. Used oil shall be stored in a used oil storage tank meeting the requirementsof the Used Oil and Glycol Control Regulations. Used oil can be stored in 205 L drums as long as the quantity does not exceed 205 L; the drums are clearly marked “used oil”; the drum is 18 gauge steel; the drum has secondary containment; the top of the drum is equipped with a sufficient opening to prevent spillage during filling or emptying; the drum is equipped with venting if it is intended to be vacuumed out and; it complies with CAN/CGSB – 43.150-95 if the drum is to be transported by road.

18. Any soil contaminated by leaks or spills of any petroleum product from equipment shall be excavated, stored in an approved container and disposed of off-site at a licensed disposal site.

19. Up-to-date Safety Data Sheets (SDS) must be available on-site prior to receipt of any hazardous materials.

20. A copy of the Master Environmental Spill Response Management Plan shall be present at storage facilities and during transfer of fuel. In the event of a spill, the outlined procedures will be followed.

21. Contractors shall at all times maintain in good condition at least one spill kit dedicated to each crew. Each spill kit shall be stored in a weather-proof container.

22. Only trained, qualified persons will handle fuels and other hazardous materials. The Workplace Hazardous Materials Information System (WHMIS) will be implemented to achieve proper handling and storage. Operators will be in attendance for the duration of all fuelling operations.

23. Diesel fuel and gasoline shall be stored in appropriate 20 litre containers, e.g., yellow containers for diesel, red containers for gasoline. Containers shall be clearly identified stating containers contents as well as the appropriate UN number.

24. Smoking will be prohibited within 50 m of a fuel storage area. Fuel storage areas shall be equipped with appropriate signage reflecting this requirement.

25. Lubricants, hydraulic fluid, grease, gasoline, diesel or other fuels will not be stored within 30 m of any watercourse.

26. Hazardous waste will not be permitted to be poured down drains, oil/water separators, septic systems or discharged into the environment in any form.

27. Handling and fuelling procedures shall comply with the GAP Regulations, WHMIS, the National Fire Code and Fire Prevention Act, and any additional requirements brought forth by the NLECC to limit potential contamination of soil or water.

28. All used oil tanks will be inspected on a regular basis as per the Used Oil and Used Glycol Control Regulation. All fuel storage tank systems will be inspected on a regular basis as per the GAP Regulations. This includes, but is not limited to, gauging or dipping and the keeping of reconciliation records.

29. Any stained soil resulting from the use of chemicals or fuels shall be cleaned up and disposed of at an approved facility prior to leaving the work area.

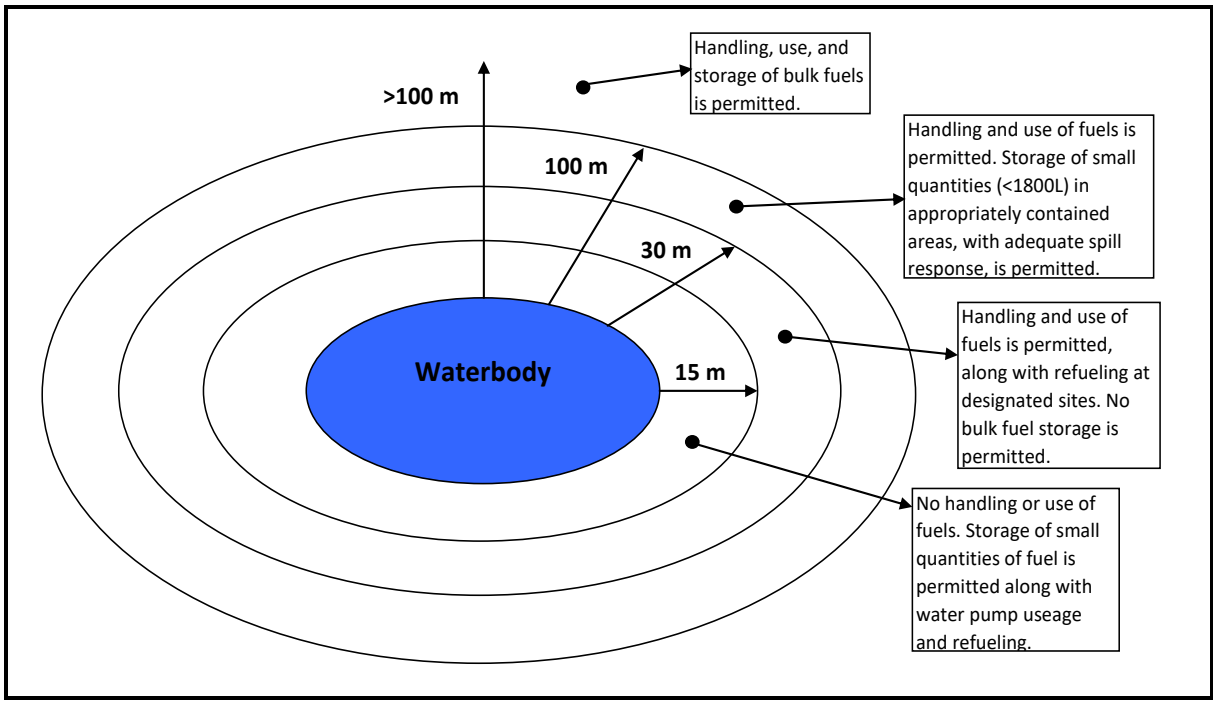

Figure 9-1: Fuel Handling, Use and Storage Near a Waterbody

9.7 Waste Management

Environmental Concerns

During construction activities, there will be a variety of wastes generated. This includes both solid and liquid wastes, as well as human waste. Solid waste (domestic waste, paper, cardboard, wood, and others), if not properly controlled and disposed of, may cause safety and human health concerns, and could result in attraction of and / or conflict with local wildlife and land use. Human waste (sewage) if not properly controlled and disposed of by appropriate sanitary utilization may cause safety and human health concerns at the project site.

Environmental Protection Procedures

The following waste management measures will be undertaken:

1. Waste reduction measures will be encouraged, and existing corporate policies on waste reduction and management during operations will be adhered to. In addition to the requirements of this section, a site-specific waste management plan may be developed that covers all aspects of waste management for the project. This requirement will be project specific and dependant on the types and volumes of wastes generated.

2. Both permanent (within accommodations camp) and portable washrooms and toilets (if required) will be routinely inspected and properly maintained. Sewage sludge removed from the facilities shall be transported off site for approved treatment and disposal. Companies engaged to perform this work must have approval from the NL Department of Government Modernization and Service Delivery (NLGMSD) and/or NLECC. All human sanitary waste must be contained and disposed in a manner that meets all environmental and health requirements. Any concerns must be brought to the immediate attention of the OSEM.

3. Waste oils and lubricants will be stored in a labelled tank or drum and disposed of an approved facility. Other than periodic greasing of equipment there will be no servicing on the work site or laydown area. All servicing will be performed off site.

4. Solvents, acids and caustic liquid waste will be collected separately and stored for removal and disposed by a waste management company specializing in such wastes.

5. Solid waste produced by project personnel and operations will be collected and removed from the worksite on a daily basis for disposal at an approved waste disposal facility or for deposit at an appropriate recycling facility.

6. Waste material generated on site (including from temporary accommodations camp) shall be collected and stored in proper containers so that it does not pose an environmental, safety or health hazard, or cause conflict with wildlife or land users.

7. All recyclable and reusable materials will be collected and transported to appropriate facilities for recycling or reuse on a regular basis.

8. Domestic waste from the field including food waste should be gathered daily and stored for removal at approved waste disposal sites.

9. Rags used in equipment maintenance and other potentially combustible materials will be kept in a separate container from other waste materials until the combustible material can be removed from the site for disposal.

10. No waste material will be deposited in a body of water.

11. All waste storage and removal activities associated with the Project will be in compliance with all applicable permits and legislative requirements.

9.8 Equipment Movement and Operation

Environmental Concerns

A variety of equipment will be used on site during construction activities and may result in ground disturbance, leading to erosion and sedimentation issues. Most physical disturbances to the environment result from moving vehicles and equipment.

The use of heavy equipment can affect environmental components such as wildlife, vegetation, surface water quality and historic resources. Noise associated with equipment operation and movement may negatively affect wildlife. Air emissions may have local air quality implications. Accidental leaks or spills of fuel or other hazardous materials may affect soils, water, fish, vegetation and wildlife. Tracked equipment has the potential to disturb the ground around/at the site.

Environmental Protection Procedures

The movement and operation of equipment will adhere to the following mitigation measures:

1. Where possible, existing roads should be used to supply operations, thus minimizing ground disturbances. There are multiple existing roads with the Project area and will be used as much as possible to avoid additional ground disturbance.

2. ATVs are not anticipated; however, ATV use should comply with the Motorized Snow Vehicles and All-Terrain Vehicle Regulations and the Environmental Guidelines for Stream Crossings by ATVs, and any forest fire potential travel restrictions in place at the time of use.

3. Prior to the commencement of construction, equipment will be inspected for the presence of soil that could contain seeds and/or propagules of invasive and non-native species. If equipment is found to have soil attached, it will be cleaned (i.e., pressure washed) in a designated location to remove the potential seed source. In addition, equipment that may come from other regions or provinces will be clean and free of potential seed sources of invasive plants.

4. The use of heavy equipment in and/or near watercourses should be minimized and restricted to only when necessary. See Section 9.9 (working near a waterbody) and Section 9.16 (erosion prevention and sediment control) for further mitigation measures.

5. If an archaeological or cultural site is encountered or disturbed due to vehicle movement, the OSEM should be notified immediately and the protection measures set out in Section 9.22 should be followed.

6. Noise control procedures (Section 9.20) shall be followed during construction activities.

7. All equipment shall have exhaust systems regularly inspected, and mufflers shall be operating properly.

8. All equipment will meet the requirements of the *NL Air Pollution Control Regulations* under the *Environmental Protection Act,* as required.

9. Vehicles shall be routinely inspected and in good repair, to reduce the potential for unplanned spills or leaks. If problems are identified the equipment will be taken out-of-service and repaired as needed.

10. All equipment on the Project site will use only oils/lubricants that classify as “biodegradable”, where feasible. Refer to Section 9.6 (Storage, Handling, Use and Disposal of Fuel & Other Hazardous Material)" of this document for additional information on the use of biodegradable oils/lubricants.

9.9 Working within 15 metres of a body of water

Environmental Concerns

A portion of construction activity (e.g., excavation of headrace and tailrace, construction of powerhouse) will involve work within 15 m of a waterbody. This may include the use of heavy equipment for certain activities.

Environmental concerns with near-water work include the release of materials into the local waterbody. Soil erosion caused by field activities can lead to stream degradation and turbidity downstream. Stream channels may become unstable as a result of the higher rates of runoff from surrounding land stripped of vegetation, and toxic wastes can impair water quality. Proper protection plans are required to minimize or eliminate sedimentation and water pollution and maintain riparian habitat near water bodies.

Environmental Protection Procedures

When working within 15 metres of a body of water, NLECC must be notified and a *Permit to Alter a Body of Water (Schedule H)* must be issued in accordance with the *Water Resources Act*. Department of Fisheries and Oceans (DFO) should also be notified, and a letter of advice may be required.

The mitigation measures within the following sections apply here and should be referenced:

1. Section 9.16: Erosion Prevention and Sediment Control;
2. Section 9.6: Fuel Storage, Handling, and Disposal;
3. Section 9.12: Buffer Zones;
4. Section 9.8: Equipment Movement and Operation; and
5. Section 9.2: Vegetation Clearing.

In addition to the requirements of this section, an Environmental Management Plan that outlines the environmental protection measures that will be implemented when working near or within waterbodies associated with the project may be required. This requirement will be project specific and dependant on the type and amount of near or in water work. If required, the plan shall cover the following activities at a minimum:

1. Alterations to a body of water, including work within 15 metres of a body of water.
2. Installing of new or maintenance of existing bridges
3. Installing of new or maintenance of existing culverts
4. Fording a body of water

5. Dredging and/or removing debris from a body of water

6. Blasting near or in a body of water.

In addition, the following measures will be taken to minimize any potential harm that works could have on a body of water:

1. Where possible, the majority of the field activities will take place during low flow and the low rainfall period (i.e., summer months).

2. Clear instructions regarding regulatory requirements and the operation of heavy equipment will be expressed to contractors and site personnel. All conditions of permits and approvals for working within 15 meters of a body of water require strict compliance.

3. Heavy equipment will be kept outside the high-water mark of all bodies of water.

4. Where an acceptable biodegradable lubricant is available for a piece of equipment working within 15 m of a water body, the biodegradable lubricants will be used.

5. Fuels, chemicals or deleterious materials will not be stored near a body of water.

9.10 Watercourse Crossings – Fording, Culverts and Bridges

Environmental Concerns

Environmental concerns associated with fording, culvert installations, bridge construction and maintenance include direct disturbances to, or mortality of, fish and loss of fish habitat resulting from sedimentation and removal of habitat and stream bank vegetation. While it is not anticipated that activities associated with the Project will require fording, culverts, or bridges, they have been included in this EPP should it become a requirement.

Environmental Protection Procedures

Watercourse crossings (fording, culvert installation and bridge crossings) will be constructed in compliance with terms and conditions of permits issued by the NLECC and federal guidelines, including a letter of advice from the DFO.

The following measures will be implemented to minimize the potential impacts of watercourse crossings:

1. Work will be performed in such a way as to ensure that deleterious substances including, but not limited to, materials such as sediment, fuel and oil do not enter watercourses and waterbodies.

2. Site reconnaissance will be conducted to identify all water crossings that might require special attention.

3. Attempts will be made to minimize the number of water crossings necessary to access the site.

4. Attention will be given to scheduling. The longer a stream is disturbed; more sediment will enter the watercourse. The ideal time for construction Is during low flow, and the low rainfall period.

5. In all areas, except at watercourse crossings, a minimum buffer of undisturbed natural vegetation (15 m from the high water mark) shall be left between the access route and the bank of any watercourse which it parallels.

6. Grubbing shall not be carried out within a 30 m buffer zone of any stream without a control and mitigation plan, and without approval of project management.

7. Watercourse crossings will be selected so as to minimize unnecessary tree clearing.

8. Temporary fuelling, servicing or washing of equipment in areas other than the main fuel storage site will not be allowed within 100 m of a watercourse except within a refuelling site approved by the OSEM. Conditions here will allow for containment of accidentally spilled fuels. All waste oil, filters, containers or other such debris shall be removed from the work area and properly disposed of at an approved waste disposal site.

9. Any alterations to a body of water which may impact navigation will require a *Navigable Water Protection Act Request for Review* under the *Navigable Water Protection Act* from Transport Canada.

10. When fording any watercourse, DFO will be notified, and the Environmental Guidelines for Fording from Water Resources Management Division will be applied. A *permit to alter a body of water* would be required in conjunction with the *Water Resources Act* and the following guidelines:
    - Avoid areas of spawning habitat.
    - Restrict crossings to a single location.
    - Ensure crossings are made at right angles to the watercourse.
    - Minimize equipment activity within the watercourse by limiting the number of crossings.
    - Ensure that all equipment is mechanically sound to avoid leaks of oil, gasoline and hydraulic fluids.

- Ensure that no servicing or washing of heavy equipment occurs within 100 metres of watercourses.
- Stabilize all bank sections which contain loose or erodible materials. If banks must be sloped for stabilization, no material should be deposited within the watercourse. Sloping can be accomplished by back-blading, and the material removed should be deposited above the high water mark of the watercourse.
- All fording activities will comply with the required approvals from the NLECC and DFO.
- Equipment should be cleaned prior to entering a watercourse to minimize a potential release of contaminants into the environment.

11. In those locations where installations or upgrading of existing culverts are required, permits are required from NLECC. In addition, a request to DFO may be required. If a letter of advice is issued from DFO, all conditions shall be followed.

12. Culvert installations should be sized and constructed in accordance with the NLECC Environmental Guidelines for Watercourse Crossings and Culverts and the DFO operational statement for Culvert Maintenance as well as the DFO fact sheets for Culvert Installations. The following measures will also be implemented:
    - Unless otherwise indicated, all work will take place in dry conditions, either by the use of cofferdam or by diverting the stream with pumps and hoses. All work involving major alterations to stream channels will be carried out at a time of low flow, in a manner that prevents downstream sedimentation.
    - Cylindrical culverts shall be counter sunk when installed in fish habitat (as recommended by DFO) such that the culvert bottom is one-third the diameter below the streambed in the case of culverts less than 750 mm outside diameter; for culverts greater than 750 mm outside diameter, the culvert bottom shall be installed a minimum of 300 mm below the streambed.
    - If two culverts are to be installed at one location, one culvert shall be installed at an elevation lower than the other one. A maximum of two culverts are allowed at one location.
    - The natural flow regime of the watercourse shall not be altered; culverts shall not disrupt flow of water or cause ponding at the upstream side of the installation.
    - A culvert shall not be installed before site-specific information such as stream gradient, fish habitat type and species present have been evaluated as required.
    - When rock energy dissipaters are utilized at culvert outlets, proper fish passage shall be ensured.

- Photographs of all culvert installations shall be taken prior to and after the installation has been completed. The OSEM shall be responsible for collecting these photographs.
- Inlet and outlet areas shall be adequately protected from erosion by installing erosion prevention structures such as rip rap.
- Culverts shall be of sufficient length to extend a short distance beyond the toe of the fill material.
- Backfill material shall be of texture that shall support the culvert and limit the seepage and subsequent washing out.
- Culverts shall be aligned such that the original direction of water flow is not significantly altered and the gradient at the culvert follows the stream channel gradient to the extent possible. Infilling or reduction of the natural cross-sectional area of the watercourse shall not be permitted.
- Fill and construction debris shall be removed from the culvert area to a location above the peak flow level to prevent its entry into the water course.
- Construction activity shall be confined to the immediate area of the culvert.
- Fill material shall not be removed from stream/riverbeds or banks except when removal of material is necessary to ensure a flat foundation for installing a culvert.
- The use of heavy equipment in watercourses or bodies of water shall not be permitted.
- Culverts shall be marked to indicate their position under the snow.

13. In those locations where a bridge is required, any applicable environmental protection measure outlined above will be adhered to. In addition, the following measures will also be adhered to:
    - Any proposed bridge installations require a permit from NLECC. In addition, a request for project review or project notification to DFO is required. If a letter of advice is issued from DFO, all conditions shall be followed.
    - Photographs of all bridge installations shall be taken prior to and after the installation has been completed. The Construction Manager shall be responsible for collecting these photographs.
    - During bridge construction all applicable guidelines shall be adhered to including but not limited to NLECC Environmental Guidelines for Bridges and Watercourse Crossings, DFO Clear Spain Bridges Operational Statement, DFO Fact Sheet for Temporary Bridges, and DFO Fact Sheet for Bridge Construction/Demolition.
    - To safely convey peak flows, permanent bridges shall be designed for a 100-year return period stream flow.
    - Temporary bridges shall consider the following basic design criteria:

- Hydraulic design shall be based on the 1:2-year storm event;
- Abutment logs shall be placed a minimum of 1 m from the top of the bank;
- Deck height shall be a minimum of 250 cm above the bank height; and
- Deck height shall be a minimum of 450 cm above the water surface at the time of installation.

- The upstream and downstream sides of abutments must be protected with erosion prevention structures such as rip rap, to prevent erosion and scouring.
- Roadside embankments near the watercourse shall be adequately protected from erosion by installing applicable erosion prevention structures.
- Adequate erosion protection such as filter fabric sediment capture dams shall be provided where roadside ditches discharge into the watercourse near the bridge.
- Abutments and piers shall be constructed in the dry and where possible during times of low flow.
- During construction of concrete components, formwork shall be constructed to prevent any fresh concrete from entering bodies of water. Dumping of concrete or washing of tools and equipment in any body of water is prohibited.
- Periodic maintenance such as painting, resurfacing, clearing of debris or minor repairs shall be carried out without causing any physical disruption of the watercourse. Care shall be taken to prevent spillage of pollutants into the water.
- All waste materials will be removed from the site and disposed of at an approved waste management facility.
- All areas affected shall be returned to a state that resembles local natural conditions.
- During rehabilitation activities following the end of construction, all temporary bridges shall be removed.

9.11 Alterations to a Body of Water/Instream Works

Environmental Concerns

Instream work proposed as part of the project include the excavation of both the headrace and tailrace channels to accommodate Unit 8. It also includes a temporary rock plug upstream, to provide dry conditions for construction of the new intake gate. The timeline of the rock plug will be limited to the area required, and for only the time needed to successfully construct the intake gate. Once construction of the intake gate and headrace channel are completed, the rock plug will be removed.

The environmental concerns associated with alterations to body of water include direct disturbance to, or mortality of, fish, disturbance to waterfowl, loss of fish habitat caused by sedimentation and removal of substrate, and disturbance to riparian vegetation.

Environmental Protection Procedures

1. Works within 15 m of a water body shall require a permit from WRMD. A request for project review shall be submitted to DFO. Work shall adhere to conditions of the permit from WRMD and the Letter of Advice from DFO, if issued.

2. Works conducted within or near a body of water will follow the best practices laid out for activities within DFO's Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador.

3. Erosion stabilization methods and effective sedimentation control practices shall be implemented when required, and these shall conform to requirements, WRMD Environmental Guidelines and specific requirements of regulatory permits and approvals.

4. Floating silt curtains or suitable alternative may be used to contain and control the dispersion of turbidity and sediment when working in or near a waterbody.

5. The curtain will be located beyond the lateral limits of the construction site; the alignment will be as close as possible to the activities but not so close as to be disturbed by the construction equipment.

6. The curtain will be firmly anchored in place.

7. The contractor will remove built up sediment and debris as required; if the fabric becomes clogged it will be replaced.

8. During construction of concrete components, formwork shall be constructed to prevent any fresh concrete from entering bodies of water. Dumping of concrete or washing of tools and equipment in any body of water is prohibited.

9. Attention will be given to scheduling. The longer a stream is disturbed; more sediment will enter the watercourse. The ideal time for construction Is during low flow, and the low rainfall period.

10. Unless otherwise indicated, all work will take place in dry conditions, either by the use of a rock plug or by diverting the stream with pumps and hoses. All work involving major alterations to stream channels will be carried out at a time of low flow, in a manner that prevents downstream sedimentation.

11. Inlet and outlet areas shall be adequately protected from erosion by installing erosion prevention structures such as rip rap.

9.12 Buffer Zones

Environmental Concerns

The potential for erosion/sedimentation, spills, and resulting effects on water quality, fish and fish habitat are key environmental concerns associated with construction activities. In addition, sensitive and rare environmental receptors (e.g., nesting sites, bat roosts, wetlands, archaeological/historic resources) require protection from activities associated with construction.

Buffer zones of natural vegetation or undisturbed areas that separate these environmental receptors from construction activities are needed to mitigate adverse environmental effects. These undisturbed areas may also provide wildlife habitat and/or travel corridors near work areas and Project features.

Due to the many buffer zones referenced in various government documents and others that may be stated in regulatory permits for the Project, the appropriate buffer zone to use in a specific area may vary over time. Therefore, the OSEM is the only Site Personnel to determine which buffer is applicable, and Contractors shall be required to consult with these individuals prior to establishing buffers.

For general guidance, the following procedures define the minimum requirements during construction.

Environmental Protection Procedures

1. DFO recommends buffer zones to separate areas of land disturbance from waterbodies shall be calculated by the following formula:
    - Buffer Width (m) = 20 m + 1.5 x slope (%) (where slope >30%)
2. A minimum buffer zone of natural vegetation 30 m from the high-water mark of waterbodies, watercourses and ecologically sensitive areas must be maintained around work areas, where available space poses a constraint, except where specified otherwise. If space available, then wider buffer zones of up to 100 m will be maintained between construction areas and watercourses, waterbodies and ecologically sensitive areas.
3. Buffer zones will be established for certain activities, in accordance with DFO Best Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador.
4. Sediment control devices will be constructed outside buffer zones, as required. These devices are required to control runoff from areas of exposed soils and prevent transport

of sediments towards waterbodies. Section 9.16 (Erosion and Sediment Control) outlines the acceptable sediment control measures.

5. All aircraft (if required) must maintain a 500 m vertical and horizontal buffer from known active raptor nests.

6. No clearing will take place within 800 m of an active raptor nest.

7. For all work activities, a 200 m buffer will be respected for active raptor nests.

8. Helicopters (if required) moving during spring and fall staging periods (typically May or September) will maintain a minimum altitude of 500 m from concentrations of waterfowl.

9. A minimum buffer zone of 100 m will be maintained from the high-water mark of waterbodies, watercourses and ecologically sensitive areas for any bulk fuel storage activities.

10. While not expected within the Project site, a minimum buffer zone of 50 m will be maintained around any discovered archaeological site. The size of buffer zones may increase or decrease depending on the type of site and the buffer zone will be determined through consultation with the Provincial Archaeology Office. Where the site has been designated for recovery and/or recording, the buffer zone will be maintained until it has been cleared with the OSEM. Where available space poses constraints, this width may be reduced and supplemented by other protective measures. Site-specific mitigative measures for known historic resources in the Project area are provided in Section 9.22 (Historic or Archaeological Resources).

Table 9-1 provides a summary of recommended buffer zones.

Table 9-1: Recommended Buffers for Various Activities

Activity	Environmental Receptor	Recommended Width (m) of Buffer Strip
Handling, use and storage of bulk fuels (> 2000L)	Waterbody	100 m
Storage and handling of small quantities (<2000L) of fuel in appropriately contained areas and with adequate spill response	Waterbody	30 m
Handling and use of fuels (including transfer and fuelling of equipment). Storage of fuel in containers ≤25L	Waterbody	15 m

Activity	Environmental Receptor	Recommended Width (m) of Buffer Strip
Clearing of Vegetation	Waterbody	20 m (+1.5 x slope (%) where >30%)
	Active Raptor Nests	800 m (between March 15 to August 15)
Aircrafts	Active Raptor Nests	500 m (vertical and horizontal)
	Waterfowl and Harlequin Duck Concentrations	500 m vertical distance
Quarrying and Aggregate Removal from Borrow Areas	Waterbody	100 m
All Activities	Archaeological sites	50 m
Cutting	Scheduled Salmon Rivers	50 m
Cutting	Black Bear Denning Sites (Late October – Late April)	50 m
Cutting/Construction	Active waterfowl/waterbird nests (species not of management concern)	100 m
Cutting/Construction	Active passerine nests (species not of management concern)	10 m
Cutting	Waterbody occupied by a beaver	30 m

9.13 Excavation, Backfilling and Grading

Environmental Concerns

The principal environmental concern associated with excavation, backfill and grading is the potential impact on aquatic ecosystems and water quality due to runoff of sediment-laden water. Potential disturbance to rare species and habitat, and archeological/ historic resources (Section 9.22) must also be taken into consideration, along with the effect on forests, side hills and steep slopes (i.e., danger trees or wind falls).

Environmental Protection Procedures

Work will be conducted in a manner that ensures the minimum amount of disturbance necessary.

See the following sections for mitigation measures that apply to excavation, backfilling, and grading activities.

1. Section 9.2– Vegetation Clearing;

2. Section 9.8 – Equipment Movement and Operations;
3. Section 9.16 – Erosion Prevention and Sediment Control; and
4. Section 9.22 – Historic and Archaeological Resources.

All works in the vicinity of waterbodies or watercourses will be performed in strict compliance with NLECC and DFO guidelines and requirements. Work will be conducted in a manner that controls potential sedimentation of watercourses and waterbodies in or adjacent to the work areas as outlined in the following procedures:

1. Excavation, backfilling and grading will be done only upon completion of grubbing and stripping. Where engineering requirements do not require grubbing and stripping (e.g., within the buffer zone of a stream crossing), filling will occur without any disturbance of the vegetation mat or the upper soil horizons.

2. Excavation, backfilling and grading in the vicinity of a waterbody will be done in a manner that ensures that erosion and sedimentation of watercourses and waterbodies is minimized and is done in strict compliance with NLECC and DFO guidelines and requirements.

3. Excavation activities will, where applicable, be in compliance with Newfoundland and Labrador's Protocol for the Management of Excavated Soils, Concrete Rubble, and Dredged Materials.

4. An adequate buffer zone will be maintained between all construction areas and waterbodies, except in instances where shoreline and riparian zone construction is needed.

5. Mitigation measures within Section 9.4, 9.6, and 9.8 will be followed for all fuel related activities associated with excavation, backfilling and grading activities.

9.14 Dust Control

Environmental Concerns

Concerns related to dust would be localized to the project site and are associated with a localized reduction in air quality and visibility, which could cause a safety risk.

Environmental Protection Procedures

Dust from construction activities are controlled where possible by using frequent applications of water. Waste oil shall not be used for dust control but other agents such as wood chips, calcium

chloride, matting and re-vegetation shall be considered on a site-specific or as needed basis and shall require the approval of owner.

9.15 Quarrying and Aggregate Removal from Borrow Areas

Environmental Concerns

The main concerns for quarry development and associated aggregate removal include the potential for impacts on aquatic systems, loss of terrestrial habitat and historic resources, potential quarry development/rehabilitation plans.

Environmental Protection Procedures

The following measures will be implemented to minimize these effects:

1. Permits to quarry shall be obtained from the NL Department of Industry, Energy, and Technology (NLIET) before quarries are established. Quarry activity shall be undertaken in compliance with these quarry permits and shall comply with all other relevant regulations.

2. Quarries shall be located 100 m from a water body unless otherwise approved by the Department of Natural Resources. If approved, additional mitigative measures may be required.

3. The development of quarry sites and rock excavations shall require monitoring to determine the absence or presence of sulphide bearing rock. For environmental protection against Acid Rock Drainage (ARD), the OSEM will visually inspect bedrock before, during, and after excavation work on a periodic basis. In the event that visible evidence of ARD is noted, the Construction Manager shall be notified immediately. Visible evidence of ARD is typically a yellowish color of water or sediment called yellow boy or evidence of sulphides in rock.

4. Quarry areas shall be developed in a controlled manner so as to minimize potential environmental effects and quarry locations shall consider sensitive wildlife areas. The following protection procedures shall be implemented to minimize disturbance and facilitate rehabilitation:
    - A buffer zone of undisturbed vegetation shall be maintained between borrow areas/quarries and watercourses, waterbodies and ecologically sensitive areas.
    - The quarry area, stockpile area and limits of clearing will be staked and/or flagged to prevent over-extension of the development, (corner posts at least 1 m high above ground will be installed to mark the quarry area).

- The area to be excavated will be clear cut of all vegetation prior to grubbing, excavation or removal of any material
- All stumps, organic matter and topsoil will be stripped from the area to be excavated and stockpiled at least 5 m from uncleared areas; stockpiles will be kept at least 10 m from the area of excavation; separate overburden piles shall be developed where this material is present; topsoil and the underlying overburden will not be mixed.
- Stockpile areas are to be confirmed by the OSEM, prior to stripping.
- Upon completion of excavation of a quarry, no cliff faces or benches will be left at a height greater than 5 m for soil or 10 m for rock. Available material left over from quarrying and stockpiled overburden will be used to minimize slopes and face heights and to rehabilitate the area.
- Each quarry will be evaluated by the OSEM on a site-specific basis to determine whether the cliff faces shall be converted to rubble slopes.
- Following sloping, the topsoil and any organic materials will be respread over the disturbed area to promote natural re-vegetation by adjacent seed sources.

5. To prevent sedimentation of waterbodies, watercourses and ecologically sensitive areas, sediment control measures (basins and traps) will be established, if required, and cleaned no a regular basis, as required, to ensure that the retention capacity is maintained at all times.

6. The Total Suspended Solid (TSS) content of construction-altered water that is released into a natural waterbody will not exceed 30 milligrams per litre and be in compliance with Environmental Control Water and Sewage Regulations.

7. With respect to maintenance of water quality within receiving waterbodies on and around the site, the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life shall be used.

8. The pH level of construction-altered water that is released into a natural waterbody will be between 5.5 and 9 pH units and be in compliance with Environmental Control Water and Sewage Regulations.

9. Dust from aggregate processing, storage and handling will be controlled with water as required during times when temperatures above freezing. A water use license must be obtained from NLECC.

10. If crushing activities in the quarry require a water source, a water use licence is also required from the NLECC.

9.16 Erosion Prevention and Sediment Control, and Site Water Management

Environmental Concerns

The potential for erosion and resulting effects to water quality and fish and fish habitat is a key environmental concern associated with construction activities. Erosion and sedimentation within both terrestrial and aquatic environments can result in potential effects on wildlife and their associated habitats.

In addition to the requirements of this section, an Erosion Prevention, Sedimentation Control and Site Water Management Plan, may be developed prior to the start of site activities. This requirement will be project specific and dependant on environmental sensitivities of the surrounding receiving environment. Erosion and Sedimentation Control and Site Water Management Plan shall be detailed and specific to the project site, identify the best methods for erosion and sedimentation prevention and site water management.

Environmental Protection Procedures

As this project is taking place at an existing hydroelectric facility, erosion prevention and sedimentation control will be a focus for all construction related activities. The application of erosion control measures is found throughout the activities listed in Section 8.0, but reiterated here to provide a more thorough evaluation of site specific activities required by Project personnel.

General

The most effective way to control erosion and sedimentation is to avoid activities that lead to it. All areas of exposed soil are to be stabilized by grading to meet slope requirements. Where erosion along an exposed slope is a concern, and sufficient vegetation does not exist to act as a buffer between the high water mark of the water body and the exposed soil, a silt fence will be constructed to control sediment runoff.

Engineering requirements will vary depending on the locations of the silt fence and will take factors such as drainage/surface area of exposed soils into consideration.

Contractors will use erosion and sedimentation control measures to ensure water control on site. Any water discharge into a waterbody, watercourse, or ecologically sensitive area, due to construction activities will comply with applicable discharge guidelines as presented in the Environmental Control Water and Sewer Regulations.

Watercourses

In-water/near-water work proposed for the project include the excavation of the new headrace channel and expansion of the existing tailrace channel. The use of the rock-plug upstream will

facilitate the dry-work construction of the new intake channel for Unit 8, as well as the excavation of the headrace channel. See Section 9.9 and 9.11 for works in and around water.

Exposure of Erodible Soils

Areas with existing vegetative cover will be developed as part of the work program. These areas include the portions of the headrace and tailrace channels that have been identified for excavation. The following actions will be taken to minimize the erosion of exposed soils and the discharge of suspended sediment in runoff waters leaving these sites:

1. preliminary site reconnaissance indicates that no natural streams flow through the areas to be developed, however, if a natural water course is found in any area, a minimum 30 metre buffer will be left adjacent to the stream bank in which no overburden will be removed.

2. overburden from the cleared areas will be stockpiled in windrows on the upslope sides to divert rainwater flows from non-cleared areas away from areas of exposed soils.

3. the downslope side of each area will be ditched suitably to allow for the capture of surface drainage water flowing over the exposed soils.

4. sediment control basins/traps will be established within the downslope ditches, accumulated sediment will be removed as required to maintain retention capacity, and the structures stability will be checked regularly and repaired as required to maintain effectiveness.

5. the Total Suspended Solid (TSS) content of construction-altered water that is released into a natural waterbody will not exceed 30 milligrams per litre and be in compliance with Environmental Control Water and Sewage Regulations.

9.17 Dewatering Work Areas

Environmental Concerns

The major concerns associated with dewatering are sedimentation, direct fish mortality, and/or habitat destruction for freshwater and marine fish species.

Environmental Protection Procedures

1. Filtration or other suitable measures, such as settling ponds, silt fences and dikes, are to be implemented for sediment removal and turbidity reduction in water pumped from work areas before discharging.

2. Where possible, clean water meeting the Environmental Control Water and Sewage Regulations, shall be discharged to vegetated areas to further reduce any potential effects on watercourses. Additionally, mechanisms to prevent scouring and erosion of the discharge location shall be installed as outlined in Section, “Erosion Prevention, Sediment Control and Site Water Management Plan”.

3. The size of sedimentation ponds shall be designed to accommodate the anticipated volume of collected water and meet discharge criteria for water quality.

4. Discharged water shall be encouraged to follow natural surface drainage patterns.

5. Harmful alteration, disruption and destruction of fish habitat shall not be permitted unless a formal HADD Authorization has been obtained from DFO.

9.18 Drilling

Environmental Concerns

Environmental concerns associated with geotechnical drilling include surface disturbances, disposal of drilling fluids and cuttings, generation of dust, noise, and potential effects on terrestrial habitats, air quality, aquatic ecosystems, and historic resources.

Environmental Protection Procedures

The following mitigation measures will be implemented to reduce the potential impacts associated with geotechnical drilling activities:

1. Drilling sites will be cleared of vegetation prior to activities occurring

2. Any excavations associated with drilling will be completed in accordance with the procedures outlined in Section 9.2, 9.3, and 9.13

3. The handling, storage, and disposal of all fuels and other wastes will be done in accordance with the mitigation measures outlined in Section 9.4 and 9.6.

4. Garbage and solid waste will be removed from the drill site and disposed of at an approved landfill. Recyclable and reusable materials should be transported to appropriate facilities for recycling or reuse.

5. Due to the nature of drilling activities, (i.e., quicksnaps, couplings) oil drops and leaks may occur. The area will be cleaned up at every opportunity and the rig will be equipped with oil absorbent material in the event of a leak or spill.

6. Proper drainage shall be maintained at drill sites to prevent build-up of standing water.

9.19 Blasting

Environmental Concerns

Blasting actives may be required during excavation activities related to the headrace and tailrace channels, and the penstock route. This would be conducted to remove large boulders and/or bedrock that may not be possible using mechanical methods. The general environmental concerns associated with on-land blasting include:

1. Destruction of vegetation outside excavation limits
2. Loosening of soils in and outside the blast area, resulting in potential erosion and sedimentation
3. Noise disturbances to wildlife
4. Disturbance of Archaeological Resources
5. Dust generation.

Blasting in or near water bodies can affect fish and the introduction of sediment into the water column is also a concern for water quality and related effects on aquatic life.

Environmental Protection Procedures

The handling, transportation, storage and use of explosives and all other hazardous materials will be conducted in compliance with all applicable laws, regulations, orders of the NLECC and the NLGMSD, the Explosives Act, and the Transpiration of Dangerous Goods Act.

The following measures will be implemented to avoid or reduce the potential effects associated with blasting:

1 Explosives will be used in a manner that will minimize damage or defacement of landscape features, trees, ecologically sensitive areas such as wetlands, and other surrounding objects by controlling through standard best practice (including precisely calculated explosive loads and adequate stemming), the scatter of blasted material beyond the limits of activity.

2. Blasting patterns and procedures will be used which minimize shock or instantaneous peak noise levels.

3. Time delay blasting cycles or blasting mats will be used, if necessary, to control the scatter of blasted material.

4. Blasting will not occur in the vicinity of fuel storage facilities.

5. All blasters will have a Blaster's Safety Certificateand a Temporary Magazine License prior to drilling and blasting.

6. Use of explosives will be restricted to authorized personnel who have been trained in their use.

7. There will be a separate magazines on site for explosives and for dynamite blasting caps. All temporary magazines for explosive storage will have appropriate approvals.

8. The immediate area of the blast site will be surveyed within one hour prior to a blast and operations will be curtailed if wildlife (e.g., black bears, water fowl etc.) is observed within 500 m. Environmental personnel will conduct pre-blast monitoring to see and identify species of concern. Additionally, any individual animal sightings by other personnel will be reported to the OSEM.

9. Blasting activity will not be permitted within 2 km of a bat hibernaculum during the period Oct 1 to April 30.

10. Blasting will, where feasible, be scheduled to avoid sensitive wildlife periods identified in Section 9.1.

11. All blasting debris such as explosive boxes and used blasting wire must be collected for proper disposal as soon as possible following blasting activity.

12. If blasting is necessary within the vicinity of an archaeological site, precautions will be taken to ensure that blasted material and shock waves do not disturb any part of the site. If necessary, protective covering will be applied to the site under the supervision of an approved archaeologist. Blasting will not be undertaken in these areas without first notifying the OSEM.

13. When blasting operations are within 200 m of a waterbody occupied by fish, the operations will be carried out in accordance with DFO best practices to protect fish and fish habitat.

14. Downstream areas will be monitored after each blast for evidence of fish kills and if any are evident, blasting operations will cease and the incident will be reported to the OSEM.

15. Three (3) hours prior to any blasting activities near waterbodies, a visual reconnaissance of the area will be undertaken to establish the presence of water fowl or aquatic mammals.

16. Drilling and blasting activities shall be undertaken in a manner that ensures the magnitude of explosions is limited to that which is absolutely necessary. A blasting plan must be prepared and reviewed with the OSEM in advance of work in close proximity to waterbodies.

17. Blasting activities will be done in accordance with DFO's Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador, which includes practices for blasting activities.

18. For multiple charges, time delay detonators will be used to reduce the overall detonation to a series of single explosions separated by minimum delay.

19. Large charges will be subdivided into a series of smaller charges with minimum delay detonation.

20. The on land set-back distance from the blast site to the waterbody or the set-back distance around the blast site in the waterbody will be based on the maximum weight of charge to be detonated at one instant in time, the substrate, and the type of fish or fish habitat in the area of the blast. These set-back distances are outlined in the Guidelines for Use of Explosives In or Near Canadian Fisheries Waters and the DFO Fact Sheet for Blasting – Fish and Fish Habitat Protection.

21. Blast holes will be stemmed with sand or gravel to grade or to streambed/water interface to confine the blast.

22. Waste rock from blasting activities will be inspected by qualified personnel for potential Acid Rock Drainage. If ARD is detected, the OSEM will be notified immediately.

23. Waste rock identified as having ARD will be stockpiled in a location where drainage can be collected and treated if required.

24. The release of water from blasting activities and waste rock drainage is required to meet Schedule A of the *Environmental Control Water and Sewage Regulations, 2003* before it is be permitted to be discharged directly or indirectly into the receiving environment. Typical treatment includes settling ponds, and the addition of chemicals or the use of mechanical processes to aid in settling or filtration. Treatment options will be confirmed by the OSEM and approved by NLECC.

9.20 Noise

Environmental Concerns

Noises associated with equipment operation may cause negative effects on fish and wildlife and affect human safety and health. All necessary precautions should be taken to minimize potential effects. As the work is being undertaken at an existing and active hydroelectric site, the work is not anticipated to contribute a large or noticeable level of noise to the surrounding area.

Environmental Protection Procedures

1. All equipment will be equipped with properly operating mufflers and exhaust systems which will be regularly inspected and in good working order. See Section 9.8 (Equipment Movement and Operations).

2. Wildlife surveillance will be conducted prior to noisy activities.

3. Project personnel will adhere to all relevant permits and approvals.

4. All safe work procedures relating to noise will be followed by project personnel.

9.21 Concrete Production

Environmental Concerns

The major concern relating to concrete production is the effects of effluent released to the environment. Liquid wastes may contain hazardous materials such as cement, concrete additives, and form oil.

Cement is very alkaline and washwater from spoiled concrete or from the cleaning of the batch plant mixers and mixer trucks, conveyors and pipe delivery systems can have pH levels outside the acceptable range. Similarly, spoiled concrete or washwater would contain concrete additives and agents, some of which are toxic to aquatic species. Aggregates, particularly the finer sand fractions may be washed from spoiled concrete or discharged in washwater. Uncontrolled release of such washwater, chemicals and sediments could adversely affect aquatic life and aquatic habitat.

Environmental Protection Procedures

1. Approval from the NLECC shall be obtained to establish the required concrete batch plants at each Site. Plant operations shall comply with the conditions outlined in the approvals and requirements under *Air Pollution Control Regulations*.

2. Prior to the release of effluent to the environment it shall be tested for appropriate parameters (as outlined in Schedule A of the Environmental Control Water and Sewage Regulations) to ensure effluent quality standards are met. The specific criteria for concrete production are a pH level between 5.5 and 9 and TSS less than 30 mg/L. Release shall be in accordance with runoff control procedures.

3. With respect to maintenance of water quality in receiving waterbodies on and around the site the CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life shall be used.

4. If water to be released does not meet discharge criteria, it shall be further treated until these discharge criteria have been met.

5. Treatment shall be site-specific as it depends on analytical results, however typical treatment may include the addition of chemicals or the use of mechanical processes to aid in filtration or settling. Treatment options shall be confirmed by the OSEM and approved by the NLECC.

6. When concrete is to be placed within 15 m of a waterbody, provisions of all required permits shall be followed. Under no circumstances shall fresh concrete come into contact with a waterbody, before the concrete has cured.

7. Washwater from the cleaning of mixers, mixer trucks and concrete delivery systems shall be handled using the following steps:

    - All rinsing activities shall be carried out at the site of the concrete batch plant, except rinsing of the chute.
    - The rinsing of the chute may be carried out at the delivery site, but care and caution shall be taken before any concrete is rinsed from a chute at the delivery site. It is permissible to rinse onto the ground or soil but under no circumstances into a pond or stream or onto a surface that leads directly to a water body, such as a storm sewer.
    - All rinsing activities at the site of the batch plant shall be done over a containment pond (approximately 12.2 m x 4.57 m and less than 0.91 m deep). The material used to form the bottom and sides of the pond can be compacted clay or a synthetic liner, however the NLECC shall approve any installation of a synthetic liner. The pond shall be self-contained with no water inlets or outlets and no possibility of surface drainage into or out of the pond.
    - Any trucks returning with unused concrete shall dispose of this concrete into an approved area able to contain it while still in liquid form before the trucks can be

washed. Once the concrete has hardened it may be used as fill material. Liquid concrete shall not be permitted to run freely over the ground.

- Once all concrete has been removed from the truck, the truck may be brought over to the containment pond where washing can take place. Any water that is used to wash the truck shall be directed into the pond.
- When the water level in the pond reaches a height that necessitates discharge, water can be discharged following the procedures outlined in this section otherwise it shall be removed by pumper truck or undergo additional treatment.
- Water shall not be discharged in an area where it would cause erosion or be able to pick up solids from the surface.

9.22 Historic & Archaeological Resources

Environmental Concerns

While not expected within the existing footprint and property boundary of Bay d'Espoir Hydroelectric Facility, field work has the potential to impact historic and archaeological resources.

Environmental Protection Procedures

In the event of a discovery of a potential archaeological site or artifact, the following procedures will apply:

1. All persons on site will be informed of the historic resources potential of the area, of their responsibility to report any unusual findings, and to leave such findings undisturbed.

2. The OSEM will report to the PAO if any potential archaeological resources are uncovered during excavation.

3. The OSEM will be contacted immediately if historic resources are discovered during the course of the work. All work within 50 m of the discovery location will stop and contingency plan procedures implemented.

4. Regular monitoring will be conducted by the OSEM to ensure that site protection measures are adequate and that the terms and intent of the EPP requirements are being met.

9.23 Wildlife Protection

Environmental Concerns

Wildlife refers to all plant and animal life, introduced or native, aquatic or terrestrial, in Newfoundland and Labrador. As mentioned throughout Section 8.0, multiple activities have the potential to interact with and affect various wildlife species and their habitats.

It is possible that threatened, endangered and protected species of plants and animals may be present during construction activities. Many wildlife species and their habitats are protected under provincial and federal regulations such as the federal Species at Risk Act and the Newfoundland and Labrador Endangered Species Act.

Environmental Protection Procedures

1. Through site surveys, existing and potential rare plant habitat will be identified prior to the commencement of any site work. Travel routes and “no-go” zones will be established to avoid sensitive areas.

2. Crews should not travel outside of marked work areas and trails. If markers are not clear or missing, or if questions regarding sensitive areas exist, the OSEM should be consulted prior to commencing or continuing with the work.

3. The OSEM should monitor work activity in sensitive sites at all times and provide advice on access and travel requirements.

4. Disturbance on the worksites should be kept to the minimum required to complete the work.

5. The OSEM should notify any regulators as to the activity proposed near sensitive areas prior to the commencement of the work and upon completion of the work.

6. All applicable activities that may have an interaction and/or effect on aquatic species and their habitat will be done in compliance with relevant permits, and using practices laid out in DFO’s Best Management Practices for the Protection of Freshwater Fish Habitat in Newfoundland and Labrador.

9.24 Abandonment of Work Sites

Environmental Concerns

Abandonment of work sites may cause disruption to wildlife and land users. Work sites must be returned to a condition as close as possible to what they were before work began.

Environmental Protection Procedures

1. No temporary buildings or structures associated with the work should be left at the site once construction and commissioning is complete.

2. All solid wastes, including petroleum, oil and lubricant containers will be removed from the site and disposed of at an approved waste management facility. Recyclable and reusable materials will be transported to appropriate facilities for recycling or reuse.

3. All excavations will be backfilled with excavated material upon completion. Organic material will be stockpiled and used as surface cover where feasible.

4. No debris, including slash, should be permitted to enter any body of water.

10.0 CONTINGENCY PLANS

10.1 Master Environmental Spill Response Management Plan

Environmental Concerns

Unplanned releases of fuel and other hazardous materials can be damaging to vegetation, soil, surface water, ground water, wildlife, aquatic organisms, historic resources and human safety and health. Unfortunately, such releases can occur during construction and commissioning activities.

In addition to the requirements of this section, prior to any major construction activity, a Master Environmental Spill Response Management Plan will be prepared. The plan will establish minimum expectations for all project personnel and ensure continuity between NLH and its contractors. Prior to transporting or positioning fuel or oil, or equipment containing fuel or oil on site, all contractors shall read and accept the master environmental spill response management plan.

Environmental Protection Procedures

In the event of the release of fuel, oil or hazardous material the following basic strategy shall apply:

1. Determine the type of product;
2. Assess the situation and determine appropriate PPE and required safety measures;
3. Identify priorities while considering the threat to people, property and the environment;
4. Initiate the appropriate response actions:
5. Stop and/or contain the source of the spill;
6. Identify the product and estimate the quantity;
7. Contact emergency personnel and request additional support if necessary;
8. Initiate the containment and recovery of any free product and/or contaminated material;
9. Ensure required reporting and notification is carried out;
10. Dispose of all waste material in the appropriate manner;
11. Restore the site to the satisfaction of the governing regulatory body; and
12. Document and investigate as required.

Based on a review of relevant legislation and in consultation with regulatory authorities immediate reporting to regulatory agencies is to be applied to:

1. A release greater than 70 litres;
2. A release, regardless of quantity, that has entered a waterbody or has the potential to contaminate nearby property or enter a water body or sewer;
3. A release, regardless of quantity, from a registered storage tank system, including any associated piping or pipelines; or
4. Notification must be made to regulatory authorities via the Environmental Emergency Report Line at (709) 772-2083 (collect calls accepted) or 1-800-563-9089.

10.2 Wildlife Encounters

Environmental Concerns

Wildlife encounters pose a potential risk for both the species involved and project personnel. As a protection measure, and in accordance with existing NLH policies, hunting, trapping or fishing by project personnel is not permitted. Firearms and ammunition are not permitted at the work

site unless authorized by the Consultant and government regulators for use as protection against wildlife. Personal pets are also not permitted to be on site at any point.

Environmental Protection Procedures

In the event of a wildlife encounter project personnel should abide by the following:

1. No attempt should be made to chase, catch, divert, follow or otherwise harass wildlife by aircraft, vehicle or on foot by any person at a work site.

2. Equipment and vehicles will yield the right of way to wildlife.

3. Project personnel will be aware of the potential for encounters with wildlife and be instructed to immediately report all sightings to the OSEM.

4. If nuisance animals are identified, responsive actions will be determined in consultation with the NLFFA Wildlife Division. A permit to destroy problem animals must be obtained from NLFFA prior to destroying any moose, black bears, or other wildlife that pose a safety risk or interfere with operations.

5. Project Personnel will not attempt to feed any wildlife.

6. Field personnel and supervisors may be supplied with bear deterrents such as bangers or spray.

<u>How to React to a Bear Encounter</u>

The following precautions must be taken when working in areas known to be inhabited by bears and other potentially dangerous animals:

1. Everyone should keep an eye out for bears:
    - Select a route that is open and well cleared, if possible;
    - Be aware of the wind direction and walk with the wind whenever you can;
    - Don’t investigate bad smells, as bears are usually attracted to them; and
    - Have binoculars readily available to help spot bears from a safe distance.

2. Bears normally avoid encounters with humans. However, there is always a possibility you may surprise a bear at close range or meet a bear which is not afraid of people. There is no guaranteed method for reacting to a bear encounter because each encounter is different. However, the following guidelines can help minimize the risk:
    - Assess the situation and think about your surroundings before you react;
    - Try to stay calm and keep the bear in sight at all times;

- If traveling in a group, stay close together;
- Do not run unless you are reasonably sure you can reach a safe place before the bear catches you. Running may invite the bear to pursue you, and a bear can run faster than a human;
- Continue to walk slowly in the opposite direction from the bear;
- In close confrontations, the bear is likely to feel threatened. Its natural tendency is to remove the threat. Try to act as non-threatening as possible, particularly if it is an adult bear or a female with young. Do not make direct eye contact; and
- Give the bear an opportunity to leave; make sure it has an escape route.

How to React to a Coyote Encounter

1. Stay calm.
2. Back away slowly while facing the animal.
3. Leave the coyote a way to escape.
4. Raise your voice and speak firmly.
5. If the coyote approaches or acts aggressively, wave your arms and make yourself look larger. Shout, make noise and throw any available objects.
6. In the unlikely event that you are attacked by a coyote, fight back. Try to remain standing and use rocks, sticks, tools and your hands to fend off the attack. Keep the animal away from your neck and head.

10.3 Historic & Archaeological Resources

Environmental Concerns

Historic and Archaeological Resources are valued by Indigenous people and the public at large for their intrinsic value and for the information they provide on the pre-contact and historic human activity in the province. They are non-renewable and, in many cases, the resources themselves and the information and cultural meaning they hold cannot be replaced if damaged or destroyed.

The management and protection of Historic and Archaeological Resources falls under the mandate of the Provincial Archaeology Office (PAO) of the Newfoundland and Labrador Department of Tourism, Culture and Recreation. The PAO administers its mandate through the Newfoundland and Labrador Historic Resources Act (1985), which has its own distinct regulatory requirements, in addition to those of the broader environmental assessment process.

Project Personnel are not permitted to knowingly disturb or destroy historic resources, including excavating archaeological sites and collecting artifacts. Project Personnel will take all reasonable precautions to prevent persons from removing or damaging any such articles or sites and may be held liable for prosecution under the provincial *Historic Resources Act* for all contraventions.

Environmental Protection Procedures

There is always the possibility that undiscovered archaeological sites such as structures, tools, butchered animal bones and graves may be discovered or disturbed during project activities. As a result, all personnel involved in these activities will be informed of their responsibility to report any suspected findings. In the event of an inadvertent discovery of a pre-contact or historic artifact or site, the following procedures would apply:

1. In the event of a confirmed or potential discovery of an historic resource, all work should cease in the immediate area of the discovery until the proponent has consulted with the PAO and is authorized to resume work.

2. Archaeological materials encountered should be reported to the OSEM who will then immediately file a report to the PAO at (709) 729-2462, fax (709) 729-0870 with the following information:
    - Nature of activity resulting in the find;
    - Nature of the material discovered; and
    - The precise location of the find.

3. Discoveries, or suspected discoveries, of historic resources should be flagged or marked with a bright colored object in the field and the area protected as required.

Following an assessment of the significance and mitigation needs, a report will be made to the NL Hydro Team and the PAO. Any proposed mitigation will first be accepted by the NL Hydro Team and approved by the PAO.

10.4 Forest Fires

Environmental Concerns

There are a number of field activities that could result in a fire which could in turn spread to the surrounding area. Forest fires pose safety and health risks and could negatively affect wildlife and vegetation.

Environmental Protection Procedures

The fire prevention and fire-fighting procedures described below will be followed and Project Personnel will take all precautions necessary to prevent fire hazards when at the work sites such as ensuring the disposal of all flammable waste on a regular basis.

In the event of a forest fire, the Consultant or other Project Personnel will take immediate steps to contain or extinguish the fire to the extent practical and safe. Fires will be reported immediately to the nearest Forest Management Unit office (**Appendix E**) and to the NL Hydro Team. The following information will be provided:

1. Name of the reporter and phone number
2. Time of detection of the fire
3. Size of the fire
4. Location of the fire.

A person shall not carry out a logging or industrial operation on forest land during the forest fire season unless the logging or industrial operation is carried out under an Operating Permit issued by the forest service. The forest fire suppression equipment referred to in the Operating Permit shall be provided at the operating site in the following ratio:

Employees	**Backpack tanks, axes or Pulaski tools and grubbers or shovels**
5 or less	1
6 – 10	2
11 – 15	3
16 – 20	4
Over 20	Add 1 back tank pump, 1 axe or Pulaski tool and 2 grubbers or shovels to the above figure for each group of 5 additional employees or fraction of that number of employees. The back tank pump must have a capacity of 20 litres and be of a type approved by the forest service.

When the number of employees reaches 20 or over, one fully functional forest fire pump shall be available at the site. Pump accessories shall include: a gated “Y” valve, hose strangler and two nozzles for each unit, additionally, 610 meters of forest fire hose shall be available for each unit. Forest firefighting equipment shall be forest service approved.

The forestry official issuing the operating permit may specify deviations from the equipment requirements should local operating conditions warrant deviations. The actual location of the forest fire suppression equipment in relation to the operating site may be designated by the forestry official issuing the permit.

A copy of the operating permit shall be on the operating site and shall be shown when requested by a forestry official. The operating permit may be temporarily suspended by a forestry official if the fire weather index for that locality rises to high or extreme. Where a forest fire occurs on forest land in an area where logging or industrial operations are being carried out the person/s carrying out the operations shall immediately notify the nearest forest management district office or ranger station and commence fighting the fire with all labour, materials, equipment and facilities at his or her disposal until relieved of this responsibility by a forestry official or the fire is extinguished.

APPENDIX A: Permits And Approvals

POTENTIAL ENVIRONMENTAL APPROVALS, PERMITS AND AUTHORIZATIONS

#	Activity	Approval, Permit, or Authorization	Legislation	Regulatory Agency
Government of Newfoundland and Labrador (not all inclusive)				
1	Project – General	Release from the Environmental Protection Act, Part X, Environmental Assessment	Environmental Protection Act	NLECC, EA Division
2	Work within 15 m of a water body and work in water (e.g., culverts, bridges, dams, fording, infilling/dredging, miscellaneous works)	Permit to Alter a Body of Water	Water Resources Act	NLECC, Water Resources Management Division
3	Water withdrawal	Water Use License	Water Resources Act	NLECC, Water Resources Management Division
4	Water and Sewerage Works	Permit to install/operate	Water Resources Act	NLECC, Water Resources Management Division
5	Private Sewage Disposal System (e.g., septic system with flows less than 4546 litres/day)	Permit to install/operate	Sanitation Regulations	Digital Government and Services NL
6	Extracting borrow material	Quarry Permit	Quarry Materials Regulations	NLIET, Mineral Lands Division

#	Activity	Approval, Permit, or Authorization	Legislation	Regulatory Agency
7	Clearing timber (e.g., right of way, quarries, camp, laydown areas)	Commercial Cutting Permit	Cutting of Timber Regulations	NLFAA, Forest Management District Office
8	Industrial Operations on forest land	Operating Permit	Forest Fire Regulations	NLFAA, Forest Management District Office
9	Stationary fuel tanks	Gasoline and Associated Products (GAP) Registration	Storage and Handling of Gasoline and Associated Products Regulations	Department of Digital Government and Service NL
10	Used oil or used glycol tanks (greater than 205L)	Used Oil and Glycol (UOG) Registration	Used Oil and Used Glycol Control Regulations	Department of Digital Government and Service NL
11	Prime power diesel generators with capacity greater than 100 kW	Certificate of Approval	Air Pollution Control Regulations, 2022 Guidance Document – Approval of Diesel Generators	NLECC, Pollution Prevention Division
10	Standby diesel generators with capacity greater than 100 kW and operate more than 500 hours per year	Certificate of Approval	Air Pollution Control Regulations, 2022 Guidance Document – Approval of Diesel Generators	NLECC, Pollution Prevention Division

#	Activity	Approval, Permit, or Authorization	Legislation	Regulatory Agency
11	General Site – Wildlife	Permit to Remove/Destroy Problem Animals	NL Wildlife Act	NLFFA
Government of Canada (not all inclusive)				
12	Work in and near water	Fish and Fish Habitat Protection Program Review	Fisheries Act	Fisheries and Oceans Canada (DFO)
13	If Project will likely result in harm of species at risk	Species at Risk Permit	Species at Risk Act	Environment and Climate Change Canada
14	Obstruction to navigation	Navigation Protection Program Review	Canadian Navigable Waters Act	Transport Canada

Newfoundland and Labrador Hydro
BDE Unit 8
July 2024

APPENDIX B: Revision Request Initiation Form

Newfoundland and Labrador Hydro
BDE Unit 8
July 2024

REVISION REQUEST INITIATION FORM

SECTION TO BE REVISED:
NATURE OF REVISION:
RATIONALE FOR REVISION:
SUBMISSION:

Please submit request to the Consultant

Newfoundland and Labrador Hydro
BDE Unit 8
July 2024

APPENDIX C: Revision Control Record

Newfoundland and Labrador Hydro
BDE Unit 8
July 2024

Revision Control Record

EPP Section	Revision Date	EPP Holder's Signature

Newfoundland and Labrador Hydro
BDE Unit 8
July 2024

APPENDIX D: NL Hydro Environmental Policy

Newfoundland and Labrador Hydro

Environmental Policy and Guiding Principles

At Newfoundland and Labrador Hydro (Hydro) we are committed to being an Environmental Leader. We will help sustain a diverse and healthy environment for present and future Newfoundlanders and Labradorians by maintaining a high level of environmental compliance, responsibility and performance.

To succeed in our goal the following guiding principles have been established:

Awareness: We foster the environmental consciousness of employees and are committed to environmental compliance. We engage with identified interested parties, support stewardship in the community and participate in environmental research and development.

Environmental Management: We maintain an Environmental Management System to respond effectively to environmental emergencies and to manage, avoid or mitigate biophysical and socioeconomic effects for all of our activities and facilities.

Sustainability: We are committed to climate change management and adaptation and the efficient use of resources including the promotion of efficient use of electricity through internal and external programs. We apply a life cycle approach to planning and engineering, design, procurement and execution.

Leadership: We are committed to environmental stewardship through active leadership that promotes the identification of opportunities for continual improvement, establishes environmental targets and monitors and reports on environmental performance.

JENNIFER WILLIAMS
President and CEO, Newfoundland and Labrador Hydro

Date: January 6, 2025

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Newfoundland and Labrador Hydro
BDE Unit 8
July 2024

APPENDIX E: Contact List

Newfoundland and Labrador Hydro
BDE Unit 8
July 2024

Project Name/Number: Bay d'Espoir Hydroelectric - Unit 8

Location: Camp Boggy, NL

Prime Contractor:

Agency	Phone Number	Location
Environment Canada Environmental Protection District Environmental Emergencies Coordinator	709-772-4285	NL
Environment and Climate Change Emergency Report Line	(709) 722-2083 1-800-563-9089	St. John's, NL
Fisheries and Oceans Canada Area Habitat Coordinator	709-772-4423 (general Inquiries) 709-772-6319 (Resource Management Officer)	St. John's, NL
Canadian Coast Guard 24-hour Pollution Line	1-800-563-2444	St. John's, NL
Canadian Coast Guard Superintendent of Environmental Response	709-772-2292	St. John's, NL
Canadian Coast Guard Air Search and Rescue Coordination Center	1-800-565-1582	Halifax, NS
Newfoundland and Labrador Department of Tourism, Culture and Recreation – Provincial Archaeology Office	709-729-2462	St. John's, NL
Newfoundland and Labrador Department of Government Services Dept. of Occupational Health and Safety (Accident Reporting) WHSCC	709-729-4444 709-778-1000	NL

Agency	Phone Number	Location
Newfoundland and Labrador Department of Fisheries, Forestry, and Agriculture – Bay d'Espoir District Forestry Office	(709) 882-2200 Emergencies (709) 290-0364	Milltown, NL
Newfoundland and Labrador Department of Wildlife Headquarters	(709) 637-2025	Corner Brook, NL
Newfoundland Water Resources Management Division – Grand Falls Windsor Regional Office	(709) 292-4997	Grand Falls-Windsor, NL
Forest Fire Reporting	1-866-709-FIRE (3473)	NL

Appendix D: Engagement Summary – What We Heard

newfoundland labrador hydro

What We Heard

Public Open Houses March 2025
Bay d'Espoir Unit 8 Project Proposal

Background

We're in the midst of an energy transition here in Newfoundland and Labrador – across Canada and the world – as the demand for new sources of reliable, renewable energy is on the rise.

Delivering reliable and renewable power to the people of our province is our responsibility, and our **Reliability and Resource Adequacy (RRA) study** is focused on planning to meet customer and system requirements over a 10-year planning horizon. As outlined in the 2024 iteration of the RRA, Hydro is proposing to add an eighth generating unit at the Bay d'Espoir Hydroelectric Generating Station.

In recognition of this, Hydro established objectives for engagement and information-sharing, including keeping local municipal governments, community residents, businesses, and other interested groups informed; providing public information and feedback opportunities; and establishing a channel for ongoing communication and collaboration as the project continues through planning, approvals, and execution. This engagement was initiated with primary interest groups early in the project planning phase, and in advance of the regulatory approval process and environment assessment registrations.

Hydro is committed to facilitating opportunities for interested groups to contribute input into decisions that will affect them, and work to incorporate strategies that minimize potential disruptions to the quality of life for those that live and work near the Generating Station. This commitment is especially heightened for the Bay d'Espoir site, where Hydro has operated the generating facility for more than 50-years.

Hydro values the perspectives of everyone who has an interest in or is affected by decisions impacting the delivery of safe, reliable electricity. It's embedded in our values and is 1 of 11 Goals in our Strategic Plan—**ENGAGE WHO WE SERVE.**

"We will proactively engage and listen to our community to better understand their expectations and demonstrate our delivery on those expectations. We believe in listening to those we serve, being open and transparent about our operations, and ensuring everyone can better understand our work and our commitment to them. By proactively engaging with interested parties, we can seek to understand their needs and operate with their unique positions and interests in mind. We will do this by sharing relevant information, seeking input to expand our knowledge, and collaborating with industry peers and partners to benefit the people of the province."
-Hydro's Strategic Plan

Beginning in late 2023, Hydro met in-person with Town Councils for Milltown-Head of Bay d'Espoir and St. Alban's, as well as with Miawpukek First Nation's (MFN) Chief and Council. Engagement with the Towns continued through 2024 with project planning updates via email as well as additional meetings with Councils. Hydro indicated intentions to facilitate public engagement sessions for broader information sharing and town officials agreed to work collaboratively to leverage the sessions. These Public Open Houses were held in March 2025.

The feedback received in these engagement activities has been summarized in this report and will continue through the project approval and construction phases.

Communications Summary

Public Open Houses for the Bay d'Espoir Unit 8 Project took place on March 4th at the Lion's Club in St. Alban's from 6 - 9pm, and March 5th at the Lion's Club in Milltown-Head of Bay d'Espoir from 6 - 9pm. The Open Houses offered residents and other interested groups flexibility to attend on either date and at any time within the 3 scheduled hours to receive information and connect with members of Hydro's project team.

These engagement opportunities were communicated broadly via the following mediums beginning February 21st:

Radio

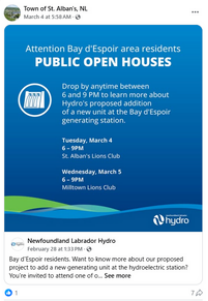
50 30 second commercials
2-week Commercial Campaign
CHCM, CKCM, and CKXG Stations
Feb. 21st - March 5th

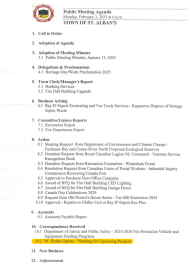
Social Media

4 Posts on Hydro's Facebook and X accounts
4 Cross-promotional posts on the Town of St. Alban's Facebook Page

Town Communications

- Milltown-Head of Bay d'Espoir February Town Meeting
- St. Alban's February Town Meeting
- Email notice to local IBEW members
- Bulletins at local Lions Clubs





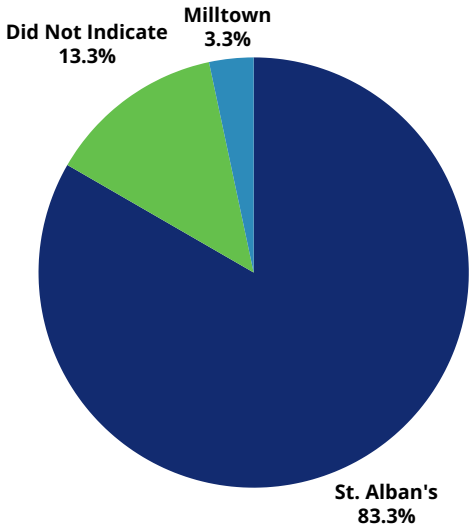
Invitations to Government Officials and Other Interest Groups

Hydro provided notice of the Public Open Houses to the chair of the Coast of Bays Regional Joint Mayors' Committee, and to three (3) aquaculture companies operating in the Bay d'Espoir area, offering to brief them on the planned Unit 8 Project if they wish.

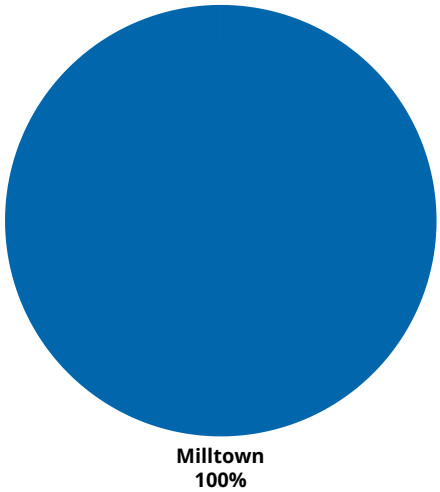
Who Participated

Fifty-two (52) individuals attended the Public Open Houses, including residents, business owners, and municipal council members from the communities of St. Alban's and Milltown-Head of Bay d'Espoir.

March 4th Open House
St. Alban's - 30 Attendees

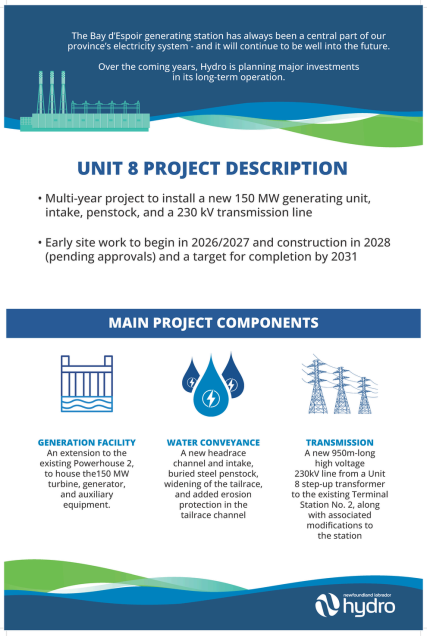


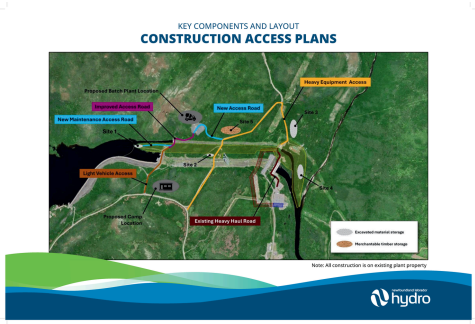
March 5th Open House
Milltown - 22 Attendees

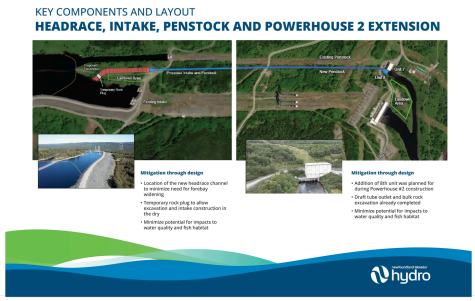


What We Did

Visitors to the Open Houses were provided information sheets upon registration and this information was broadened by a series of Poster Boards that described various aspects of the Project, including *water volumes and flows*, *environmental assessment process*, *construction access plans*, and *economic and employment activity*. Project Managers from Hydro were available to answer questions and expand on the information on display. Visitors were also provided feedback cards to leave behind any comments about the Project.







Key Themes

Remarks and questions on the Project can be organized into the following key themes:

Benefits of Employment and Business Activity

There is a sense of optimism among many local residents, workers, and business owners that the construction activity associated with the Unit 8 project (along with other substantial future capital projects at the generating facility) will have a positive impact on local employment, business and economic activity during the construction phases. Hydro will work with the Towns and contractors to continue sharing information for local suppliers and businesses.

Perceived Increase in Volumes of Water Outflow

There were some concerns expressed that another unit will mean a greater volume of water coming through the plant, which they feel would have impacts on the marine environment and silt deposit in the bay. These concerns seem to be largely alleviated, as Hydro provided information to explain that while the eighth unit provides additional capacity, the volumes of water used by the generating station throughout the course of a typical year will be largely unchanged as the size of the existing reservoir is not being modified.

Emergency Response During Construction

Town officials and some residents have expressed some concern about the potential for local medical and emergency response personnel and resources to be strained by the substantial increase in industrial/ construction activity and the associated construction workforce – particularly should an accident occur on site. They have questioned how this could impact their community volunteer fire departments and the local medical clinic. As a result of receiving this input during early-stage communication and engagement with the Towns, Hydro is aware of this sensitivity and has committed to address this in its contractor engagement and orientation, by having a clear guidance and expectation that the contractors must plan to be “self-sufficient” in their emergency response and account for this in their emergency response plans.

What Else We Heard

Other issues and questions raised by visitors in discussion include:

Community Investment and Local Benefits	**Traffic Disruptions and Re-routes**
Changes to Landscape	**Employment Opportunities**
Schedule Overruns and Impacts to Cost	**Environmental Assessment Process**
Project Schedule	**Accommodations for Construction Crews**

Other Feedback and Observations

- There were expectations for the event to be a formal presentation from 6-9pm, and feedback was very positive when it was realized that it was an informal opportunity to engage directly with Hydro staff.

- There is some confusion about the other projects planned for the Generating Station, with a major penstock refurbishment scheduled for 2025, as well as other replacement and refurbishment work in the future; Residents would benefit from a description and schedule of each project, especially with some overlap in execution.

- General understanding of the need for the Project, especially with plans for Unit 8's eventual installment in the original build.

- Strong engagement in the planning process and Hydro's long-term investment in Bay d'Espoir.

- Residents would like to see a more impactful community investment by Hydro (i.e. payment of utilities for the Rec Plax; Paving of roads).

- Both events were well attended because of Hydro's significance as a major employer for the region.

- Positivity around localized economic activity.

- Hoteliers would appreciate early confirmation of whether the contractor will be setting up a camp or availing of local accommodations so that they can prepare appropriately.

Continuing the Conversation

Digital copies of the information (handouts) that were distributed at the Open Houses was sent to contacts at the Town of St. Alban's and Milltown-Head of Bay d'Espoir, and paper copies were made available at the plant for employees.

Included in these materials is a dedicated email (*ProjectFeedback@nlh.nl.ca*) for all stakeholders to send questions, concerns, and all related feedback for record and response.

Hydro is committed to organizing future public engagement opportunities for the Bay d'Espoir Unit 8 Project as it advances, especially as activity increases at the site.


newfoundland labrador
hydro

Appendix E: 2D Tailrace Modelling

TECHNICAL MEMORANDUM

Bay d'Espoir Unit 8 FEED - 2D Tailrace Modeling to Evaluate Project Impact Under Normal and Flood Conditions

SUBJECT	DOCUMENT NO.	DATE
2D Tailrace Modeling to Evaluate Project Impact Under Normal and Flood Conditions	BDE-AKR-10000-EA-CAL-0001-01 699257-0000-4HCM-0001, Rev B0	Dec 13, 2024

PREPARED BY	REVIEWED BY	APPROVED BY
Atefeh Fazlollahi Ph.D.	Ahmed Bouayad, P. Eng. Carissa Sparkes, P. Eng.	Carissa Sparkes, P. Eng

Document history

Revision	Purpose description	Originated	Reviewed	Authorized	Date
A0	Preliminary	A.F.	F.L.	C.P.	2024-09-19
B0	Issued for FEED	A.F.	A.B./C.S.	C.S.	2024 12-13

Client signoff

Client	Newfoundland and Labrador Hydro		
Project	Bay d'Espoir Unit 8 FEED - 2D Tailrace Modeling to Evaluate Project Impact Under Normal and Flood Conditions	**Doc No.**	BDE-AKR-10000-EA-CAL-0001-01 699257-0000-4HCM-0001, Rev B0
Client signature / date			

TECHNICAL MEMORANDUM

Signatures

Prepared by:

Atefeh Fazlollahi Ph.D

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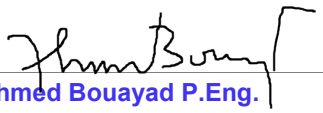

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1. Introduction

1.1 Background

The Bay d'Espoir complex consists of three main components: (i) a reservoir with dams and a spillway, (ii) two adjacent powerhouses with an average gross head of 179 m and a total installed capacity of 600 MW, and (iii) a tailrace channel that rejoins the Bay.

Powerhouse 1 (PH 1) features six generating units, each with a nominal capacity of 75 MW. It has three individual intakes and penstocks, each supplying two units through a bifurcation near the powerhouse. A single headrace channel supplies water to the three intakes, and the powerhouse discharges into a tailrace channel approximately 4.5 km long, reaching Fortune Bay d'Espoir.

Powerhouse 2 (PH 2) includes a single unit (Unit 7) with a nominal capacity of 150 MW. It receives water from a separate headrace channel, intake, and penstock. This powerhouse discharges into its own tailrace channel, which connects to the tailrace channel of Powerhouse 1. The addition of another unit in PH 2 (Unit 8) is being considered. Unit 8 would have similar characteristics and capacity to the existing Unit 7. The outflow from Unit 8 is planned to be added to the existing tailrace of PH 2.

The existing tailrace canal connecting PH 2 to PH 1's tailrace canal was partially excavated near PH 2 to accommodate two 150 MW units. At the draft tube exit, the canal is 30.5 m wide and cut into rock with vertical walls. It then narrows from 30.5 m to 15.25 m, with the invert rising from an elevation of -9.5 m to -3.0 m over a distance of about 40 m, while the tailrace sidewalls remain vertical. For the next 70 m, the rock surface gradually drops below the channel invert, and the side slopes transition from vertical (in rock) to a 2H:1V side slope in overburden, with the invert remaining horizontal and 15.25 m wide at an elevation of -3.0 m. Approximately 110 m downstream from Powerhouse 2, the width of the channel bottom continues to narrow over the next 100 m, reducing from 15.25 m to 6.10 m wide at the confluence with the tailrace from Powerhouse 1.

1.2 Objectives

The objective of this study is to compare the tailrace flow depths and velocities experienced under current peak operating conditions to the flow depths and velocity impacts in the tailrace channel as a result of the installation of Unit 8. To determine the potential changes in flow depths and velocities in the tailrace before and after the installation of Unit 8, a 2D hydrodynamic model of the tailrace channel was developed using collected bathymetric and LiDAR information. This modelling assessment has been completed in support of the Environmental Assessment Registration for the Bay d'Espoir Unit 8 development project.

2. Assessment Scenarios

Both normal and flood operation scenarios were modeled for the pre and post Unit 8 conditions. For the current normal operation scenario, historical hourly discharge data for the period of 2014-2023 was used to obtain the total peak discharge in the past 10 years of operation, as observed from PH1 and PH2 simultaneously. Also under the current normal operating condition, the 1:2-year flood peak inflows from Northwest Brook and Bear Brook were calculated using statistical analysis and were used as inflows to the tailrace channel For the normal operations scenario including Unit 8 discharges, the same 1:2-year stream inflows were simulated in the model; however, a peak discharge of 102 m^3/s was added to the current peak discharge from PH1 and PH2 to account for the additional flow from Unit 8.

The current flood operation scenario includes similar discharge from the powerhouses as noted above; however, the stream inflows at Northwest Brook and Bear Brook were increased to the 1:1000-year flood inflows. Likewise, for the flood operations scenario including Unit 8, the same 1:1000-year stream inflows were included in the model and a peak discharge of 102 m^3/s was added to the current peak discharge from PH1 and PH2 to account for the addition of Unit 8. The results of the statistical analysis of the historical turbine flows as well as the hydrological assessment are presented in Section 3.

The following scenarios were modeled:

Table 1 – Summary of Model Scenarios

Operating Regime	Condition	Scenario	Units 1-7 discharge	Unit 8 discharge	Stream inflows	Low tide	High tide
Normal	without Unit 8	1	10 yr historical peak	-	1:2 yr	Yes	-
		2	10 yr historical peak	-	1:2 yr	-	Yes
	with Unit 8	3	10 yr historical peak	102 m^3/s	1:2 yr	Yes	-
		4	10 yr historical peak	102 m^3/s	1:2 yr	-	Yes
Flood	without Unit 8	5	10 yr historical peak	-	1:1000 yr	Yes	-
		6	10 yr historical peak	-	1:1000 yr	-	Yes
	with Unit 8	7	10 yr historical peak	102 m^3/s	1:1000 yr	Yes	-
		8	10 yr historical peak	102 m^3/s	1:1000 yr	-	Yes

3. Hydrological Assessment

3.1 Stream Inflow Determination:

For normal operations, the 1:2-year flood was determined for both Northwest Brook and Bear Brook, while for flood operations, the 1:1000-yr flood for both these channels was determined. For Bear Brook, the 1:2-year and 1:1000-year

floods were estimated using the rational method. This method was selected based on the small sub-watershed area of 5.3 km² for Bear Brook and this is an accepted methodology to use for drainage areas of this size. For Northwest Brook, the watershed area exceeds the recommended basin limit for use of the rational method and therefore the flood estimation for Northwest Brook was based on a statistical analysis of the flows in Conne River; a nearby gauged river. The station (ID: 02ZE004) is located downstream of Conne River Pond and provides discharge data since 1989. A watershed area ratio, which is consistent with the provincial regional flood frequency methodology, was applied to estimate the 1:2-year and 1:1000-year floods in Northwest Brook.

Figure 1 : Northwest Brook and Bear Brook Watersheds

3.2 Peak Turbine Flow Determination

The 10-year historical peak outflow is calculated based on hourly outflow data for the period of 2014-2023. The 10-year historical peak outflow from Unit 7 is calculated as 107.6 m^3/s and was observed in January 2014. A review of the average annual peak outflow over the ten years of flow data is 104.1 m^3/s and the standard deviation is 1.8 m^3/s which indicates a non-significant variation in the annual peak outflow during this period compared to the historical peak observed in January 2014. A review of the outflows from Units 1 through 6 indicates that the 10-year historical peak outflow is 294 m^3/s. The standard deviation of annual peak outflow for Units 1 to 6 ranges from 0.6 m^3/s to 1.9 m^3/s, which indicates a non-significant variation in the annual peak outflow of these units as compared to the historical 10-year peak. For all units, the annual peak is within 3 - 4 m^3/s of the 10-year historical peak and has been observed at least once every year over the 10-year period of record.

4. 2D Hydraulic Model

4.1 Software

HEC-RAS 2D (Hydrologic Engineering Center's River Analysis System) is developed by the U.S. Army Corps of Engineers for modelling two-dimensional (2D) hydrodynamic and floodplain processes. HEC-RAS 2D was selected for the present study, as it is widely used for simulating river flows, floodplain mapping, and water surface profiles under both steady and unsteady flow conditions. The 2D capabilities of HEC-RAS extend its applications beyond the traditional one-dimensional (1D) riverine modelling by allowing users to represent complex flow patterns over large, unstructured grids, making it highly suitable for scenarios where flow moves in multiple directions, such as during flooding.

HEC-RAS 2D uses a finite volume solver to simulate shallow water equations (Saint-Venant equations), which model the movement of water with high accuracy. The software allows for flexible mesh generation and can work with both structured and unstructured grids, giving users control over spatial resolution.

4.2 Terrain

The Digital Elevation Model (DEM) used in the 2D modeling was created by combining LiDAR and bathymetric data. The LiDAR was provided by NL Hydro, with a 1 m cell size resolution. The bathymetric data was collected in May 2024 using multibeam sonar. The dataset has a high resolution of 0.25 m by 0.25 m and covers the channel bed from downstream of the powerhouse down to the bridge on Route 361 (St. Veronica’s Bridge). The dataset coverage is shown in Figure 2.

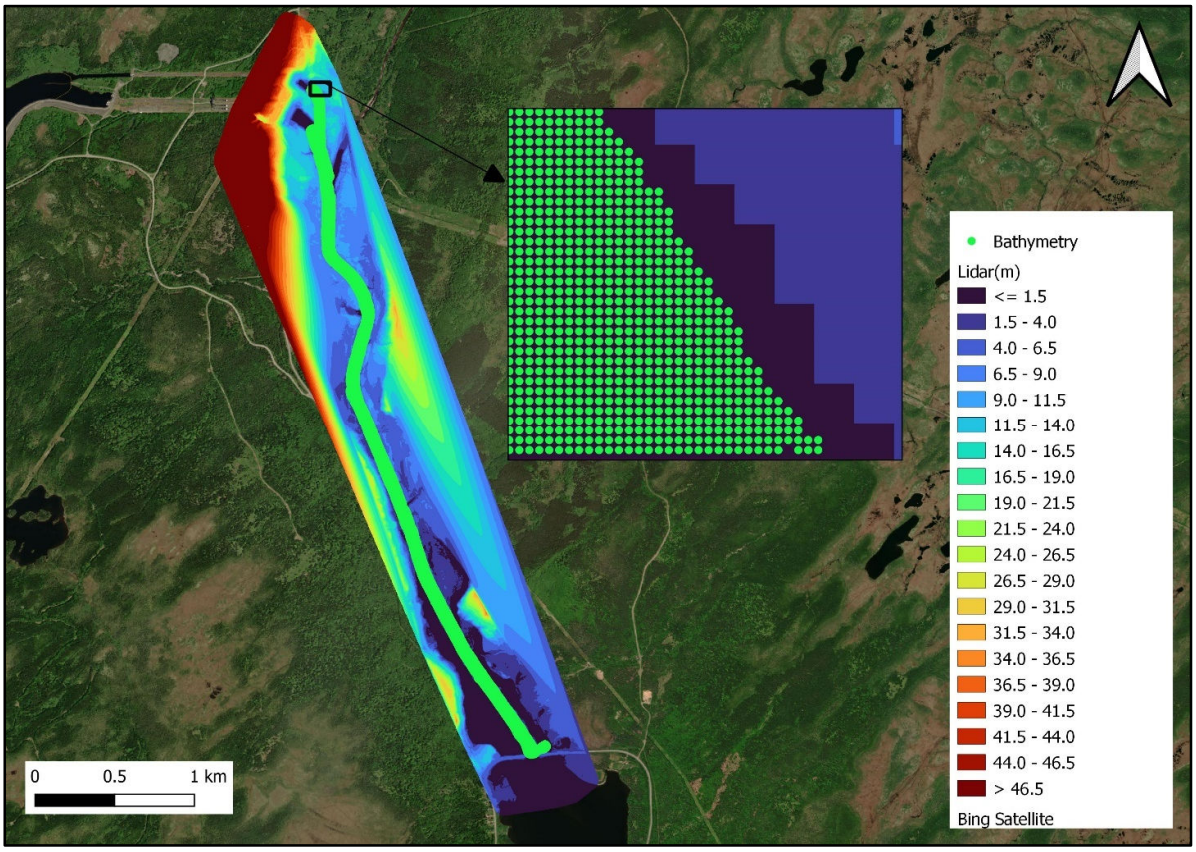


Figure 2 - LiDAR and bathymetric data

4.3 Geometry and boundary conditions

The 2D model developed for this study covers a domain extending from the draft tubes of the powerhouses to St. Veronica's Bridge on Route 361, approximately 4.6 km downstream. The upstream boundary condition is the discharge outflow from the powerhouses, while the downstream boundary condition at St. Veronica's Bridge is the water level at high and low tide conditions (Table 2).

The high tide water level noted throughout this document corresponds to the "higher high water large tide" level as defined by Fisheries and Oceans Canada for St. Albans station, converted to the CGVD28 vertical datum from the chart datum. This is the average of the highest high waters, 1 from each of 19 years of predictions. The low tide water level noted throughout this document corresponds to the "lower low water large tide" level as defined by Fisheries and Oceans Canada for St Albans station. This is the average of the lowest low waters, 1 from each of 19 years of predictions.

The model also includes inflows from the Northwest Brook and Bear Brook. These flows are applied at the confluence locations with the main tailrace channel and are presented in Table 3.

The mesh size used is 5 m x 5 m, resulting in approximately 49,000 cells throughout the domain. A sensitivity analysis showed an acceptable variation in water level and velocity when comparing a mesh size of 2 m to 5 m with 0.09 m difference in water level at PH1 and PH2. A Manning roughness coefficient of 0.025 $s/m^{1/3}$, typical for riverbeds, was

used in the modeling. The sensitivity analysis indicated that a 0.005 s/$m^{1/3}$ variation in Manning roughness would change the water level by 0.2 m at the powerhouse.

It should be noted that historical tailrace water level measurements could not be reliably used for calibration purposes due to the uncertainty of the vertical datums at both the PH1 and PH2 gauges. However, the high-resolution bathymetric data provided an accurate representation of the terrain, and surveys showed that the water level measured at St. Alban's tidal station aligns well with tidal water levels at the model downstream conditions. This provided an acceptable reliability of the model for assessing the differential impacts of project conditions versus existing conditions on flow velocity and flow depth.

Table 2 - Flow at Upstream Boundary Locations of the 2D model

Scenario	Flow (m^3/s)			
	Powerhouse 1	Powerhouse 2	Northwest Brook	Bear Brook
Normal Operation-without Unit 8	306	102	17.4	6.8
Normal Operation-with Unit 8	306	204	17.4	6.8
Flood Condition-without Unit 8	306	102	44.3	23.7
Flood Condition-with Unit 8	306	204	44.3	23.7

Table 3 - Water Levels at the Model Downstream Boundary

Scenario	Water Level at Model Downstream BC (m)
Low Tide	-1.00
High Tide	1.12

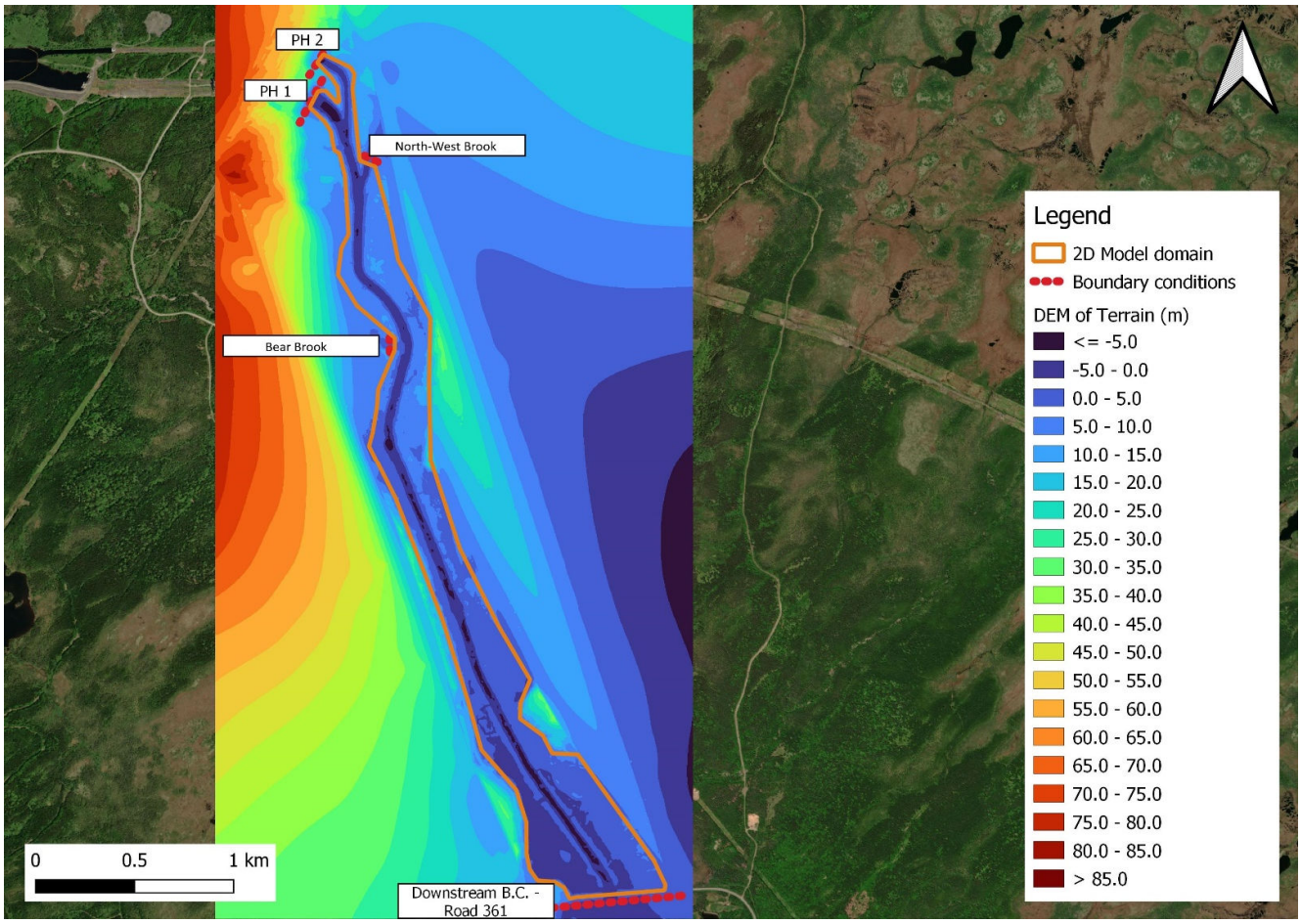


Figure 3 - 2D Model Domain and Boundary Condition Locations

5. Results

The simulation results provide the modelled inundation extents for all scenarios. Flow depths and flow velocities were extracted from the model at the tailrace cross sections of five locations of interest including:

- PH1 and PH2 tailrace confluence,
- the confluence with Northwest Brook,
- the confluence with Bear Brook,
- the tailrace bridge on the tailrace access road, and
- the building on the east side of the tailrace near route 361.

Information was also extracted approximately 30 m upstream of St. Veronica's Bridge to identify changes in flow depth and velocities specific to bridge hydraulics. There is uncertainty regarding the results near this bridge as bathymetry was not collected under the bridge and therefore flow depths and velocities from the model may not be accurate.

All of these locations were reviewed for flow depths and velocities for normal operation (N.O. as used in the following figures) and flood operation under both high tide and low tide conditions. Results for each Point of Interest cross section are provided in Tables 4 and 5, as well as in Figures 4 to 7.

The largest impact on flow depths and velocities from the installation of Unit 8 occurs during high tide conditions under both normal operation and flood scenarios at the point of interest called “Tailrace Road Bridge”. At this location some flooding of the tailrace road near the tailrace road bridge currently occurs during normal operations with high tide, as shown in Figure 6. Flooding also would currently occur during flood operations with high tide as shown in Figure 8 (shows the flooding for a 1:1000-yr flood). The depth of flooding can be found in Table 5 for all the scenarios modelled. The tailrace road near the tailrace road bridge does not appear to flood during normal or flooding operations for low tide for both the current unit configuration and with the installation of Unit 8.

It should be noted that the flooding under high tide, pre and post Unit 8 installation, will occur on the tailrace road in various areas to various depths. Tree cover in the area of the tailrace road bridge may impair the accuracy of the LiDAR and the flood depth at this location is as small as 0.1 m. Therefore, while it is possible that this location may already be flooded occasionally without the presence of Unit 8, the modelled flooding could also be a consequence of DEM accuracy.

Table 4 - Water Levels at Tailrace Cross Sections for Various Points of Interest

Distance from PH 2 (km)	Point of interest Tailrace Cross Section	Flow Water Levels (m) [2,3]							
		Normal Operation Scenarios				Flood Operation Scenarios			
		SC 1	SC 2	SC 3	SC 4	SC 5	SC 6	SC 7	SC 8
0.38	DS of the confluence with PH1 Tailrace channel	2.73	**2.95**	3.32	**3.47**	2.96	**3.15**	3.53	**3.66**
0.78	DS of the confluence with Northwest Brook	2.46	**2.71**	3.03	**3.20**	2.69	**2.91**	3.25	**3.39**
1.62	Bear Brook Confluence	1.90	**2.28**	2.44	**2.70**	2.15	**2.48**	2.69	**2.51**
3.67	Tailrace Road Bridge	0.29	**1.38**	0.69	**1.51**	0.47	**1.43**	0.84	**1.57**
4.25	Building	-0.22	**1.25**	0.10	**1.31**	-0.07	**1.27**	0.22	**1.35**
4.66	30 m upstream of St Veronica’s Bridge[1]	-1.07	**1.15**	-1.04	**1.16**	-1.06	**1.15**	-1.0	**1.17**

(1) There are uncertainties in results near model boundaries and therefore the results near St. Veronica’s bridge are not recommended for design rehabilitation.
(2) Highlighted cells are post-Unit 8 installation and non-highlighted cells are pre-Unit 8 installation.
(3) Bolded values are results during high tide. Non-bolded values are results during low tide.

Table 5 - Flow Velocities at Tailrace Cross Sections for Various Points of Interest

Distance from PH 2 (km)	Point of interest Tailrace Cross Section	Flow velocity (m/s) [2,3]							
		Normal Operation Scenarios				Flood Operation Scenarios			
		SC 1	SC 2	SC 3	SC 4	SC 5	SC 6	SC 7	SC 8
0.38	DS of the confluence with PH1 Tailrace channel	0.9	**0.8**	1.4	**1.3**	0.8	**0.8**	1.3	**1.3**
0.78	DS of the confluence with Northwest Brook	1.8	**1.7**	2.0	**1.9**	1.9	**1.8**	2.0	**2.0**
1.62	Bear Brook	2.6	**2.2**	2.7	**2.4**	2.5	**2.2**	2.6	**2.9**
3.67	Tailrace Road Bridge	2.4	**1.8**	2.6	**2.1**	2.5	**1.9**	2.7	**2.3**
4.25	Building	2.6	**1.5**	2.8	**1.9**	2.7	**1.7**	2.9	**2.0**
4.66	30 m upstream of St Veronica's Bridge[1]	3.2	**1.5**	3.9	**1.8**	3.5	**1.6**	4.1	**2.0**

(1) There are uncertainties in results near model boundaries and therefore the results near St. Veronica's bridge are not recommended for design rehabilitation.

(2) Highlighted cells are post-Unit 8 installation and non-highlighted cells are pre-Unit 8 installation.

(3) Bolded values are results during high tide. Non-bolded values are results during low tide.

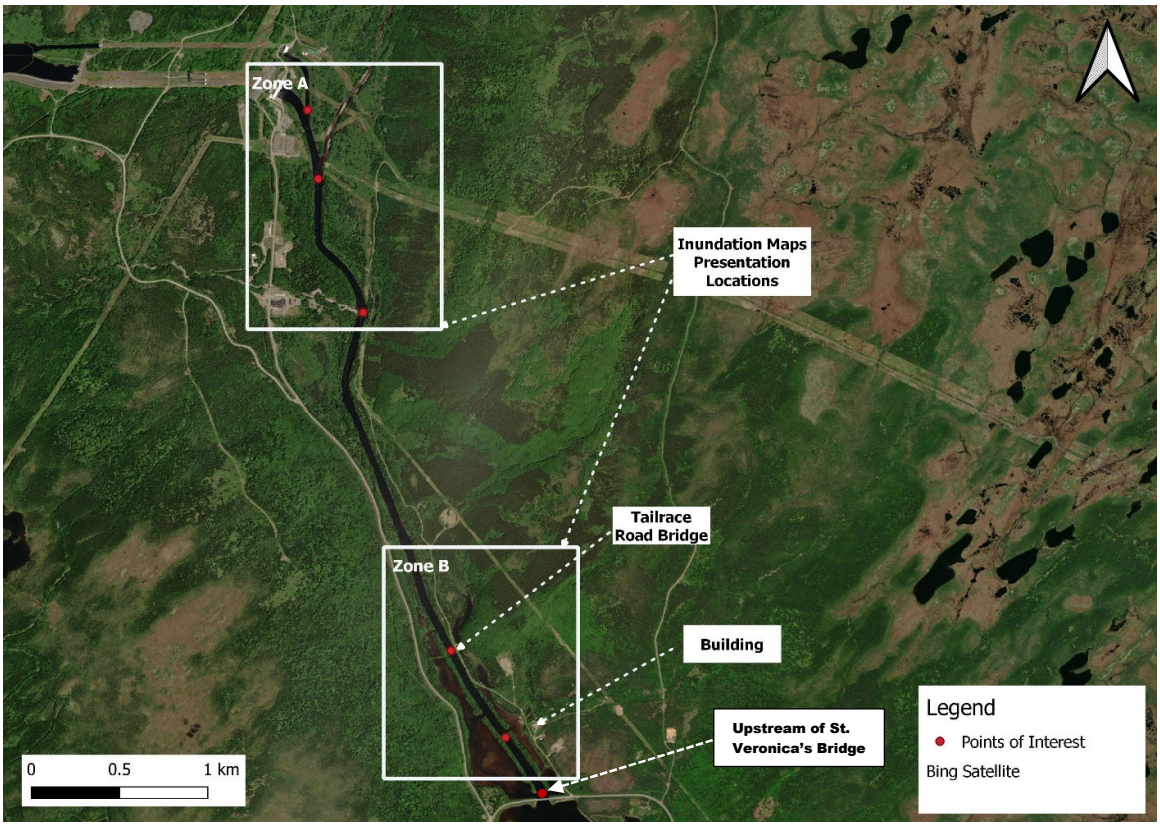


Figure 4 - Location of Inundation Map Figures

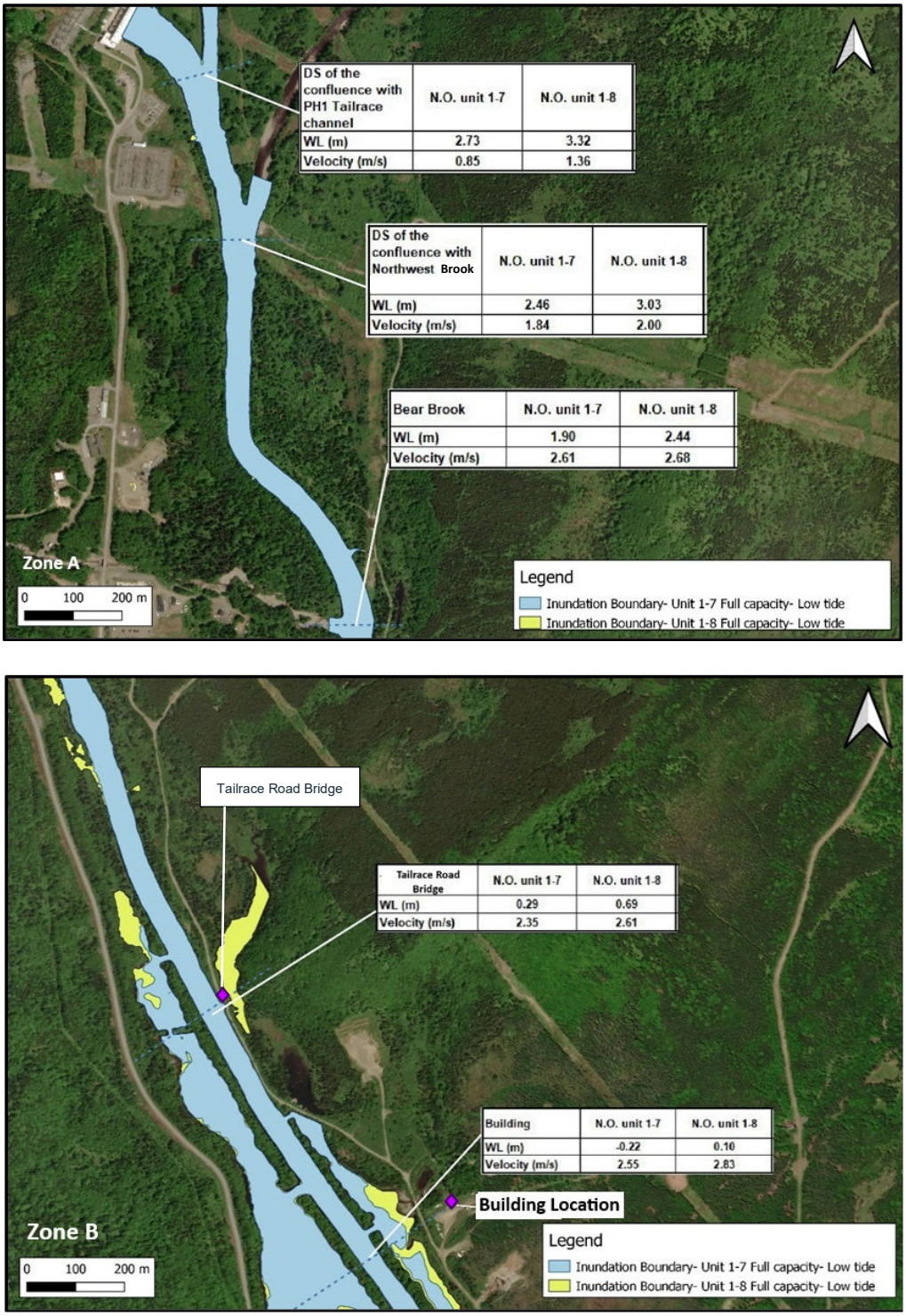
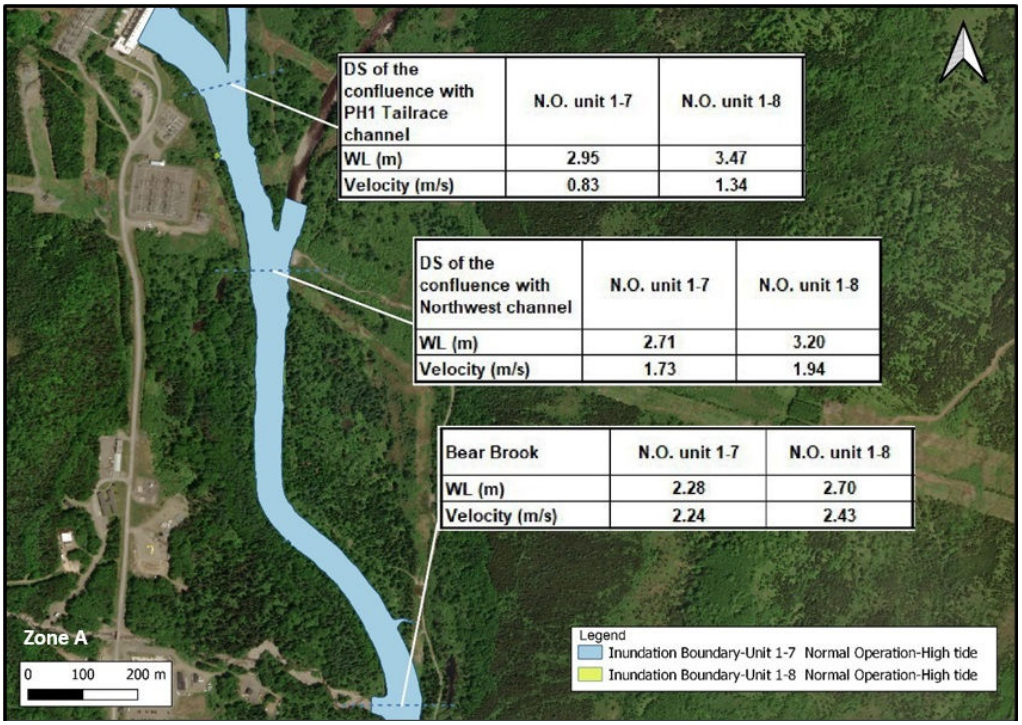


Figure 5 - Modelling Results at Points of Interest for Normal Operation and Low Tide Conditions (Scenarios 1 and 3)



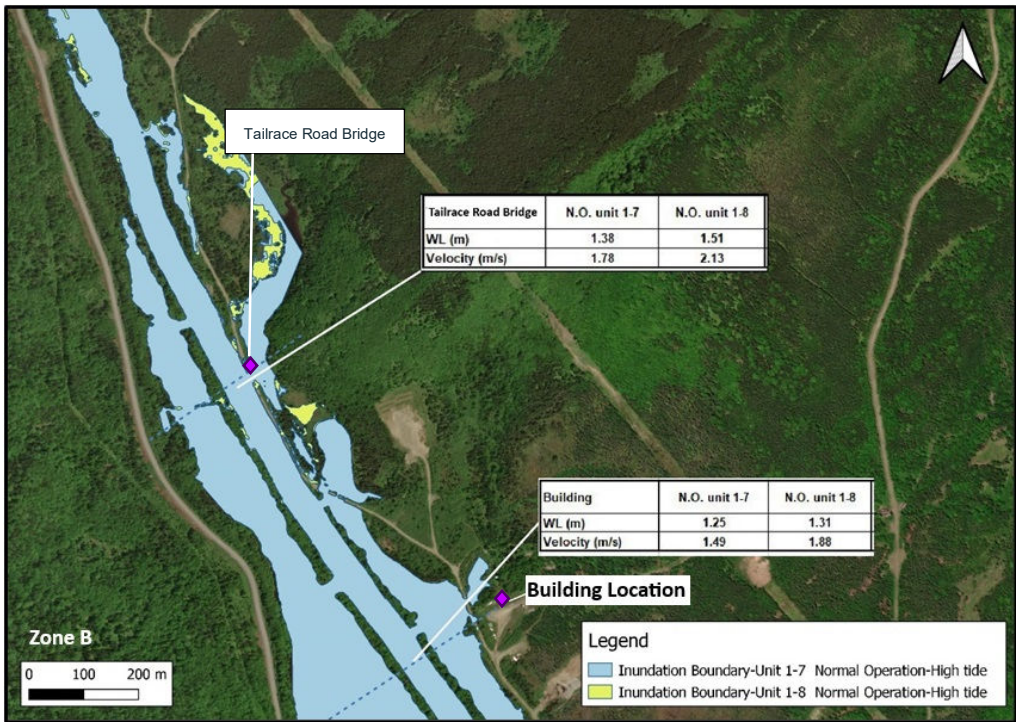


Figure 6 - Modelling Results at Points of Interest for Normal Operation and High Tide Conditions (Scenarios 2 and 4)

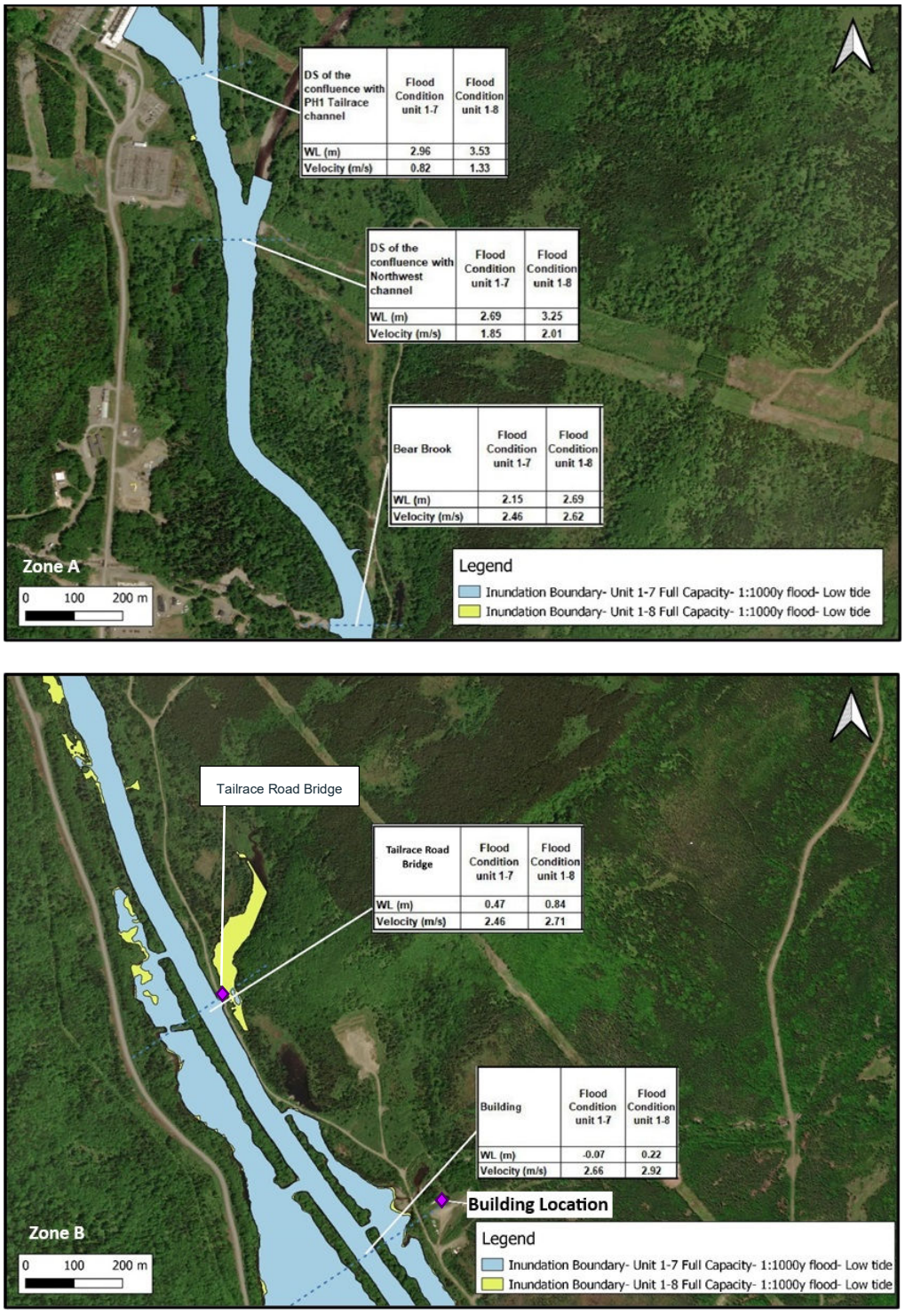


Figure 7 - Modelling Results at Points of Interest for Flood Operation and Low Tide Conditions (Scenarios 5 and 7)

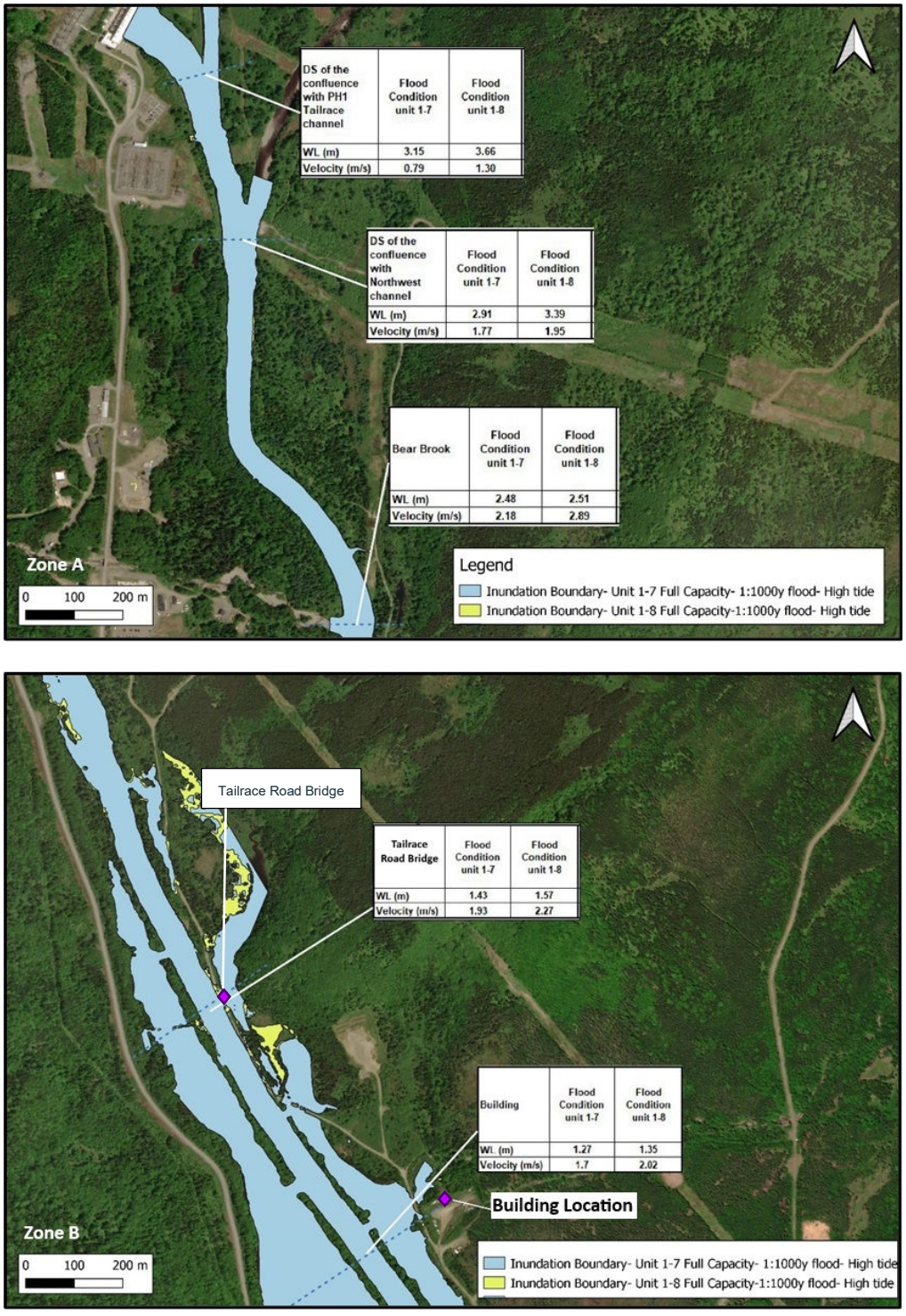


Figure 8 - Modelling Results at Points of Interest for Flood Operation and High Tide Conditions (Scenarios 6 and 8)

6. Conclusion

This technical note presents the results of the 2D modeling completed for the Bay d'Espoir PH1 and PH2 tailrace canal to 4.6 km downstream at St Veronica's Bridge on Route 361. The tailrace water levels at each powerhouse were deemed unsuitable for use in calibration of the model; however, the model was calibrated using tidal data, as well as bathymetric and LiDAR water levels and provided acceptable results.

Overall, the modelling results indicate a general increase in flow velocity and flow depth with the addition of Unit 8, which is expected. With the installation of Unit 8, the depth of flooding in the tailrace channel increases by as much as 0.49 m while the velocity increases by as much as 0.4 m/s. During high tide conditions, the tailrace road at various locations and in the vicinity of tailrace road bridge is flooded for both normal operation and flood operations scenarios, with and without unit 8.

The flow depths and velocities modelled near the model boundaries, such as at St. Veronica's bridge, are not recommended for use in design rehabilitation due to uncertainties in the model at boundary conditions. Further data collection and refinement of the model would be required at this location for bridge rehabilitation design.

7. References

SNC-Lavalin. 2018. “Proposed Bay d’Espoir Hydro Generating Unit 8, Hydraulic Analysis of The Conveyance System, Final report”.

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