ARC Clean Technology Advanced Small Modular Reactor - Commercial Demonstration Unit

Point Lepreau, New Brunswick

New Brunswick
Environmental Impact Assessment
Registration Document

TO BE SUBMITTED TO:
New Brunswick Department of Environment and Local Government
Environmental Impact Assessment Branch
P.O. Box 6000,
Marysville Place
Fredericton, NB,
E3B 5H1

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EXECUTIVE SUMMARY

New Brunswick Power Corporation (NB Power), with support of ARC Clean Technology Inc. (ARC), plans to construct and operate an advanced small modular reactor (SMR) on the Lepreau Peninsula in New Brunswick (the Project), which is home to New Brunswick's only licensed and operating nuclear power plant. The Project is the commercial demonstration of a nuclear technology that will provide 100 to 150 megawatts (MWe) of low-carbon electricity to the New Brunswick grid, while also demonstrating the performance of the ARC SMR design.

This registration document is being submitted to the New Brunswick Department of Environment and Local Government (NBDELG) to register the Project as an undertaking, with the understanding that the Project will be subject to an Environmental Impact Assessment (EIA) pursuant to the New Brunswick *Environmental Impact Assessment Regulation* under the *Clean Environment Act*.

Project Context

Under the *Canada Net-Zero Emissions Accountability Act*, the country has committed to a 40 to 45% reduction in greenhouse gas emissions (GHG), from a 2005 baseline by 2030, and to achieve net-zero emissions by 2050. New Brunswick has set the goal of reducing provincial GHG emissions to 10.7 million tonnes (Mt) by 2030 and reaching net-zero emissions by 2050. Canada's action to ensure a net-zero energy grid by 2035 is an integral step towards achieving these goals. The ARC SMR will support these goals through provision of 100 to 150 MWe of reliable low-carbon electricity baseload and load-following capability which is integral to providing reliable energy, and effectively meeting changes in demand and supply of energy to the grid. This is essential for supporting intermittent energy providers such as solar, wind and tidal to contribute to the grid and maintain reliability of energy to users.

The ARC SMR will also support the pan-Canadian approach to SMR development and deployment. In November 2018, a *Call to Action: A Canadian Roadmap for Small Modular Reactors* was released to guide future actions needed to capitalize on Canada's SMR advantage. This led to the launch of Canada's *Small Modular Reactor (SMR) Action Plan* for the development, demonstration, and deployment of SMRs in December 2020. New Brunswick has endorsed the action plan and has jointly developed a strategic plan for the deployment of SMRs with the provinces of Ontario, Alberta and Saskatchewan.

New Brunswick plans to become a centre of excellence for the development of advanced SMR technology. An economic impact analysis of the implementation of SMRs in New Brunswick projected that, over the 2020-2035 period, the development of advanced SMRs in New Brunswick could create, on average, 730 jobs per year over 15 years, $1 billion in gross domestic product and $120 million in provincial government revenue.

Regulatory Overview

The Project will undergo an EIA under New Brunswick's *Environmental Impact Assessment Regulation - Clean Environment Act*, and it is anticipated that a Comprehensive EIA will be required. An impact assessment under the federal *Impact Assessment Act* is not required.

The Project is also subject to nuclear licensing requirements under the *Nuclear Safety and Control Act* (*NSCA)* and its regulations. Licences are required for all phases in the lifecycle of a nuclear

power plant, including site preparation, construction, operation and decommissioning. The Canadian Nuclear Safety Commission (CNSC) requires that the environmental effects of all nuclear facilities or activities be characterized and evaluated prior to licensing decisions being made. When a project requires a provincial EIA, the CNSC cannot issue a licence related to that project until an EIA decision has been issued that allows the project to proceed.

Indigenous, Public and Regulatory Engagement

Engagement has been ongoing since 2018, throughout the conceptual development of the SMR program in New Brunswick. By integrating various perspectives into the Project planning, NB Power aims to understand and address topics of interest, enhance inclusive decision-making, promote equity, and build support for the Project and SMR deployment in New Brunswick.

Indigenous Engagement: NB Power recognizes the history, significance, distinct interests, and culture of Indigenous peoples in New Brunswick. An Indigenous Inclusion Plan (IIP) has been developed incorporating insight and guidance from the Wolastoqiyik/Wəlastəkwiyik, the Mi'gmaq and the Peskotomuhkati at Skutik (Peskotomuhkati)/Passamaquoddy First Nations to build and enhance mutually beneficial relationships with NB Power.

Key elements of NB Power's approach to engagement for the Project include the participation of First Nations in several baseline studies, completion of Indigenous Land and Resource Use and Indigenous Knowledge (IK) Studies, incorporation of IK and perspectives, and the development and review of the EIA documentation. Contributions will be braided into the EIA process with the guidance of each First Nation. To date, there have been over 100 meetings involving First Nations organizations and community members. NB Power will continue to work with First Nations to understand areas of concern and identify mitigation measures for potential impacts the Project may have. NB Power will also continue to engage and communicate with First Nations throughout the EIA process and the lifecycle of the Project.

Public and Stakeholder Engagement: Over the past five years NB Power has been engaging with public stakeholders and will continue to do so. NB Power has developed a public engagement strategy with the primary goal of ensuring that information related to the health, safety, and security of people and the environment is effectively communicated to the public through all stages of the Project. NB Power and ARC provide information on advanced SMRs through various accessible channels, including the SMR website, social media, print materials, in-person events, and virtual presentations and gatherings. NB Power also tracks public topics of interest related to advanced SMRs through the media, surveys, and direct correspondence. The aim is to understand each stakeholder's stated purposes, as well as their interests, concerns, information needs, and expectations of involvement. NB Power will continue to engage and communicate with the public throughout the EIA process and the lifecycle of the Project.

Regulatory Engagement: During the initial design of the Project, NB Power has engaged with several federal and provincial government departments and agencies. The intent of this engagement has been to increase awareness of the proposed Project, gain an understanding of the regulatory requirements and processes, identify funding sources to support participation of Indigenous rights holders in the EIA, and create opportunities to inform the local supply chain of opportunities within the growing nuclear sector.

Project Description

The ARC SMR is a modular, sodium-cooled fast nuclear reactor that will be located on the NB Power's Point Lepreau property, west of the Point Lepreau Nuclear Generating Station (PLNGS). The nuclear reactor will provide heat required to generate steam, which will be used to drive a turbine connected to a generator set, which in turn will produce electricity.

The ARC SMR has been designed with nuclear safety and security in mind. The design ensures nuclear safety by adopting a "defence-in-depth" safety philosophy, which includes using simplified, reliable systems and ample thermal and safety margins for safe operation. Based on the safety design goals and philosophy, the ARC SMR has an integrated implementation of safety design provisions, nuclear security measures and nuclear material accounting processes.

The main project components and infrastructure required for the Project are:

- Major Buildings and Enclosures,
- Nuclear Systems,
- Power Production System,
- Electrical Systems, Instrumentation and Controls,
- Safety and Support Systems, and
- Associated Infrastructure, which includes infrastructure to provide a freshwater supply, sanitary sewage treatment, radioactive waste storage facilities, access roads, and temporary workspaces and laydown yards.

The Project lifecycle will include site preparation, construction, operation and decommissioning. The site preparation will be initiated following the receipt of the EIA approval and all ancillary permits, approvals, licences and authorizations for the Project, including a Licence to Prepare Site from the CNSC. Subsequently, the construction, operation and decommissioning phases will start with the granting of the licences by the CNSC. For the purposes of the EIA, the period of operation of the ARC SMR will be approximately 60 years before decommissioning is required.

Description of the Existing Environment

The description of the existing environment is based on information available from previous studies undertaken at Point Lepreau, as well as recent baseline studies undertaken for the planning phase of this Project. Additional studies will be ongoing through the planning phase for the purpose of the EIA. Some of the key findings from the completed baseline assessments are summarized below, focussing on the key environmental components identified for the EIA.

Atmospheric Environment*:* The Project site is characterized by a moderate maritime climate with mild winters and cool summers. Severe weather events that occur at Lepreau Peninsula are usually associated with winter east coast storms (Nor'easters) or tropical cyclones (hurricanes). Ambient air quality in New Brunswick is generally characterized as "very good", with few exceedances of the provincial ambient air quality objectives or Canadian Ambient Air Quality Standards. The sound quality at the Point Lepreau site is typical of an average rural setting.

***Geophysical Environment**:* The geology of the Point Lepreau area is a sequence of Triassic sedimentary rocks consisting of sandstones and conglomerates, with thin layers of siltstones and shales. The overburden, less than 1metre thick, generally consists of a thin layer of topsoil/rootmat over a mix of various forms of loose sand, gravel and silt.

***Freshwater and Marine Environment**:* Point Lepreau extends into the Bay of Fundy, with coastal bays on either side of the peninsula. The Bay of Fundy is a productive marine environment and home to many marine species, including commercial fish species. There are currently 12 marine species in the Bay of Fundy that are listed as species at risk, of which the harlequin duck (*Histrionicus histrionicus*) has a high potential to be present near the Project site.

The freshwater environment at Point Lepreau is characterized by short and narrow first or second order streams that empty into the Bay of Fundy. On the NB Power property, there are six watercourses, several drainage ditches and channels, and numerous wetlands. Water flow tends to be southwards from the high point in the northwest corner of the property. Two independent groundwater regimes exist on the NB Power property, including a perched upper groundwater system in overburden layers and clayey deposits, and a lower groundwater system in the shallow bedrock. The five hydrostratigraphic units identified include organic soils, granular soils, clayey deposits, shallow bedrock and deep bedrock.

In general, the water quality is good, with neutral pH, high oxygen concentrations and low levels of dissolved solids. The concentration of radiological indicators (tritium and gamma-emitters) at Point Lepreau are below guidelines for all environmental media and are similar to natural background levels for the region.

Freshwater sediment is generally good with some exceedances of guidelines for parameters typical to the area. Fish and fish habitat field surveys were undertaken in 2022, in the five identified watercourses in the study area. Brook trout and ninespine stickleback were observed within one watercourse, and American eel was observed in reaches of two other watercourses.

***Terrestrial Environment**:* The Project site is located in the Fundy Coastal Ecodistrict, which supports primarily coniferous forest comprising the southern coastline of New Brunswick along the Bay of Fundy. The study area where the SMR is proposed contains 13.8% previously disturbed ground with the remaining dominated by the Old Red Spruce-Balsam Fir community.

The Project site is located within the Point Lepreau/Maces Bay Important Bird Area, which contains important spring staging areas for migrating brant (*Branta bernicla*), semipalmated plover (*Charadrius semipalmatus*), least sandpiper (*Calidris minutilla*), black scoter (*Melanitta americana*) and surf scoter (*Melanitta perspicillata*). The islands located in Maces Bay support a large colony of approximately 1,000 nesting pairs of common eider (*Somateria mollissima*).

The Point Lepreau site is also home to many mammals, herptiles, and invertebrate species. Of particular significance is the presence of the monarch butterfly (*Danaus plexippus*), which is known to utilize Point Lepreau as a stopover on its fall migration south. Three at-risk bat species: tri-colored bat (*Perimyotis subflavus*), little brown myotis (*Myotis lucifugus*), and northern myotis (*Myotis septentrionalis*) were reported within 1 kilometre of the Project study area.

Socio-economic Environment: According to census data, in 2021, New Brunswick had a population of 775,610 with three major urban areas: Saint John, Moncton and Fredericton home to

over 47% of the province's population. The provincial population has seen an increase of 3.8% since 2016. In 2021, New Brunswick had a 10.3% unemployment rate, with a labour force participation rate of 60.1%. Unemployment in the Point Lepreau area is higher than the provincial average.

Prior to the development of the PLNGS, Point Lepreau was mostly rural with very little industrial or commercial land use. The Point Lepreau area remains largely undeveloped with the main industrial activity being the PLNGS. Residential communities are found in Welch Cove, Maces Bay, Dipper Harbour and the Village of Lepreau. Many communities along the shore of the Lepreau Peninsula are known fishing locations.

***Indigenous Peoples**:* Indigenous Peoples have existed in the area that makes up modern-day New Brunswick since time immemorial. There are 16 First Nation communities in the province of New Brunswick; six from the Wolastoqey First Nation, nine from the Mi'gmaq First Nation, and the Peskotomuhkati First Nation. The Point Lepreau site is located on the traditional lands of the Wolastoqey, Mi'gmaq, and Peskotomuhkati peoples. According to the 2021 census, the employment rate is below the provincial average in many communities for which data were available, with a few communities showing above average rates between 30% and 64%. There is significant variation in the income composition across the different communities.

***Archaeology and Heritage Resources**:* According to the New Brunswick Heritage and Archaeological Services Branch, there is one registered archaeological site on the NB Power property at Point Lepreau in the Duck Cove area, and two registered archaeological sites within five km of the PLNGS. An archaeological impact assessment will be undertaken for the proposed Project, led by the New Brunswick Museum and including Indigenous technicians or monitors from each of the three Nations.

***Human Physical Health**:* Access to primary health care services in the Saint John Region is generally higher than provincial averages. More than half of the adults in the region (57%) reported being able to book an appointment with their doctor within five days of calling. This region also has some of the shortest provincial wait times for emergency services, with 71% of people reporting a wait time of less than an hour to access emergency services. The most common reasons for health care admission in the Saint John Region are birth, chronic obstructive pulmonary disease, heart failure, knee replacement, pneumonia, percutaneous coronary intervention, and newborn/neonate care. The most common chronic health conditions include high blood pressure or hypertension, arthritis, high cholesterol, anxiety, depression, chronic pain, gastric reflux, diabetes, asthma, and heart disease.

Potential Interactions Between the Project and the Environment

The Project is expected to interact with a range of environmental components during the site preparation, construction, operation and decommissioning phases of the Project. There is also the possibility of impacts to the environment related to potential accidents and malfunctions.

A preliminary assessment of the potential interactions between the Project and the environment has been undertaken, based on the information currently available, to facilitate the formal determination about whether a Comprehensive EIA is required. The potential interactions between environmental components and the various phases of the Project are identified in the following table.

The effects from such interactions and corresponding mitigation measures are discussed in the registration document. A more fulsome assessment of the predicted effects of the Project on the environment, mitigation measures and the resulting significance of residual effects will be completed as part of the EIA and in accordance with the EIA study guidelines that will be issued by NBDELG.

Project Phase	Site Preparation	Construction	Operation	Decommissioning	Accidents and Malfunctions
Atmospheric Environment					
Air Quality and Greenhouse Gases	×	×	×	×	×
Acoustic Environment	×	×		×	×
Geophysical Environment					
Geology and Soils	×	×	×	×	×
Freshwater Environment					
Surface Water Resources	×	×	×	×	×
Groundwater Resources	×	×	×	×	×
Wetlands	×	×	×	×	×
Freshwater Fish and Fish Habitat.	×	×	×	×	×
Terrestrial Environment					
Vegetation	×	×	×	×	×
Avifauna	×	×	×	×	×
Wildlife	×	×	×	×	×
Marine Environment					
Marine Physical and Chemical Environment		×	×	×	×
Marine Biota		×	×	×	×
Socio-economic Environment					
Social Environment	×	×	×	×	×
Economic Wellbeing	×	×	×	×	×
Land Use	×	×	×	×	×
Indigenous Peoples	×	×	×	×	×
Archaeology and Heritage Resources	×	×			
Human Physical Health			×		×

Mitigation and Monitoring

NB Power is committed to avoiding and minimizing adverse effects, maximizing Project benefits, and complying with the applicable approvals, standards, and guidelines. To achieve this, a comprehensive set of mitigation measures, monitoring programs and contingency planning will be implemented, and will be based on avoiding impacts first, then reducing unavoidable impacts, and then compensating for significant unavoidable impacts. A significant element for avoiding impacts is the design of the facility, which includes a relatively small footprint and nuclear safety and security features. Implementation of the radiation protection philosophy for the ARC SMR design will ensure that radiation emissions to the environment will be minimal and well below regulatory limits.

Preliminary mitigation measures have been identified for the various environmental components based on the initial assessment. These will be reviewed and updated as EIA studies progress and are integrated into various environmental management and emergency plans, including the Environmental Management Plan and the Emergency Preparedness Plan.

Post-construction monitoring of environmental effects will be undertaken in accordance with requirements identified through the EIA process, and to meet regulatory requirements under the *NSCA*. On-going environmental monitoring and environmental risk assessments will be conducted as part of licensing requirements to confirm emissions during normal operating conditions are below regulatory limits and do not pose a risk to the environment or to people.

On-going Site Characterization and Assessment

Characterization of baseline conditions of the Project site is ongoing through a series of studies that have been scoped to meet the anticipated requirements of a Comprehensive Review process, as well as CNSC requirements. Identification of additional studies will be ongoing through the Project EIA and planning phase, with input from regulators, First Nations and the public.

Conclusion

The construction and operation of an advanced SMR is needed to provide 100 to 150 megawatts (MWe) of low-carbon electricity to the New Brunswick grid, while also serving as the commercial demonstration of the performance of the ARC SMR design on the grid. The SMR should be sited at Point Lepreau because it has capacity, is well characterized, and is home to New Brunswick's one existing nuclear power plant, the PLNGS, which is already licensed and operating. Like the PLNGS, NB Power is committed to constructing and operating the Project in an environmentally responsible manner, consistent with sustainability principles, and to ensure public and worker health and safety through the entire lifecycle of the project.

This registration document is being submitted to NBDELG to register the Project as an undertaking, with the understanding that the Project will be subject to a provincial EIA. This document contains preliminary information about the Project purpose and need, alternatives, a description of the ARC SMR technology, characterization of the baseline biophysical and human environment, potential project-environment interactions and proposed mitigation strategies. It is not intended to be a thorough report of the results of an EIA study, but rather a preliminary document

to facilitate a formal determination about whether a Comprehensive EIA is required to fully assess the nature and significance of the potential impacts of the Project.

Following a decision that a Comprehensive Review is required and receipt of EIA study guidelines from NBDELG, NB Power will complete supplementary studies to inform the EIA, including detailed assessments examining the potential impacts of the Project, the proposed mitigation measures, and the predicted residual impacts on the environment. There will also be numerous opportunities for consultation, engagement and input into the assessment.

Based on the preliminary assessment to date, it is understood that several Project-environment interactions will occur as a result of the Project, and may result in impacts to the environment, though significant effects are not anticipated once thorough mitigation, management and monitoring measures are well defined and implemented as a condition of the Project approval. This conclusion will be verified through the EIA process.

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ABBREVIATIONS

AC	alternating current
AC CDC	Atlantic Canada Conservation Data Centre
ACEA	Atlantic Clean Energy Alliance
ACOA	Atlantic Canada Opportunities Agency
AECB	Atomic Energy Control Board
AIA	Archaeological Impact Assessment
ALARA	as low as reasonably achievable
AFNWA	Atlantic First Nations Water Authority
ARC	ARC Clean Technology Inc.
ATC	Approval to Construct
ATO	Approval to Operate
BTEX	benzene, toluene, ethylbenzene, and xylene
CAAQS	Canadian Ambient Air Quality Standards
CANDU	Canada Deuterium Uranium
CCA	Climate Change Assessment
CCME	Canadian Council of Ministers of the Environment
CCW	circulating cooling water
CMA	Census Metropolitan Area
CME	Canadian Manufacturers and Exporters
CNSC	Canadian Nuclear Safety Commission
CO	carbon monoxide
CO_2	carbon dioxide
CO_2eq	carbon dioxide equivalent
COEE	Centre of Excellence for Energy
COPD	chronic obstructive pulmonary disease
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSA	Canadian Standards Association
DFO	Fisheries and Ocean Canada
DGR	deep geological repository
DRACS	direct reactor auxiliary cooling system
DRL	derived release limit

EBR-II	Experimental Breeder Reactor II
ECCC	Environment and Climate Change Canada
EcoRA	ecological risk assessment
EIA	environmental impact assessment
EMS	environmental management system
EPP	environmental protection program
EPR	environmental protection reviews
ERA	environmental risk assessment
FNPA	First Nations Power Authority
GHG	greenhouse gas
HADD	harmful alteration, disruption or destruction
HALEU	High Assay Low Enriched Uranium
HHRA	human health risk assessment
IAAC	Impact Assessment Agency of Canada
IAEA	International Atomic Energy Agency
IBA	Important Bird Area
IBoF	Inner Bay of Fundy
IDF	intensity-duration-frequency
IHX	intermediate heat exchangers
IIP	Indigenous Inclusion Plan
IK	Indigenous Knowledge
ISO	International Organization for Standardization
ISQG	interim sediment quality guidelines
JEDI	Joint Economic Development Initiative
LAA	Local assessment area
LOCA	loss-of-coolant accident
LSD	Local Service District
LTE	long-term evolution
MBBA	Maritimes Breeding Bird Atlas
MOU	memorandum of understanding
MPA	Marine Protected Area
MTI	Mi’gmawe’l Tplu’taqnn Incorporated

MUIN	Mi'gmaq United Investment Network
NB	New Brunswick
NBCC	New Brunswick Community College
NBDELG	New Brunswick Department of Environment and Local Government
NBDNRED	New Brunswick Department of Natural Resources and Energy Development
NB *SARA*	New Brunswick *Species at Risk Act*
NO_X	nitrogen oxide
NSCA	*Nuclear Safety and Control Act*
NWMO	Nuclear Waste Management Organization
O_3	ozone
OBoF	Outer Bay of Fundy
ONB	Opportunities New Brunswick
PIRI	Partnership in Risk-Based Corrective Action Implementation
PLNGS	Point Lepreau Nuclear Generating Station
PM	particulate matter
PM_{10}	particulate matter (10 microns)
$PM_{2.5}$	particulate matter (2.5 microns)
PSS	*Pathway-Specific Standards*
RAA	Regional assessment area
RSD	Rural Service District
RVACS	reactor vessel auxiliary cooling system
SAR	species at risk
SARA	*Species at Risk Act*
SDS1	Shutdown System No. 1
SDS2	Shutdown System No. 2
SFR	sodium-cooled fast-reactor
SMR	small modular reactor
SNBSC	Southwest New Brunswick Service Commission
SO_2	sulphur dioxide
SoCC	species of conservation concern
SRWMF	Solid Radioactive Waste Management Facility
SWNB	Southwest New Brunswick

TOP	transient overpower
TPH	total petroleum hydrocarbon
TRC	Technical Review Committee
TRS	total reduced sulphur
TSP	total suspended particulate
UNB	University of New Brunswick
UNDRIP	United Nations Declaration on the Rights of Indigenous Peoples
VC	Valued components
WANO	World Association of Nuclear Operators
WAWA	watercourse and wetland alteration
WC	watercourse
WESP-AC	Wetland Ecosystem Services Protocol – Atlantic Canada
WHMIS	Workplace Hazardous Materials Information System
WNNB	Wolastoqey Nation in New Brunswick

UNITS

%	percent
Bq/MeV	becquerels per million electron volts
Bq/year	becquerel per year
°C	degree Celsius
cm	centimetre
dBA	A-weighted decibels
g	gram
µg/m³	microgram per cubic metre
ha	hectare
km	kilometre
km/h	kilometre per hour
kV	kilovolt
Leq	equivalent sound level
L/s	litres per second
m	metre
m^2	square metre
m^3	cubic metre
masl	metres above sea level
mg/kg	milligram per kilogram
mg/L	milligram per litre
mm	millimetre
mSv	millisieverts
Mt	million tonnes
MWe	megawatt (electricity)
MW_{th}	megawatt (thermal)
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
µS/cm	microsiemens per centimetre

1.0 INTRODUCTION

New Brunswick Power Corporation (NB Power), with support of ARC Clean Technology Inc. (ARC), plans to construct and operate one advanced small modular reactor (SMR) at the NB Power property on the Lepreau Peninsula in New Brunswick, to the west of the existing Point Lepreau Nuclear Generating Station (PLNGS) (the Project).

The Project will involve site preparation, construction, operation, and eventually decommissioning of the SMR and supporting infrastructure at the property. The ARC SMR is a modular, sodium-cooled fast reactor that will generate 100 to 150 megawatts (MWe) for the electrical grid, providing power for approximately 75,000 homes. The Project will be the first deployment of an on-grid advanced SMR facility in Canada, and the unit is expected to operate for 60 years.

1.1 Purpose of this Document

The *Environmental Impact Assessment Regulation - Clean Environment Act*, provides a schedule that lists the types of projects (called undertakings), that must be registered with the provincial Minister of Environment and Climate Change in order for the Minister to determine whether the completion of an environmental impact assessment (EIA) is required. The purpose of an EIA is to identify and evaluate the potential impacts the proposed Project will have on the environment, as well as the measures to avoid or mitigate those environmental impacts.

Under the Regulation, no proponent may carry out an undertaking unless the provincial Minister has determined, through the Determination Review process, that the undertaking may be carried out or the provincial Lieutenant-Governor in Council, following the completion of a Comprehensive Review EIA, has given an approval to carry out the undertaking.

Based on Schedule A of the Regulation, this Project is considered an undertaking that must be registered with the Minister. This is typically accomplished by submitting a registration document that reports on the results of an EIA study conducted by the proponent and includes details of the proposed undertaking, its potential environmental impacts, and how significant impacts may be addressed (NBDELG, 2018). Registered projects then typically undergo a Determination Review, after which the Minister determines whether the project can proceed subject to terms and conditions. The Minister may decide that a project requires additional study and advise the proponent to prepare a more detailed Comprehensive EIA before receiving an approval, or the proposal is denied.

Although the Determination Review has not been formally initiated for this Project, early regulatory engagement with the New Brunswick Department of Environment and Local Government (NBDELG) has allowed NBDELG to proactively indicate to NB Power that a Comprehensive EIA is expected to be required. As such, this registration document is not intended to be a thorough report of the results of an EIA study as described in *A Guide to Environmental Impact Assessment in New Brunswick* (NBDELG, 2018), but rather a preliminary document to facilitate the anticipated decision that a Comprehensive EIA is required to fully assess the nature and significance of the potential impacts of the Project.

This document contains preliminary information on the Project purpose and need, alternatives, a description of the ARC SMR technology, characterization of the baseline biophysical and human

environment, potential project-environment interactions and proposed mitigation strategies. It is anticipated that this document will meet the process requirements for a Determination Review.

Section 2.0 provides details about the provincial EIA process and other federal, provincial and municipal environmental and nuclear regulatory requirements for the Project, including the expected licensing requirements under the *Nuclear Safety and Control Act (NSCA)*.

1.1.1 Report Organization

As discussed above, this document is intended to facilitate the formal Determination Review process with the understanding that there will be a decision that a Comprehensive EIA is required. As such, this registration document is not intended to be a thorough report of the results of an EIA study; however, it has been prepared with the intent to provide the general information required in order to register the undertaking under the *Environmental Impact Assessment Regulation - Clean Environment Act*, as described in *A Guide to Environmental Impact Assessment in New Brunswick* (NBDELG, 2018).

Table 1.1 provides an outline of the registration document requirements set out in *A Guide to Environmental Impact Assessment in New Brunswick* (NBDELG, 2018), and indicates where in this document the corresponding information is provided.

Table 1.1: EIA Registration Document Requirements – Concordance Table

EIA Registration Document Requirements	Location in Document
1.0 THE PROPONENT	Section 1.2
Proponent contact details	Section 1.2
Property ownership	Section 1.3.3
2.0 THE PROJECT DESCRIPTION	Section 4.0
Project name	Section 1.3.1
Project overview	Sections 1.0 and 4.0
Purpose/rationale/need for the undertaking	Section 1.4
Alternatives to the Project	Section 1.5
Project location	Section 1.3.2
Siting considerations	Section 4.1
Physical components and dimensions of the Project	Section 1.3 and 4.3
Construction details	Section 4.5.1
Operation and maintenance details	Section 4.5.2
Future modifications, extensions, or abandonment – preliminary decommissioning information	Section 4.5.3
Documents related to the undertaking	Section 1.1.2
3.0 DESCRIPTION OF THE EXISTING ENVIRONMENT	Section 5.0
Physical and natural features	Section 5.1 to 5.5
Cultural features	Section 5.6
Existing and historic land uses	Section 5.6.3
4.0 IDENTIFICATION OF ENVIRONMENTAL IMPACTS	Section 6.0
Anticipated impacts of the Project on the environmental features identified.	Section 6.0

EIA Registration Document Requirements	Location in Document
5.0 SUMMARY OF PROPOSED MITIGATION	Section 6.5
Measures that will be used to reduce or eliminate the environmental impacts identified.	Section 6.5
6.0 PUBLIC AND FIRST NATIONS INVOLVEMENT	Section 3.0
Description of how the public and First Nations input has been or will be sought and considered in relation to the proposed undertaking	Section 3.0
Summary Public Involvement Report	Section 1.1.2 and 3.0
7.0 APPROVAL OF THE PROJECT	Section 2.0
List of permits, licences, approvals, and other forms of authorization required for the undertaking in addition to its requirements under the EIA Regulation	Section 2.0
8.0 FUNDING	Section 1.3.4
Information on government grant or loan of capital funds.	Section 1.3.4
9.0 SIGNATURE	Section 1.2
Signature of main proponent contact.	Section 1.2

1.1.2 Additional Documents Related to the Undertaking

This registration document includes some relevant documents as appendices. These include:

- Appendix A – Records of Indigenous Engagement and Public Engagement;
- Appendix B – Wetland Functional Assessment Summary;
- Appendix C – Atlantic Canada Conservation Data Centre Report 2022;
- Appendix D – Vegetation Lists for the Point Lepreau Site; and
- Appendix E – Bird Lists for the Point Lepreau Site.

Additional documents related to this undertaking will be made available, once prepared. These will include:

- Application to the Canadian Nuclear Safety Commission (CNSC) for the Licence to Prepare Site,
- Site Evaluation Report to support the Licence to Prepare Site Application, and
- Summary Public Involvement Report.

1.2 Proponent Information

The name and type/sector of the Project, the details about the proponent and the contact person for the EIA are as follows:

Name of Project	ARC Clean Technology Advanced Small Modular Reactor - Commercial Demonstration Unit, Point Lepreau, New Brunswick
Type/Sector	Nuclear Project/Energy Sector
Name of the Proponent	New Brunswick Power Corporation
Address of the Proponent	PO Box 2000, 515 King Street Fredericton, NB E3B 4X1
Proponent Executive/Principal Contact	Brett Plummer Vice President Nuclear and Chief Nuclear Officer Tel. 506-659-2220 Email. smr@nbpower.com
Principal Contact Person for Purposes of EIA	Andrea McGathey, M.Eng. Senior Technical Specialist, Environment Advanced Reactor Development Program Tel. 506-478 -1134 Email. amcgathey@nbpower.com

Signed by BRETT PLUMMER

On behalf of NEW BRUNSWICK POWER CORPORATION

1.3 Project Information

1.3.1 Project Name

The undertaking will be referred to as the ***ARC Clean Technology Advanced Small Modular Reactor - Commercial Demonstration Unit, Point Lepreau, New Brunswick***.

1.3.2 Project Location

The Project will be located on the existing NB Power property on the Lepreau Peninsula at civic address 122 County Line Road, Maces Bay, New Brunswick, E5J 1W1.

The 500-hectare Point Lepreau site (45°4'N, 66°27'W) is located approximately 40 kilometres southwest of the city of Saint John on Route 790, off Highway 1 (**Figure 1.1**). It is approximately 0.6 kilometres southwest of Dipper Harbour, which is the closest community to the property. The next closest community is Maces Bay, which is 1.3 kilometres to the northwest of the property. The property spans the boundary between Saint John County and Charlotte County, as well as Fundy Shores (the new legal name as of January 2023 for the combined Musquash Local Service District [LSD] and the Lepreau LSD).

There are three First Nations in New Brunswick: the Wolastoqiyik/Wəlastəkwiyik, the Mi'gmaq and the Peskotomuhkati at Skutik (Peskotomuhkati)/Passamaquoddy. The property where the SMR will be located falls within the claimed Aboriginal title area of the Wolastoqiyik/Wəlastəkwiyik, and the Mi'gmaq and the Peskotomuhkati/Passamaquoddy Nations, which also assert this property as part of their respective territories.

1.3.3 Property Ownership

The Project will be undertaken on the Point Lepreau site, which is solely owned by NB Power, a provincial Crown corporation. Parcel identification numbers associated with the property are: 01231323, 55062665, 55010086, 550662657, 55062640, 00427138 and 00471136.

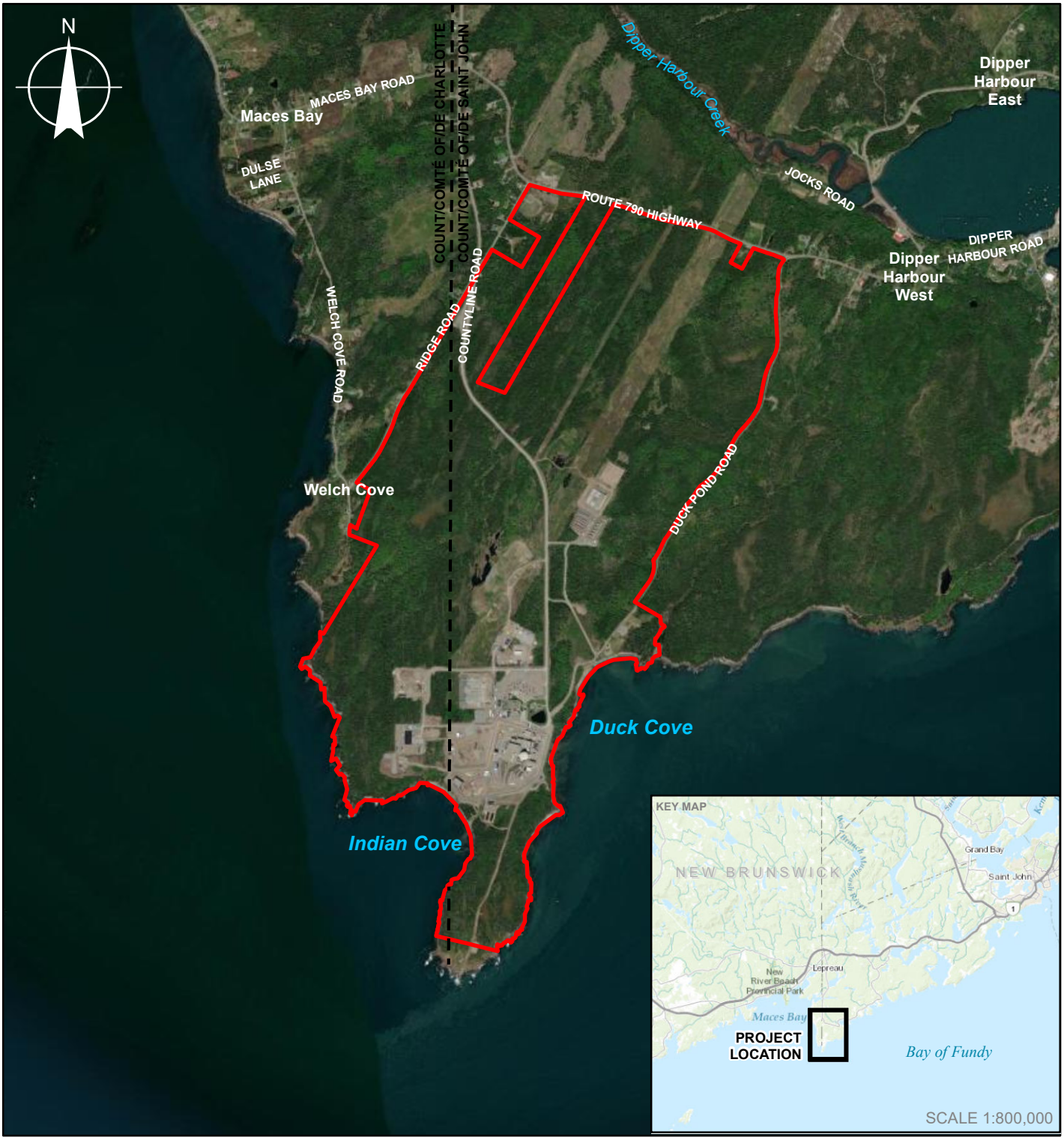
The Project is not located on federal lands.

1.3.4 Public Funding of the Undertaking

SMRs are an innovative clean energy solution, the deployment of which will help New Brunswick and Canada achieve their goals to reduce greenhouse gas (GHG) emissions. To date, SMR development has been funded largely by private investment, with additional funding from the Province of New Brunswick and to a lesser extent the federal government.

In 2018, The New Brunswick Energy Solutions Corporation, a provincial Crown corporation, committed $10 million towards the establishment of an SMR Research Cluster in New Brunswick, $5 million of which was for ARC. ARC also invested $5 million to progress research and development of its advanced technology. In March 2021, the Atlantic Canada Opportunities Agency (ACOA) provided $4,999,568 to NB Power and $561,750 to the University of New Brunswick to support SMR development.

In February 2021, ARC was awarded $20 million in funding from the Government of New Brunswick to support its next phase of technology development. This funding was conditional upon ARC providing $30 million of matching funds from private investors.



LEGEND

- COUNTY BOUNDARY
- PLNGS PROPERTY BOUNDARY

0 250 500 1,000 1,500

1:30,000 METRES

REFERENCE(S)

1. BASEMAP SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
2. COORDINATE SYSTEM: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

CLIENT
Énergie NB Power

NEW BRUNSWICK POWER

PROJECT
ARC CLEAN TECHNOLOGY ADVANCED SMALL MODULAR REACTOR COMMERCIAL DEMONSTRATION UNIT - POINT LEPREAU, NEW BRUNSWICK

TITLE
PROJECT LOCATION OVERVIEW

CONSULTANT
wsp

YYYY-MM-DD	2023-06-28
DESIGNED	----
PREPARED	SO
REVIEWED	JW
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
221-111217	0001	A	1.1

0930-07020-7000-001-ENA-A-00

1.4 Purpose, Rationale and Need for the Undertaking

The purpose of this SMR commercial demonstration project is two-fold. It is needed to:

- Provide 100 to 150 MWe of low-carbon baseload electricity with load-following capability to the New Brunswick grid.
  - "Low-carbon electricity" is electrical energy produced with substantially lower GHG emissions than conventional fossil fuel power generation,
  - "Baseload" refers to the minimum amount of electric power needed to be supplied to the electrical grid at any given time, and
  - "Load-following capability" refers to the ability for the power plant to adjust its output as demand for electricity fluctuates throughout the day.
- Demonstrate the performance of this SMR design with focus on the following objectives:
  - Demonstrate baseload and load-following capabilities on the electrical grid,
  - Demonstrate operational performance of the SMR, and
  - Refine construction practices.

1.4.1 Need for Low-Carbon Baseload Electricity

The ARC SMR would provide 100 to 150 MWe of low-carbon baseload electricity with load-following capability, which is needed to support provincial and national GHG emission reduction targets. Its steady baseload supply of electricity to the grid will also enhance electricity reliability in New Brunswick.

In 2015, Canada along with 194 other countries signed the Paris Agreement and collectively committed to reduce global GHG emissions (Government of Canada, 2016). In March 2016, Canada's First Ministers released the Vancouver Declaration on Clean Growth and Climate Change, which included a nationwide targeted reduction of emissions to 30% below 2005 levels by 2030 (Canadian Intergovernmental Conference Secretariat, 2016). In 2021, Canada further increased this targeted reduction to 40 to 45% below 2005 levels by 2030, as legislated in the *Canada Net-Zero Emissions Accountability Act*. This legislation also set a target to achieve economy-wide net-zero by 2050 (Government of Canada, n.d. b). Achieving net-zero emissions means reducing GHG emissions to as close to zero as possible and counter-balancing any remaining emissions through removals such as natural carbon sinks or emerging technologies (Government of New Brunswick, 2022a).

In 2018, in the *Climate Change Act*, New Brunswick set a legislated goal of reducing provincial GHG emissions to 10.7 million tonnes (Mt) by 2030. In 2022, New Brunswick released its latest *Climate Change Action Plan 2022-2027*, which further committed the province to net-zero GHG emissions by 2050 (Government of New Brunswick, 2022a). New Brunswick's 2005 emissions were 19.6 Mt. The 2030 emission target of reducing emissions to 10.7 Mt represents a 45% reduction, which is required to achieve the federal target of 40 to 45% reduction.

The electricity sector plays a pivotal role in the pathway to net zero, as reaching the 2050 target will involve electrifying more activities such as vehicles, heating and cooling buildings and industrial processes, creating an increased demand on the electrical grid even with energy efficiency efforts. One of the challenges of managing an electricity system (i.e., a grid), is

keeping electricity generation coming onto the grid smoothly and reliably to meet the peaks and valleys of demand. Managing the grid reliably requires a smooth flow of generated electricity, as well as a load-following electricity supply that can be dispatched and removed quickly from the grid to manage those daily ups and downs. This is further complicated by generation methods that are susceptible to the unpredictability of the weather conditions, such as wind and solar technologies.

SMRs, such as ARC Clean Technology's advanced SMR reactor, would provide more flexibility for the grid to meet peek demands and support intermittent renewable sources such as wind and solar. The ARC SMR project will demonstrate the contribution of SMRs to the grid as a steady baseload supply, enhancing electricity reliability in New Brunswick.

New Brunswick's largest provider of low-carbon energy is the PLNGS, which provides approximately 35% of New Brunswick's electricity requirements and avoids approximately 4 Mt of GHGs from being emitted into the environment annually. NB Power forecasts that at least 75% of New Brunswick's electricity requirements will be met by low-carbon and carbon-free sources in each year until 2029. The addition of SMRs will be key to approaching nearly 100% low-carbon and carbon-free emissions in 2035 and beyond.

SMRs play a major role in achieving a net-zero electricity system by 2035. The ARC SMR will support NB Power's commitment to deliver safe and reliable power to New Brunswickers, which includes the reliable operation of transmission, distribution, and generation resources.

1.4.2 Demonstrate ARC SMR Performance

The second need for the Project is to support the pan-Canadian approach to SMR development and deployment. In November 2018, a Canadian SMR roadmap was released to guide future actions needed by government, industry, and other nuclear stakeholders to capitalize on Canada's SMR opportunity (Canadian Small Modular Reactor Roadmap Steering Committee, 2018). In recognition of the opportunities presented, the governments of Ontario, New Brunswick and Saskatchewan signed an interprovincial SMR Memorandum of Understanding (MOU) in December 2019, with the addition of Alberta in April 2021. The MOU outlines several commitments for the provinces, including collaborating on SMR development and deployment, including "committing to collaborate on the development and deployment of innovative, versatile, and scalable nuclear reactors". In May 2023, the provinces of New Brunswick and Saskatchewan signed an MOU to further collaborate on development and deployment of SMR technology.

In 2020, the government of New Brunswick endorsed Canada's *Small Modular Reactor (SMR) Action Plan* (Government of Canada, n.d.) for the development, demonstration, and deployment of SMRs, and has jointly developed a Strategic Plan for the deployment of SMRs with the provinces of Ontario, Alberta and Saskatchewan (Governments of Ontario, New Brunswick, Alberta and Saskatchewan, 2022).

New Brunswick plans to become a centre of excellence for the development of the advanced SMR technology. The ARC SMR demonstration project is key to the province's development both economically and as a centre of excellence.

The vision is to establish a supply chain largely centred in New Brunswick, demonstrate the ARC SMR technology at Point Lepreau, and progress towards the implementation of a fleet of

reactors that could be deployed elsewhere in New Brunswick, other Canadian provinces, and export to other countries. Reactors would be supported by regional fleet support centres. The realization of this vision is dependent on the success of the Project. As well, an economic impact analysis of the implementation of SMRs in New Brunswick projected that over the 2020 to 2035 period, the development of advanced SMRs in New Brunswick will create (direct and indirect) an average of 730 jobs per year over 15 years; $1 billion in Gross Domestic Product and $120 million in provincial government revenue (NB Power, n.d.).

The demonstration of the ARC technology at scale will allow for the collection of baseline data to support fine tuning of the unit's performance by:

- confirming assumed conservatisms are accounted for in safety analysis models with real world data,
- to confirm and improve safety margin, and
- support any future design changes for the units.

1.5 Alternatives to the Project

As part of the provincial EIA process, an evaluation of alternatives to the Project will be required. The following provides a brief discussion of the alternatives that could fulfill the same goal or provide the same benefits as described in **Section 1.4**, as well as a rationale for choosing the selected alternative. This review will be elaborated in the Comprehensive EIA process, and is expected to include consideration of alternative means of implementing the project, which are discussed in **Section 4.4** of this registration document (e.g., cooling water options or design refinements).

1.5.1 Do Nothing

While the “do-nothing” approach must be considered, and is a feasible option, it would not meet New Brunswick’s need for a steady low-carbon baseload supply of electricity that will both support provincial and national GHG emission reduction targets and enhance electricity reliability in New Brunswick.

Doing nothing would also not meet NB Power’s second need, which is to demonstrate the ARC SMR design and progress New Brunswick’s commitment to the development and deployment of innovative, versatile, and scalable nuclear reactors.

The ARC SMR Project is preferred over the do nothing alternative because it will provide reliable electricity, support national and provincial emissions reductions goals, and demonstrate several SMR performance objectives including: demonstration of the baseload and load-following capabilities on the electrical grid, demonstrating operational performance, refinement of construction practices, demonstrating the potential for medical isotopes production using a fast flux spectrum and the demonstration of high temperature steam to support industrial processes.

1.5.2 Renewable Technologies as Alternative Options to Nuclear Power

Preliminary results from NB Power’s 2023 Integrated Resource Plan analysis show that the leading alternative to SMRs are a combination of renewables, electricity imports, battery storage and some carbon emitting generation, which would operate at extremely low-capacity factors in order to maintain reliability. Many alternatives were considered in the analysis including wind,

solar, storage, dual-fuel (oil/natural gas) combustion turbines, natural gas units with carbon capture and sequestration, geothermal, tidal, wave, and hydrogen fueled combustion turbines.

However, in the absence of SMRs, the preliminary Integrated Resource Plan analysis shows over 3,000 MW of wind and over 500 MW of solar would be needed, which would require a more than 10-fold increase of variable renewables in New Brunswick. The complexities of transmission constraints, voltage and frequency control, and the variability and forecast error could seriously impact operations and reliability. This energy reliability is further complicated by the reduction in other in-province generation in a net-zero future.

SMRs play a critical role in New Brunswick's pathways to net-zero. Particularly, with increased load from electrification, SMRs provide a stable, predictable generation source capable of responding to daily fluctuations in energy demand, in a future where that is becoming increasingly less common.

Wind, solar and battery storage are expected to play a large role in the future, and pair well with SMRs, but relying on variable renewables technologies alone would create significant challenges from operational, cost, and reliability perspectives. Alone they will not meet the full purpose of the proposed Project to provide reliable power to the grid and progress New Brunswick's plans to become a centre of excellence for the development of the advanced SMR technology.

The ARC SMR Project is preferred over the alternative options to nuclear power because it will provide reliable low-carbon baseload electricity with load-following capability to contribute to the New Brunswick electrical grid reliability, while also supporting New Brunswick's commitment to demonstrate to SMR development and deployment.

1.5.3 Alternative Options for Small Modular Reactors

As part of the pan-Canadian approach to SMR development and deployment, New Brunswick is pursuing advanced Generation IV SMRs. Generation IV nuclear energy systems are next generation technologies being developed to have comparative advantages including reduced capital cost, enhanced nuclear safety, minimal generation of nuclear waste, and further improvements related to non-proliferation.

Types of Generation IV reactors include the following (IAEA, 2010):

- Sodium-Cooled Fast Reactor,
- Gas-Cooled Fast Reactor,
- Very-High-Temperature Reactor,
- Supercritical-Water-Cooled Reactor,
- Lead-Cooled Fast Reactor, and
- Molten Salt Reactor.

The ARC SMR is an advanced Generation IV sodium-cooled fast reactor (SFR). Sodium fast reactors are a mature technology, with nearly 400 reactor years of operating experience around the world.

The ARC reactor is an evolution of a long line of fast spectrum sodium-cooled reactors developed by General Electric, now GE-Hitachi. The ARC reactor design is based on the experience gained from the Experimental Breeder Reactor II (EBR-II) and the Fast Flux Test

Facility in the United States. The EBR-II was a sodium-cooled fast reactor designed, built and operated by Argonne National Laboratory at the National Reactor Testing Station in Idaho, which ran for more than 30 years until operation ended in 1994. The Fast Flux Test Facility is a 400 MW thermal, liquid sodium cooled, nuclear test reactor in Washington State, owned by the U.S. Department of Energy. The ARC reactor has incorporated experience from these facilities including inherent safety characteristics, and passive safety features, both of which contribute to lowering risk to workers, the public and environment from normal operations and accidents and malfunctions. In an effort to simplify the design, improve plant reliability, and reduce maintenance burden, the ARC design is composed of fewer system components compared to a water-cooled reactor. The design also benefits from over 400 years of liquid sodium fast reactor operating experience around the world.

The ARC SMR design was selected as the preferred alternative for this commercial demonstration project following an extensive technology review for the following reasons:

- It is based on a mature proven technology;
- It has inherent and passive safety features (e.g., it shuts itself down to a safe state when it overheats and has passive emergency core cooling, which has been demonstrated by actual test reactor experience);
- It is a pool type reactor, which means the core is not pressurized (added safety feature);
- It has a simple design with fewer systems and components than other technologies, leading to lower capital and operational costs;
- It has more factory construction, leading to shorter on-site construction times;
- It has superior load-following characteristics allowing it to support the intermittent output from renewable power sources;
- It has a high output temperature, which allows for co-generation of heat and electricity that can be used for industrial purposes, including the generation of hydrogen and hydrogen-based products such as ammonia or synthetic fuels;
- It has technical support through relationship with GE-Hitachi;
- It has the ability to use recycled fuel (a potential feature of the technology only – fuel recycling will not be part of the Project); and
- ARC’s commitment to work with the province of New Brunswick and NB Power to establish headquarters in Saint John, New Brunswick.

Since initial selection, NB Power and ARC have also identified additional opportunities associated with the ARC SMR, including the potential for isotope production, which could be used for medical applications and the use of high temperature steam to support industrial processes.

2.0 REGULATORY OVERVIEW

This section describes the environment and nuclear-related regulatory mechanisms that are anticipated to require a permit, approval or similar type of authorization before the Project can proceed, or under which the Project is expected to be constructed and operated. Additional requirements relating to other types of regulatory requirements, such as Occupational Health and Safety, the *Workers Compensation Act* and Canada Building Code, will be identified for compliance prior to Project initiation as part of the overall permitting plan.

For context, in December 2022, the Impact Assessment Agency of Canada (IAAC) prepared an Analysis Report for consideration by the federal Minister of Environment and Climate Change in response to a public request to designate the Project pursuant to section 9 of the federal *Impact Assessment Act* so that a federal impact assessment could be required (IAAC, 2022).

Taking IAAC's analysis into account, the federal Minister of Environment and Climate Change decided that the proposed SMR development did not warrant designation (Guilbeault, 2022). This was based on the reasoning that other existing regulatory mechanisms and related consultations provide a framework to address the potential adverse impacts and concerns raised by Indigenous peoples and members of the public, and the Project must be carried out in compliance with federal and provincial legislation. These other regulatory and consultation requirements include:

- the regulatory framework and licensing process of the *Nuclear Safety and Control Act (NSCA),* which includes consideration of environmental effects and matters related to public health and safety, public and Indigenous consultation, and conditions for the licensee;
- the provincial EIA process under New Brunswick's *Clean Environment Act*, which has consultation requirements and may include enforceable terms and conditions to mitigate potential environmental effects for all stages of the development;
- additional provincial legislation, as applicable, such as the *Clean Water Act*; and
- additional federal authorizations and approvals that may be required under the *Fisheries Act, the Species at Risk Act*, and the *Canadian Navigable Waters Act*.

As well, the project must be carried out in compliance with the *Migratory Birds Convention Act, 1994*, the *Canadian Environmental Protection Act, 1999,* and other legislation (Guilbeault, 2022).

As a result of the federal decision, a federal impact assessment under the *Impact Assessment Act* is not required.

Some aspects of the Project require further study to demonstrate whether specific regulatory requirements will need to be met for this project. These will be confirmed through the refinements to the Project design and in consultation with regulators. Resulting applications to federal, provincial and municipal agencies are expected to be informed through the EIA studies.

The environmental permit or approvals that are expected to be required are summarized in **Table 2.1.**

Table 2.1: Anticipated Environmental Permits and Approval Requirements

Legislative Framework	Responsible Jurisdiction	Key Licence, Permit, Authorization or Approval
Key Provincial Legislation		
Clean Environment Act Environmental Impact Assessment Regulation	New Brunswick Department of Environment and Local Government (NBDELG)	EIA Approval
Clean Environment Act Water Quality Regulation	NBDELG	Approval to Construct Approval to Operate
Clean Water Act Watercourse and Wetland Alteration Regulation	NBDELG	Watercourse and Wetland Alteration (WAWA) Permit
Coastal Areas Protection Policy	NBDELG	WAWA Permit and/or EIA Approval
Clean Air Act	NBDELG	Approval to Construct Approval to Operate
Species at Risk Act	New Brunswick Department of Natural Resources and Energy Development (NBDNRED)	Permit to Engage in Activity
Heritage Conservation Act	New Brunswick Tourism, Heritage and Culture	Permit to Alter an Archaeological Site
Crown Lands and Forests Act Lands Administration Regulation	NBDNRED	Crown Land Licence of Occupation
Quarriable Substances Act	NBDNRED	Written Authorization
Motor Vehicle Act Vehicle Dimensions and Mass Regulation Special Permit Fees Regulation	New Brunswick Transportation and Infrastructure	Special Permit(s)
Key Federal Legislation		
Nuclear Safety Control Act General Nuclear Safety and Control Regulations Class I Nuclear Facilities Regulations Nuclear Security Regulations Nuclear Substances and Radiation Device Regulations Packaging and Transport of Nuclear Substances Regulations Radiation Protection Regulations	Canadian Nuclear Safety Commission (CNSC)	Licence to Prepare Site Licence to Construct Licence to Operate Licence to Decommission
Constitution Act, 1982 *United Nations Declaration on the Rights of Indigenous Peoples Act*	Federal Departments and Agencies New Brunswick Provincial Government, including NB Power as a Crown corporation	The Crown has a duty to consult, and where appropriate, accommodate Indigenous peoples when it considers conduct that might adversely impact potential or established Aboriginal or treaty rights.

Legislative Framework	Responsible Jurisdiction	Key Licence, Permit, Authorization or Approval
Fisheries Act	Fisheries and Oceans Canada (DFO)	*Fisheries Act* Authorization
Migratory Birds Convention Act, 1994 Migratory Bird Regulations	Environment and Climate Change Canada (ECCC)	Compliance Required
Species at Risk Act (*SARA*)	DFO and/or ECCC	Permit Authorizing an Activity Affecting Listed Wildlife Species
Explosives Act	Natural Resources Canada	Permit for the use, storage, or transportation of explosives.

2.1 Key Provincial Legislation

2.1.1 Clean Environment Act

2.1.1.1 Environmental Impact Assessment Regulation

The purpose of an EIA is to identify and evaluate the potential impacts a proposed Project will have on the environment, and then identify and present measures to avoid or mitigate those potential environmental impacts. The *Environmental Impact Assessment Regulation - Clean Environment Act* is administered in a way that provides the public, stakeholders and First Nations the opportunity to learn about and comment on proposed projects. This opportunity is one of the most important aspects of the EIA process in New Brunswick.

The *Environmental Impact Assessment Regulation - Clean Environment Act*, provides a schedule that lists the types of projects (called undertakings), that must be registered with the provincial Minister of Environment and Climate Change in order for the Minister to determine whether or not the completion of an EIA is required before the project commences. Under the Regulation, no proponent may carry out an undertaking unless the provincial Minister has determined that the undertaking may be carried out without the completion of an EIA, or the Lieutenant-Governor in Council, following the completion of a required EIA, has given an approval to carry out the undertaking.

Schedule A of the Regulation includes the following as undertakings:

> *(b) all electric power generating facilities with a production rating of three megawatts or more;* and
>
> *(w) all facilities for the processing of radioactive materials.*

Based on Schedule A, this Project is considered an undertaking that must be registered with the Minister. Per *A Guide to Environmental Impact Assessment in New Brunswick* (NBDELG, 2018), this is typically accomplished by submitting a registration document that reports on the results of an EIA study conducted by the proponent and includes details of the proposed undertaking, its potential environmental impacts, and how significant impacts may be addressed (NBDELG, 2018). Registered projects then typically undergo a Determination Review, which determines whether:

a) a Certificate of Determination can be issued (the project can proceed subject to terms and conditions); or

b) a Comprehensive EIA is required (the proponent must prepare a more detailed EIA submission that is subject to enhanced public, stakeholder, and First Nation engagement); or

c) the proposal is denied with the assent of the Lieutenant-Governor-in-Council (the project is not permitted to proceed).

Although the Determination Review has not been formally initiated for this Project, through NB Power's early engagement with NBDELG, due to the nature of the Project NBDELG has proactively indicated to NB Power that a Comprehensive EIA is anticipated to be required. As such, this registration document is not intended to be a thorough report of the results of an EIA study as described in *A Guide to Environmental Impact Assessment in New Brunswick*, but rather a preliminary document to facilitate the formal determination and subsequent public notice that a Comprehensive EIA is required to fully assess the nature and significance of the potential impacts of the Project.

The following is a high-level summary of the anticipated process that will be undertaken after the Minister's decision.

EIA Study Guidelines: Prior to NB Power commencing the Comprehensive EIA, a Technical Review Committee (TRC) comprised of representatives of federal, provincial, and municipal agencies that have a mandate or expertise related to the Project will work with NBDELG to develop EIA study guidelines for the Comprehensive EIA. These guidelines will identify the issues that must be considered and the general approach that must be followed in conducting the Comprehensive EIA, including requirements for engagement and consultation. The draft guidelines will be issued for review by NB Power, First Nations, public and stakeholders, and once the feedback has been incorporated into the guidelines, the Minister will issue final EIA study guidelines (NBDELG, 2018).

Terms of Reference: NB Power will then need to prepare draft Terms of Reference outlining how the requirements in the EIA study guidelines will be met. The draft Terms of Reference will be reviewed by the TRC and once TRC comments are addressed, NB Power will then engage with First nations and the public on the draft Terms of Reference. NB Power will revise the document according to the feedback received and will submit to NBDELG for review and approval.

EIA: Once the Terms of References are accepted, the EIA will commence. This will require the completion of ongoing engagement and supplementary studies to inform the assessment, followed by a detailed assessment examining the predicted impacts of the project, the proposed mitigative measures, and the predicted residual net effect on the environment (NBDELG, 2018). NB Power will prepare a draft EIA report, which will be submitted for review and comment by the TRC. Once the draft report is deemed to adequately address the TRC comments and the Terms of Reference, the final EIA report will be submitted. NBDELG will prepare a general review statement and summary of the report, which will be released with the final EIA report for First Nation and public review.

NBDELG will then engage on the EIA using various means. Ultimately, a summary of the public participation will be prepared by NBDELG, and a full recommendation package, which may

include conditions of approval, will be forwarded to the Minister for final consideration (NBDELG, 2018).

After receiving the relevant information generated through the Comprehensive Review process, the provincial Minister will submit a report and a recommendation to the provincial Lieutenant-Governor in Council, which would then either issue an EIA approval or deny any approval of the Project. If an approval is granted, terms and conditions may be stipulated that NB Power must adhere to in implementing the Project (NBDELG, 2018).

2.1.1.2 Water Quality Regulation – Approval to Construct

The *Water Quality Regulation* of the New Brunswick *Clean Environment Act* requires owners or operators of a facility that releases a contaminant to the environment to apply for and obtain approval for the construction of the source. Construction of the facility may only commence after an Approval to Construct (ATC) has been issued by the NBDELG Minister and construction must be done in accordance with the terms and conditions imposed in the approval issued for that source.

Potential effects to watercourses and wetlands will be assessed during the EIA process, and requirements for a permit application will be confirmed in consultation with NBDELG.

2.1.1.3 Water Quality Regulation – Approval to Operate

The *Water Quality Regulation* of the New Brunswick *Clean Environment Act* requires owners or operators of a facility that releases a contaminant to the environment to apply for and obtain approval for the operation of the source. Operation of the facility may only commence after an Approval to Operate (ATO) has been issued by the NBDELG Minister and operation must be done in accordance with the terms and conditions imposed in the approval issued for that source.

It is expected the ARC SMR facility will have its own sanitary sewage treatment plant, which will be sized for a peak workforce of between 400 and 1,200 persons, depending on the construction strategy. Thus, it is expected that the new treatment plant facility may require an application for an ATO to be issued by the NBDELG under the *Clean Environment Act*.

2.1.2 Clean Water Act

New Brunswick's watercourses and wetlands are afforded protection under the *Watercourse and Wetland Alteration (WAWA) Regulation* of the New Brunswick *Clean Water Act*. Any proposed alterations within watercourses or wetlands, or within their 30-metre regulated buffer, require permitting through the NBDELG's WAWA program.

Potential effects to watercourses and wetlands will be assessed during the EIA process, and requirements for a permit application will be confirmed in consultation with NBDELG.

2.1.2.1 Coastal Areas Protection Policy

The *Coastal Areas Protection Policy* for New Brunswick is implemented through the *WAWA Regulation* and administered by the Source and Surface Water Management Branch of NBDELG. It establishes a foundation for coastal area planning and management and provides for appropriate environmental assessment for coastal area development. It also sets out the types of activities that are not permitted in each coastal protection zone, and those that are permitted in each zone with the issuance of a WAWA permit and/or EIA Approval (NBDELG, 2019a).

If the Project requires works landward of the ordinary high-water mark, approval from the local regional service commission, municipality, or NBDELG will be required. Where coastal development initiatives require registration under the *Environmental Impact Assessment (EIA) Regulation – Clean Environment Act*, the Source and Surface Water Management Branch of NBDELG will coordinate with the Environmental Assessment Branch (NBDELG, 2019a).

If the Project requires works on Crown lands below the ordinary high-water mark, review and approval from the NBDNRED will be required.

2.1.3 Clean Air Act

2.1.3.1 Air Quality Regulation - Approval to Construct

Part I of the *Air Quality Regulation* of the New Brunswick *Clean Air Act* requires owners or operators of a facility that releases a contaminant to the environment to apply for and obtain approval for the construction of the source. Construction of the facility may only commence after an ATC has been issued by the NBDELG Minister and construction must be done in accordance with the terms and conditions imposed in the approval issued for that source.

NBDELG will be consulted once more Project details are available regarding air emissions in order to determine if an ATC is required.

2.1.3.2 Air Quality Regulation - Approval to Operate

Part I of the *Air Quality Regulation* of the New Brunswick *Clean Air Act* requires owners or operators of a facility that releases a contaminant to the environment to apply for and obtain approval for the operation of the source. Operation of the facility may only commence after an ATO has been issued by the NBDELG Minister and operation must be done in accordance with the terms and conditions imposed in the approval issued for that source.

Depending on the emissions to air from the Project, an ATO under the *Clean Air Act* may be required; however, this is not expected to be required as the PLNGS does not currently operate under an ATO under the Act.

2.1.4 Species at Risk Act

Under the New Brunswick *Species at Risk Act* (NB *SARA*), prohibitions and/or habitat designations may be put into regulation in support of the recovery of listed wildlife species. It is illegal to kill, harm, harass, take, possess, buy, sell, or trade a species listed under the NB *SARA* as extirpated, endangered, or threatened.

Under specific circumstances, the NBDNRED Minister may issue a permit for exceptions to the prohibitions that protect individuals of a species at risk or for activities that would normally not be allowed in areas under a habitat designation; however, a permit cannot be issued unless there is no reasonable alternative, and the action will not put the species at further risk.

At this time, it is understood that there is no designated habitat on or near the property, and an application for a permit for exceptions to the prohibitions is not anticipated to be required; however, NB Power intends to abide by the spirit of the legislation and will confirm the requirements during the EIA process.

2.1.5 Heritage Conservation Act

Designated Historic places in New Brunswick are protected under the *Heritage Conservation Act*. Unauthorized alteration of any archaeological site in the province is prohibited under the Act. If the Project could impact such a location, it must be submitted for review well in advance to the Heritage Branch of the Department of Wellness, Culture and Sport.

Several studies on the archaeological potential of the Point Lepreau site have been conducted with the results indicating the particular areas were of low archaeological potential. In 2022, an artifact was found on the property in the area of Duck Cove (in the southeast part of the property), making the property a registered site in the provincial database. Other and registered archaeological sites have been identified within 5 kilometres of the PLNGS. An archaeological impact assessment of the proposed Project footprint (i.e., area of potential disturbance) will be undertaken for the Project in collaboration with First Nations. This additional desktop work and/or fieldwork undertaken during the EIA process will help better identify the potential for discovering archaeological resources on the property.

2.1.6 Crown Lands and Forests Act

A harvesting permit is required under the *Timber Regulation* of the New Brunswick *Crown Lands and Forests Act* when harvesting timber on Crown lands, including for roadside clean-up, fuelwood contractors, and managing fuelwood stands.

The Project may not impact any standing timber, in which case a permit would not be required. Once the Project site is confirmed, representatives of the NBDNRED will be consulted to confirm whether a harvesting permit is required.

2.1.7 Quarriable Substances Act

Aggregate resources (i.e., quarriable substances) include sand, gravel, and ordinary, building or construction stone that are required for construction of infrastructure. The Minister of the NBDNRED, through the *General Regulation – Quarriable Substances Act* (Regulation 93-92), has the authority to manage tenure, exploration, development and production of aggregates on Crown lands, as well as any private lands that lie within 300 metres of the ordinary high-water mark of the provincial coastline (NBDNRED, n.d.).

The *Quarriable Substances Act* restricts the operation of a quarry or the taking or removing of a quarriable substance located on Crown lands unless a valid quarry tenure relative to that quarry has been obtained. The NBDNRED administers three forms of tenure for quarries, including written authorization, quarry permit, and a quarry lease (NBDNRED, n.d.). Written Authorization is generally intended for one-time private use, whereas a quarry permit and/or quarry lease would be required for the removal of a quarriable substance from a Crown quarry site for commercial use.

A Written Authorization may be required if aggregate materials are proposed to be extracted from the Pointe Lepreau site for construction purposes. Alternatively, aggregates for construction may be acquired from an existing permitted quarry off-site. The requirements for a permit application will be confirmed in consultation with NBDNRED as the construction plan is further developed.

2.1.8 Motor Vehicle Act

The sizing of vehicles and their loadings on roadways in New Brunswick is controlled under the *Vehicle Dimensions and Mass Regulation* of the *Motor Vehicle Act*. The trucks used for the Project must adhere to the legal load weight limits at all times, including spring weight restrictions. If a truck exceeds dimensions or mass for a roadway, then there will be a requirement to obtain permission under the *Special Permit Fees Regulation* of the Act.

2.2 Key Federal Legislation

As mentioned in **Section 2.0**, in December 2022, the federal Minister of Environment and Climate Change posted a decision that the proposed ARC SMR development did not warrant designation under the federal *Impact Assessment Act* (Guilbeault, 2022); thus, further discussion about federal impact assessment requirements are not included within this section.

2.2.1 Nuclear Safety and Control Act

The Project is subject to nuclear licensing requirements under the *Nuclear Safety and Control Act* (*NSCA*). The Government of Canada has a mature and robust regulatory framework under the *NSCA*, supported by specific regulations that apply to the entire life cycle of a nuclear power plant. All aspects of nuclear energy in Canada are regulated by the Canadian Nuclear Safety Commission (CNSC) for the lifetime of the facility. Under the *NSCA*, the CNSC has a mandate to regulate the use of nuclear energy and materials in order to protect health, safety, security and the environment and to implement Canada's international commitments on the peaceful use of nuclear energy. The Commission, which is part of the CNSC, is an independent, quasi-judicial administrative tribunal and court of record. In Canada, licensing decisions for nuclear power plants are made by the Commission (IAAC, 2022).

As part of the licensing process, the CNSC assesses that the applicant is qualified to carry out the activities under the licence, and in doing so, will make adequate provisions for protecting the environment, the health and safety of persons, and the maintenance of national security and measures required to implement international obligations on the peaceful use of nuclear energy. The licensing process with the CNSC is rigorous, well documented, and transparent. It involves public hearings, allowing Indigenous and public intervention to inform the decision-making process of the Commission.

Nuclear power plants, including SMRs, are classified as Class I nuclear facilities. The Project would be subject to the *Class I Nuclear Facilities Regulations* under the *NSCA*, which outlines licence applications, timelines, obligations of licensees, and records to be kept and made available. The licensing process would ensure, among other things, the proposed site is suitable, the Proponent conforms with regulatory requirements, appropriate safety management systems, plans and programs are established, and the Proponent is qualified to carry out the Project (IAAC, 2022). The CNSC requires that the environmental effects of all nuclear facilities or activities be characterized and evaluated when licensing decisions are made.

Other key regulations under the *NSCA* that apply to this Project include:

- General Nuclear Safety and Control Regulations,
- Nuclear Security Regulations,
- Nuclear Substances and Radiation Device Regulations,

- Packaging and Transport of Nuclear Substances Regulations, and
- Radiation Protection Regulations.

The regulations require licences (which may be separate or combined) for all phases in the lifecycle of a nuclear power plant, including site preparation, construction, operation, and decommissioning.

The following applications for CNSC licensing will be required:

- Licence to Prepare Site,
- Licence to Construct,
- Licence to Operate, and
- Licence to Decommission.

CNSC sets out its requirements and guidance for the different types of applications in its regulatory document framework. Assessments of effects are required commensurate with a graded approach for each of the four licensing phases, as set out in respective Licence Application Guides:

- *REGDOC-1.1.1 Site Evaluation and Site Preparation for New Nuclear Power Plants*,
- *REGDOC-1.1.2 Licence Application Guide: Licence to Construct a Reactor Facility*,
- *REGDOC-1.1.3 Licence Application Guide: Licence to Operate a Nuclear Power Plant*, and
- *REGDOC-1.1.4 Licence Application Guide: Licence to Decommission Reactor Facilities*.

As part of the CNSC licensing process, NB Power will have to evaluate potential impacts of the Project to the health and safety of the public, the environment, and any potential or established Aboriginal or treaty rights. NB Power will also have to demonstrate adequate engagement with stakeholders and Indigenous communities, groups and organizations, and consideration of their views.

The CNSC will also evaluate the potential environmental effects of the Project, and conduct public and Indigenous consultation. The CNSC will ensure that its licensing decisions uphold the honour of the Crown and consider Indigenous peoples' potential or established Aboriginal or treaty rights pursuant to section 35 of the *Constitution Act, 1982*. The CNSC will consult Indigenous communities, groups and organizations and ensure they have meaningful opportunities to participate in the environmental review and licensing process (IAAC, 2022).

Site evaluation activities as per CNSC *REGDOC-1.1.1* are underway, and NB Power intends to submit an application for a Licence to Prepare Site for an ARC SMR to the CNSC concurrently with the submission of this EIA registration document to NBDELG.

Since the ARC SMR is subject to provincial EIA legislation, the CNSC will provide subject matter experts to participate as members of the TRC. The CNSC will retain decision making authority on licensing matters, and use the information gathered in the EIA process to inform its licensing decisions under *NSCA* (IAAC, 2022).

The CNSC may begin the licence application review concurrent with the provincial EIA; however, when a project requires a federal or provincial impact or environmental assessment, the

CNSC cannot issue a licence related to that project until a decision has been issued that allows the project to proceed. Given that a provincial EIA review is required for the Project, the CNSC would not issue a licence until the provincial EIA decision has been issued (IAAC, 2022).

The remaining licence applications for construction and operation, per *REGDOC-1.1.2* and *REGDOC-1.1.3*, are anticipated to follow in 2024 and 2027, respectively.

2.2.2 Constitution Act, 1982

Section 35 of the *Constitution Act, 1982* recognizes and affirms the existing Aboriginal and treaty rights of the Aboriginal peoples (Indigenous peoples) of Canada. Section 35 defines "Aboriginal peoples of Canada" as including the Indian (First Nation), Inuit and Métis peoples of Canada and clarifies that treaty rights include rights that now exist by way of land claims agreements or may so be acquired (i.e., rights derived from current land claims agreements or rights that may be obtained via land claim agreements in the future). It also clarifies that Aboriginal and treaty rights are guaranteed equally to male and female persons (Government of Canada, 1982). Rights vary by Indigenous peoples and can include title claims, rights to occupy and use land, self government rights, as well as cultural and social rights.

The duty to consult with Indigenous peoples of Canada is based on judicial interpretation of the obligations of the Crown (federal, provincial and territorial governments) in relation to potential or established Aboriginal or treaty rights recognized and affirmed in section 35 of the *Constitution Act, 1982*, as well as specific requirements to consult that are set out in statutes and regulations, and provisions in land claim agreements, self-government agreements and consultation agreements (AANDC, 2011).

Procedural aspects of the Crown's duty to consult can be delegated to third parties such as NB Power; in that event, NB Power is committed to undertaking meaningful consultation upholding the honour of the Crown. Should NB Power not be delegated procedural aspects of consultation, NB Power is committed to informing those involved in the design and decision-making processes about the impacts of the proposed Project on the potential or established Aboriginal or treaty rights, to both support the Crown's duty to consult and also to address concerns, monitor and follow-up throughout the life of the Project.

2.2.3 United Nations Declaration on the Rights of Indigenous Peoples Act

The *United Nations Declaration on the Rights of Indigenous Peoples Act* received Royal Assent and came into force in Canada on June 21, 2021. This Act provides a roadmap for the Government of Canada and First Nations, Inuit, and Métis peoples to work together to implement the Declaration based on lasting reconciliation, healing, and cooperative relations.

The Province of New Brunswick is undertaking a technical compliance review of its programs, policies and legislation to determine the extent to which they comply with the principles articulated in the Declaration (Government of New Brunswick, 2022c).

In addition to the requirements set out by the Government of Canada and keeping in spirit with the opportunity for this potential development to support reconciliation goals, NB Power will seek to align consultation and engagement with the Truth and Reconciliation Call to Action #92. Call to Action #92 calls upon the corporate sector in Canada to adopt the *United Nations Declaration on the Rights of Indigenous Peoples* (UNDRIP) as a reconciliation framework and to apply its principles, norms, and standards to corporate policy and core operational activities

involving Indigenous peoples and their lands and resources. This includes meaningful consultation, equitable access to opportunities, and benefits for Indigenous peoples, First Nations, and communities.

2.2.4 Fisheries Act

The Fish and Fish Habitat Protection Program of Fisheries and Ocean Canada (DFO) reviews projects for their potential to impact fish and fish habitat and ensures compliance with the federal *Fisheries Act* and *Species at Risk Act* (*SARA*). Through this program, DFO may provide information to NB Power in order to avoid and mitigate potential negative impacts of the Project. The requirement for authorization under the *Fisheries Act* would be confirmed during the provincial EIA process (IAAC, 2022).

A *Fisheries Act* authorization would be required if the Project is likely to cause harmful alteration, disruption, or destruction (HADD) to fish habitat and/or is likely to result in the death of fish. For example, if a fish-bearing watercourse or wetland could be impacted as a result of the Project, a *Fisheries Act* authorization may be required before any impact can occur. Modifications to existing infrastructure within the marine environment, construction of new infrastructure, or adverse changes to the marine environment (e.g., entrainment and impingement, contaminants and thermal releases) may require approval through a *Fisheries Act* authorization. The *Fisheries Act* also prohibits the deposit of deleterious substances into waters frequented by fish, unless authorized by regulations or other federal legislation (IAAC, 2022).

For works in or near water where impacts to fish and fish habitat cannot be avoided, a DFO Request for Review of the proposed Project is expected to be required. The Request for Review may also be required under the *SARA* if the Project could have adverse effects to an aquatic species at risk or its habitat. If death of fish or a HADD of fish habitat can be avoided, a Letter of Advice for the Project may be issued with recommendations from DFO, stating that the Project can proceed. If death of fish or a HADD of fish habitat will likely result, DFO may communicate a need to continue the process to obtain an Authorization under the *Fisheries Act*, with or without *SARA* conditions. In either case, the cooling water and intake design would be planned in consultation with DFO and would be mitigated and offset, if required.

Consideration of the issuance of a *Fisheries Act* Authorization includes consultation with Indigenous communities and organizations. If granted, a *Fisheries Act* Authorization would include legally-binding conditions for avoidance, mitigation, and offsetting requirements commensurate with project impacts. Monitoring to validate impacts, and verify efficacy of mitigation measures and offsetting are also part of Authorization conditions (IAAC, 2022).

2.2.5 Migratory Birds Convention Act, 1994

The *Migratory Birds Convention Act, 1994* protects migratory birds and their eggs and nests. Prohibitions under the *Migratory Birds Convention Act, 1994* would apply to the Project. For example, the *Migratory Birds Convention Act, 1994* prohibits the disturbance or destruction of migratory bird nests and eggs, including for those species also listed under the federal *SARA*. It also prohibits the deposit of harmful substances into waters or areas frequented by migratory birds or in a place from which the substance may enter such waters or such an area (IAAC, 2022). The *Migratory Bird Regulations* under the Act also establish areas that provide control and management of migratory birds.

If migratory birds, their eggs, or their nests are to be relocated to facilitate an undertaking, habitat and species assessments within the Project footprint will be completed in order to determine if a Damage or Danger Permit is required. The assessment of potential to impact migratory birds or their habitat will be completed as part of the EIA process, including baseline studies for potential habitat and an assessment of project features that could interact with birds (e.g., cooling towers or lighting).

2.2.6 Species at Risk Act

The purposes of the federal *SARA* are to prevent Canadian indigenous species, subspecies, and distinct populations from becoming extirpated or extinct, to provide for the recovery of endangered or threatened species, and encourage the management of other species to prevent them from becoming at risk (ECCC, 2019b).

Under section 73 of *SARA*, ECCC or DFO may enter into an agreement or issue a permit authorizing NB Power to engage in an activity affecting a listed wildlife species, any part of its critical habitat or its residences. Permits are required to conduct an activity that would otherwise violate *SARA*'s prohibitions. The *SARA* contains prohibitions against the killing, harming, harassing, capturing, taking, possessing, collecting, buying, selling or trading of individuals of endangered, threatened and extirpated species listed in Schedule 1 of the Act. The Act also contains a prohibition against the damage or destruction of residences (e.g., nest or den). These prohibitions apply to individuals of such *SARA*-listed species that are:

- found on federal lands in a province, or on lands in a territory under the authority of the Minister of the Environment and Climate Change or of the Parks Canada Agency;
- migratory birds protected by the *Migratory Birds Convention Act, 1994*, anywhere they occur, including private lands, lands in a province and lands in a territory; and
- aquatic species anywhere they occur, including private lands, lands in a province and lands in a territory (ECCC, 2014).

No federal lands or lands outside of New Brunswick or Canada will be directly impacted by the Project; therefore, it is not anticipated that a federal *SARA* permit will be required for terrestrial species; however, NB Power intends to abide by the spirit of the federal legislation and will confirm the requirements during the EIA process in consultation with DFO and ECCC as the anticipated responsible authorities under the *SARA*.

Refer to **Section 2.2.4** for expected requirements relating to aquatic species at risk.

2.2.7 Explosives Act

Under the *Explosives Act* and *Explosives Regulations* there may be a requirement for a licence, certificate, permit or enrolment to work with explosives or restricted components, depending on the type and the amount expected to be required for blasting.

An application will be filed with the Natural Resources Canada for a permit or licence for the transportation, temporary storage and use of explosives before blasting activities are undertaken, as set out in section 7 of the *Explosives Act*.

2.3 Key Municipal Legislation

2.3.1 Community Planning Act

2.3.1.1 Building Permit

Pursuant to the New Brunswick *Community Planning Act*, a building permit must be obtained prior to the construction, relocation, demolition, or altering of any structures on land within a municipality or Rural Service District (RSD, noting that prior to January 2023 these were referred to as Local Service Districts [LSDs]). Building permits will be required for the construction of new buildings or structures as well as the demolition, relocation, alteration, or replacement of an existing building or structure associated with the Project (if any).

The Point Lepreau site is located in the amalgamated community or RSD of Fundy Shores. The Fundy Shores communities include (among others) Chance Harbour, Dipper Harbour, Lepreau, and Maces Bay. Planning and development and issuance of building permits within the RSD of Fundy Shores is administered by the Southwest New Brunswick Service Commission (SNBSC).

2.3.1.2 Re-Zoning

On June 7, 2011, the New Brunswick Minister of Environment implemented the *Lepreau-Musquash Planning Area Rural Plan Regulation*. According to the Rural Plan map, the Point Lepreau site is identified as being located within the Mixed-Use Zone. NB Power will confirm with planning officials at the SNBSC, who administer re-zoning within the RSD of Fundy Shores, that the Mixed-Use Zone designation will accommodate the construction and operation of the Project, considering that the property currently hosts a nuclear reactor.

2.3.2 Local Governance Act

Under the New Brunswick *Local Governance Act*, rock blasting activities require approval within a municipality or RSD. Blasting activities are controlled under the *Blasting Code Approval Regulation* of the Act and approval is administered by the Regional Service Commissions.

NB Power anticipates that rock removal will be required for the facility, possibly using pneumatic hammers, blasting, or expansive methods. Alternative excavation methods will be evaluated during the planning process and will include consideration of the nature and extent of excavation required.

3.0 ENGAGEMENT

Engagement activities have been ongoing since 2018, throughout the conceptual development and the pre-project phase of SMRs in New Brunswick. NB Power recognizes the importance of developing and fostering inclusive partnerships and long-lasting relationships throughout the EIA and the lifecycle of the project. By integrating various perspectives into project planning, NB Power aims to understand and address topics of interest, enhance inclusive decision-making, promote equity, and build support for this Project and general SMR deployment in New Brunswick.

This section provides an overview of the engagement undertaken by NB Power to date. It summarizes the topics of interest and support raised and provides an outline of the engagement activities that are planned or anticipated. These activities will be further informed by the EIA Guidelines and refined once the EIA process has been initiated.

3.1 Indigenous Engagement

NB Power operates PLNGS under a Power Reactor Operator Licence, with more specific requirements outlined in a Licence Condition Handbook. As a requirement of the licence, NB Power adheres to the specific requirements and guidance outlined in the CNSC's regulatory document *REGDOC-3.2.2 Indigenous Engagement.*

NB Power recognizes the history, significance, distinct interests, and culture of Indigenous peoples in New Brunswick and understands the importance of building positive relationships. NB Power has a strategic approach to First Nations relations led by the Corporate First Nations Affairs team, which acts as the central point of contact within the organization for inquiries and interests or concerns. The three tenants of NB Power's strategic approach are: Engagement and Community Relations; Education, Cultural Awareness and Sensitivity; and Employment.

Across the organization, NB Power leadership and staff, together with Corporate First Nations Affairs, work with First Nation communities and organizations to foster positive relationships by addressing their topics of interest, providing customer service, facilitating the resolution of legacy issues, and undertaking consultation and engagement activities.

An Indigenous Inclusion Plan (IIP) is being co-developed among First Nations and NB Power to build and enhance mutually beneficial relationships with First Nations communities. This plan is a living document that, as it evolves, incorporates insight and guidance from the Wolastoqiyik/Wəlastəkwiyik/Wolastoqey, the Mi'gmaq and the Peskotomuhkati/Passamaquoddy First Nations, reflecting the spirit of collaboration and mutual respect necessary for long-term, sustainable relationships.

The IIP is founded on the following five pillars:

- Leadership: Commit to inclusion as part of our journey and tracking our progress on accountability with metrics and targets around commitments.
- Relationships and Culture: Build and maintain sustainable, long-term relationships with First Nations communities that are based on positive and meaningful connections, and early and ongoing engagement.

- People and Inclusion: Create an engaged and inclusive workforce that reflects broad diversity of First Nations communities and peoples across our companies.
- Economic Empowerment: Advance economic reconciliation with First Nations communities and businesses through meaningful engagement, collaboration, and partnership.
- Environmental Stewardship: Be a trusted partner in environmental stewardship and an ally in addressing climate change.

Each of the pillars aims to support the recognition of unique cultural and historical characteristics of Indigenous peoples and their world view and strives to create mutually beneficial relationships with First Nations communities and Indigenous organizations. The pillars are interdependent, with the success in one strongly influencing the other. For example, committed leadership results in respectful and sustainable relationships allowing for direct collaboration with First Nations community members and knowledge keepers to develop an on-going integrated approach to inform the site evaluation process (Environmental Stewardship pillar). Indigenous inclusion in this process contributes to strengthening the People and Inclusion pillar by increasing capacity within the Indigenous workforce to support the nuclear industry.

3.1.1 First Nations Communities

There are three (3) First Nations in New Brunswick: Wolastoqiyik/Wəlastəkwiyik/Wolastoqey, the Mi'gmaq and the Peskotomuhkati/Passamaquoddy. The Point Lepreau property falls within the claimed Aboriginal title area of the Wolastoqiyik. The Peskotomuhkati and Mi'gmaq also assert the site as part of their respective territories. NB Power have been working with each of the three (3) Nations at the community level, along with the consultative bodies and tribal councils.

There are (16) First Nations communities in New Brunswick:

- Wolastoqey (Maliseet) First Nations:
  - Matawaskiye/Madawaska Maliseet First Nation;
  - Neqotkuk/Tobique First Nation;
  - Welamukotuk/Oromocto First Nation;
  - Bilijk/Kingsclear First Nation;
  - Sitansisk/Saint Mary's First Nation; and
  - Wotstak/Woodstock First Nation.
- Mi'gmaq First Nations:
  - Amlamgog/Fort Folly First Nation;
  - Elsipogtog/Big Cove First Nation;
  - Esgenoôpetitj/Burnt Church First Nation;
  - Oinpegitjoig/Pabineau First Nation;
  - L'nui Menikuk/Indian Island First Nation;

  - Metepenagiag/Red Bank First Nation;
  - Natoaganeg/Eel Ground First Nation;
  - Tjipogtotjg/Bouctouche MicMac First Nation; and
  - Ugpi’ganjig/Eel River Bar First Nation.
- Peskotomuhkati Nation at Skutik/Peskotomuhkati (Passamaquoddy).

There are three tribal councils, the Wolastoqey Tribal Council Inc, the Mawiw Council, and the North Shore Mi’gmaq District Council (NSMDC), which support areas such as education, health service delivery, employment, and procurement for their respective communities. NB Power also works with two (2) economic development organizations, the Mi'gmaq United Investment Network (MUIN) and the Joint Economic Development Initiative (JEDI).

There are four (4) consultative bodies that have been established by First Nations communities to ensure co-ordination of engagement and consultation on various topics of relevance to Indigenous peoples, including:

- Wolastoqey First Nation in New Brunswick (WNNB), which represents the six Wolastoqey First Nations;
- Mi’gmawe’l Tplu’taqnn Incorporated (MTI), which represents eight Mi’gmaq First Nations in New Brunswick, excluding Elsipogtog First Nation;
- Passamaquoddy Recognition Group Inc., which represents the Peskotomuhkati Nation; and
- Kopit Lodge, which represents Elsipogtog First Nation.

In addition, NB Power has engaged several other Indigenous organizations. **Appendix A1** provides a summary of engagement events to date.

3.1.2 Summary of Indigenous Engagement Activities

Prior to embarking on research and development of SMRs, NB Power had relationships with the First Nations communities and Indigenous organizations in New Brunswick, including existing capacity agreements with consultative bodies. Building on these relationships, members of the SMR team began attending pre-established meetings to introduce SMR technology and the potential project at the Point Lepreau site, and discuss potential opportunities associated with SMR development. NB Power and First Nations representatives in New Brunswick also participate on the SMR Leadership Team, which is part of a national body to keep informed, learn, and listen to the perspectives of all regarding SMR development and deployment.

NB Power recognizes that a collaborative, inclusive program is required and has endeavored to create such a program, acknowledging that it is an ongoing process.

To date there have been over 100 meetings involving First Nations communities and Indigenous organizations and youth. Engagement initiatives with First Nations have also included information sessions about SMRs held in many of the communities. Youth engagement activities are also included in the IIP.

EIA baseline studies have also been designed to be inclusive and incorporate Indigenous knowledge (IK) and perspectives. Where First Nations are leading studies or contributing IK or

guidance to a study or assessment, the IK will be braided into the baseline studies and EIA process with the guidance of each First Nation. EIA documentation will be shared with First Nations for their review and comment prior to submission to the regulator. As part of the engagement process, a list of identified baseline studies was shared with First Nations to provide information about the site evaluation process and to identify interests in leading, participating, or reviewing the relevant documentation. Several of the studies currently being undertaken to describe the baseline conditions for the EIA have been designed and planned with the participation of First Nations communities. These include the aquatic and terrestrial baseline studies (Dillon and SOAR, 2023a,b), marine and archaeological studies to be designed and undertaken in 2023, and the on-going Sustainability and Well-being Assessment. Indigenous Land and Resource Use Studies and IK studies are being completed by each of the four consultative bodies representing the three First Nations.

Appendix A1 summarizes the engagement activities that have occurred since 2018 up to June 2023. Key activities to date are summarized in **Table 3.1**.

Table 3.1: Key Indigenous Engagement Activities

Year	Event
2018	Discussion to introduce the topic of SMRs with Wolastoqey First Nation in New Brunswick (WNNB), Mi'gmawe'l Tplu'taqnn Incorporated (MTI), the Peskotomuhkati, and Kopit Lodge.
2019	Hosted a workshop for Economic Development Officers within the sixteen First Nations communities to begin discussions about economic development and equity.
2019/2020	Scoped environmental studies for site evaluation, employing an inclusive approach. Studies required for site evaluation and EIA were shared with First Nations to identify their interest in participation/capacity-building, leading, or being informed about the proposed study. Work on these studies proceeded in accordance with this feedback.
2019/2020	Began equity discussions with WNNB and North Shore Mi'gmaq District Council (NSMDC).
2020	Drafted the first revision of an Indigenous inclusion plan and sought input and feedback from First Nations communities and Indigenous organizations.
2021	Natural Resources Canada (NRCan) established an Indigenous Advisory Council for the SMR Action Plan, including two Indigenous representatives from New Brunswick.
2022	NSMDC hosted an SMR Symposium for First Nations communities including Wolastoqey.
2022	Participated in an inclusive, collaborative SMR Supply Chain meeting, supported by Opportunities New Brunswick (ONB), Canadian Manufacturers and Exporters (CME), First Nations Power Authority (FNPA), and Atlantica Centre for Energy, and featuring speakers and participants from First Nations communities and Indigenous organizations across New Brunswick.
2022	Established a Working Group and Steering Committee for Indigenous inclusion, both including representatives from First Nations communities and Indigenous organizations in New Brunswick.
2022/2023	Initiated Indigenous inclusion through field programs to support Site Evaluation (to support CNSC Licensing requirements) and the EIA. This continued into 2023 field work and recommendations from the studies are being incorporated into the programs, where possible.

3.1.3 Summary of Topics of Interest

A comprehensive summary of the topics of interest specific to the Project from First Nations communities and Indigenous organizations is in development through the engagement process. NB Power has specifically noted topics of interest identified in interventions from recent

relicensing activities for the existing PLNGS, community engagement, and the designation requests for a review under the federal *Impact Assessment Act*.

Topics raised to date have been identified and addressed, and additional topics will continue to be addressed during design of the Project and through the EIA process. For example:

- In June 2022, there were several meetings with the Wolastoqiyik First Nations communities. The communities asked questions on a range of topics, including: the transportation and disposal of nuclear waste, construction, human health, cumulative effects, impacts to Indigenous rights, and environmental impacts.
- Kopit Lodge has expressed concerns about the general Point Lepreau site's potential to impact lands and waters. A summary of concerns was outlined in the Kopit Lodge and Elsipogtog First Nation written submission to the CNSC in relation to a licence renewal application for the PLNGS (Kopit Lodge and Elsipogtog First Nation, 2022).
- In 2022, a summary of PLNGS Licence Renewal intervenor comments to the CNSC that related to proposed SMRs in New Brunswick was compiled.

A sampling of key topics of interest raised has been compiled from various sources and is included in **Table 3.2**, along with NB Power's current discussion points. Topics of interest raised by First Nations communities and Indigenous organizations will continue to be addressed in future engagement activities during the EIA and licensing processes.

Table 3.2: Key Topics of Interests from Indigenous Engagement

Item #	Topic	Interests	Discussion
1	Land Access and Traditional Use of the Land	The primary impact of the Point Lepreau Nuclear Generating Station (PLNGS) facility is the loss of access to traditional lands. The property is strictly controlled and First Nations community members are restricted from accessing the property and lands. Inability to practice traditional land use activities (e.g., hunting, fishing, fishing, trapping, camping, gathering, etc.) Effects on the ability to exercise 1) right to community health and wellbeing, 2) right to consultation/engagement (including consideration of Indigenous knowledge [IK]), 3) right to environmental health, 4) treaty rights, 5) right to benefit from title lands (e.g., compensation for	Indigenous Land and Resource Use / IK studies are being completed by the Peskotomuhkati, Mi'gmaq, and Wolastoqey First Nations. These studies are likely to inform assessments on impact to Indigenous rights by each First Nation related to various considerations including loss of access to traditional lands and the right to benefit from use of resources on traditional lands. The proposed small modular reactor (SMR) development would be located within the existing property boundary of the PLNGS. Access to the PLNGS property is strictly controlled for security and safety purposes in accordance with regulatory requirements for nuclear facilities as legislated by the *Nuclear Safety and Control Act* (*NSCA*) and implemented by the Canadian Nuclear Safety Commission (CNSC). NB Power makes every effort to ensure First Nation community members are provided safe access to perform ceremonies, harvest sweetgrass, or otherwise spend time on the land. First Nation community members have provided insight regarding the presence of sweetgrass and other culturally important plant species on the property and have harvested the sweetgrass at the appropriate time of year to encourage continued growth. NB Power has an Indigenous engagement program and will work with the First Nations on an Indigenous Inclusion Plan (IIP) to address various areas of inclusion

Item #	Topic	Interests	Discussion
		operating on traditional land), 6) right to free, prior and informed consent.	including, relationship-building, equity, and environmental stewardship. As part of conducting studies to characterize the natural environment at the Point Lepreau property for the environmental impact assessment (EIA), the aquatic and terrestrial habitat characterization was Indigenous-led and the resulting reports are braiding IK and western science together to provide a more holistic characterization of the property and surrounding environment/ecosystems.
2	Consultation and Engagement	Concern that First Nations have not been and/or will not be properly engaged or consulted, including First Nation youth.	NB Power is committed to meaningful engagement throughout the planning phases of the Project. As part of the EIA process, there will be various opportunities for engagement (e.g., comment on draft study guidelines, Terms of Reference, the EIA Report, and various meetings held by NBDELG and/or NB Power). Once the proposed project is formally registered with NBDELG, the Crown will have a formal duty to consult First Nations and accommodate, if appropriate (e.g., in accordance with the NB Department of Aboriginal Affairs protocol). An on-going requirement for the lifecycle of an approved nuclear facility, including the proposed Project, is continued, meaningful engagement. This is mandated by the CNSC and a condition of the operating licence. NB power would meet this requirement for an approved SMR facility.
3	Impacts on the Environment	Psychological impact related to concerns of land users consuming potentially contaminated wild foods.	NB Power is undertaking a Sustainability and Wellbeing Assessment related to the proposed development of the ARC SMR. This study considers potential impacts to mental wellbeing of communities, including more vulnerable sub-groups like women and children, minorities, and the elderly. First Nations will be asked to share information about their community/organization's concerns, such as psychosocial impacts described here. These concerns will be acknowledged, assessed and mitigated to the extent practicable as part of the EIA studies for the overall proposed development.
4	Impacts on the Environment	Concerned that the Project will impact species and species habitats for terrestrial species (including birds) and marine species (including fish).	As part of the EIA, several baseline studies are being completed to understand aspects such as surface and groundwater, marine species and habitat, avian, terrestrial, and aquatic habitats and species compositions, including species at risk. Indigenous Land and Resource Use and IK studies are being completed and will provide information about culturally important species, which will be braided into the EIA. This information will be used to influence the engineering, design, and location of the proposed SMR and associated infrastructure. In the case of birds, it will also be used to influence lighting and the height of infrastructure, where possible. The EIA and subsequent licensing process with the CNSC will consider the potential project-environment interactions for each of the components described above,

Item #	Topic	Interests	Discussion
			among others. The conditions associated with both of these approval processes will serve to mitigate potential impacts to species and/or their habitats.
5	Human Health	Short-term health effects, long-term intergenerational health risks, and any cumulative effects.	The evaluation of short- and long-term health effects and intergenerational health risks associated with the proposed development of the ARC SMR will be evaluated through the completion of various assessments, including Human Health and Ecological Risk Assessments, Sustainability and Wellbeing Assessment, and a Cumulative Effects Assessment. Outputs from these assessments will inform the overall EIA and determine whether there are adverse effects on human health.
6	Human Health	The risk of worker dose and resulting health impacts.	The *Radiation Protection Regulations*, established by the CNSC, set limits on the amount of radiation the public and nuclear energy workers may receive. Prior to the ARC SMR facility becoming operational, workers will receive specific training in radiation protection, how to measure it and detect it, and how to ensure they are protected. The radiation protection program directives will follow federal and provincial regulations and will be approved by the CNSC, the lifecycle regulator for nuclear facilities.
7	Nuclear Safety and Security	Potential impacts of an accident or malfunction, including one caused or exacerbated by extreme weather events that may be influenced by climate change or an earthquake. Potential effects of an accident or malfunction on lands and air quality outside New Brunswick and outside Canada. Concern of individuals who live or exercise rights near the property regarding the risk of major accidents or malfunctions.	Advanced SMRs have inherent safety characteristics and utilize the concept of passive safety. This means that they have fewer complex systems and equipment and require very little operator involvement. For example, they can shut themselves down without operator intervention. The CNSC is a world-class nuclear regulator and ensures that every nuclear power plant in Canada meets the highest levels of safety. The CNSC's regulatory framework addresses potential accident and malfunction scenarios with design requirements identified in their various Regulatory Documents. The Provincial EIA process will also consider potential accidents and malfunctions associated with the Project. A Climate Change Assessment is being completed for the Lepreau Peninsula that will be used to inform the safety evaluation for the proposed SMR development.
8	Nuclear Safety and Security	Planning and preparedness in the case of a nuclear emergency.	Emergency response planning is a requirement for the construction and operation of a nuclear facility to ensure that adequate and timely emergency assistance is available to protect workers, the public and the integrity of site security, while mitigating adverse environmental effects in the event of an emergency.

Item #	Topic	Interests	Discussion
9	Nuclear Safety and Security	Nuclear storage and waste including, potential used fuel management, storage of long-lasting nuclear waste streams, dry canister storage silos testing.	The plan for used fuel from the proposed development of an ARC SMR is for the used fuel to be temporarily stored in the periphery of the reactor vessel coolant pool for initial cooling. After a period of time, the used fuel will be removed from the reactor and loaded into a dry shielded canister which in turn is then placed into an on-site concrete module for interim storage. Used fuel storage locations will be provided in the reactor vessel with sufficient capacity to hold an entire core load of fuel assemblies. The intent is to transfer a fuel load following up to 20 years of operation. Irradiated fuel assemblies are initially transferred from the core to these used fuel storage locations using the in-vessel transfer machine. Once the used fuel assemblies are sufficiently cool, they will be extracted and transferred directly into a commercially available dry storage module. Interim storage of used fuel within the ARC SMR site is planned for 20-year irradiation cycles and sized for a minimum of 60 years plus the decommissioning phase. Under the *Nuclear Fuel Waste Act*, the NWMO is responsible for the safe, long-term management of all Canada's used nuclear fuel, including that created using new or emerging technologies such as SMRs. Canada's plan will be implemented over many decades, and a fundamental tenant to the approach, referred to as Adaptive Phased Management, is incorporating new knowledge and adapting to new technology. NB Power and ARC have been working with the NWMO regarding the most appropriate option for the long-term disposal of used fuel from the ARC reactor.
10	Nuclear Safety and Security	Transportation of nuclear waste to and from the PLNGS site.	In Canada, the responsibility for ensuring the safe transport of used nuclear fuel is shared between the CNSC and Transport Canada. Transport Canada's Transportation of Dangerous Goods Regulations deal with the transport of all classes of dangerous goods. The CNSC's Packaging and Transport of Nuclear Substances Regulations, 2015 are primarily concerned with the health, safety, and security of the public and the protection of the environment related to the special characteristics of radioactive material, in this case used nuclear fuel. The proposed ARC SMR project would comply with the regulatory requirements of the CNSC and Transport Canada.
11	Nuclear Safety and Security	Concern regarding SMR technology and molten salt corroding the fuel bundle and about salt water due to sea spray corroding the facility, equipment, fuel storage.	The proposed ARC SMR will undergo rigorous reviews related to design, construction, operation, and maintenance. Prevention of corrosion is an important aspect of the design.

Item #	Topic	Interests	Discussion
12	Nuclear Safety and Security	Concerns regarding the proliferation of nuclear weapons, nuclear attacks, political instability and national security.	The CNSC is responsible for implementing Canada's nuclear non-proliferation policy which contains two broad, long-standing objectives: 1. To assure Canadians and the international community that Canada's nuclear exports do not contribute to the development of nuclear weapons or other nuclear explosive devices; and 2. To promote a more effective and comprehensive international nuclear non-proliferation regime. These commitments are met through compliance (by nuclear operators) with the *NSCA*. NB Power meets the applicable requirements for Safeguards and non-proliferation for the existing PLNGS. The proposed ARC SMR commercial demonstration unit will also comply with these requirements.
13	Workforce	The availability of a skilled workforce and continuation of jobs. Skilled workforce programming and support will not be included as part of the SMR development project (e.g., education, professional development, mentoring).	NB Power is working with the New Brunswick supply chain, both local and Indigenous, to identify education and training requirements and opportunities to support the establishment of a new industrial supply sector in the province. NB Power, ARC, and NB Power partners have also established partnerships with post-secondary educational institutions, including the University of New Brunswick (UNB) and New Brunswick Community College (NBCC). The companies are working with UNB's Centre for Nuclear Energy Research on advanced nuclear engineering research and development and with NBCC on program and skills development to help build the next generation of nuclear workers. Over the 2020 to 2035 time period, the development of SMRs in New Brunswick is projected to create an average of approximately 730 jobs per year over 15 years.
14	Licensing and Approvals	The CNSC licensing process is too narrow in scope to cover cumulative, social, cultural, Indigenous and human rights impacts.	Existing legislative frameworks (both provincial and federal) will consider social, cultural, Indigenous and human rights impacts, including potential impacts to section 35 rights, that may be caused by the proposed Project. In addition to the CNSC licensing process, the provincial EIA process will require consideration of social, cultural, Indigenous and cumulative impacts and measures to avoid or mitigate those impacts. There will be provisions for an opportunity to comment on the Project as part of the provincial EIA. The Proponent will have to demonstrate that the potentially affected First Nations communities and Indigenous organizations have been given the opportunity to review and comment on the Project. During a Comprehensive EIA, there would also be an opportunity to comment on draft EIA study guidelines, Terms of Reference, and the Proponent's

Item #	Topic	Interests	Discussion
			EIA Report, and at least one public meeting would be held.
15	Licensing and Approvals	The provincial EIA process is insufficient to cover federal jurisdiction.	The Impact Assessment Agency of Canada (IAAC) and Minister of the Environment and Climate Change are of the view that existing legislative mechanisms are sufficient to cover federal jurisdiction such that the Project does not warrant designation under the *Impact Assessment Act*. Existing mechanisms will provide a framework to consider the potential impacts of the Project on Indigenous peoples, including health and safety, as well as potential impacts on Aboriginal and treaty rights and interests (IAAC 2022). Existing legislative mechanisms will also provide a framework to consider any impact resulting from any change to the environment on physical and cultural heritage, the current use of lands and resources for traditional purposes, or on any structure, site, or thing that is of historical, archaeological, paleontological or architectural significance. In particular, potential effects to Indigenous peoples will be considered during assessments under the *NSCA* and the provincial EIA process, which both include engagement with Indigenous communities, groups and organizations. As well, the Province of New Brunswick confirmed that Indigenous communities, groups and organizations will be provided with an opportunity to comment on the Project as part of the provincial EIA, as discussed in the row above.
16	Licensing and Approvals	Permitting requirement scope and assessments will not cover 1) changes in water intake from the Bay of Fundy, 2) climate change impacts in the assessment, especially change in ocean temperatures and impact of the thermal plume.	Permitting associated with new infrastructure in the Bay of Fundy, if any, will be obtained from DFO if required. Changes to flow associated with the existing intake and outlet would require review by DFO and possible permitting under the *Fisheries Act* depending on the change. DFO will be a member of the Technical Review Committee for the EIA for the ARC SMR. NB Power is in the process of carrying out a climate change assessment for the Lepreau Peninsula, which will support the EIA for the Project.
17	Technology	Renewable options have not been explored as viable alternatives.	Renewables are an important part of NB Power's clean electricity generation mix. Clean electricity makes up approximately 80% of New Brunswick's production. Of that, 40% of New Brunswick's electricity requirements come from renewable sources. While all carbon-free sources are important contributors to achieving 100% clean energy supply, they each play different roles in the electricity system. To ensure that New Brunswickers can count on electricity being available when they need it, we must effectively balance supply with demand. Some renewable sources, such as wind and solar, are not able to provide electricity reliably and must be paired with a dependable source, or baseload, such as nuclear, which is available when

Item #	Topic	Interests	Discussion
			required to provide a constant amount of electricity to the grid. As discussed in **Section 1.5** of this registration document, part of the Provincial EIA process, an evaluation of the purpose, rationale and need for the undertaking, and an assessment of alternatives (i.e., renewables) will be required.
18	Technology	Inquiry surrounding choice and consideration of smaller SMR units versus SMRs.	The very small SMRs are designed for off-grid applications such as mines or remote communities such as in the northern part of Canada that rely heavily on diesel. In New Brunswick, we have a strong and stable electricity grid and thus are interested in grid-scale SMRs.

3.1.4 Future Indigenous Engagement

NB Power will build on existing engagement and consultation strategies to work with First Nations to understand areas of concern and identify mitigation measures for potential impacts the Project may have on Indigenous peoples. These strategies will be informed by requirements identified by the NBDELG through the EIA process as well as specific needs of each community (e.g., method and frequency of communication, topics for discussion). NB Power will continue to work towards braiding IK into the planning and design of studies for site characterization, and the planning and assessment of the Project. Information with respect to IK will be collected and presented with guidance from First Nation communities and organizations. NB Power will also reference IAAC's guidance for *Assessment of Potential Impacts on the Rights of Indigenous Peoples* (IAAC, 2021). The EIA will give consideration to understanding historical baseline conditions associated with the ability to transfer culture (e.g., through language, ceremonies, harvesting, and teaching of sacred laws,). The assessment will describe, to the extent possible, the pre-existing impacts and cumulative effects that have already interfered with Indigenous peoples' ability to exercise rights or to pass along Indigenous cultures and cultural practices.

NB Power is working to continue to strengthen relationships with First Nations across the province. Some examples of specific activities that are currently underway include:

- Indigenous Inclusion Steering Committee (includes NB members from the National SMR Action Plan Indigenous Advisory Council and Leadership Table, as well as a lead from Wolastoqey Nation in New Brunswick);
- Interactive SMR Information Sessions in First Nation communities;
- Indigenous Employment Strategy is being developed with Indigenous Works Canada;
- Equity discussions are occurring with several New Brunswick First Nation communities;
- Additional Indigenous-focused Procurement /Supply Chain workshops are being planned;
- IK/Indigenous Land and Resource Use Studies are currently being conducted;
- Aquatic and terrestrial baseline environmental studies are being completed in-part by an Indigenous-owned and operated consulting firm. First Nation community members are being integrated into these studies for capacity-building opportunities. IK keepers and

Elders are visiting the Project location and providing insight to be shared in the baseline studies; and

- IK will be braided with Western science into the EIA and site evaluation reports, where possible.

3.2 Public and Stakeholder Engagement

NB Power has developed a public engagement strategy with the primary goal of ensuring that information related to the health, safety, and security of the persons and environment is effectively communicated to the public through all stages of the Project. Public and stakeholder engagement includes communicating the potential benefits in terms of economy and climate change action, as well as relaying information on other topics associated with SMRs. It is an opportunity for interested parties to express their topics of interest (e.g., concerns or support) for the Project and gain information about the Project.

NB Power has also identified a preliminary list of stakeholders that could be affected by or have an interest in the Project above and beyond the general public, including:

- Members of the public with an interest in the Project;
- Residents or landowners located close to the Project site;
- Local communities, municipalities, towns or township;
- Any elected representative or government agency with an interest in the Project; and
- Federal and provincial government departments that have regulatory oversight.

3.2.1 Public and Stakeholders

Public stakeholders identified by NB Power for the Project include: the general public and individual community members (including nearby landowners); academic institutions; youth; supply chain and related industry businesses; professional associations; not-for-profit organizations, and local governments and agencies.

NB Power recognizes that each group with an interest in a potential SMR project requires and expects different types of information and those expectations can be met in varying ways. The aim is to understand each stakeholder's stated purposes, as well as their interests, concerns, information needs, and expectations of involvement. NB Power considers the communication and engagement techniques best suited to each person or group and will incorporate this information into the overall strategy as engagement activities evolve.

3.2.2 Summary of Public and Stakeholder Engagement Activities

NB Power and ARC provide information about advanced SMRs to the public and other interested and affected parties through various accessible channels, including the SMR website, social media, print materials, in-person events, and virtual presentations and gatherings.

Appendix A2 summarizes the engagement activities that have occurred since 2018 up to June 2023.

Some examples of specific activities that have occurred and are currently underway are described below.

3.2.2.1 Local Community Engagement

NB Power engages with local communities near the Project site through presentations at the PLNGS Community Relations Liaison Committee meetings, SMR company booths at open houses, and participation in community events. In addition to meetings with members of the public (i.e., local citizens), NB Power has also worked to engage local governments, providing presentations and holding information sessions and meetings with several municipalities and townships in the local area, as well as across the province through a variety of organizations.

3.2.2.2 Industry and Academic Engagement

NB Power has collaborated with technology developers and other organizations to communicate information about SMRs to a broader audience. A key example of this collaboration is the formation of the Atlantic Clean Energy Alliance (ACEA) in 2020. ACEA is a stakeholder consortium of project proponents from the private sector, academia, utilities, unions, First Nation communities, supply chain businesses, and government. NB Power has worked with ACEA on several public engagement initiatives, including webinars, editorial products, joint submissions, and educational resources.

Since 2020, NB Power has partnered with the New Brunswick Department of Education's Centre of Excellence for Energy (COEE) to facilitate learning opportunities for youth and educators. COEE is an initiative of the New Brunswick Department of Education and Early Childhood Development to invigorate sector-specific education in the school system. COEE facilitates virtual and experiential learning opportunities related to energy, including presentations, classroom visits, and plant tours. Nuclear-themed webinars and videos have been made accessible to all school districts within the province, and in-person presentations and tours of Point Lepreau for teachers and students have been undertaken.

NB Power and ARC have also established partnerships with post-secondary educational institutions, including the University of New Brunswick (UNB) and New Brunswick Community College (NBCC). Together they are working with UNB's Centre for Nuclear Energy Research on advanced nuclear engineering research and development and with NBCC on program and skills development to help build the next generation of nuclear workers. NB Power has also met with the University of Moncton to provide an overview of SMR development in New Brunswick. Both NB Power and ARC supply content to the University of New Brunswick's certificate program, Energy Fundamentals, on the topic of SMR development in New Brunswick.

Advanced SMR development in New Brunswick is expected to lead to the establishment of a new industrial supply sector. NB Power has met with numerous industry specialists, including companies and professional associations, as well as other interested organizations.

3.2.3 Summary of Topics of Interest

NB Power tracks public topics of interest related to advanced SMRs through the media, surveys, and direct correspondence. Primary topics raised to date relate to safety, waste management, and cost. NB Power strives to ensure that communications with the public address these topics of interest and provide information to demonstrate how the SMR designs being developed in the province will address these topics.

NB Power has noted public topics of interest as identified in interventions from recent relicensing activities for the existing PLNGS station activities, community engagement, and the

designation requests for a review under the federal *Impact Assessment Act* to the federal Minister of ECCC for the proposed Project (i.e., the Coalition for Responsible Energy Development in New Brunswick request July 2022, and the Sierra Club Foundation request March 2023).

In 2022, NB Power compiled a summary of intervenor comments from the CNSC PLNGS Licence Renewal that related to proposed SMRs in New Brunswick. Many of the topics of interest expressed by the public were similar to those expressed by the First Nations communities and Indigenous organizations, which are outlined in **Section 3.1.3**. These topics will continue to be addressed in planning future engagement activities with stakeholders during the EIA and licensing processes.

An example of key topics of interest raised has been compiled from various sources and is included in **Table 3.3**, along with NB Power's current discussion points.

Table 3.3: Key Topics of Interest from Public Engagement

Item #	Topic	Comment	Discussion
1	Nuclear Safety and Security	Concerns about safety.	Nuclear energy and materials are highly regulated in Canada by the Canadian Nuclear Safety Commission (CNSC). The CNSC is a world-class nuclear regulator and ensures that every nuclear power plant in Canada meets the highest levels of safety. Advanced small modular reactors have inherent safety characteristics and utilize the concept of passive safety. This means that they have fewer complex systems and equipment and require very little operator involvement. For example, they can bring themselves to a safe state without operator intervention. The CNSC licensing process will consider, among other things, whether the Proponent conforms with regulatory requirements, including appropriate safety management systems, plans and programs.
2	Nuclear Safety and Security	Concerns about the effects of climate change and that planning and preparedness is insufficient to protect human health and the environment. NB Power should be accountable to the national commitment made under Canada's *Net Zero Emissions Accountability Act*.	The overall purpose of the proposed ARC SMR is to provide reliable low-carbon electricity. To support the environmental impact assessment (EIA) and licensing of the SMR, NB Power is also in the process of completing a climate change assessment to understand potential environment-project interactions based on changing climate variables such as wind, sea level rise, and temperature changes. The results of this will inform the EIA.
3	Technology	Fuel typed used.	The ARC SMR uses a U-10%Zr (uranium with 10 percent by weight [wt%] zirconium) sodium-bonded binary metallic fuel with an average enrichment of Uranium-235 of 13.1%.
4	Reliability	Questions about whether SMRs will be reliable.	Nuclear is a predictable source that is available when required to provide a constant amount of electricity to the grid. On average, a nuclear power plant produces electricity 90% of the time. Due to their simple, inherently safe design, SMRs are expected to operate efficiently and reliably.

3.2.4 Future Public Engagement

NB Power will continue to engage and communicate with the public throughout the EIA process and various licence application phases of the ARC SMR (i.e., site preparation, construction, operation and decommissioning). NB Power will develop a detailed engagement and consultation plan to meet requirements of the EIA and CNSC licensing processes, including proponent-led engagement on the Terms of Reference. NB Power will continue to seek feedback and document the topics of interest to adjust plans moving forward.

3.3 Regulatory Engagement

As described in **Section 2.0**, the environmental permit or approvals expected to be required are summarized in **Table 2.1** and will be confirmed through the refinements to the Project design and in consultation with regulators through the EIA process.

During the early planning stages of the proposed development of the ARC SMR, NB Power has been engaging with a number of federal and provincial government departments and agencies to increase awareness of the proposed project. The meetings have also created an opportunity to gain an understanding of the regulatory requirements/processes, identify funding sources to support participation of Indigenous rights holders in the EIA and licensing processes, and create opportunities to inform the local supply chain of opportunities within the growing nuclear sector. Some of these departments are as follows:

New Brunswick

- Climate Change Secretariat;
- Department of Aboriginal Affairs;
- Department of Environment and Local Government;
- Department of Natural Resources and Energy Development;
- New Brunswick Energy Secretariat; and
- Opportunities New Brunswick.

Prince Edward Island

- Department of Environment and Energy.

Federal

- Atlantic Canada Opportunities Agency;
- Canadian Nuclear Safety Commission;
- Environment and Climate Change Canada;
- Impact Assessment Agency of Canada;
- Indigenous Services Canada;
- Natural Resources Canada; and
- Organization for Economic Cooperation and Development.

NB Power requested and established regular pre-licensing engagement meetings with the CNSC to better understand the requirements for the Licence to Prepare Site application for the ARC SMR. These discussions do not involve any binding decisions by either NB Power or the CNSC. A similar meeting series has been initiated with the NBDELG and the Department of Aboriginal Affairs. These pre-registration meetings allow for information sharing regarding various components and proponent responsibilities of both the EIA process and the Duty to Consult. Once the Licence to Prepare Site application and EIA registration document have been accepted for the proposed ARC SMR, this regulatory engagement will transition to the formal process for the respective departments.

4.0 PROJECT DESCRIPTION

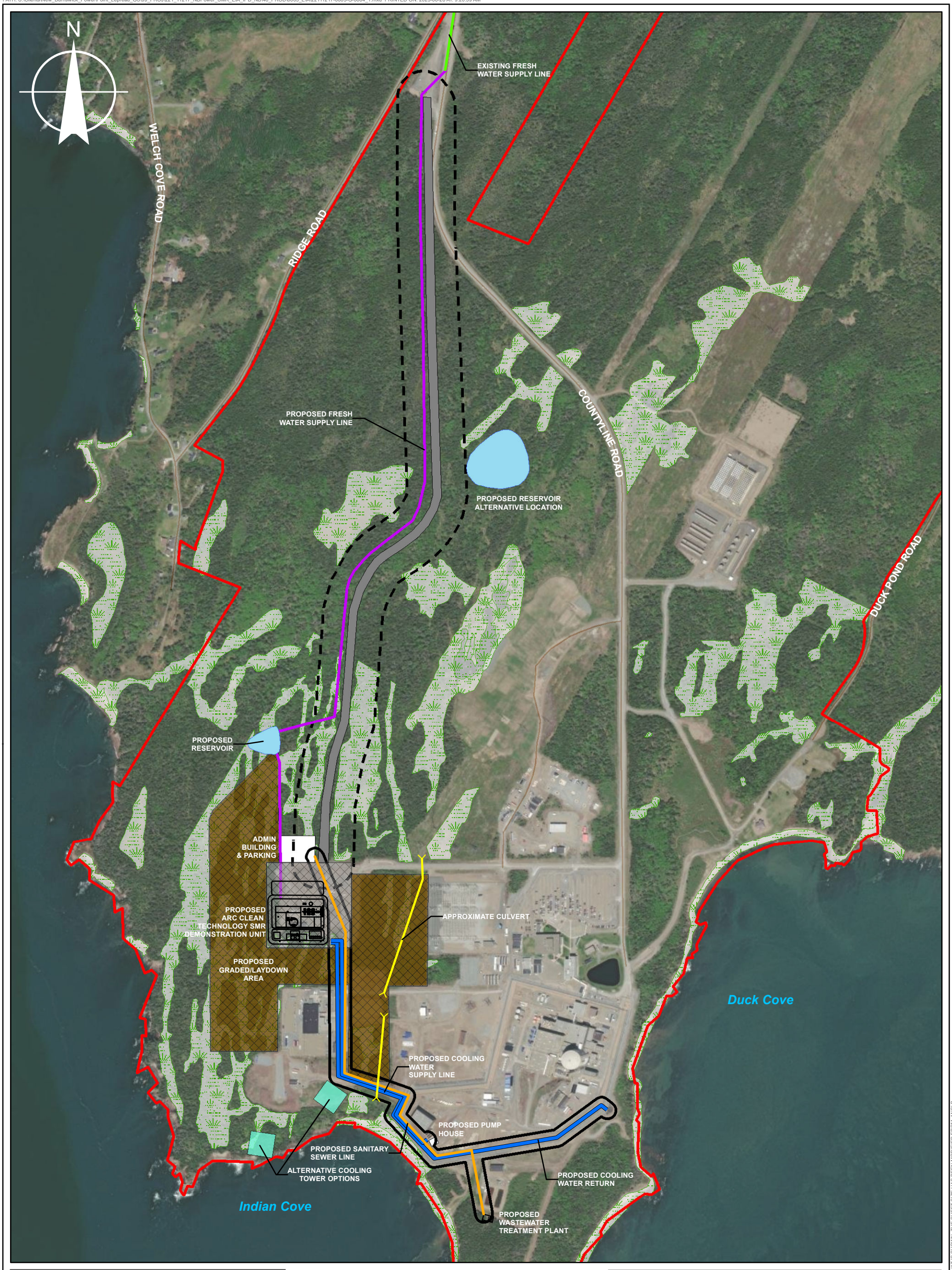
The ARC SMR is a modular, sodium-cooled fast reactor that will generate 100 to 150 MWe for the electrical grid. The Project will be the first deployment of an advanced Generation IV on-grid SMR in Canada, and the unit is expected to operate for 60 years.

The ARC facility will be located on the NB Power Point Lepreau property and form its own site to the west of the current PLNGS (**Figure 4.1**).

The following description of the Project reflects the design progress at the time of reporting. It is expected that there will be refinements to the Project design throughout the EIA process, reflecting the value of EIA as a planning tool.

4.1 Siting Considerations

New Brunswick has one nuclear power plant in the province, which is the PLNGS located at Point Lepreau. The PLNGS houses Canada's first licensed single CANDU 6 (660 MWe net) pressurized heavy water reactor, which began commercial operations as a baseload power generation facility in March 1983. The unit was subsequently refurbished, extending its operational lifespan to at least 2042. The NB Power property at Point Lepreau was originally intended to have a number of nuclear units, has an existing operating nuclear facility sited there, and has supporting infrastructure. The site is well characterized and has undergone extensive studies including four previous environmental assessments (Hickman, 2010).



LEGEND

- WETLAND
- PROPOSED ROAD RIGHT-OF-WAY
- PROPOSED ROAD CORRIDOR
- NB POWER PROPERTY BOUNDARY

0 85 170 340

1:8,500 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. IMAGERY: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
2. COORDINATE SYSTEM: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

CLIENT
Énergie NB Power
NEW BRUNSWICK POWER

PROJECT
ARC CLEAN TECHNOLOGY ADVANCED SMALL MODULAR REACTOR COMMERCIAL DEMONSTRATION UNIT - POINT LEPREAU, NEW BRUNSWICK

TITLE
SITE PLAN

CONSULTANT
wsp

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REVIEWED	JW
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
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In 2020, Fundy Engineering completed a *Baseline Environmental Desktop Analysis and Preliminary Siting Study* for the development of SMRs at the Point Lepreau site. The criteria for identifying siting options were based on an initial Project design in the 2019-2020 timeframe and decisions regarding the ability to share infrastructure with the existing PLNGS facility. The criteria included (Fundy Engineering, 2020):

- **Space required for the ARC SMR facility –** The ARC SMR facility Project components (see **Figure 4.1**), as described in **Section 4.3**, have a spatial extent and configuration that needs to be considered with the land availability when siting.
- **Location of existing infrastructure at Point Lepreau** – The location of existing infrastructure and its permanence was considered in identification of siting options. Some of the existing infrastructure cannot be re-located or modified, such as the Solid Radioactive Waste Management Facility (SRWMF). When identifying possible candidate sites for the Project, those areas were avoided. Other infrastructure, such as construction stores and parking, could be relocated to facilitate the placement of an SMR. Consequently, those areas were considered for possible candidate sites.
- **Proximity to the existing switchyard and potential expansion of the switchyard** – During discussions with NB Power and vendor representatives, it was noted that it would be desirable to locate candidate sites as close to the existing switchyard as possible. The reasoning was to potentially reduce overall infrastructure costs. It was determined to be advantageous to locate the candidate sites such that the existing switchyard could be expanded to include additional infrastructure if required.
- **Proximity to existing cooling water infrastructure** – The existing condenser cooling water system at the Point Lepreau site was designed to accommodate two CANDU 6 reactors. An opportunity for cooling water to be supplied via this system to any SMRs on-site was considered practical and, therefore, the candidate sites were located, if possible, near the existing system to reduce overall infrastructure costs. This criterion allowed for cooling options to remain open regarding design of the plant at the site selection stage.
- **Proximity to the existing sanitary wastewater treatment plant** – Collection and treatment of sanitary wastewater would be required. If the existing system could handle additional loadings, then it would be desirable to locate the candidate sites as close as possible to reduce overall infrastructure costs. It has since been determined that new wastewater treatment plant will be required.
- **Impact on watercourses and wetlands** – There are several watercourses and wetlands located on the Point Lepreau site. It was identified as preferable to avoid these features where possible to limit environmental impacts. Disturbance will be minimized where possible with disturbances offset with compensation measures.
- **The groundwater divide** – One of the safety features of the SMR is placement of the reactor in a below-ground containment structure. Groundwater at the Point Lepreau site is found at shallow depths and a groundwater divide may bisect the site. It would be more preferred to locate a candidate site such that the reactor does not span any groundwater divide. This would potentially reduce the amount of groundwater pumping that may be required to keep a vault or pit dry.

- **Impact on undeveloped lands** – Some portions of the Point Lepreau site have never been developed. If possible and practical, it is preferable to use developed lands first as opposed to undeveloped lands within the existing property. This would limit the potential environmental impacts associated with the Project.
- **Flood and tidal impact thresholds**– The reactor grade level is at least 12.8 m higher than current mean sea level to mitigate potential for tsunami-induced flooding. Climate change projections were applied to tsunami runup combined with projected increases to sea level and high tide, which resulted in this recommendation (NB Power, 2023b).

The site selection variables were ranked via a simple analysis where each variable was assumed to be weighted equally. Two study areas, referred to as the "West Study Area" and the "Northeast Study Area" (see **Figure 5.4**), were identified as possible locations for SMR siting and were assessed during Project-specific baseline studies. The exercise revealed that siting a future SMR facility in the developed area to the west of the PLNGS (the West Study Area) is the preferred location for the ARC SMR with respect to potential reduced environmental impact, reduced infrastructure costs, and opportunity for infrastructure expansion. The facility planning for the exact siting of the ARC SMR demonstration unit, and associated buildings and infrastructure (i.e., the Project footprint) is underway. The potential bounding extent of the Project footprint is within the NB Power property boundary shown on **Figure 1.1**.

4.2 Safety Objectives and Design Approach

The life cycle of the ARC SMR corresponds to the licensing phases: Site Preparation, Construction, Operations, and Decommissioning. Depending on the nature of the facility life cycle, the following safety considerations are of importance to varying degrees: conventional safety, nuclear safety, and radiological safety. Whereas conventional safety is applicable to all four life-cycle phases, nuclear and radiological safety achieve prominence during the Operations and Decommissioning phases.

As a Generation IV reactor, the ARC SMR utilizes international best practices from the hierarchy of safety standards developed by the Generation-IV International Forum. The safety and reliability goals for the ARC SMR design are based on the following high-level objectives:

- The ARC SMR will excel in operational safety and reliability.
- The ARC SMR will have a very low likelihood and degree of reactor core damage.
- The ARC SMR will reduce the need for off-site emergency response.

These objectives will be accomplished through establishing design goals that minimize the occurrence of operational events that can cause an outage, improve worker safety, and reduce routine emissions. Further, inherent and passive safety design features will manage and mitigate the consequences of severe plant conditions.

4.2.1 Nuclear Safety and Design Philosophy

The conventional safety design of the facility will follow generally accepted safety practices and standards associated with industrial facilities subject to the applicable provincial and federal regulations through all life cycle phases.

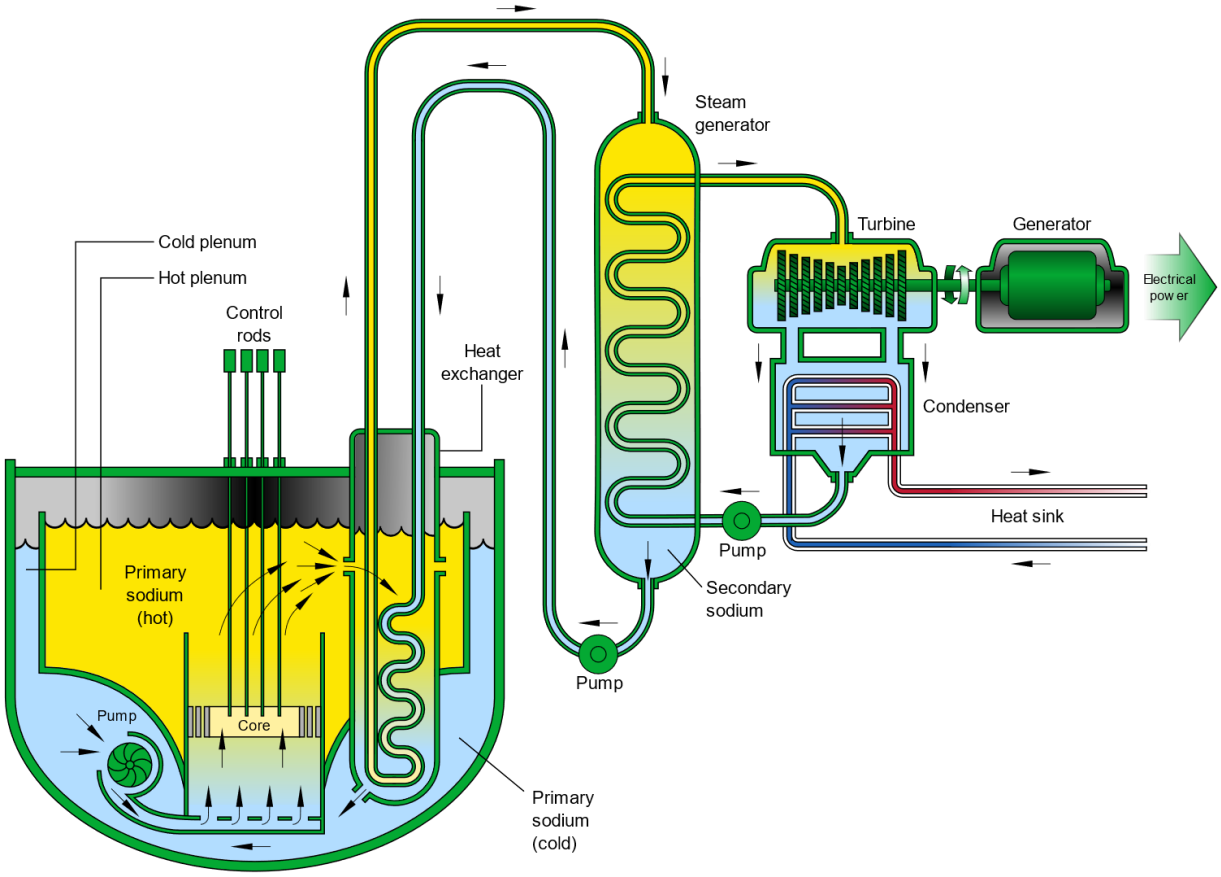
Nuclear safety in the ARC SMR design is assured by requiring that there are systems important to safety available to perform the following fundamental safety functions in all plant states (plant states range from normal operation to severe nuclear event and are described in **Section 4.8**):

1. Control of reactivity;
2. Removal of heat from fuel;
3. Containment of radioactive material;
4. Shielding against radiation;
5. Control of operational discharges and hazardous substances, as well as limitation of accidental releases; and
6. Monitoring of safety-critical parameters to guide operator actions.

The nuclear safety approach for design of the ARC SMR ensures safety for any plant state by applying a "defence-in-depth" philosophy. At a high level, defence-in-depth first emphasizes prevention of events, then focuses on mitigation of consequences where prevention fails. Defence-in-depth is implemented through a combination of control systems, inherent characteristics, engineered safety systems (passive and non-passive), and complementary design features. The application of each level of defence-in-depth are discussed in further **Section 4.8** as it pertains to each system and in more detail in the Licence to Prepare Site (NB Power, 2023a) and Site Evaluation Report (NB Power, 2023b).

4.3 Project Components and Infrastructure

The ARC SMR is a pool-type sodium-cooled fast reactor. As illustrated on **Figure 4.2**, heat generated in the reactor core by the fission process is removed by the primary liquid sodium coolant, which is circulated by pumps. This heat is then transferred to a secondary sodium loop in the intermediate heat exchangers (IHX), where it is then used to produce steam in a steam generator. This steam is used to drive a turbine connected to a generator set, which produces electricity for the grid. The low-pressure steam is condensed and recycled back into the steam generator. Each major system of the ARC SMR will be described in further detail in subsequent sections of this document.



Source: Generation IV International Forum, 2023

Figure 4.2: Typical Sodium-Cooled Fast Reactor

4.3.1 Plant Layout

The plant layout for the ARC SMR is based on typical single unit arrangements for a nuclear power plant. The major buildings and structures associated with the overall arrangement are those necessary to directly support the long-term operation and maintenance of the plant. The plant layout is shown on **Figure 4.2** with an artist rendition of the facility shown in **Figure 4.3**. The SMR facility area is expected to be approximately 190 metres by 285 metres (54,000 square metres) with all buildings within that area. This area excludes external facilities (e.g., parking areas) and temporary laydown areas required during site preparation and construction.

The major buildings and enclosures associated with the plant are described below. Other plant buildings and structures include the training centre/office, warehouse, water/sewerage infrastructure, fire water storage and pumps, switchyard, cooling towers and other plant services (e.g., parking, security).

The **reactor building** provides an environmental boundary, biological shielding, and one of multiple physical barriers for containing radioactive material in the event of an accident. It houses the reactor vessel, the intra-building cask and the collector cylinder for the reactor vessel auxiliary cooling system. It also houses the piping for the intermediate heat transfer system, primary sodium system, direct reactor auxiliary cooling system and the reactor vessel auxiliary

cooling system and ducting (**Figures 4.6 and 4.7**). It is a cylindrical concrete containment structure with the reactor vessel located below ground level and an operating deck above. The containment structure is designed to withstand earthquakes, hurricanes, other site hazards, and aircraft crash impact.

The **reactor auxiliary building** surrounds the reactor building. It is a multi-storey structure connected to the reactor building by a bulkhead and transfer chamber through the reactor auxiliary building. It is designed to withstand earthquakes, hurricanes, and other site hazards. It also accommodates the piping and ducts for the intermediate heat transfer system.

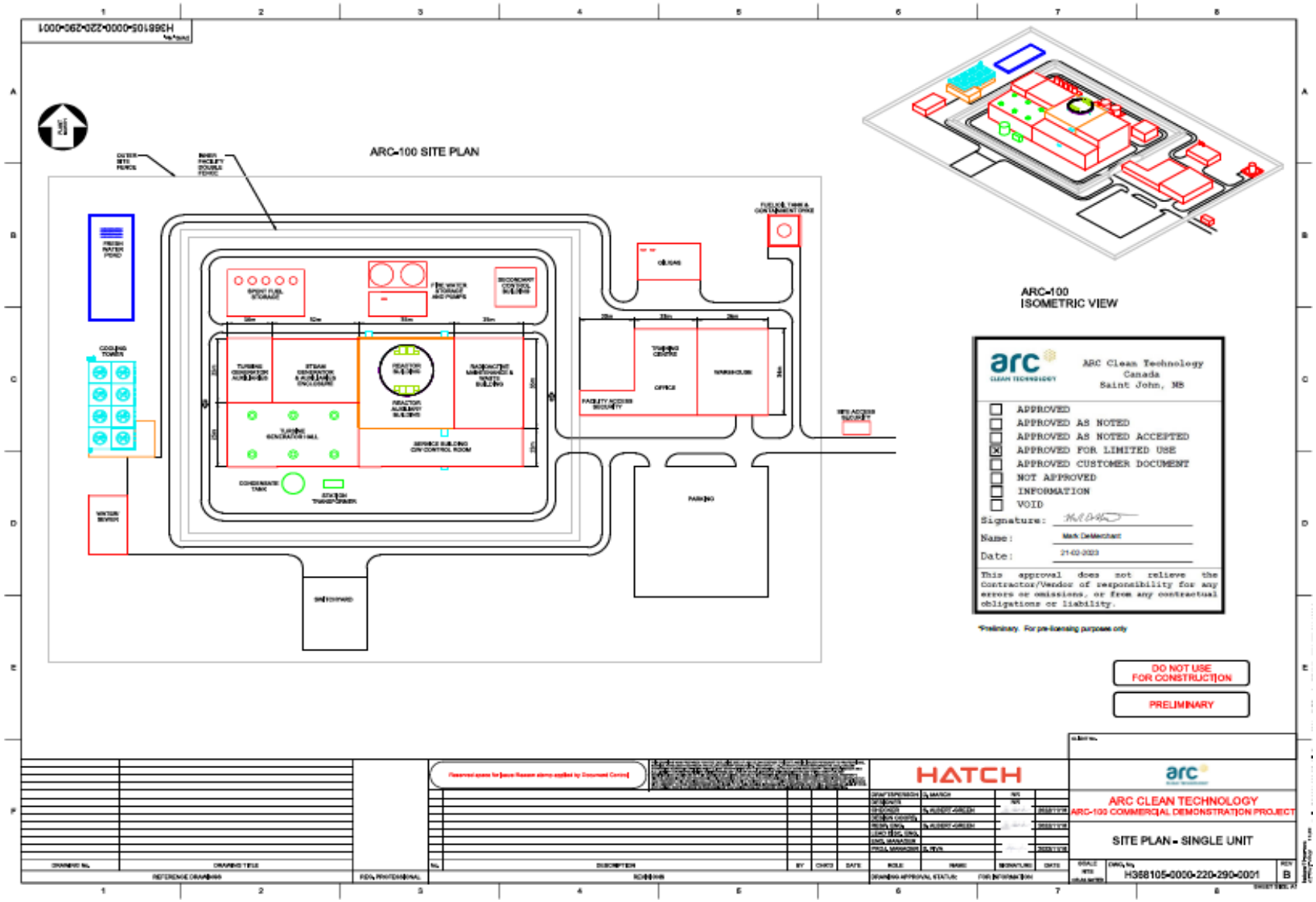


Figure 4.3: Preliminary Plant Layout of the ARC SMR

Figure 4.4: Artist Rendition of ARC SMR Facility Layout

The **reactor maintenance and radioactive waste building** houses facilities and services for solid and liquid waste management, and for maintenance and operation of the plant. It is a multi-storey structure connected to the reactor building by a bulkhead, used for movement of fuel assemblies, reactor components and personnel.

The **service building** houses systems related to controlling plant operation, including the **main control room**. It is a multi-storey structure designed to withstand earthquakes, hurricanes, other site hazards, and aircraft crash impact.

The **secondary control building** houses the **secondary control room** and is designed to withstand earthquakes, hurricanes, other site hazards, and aircraft crash impact.

The **turbine generator hall** houses the turbine generator. The turbine generator auxiliary systems, condenser, and condensate and feedwater systems are housed both in the turbine generator hall and the adjacent **turbine generator auxiliaries structure**.

The **steam generator and auxiliaries enclosure** houses the steam generator system and intermediate heat transfer system. It is designed to withstand earthquakes, hurricanes, and other site hazards. The wall between the turbine generator hall and the steam generator and auxiliaries enclosure is designed to withstand turbine-generated missiles.

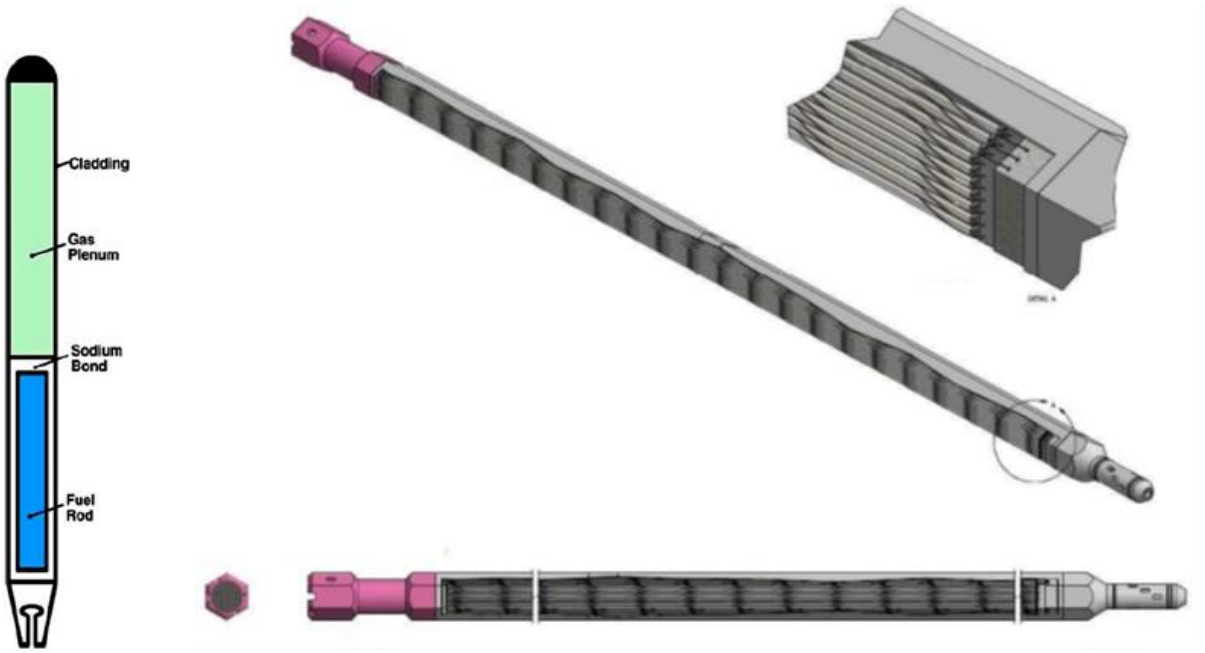
4.3.2 Nuclear Reactor Core and Fuel Assemblies

The ARC SMR utilizes sodium-cooled fast reactor technology (**Figure 4.4**). Sodium-cooled fast reactors use a liquid metal (sodium) as a reactor coolant instead of light or heavy water used in most nuclear power plants. This allows for the coolant to operate at higher temperatures and lower pressures, creating significant safety margins and improved efficiency. Sodium-cooled fast reactors also use a fast neutron spectrum, meaning that neutrons cause fission without having to be slowed or moderated first. This allows the core to be compact.

The amount of liquid sodium for the ARC design is approximately 700 m^3, with about 500 m^3 in the reactor itself, and the remainder in the heat transfer loops. Liquid sodium provides a large safety margin in the event of a malfunction, and high thermal efficiency for electricity generation. It has a high boiling point of 880°C, which allows for a core outlet coolant temperature of 510°C and a margin of safety to boiling of 370°C.

The ARC SMR uses a U-10%Zr (uranium with 10 percent by weight [wt%] zirconium) sodium-bonded binary metallic fuel, with an average uranium enrichment of 13.1 wt% uranium-235. The maximum enrichment will be less than 20 wt% in compliance with the International Atomic Energy Agency (IAEA) requirements for high-assay low-enriched uranium (HALEU). The U-10%Zr has a low operating temperature that provides a large safety margin to fuel melting.

Approximately 100 fuel assemblies (**Figure 4.5**), containing approximately 220 fuel pins each, will be placed inside the reactor core in the reactor vessel and remain in place for up to 20 years, depending on electrical output. During refuelling, the irradiated fuel assemblies will be transferred to the used fuel storage site (see **Section 4.3.13**) within the reactor vessel, and new fuel assemblies will be loaded into the core.



Fuel Pin *Fuel Assembly*

Source: NB Power, 2023b

Figure 4.51: Schematic of a Fuel Pin and Fuel Assembly

4.3.3 Nuclear Reactor Vessel System

The reactor vessel design is based on the established pool-type sodium-cooled fast reactor technology, where a pool of sodium is contained within the reactor vessel and top plate (**Figure 4.6**). The system consists of the **reactor vessel**, the **reactor top plate** and the **top plate mounted components** (i.e., rod drive mechanisms).

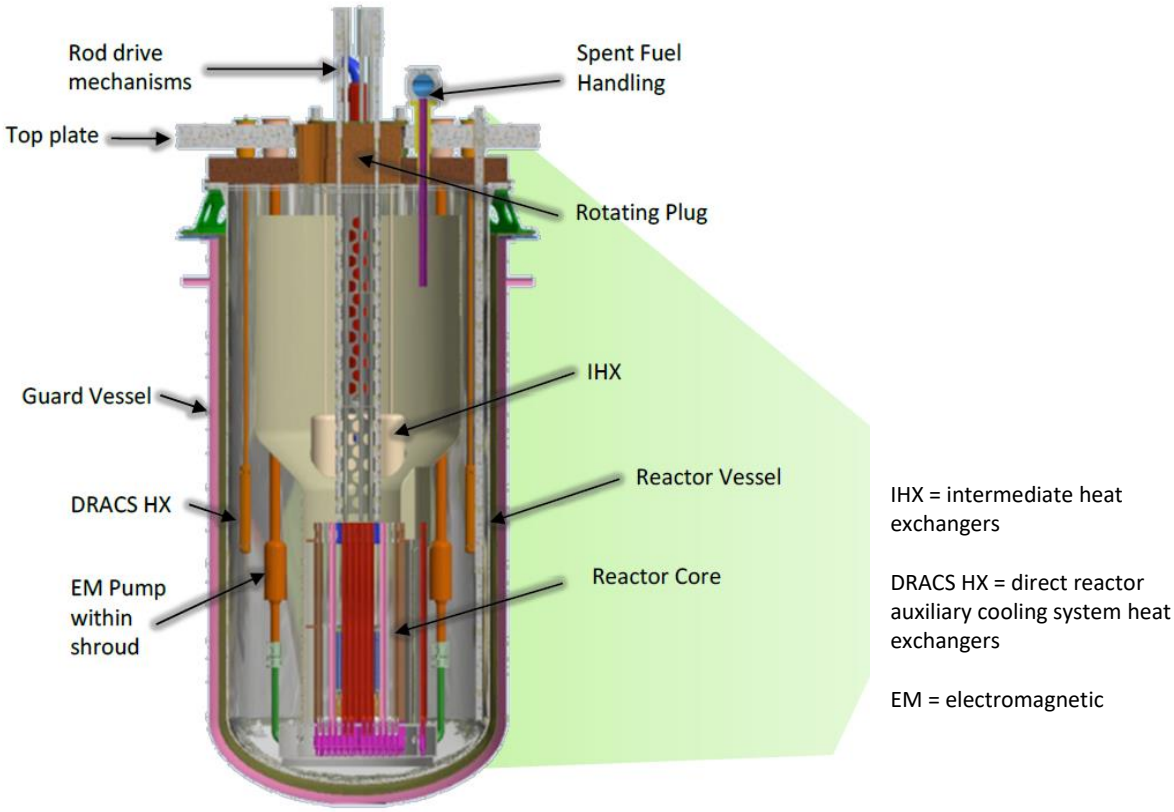


Figure 4.623: ARC SMR Reactor Vessel System

The reactor vessel is enclosed within a **guard vessel**, which serves as a leak-proof jacket. The guard vessel also serves as the heat transfer surface for the reactor vessel auxiliary cooling system. The reactor vessel is filled with sodium and has an argon cover gas blanket kept slightly above atmospheric pressure. Access to the fuel and various components within the reactor vessel is from the top of the reactor, eliminating penetrations of the pressure retaining sections of the vessel below the top plate.

The low operating pressure, elimination of penetrations below the reactor top plate, and the double vessel design practically eliminates the possibility of a loss of coolant.

4.3.4 Nuclear Heat Transport and Auxiliary Systems

Heat transport from the reactor core is performed by three heat transport systems.

The **primary heat transport system** is the coolant loop of the reactor core, contained in the reactor vessel (see **Figure 4.6**). It uses four pumps located within the reactor vessel to circulate the liquid metal sodium, to carry the heat from the core to the heat exchangers. The hot sodium is pushed out of the primary sodium pool at the outlet of the core, through the intermediate heat exchangers and into the cold pool. The intermediate heat exchangers bridge the hot and cold pools and provide the means for transferring heat to the intermediate heat transport system. The **primary sodium processing system** provides purification of primary liquid sodium within the reactor vessel. Within the reactor vessel there is argon cover gas above the primary liquid sodium

pool. The argon gas is slightly pressurized and prevents any unwanted air ingress. The **gaseous radioactive waste system** purifies the argon cover gas.

The **intermediate heat transport system** is a sodium fluid system for transporting reactor heat to the steam generator. It mitigates the risk of any water from the steam generator system migrating back into the reactor coolant system. It consists of two piping loops between the intermediate heat exchangers and the steam generator. Each piping loop includes a minimum of one pump to circulate the sodium, and permanent magnet flowmeters in the cold leg. It contains engineered measures to both robustly prevent water leaks from the steam generator and to detect the presence of any leaks that do occur and act with sufficient grace time to ensure that any failures remain small and local.

The **steam generator system** includes the **steam generator**, the **sodium dump valve**, and the **intermediate sodium processing system** (used to maintain coolant purity), which are located in the steam generator and auxiliaries enclosure. Steam is produced in the steam generator to drive the turbine generator, which produces electricity (**Figure 4.6**). The intermediate heat transport system and the steam generator system provide heat removal during normal operation, including decay heat removal when the reactor is shut down.

The steam generator is a helical coil, shell-and-tube exchanger. Hot sodium heats the water to generate superheated steam for the steam turbine plant. Sodium flows through the shell side of the steam generator, while water flows through the helical coil tube bundles. The steam generator system is equipped with isolation valves that close on demand to isolate the steam generator from its feedwater system and the turbine generator. It also has dump valves that open on demand to drain the water and steam inventories from the steam generator.

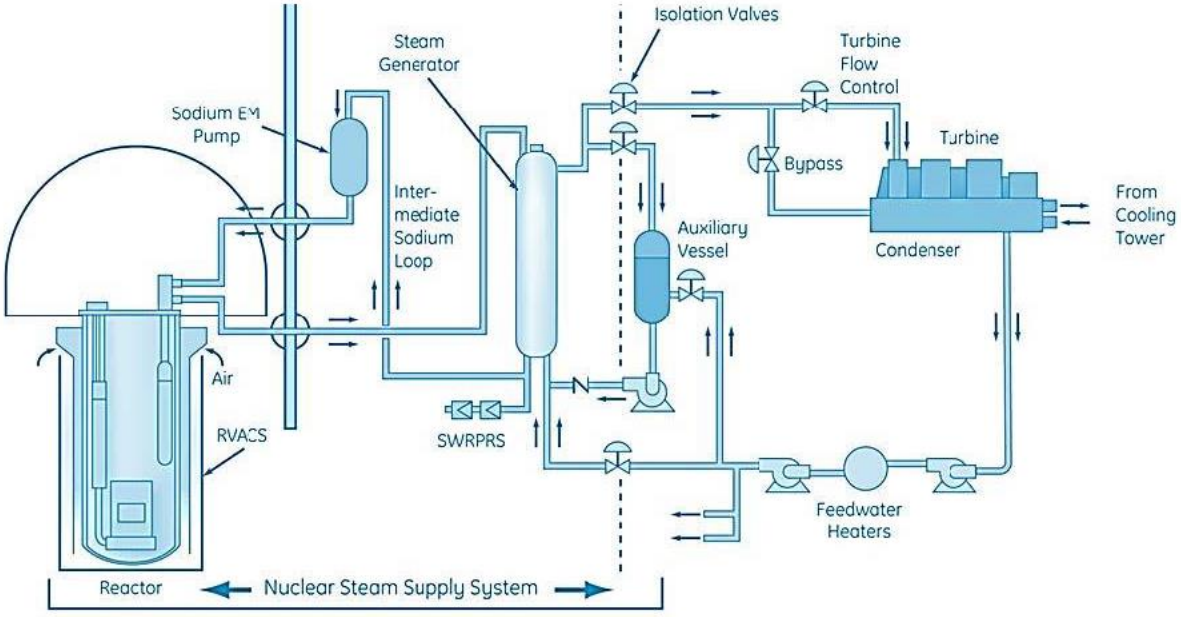


Figure 4.74: Steam Generator and Auxiliaries Flow Diagram

4.3.5 Passive Nuclear and Emergency Core Cooling Systems

The core cooling and emergency core cooling systems are independent systems that act to remove heat from the reactor core. They include the direct reactor auxiliary cooling system and the reactor vessel auxiliary cooling system. Both are passive systems, meaning that they do not depend on an external input such as actuation, mechanical movement or supply of power.

The **direct reactor auxiliary cooling system (DRACS)** uses natural convection to transfer heat from the sodium pool to air heat exchangers. Air heat exchangers located within the reactor building use fans for forced convection to transfer heat to the atmosphere during normal operation, but can rely on natural air circulation to transfer heat to the atmosphere during accident conditions, without requiring emergency power. The cold air inlet vents and hot air outlet vents for each cooling loop are physically separated within the reactor auxiliary building.

The **reactor vessel auxiliary cooling system (RVACS)** operates continuously to maintain the reactor vessel and guard vessel shells within structural temperature limits. It is composed of a collector cylinder with vertical ducts to draw cold air in, and additional vertical ducts to discharge hot air to the environment. The collector cylinder is located between the guard vessel and the concrete inner shaft that supports the reactor vessel.

4.3.6 Nuclear Containment Structure

The **containment structure** (**Figure 4.7**) is part of a multiple barrier approach to confinement of radionuclides and containment against releases and completely encloses the reactor vessel to ensure that any release of radioactive materials to the external environment during normal operation or accident conditions remain well below regulatory limits. It includes a cylindrical concrete structure with the reactor vessel located below ground level and an operating deck above the reactor vessel top plate. The structure includes containment doors, and a set of isolation valves in certain process lines or dampers in the ventilation ducts penetrating the containment envelope.

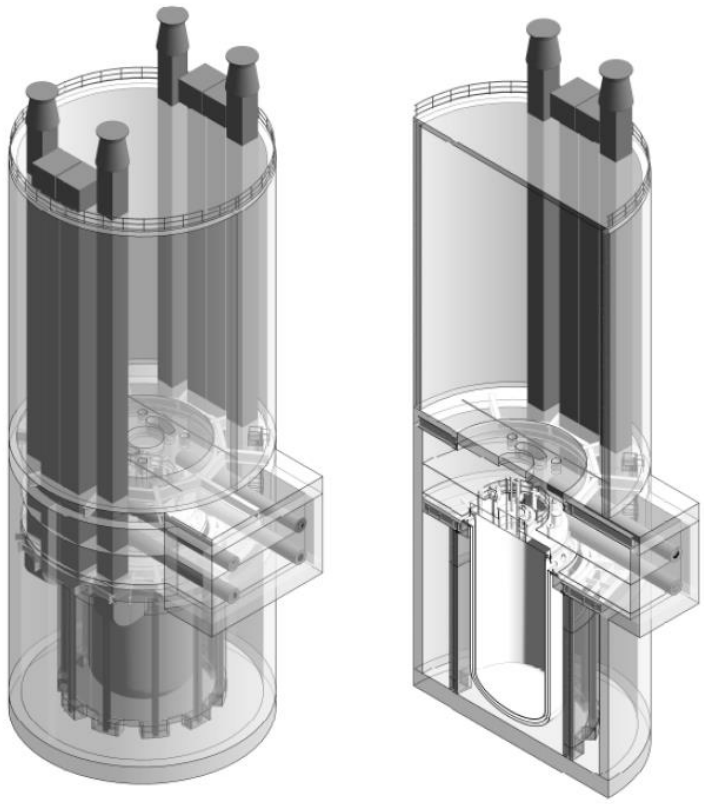


Figure 4.85: ARC SMR Containment Structure

4.3.7 Power Production System

The **power production system** is a turbine generator system, typical of what is used in any current power plant, that uses the steam produced to rotate the turbine and provide the mechanical energy for the generator to produce electricity from an electromagnetic field. The main components are:

- The **turbine main steam system**, which transports the steam produced by the steam generator to its point of use and extracts its available thermal energy. Included in this system are the components needed to support the operation of the main turbine generator. The auxiliary systems provide cooling, sealing, lubricating, and control functions necessary for safe and efficient operation of the turbine generator.
- The **main turbine** will be a single casing, non-reheat, air-cooled, combined intermediate- and low-pressure turbine, with a side exhaust.
- The **generator** will be a highly optimized high-efficiency, externally cooled unit. The stator, which converts the rotating magnetic field to electric current, will be equipped with multi-chamber cooling to allow efficient heat transfer, and a direct axial rotor winding cooling system to ensure temperature uniformity.
- A **condensate and feedwater system** will collect water from the main turbine and auxiliaries after available thermal energy in the steam has been extracted. This will be conditioned and returned to the steam generator.

Both the turbine generator system and the condensate and feedwater systems will be commercial off-the-shelf designs, selected to meet the ARC SMR design requirements and to ensure that Project safety and reliability objectives are met. **Figure 4.8** provides an example of the layout of the turbine generator system in the turbine hall.

Figure 4.96: Turbine Generator Hall

4.3.8 Power Production Plant Cooling Water Systems

A **circulating cooling water (CCW) system** provides seawater cooling to the main turbine condenser and the turbine plant component cooling water heat exchangers to remove waste heat from the turbine generator cycle (**Figure 4.9**). One design option calls for the cooling of the circulating water system by means of a closed-cycle (recirculating) **mechanical draft wet cooling tower**. The water is drawn from the cooling tower, circulated through the condenser and returned to the tower to be cooled.

The mechanical draft cooling towers are separate structures from the main turbine hall. They will be less than 13 metres in height above finished grade and have a footprint of less than 1,200 square metres (15 metres by 80 metres), not including pumps, conveyance piping and ancillary equipment. They make use of fans to force or draw air through the tower to promote the evaporative cooling process. Make-up water for the cooling tower will likely be from the existing forebay of the PLNGS cooling water system (see **Figure 4.9**).

This design has not been finalized; an alternative option being investigated is a once through cooling system, as described in **Section 4.4.1.** Alternative intake options for the make-up water are also being investigated and will be assessed in the EIA, if identified (**Section 4.4.2**).

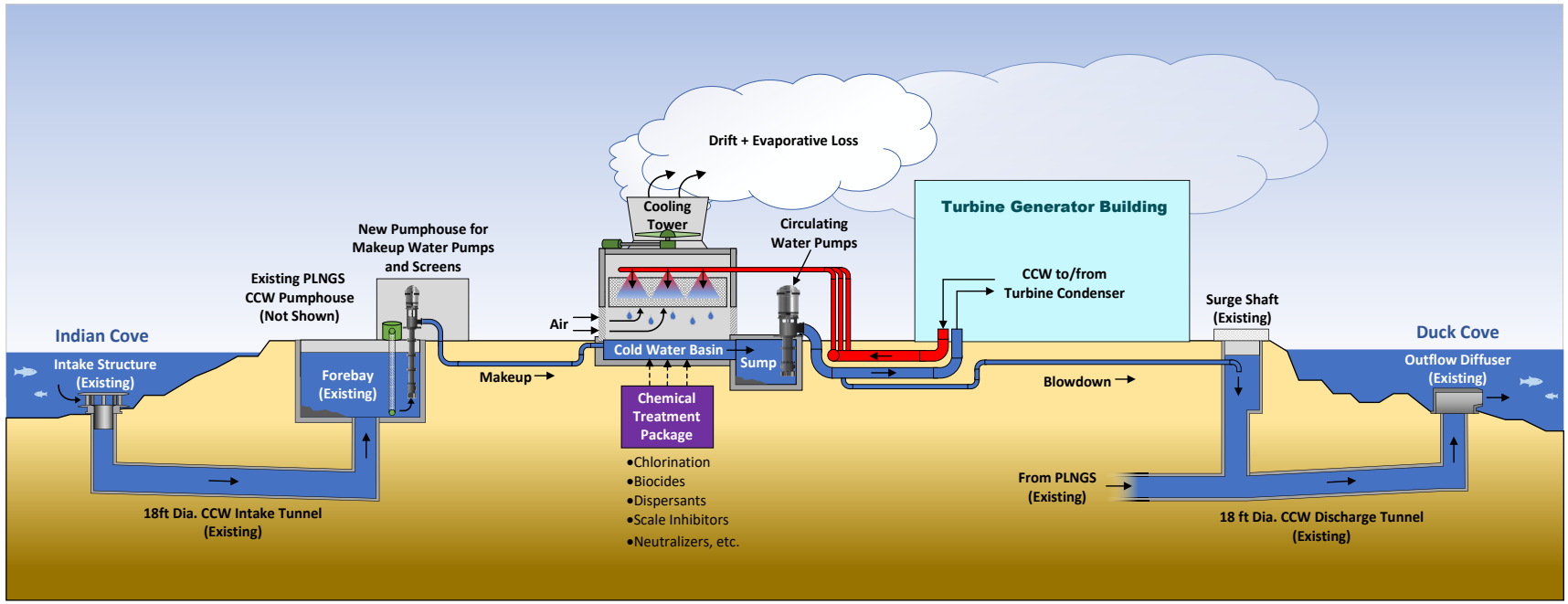


Figure 4.107: Circulating Cooling Water (CCW) System

A **closed-loop component cooling water system** of demineralized and de-aerated water cools various equipment in the rest of the plant. The component cooling water system transfers heat to the seawater-cooled **service water system** via heat exchangers to prevent mixing of the two cooling water systems. The service water system intake and outlet will be combined with the circulating water system and will not involve a separate intake or outlet external to the plant.

4.3.9 Electrical Systems

The electrical system provides an integrated power supply and transmission system comprised of the turbine generator and the associated main output system, and the connection to the off-site transmission grid, including transformers. On-site standby generators, battery power supplies, and uninterruptible power supplies provide back-up power for critical systems in the event main power generators, or power from the grid, is lost. The distributed control and information system provides an integrated control and monitoring system for the power plant.

The ARC SMR electrical system is comprised of four classes of power:

- Class I from several diverse back up battery banks;
- Class II from back up battery banks;
- Class III from standby generators; and
- Class IV from the main generator and/or the local transmission system.

The electrical system includes standardized electrical connection panels to facilitate use of mobile power supplies in the event they are needed.

4.3.9.1 Switchyard

The ARC SMR requires network transmission service at 345 kilovolt (kV) to be connected into the existing terminal that services PLNGS. NB Power is currently undertaking a comprehensive Electrical Connection Assessment to conclusively determine whether any new transmission capacity is required.

At least two separate and independent alternating current (AC) power connections to the electrical grid are required. Design of the switchyard is highly dependent on the location of the SMR relative to the existing switchyard; however, it is envisioned that a new switchyard or an expansion of the existing switchyard will be required. The switchyard design will consider how separation between the SMR plant and PLNGS will be maintained to prevent and mitigate a common mode failure that could affect both facilities (i.e., where two components or portions of a system fail in the same way, at the same time).

4.3.9.2 Stand-By Generators and Fuel Storage

Back-up power will be supplied by two 2.5 MW standby diesel generators. The required fuel storage capacity will be provided by two separate tanks (one per generator), each with a working volume of 100 m^3, sufficient to run both units for a seven-day period without off-site resupply. The storage tanks will be located at a specified distance away from the main building to prevent potential fire events from impacting on the plant and the tanks will be supplied with engineered dyke measures to contain any leaks or spills and prevent discharge to grade.

4.3.10 Instrumentation and Control System

The ARC SMR will have an automated control system that will reduce manual operator action. As a Generation IV design, the instrument and control system is predicated on systems that support already inherent and passive reactivity control features in the advanced SMR system. Thus, the systems supervise and intervene automatically. The role of the operator is to maintain situational awareness and to respond to adverse conditions when necessary.

The ARC SMR **distributed control and information system** combines modern distributed control, display, and network communication technologies with analog logic through:

- Reduced number of instrumentation and control components, leading to improved reliability and reduced maintenance and construction costs.
- Increased automation to reduce the frequency of operator error.
- Improved information and data communications systems that facilitate awareness of the operational state, providing better detection and diagnosis of faults, and reducing plant outages.
- Use of analog logic for redundant and diverse backup for reactor trip parameters to further improve reliability, and to support cyber security.
- Use of low voltage uninterruptible power as the shutdown systems fail-safe when the AC electrical power is lost.
- Use of a three-division control and monitoring system design, each with separate and independent power supply electrical systems in the reactor protection system and diverse protection system, sub-systems of the distributed control and information system.

The ARC SMR distributed control and information system includes sub-systems to support the:

- Control and monitoring of plant systems for electricity generation;
- Monitoring of safety systems using seismically qualified instrumentation and control hardware to mitigate the consequences of design basis accidents; and
- Monitoring and control of plant conditions using seismically qualified equipment to maintain the plant in a safe state after seismic events (e.g., earth tremors).

The ARC SMR plant includes control centers where the operating staff monitor, control, and operate the plant. They include:

- **Main Control Room** - The Main Control Room includes consoles for the human-machine interfaces required to operate the plant safely and reliably under normal operation and maintain the plant in a safe state under accident conditions, except for events that disable the Main Control Room itself.
- **Secondary Control Room** - The Secondary Control Room provides a separate, redundant facility where operations staff can shut down the reactor and maintain it in a safe state in the event the Main Control Room is disabled. Control instrumentation, a safety parameter display system, and communications systems are provided to support management.

4.3.11 Safety and Support Systems

The ARC SMR reactor has the following fail-safe safety systems, designed to shut down the reactor, remove decay heat, and limit releases if there is a failure of normally-operating process systems.

- The primary means of shutdown **(Shutdown System No.1, [SDS1])** consists of the **reactor protection system**, which monitors specific neutronic and process parameters to ensure safe operating envelope limits are not exceeded, and the **shut-off rod system**, which drops poised shut-off rods into the core under gravity when the reactor protection system is tripped.
- The secondary means of shutdown **(Shutdown System No. 2, [SDS2])** consists of the **diverse protection system** that monitors specific neutronic and process parameters to ensure safe operating envelope limits are not exceeded and the **reactivity characteristics of the reactor**, which induces negative reactivity in the core due to the sodium temperature increasing when the diverse protection system, actuates its trip signals to isolate the steam generator. With the steam generator isolated, the intermediate heat transport system is unable to remove heat from the core and the sodium temperature increases. The increasing negative reactivity causes the core to become subcritical.
- Complementary means of shutdown consist of separate **instrumentation and control** to de-energize the electromagnetic solenoids and dropping the **primary control rods** into the core under gravity as a complementary safety design feature during accidents. The primary control rod drive mechanisms also have a motor run-in feature to ensure that the control rods are inserted into the core when the electromagnetic solenoids are de-energized. These mechanisms are activated automatically through instrumentation and can also be activated manually.
- The **direct reactor vessel auxiliary cooling system,** which is described in **Section 4.3.5**, transfers decay heat from the sodium pool through heat exchangers. During normal operation, fans flow air through the air draft heat exchangers. When power to the fans is not available, the dampers fall completely open to maximize passive decay heat removal to the atmosphere. This system is designed to be able to operate in a degraded state resulting from a design basis accident (defined in **Section 4.8**), as the safety function for removal of decay heat from the fuel will still be achieved.
- The **reactor vessel auxiliary cooling system,** which is described in **Section 4.3.5**, provides continuous removal of the reactor's decay heat through the reactor vessel and guard vessel walls. The system is designed to be able to operate in a degraded state resulting from a design basis accident, as the safety function for removal of heat from the reactor vessel will still be achieved.
- The **containment structure supports** provide a continuous envelope around the reactor vessel to ensure that the release of any radioactive materials to the external environment during normal operation and accident conditions remain below regulatory limits (see **Section 4.3.6**).

4.3.11.1 Safety Support Systems Uninterruptable Power Supply

The passive, fail-safe designs for the ARC SMR safety systems means that only a limited demand for uninterruptible power is required for the functioning of the safety systems during design basis accidents and accidents beyond the design basis including DEC:

- The Shut-off Rod System requires Class II power for its motor run-in function, as a back-up feature, to ensure that the shut-off rods fully insert into the core when demanded.
- The Primary Control Rod System requires Class II power for its motor run-in function, as a complementary design feature, to ensure that the primary CRs fully insert into the core when demanded during accidents beyond the design basis including DEC.

Class I electrical power is also provided for monitoring safety parameters to inform the operators about the performance of the safety systems.

4.3.11.2 Emergency Planning and Response Infrastructure

The ARC SMR design includes an on-site emergency support center and plans for emergency response.

The **On-Site Emergency Support Center** is used by on-site operations support personnel for emergency support. It is equipped with a safety parameter display system, a dedicated on-site and off-site communication system, and a voice communication system to coordinate with operating staff in the Main Control Room, Secondary Control Room and Technical Support Center.

The **Technical Support Center** is used as an assembly area for plant management and technical support during emergency conditions. It is equipped with a safety parameter display system, radiation monitoring for the plant and immediate surroundings, meteorological monitoring, communication systems for on-site and off-site communication, storage space for emergency plans, procedures, protective clothing, drawings, and cabinets housing equipment for first aid.

4.3.12 Underground Services

4.3.12.1 Freshwater Supply

Freshwater is the feed source of the ARC SMR's firewater, domestic water, and the demineralization plant. The existing water supply system (Hanson Stream) has surplus capacity to supply the ARC SMR.

A new pipeline, approximately 10 kilometres in length, may constructed from the existing water supply infrastructure (Hanson Stream pumphouse) to provide fresh water to the ARC SMR site (**Figure 4.10** and **Figure 4.11**). It is anticipated that this connection will be constructed during site preparation to provide water for construction, as well as for temporary water supply until permanent facilities are installed.

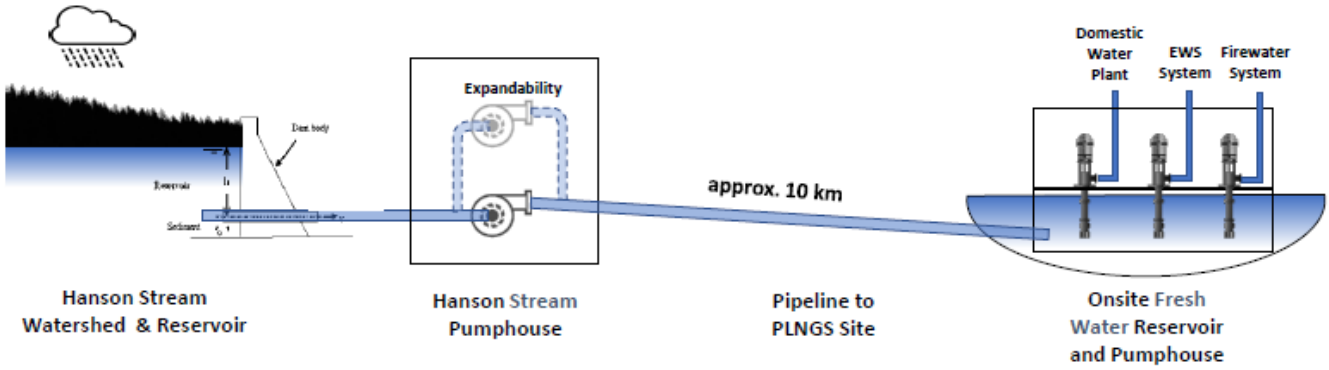


Figure 4.118: Freshwater Supply Schematic

The water delivered to the ARC facility will be stored either in dedicated tanks or a new freshwater reservoir will be constructed. The expected required rate of fresh water during normal operations is approximately 10 to 15 litres/second (L/s); however, the pipeline and trench will be sized considering possible future expansion.

LEGEND

- EXISTING FRESH WATER SUPPLY
- NB POWER PROPERTY BOUNDARY

0 295 590 1,180

1:30,000 METRES

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. IMAGERY: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
2. COORDINATE SYSTEM: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

CLIENT
Énergie NB Power
NEW BRUNSWICK POWER

PROJECT
ARC CLEAN TECHNOLOGY ADVANCED SMALL MODULAR REACTOR COMMERCIAL DEMONSTRATION UNIT - POINT LEPREAU, NEW BRUNSWICK

TITLE
EXISTING FRESHWATER SUPPLY

CONSULTANT
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4.3.12.2 Treated Sanitary Sewage

The ARC SMR facility requires its own sanitary sewage treatment plant, sized for a peak construction or maintenance workforce of between 400 and 1,200 persons. The treated sanitary sewage from the facility is likely to be discharged to the current PLNGS outfall. Therefore, a pipeline will be required to connect the new sewage treatment plant to the current outfall, located adjacent to the existing sewage treatment plant. Effluent will be continuously monitored prior to discharge to ensure that it meets all regulation requirements.

To the extent possible, underground services will be constructed within existing pipeline corridors to minimize any further land disturbance and for ease of excavation. Conventional pipeline construction methods (e.g., trenching) will be employed. The typical trench depth for these services will be 1 to 1.5 metres.

4.3.13 Radioactive Waste Storage Facilities

Used fuel storage locations are provided in the reactor vessel with sufficient capacity to hold an entire core load of fuel assemblies for initial cooling (see **Section 4.3.2**). After approximately two years, when the used fuel is sufficiently cool to allow its removal from the reactor vessel, the used fuel assemblies will be extracted and transferred directly into commercially available dry storage modules, such as the Orano NUHOMS® system (Orano, 2023).

For **low and intermediate level radioactive waste storage**, the ARC SMR facility will use, as much as practical, commercial off-the-shelf waste management systems and equipment. The radioactive waste system will provide the equipment for collecting, processing, monitoring, storing, and disposing of liquid and solid radioactive wastes within areas in the radioactive maintenance and waste building (see **Section 4.7.4**).

4.3.14 Access Roads

The Project will require improvements to existing, and construction of new, on-site features to allow access into, and movement throughout, the site. This will include a dedicated local access road, approximately 1.5 to 2.0 kilometres in length, branching off near the existing Point Lepreau gatehouse to direct Project-related traffic directly to the ARC SMR site; and parking facilities to accommodate workforce-related and other vehicles during both the construction and operation phases. To minimize the impact on adjacent wetlands, the road will be routed along a natural ridgeline. The exact location of associated infrastructure will be determined as the Project design progresses.

4.4 Alternative Means of Carrying Out the Project

Alternative means of carrying out the Project are the various technically and economically feasible ways, including using best available technologies, and in consideration of preventing/mitigating adverse environmental impacts, which would allow the Project and its physical activities to be carried out. The design of the Project is being refined as additional site-specific information becomes available. Various alternatives have been considered during the initial design of the Project components and the most appropriate technology selected.

Alternative project components and infrastructure that are currently under design review, for which a final decision has not been made, are presented below. As part of the EIA, an evaluation of the alternative means of implementing the Project will be presented, including the rationale

provided for the exclusion of any particular means based on established criteria against which they have been evaluated. Any alternatives for which a decision is still pending at the time of the EIA submission will be carried through the EIA process as part of the bounding envelope.

4.4.1 Power Production Cooling Water System: Once-Through Cooling System or Mechanical Draft Towers

As presented in **Section 4.3.8**, a circulating water system will provide seawater cooling to the main turbine condenser and the turbine plant for cooling. One design option calls for the cooling of the circulating water system by means of a closed-cycle (recirculating) mechanical draft wet cooling tower (see **Section 4.3.8**); however, an alternative for this is a **once-through cooling system** that would withdraw water from the Bay of Fundy and use it to extract waste heat from the steam cycle, and then return it to the Bay at a slightly elevated temperature.

At the existing PLNGS, waste heat is extracted from the steam cycle using once-through cooling. Cooling water is conveyed to and from the Bay through 5.5-metre diameter concrete-lined tunnels. The intake is a 13-metre diameter, horizontal flow intake structure located in Indian Cove, 700 metres from shore, and the outfall (with diffuser) is in Duck Cove, 465 metres from shore. The existing cooling water tunnels, intake velocity cap, and outfall diffuser were all sized for two-unit CANDU-6 operation with a total flow capacity of 60,600 L/s; however, only one unit was constructed. The excess capacity of the existing intake seawater systems, conservatively estimated at >25,600 L/s, is sufficient to supply the cooling water needs of the ARC SMR facility.

4.4.2 Power Production Cooling Water System: Use of Existing Intake and Outlet Structures or New Intake and Outlet Structures

The seawater make-up for the mechanical draft cooling towers is expected to be extracted from the existing PLNGS pumphouse forebay via a new intake pipeline (see **Section 4.3.8**). The blowdown (defined in **Section 4.7.7**) from the system will be discharged back to the Bay of Fundy preferably via tie-in with the existing surge chamber of the PLNGS outflow tunnel, or alternatively via new outflow drainage ditch/channel or discharge pipe and submerged diffuser to Indian Cove. The expected discharge will likely be <1% of current PLNGS cooling water outflow.

4.4.3 Electrical Systems: Existing Switchyard Expansion or New Switchyard

At least two separate and independent AC power connections to the electrical grid are required (see **Section 4.3.9.1**). This will require an expansion of the existing switchyard, or the construction of a new switchyard. NB Power is currently undertaking a comprehensive Electrical Connection Assessment to conclusively determine whether any new transmission capacity is required and determine whether expansion of the existing switchyard will meet the needs of the Project.

4.4.4 Freshwater Supply: Freshwater Tanks or New Reservoir

Freshwater is required for firewater, domestic water, and the demineralization plant (see **Section 4.3.12.1**). Water pumped from Hanson Stream will be stored in dedicated freshwater tanks, or a new freshwater reservoir will be constructed.

4.5 Project Phases and Activities

4.5.1 Site Preparation, Construction and Commissioning

The EIA approval from the Province of New Brunswick will be for all CNSC licensing phases of the proposed ARC SMR development. The site preparation phase will be initiated following the receipt of the EIA approval and all ancillary permits, approvals, licences and authorizations for the Project (see **Section 2.0**), including the CNSC Licence to Prepare Site. The Licence to Construct, Licence to Operate and Licence to Decommission would be issued subsequently following the successful completion of those licence application processes. During site preparation and construction, provincial and/or federal environmental inspectors will enforce the construction specifications, site-specific environmental mitigation measures contained in the Environmental Management Plan (see **Section 4.9**), and any regulatory approval conditions. Applicable best practices, restrictions and details from the Environmental Management Plan will be included in the construction drawings to ensure compliance in the construction methodology.

Construction activities for the Project include both new construction and linkages to existing infrastructure. The Project construction activities will occur mainly within NB Power property boundaries at the Point Lepreau. The ARC SMR itself is modular and sections will be constructed off-site at a centralized factory and assembled upon delivery to the site. A temporary work area (i.e., for equipment and staging areas) will be located close to the construction of the ARC SMR, with the final location to be determined. The scope of construction will also include certain plant commissioning activities that do not involve fissile materials (i.e., nuclear fuel) installed in the core. Activities associated with the phase of plant operation begin once fissile materials are brought onto the Project site for installation into the reactor.

The principal works and activities associated with site preparation, construction and commissioning are described below.

4.5.1.1 Engineering Survey and Utility Location

During site preparation, a survey crew will survey and stake the boundaries of the new components, as well as the temporary workspaces and access routes required for construction purposes. Following site surveys, the utilities (e.g., telephone lines, power lines) will be located. Buried services will be "daylighted" if there is any confusion in their location (e.g., exposed using safe means such as hydro-vacuum excavation). Temporary and permanent environmental buffer areas will also be marked in the field.

4.5.1.2 Mobilization of Workforce and Equipment

The mobilization of equipment and the construction workforce (**Section 4.5.4**) to the site will occur through site preparation and construction. Following initial mobilization, the movement of workers and equipment to and from the site will be ongoing throughout the construction phase. The physical aspects of mobilization include establishment of parking areas for staff and equipment; contractor trailers for use as construction offices, other administrative support locations and equipment storage; construction phase fencing for security and safety, and security/guardhouse and reception facilities.

4.5.1.3 Vegetation Clearing and Grubbing

Vegetation clearing consists of removing trees, stumps, and brush to allow access for construction. A portion of the NB Power property is clear of vegetation due to previous works

and infrastructure (**Figure 1.1**). Clearing will be required for the remainder of the Project area. Survey activities will identify the extent of clearing required and efforts will be made to minimize vegetation loss to the extent possible.

Areas to be cleared will be defined by staking installed during site preparation activities. Clearing will be completed primarily by using mechanical brush cutter and mulcher attachments on standard forestry equipment. Heavy duty mechanical methods may be supplemented by manual methods (e.g., chain saws, brush saws). Vegetation will be maintained along wetlands and watercourses buffers as much as possible, and where necessary (e.g., near wetlands and drainages), clearing will be conducted manually and permits will be obtained, where required.

Grubbing includes the removal and disposal of stumps and roots remaining after vegetation clearing and is anticipated for site clearing. Grubbing will be conducted using a skidder or bulldozer to remove the roots and stumps of cleared vegetation. Grubbings will be stored within the defined Project area, in inactive areas, and used as fill material during construction. Any grubbings will be buried at pre-selected locations and away from watercourses and other sensitive environmental features.

Environmental effects management measures will be applied during the work. In particular, clearing activities will be conducted outside of the typical bird breeding season (early April to end of August) to the extent possible, to prevent the undue disturbance of migratory birds or their nests, as per the *Migratory Birds Convention Act, 1994*. If clearing is required within this season, the Canadian Wildlife Service will be consulted and mitigation developed to meet *Migratory Birds Convention Act, 1994* requirements. This may include a survey by trained ornithologists to determine if nesting is occurring within these areas and if so, a buffer will be maintained around active nests until the young have fledged.

Appropriate measures will be taken to protect habitat and other environmental and on-site recreational features in areas outside the working limits. Erosion and sedimentation control techniques will be employed during vegetation clearing, as well as for subsequent construction activities, to minimize erosion of exposed areas and sedimentation into wetland areas and into the Bay of Fundy. Dust suppression will also be employed during vegetation clearing activities to minimize the potential environmental effects of fugitive dust to off-site locations.

Previously undiscovered archaeological artifacts could be uncovered during grubbing of topsoil and overburden as well as from other earth moving activities on the site during the construction phase. An Archaeological Impact Assessment (AIA) will be completed for the West Study Area in order to minimize impacts to cultural resources. During site preparation and construction activities, a contingency plan for archaeological discovery will be followed. NB Power has developed such a contingency plan with input from First Nations in New Brunswick. The applicability of this plan and required amendments for this Project will be determined through further engagement with First Nations.

4.5.1.4 Installation of Services, Utilities, Access Roads and Additional Infrastructure

Installation of services and utilities will include both the temporary services and utilities required during construction and the permanent services and utilities required to support operations. Wherever possible, utilities and services will be installed to accommodate the needs of both the construction and operation phases. A local access road and parking will be constructed to accommodate Project-related traffic.

Temporary contractor trailers will be mobilized to serve as construction offices. Temporary services connected to those facilities will include electricity supply, fresh water supply, sanitary sewage collection and treatment, and communication services.

Materials being delivered to the Project will use a combination of shared roads and dedicated Project roads, specifically built to limit interference with the existing PLNGS. Those entrances will also be used by heavy equipment going to and from the Project site and by Project personnel.

Until permanent amenities are established for the ARC SMR Project, temporary washroom facilities may be required during construction. Any temporary washrooms will be maintained by licensed and approved third-party contractors who will regularly service and maintain the facilities. Wash trailers and heat-traced portable sewage tanks requiring pump out services are likely required.

The Project assumes that off-site parking facilities will not be necessary, and the workforce will park wholly within the Point Lepreau site boundary. Contractors bringing their own vehicle to the site will be required to park their vehicle in designated parking lot(s).

4.5.1.5 Excavation and Grading

Excavation and grading will comprise earth and rock-handling activities, including earthmoving and grading, rock excavation and development of construction laydown areas. Appropriate protocols will be developed in advance of the work and good industry management practices will be followed to mitigate effects associated with unstable soils. These protocols and practices will be developed as part of the Environmental Management Plan for the Project and will include appropriate handling and disposal of soil and waste rock, dust and noise control, erosion and sediment control, and stormwater management. The specific details related to mitigating impacts due to excavation and grading will be identified through the EIA process. In addition, the design for grading and contouring of the site will optimise reasonable opportunities to incorporate natural visual screening features, such as soil berms or plantings, into the completed topography.

In the areas being considered for the ARC SMR facility, the overburden ranges from 0.6 metres to 2.0 metres. The rock underneath is red, granite-clast, conglomerate, red fine- to medium-grained sandstone to pebbly sandstone and minor red mudstone, which locally contains calcareous nodules (CBCL, 2023).

It is estimated that Project construction will require excavation and handling of approximately 90,000 cubic metres of soil and rock. Of this, approximately 9,000 m^3 will be excavated to a depth of approximately 25.0 metres to facilitate the installation of the ARC SMR reactor into the reactor building. Where possible, excavated soil and rock will be reused elsewhere, such as for levelling or backfilling to minimize off-site disposal. It is likely that additional fill will be required from off-site, depending on the full extent of grading to the west. However, any

remainder that cannot be repurposed on-site will be transported to an appropriate off-site disposal.

Previously undiscovered archaeological artifacts could be uncovered during excavation of topsoil and overburden, as well as from other earth moving activities on the site during the construction phase. The AIA and contingency plan for archaeological discovery mentioned in relation to clearing and grubbing activities will also apply to excavation and grading.

The Project will undertake an acid rock survey prior to excavation activities to identify any acid rock drainage potential. An acid rock drainage management plan will be developed if required.

Earthmoving and Grading

Soil and like materials within areas of construction will be excavated and graded by means of suitable earthmoving equipment (e.g., excavators, bulldozers and trucks). A mobile crushing plant is likely to be brought to site to break up rock and generate granular fill. Where possible, excavated earth material will be transferred to areas requiring earth fill quantities. Cut materials in excess of fill requirements will be transferred to the designated spoils disposal areas on-site (locations to be determined) or transported to an off-site disposal facility.

As the site develops, low spots and potentially existing wetland areas may need to be infilled. Where wetlands are affected, the Project will ensure the necessary WAWA permits are obtained, and compensation measures are identified for any permanent loss. Any water flow to infilled areas will be managed, most likely by installed underground collection pipelines to channel the water to appropriate discharge locations (yet to be determined).

On-site soil handling practices will include measures to minimize surface erosion and dust generation (e.g., minimize surface area of active operations, stabilize surfaces in inactive areas and completed works, suspend work during adverse weather conditions, and apply appropriate dust suppression procedures) and to control related aspects including noise and vehicle emissions.

Off-site Disposal of Surplus Soil

If necessary, surplus soil will be transported for disposal at a suitable off-site location(s). The material may be used to rehabilitate extraction pits and quarries or other development sites, or similar beneficial use. The destinations for this material have not yet been determined and transport routes for the material will depend on the receiving destinations ultimately selected. However, it is likely that trucks will exit the Lepreau peninsula via Route 790. A Traffic Management Plan, including elements to address potential nuisance effects (e.g., dust, noise) will be developed and implemented.

Rock Excavation (Drilling, Blasting, Boring)

Rock excavation (mostly comprised of sandstone) may be undertaken using one or more of a variety of methods. Much of the excavation may be achieved using bulldozers, pneumatic hammers or excavators due the softness of the rock. Other areas may require drilling, blasting and transfer to fill areas. Drilling and blasting operations would consist of drilling into the rock mass by pneumatic means (e.g., compressors, track-mounted drilling machines, jack hammers), and the placement and detonation of explosive charges to displace and fragment the rock.

Excavation technologies, such as a vertical shaft sinking machine, for the excavation and construction of the reactor building below grade, are also be considered. This would enable both excavation and shaft construction to occur simultaneously and minimize the need for blasting.

Should blasting be required, blasting operations will be rigidly controlled utilizing mature practices in the construction industry, such that there will be minimal ground motion or vibration in areas beyond the ARC SMR site. Dust, vibration and noise management plans, including provisions to alert area residents in advance of blasting operations, will be instituted, as required.

An application will be filed with the Department of Natural Resources Canada for a licence for the temporary storage and use of explosives before these activities are undertaken as set out in section 7 of the *Explosives Act*. Blasting will be carried out using conventional explosives in controlled charges as required.

4.5.1.6 Development of Laydown Areas, Administration and Support Facilities

Construction laydown areas provide necessary staging areas for contractor operations and storage of various construction equipment and materials. Laydown areas will be graded, fenced, and surfaced with either granular material or asphalt, depending on the intended use. It is anticipated that for the ARC SMR the main laydown area will either be to the north or south of the facility area and will be approximately 100 metres by 150 metres.

Temporary construction offices and warehouses will also be erected for the duration of the construction phase. Their footprint is estimated to be approximately 75 metres by 50 metres. Their final locations will be decided once detailed construction and execution plans are developed.

4.5.1.7 Construction of Reactor and Reactor Auxiliary Buildings

The reactor and reactor auxiliary buildings, known collectively as the facility's power block, include the reactor building and the generator building/turbine hall, and related structures. Development of this block includes the installation of the power generation equipment within it, including the reactor, primary and secondary heat transport components, and all powerhouse components including the turbine, generator, heat exchangers, pumps and standby power systems.

The reactor building extends to approximately 30 metres above grade. Above-grade construction will involve techniques typical of heavy industrial development. Placement of components situated within the power block will require the use of heavy equipment, such as heavy-lift cranes (mobile versus fixed to be determined). Installation of operating equipment will involve movement and placement of large and specialty components using various standard and extraordinary procedures, depending on the size and weight of the component. The reactor vessel may be delivered as a single modular component or several large components, and will be lifted and lowered into the building, after which the remainder of the internals will be installed.

Supply of construction materials and operating equipment to the site is outlined in **Section 4.5.1.11**. Foundations for the power block will extend into bedrock and may require drilling and blasting (as described in **Section 4.5.1.5**).

4.5.1.8 Construction of Mechanical Draft Cooling Towers

Construction of the mechanical draft cooling towers (if selected) will include the towers and the associated intake and outlet infrastructure and ancillary equipment to support their operation.

Their foundations will extend into bedrock and will likely require drilling and blasting. Some elements of construction may be further supported on steel piles.

The Project will aim to minimize in-field construction by using modular construction techniques and factory preassembly as much as possible. Where this is not possible, the cooling towers will be assembled at site using conventional methods and materials, primarily steel framing and concrete, with mechanical and electrical components. Modules will be lifted into place using heavy lift cranes.

Most cooling towers are sized to fit on semi-trailers for road transport as sectional modules, component subassemblies, or individual parts to be assembled at site using conventional methods and mechanical fasteners. The level of shop preassembly and modularity will depend on the application and transportation limits on weight and size. Cooling towers are generally constructed in one of two manners: packaged or field-erected. Packaged towers are factory-assembled as modules that are built and shipped in as few sections as possible, where each cell may be assembled from 1 to 6 modules. Field-erected towers are primarily constructed at destination from piece marked individual parts and subassemblies. Packaged towers are widely used for heating, ventilation, air conditioning, and light industrial applications while field-erected towers are used for power and heavy industrial applications and offer greater customization options. **Figure 4.12** shows an example of a packaged cooling tower with modular arrangement and shipping typical in many industrial applications. An initial supply chain review has indicated that packaged units may not be commercially available to handle applications with seawater makeup. Seawater mechanical draft cooling tower applications are less common and require special consideration for selection of corrosion resistant materials. Hence, seawater mechanical draft cooling towers have traditionally been of the field-erected type. Nonetheless, opportunities for increased modularization will continue to be explored.

Figure 4.13 Modularization of Cooling Towers

Mechanical draft cooling tower arrays will be oriented so that the cooling effects of prevailing winds are maximized, while potential adverse impacts to community, environment, and facility safety and integrity are minimized.

4.5.1.9 Construction of Intake and Outlet Structures for Cooling Tower Water Makeup

Seawater will be circulated through mechanical draft cooling towers to provide the cooling water duty for the circulating and service water systems (see **Section 4.3.8**). Additional make-up water will be required to replace cooling tower blowdown and other losses (primarily through evaporation, drift, and windage). The new makeup and blowdown pipelines will likely be routed underground using traditional open-cut trench excavation and/or horizontal directional drilling methods. The intake and discharge structures for cooling towers will be tied into existing PLNGS infrastructure, where practical, to minimize negative cumulative effects on aquatic life and the environment. The seawater make-up will be drawn from a likely expansion of the existing PLNGS pumphouse forebay. The blowdown will be discharged back to the Bay of Fundy preferably via tie-in with the existing surge chamber of the PLNGS outflow tunnel, or alternatively via new outflow drainage ditch/channel or discharge pipe and submerged diffuser to Indian Cove.

Pumps, pipelines, intake, and discharge structures will be sized to consider the water volumes required for makeup and blowdown. Cooling tower circulating water cycles of concentration will determine the required makeup and blowdown flow rates, which will then determine sizing of pipelines and design of intake/discharge structures.

4.5.1.10 Management of Stormwater

As the site is developed, ditches and swales will be constructed to collect and convey stormwater to existing surface water courses that discharge to the Bay of Fundy. Stormwater management features will be designed specifically for runoff control both during site preparation and construction (temporary) and during operations (permanent). The impermeable surface area requiring stormwater collection is estimated to be 11,000 square metres , including building rooftops and any bunded areas (e.g., tank storage areas). Parking lots, whether temporary or permanent, are not likely to be paved.

Stormwater management planning will be undertaken as part of the site preparation and construction planning in support of the EIA and licensing. Flooding scenarios for the site will be evaluated and where necessary, catch basins or filtering prior to release into waterways or the Bay of Fundy will be implemented.

Where stormwater may have potential become laden with sediment or contaminated (e.g., spill or leak of hydrocarbons), it will be collected and treated using conventional oily water treatment (e.g., separator) prior to discharge to ensure applicable water quality regulations are met. Protocols and physical features will be developed to ensure appropriate control of sediment transport, and collection and treatment of water that may have come into contact with contaminants.

Industry best management practices will be applied to ensure that appropriate and effective stormwater control and management features are incorporated into all phases of the Project, and that discharges from related facilities will meet applicable criteria for release to the receiving environment.

4.5.1.11 Supply of Construction Equipment and Material

Supply of construction equipment, materials and operating plant components includes the delivery of the necessary materials and components for construction of the ARC SMR to the site. It is expected that the material and components will be delivered to the site via Highway 1 and

Route 790. It is not anticipated that the Project components will be large enough to warrant delivery by water; therefore, the use of barges and construction of barge offloading facilities is not expected to be required.

Construction Equipment

Construction equipment comprises the mechanized and related equipment required to support construction. Heavy earthmoving equipment will be typical of large-scale construction projects (e.g., trucks, dozers, loaders, excavators, scrapers, graders, and compactors) and delivered to site via highway-licensed trucks travelling on Highway 1 and Route 790.

Aggregate and Concrete

Preferably, mixed concrete will be provided by an off-site supplier; however, an on-site batch plant may be necessary, particularly to provide the concrete for the underground reactor containment structure. This structure will require an estimated 4,000 to 5,000 cubic metres of higher-grade concrete. Modularized construction techniques aim to minimize quantities required to be poured on-site. Specific quantities have yet to be determined, but it is not expected that daily concrete deliveries would exceed 200 cubic metres of concrete over the course of a 12-hour day (assuming a 16 cubic metre concrete truck).

The requirements for aggregates required for construction, including the volume and source(s) will be assessed and confirmed as the construction plan is further developed.

Manufactured Construction Materials

The ARC SMR design facilitates the use of prefabricated modules for some systems. For example, the design of the reactor vessel enables its installation as a single factory-fabricated module within the reactor building or as several large modules. This module could contain as many pre-installed core internal components as possible, based on size and weight limits for transportation and installation, and excluding the fuel assemblies and reactivity drive mechanisms. Construction materials will include items associated with site preparation (e.g., precast concrete structures, culverts and utility piping, fence), structural components for buildings and other facilities (e.g., fabricated steel products, masonry), mechanical and electrical components for buildings and facilities, and various sundry items (e.g., interior finish components). The manufactured construction materials will be delivered to the site via highway-licensed trucks travelling on Highway 1 and Route 790.

4.5.1.12 Management of Site Preparation and Construction Waste, Hazardous Materials, and Fuels and Lubricants

Site preparation and construction-related waste will be transferred from the site for disposal or recycling at appropriately-licensed waste management facilities. This activity does not include disposal of excavated spoil.

Hazardous materials (e.g., solvents, chemicals, and compressed gases) associated with site preparation and construction will be managed, including storage, use and disposal, in compliance with applicable legislation, codes and practices. These materials will include chemicals, cleaners, paint, aerosol cans and electrical components. Non-radioactive oil and chemical wastes will be removed from the site for disposal.

Explosives required for excavation activities will be delivered to the site as required by an appropriately qualified and licensed contractor. The use and management of explosives,

including storage in on-site magazines, will comply with the federal *Explosives Act* and its regulations.

Fuels and lubricants required for mechanical site preparation and construction equipment will be delivered to the site in appropriate vehicles and/or containers, stored in purpose-built facilities, and dispensed and used, in compliance with applicable legislation, codes and practices. Contingency plans for a detailed response system in the event of a spill will be developed as part of broader environmental management during the construction phase.

4.5.1.13 Site Cleanup and Stabilization

Following construction, disturbed areas will be restored and stabilized. Disturbed areas from construction will be reinstated to pre-construction conditions, where practical. Topsoil, where previously segregated, will be graded out and seeded. Sediment fencing will remain in areas adjacent to watercourses and wetlands until the vegetation has been re-established.

4.5.1.14 Commissioning

Commissioning is performed to verify the components and systems are performing per their design and performance specifications. Commissioning is generally divided into four different phases:

- Phase A: Prior to fuel load;
- Phase B: Prior to leaving reactor shutdown state;
- Phase C: Approach to critical and low power tests; and
- Phase D: High-power tests.

Each phase usually represents a hold point in the Commissioning Plan, which is captured under the applicable licence issued by the CNSC. For each hold point, the necessary prerequisites established between the licensee and the CNSC need to be met and confirmed.

4.5.2 Operation and Maintenance

The operation phase of the Project starts with the granting of the Licence to Operate by the CNSC. For the purposes of the EIA, the period of operation of the ARC SMR will be approximately 60 years before decommissioning is required.

4.5.2.1 Maintenance Activities

Maintenance activities to be undertaken will include tasks ranging from minor and routine activities to major maintenance requiring a complete plant outage. Maintenance tasks include preventative maintenance (usually planned), corrective maintenance (which can include both planned and reactive) and improvement or upgrade activities. It is expected the majority of maintenance tasks will be performed while the reactor unit remains online, with very few maintenance activities requiring a plant outage. In addition to maintenance, routine surveillance or ‘condition monitoring’ and testing will be performed at pre-determined intervals to ensure safe and efficient operation of the systems in the facility (not just the nuclear island or power block), as well as preventing more costly corrective maintenance in the future. The ARC SMR plant is designed for short maintenance outages with a longer maintenance and refuelling outage occurring once up to every 20 years. Most components will be designed for a minimum design life of 60 years. Where components do not have a 60-year nominal design life, the plant design provides the capability to readily replace them.

4.5.2.2 Nuclear Fuel Handling and Storage

The fuel handling and storage system manages the fuel from the arrival of new fuel on the site to the interim storage of used fuel. Since refuelling of the core may not be needed for up to 20 years, some of the fuel handling equipment only needs to be available during a refuelling campaign. The fuel handling and storage system is divided into new fuel transfer and storage, refuelling, and used fuel transfer and interim storage. There will be programs in place to ensure no out-of-core criticality and to ensure safeguards of the fuel are in compliance with regulatory requirements.

New Fuel Handling and Storage

When new fuel assemblies arrive on the site in their certified fissile material transport containers, they will be temporarily stored in a defined location on-site until they have been loaded in the reactor core, while the unit is shutdown. An intra-building cask will be used to transfer a new fuel assembly from its transport container to the reactor containment. Inside the reactor containment, the new fuel assembly will be transferred from the intra-building cask to the reactor.

Refuelling and Initial Cooling of Used Fuel

At the end of the fuel irradiation cycle (up to 20 years) the used fuel assemblies will be relocated from the core to the in-vessel storage and extraction area by the in-vessel transfer machine. The used fuel will be temporarily stored and cooled within the sodium reactor coolant pool, but outside the core. New fuel assemblies will then be transferred from the new fuel transport containers into the reactor with the intra-building cask and placed into position in the core by the in-vessel transfer machine.

After approximately two years of reactor operation post refuelling, the used fuel will be sufficiently cool to allow its removal from the reactor vessel at a convenient planned plant outage sometime during the new fuel irradiation cycle. At such a time, the used fuel assemblies will be extracted and transferred directly into a commercially available dry storage module, such as the Orano NUHOMS system (Orano, 2023). There is no need for an external pool for short-term cooling.

Interim On-Site Storage

Interim storage of used fuel within the ARC site is planned for 20-year irradiation cycles, and sized for a minimum of 60 years plus the decommissioning phase. After five years of cooling, the decay heat of the fuel assembly is less than one kilowatt, which is well within the temperature limitations for permanent storage prescribed by the Nuclear Waste Management Organization (NWMO).

Long-term Disposal of Used Fuel

Under the *Nuclear Fuel Waste Act*, the NWMO is responsible for the safe, long-term management of all Canada's used nuclear fuel, including that created using new or emerging technologies such as SMRs. Canada's plan will be implemented over many decades, and a fundamental tenant to the approach, referred to as Adaptive Phased Management, is incorporating new knowledge and adapting to new technology. NB Power and ARC have been working with the NWMO regarding the most appropriate option for the long-term disposal of used fuel from the ARC reactor.

4.5.3 Decommissioning

Planning for decommissioning is integrated into the design of the ARC SMR. Design improvements are regularly being assessed and implemented to address lessons learned from the decommissioning experience of similar reactors around the world. The planning and sequencing of decommissioning activities will be performed in accordance with relevant legislation, regulations, codes and standards at the time of decommissioning. The CNSC's *REGDOC-2.11.2 Decommissioning* provides the current requirements and guidance for all phases of decommissioning. In addition, the requirements outlined in the Canadian Standards Association *CSA N294 Decommissioning of facilities containing nuclear substances* will be incorporated in decommissioning plans. Each CNSC licensing phase will require a Preliminary Decommissioning Plan and financial guarantees appropriate to the phase of the Project.

The Preliminary Decommissioning Plan describes: the selected decommissioning strategy; main decontamination, dismantling and clean-up activities; end-state objectives; an overview of the principal hazards and protection strategies; a waste management strategy; and a cost estimate. The objective is to establish a decommissioning planning process that will be periodically updated during future phases to ensure that the financial resources are available when decommissioning takes place after the end of the operating life of the plant. The decommissioning plan will also be periodically updated to reflect changes in requirements and industry experience.

It is envisioned that the SMR site will be decommissioned in phases, with the work further subdivided into smaller manageable work packages. The decommissioning phases include preparation for safe storage, dormancy (storage with surveillance), and dismantling and site restoration. Each of these phases will be categorized by generic work activities, such as engineering and planning work area preparations, equipment removal, decontamination, waste processing and disposal, demolition, final surveys, licence termination applications, and site restoration.

4.5.4 Project Workforce

4.5.4.1 Construction Workforce

Site preparation and construction will require a contractor labour force that will vary in size depending on the Project phase and the nature of the activities underway at any given time. This activity will represent the daily transportation-related aspects of the workforce commute as well. It is estimated that the labour force will peak during the construction phase with approximately 400 to 1,200 workers on-site at any time during day or night shifts. Site preparation activities that occur in advance of construction are expected to have a substantially lower headcount (yet to be determined). It is also expected that site preparation work crews will be less concentrated, and more dispersed over a larger area, undertaking such tasks as road building and pipeline trenching in addition to preparation for building construction. Protocols and management procedures will be developed to ensure that interference with existing PLNGS operations is either eliminated or minimized as much as possible.

4.5.4.2 Operation Workforce

Operational workforce is expected to be in the range of 100 to 125 full time equivalents, including during refuelling and major maintenance activities.

4.6 Project Schedule and Work Hours

The anticipated Project schedule is as follows (**Figure 4.12**):

- **Site preparation** will begin as soon as the EIA review has been completed and the applicable permits, approvals or other forms of authorization have been obtained, including the Licence to Prepare Site from the CNSC.
- **Construction** is expected to begin once the Licence to Construct has been granted by the CNSC. The first fuel load will take place after receipt of the Licence to Operate, followed by **Commissioning** (Phase A).
- **Operation** will commence following Phase A Commissioning, and once the Licence to Operate is granted by the CNSC and the hold points related to commissioning Phases B, C and D are complete. The ARC SMR will then continue to operate efficiently and safely for an estimated 60 years.
- **Decommissioning** of the Project will be conducted at the end of the operational life of the unit. Following final shutdown, fuel will be removed from the core, placing the unit into a safe storage state for an initial dormant period, which will be estimated for project bounding purposes during the EIA process. At the end of the dormancy period, once the Licence to Decommission is granted by the CNSC, decommissioning activities will start and follow the approved, fully funded, Decommissioning Plan.

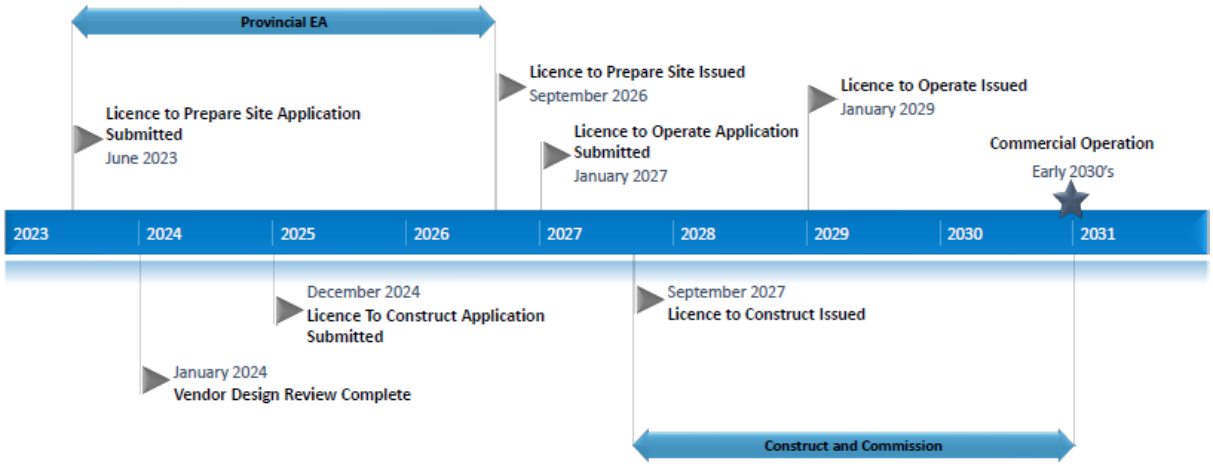


Figure 4.14: Estimated Project Schedule

During the construction phase, activities are expected to be continuous, particularly during the summer construction season. Loud and possibly disruptive construction work, such as blasting or drilling, will be conducted during regular working hours Monday through Friday. Potentially disruptive work outside of these hours, including the possibility of work on Saturdays, Sundays and evenings, will only be undertaken in consultation with affected nearby residents. A Noise Management Plan will include details for community engagement.

4.7 Emissions and Waste Management

4.7.1 Air Emissions

The potential air emissions for the construction phase of the Project would primarily be:

- Particulate matter (PM, including its common size fractions PM_{10} and $PM_{2.5}$) from fugitive sources (e.g., excavation and earthworks, material handling, and soil storage piles); and
- Combustion gas emissions such as carbon monoxide (CO), nitrogen oxides (NO_X), and sulphur dioxide (SO_2) from the combustion of fossil fuel by construction equipment.

Some limited GHG emissions will occur during the site preparation and construction from machinery used for construction and transportation, and during normal operation as a result of standby diesel generator testing and vehicle traffic on-site.

Further air quality characterization study and assessment is planned as part of further EIA studies (see **Section 7.0**).

4.7.2 Noise Emissions

Noise emissions from the Project will occur during site preparation and construction. Construction noise will include traffic to and from the site, as well as on-site noise generation. On-site construction noise will generally be intermittent, as equipment is transient and operated on an as-needed basis and mostly during daylight hours. Noise emissions will adhere to applicable noise guidelines and limits.

No noticeable noise is anticipated to arise during the operational phase as the Project site is more than 1 kilometre from nearby noise-sensitive areas and residences.

An acoustic characterization study and assessment is planned as part of further EIA studies (see **Section 7.0**).

4.7.3 Lighting

During evening and night shifts during operations, various fixtures will be required to ensure sufficient lighting for workers to avoid hazards. These may include permanent fixture or mobile lighting towers. Lighting will also be required to provide the necessary security lighting in accordance with applicable *Nuclear Security Regulations*, as well as potential lighting for aviation purposes. Protocols will be developed to ensure that any such lighting does not disrupt the surrounding populated areas or disturb wildlife migratory or breeding habits.

A light characterization study and assessment is planned as part of further EIA studies (see **Section 7.0**).

4.7.4 Radioactive and Hazardous Materials

The ARC SMR facility will use, as much as practical, commercial off-the-shelf waste management systems and equipment. The radioactive waste system will provide the equipment for collecting, processing, monitoring, storing, and disposing of liquid and solid radioactive wastes within areas in the radioactive maintenance and waste building. **Solid radioactive waste** will be collected, characterized, compacted, packaged, and prepared for disposal using conventional waste management equipment. A few processes generate limited **liquid radioactive waste**, which will be processed by evaporation. The resulting solid waste will be packaged and the vapours from the evaporation process filtered.

A **gaseous radioactive waste** system will receive, analyze, and filter airborne radionuclides that could exist in areas of the plant (see also **Section 4.7.5**). This is done locally where there is a

potential for radioactive gas being present. For example, argon cover gas within the reactor vessel is provided by a closed system that includes a subsystem for collecting, monitoring, treating, and filtering radioactive gases, vapours, or airborne particulates released from the sodium pool. Controlled discharges to the atmosphere take place when maintenance of the argon cover gas system requires it to be purged.

Interim **used fuel dry storage** will use a system for dry storage of light-water reactor fuel assemblies. Although space has been allocated on the ARC SMR site for the used fuel dry storage facility, the first interim used fuel dry storage module will not be required until several years after the first refuelling of the reactor core (see **Section 4.3.13** and **Section 4.3.2**).

The disposal of used fuel from the ARC SMR will be to a planned deep geological repository (DGR) for used nuclear fuel, consistent with international best practice for managing high-level radioactive waste. Under the *Nuclear Fuel Waste Act*, the NWMO is responsible for the safe, long-term management of Canada's used nuclear fuel, including that created using new or emerging technologies such as SMRs. Disposal of used fuel will be in accordance with the NWMO's Adaptive Phased Management, which requires nuclear fuel to be contained and isolated in a deep geological repository. NB Power and ARC have been working with the NWMO regarding the most appropriate option for the long-term disposal of used fuel from the ARC reactor.

4.7.5 Radioactive Emissions

Implementation of radiation protection design and operating practices for ARC SMR design will ensure that radiation exposures to workers and members of the public during normal plant operation are "as low as reasonably achievable" (ALARA). Design targets based on operating experience in operating nuclear power plants are established to support applying the ALARA principle. This approach ensures that the design will be well below regulatory dose limits with large margins.

Activation products, e.g., argon-41, from neutron activation of air in the reactor vessel auxiliary cooling system, are the main source of radioactive emissions from the ARC SMR reactor. Operating experience from sodium-cooled fast reactors with similar designs show that annual radiation exposures to the public have been more than a thousand times less than the regulatory dose limit.

The layout of the ARC SMR plant includes the features to prevent radiation exposures, such as:

- Radiation zones are defined to divide the plant into areas related to their expected occupancy and to radiation levels and contamination levels in operational states and to potential radiation levels and contamination levels in accident conditions.
- Shielding is provided to prevent or reduce radiation exposures.
- As far as is reasonably practicable, materials used in the manufacture of structures, systems and components are selected to minimize activation of the material.
- Systems are designed to collect, monitor, treat or filter radioactive substances, prior to controlled releases to the environment.

4.7.6 Solid Waste

Solid waste management for the Project will generally follow the principles of reduction at the source, re-use, and recycling. Specific details will be identified through the EIA process.

Solid wastes generated during construction will include brush, stumps, grubbings, extra subsoil and rock, temporary fencing, signs, metal containers, and canisters, as well as scrap pipe, cables, welding rods, and domestic wastes. Scrap paper and other office wastes will also be generated. Construction-related waste will be transferred from the site to disposal or recycling at appropriately licensed waste management facilities.

Solid wastes will be collected and disposed of in a manner consistent with local and provincial standards. The types of materials that will be sent to the landfill will be consistent with operation of the PLNGS facility.

Similar to existing operations, NB Power will continue to actively cooperate with municipal waste reduction and recycling programs and will encourage conservation throughout its facilities. Non-hazardous wastes will be separated as recyclable and non-recyclable, with recyclable material collected and transported to a licensed recycling facility. Waste management procedures will be outlined in the Environmental Management Plan and comply with provincial solid waste resource management regulations, as well as additional municipal and disposal facility requirements. Non-recyclable wastes will be disposed of according to PLNGS' existing waste management procedures.

4.7.7 Effluent Discharge

The ARC SMR facility will have water effluents related to cooling tower circulating water blowdown, treated sanitary sewage, domestic water and grey water, and stormwater runoff.

When water evaporates from a cooling tower, solids that were in that water remain in the basin and redistribute into the circulating water. Over time, this water needs to be removed and replaced with makeup water. This process is called blowdown. Blowdown may contain quantities of biocides, anti-scaling, dispersants, and neutralizers and will be appropriately treated to meet regulatory water quality requirements. Waste streams from steam cycle demineralized blowdown and discharged treated grey water could potentially be added to the cooling tower makeup or blowdown streams. Depending on release limits and treatment requirements, there are options to neutralize free chlorine/oxidizers prior to release. If further study determines the need for a 24-hour retention ditch/pond for monitoring and treatment prior to discharge, one may be installed.

Treated sanitary sewage will be discharged through common surface water outfalls (with the existing PLNGS) and will meet the required standards and regulations. Facility floor and equipment drains will be collected, sampled, and routed to the appropriate wastewater systems. Approximate treated grey/sanitary water discharge volume is expected to be 20 litres per minute.

There is potential for erosion and sedimentation during the construction phase of the Project. The Environmental Management Plan will include plans for erosion and sediment control measures and will be developed prior to commencement of construction activities. At a minimum, surface run-off and sedimentation control will adhere to NBDELG standards and guidelines. Following completion of construction, erosion and sedimentation are not expected to be a concern during operation of the ARC SMR.

4.8 Malfunctions and Accidents

The works and activities described for the Project in **Section 4.5** outline the normal operation of the ARC SMR facility. As described in **Section 4.3**, many of the systems and components of the ARC SMR include various aspects and inherent design features in the case of unanticipated malfunctions or accident event scenarios. This section provides an overview of the design provisions in place to reduce the likelihood and consequence of a potential accident, safety and security measures, emergency response procedures, and safeguards. Accidents and malfunctions and safety measures are described in further detail within the Site Evaluation Report (NB Power, 2023b).

At a nuclear facility, the following definitions are used when referring to different plant states:

- **Normal Operation:** The operation of a nuclear facility within specified operational limits and conditions, including (where applicable) start-up, power operation, shutting down, shutdown, maintenance, testing and refuelling.
- **Anticipated Operating Occurrence:** An operational process deviating from normal operation that is expected to occur at least once during the operating lifetime of a reactor facility but, because of appropriate design provisions, does not cause any significant damage to items important to safety or lead to accident conditions. Some examples of Anticipated Operating Occurrences are loss of normal electrical power and faults such as a turbine trip, malfunction of individual items of a normally running plant, failure of individual items of control equipment to function, and loss of power to the main coolant pump.
- **Design Basis Accident**: Accident conditions for which a nuclear facility is designed according to established design criteria and for which damage to the fuel and the release of radioactive material are kept within authorized limits.
- **Beyond Design Basis Accident:** An accident less frequent and potentially more severe than a design basis accident. For a reactor facility, a beyond design basis accident may or may not involve fuel degradation.
- **Severe Accident**: An accident more severe than a design basis accident and involving severe fuel degradation in the reactor core or irradiated fuel storage.

4.8.1 Safety Design Provisions and Application of Defence-in-Depth

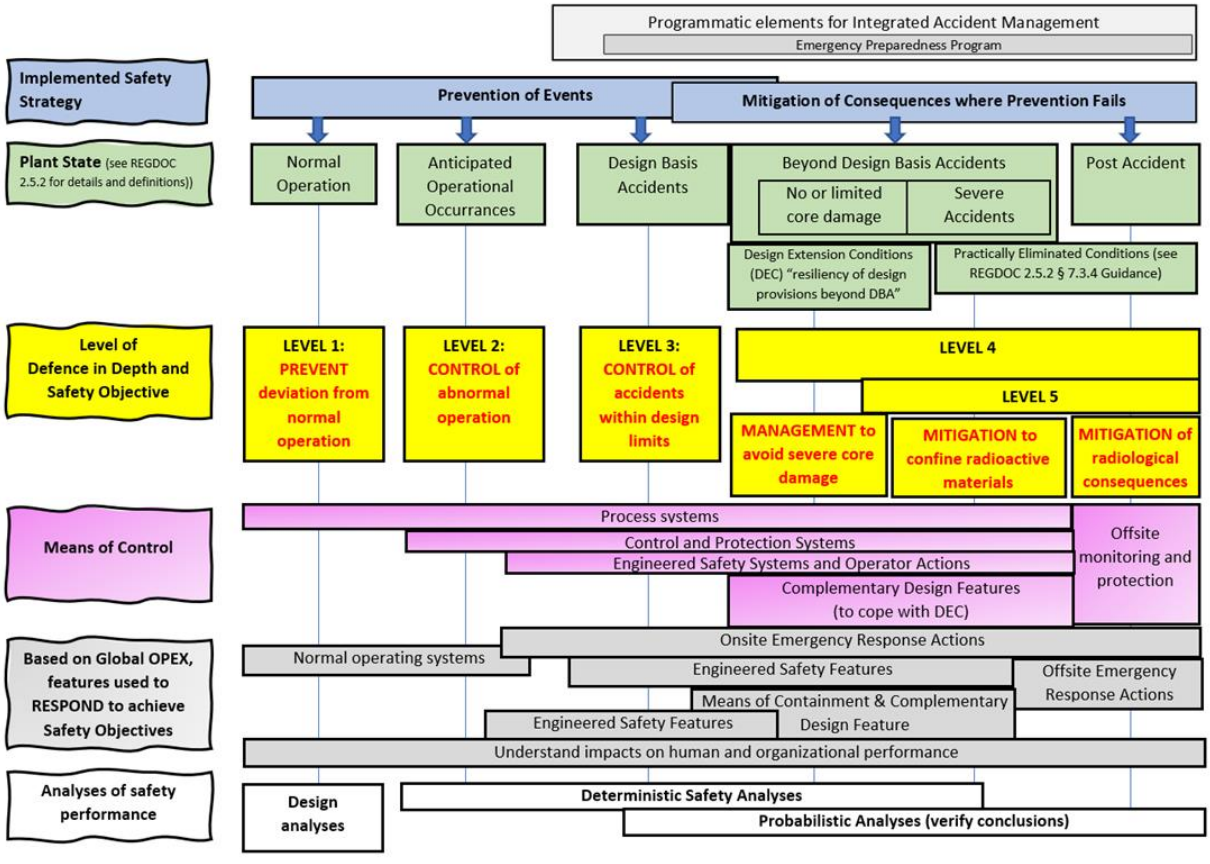
The ARC SMR is being designed to meet Canadian design requirements such as *REGDOC-2.5.2 Design of Reactor Facilities: Nuclear Power Plants* and implementing modern practices for safety and security as a Generation IV technology. The safety and reliability goals for its design include:

- Minimizing the occurrence of operational events that can cause a forced outage, improving worker safety, and reducing routine emissions.
- Preventing and mitigating the likelihood and degree of reactor core damage by providing design features that create high confidence that the possibility of core damage accidents will be low.
- Maximizing the capability of the safety features to manage and mitigate the consequences of severe plant conditions, to reduce the need for off-site emergency response.

Nuclear safety in the ARC SMR design is assured by requiring that systems important to safety are available for any plant state to perform the following fundamental safety functions:

- the control of reactivity;
- removal of heat from fuel;
- containment of radioactive material;
- shielding against radiation;
- control of operational discharges and hazardous substances, and
- monitoring of safety-critical parameters to guide operator actions.

The design of the ARC SMR has adopted a "defence-in-depth" safety approach (**Figure 4.14**), which contributes to achieving each of the safety goals listed above. There has been a strategic focus of engineering and design activities to ensure prevention and subsequent control of off-normal events (Defence-in-Depth Levels 1 to 3), to avoid progression to beyond design basis and severe accident scenarios.



SOURCE: NB Power, 2023b

Figure 4.15: Implementation of Defence-in-Depth into Design and Operation of Nuclear Facilities

Defence-in-depth is applied at every level with “safety by design” in mind, incorporating separate, diverse, and redundant measures to prevent and mitigate event progression. This includes using simplified, more reliable systems and ample margins for safe operation.

As an example, the ARC SMR uses liquid sodium as a coolant. Sodium has a boiling point of 883°C, allowing the primary heat transport system to operate at higher temperatures and lower pressures. This reduces the driving force of radionuclides out of containment in the extremely low likelihood event of a breach occurring, minimizing the potential off-site impact to public health and the environment.

A feature of the ARC SMR pool-type reactor design is the practical elimination of a large loss-of-coolant accident (LOCA). Any breach in the primary heat transport system would be contained within the reactor vessel, and penetrations (e.g., control rod drivelines, intermediate heat transport piping) in the reactor vessel itself will be well above the sodium pool level. The guard vessel is another barrier against LOCAs resulting from breaches in the reactor vessel. The guard vessel is sized such that the reactor core is always covered by sodium if a breach in the reactor vessel does occur. Additionally, the guard vessel itself is surrounded by the concrete containment structure.

While inherent safety characteristics of the reactor design can themselves prevent events from occurring, the ARC SMR has also engineered passive safety systems to control and mitigate their effects. As an example of how several separate, redundant, and diverse systems work together to apply the defence-in-depth philosophy, if there is an event in which a small positive reactivity insertion occurs (referred to as a transient overpower, or TOP, event). This event is considered an Anticipated Operational Occurrence as the failure of the distributed control and instrumentation system (**Section 4.3.10**) is the postulated initiating event. As a result of the positive reactivity insertion, the fission power in the core would increase, and consequently thermal power would increase. If the setpoints are surpassed for these parameters, the reactor protection system would trip (**Section 4.3.11**), dropping the poised shut-off rods into the core under gravity. There would be sufficient negative reactivity in two shutdown rods to guarantee shutdown in the case that one of the three shutdown rods does not drop.

In the extremely low likelihood of a compounded event in which ***all*** shutdown rods fail to drop into the core after the distributed control and instrumentation system has failed, the diverse protection system (**Section 4.3.11**) is still available to shut down the reactor. When the diverse protection system activates, valves close to isolate the steam generator from the intermediate heat transport loop, which ceases the removal of heat from the reactor core. The temperature of the fuel, coolant, and structural materials begin to rise; however, the inherent characteristics of the ARC core design result in an overall negative reactivity feedback upon an increase in temperature, causing the reactor to shut down.

The design of the ARC SMR also includes two safety-classified emergency heat removal systems that are separate, diverse, and independent of the normal heat removal system; the Direct Reactor Auxiliary Cooling System (DRACS) and the Reactor Vessel Auxiliary Cooling System (RVACS) (**Section 4.3.5**). The RVACS is a passive system, only reaching its full heat removal capacity in the absence of any other heat removal systems.

Each of the levels of defence-in-depth are summarized briefly in the following sections. Further detail and examples of systems that contribute to each level may be found in the Site Evaluation Report (NB Power, 2023b).

4.8.1.1 Level 1 Defence-in-Depth – Prevention of Abnormal Operation

The aim of the first level of defence is to prevent deviations from normal operation, and to prevent failures of structures, systems and components important to safety. The ARC SMR is designed to operate with a high level of reliability and inherent stability to prevent accident initiators from occurring. The fuel, cladding, coolant, and structural materials in the reactor core are chemically compatible. The reactor operates with large temperature margins between normal operating conditions and limiting failure conditions. These safety features were demonstrated by the EBR-II. The ARC SMR further increases the margins for safety by operating at a significantly lower power density than EBR-II.

The arrangement of the components allows monitoring, inspection, and testing for performance changes and detection of degradation. The arrangement also provides for the repair and replacement of necessary components to assure that safety margins are not degraded.

The selection of liquid sodium and metallic fuel with a pool-type Primary System arrangement provides a highly reliable Reactor System with large operational safety margins. The coolant's thermo-physical properties provide superior heat removal and transport at low operating pressure (essentially atmospheric) with large temperature margins to boiling. The metallic fuel operates at a relatively low centerline temperature (well below the sodium coolant boiling point) due to its high thermal conductivity. The pool-type Primary System confines significantly radioactive materials within a single vessel. The liquid sodium coolant has the additional advantage of trapping non-gaseous fission products escaping failed cladding. Lastly, the pool-type Primary System allows decay heat removal by natural circulation and easy removal and replacement of components.

4.8.1.2 Level 2 Defence-in-Depth – Control of Abnormal Operations and Anticipated Events

The aim of the second level of defence is to detect and intercept deviations from normal operation, in order to prevent Anticipated Operating Occurrences from escalating to accident conditions and to return the plant to a state of normal operation. This level of protection is provided by the large thermal inertia of the Primary Coolant System and the reactor internals resulting in a slow progress of transients, inherent negative reactivity feedback provided by the core design ensuring a high degree of reactor self-control, and appropriate monitoring and detection systems.

4.8.1.3 Level 3 Defence-in-Depth – Protection against Design Basis Accidents

The aim of the third level of defence is to minimize the consequences of accidents by providing inherent safety features, fail-safe design, additional equipment and mitigating procedures. This level of protection is provided by engineered safety systems for reactor shutdown, reactor heat removal, and emergency power. Each of these safety systems function in the event of failure in the corresponding operating system. These systems are continuously monitored and are periodically tested and inspected.

The ARC SMR design provides independently powered Primary and Secondary Instrumented Shutdown Systems that operate automatically to rapidly reduce power if the Primary Control Rod System fails. Moreover, the inherent highly negative reactivity feedback will shut down the reactor if the Secondary Shutdown System were to also fail. For shutdown cooling, the ARC SMR includes a safety classified emergency heat removal system that is independent from the normal heat removal system. This system (DRACS) is capable of removing the decay heat by forced or natural circulation. Decay heat removal can also be accomplished via a third system

(RVACS), which cools the exterior of the guard vessel via natural air circulation to the atmosphere.

4.8.1.4 Level 4 Defence-in-Depth – Control of Severe Plant Conditions

The aim of the fourth level of defence is to ensure that radioactive releases caused by severe accidents are kept as low as practicable. The main Level 4 ARC SMR protections are the inherent and passive safety characteristics of the facility which ensure that the plant survives postulated initiating events (design basis and beyond design basis) without operator intervention and external power supply required for at least several days. The Level 4 systems for cooling assurance and containment of radioactivity are provided by the guard vessel and the reactor building. The guard vessel assures that the reactor core remains covered with coolant and is cooled by the emergency heat removal system, even if the primary vessel fails. In the unlikely event that the primary coolant leaks and the sodium oxidizes in the reactor building air atmosphere, or if failures of the cladding and the primary system barriers lead to release of gaseous fission products, the reactor building provides a final low leakage barrier to release of radioactivity to the environment. Lack of piping penetrations below the top of the Reactor Vessel and the inclusion of a surrounding guard vessel practically eliminates loss of coolant accidents and ensures the fuel will remain immersed in sodium. Operating experience indicated that sodium leaks often start slowly allowing time for detection and mitigation and design features such as double walled pipe, leak jackets and chases, cell liners, drip pans, suppression decks, and inerted environments may further reduce the risk of sodium fires. Furthermore, the low-pressure design of the pool type reactor reduces the driving force of radionuclides out of the containment.

4.8.1.5 Level 5 Defence-in-Depth – Protection of the Public Health and Safety in Case of Accidents

The aim of the fifth level of defence is to mitigate the radiological consequences of potential releases of radioactive materials that may result from accident conditions. The Level 5 protection of public health and safety consists of onsite and offsite emergency preparedness planning to address residual risks not already prevented and mitigated by defence-in depth Levels 1 through 4. Residual risks that include the inherent and passive safety characteristics of the facility will also ensure that the plant survives postulated initiating events (design basis and beyond design basis) without operator intervention and external power supply for at least several days. In addition, the design goal of the ARC SMR is to have the emergency planning zone limited such that there is no evacuation of the public required.

4.8.2 Safety and Security

The design, security plan and program will meet the requirements of the Nuclear Security Regulations and the associated CNSC regulatory documents and will ensure nuclear safety objectives and safeguard obligations are met. Design provisions will also be provided related to cyber security, and physical security programs will be put in place to address safety and security.

4.8.2.1 Nuclear Security Measures to Support Mitigation of Accidents Initiated by Threats

Nuclear security governance follows the Canadian *Nuclear Security Regulations*, under the *NSCA*, and the specific regulatory documents in the REGDOC 2.12 series. The licensee of a nuclear power plant must demonstrate, through the design and the operational response, that they meet these requirements.

The NB Power security strategies and objectives utilize five defence-in-depth levels: 1) deterrence, 2) detection, 3) delay, 4) an on-site security response and 5) an off-site security response backup. A combination of multiple layers of physical systems and equipment, plant layout and procedures (including the arrangements for on-site security forces and off-site response forces) have to be overcome or circumvented before physical protection is compromised. This defence-in-depth approach for nuclear security parallels that for nuclear safety.

The physical security requirements for the ARC SMR are:

- Fuel, systems, and equipment that are important to safety and the sabotage of which could lead to unacceptable radiological consequences, are located within vital areas.
- Access and number of access points to the protected area(s) and the vital area(s) are kept to a minimum, and are strictly controlled.
- The design and construction of vital areas provide penetration delay. Vital areas are secured, and alarms set when unattended.
- A series of independent physical barriers are provided consistent with the defence-in-depth principle.
- The protected area is provided with a robust physical barrier. Intrusion detection is provided at the physical barrier. Clear areas are provided on both sides of the perimeter of the protected area with illumination sufficient for assessment.
- A continuously staffed and hardened central alarm station is provided.
- All intrusion detection sensors annunciate in the security monitoring room.
- Dedicated and tamper indicating transmission systems and power supplies (from uninterruptible emergency power) are provided for and between the security monitoring room and the intrusion detection systems.
- Dedicated and diverse transmission systems for two-way communication between the security monitoring room and the response force are provided.

The ARC SMR is designed to resist a set of threats that are categorized as “design basis threats” and “beyond design basis threats”. Threats identified as design basis threats have credible attributes and characteristics of potential insider or external adversaries who might attempt sabotage, against which a physical protection system is designed and evaluated. Beyond design basis threats are less frequent and more severe than design basis threats, and their consequences are assessed to establish means of mitigation to the extent practicable. Threats may be national, project-specific or site specific.

4.8.3 Nuclear Material Accounting and Safeguards

To obtain a licence for a nuclear power plant in Canada, an applicant must demonstrate that it is qualified and has made adequate provisions to maintain national security, and implement measures required to meet Canada’s international obligations. The ARC SMR design includes intrinsic and extrinsic features that facilitate IAEA and CNSC surveillance, item accountancy verification, and minimize the attractiveness of this technology as a target for proliferation, such as:

- The fuel is U-10%Zr binary metallic fuel and will be sourced from outside of Canada and has an average uranium enrichment of 13.1wt%, which the IAEA defines as a nuclear material that cannot be used for the manufacture of nuclear explosive devices without transmutation or further enrichment.
- The seal-welded access to the reactor vessel means that the core is only accessible during outages.
- The fuel assemblies require the use of lifting equipment and shielded casks to transport them.
- In-vessel storage of used fuel assemblies is protected by access to the reactor vessel and can be monitored accounted for and verified.
- NB Power will demonstrate that access to the reactor vessel and used fuel wet and dry storage can be monitored by installing IAEA containment/surveillance seals.
- Use of the fuel handling equipment is very infrequent and easily monitored by installing IAEA containment/surveillance seals.
- IAEA surveillance equipment will monitor the used fuel in dry storage.

4.9 Environmental Protection and Management

The CNSC requires that the environmental effects of all nuclear facilities or activities be characterized and evaluated when licensing decisions are made. The CNSC assesses, evaluates, reviews, verifies and reports on regulatory requirements under its "Environmental protection" safety and control area. *REGDOC-2.9.1 Environmental Principles, Assessments and Protection Measures* provides information to applicants and licensees about protecting the environment and the health of persons, including the CNSC's principles for environmental protection and the CNSC's requirements and guidance to applicants and licensees for developing environmental protection and assessment measures for both new and existing facilities or activities. CNSC's regulatory framework for environmental protection is further supported by a graded application of requirements further articulated in federal and provincial environmental legislation (see **Section 2.0**), a number of Canadian Standards Association (CSA) standards in the N288 series, and International Organization for Standardization (ISO) *14001 Environmental Management Systems*.

The environmental protection measures and assessments are periodically reviewed and updated through the lifecycle of a project using the accumulated site knowledge derived from operational experience, monitoring, special investigations, incorporation of advances in scientific knowledge and, where available, IK.

The Project will be constructed and managed in line with NB Power's *Environmental Policy*, which acknowledges the company's responsibility to manage the environmental impacts associated with its operations, and the need to continually improve environmental performance by incorporating strategies and procedures that promote sound practices into processes and facilities.

NB Power manages all aspects of its business in accordance with the NB Power Management Systems of the PLNGS Nuclear Management Manual and Advanced Reactor Management Manual. The combination of the two systems demonstrates how NB Power meets regulatory

requirements. NB Power will ensure ongoing and intrusive oversight for all phases of the Project through its Management System. Furthermore, NB Power requires its contractors to have their own management system compliant with applicable current standards.

The environmental management of the ARC SMR facility will follow the Environmental Management System (EMS) outlined in process document 0920-00015-EV01-001-PD-A, *Environmental Management System* under the management system for the Project. The EMS will meet the requirements of the *ISO 14001 Environmental Management Systems*. The EMS ensures that activities and products that could impact the environment have been identified and are tracked and monitored. It provides a transparent way for NB Power to manage and minimize any impact from its operations. Aspects that are monitored and managed to ensure the health of the ecosystem and of surrounding communities include radiological and non-radiological releases to air, soil and water, nuclear and non-nuclear waste management and emergency management. Environmental assessment and improvement programs have been developed to ensure continual improvement. The EMS will ensure that conditions of approval from the EIA process are met.

The EMS will also include the following:

- Effluent and emissions control and monitoring measures;
- Environmental monitoring measures to confirm predictions of changes to baseline conditions in the EIA;
- Groundwater protection and monitoring measures; and
- Contingency plans to address unplanned non-nuclear events (i.e., spills, discovery of archaeological resources).

5.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

The following sections provide a description of the existing environment based on information available from previous studies and environmental assessments undertaken at Point Lepreau since the construction of the existing PLNGS as well as current baseline assessments completed for some components of the biophysical environment as part of the planning phase for this Project.

The following summary is taken directly from the CNSC's *Environmental Protection Review Report: Point Lepreau Nuclear Generating Station* to provide an understanding of existing baseline conditions related to operation of the licensed PLNGS facility (CNSC, 2022).

The CNSC staff conduct science-based technical assessments called environmental protection reviews (EPRs) for all nuclear facilities with potential project-environmental interactions, in accordance with its mandate under the *NSCA* to ensure the protection of the environment and the health of persons. The EPR report focuses on items that are of Indigenous, public and regulatory interest, such as potential environmental releases from normal operations, as well as risk of radiological and hazardous substances to the receiving environment, valued components and species at risk. Documents reviewed by the CNSC to inform the EPR review for the existing operation of the Point Lepreau Nuclear Generating Station include, but are not limited to, annual compliance reports, site-wide Environmental Risk Assessments from 2016 and 2021, and the CNSC's Independent Environmental Monitoring Program.

Based on CNSC staff's assessment and evaluation of NB Power's documentation and data, CNSC staff have found that the potential risks from physical stressors, as well as from radiological and hazardous releases to the atmospheric, aquatic, terrestrial and human environments from the PLNGS are low to negligible, resulting in no significant adverse effects. The potential risks to the environment from these releases are similar to natural background and the potential risks to human health are indistinguishable to health outcomes in the general public. Therefore, CNSC staff have found that NB Power implements and maintains effective environmental protection measures to adequately protect the environment and the health of persons. Impacts to the human environment from radiological and hazardous substances released from the facility are negligible, and that people living or working near the site remain protected.

NB Power is completing several additional studies hat will update the existing knowledge of the Project site and surrounding region and provide the baseline site characterization for the Project (see **Section 7.0**). Several of the studies currently being undertaken to describe the baseline conditions for the EIA have been designed and planned with the participation of First Nations communities (**Section 3.1.2**).

Descriptions of the existing environment are provided at the spatial scale appropriate for each environmental component, based on the information available. Regional information was used to describe components such as climate, air quality, marine and socio-economic conditions; local information within the boundaries of the Point Lepreau property was used for the description of the aquatic and terrestrial environment. Because two study areas, referred to as the West Study Area and the Northeast Study Area" (see **Figure 1.1**), were originally identified as possible locations for SMR siting, both were assessed during Project-specific baseline studies. The West Study Area was then identified as the area where the ARC SMR facility will be sited, though the facility planning for the exact siting of the ARC SMR demonstration unit and associated buildings and infrastructure (i.e., the Project footprint) within the West Study Area is underway.

5.1 Geophysical Environment

5.1.1 Geomorphology and Topography

The Project site is situated on the Lepreau Peninsula extending south into the Bay of Fundy. The property consists of a low, rolling plateau with steep rock cliffs dropping into the Bay of Fundy. The high point, at approximately 55 metres above sea level (masl) is located in the northwestern corner of the property. Within the property, the topography is relatively flat until descending rapidly towards the shoreline.

The eastern shoreline forms part of Duck Cove and is characterized by smooth, sloping bedrock. The western shoreline is part of Indian Cove and is generally rough and steep with wave worn and sweeping rock formations. Stunted trees line the cliff edge, while sand and cobble beaches are present beneath the shoreline cliffs (MacLaren Atlantic, 1977).

5.1.2 Geology and Soils

The Project site is located in the Fundy Coastal Ecodistrict of the Fundy Coast Ecoregion, which comprises the southern coastline of New Brunswick along the Bay of Fundy. According to the regional bedrock maps (Government of New Brunswick, 2023a), the bedrock of the area is of the Triassic Age, Lepreau Formation. The bedrock is characterized as, “red, granite-clast, conglomerate, red fine- to medium-grained sandstone to pebbly sandstone and minor red mudstone which locally contains calcareous nodules”.

The geology of the Point Lepreau area is described as a sequence of Triassic sedimentary rocks consisting of sequences of sandstones and conglomerates, with thin layers and lenses of siltstones and shales, that dip to the west at inclinations of 20° to 60° to horizontal. The Triassic rocks are underlain unconformably by Carboniferous and older rocks, which are exposed at the surface three to four kilometers to the northeast of the site (ADI Ltd, 1975). Recent geotechnical investigations of the West and Northeast study areas (CBCL, 2023) indicated that bedrock was typically reddish brown to reddish grey conglomerate, reddish brown sandstone/siltstone, and/or interbedded layers of conglomerate, sandstone, and siltstone (sedimentary bedrocks) consistent with the regional geology map and existing bedrock literature in the area.

Based on the most recent surficial geology mapping for the area (Allard and Dickinson, 2013) the Lepreau Peninsula is host to Late Wisconsin (100,000 to 11,000 years before present) littoral and nearshore sediments characterized by massive or stratified sands, silts, gravels and cobbles generally greater than 1 metre thick. These sediments tended to form plains and terraces in these nearshore and lower elevation areas that were inundated by seawater in the Late Wisconsin stage of the last glaciation.

According to the regional maps, surficial sediments in the Musquash area (NTS 21 G/01, including Point Lepreau) are of Pleistocene and Holocene age (Government of New Brunswick, 2023a). These sediments reveal a complex sequence of glacial erosion and deposition followed by deglaciation. Major fluctuations in glacial activity, seawater levels, and land levels occurred during the Late Pleistocene and had a profound effect in shaping the regional landscape (Government of New Brunswick, 2023a).

Observed till thickness is generally less than 1 metre except for in very localized bedrock hummocks where thicker till accumulations (up to 4 metres) have been observed. Till deposits in this area have been subjected to a high degree of marine reworking. Despite this reworking, the

lithology, texture, and colour generally reflect local bedrock sources (Government of New Brunswick, 2023a).

According to the geotechnical reports carried out at Point Lepreau, the original overburden soils consist generally of a thin layer of sand and gravel. In the low-lying areas, peats up to 1.5 metres thick have been found and red clay and or glacial till have been found up to 5.5 metres deep in some of the thicker overburden areas below elevation 27 metres (GEMTEC, 2008). GEMTEC (2000) indicated that boreholes drilled for a past study encountered peat or topsoil underlain by granular sand and gravel deposits that vary in depth between <1 metre to approximately 5 metres over much of the site, which is consistent with the description of soils provided by the most recent mapping (Allard and Dickinson, 2013). GEMTEC (2000) also noted variability in the surficial soils thickness and composition, interpreted as a glacial channel scoured into the bedrock.

Recent geotechnical investigations (CBCL, 2023) of the West Study Area indicate that there is a thin layer of overburden encountered above bedrock that is typically less than 0.3 metres to 1.0 meter thick. The thickness of the overburden exceeds 1.5 metres occasionally in areas where fill was added from past site development, and at the southern end of the study area. Typically, the overburden within the undeveloped (forested) areas on the eastern half of the West Study Area consist of a thin topsoil/rootmat layer over very loose to loose brown silty gravel with sand or gravel with silt and sand. The overburden within the undeveloped (forested) areas on the western half of the West Study Area consist of a thin topsoil/rootmat layer over very loose to loose brown silty sand, silty sand with gravel, or sand with silt and gravel. The overburden within the developed areas (areas that have been grubbed and levelled for laydown, roads, parking, or other facilities in conjunction with the existing generating station) consist of a relatively thin layer (<2.5 metre total thickness) of sand with gravel (fill) over a mix of sand, silt and gravel (till).

The potential for acid rock drainage at the Project site was assessed by using bedrock and surficial geology maps to create an understanding of mineral compositions in the area. The formation of bedrock made up from sandstones and interbedded mudstone with local calcareous nodules. The New Brunswick Bedrock Lexicon has no mention of acid rock drainage within the Fundy Group, and no mention of sulfide-containing minerals within the Fundy Group. Existing work performed for the Fundy Group bedrock lithology and surficial geology indicated that the Fundy Group has low potential for acid rock drainage. The lithographic literature and numerous examples of fractures and veins coated or infilled by calcium carbonate mineral calcites in bedrock exposures indicate low potential for acid rock drainage.

5.2 Atmospheric Environment

5.2.1 Climate

The climate of New Brunswick is considered continental[1], although tempered by proximity to the ocean. Located along the southern coast of New Brunswick, the site is characterized by a moderate maritime climate with milder winters and cooler summers (CNSC, 2022; GEMTEC, 2023a). The Bay of Fundy and Lurcher marine areas west of Nova Scotia provide a strong moderation of air temperature over the region in both summer and winter (JWEL, 2003).

A description of the meteorological conditions for the Project was compiled by Stantec (Stantec, 2021a), and is summarized below. The information obtained for historical climate and meteorological conditions was acquired from the most up-to-date sources at the time of the Stantec (2021a) report.

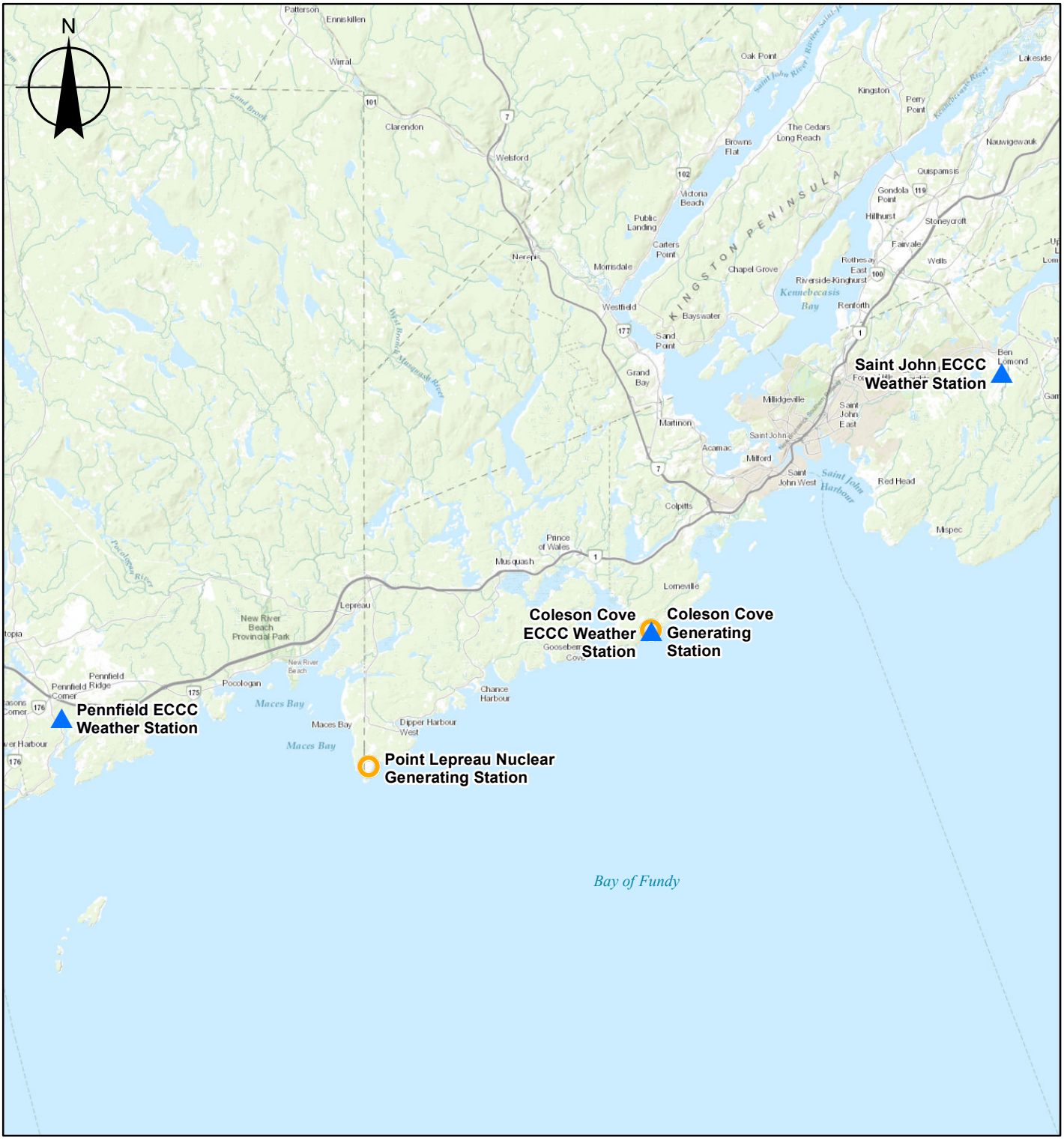
Climate normals and information on extreme meteorological events were obtained from three ECCC weather stations within approximately 50 kilometres of the Project: Coleson Cove, Pennfield and Saint John Airport (**Figure 5.1**; Stantec, 2021a). The Coleson Cove and Pennfield stations are located closest to the Project site, but are not currently active and have shorter periods of record than the Saint John Airport station (GEMTEC, 2023a). The Saint John Airport weather station is located further from the Project site (approximately 52 kilometres); however it provides a good representation of the climate conditions expected at the site (GEMTEC, 2023a). The Saint John Airport station is the only station that meets the World Meteorological Organization standards, and the only one that provides historical data on wind conditions (Stantec, 2021a).

In addition to these three weather stations, ECCC operates the Lepreau Climate Station, established in 1992, at Point Lepreau north of Duck Cove (GEMTEC, 2023a). However, this station was not included in the most recent climate normals published by ECCC for the 30-year period of 1981-2010, as it did not have at least 15 years of data within this time period (GEMTEC, 2023a).

Climate normals from these stations, based on historical data for the period of 1981-2010, are presented in **Table 5.1**. Extreme (max recorded) meteorological events for the same period are presented in **Table 5.2**.

A common way of representing extreme rainfall is through intensity-duration-frequency (IDF) data sets. The IDF curves are a statistical model of how often (i.e., the frequency) a certain amount of rain (i.e., the intensity, usually in millimetres) will occur over a certain amount of time (e.g., a duration of 10 minutes or 1 hour). The statistics are typically based on hourly and sub-hourly precipitation measurements. ECCC have compiled baseline IDF data for Point Lepreau from 2004 to 2016 (**Table 5.3**; Stantec 2023).

[1] Continental climates are characterized by variable weather patterns and significant variation in temperature. Continentality is the measure of the degree to which a region's climate typifies that of an interior of a large landmass. This type of climate occurs in the mid-latitudes.



LEGEND

- GENERATING STATION
- WEATHER STATION

0 5 10 20

1:400,000 KILOMETERS

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. BASEMAP SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
2. COORDINATE SYSTEM: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

CLIENT

Énergie NB Power

NEW BRUNSWICK POWER

PROJECT

ARC CLEAN TECHNOLOGY ADVANCED SMALL MODULAR REACTOR COMMERCIAL DEMONSTRATION UNIT - POINT LEPREAU, NEW BRUNSWICK

TITLE

METEOROLOGICAL STATIONS NEAR LEPREAU PENINSULA, NEW BRUNSWICK.

CONSULTANT

wsp

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Table 5.1: Climate Normals Near Lepreau Peninsula, New Brunswick (1981-2020)

Station	Distance from PLNGS (km)	Average Annual Wind Speed (km/h)	Maximum Daily Temp. (°C)	Minimum Daily Temp. (°C)	Annual Snowfall (cm)	Annual Rainfall (mm)	Annual Precipitation [2] (mm)
Coleson Cove	22 northeast	n/a	19.3	-10.2	142.0	1,023	1,165
Pennfield	23 northwest	n/a	21.3	-12.3	192.0	1,238	1,430
Saint John A[1]	52 northeast	15.2	22.6	-13.3	239.6	1,076	1,296

Source: Stantec, 2021a
[1] Meets World Meteorological Organization standards
[2] Recorded as rainfall equivalents
'n/a' - data not available for this station

Table 5.2: Extreme (Maximum Recorded) Meteorological Events near Lepreau Peninsula

Station	Distance from PLNGS (km)	Hourly Wind Speed (km/h)	Gust Wind Speed (km/h)	Max. Temp. (°C)	Min. Temp. (°C)	Daily Snowfall (cm)	Snow Depth (cm)	Daily Rainfall (mm)
Coleson Cove	22 northeast	n/a	n/a	34.5 (1993)	-29.0 (2000)	40.0 (2000)	49.0 (1992)	102 (1975)
Pennfield	23 northwest	n/a	n/a	37.2 (1977)	-36.5 (1982)	38.0 (2000)	195.0 (1987)	111 (1981)
Saint John A[1]	52 northeast	111 (1978)	148 (2002)	34.4 (1976)	-36.7 (1948)	58.2 (1960)	102.0 (1963)	154 (1975)

Source: Stantec, 2021a
[1] Meets World Meteorological Organization standards
'n/a' - data not available for this station

Table 5.3: Historical Intensity-Duration-Frequency (IDF) Data for Point Lepreau (2004-2016)

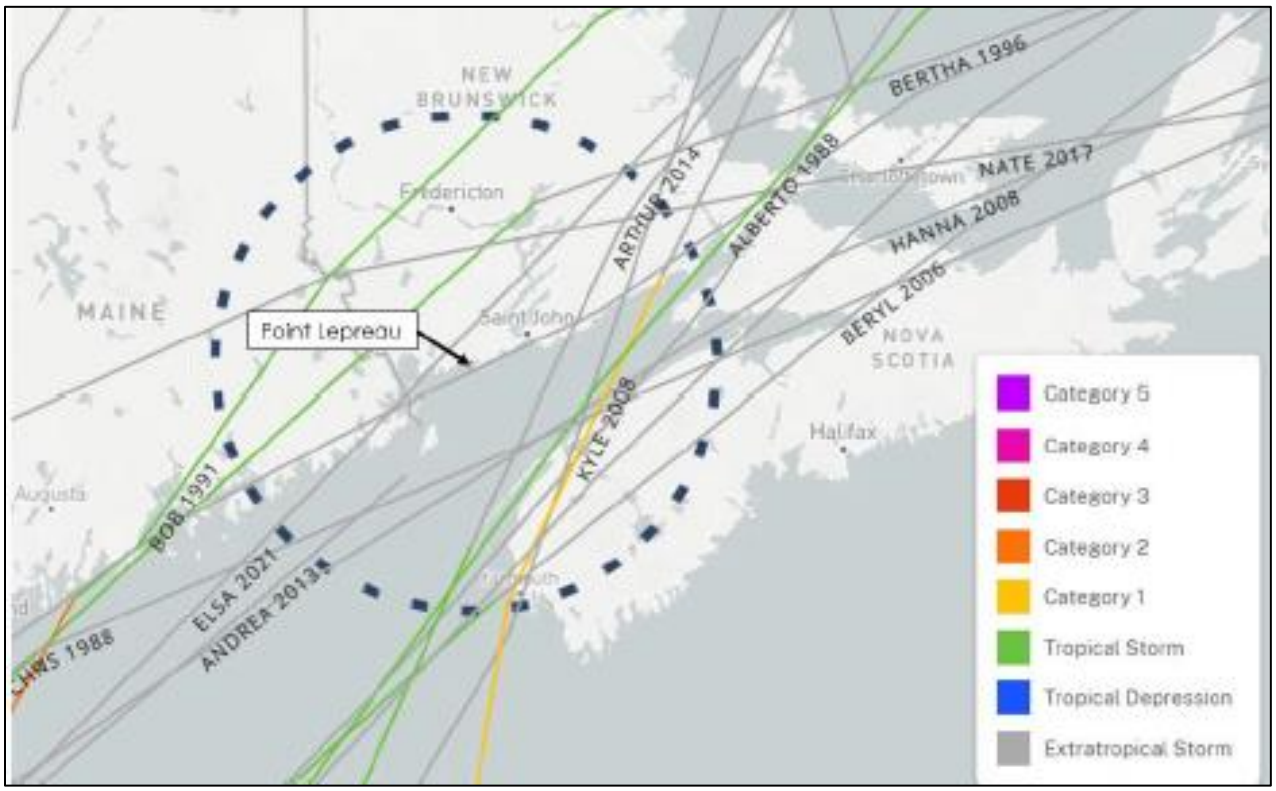
Interval	Precipitation Total (mm) by Event Return Period (Years)					
	2	5	10	25	50	100
1 h	23.7	30.2	34.5	40.4	44.0	48.0
2 h	35.5	46.6	54.0	63.4	70.3	77.2
6 h	54.7	71.7	82.9	97.1	107.6	118.0
12 h	73.8	96.5	111.5	130.4	144.5	158.4
24 h	83.3	106.2	121.3	140.4	154.6	168.7

Sources: Stantec 2023

Historical records for the Saint John Airport show that thunderstorms have occurred infrequently (10 per year average) in the past, and primarily during the months of June, July and August (NB Power, 1998; JWEL, 2003). Severe weather events that occur at Lepreau Peninsula are usually associated with winter east coast storms (Nor'easters) or tropical cyclones (hurricanes) (JWEL, 2003).

The Atlantic region is located under the converging tracks of most eastward moving storms in eastern North America. Occasionally, cyclones tracking across the continent undergo redevelopment off the American east coast. These east coast storms are characterized by rapidly falling pressures and storm-force or hurricane-force winds that develop in the order of hours. Occasionally, hurricanes or remnants of hurricanes move through the Atlantic region. Hurricanes usually occur in the North Atlantic during the June to November period. Since 1981, the eye of 15 tropical hurricanes have tracked within 150 kilometres of Point Lepreau (**Figure 5.2**; Stantec, 2023). Most tropical storms that impact the region are not categorized as hurricanes, since sustained winds do not exceed 118 kilometres per hour and are instead classified either as tropical storms (sustained wind speeds greater than 63 kilometres per hour) or they will have undergone the transition to extratropical systems. Despite their non-hurricane classification, systems that have undergone the transition to extratropical can still bring winds equivalent to hurricane-strength and tropical storms, regardless of strength, often bring heavy rain and storm surge. Of the 15 tropical hurricanes within 150 kilometres of Point Lepreau since 1981, four systems were classified at hurricane strength when they made landfall. The strongest hurricane near Point Lepreau was Hurricane Kyle which passed as a Category 1 Hurricane in 2008 (Stantec, 2023).

It is anticipated that these meteorological conditions will change in the future due to climate change. The projected future climate for the region will be assessed as part of the Climate Change Assessment for the Project (see **Section 7.0**; Stantec, 2023), including climate modelling re-analysis for baseline conditions at the Point Lepreau site itself.



Source: https://coast.noaa.gov/hurricanes, Stantec 2023.

Figure 5.2: Tropical Cyclones Within 150 Kilometres of Point Lepreau (1981-2020)

5.2.2 Air Quality and Greenhouse Gases

The information presented below is based on information available at the time of writing. An Air, Noise and Light Baseline Study is currently being undertaken for the Project to better understand existing conditions at the SMR site.

5.2.2.1 Air Quality Standards

Air quality in New Brunswick is regulated by the *Air Quality Regulation* under the *New Brunswick Clean Air Act*. The province's air quality objectives, established under the *Clean Air Act* in 1997, are presented in **Table 5.4**.

Table 5.4: New Brunswick Air Quality Standards

Pollutant	Averaging Period			
	1 Hour	8 Hour	24 Hour	1 year
Carbon Monoxide	35,000 micrograms per cubic metre (µg/m³) (30 parts per million [ppm])	15,000 µg/m^3 (13 ppm)	—	—
Hydrogen Sulphide[1]	15 µg/m^3 (11 per million [ppb])	—	5 µg/m^3 (3.5 ppb)	—

Pollutant	Averaging Period			
	1 Hour	8 Hour	24 Hour	1 year
Nitrogen Dioxide	400 µgAr/m^3 (210 ppb)	—	200 µg/m^3 (105 ppb)	100 µg/m^3 (52 ppb)
Sulphur Dioxide	900 µg/m^3 (339 ppb)	—	300 µg/m^3 (113 ppb)	60 µg/m^3 (23 ppb)
Total Suspended Particulate	—	—	120 µg/m^3	70 µg/m^3

Sources: Stantec 2021a; NBDELG 2020a
Notes:
1. The objective for sulphur dioxide is 50% lower in Saint John, Charlotte and Kings counties compared to the rest of New Brunswick.

At the federal level, the main guidance available for air quality is the Canadian Ambient Air Quality Standards (CAAQS) (CCME, 2020) developed by the Canadian Council of Ministers of the Environment (CCME). The CAAQS record long-term trends for fine particulate matter ($PM_{2.5}$) and ground-level ozone (O_3) across Canada. The targets are presented in **Table 5.5**.

Table 5.5: Canadian Ambient Air Quality Standards

Compound	CAAQS Standard
Ground Level Ozone (O_3) (8-hour metric)	63 ppb
Fine Particulate Matter ($PM_{2.5}$) (annual metric)	10 µg/m³
Fine Particulate Matter ($PM_{2.5}$) (daily metric)	28 µg/m³

Sources: Stantec 2021a; NBDELG 2020a

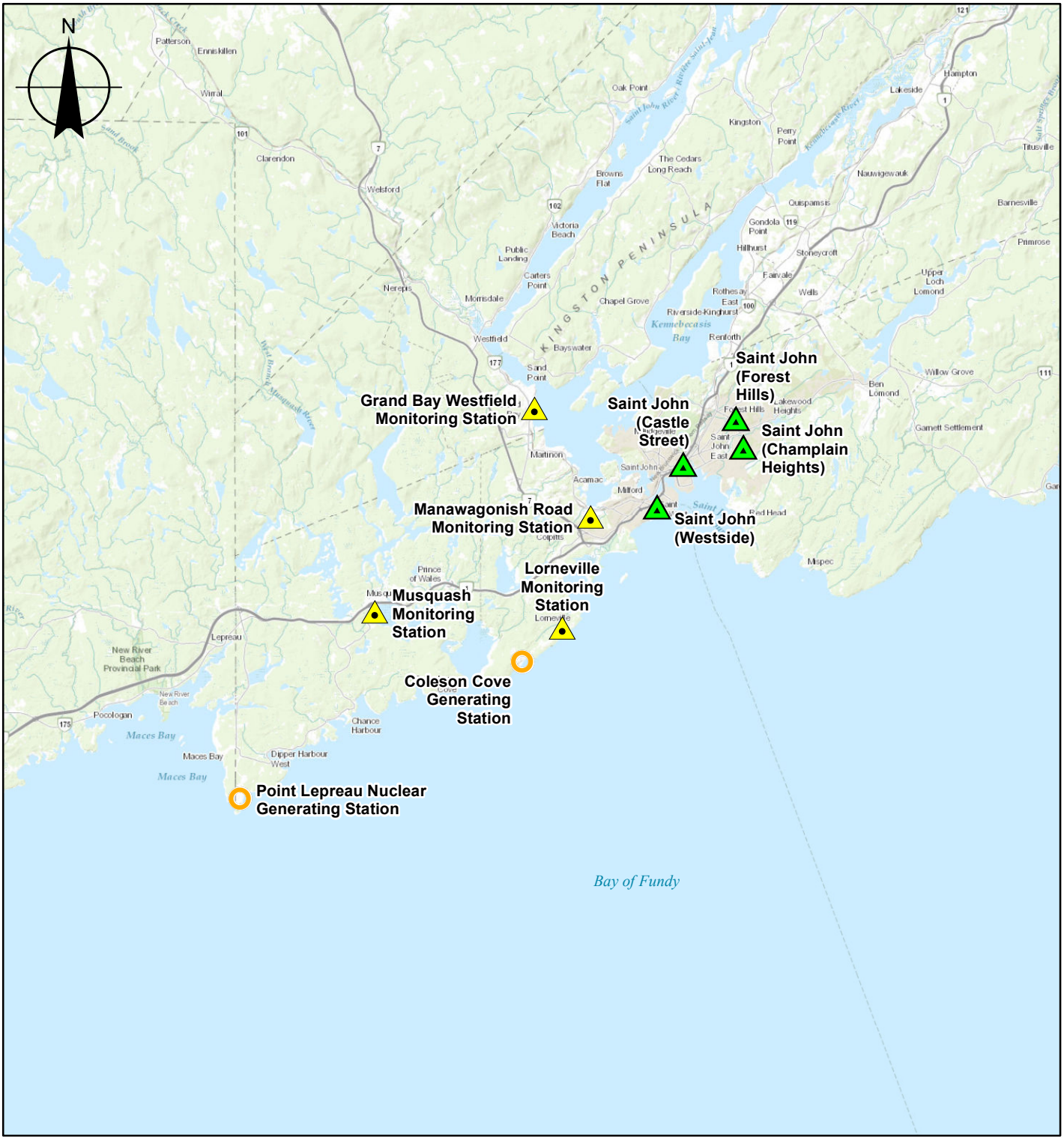
5.2.2.2 Regional Baseline Conditions

Ambient air quality in New Brunswick is generally characterized as “very good”, with few exceedances of the provincial ambient air quality objectives or CAAQS (Stantec, 2021a). In 2020, the provincial network included ten air quality monitoring stations (NBDELG, 2022a). In 2020, there were a total of six exceedance events (resulting in the nine cumulative hours of exceedances). The exceedances in 2020 were related to infrequent, intermittent increases in odorous compounds (hydrogen sulphide [H_2S] and sulphur dioxide [SO_2]) released in Saint John. Industries in these areas are known to emit H_2S and SO_2 as part of their processes; however, they have made efforts to reduce emissions of these contaminants in the past 20 years through fuel switching to lower sulphur fuel as well as process improvements (Stantec, 2021a).

5.2.2.3 Local Baseline Conditions

There are four provincial ambient air quality monitoring stations located in the Saint John area (**Figure 5.3**). A summary of the most recent three years of exceedances of the provincial air quality objectives at the provincial monitoring stations is presented in **Table 5.6.** There were no

exceedances of carbon monoxide, nitrogen dioxide, or total suspended particulate at the monitoring stations located in southern New Brunswick between 2018 and 2020.



LEGEND

- GENERATING STATION
- NB POWER AIR AQUALITY MONITORING STATION
- NBDELG AIR QUALITY MONITORING STATIONS

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1:400,000 KILOMETERS

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE

REFERENCE(S)

1. BASEMAP SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
2. COORDINATE SYSTEM: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

CLIENT

Énergie NB Power

NEW BRUNSWICK POWER

PROJECT

ARC CLEAN TECHNOLOGY ADVANCED SMALL MODULAR REACTOR COMMERCIAL DEMONSTRATION UNIT - POINT LEPREAU, NEW BRUNSWICK

TITLE

AIR QUALITY MONITORING STATIONS NEAR POINT LEPREAU

CONSULTANT

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Table 5.6: Air Quality Objective Statistics in Southern New Brunswick (2018-2020)

Year	Parameter	Location	Number of Exceedances	Comments
2018	Hydrogen Sulphide (as Total Reduced Sulphur [TRS])	Saint John, East	2	The one-hour objective was exceeded twice on August 25 and October 10, 2018, at the Midwood Avenue station (operated by Irving Oil Ltd). Each event lasted one hour. No operational issues were recorded at the refinery during this episode. Emissions from a nearby wastewater treatment plant and/or adjacent tidal flats may have contributed.
2019	Hydrogen Sulphide (as TRS)	Saint John, East	5	The one-hour objective was exceeded five times (July 19, July 22, August 23, August 27, and August 28, 2019, at the **Midwood Avenue station** (operated by Irving Oil Ltd). Each event lasted one hour. No operational issues were recorded at the refinery during these episodes. Emissions from a nearby wastewater treatment plant and/or adjacent tidal flats may have contributed.
		Saint John, West	1	The one-hour objective was exceeded at the **Hillcrest station** (operated by NBDELG), on December 5, 2019. The event lasted one hour. This exceedance was related to a power supply malfunction at the Irving Pulp and Paper Ltd. mill, which caused one of its boilers to release TRS-laden gas (rather than the gas being incinerated). Corrective action was immediately implemented by the mill.
	Sulphur Dioxide	Saint John, East	2	The one-hour objective was exceeded on November 7, 2019, at the **Grandview West station** (operated by Irving Oil Ltd.). The event lasted two hours. The exceedance was related to an unplanned maintenance shutdown of the refinery's Sulphur Recovery Unit. Adjustments were made immediately, and levels returned to normal. The one-hour objective and 24-hour objective were exceeded on November 8, 2019, at the **Grandview West station** (operated by Irving Oil Ltd.). The event lasted 25 hours, with the one-hour objective being exceeded for a total of four hours. The event was associated with issues encountered by the refinery while starting its Sulphuric Acid Regeneration Unit. Corrective actions and adjustments were immediately made to reduce emissions.
2020	Hydrogen Sulphide (as TRS)	Saint John East	5	The one-hour objective was exceeded five times (August 9, August 13, August 21, August 22, and September 9, 2020) at the **Midwood Avenue station** (operated by Irving Oil Ltd.). Four of the events lasted one hour and one (August 21) lasted for two hours. No operational issues were recorded at the refinery during these episodes. Emissions from a nearby wastewater treatment plant and/or adjacent tidal flats may have contributed.
	Sulphur Dioxide	Saint John East	1	The one-hour objective was exceeded on January 19, 2020 at the **Grandview West station** (operated by Irving Oil Ltd.). The event lasted three hours. The Sulphur Recovery Unit was taken out of service on January 16 for an unplanned maintenance outage. It was brought back online on the 19th and the start-up activities caused the short-term exceedance

Source: NBDELG 2020a; 2021a; 2022a

Additionally, NB Power collects data at several stations, including Musquash (SO_2), Lorneville Cemetery ($PM_{2.5}$ and SO_2), Manawagonish Road ($PM_{2.5}$ and SO_2), and Grand Bay (SO_2) (see **Figure 5.3**), as part of the ambient air quality monitoring for the Coleson Cove Generating Station.

The 24-hour average concentration of $PM_{2.5}$ in micrograms per cubic metre (µg/m³) measured at the Lorneville and Manawagonish Road monitoring stations in 2018, 2019 and 2020 were below the provincial air quality objective for total suspended particulate (TSP) (120 µg/m³). The one-hour average concentrations of SO_2 in parts per billion measured at the Grand Bay, Lorneville, Manawagonish Road, and Musquash stations 2018, 2019 and 2020 were well below the one-hour standard of 169.5 parts per billion (NBDELG 2020b, 2021b, 2022b). The 2018, 2019 and 2020 CAAQS targets were met at all stations in New Brunswick (NBDELG, 2020a, 2021a, 2022a).

5.2.2.4 Existing Radiological Air Emissions

The PLNGS' Environmental Protection Program (EPP) contains site-specific derived release limits (DRLs) to control radiological effluents and emissions (CNSC, 2022). The DRLs for each radiological emission ensures releases to the environment do not exceed the annual regulatory public dose limit of 1 millisieverts (mSv) per year, which is protective of human health (CNSC, 2022).

The annual radiological releases from the facility to the atmosphere between 2015 and 2020 are provided in **Table 5.7**. The radiological emissions from the PLNGS have remained at a small fraction of the DRLs (CNSC, 2022). NB Power has accomplished this through strong environmental processes and a policy to surpass regulatory obligations for protecting the environment, an approach which will carry forward to this Project.

Table 5.7: Annual Radiological Air Emissions from the PLNGS (2015-2020)

Parameter	2015	2016	2017	2018	2019	2020	2020 DRL
Tritium (Bq/year)[1]	2.8×10^{14}	2.5×10^{14}	1.4×10^{14}	1.5×10^{14}	1.5×10^{14}	1.4×10^{13}	2.4×10^{17}
C-14 (Bq/year)[1]	1.6×10^{11}	2.8×10^{11}	3.3×10^{11}	3.1×10^{11}	1.1×10^{11}	7.1×10^{10}	1.2×10^{16}
Noble gases (Bq/MeV)[2]	8.1×10^{13}	2.9×10^{13}	2.5×10^{13}	4.6×10^{13}	9.5×10^{13}	5.9×10^{12}	8.4×10^{16} to 4.3×10^{19}
I-131 (Bq/year)[1]	7.1×10^{6}	2.7×10^{7}	1.3×10^{6}	$<5.2 \times 10^{5}$	5.2×10^{5}	$<5.0 \times 10^{5}$	3.9×10^{13}
Gross beta/gamma (Bq/year)[1]	$<8.4 \times 10^{4}$	$<1.1 \times 10^{8}$	$<2.2 \times 10^{6}$	$<2.2 \times 10^{6}$	$<2.2 \times 10^{6}$	$<8.1 \times 10^{5}$	8.6×10^{13} to 2.6×10^{17}

Source: CNSC, 2022

1 Releases reported as total becquerels per year (Bq/year)

2 Releases reported as becquerels per million electron volts (Bq/MeV)

5.2.2.5 Greenhouse Gas Emissions

Under the federal *Canadian Environmental Protection Act, 1999*, NB Power is required to monitor and report on GHG emissions. Nuclear facilities that emit more than the emission reporting threshold (that is, 10,000 tonnes of carbon dioxide equivalent [CO_2eq]) on an annual basis must report its GHG emissions to ECCC. NB Power's PLNGS facility is non-emitting, and has ensured, through its operational programs, that activities (that result in the emission of

GHGs, such as use of diesel generators) at the site have remained below GHG emission thresholds in past years, and therefore, has not been required to report on GHG emissions in the annual compliance reports (CNSC, 2022). It is expected that the ARC SMR will similarly remain well below GHG emission thresholds.

5.2.3 Acoustic Environment (Noise)

The information presented below is based on information available at the time of writing. An Air, Noise and Light Baseline Study is currently being undertaken for the Project to better understand existing conditions at the Project site.

Generally, sound quality at the Point Lepreau site is typical of an average rural setting, with background equivalent sound pressure levels (1-hour Leq) as measured at three distinct sites near the Point Lepreau site ranging from 35.8 A-weighted decibels (dBA) to 54.8 dBA (JWEL, 2003). Sound quality is generally influenced by vehicle movement, as well as the operation of heavy equipment, such as bulldozers, trucks, and diesel generators.

A baseline noise assessment was conducted in 2002 to support the environmental assessment for the PLNGS Solid Radioactive Waste Management Facility (SRWMF) modifications (JWEL, 2003). This assessment consisted of measuring the noise levels at several noise sensitive areas around the PLNGS comparing these with typical regulatory threshold values. These areas were:

- Welch Cove, approximately 1.3 kilometres from the PLNGS;
- Dipper Harbour, approximately 3 kilometres from the PLNGS, and
- A residential area to the north, approximately 2.6 kilometres from the PLNGS.

Noise monitoring was conducted at these areas on May 29, 2002 (JWEL, 2003). Sound level measurements were logged at three locations mentioned above, specifically at the end of Welch Cove Road nearest to the facility, at the intersection near the main gate (near the residential area), and at the east gate near the coast on Duck Pond Road (Dipper Harbour), for a 1-hour period each. Using the data obtained, 1-hour equivalent sound level (Leq) values were calculated (**Table 5.8**).

Table 5.8: Summary of Baseline Noise Monitoring at and near the PLNGS

	1-hour Leq (dBA)	2-minute Spotcheck Leq (dBA)
Welch's Cove	35.8	—
Main Gate	54.8	—
Duck Cove	41.6	—
300 m north of Welch's Cove	—	34.8
200 m southwest of Main Gate	—	31.6
600 m northeast of Main Gate	—	37.0
2050 m north of Duck Cove	—	39.7
2000 m northeast of Duck Cove	—	32.4
1350 m northeast of Duck Cove	—	33.3
850 m northeast of Duck Cove	—	35.5

Source: JWEL, 2003

Additionally, 2 minute spot-checks were made at several locations inside the Point Lepreau site boundary and the surrounding area (JWEL, 2003). At the Welch Cove Road sampling site, the 1-hour equivalent sound level was 35.8 dBA. The 1-hour equivalent sound level near the main gate was 54.8 dBA and at the east gate it was 41.6 dBA. The noise levels at the main gate and near Duck Pond Road are mainly associated with vehicle traffic to and from the site, although a foghorn was clearly audible during the Duck Pond Road monitoring session. The peak noise levels at the Welch Cove sampling site were principally attributable to bird sounds and traffic from a distance away.

The noise levels measured during the off-site spot checks were between 32.4 and 39.7 dBA (**Table 5.8**). For the on-site spot checks, the measured noise levels were between 34.7 and 52.6 dBA, with the exception of one spot check, where a forklift was operating nearby, and the measured noise level was 59.9 dBA (JWEL, 2003).

While no specific noise guideline currently exists in New Brunswick, permitting requirements stated in some recent Certificates of Approval from the NBDELG have included a maximum noise level of 55 dBA at facility boundaries. The United States Environmental Protection Agency has identified an outdoor noise level of 55 dBA as the level that will not result in adverse environmental effects on health or welfare (JWEL, 2003).

5.3 Freshwater Environment

5.3.1 Surface Water

5.3.1.1 Hydrology

Point Lepreau falls within the Musquash Lowlands, which are generally well drained, except for swampy areas located in broad basins scoured in bedrock (Rampton *et al.,* 1984). The Lepreau Peninsula itself is characterized by short and narrow first or second order streams, which empty quickly into the Bay of Fundy. The high point of the peninsula is about 55 metres above sea level, located in the northwestern corner of the property, influencing surface water drainage and flow in the undeveloped areas of the peninsula (**Figure 5.4**).

To the northeast of the referenced high point, surface water drains towards Dipper Harbour Creek, which flows northeast into Dipper Harbour. To the south, on the NB Power property itself, there are three provincially mapped watercourses, three additional watercourses, local drainage ditches and channels and numerous wetlands (**Figure 5.4**) (GEMTEC, 2023a). These waterbodies occur across the West and Northeast SMR study areas. Mapped wetlands cover approximately 27% (~25 of 92 hectares) of the combined West and Northeast SMR study areas and approximately 10% (~50 of 500 hectares) of the NB Power property at Point Lepreau overall (GEMTEC, 2023a). An additional watercourse and several wetlands are located just outside the boundary.

Recent investigations of the surface waters at Point Lepreau (Dillon and SOAR, 2023a; GEMTEC, 2023a), identified and delineated the following watercourses (**Figure 5.4**):

- **Watercourse 1 (WC1)** - This watercourse drains south across the property to Indian Cove. The headwaters of WC1 consist of a large open wetland area. WC1 bisects the eastern portion of the West Study Area and is located in a well-defined valley that constrains flooding within its corridor. The bankfull width of the assessed reaches ranged from 3.5 to 4.5 metres, with a depth of 0.25 to 0.3 metres. Corrugated steel culverts (1.2 to 1.5 metres in diameter) convey flow at three road crossings.

LEGEND

- SURFACE WATER SAMPLE
- SAMPLED WATERCOURSE (DILLON)
- WETLAND [2]
- NORTHEAST STUDY AREA
- WEST STUDY AREA
- NB POWER PROPERTY BOUNDARY

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE
2. WETLANDS SHOWN WITHIN THE STUDY AREA BOUNDARIES ARE FIELD DELINEATED WETLANDS, PROVIDED BY DILLON (2022).

REFERENCE(S)

1. BASEMAP SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
2. COORDINATE SYSTEM: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

CLIENT
Énergie NB Power
NEW BRUNSWICK POWER

PROJECT
ARC CLEAN TECHNOLOGY ADVANCED SMALL MODULAR REACTOR COMMERCIAL DEMONSTRATION UNIT - POINT LEPREAU, NEW BRUNSWICK

TITLE
SURFACE WATER RESOURCES AT POINT LEPREAU

CONSULTANT
wsp

YYYY-MM-DD	2023-06-28
DESIGNED	----
PREPARED	SO
REVIEWED	JW
APPROVED	TS

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- **Watercourse 2 (WC2)** - A local drainage channel bisects the southern portion of the Northeast Study Area and carries water from the drainage ditch along County Line Road. The drainage ditches may run dry at certain times of year. Downstream, the watercourse naturalises into a stream with an assessed bankfull width of approximately 4 metres and a depth of 0.25 metres (Dillon and SOAR, 2023a). Runoff from Watercourse 2 is discharged to Duck Cove through a 1.5 metre diameter perched culvert crossing Duck Pond Road, and a steep grade drop to the Bay of Fundy.
- **Watercourse 3 (WC3)** - This watercourse drains to the southeast of the high point and along Duck Pond Road to an outlet into Duck Cove just west of Plumper Rock, with a tributary intersecting with the northern area of the Northeast Study Area. WC3 begins as a cedar swamp with limited pool-riffle sequencing, but downstream of the road crossing becomes a 4-metre-wide and 0.25-metre-deep stream, before becoming an estuary and emptying into the Bay of Fundy (Dillon and SOAR, 2023a).
- **Watercourse 4 (WC4)** - The area to the southwest of the drainage line drains to an outlet located to the south of Welch Cove; outside of the boundary of the West Study Area. It is associated with several riparian wetlands.
- **Watercourse 5 (WC5)** - WC5 is located near the western boundary of the West Study Area, flowing south into the Bay of Fundy. It is a steep watercourse with low flows, containing riffle and pool habitats; the average bankfull width was measured at 4.65 metres and average bankfull depth was 0.35 metres (Dillon and SOAR, 2023a).
- **Watercourse 6 (WC6)** - WC6 is a short coastal stream at the southern extent of the West Study Area. It is mostly characterized as wetland habitat, with a channel only apparent in the lower section, before a steep grade drop to the Bay of Fundy (Dillon and SOAR, 2023a).

5.3.1.2 Surface Water Quality

In-situ surface water quality measurements were taken at sites along the six watercourses (see **Figure 5.4**) in summer and fall 2022 (Dillon and SOAR, 2023a; **Table 5.9**). The results provide an indication of the current water quality at the streams within the West and Northeast Study Areas.

Table 5.9: Summary of In-situ Water Quality Results

Sample Site	Date	Parameter				
		Temperature (°C)	pH	Specific Conductivity (µS/cm)	Total Dissolved Solids (mg/L)	Dissolved Oxygen (mg/L)
WC1 lower	July 19, 2022	16.7	7.60	262	203	**8.62**
	October 3, 2022	9.40	7.92	278	180	15.0
WC1 mid	July 19, 2022	15.6	7.31	256	166	**6.69**
	October 3, 2022	12.8	7.09	183	119	9.94
WC1 upper	July 19, 2022	16.7	7.09	175	136	**8.45**
	October 3, 2022	12.1	**6.32**	91	59.2	**9.30**
WC2 lower	July 20, 2022	15.8	8.14	569	370	13.1
	October 3, 2022	11.0	7.57	357	232	10.7

Sample Site	Date	Parameter				
		Temperature (°C)	pH	Specific Conductivity (µS/cm)	Total Dissolved Solids (mg/L)	Dissolved Oxygen (mg/L)
WC2 mid	July 20, 2022	19.3	7.90	611	397	**7.75**
	October 3, 2022	10.9	7.59	439	285	10.1
WC2 upper	July 22, 2022	16.3	7.76	139	916	10.0
	October 3, 2022	11.6	7.23	450	293	**9.22**
WC3 lower	July 21, 2022	15.5	7.62	670	429	**9.06**
	October 2, 2022	6.80	6.50	96	62	**8.72**
WC3 upper	October 2, 2022	9.80	6.97	133	87	**9.09**
WC5	July 22, 2022	13.9	**5.66**	242	157	**7.42**
	October 4, 2022	9.40	**4.55**	77	50	**9.23**
WC6	July 22, 2022	16.2	6.55	324	211	**5.47**
	October 4, 2022	9.80	8.23	157	102	**7.43**

Source: Dillon and SOAR, 2023a.
Bold - Exceeds Canadian Council of Ministers of the Environment Freshwater Aquatic Life (Long Term) guideline

5.3.1.3 Sediment Quality

As part of the freshwater environment baseline assessment undertaken in 2022 (Dillon and SOAR, 2023a) sediment quality samples were taken at sampling sites on each of the six identified water courses (see **Figure 5.4**; **Table 5.10** and **Table 5.11**). Concentrations of arsenic, iron, lead, manganese, selenium and zinc were above the Atlantic Partnership in Risk-Based Corrective Action Implementation (PIRI) *Pathway-Specific Standards (PSS) for Freshwater Sediments* in at least one sample site within the study areas. Concentrations of cadmium and zinc also exceeded the CCME interim sediment quality guidelines (ISQGs) but were below Atlantic PIRI PSS in one site each and arsenic exceeded ISQGs but not Atlantic PIRI PSS at two sites, indicating no probable effects. Other metals, such as tellurium, silver, tin, and bismuth were below laboratory detection limits.

There were no detectable lighter chain hydrocarbon concentrations (benzene, toluene, ethylbenzene, xylene) in the sediment samples; there were petroleum hydrocarbon concentrations above the detection limits but mostly below the applicable guidelines. There was one exceedance of the modified total petroleum hydrocarbon (TPH) fraction in WC6.

Table 5.10: Metal Concentrations in Sediment

Parameter	Atlantic PIRI Ecological Tier II Pathways Specific Standards (PSS) for Sediment - Freshwater (mg/kg)	CCME Sediment Quality Guidelines for the Protection of Aquatic Life in Freshwater ISQGs (mg/kg)	WC1 lower	WC1 lower dup (field)	WC1 lower dup (lab)	WC2 lower	WC3 upper	WC5	WC6
			Oct. 4, 2022	Oct. 4, 2022	Oct. 4, 2022	Oct. 3, 2022	Oct. 3, 2022	Oct. 4, 2022	Oct. 4, 2022
Aluminum	NG	NG	6,840	8,080	7,740	5,920	12,800	7,290	10,600
Antimony	25	NG	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1	0.2
Arsenic	17	5.9	**6**	**7**	**8**	3	***19***	**11**	***22***
Barium	NG	NG	221	257	247	82	190	58	471
Beryllium	NG	NG	0.4	0.4	0.4	0.4	0.8	0.3	0.5
Bismuth	NG	NG	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Boron	NG	NG	2	2	3	1	2	2	7
Cadmium	3.5	0.6	0.17	0.24	0.23	0.11	0.32	0.14	**1.20**
Calcium	NG	NG	2,360	3,180	2,980	1,770	3,810	2,070	19,700
Chromium	90	37.3	11	13	13	10	17	10	8
Cobalt	NG	NG	5.3	6.0	6.1	4.3	13.5	8.2	44.9
Copper	197	35.7	6	10	16	4	7	2	6
Iron	43,766	NG	21,200	26,700	31,100	13,500	***50,800***	24,500	***58,500***
Lead	91.3	35	7.0	11.6	15.5	6.3	10.2	24.1	***112.0***
Lithium	NG	NG	14.8	16.2	14.8	12.0	20.7	11.6	5.7
Magnesium	NG	NG	3,120	3,370	3,280	2,930	5,110	2,140	1,880
Manganese	1,100	NG	***3,350***	***3,420***	***3,340***	***1,260***	***7,450***	***2,440***	***20,400***
Molybdenum	NG	NG	0.4	0.5	0.6	0.2	1.0	0.8	2.4
Nickel	75	NG	10	10	12	9	14	7	9
Potassium	NG	NG	520	560	540	440	490	540	1,170
Rubidium	NG	NG	6.3	7.7	6.7	4.5	5.7	10.3	7.3
Selenium	2	NG	< 1	< 1	< 1	< 1	1	1	***2***
Silver	0.5	NG	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1

Parameter	Atlantic PIRI Ecological Tier II Pathways Specific Standards (PSS) for Sediment - Freshwater (mg/kg)	CCME Sediment Quality Guidelines for the Protection of Aquatic Life in Freshwater ISQGs (mg/kg)	WC1 lower	WC1 lower dup (field)	WC1 lower dup (lab)	WC2 lower	WC3 upper	WC5	WC6
			Oct. 4, 2022	Oct. 4, 2022	Oct. 4, 2022	Oct. 3, 2022	Oct. 3, 2022	Oct. 4, 2022	Oct. 4, 2022
Sodium	NG	NG	90	140	130	70	70	100	490
Strontium	NG	NG	8	10	10	6	13	9	75
Tellurium	NG	NG	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thallium	NG	NG	< 0.1	< 0.1	< 0.1	< 0.1	0.1	0.1	0.2
Tin	NG	NG	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Uranium	NG	NG	0.9	1.2	1.1	0.7	1.4	0.7	0.9
Vanadium	NG	NG	20	27	24	18	45	31	94
Zinc	315	123	79	**135**	***413***	43	67	23	114

Source: Dillon and SOAR (2023a)
NG = no guideline available
Bold = concentration exceeds the CCME ISQG Guidelines
Bold and ***italic*** = concentration that exceeds the Atlantic PIRI Tier II PSS.

Table 5.11: Petroleum Hydrocarbons in Sediment

Parameter	Atlantic PIRI Ecological Tier I ESLs - Typical Petroleum Hydrocarbon Sediment Ecological Screening Levels for the Protection of Freshwater Aquatic Life[a]		WC1 Lower	WC1 Lower Field dup.	WC1 Lower Lab dup.	WC2 Lower	WC3 Upper*	WC5	WC6
			Oct. 4, 2022	Oct. 4, 2022	Oct. 4, 2022	Oct. 3, 2022	Oct. 3, 2022	Oct. 4, 2022	Oct. 4, 2022
Benzene	1.2		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.1	< 0.1
Toluene	1.4		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1
Ethylbenzene	1.2		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.1	< 0.1
Xylenes	1.3		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.1	< 0.1
Purgeable C6 - C10	NG		< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	8.1	< 25
Purgeable C10 - C16	NG		< 12	< 12	< 12	< 12	< 12	< 12	270
Extractable C16 -C21	NG		< 12	< 12	13	< 12	< 12	35	460
Extractable C21 - C32	NG		28	38	47	32	27	240	580
Extractable >C16-C32	NG		28	38	60	32	27	280	1,000
Modified TPH (less BTEX)	Gasoline Fuel Oil Lube Oil Max	15 25 43 500	28	38	60	32	27	280	**1,300**
Resemblance	NG		NR	NR	NR	NR	LO	NR	NR

Source: Dillon and SOAR (2023a)
NG = no guideline available
NR = no resemblance
Bold = concentration exceeds the Atlantic PIRI Ecological Tier I ESLs
* WC3 Lower was not sampled due to depth of water.

5.3.2 Groundwater

Numerous groundwater investigations have been undertaken at the Point Lepreau site and detailed in previous reports (MacLaren Atlantic, 1974; Rast, 1975; ADI Limited, 1976; Washburn and Gillis Associates, 1984; JWEL, 2003; GEMTEC, 2000, 2001a,b, 2008, 2009; Arcadis, 2016; Ecometrix 2020a, 2020b). These have indicated that the Lepreau Peninsula is hydrogeologically isolated from the older mainland rocks to the north and that there is no evidence of artesian pressures in the bedrock (MacLaren Atlantic, 1974; JWEL, 2003). Typically, measured water levels in the shallow wells have been within a few feet of the ground surface regardless of well depth or location. The bedrock matrix is relatively impervious with water flowing through the rock following jointing systems and most water-bearing joints being subvertical.

In 2022, GEMTEC Consulting Engineers and Scientists were retained to characterize the Project site hydrogeology (GEMTEC 2023b). The following summarizes their findings in the West and the Northeast Study Areas, based on a review of past work and a targeted physical and chemical hydrogeology assessment of the two study areas.

The characteristic hydrogeology of the West and Northeast Study Areas indicates two independent groundwater regimes: a perched upper groundwater system present in overburden layers and clayey deposits, and a lower groundwater system in the shallow bedrock. Granular overburden present in the study areas directly overlies fractured bedrock, interpreted as an unconfined water table aquifer, which is the most common in both study areas (GEMTEC, 2023b).

Hydrostratigraphic units are the layers units of soils or bedrock that have distinct hydraulic properties that affect groundwater occurrence and flow. Within the site study areas, five distinct hydrostratigraphic units were identified:

- Organic soils;
- Granular soils (primarily mixtures of sand, gravel and silt; including fill);
- Clayey deposits (undifferentiated clay-bearing granular soils to marine clay deposits);
- Shallow bedrock (moderately to densely fractured; dominant groundwater flow); and
- Deep bedrock (lower fracture density; limited groundwater flow).

Based on groundwater levels measured at 45 monitoring wells (21 new and 24 existing), shallow groundwater flows from the upland north end of the PLNGS property toward the south, where it diverges based on local topography and infrastructure development (GEMTEC, 2023b). A local groundwater divide aligned north-south, occurs in the West Study Area.

Horizontal hydraulic gradients are gentle to moderate across the West and Northeast Study Areas, becoming slightly steeper in the Northeast Study Area. This is a direct effect of surface topography differences. Vertical hydraulic gradients vary across the site along with upward gradients. It is reasoned that a recharge and discharge transition may occur somewhere roughly along the northern border of the West and Northeast Study Areas.

Diurnal tidal effects on groundwater levels were observed in overburden and bedrock wells in both study areas. However, these are non-systematic, likely reflecting the complex geometry of the overburden and bedrock channels identified in the wells inland from the coastline. Tidal

effects were small, with the largest effects measured close to Indian Cove within a bedrock channel open to the ocean. These measurements indicate that tidal head changes do not propagate through shallow earth at Point Lepreau.

GEMTEC (2023b) suggests that surface water-groundwater interaction does occur in the West and Northeast Study Areas, but that it is not substantial. There is some physical hydrogeological evidence of shallow groundwater flow toward local streams and geochemical evidence of co-mingling of surface water and shallow groundwater, although ground- and surface water chemistry remains distinct.

5.3.3 Wetlands

The Fundy Coast ecoregion has a rich diversity of wetland types, which include raised coastal bogs that occur predominately west of Saint John. The Fundy coastal bogs contain much of the common vegetation found in coastal bogs elsewhere within the province but are distinguished by their morphology and surface features as they form in deep depressions that are topographically restricted. The Fundy coastal bogs have a limited number of small surface pools and do not form large complexes compared to bogs along the Chaleur and Northumberland coasts. Additionally, the coastal bogs have lawns of *Scirpus* mixed in with mosses, lichen, and ericaceous shrubs (Zelazny, 2007).

The provincial wetland database identified several wetlands located in the overall NB Power property. The database did not identify any within the West Study Area, although several are identified in the database immediately northwest and northeast of this study area boundary. One provincially mapped wetland was identified within the Northeast Study Area. Recent field surveys, undertaken in 2022, identified and delineated 15 unmapped wetlands within the West Study Area and eight (including the one mapped wetland) within the Northeast Study Area (Dillon and SOAR 2023b; see **Figure 5.3**). From these studies, it is estimated that wetlands cover approximately 10% of the Point Lepreau site overall, and 27% of the combined West and Northeast SMR study areas (GEMTEC, 2023a). Wetland complexes are comprised of multiple hydrologically connected wetland types, including aquatic bed, bog, fen, forested wetland, and shrub wetland.

A total of 18.76 hectares of wetland was delineated within the West Study Area. Wetlands within this area are comprised of the following types: Coniferous Treed Basin Swamp, Coniferous Treed Drainageway Swamp, Mixed Treed Slope Swamp, Tall Shrub Basin Swamp, Tall Shrub Riparian Swamp, Coniferous Treed Basin Swamp/Low Shrub Bog (Complex). A summary description of wetlands within the West Study Area, as the location of the SMR facility, is presented in **Table 5.12**.

Table 5.12: Summary of West Study Area Wetlands

Wetland ID	Wetland Size (ha)	Wetland Type	Dominant Vegetation/ Soil Type	Provincially Mapped Wetland	Provincially Mapped Watercourse	Unmapped Watercourse
WWL1	12.70	Coniferous Treed Basin Swamp	The tree and shrub strata are dominated by black spruce and balsam fir. The shrub stratum was also dominated by speckled alder. The herbaceous stratum was dominated by bunchberry, three-seeded sedge, star sedge, and lambkill. The herbaceous stratum also contained three-leaved false Solomon's seal, mountain holly, eastern teaberry, and twinflower. Hydrology indicators included high water table (A2) and soil saturation (A3). Wetland soil indicator: histosol (A1).	No	No	Yes
WWL2	0.41	Coniferous Treed Drainage way Swamp	The tree stratum was dominated by balsam fir, but contained heart-leaved birch and black spruce as well. The shrub stratum was dominated by black spruce, speckled alder, and balsam fir. While the herbaceous stratum was dominated by bunchberry, three-seeded sedge, and three-leaved false Solomon's seal and twinflower in descending abundance. Hydrology indicators included soil saturation (A3) and hydrogen sulphide odour (C1). Wetland soil indicator: histosol (A1) with strong sulfidic odour (A4).	No	No	No
WWL3	0.21	Mixed Treed Slope Swamp	Wetland characteristics are similar to WWL9. A more detailed description was not provided by Boreal Environmental and Maqamigew Anqotumeg. Further details will be provided following 2023 surveys.	No	Yes	No
WWL4	0.36	Mixed Treed Slope Swamp	The tree stratum was dominated by balsam fir and heart-leaved birch while the shrub stratum was dominated by speckled alder. The herbaceous stratum was dominated by broad-leaved cattail, Canada goldenrod, bunchberry, fowl manna grass, evergreen wood fern, bristly black current, dwarf red raspberry, and red raspberry, in descending order of abundance. Hydrology indicators included surface water (A1) and soil saturation (A3).	No	Yes	No

Wetland ID	Wetland Size (ha)	Wetland Type	Dominant Vegetation/ Soil Type	Provincially Mapped Wetland	Provincially Mapped Watercourse	Unmapped Watercourse
			Wetland soil indicator: histosol (A1).			
WWL5	0.21	Coniferous Treed Basin Swamp	The tree stratum was dominated by heart-leaved birch and contained lesser amounts of balsam fir. The shrub stratum was dominated by speckled alder. The herbaceous stratum was dominated by bunchberry, bristly black currant, and rough-stemmed goldenrod. The herbaceous stratum also contained slender mana grass, creeping bent grass, yellow bluebead lily, and creeping snowberry. Hydrology indicators included soil saturation (A3). Wetland soil indicator: histic epipedon (A2).	No	No	No
WWL6	0.19	Coniferous Treed Basin Swamp	The tree and shrub strata were dominated by balsam fir. The tree stratum also contained paper birch. The herbaceous stratum was dominated by three-seeded sedge and fowl manna grass. The herbaceous stratum also contained slender mana grass, common speedwell, dwarf red raspberry, and lambkill. Hydrology indicators included soul saturation (A3). Wetland soil indicator: histosol (A1).	No	No	No
WWL7	0.04	Coniferous Treed Basin Swamp	Detailed characteristics for this wetland will be provided in 2023.	No	No	No
WWL8	0.11	Coniferous Treed Basin Swamp	The tree stratum was dominated by balsam fir. The shrub layer was dominated by black spruce and balsam fir and three-seeded sedge was the sole herbaceous plant species dominating the herbaceous layer. Hydrology indicators included soil saturation (A3). Wetland soil indicator: histosol (A1).	No	No	No
WWL9	0.09	Coniferous Treed Basin Swamp	The tree stratum was dominated by balsam fir. The shrub layer was dominated by black spruce and balsam fir and three-seeded sedge was the sole herbaceous plant species dominating the herbaceous layer. Hydrology indicators included soil saturation (A3).	No	No	No

Wetland ID	Wetland Size (ha)	Wetland Type	Dominant Vegetation/ Soil Type	Provincially Mapped Wetland	Provincially Mapped Watercourse	Unmapped Watercourse
			Wetland soil indicator: histosol (A1).			
WWL10	0.04	Tall Shrub Basin Swamp	Detailed characteristics for this wetland will be provided in 2023	No	No	No
WWL11	0.21	Coniferous Treed Basin Swamp	The tree and shrub strata were dominated by balsam fir and black spruce. The herbaceous stratum was dominated by three-seeded sedge. The herbaceous stratum also contained bunchberry, lambkill, and creeping snowberry. Hydrology indicators included soil saturation (A3) and hydrogen sulphide odour (C1). Wetland soil indicator: histosol (A1) with strong sulphur odour (A4).	No	Yes	No
WWL12	0.38	Tall Shrub Riparian Swamp	WWL6 was dominated by speckled alder. The herbaceous stratum was dominated by Canada goldenrod. Red raspberry, soft rush, and fowl manna grass were less abundant but were present throughout the wetland. Hydrology indicators included surface water (A1), soil saturation (A3), and water-stained leaves (B9). Wetland soil indicator depleted matrix (F3).	No	Yes	No
WWL13	0.67	Coniferous Treed Drainagewa y Swamp	The tree stratum was dominated by balsam fir, paper birch, and black spruce. The shrub stratum was dominated by speckled alder and black spruce. The herbaceous stratum was dominated by three-seeded sedge and lambkill. The herbaceous stratum also contained bunchberry, three-leaved false Solomon's seal, and common Labrador tea. Hydrology indicators included high water table (A2), soil saturation (A3), and hydrogen sulphide odor (C1). Wetland soil indicator: histosol (A1) with a strong sulphidic odour (A4).	No	No	No
WWL14	0.04	Coniferous Treed Basin Swamp	The tree stratum was dominated by black spruce. The shrub stratum was dominated by black spruce. The herbaceous stratum was dominated by three-seeded sedge, bunchberry, three-	No	No	No

Wetland ID	Wetland Size (ha)	Wetland Type	Dominant Vegetation/ Soil Type	Provincially Mapped Wetland	Provincially Mapped Watercourse	Unmapped Watercourse
			leaved false Solomon's seal and lambkill. Hydrology indicators included high water table (A2), soil saturation (A3), and hydrogen sulphide odor (C1). Wetland soil indicator: histosol (A1).			
WWL15	3.10	Coniferous Treed Basin Swamp/ Low Shrub Bog (Complex)	Coniferous swamp component: The tree stratum was dominated by black spruce and balsam fir. The tree stratum also contained tamarack. The shrub stratum was dominated by balsam fir. The herbaceous stratum was dominated by three-leaved false Solomon's seal and three-seeded sedge. Bog component: The shrub stratum was dominated by black spruce and tamarack. The herbaceous stratum was dominated by black crowberry, lambkill, and common Labrador tea. The herbaceous stratum also contained three-seeded sedge, small cranberry, northern pitcher plant, tussock sedge, and tussock cottongrass. Hydrology indicators included surface water (A1), high water table (A2), soil saturation (A3) and water-stained leaves (B9). Wetland soil indicator: histosol (A1).	No	No	No

A total of 6.59 hectares of wetland habitat was delineated within the Northeast Study Area; comprised of Coniferous Treed Basin Swamp, Coniferous Treed Drainageway Swamp, and Coniferous Shrub Drainageway Swamp wetland types.

Functional assessments following the Wetland Ecosystem Services Protocol – Atlantic Canada (WESP-AC) method were completed for the delineated wetlands (Dillon and SOAR, 2023b). A summary of the functional assessments is provided in **Appendix B**.

5.3.4 Freshwater Fish and Fish Habitat

As part of the baseline characterization of the Project site, Dillon and SOAR (2023a) completed a freshwater aquatic habitat assessment at Point Lepreau, in collaboration with Avanti Environmental Consulting and the Wolastoqey Nation in New Brunswick (WNNB)[2]. The study aimed for a collaborative relationship to braid IK with conventional western scientific knowledge in a manner that is culturally relevant and respectful to the Wolastoqiyik. The following sections have been compiled based on this study.

5.3.4.1 Pre-Development Conditions

Site-specific IK for the Lepreau peninsula was not documented prior to the development of the PLNGS. In the WNNB *Strategic Rights Plan*, the year 1726 was chosen as a starting point to characterize a historic period when few non-Indigenous peoples lived in the Wolastoqey homeland and natural resources were largely in a state of good health, abundance, and diversity (WNNB, 2019).

"Historic records indicate that many Wɔlastɔkwiyik/Wolastoqiyik dispersed into smaller groups in winter to hunt large game like moose, bear, and caribou in the lands bordering the northern tributaries of the Wɔlastɔkw/Wolastoq [Saint John River]*, and in adjacent watersheds. They then descended to the middle and lower reaches of the Wɔlastɔkw/Wolastoq in spring to form larger groups and to plant crops like corn, to fish, and harvest species such as fiddleheads. Warm seasons were spent living in more permanently established villages on the banks of the Wɔlastɔkw/Wolastoq fishing and harvesting smaller game, as well as gathering and cultivating plants along the waterway's shores and intervales. In fall crops like maize were harvested, and a late run of salmon was accessed before dispersing once again to winter hunting grounds."* (WNNB 2019 and sources cited within).

In this landscape, the Lepreau Peninsula is both a land feature on its own with freshwater resources, but also linked to the marine and littoral environments. According to the WNNB *Strategic Rights Plan "Salmon, sturgeon, gaspereau, perch, bass, sea trout, and shad migrated up and down the* [Wolastoq] *river yearly making them predictable and important protein sources. Brook trout and other species remained in interior lakes and waterways year-round. Shellfish like clams and mussels were collected in littoral zones. Fishing often occurred near villages in the spring season, and saltwater resources were usually harvested in the summer"* (WNNB 2019 and sources cited within).

[2] The Wolastoqey Nation participated in the studies and reviewed reports, but gathering of Wolastoqey IK specific to fish and fish habitat was not conducted as a part of these studies.

A range of aquatic resources were harvested by the Wolastoqiyik circa 1726 (WNNB, 2019). **Table 5.13** provides a list of freshwater and diadromous fish harvested, adapted from WNNB (2019 and sources cited within).

Table 5.13: Wolastoqiyik Use of Freshwater* Fish Species, Circa 1726

Common Name	Western Science - Scientific Name	Wolastoqey Name	Wəlastəkwey Name	Where Harvested (when specified)
American eel	*Anguilla rostrata*	kat	kat	Wəlastəkok
American shad	*Alosa sapidissima*	ĕm-sam’	psam	Wəlastəkok
Atlantic salmon	*Salmo salar*	pĕ-lam	pəlam	Wəlastəkok
Atlantic sturgeon	*Acipenser oxyrinchus*	pa’-si-kĕs	pasəkəs	Wəlastəkok
Brook trout	*Salvelinus fontinalis*	sko’-tĕm	skohtəm	
Gaspereau, alewife	*Alosa pseudoharengus*	si-kwĕn-ĕm-ekw’	sikwənəmekw	Wəlastəkok
Gizzardfish				
Lake chub	*Couesius plumbeus*	pĕ-nCp-skwźs’	pənapskwes	freshwater lakes
Pike and Pickerel	*Esox lucius*		kwənos	freshwater lakes
Pumpkinseed	*Lepomis gibbosus*			
Rainbow smelt	*Osmerus mordax*	sĕ-mel’-sis	səmelsis	
Striped bass	*Morone saxatilis*	mĕk-ak’	məkahk	Wəlastəkok
Togue, lake trout	*Cristivomer namaycush*			freshwater lakes
White perch; Sea perch	*Morone americana*		pohkakən	Wəlastəkok
White sucker	*Catostomus commersonii*	ki-kamkw’	kihkamkw	freshwater lakes
Yellow perch	*Perca flavescens*	at’-sak-wa’-lus	cahcakwalohs	
Freshwater clams			clsm-ess	

Source: WNNB (2019), Table 2: Use of Fish and Sea/Shell Fish Circa 1726” Chapter 2, pg. 34.
* Marine species were included in the source table, but excluded from this table to focus on freshwater species.

5.3.4.2 Baseline Conditions 2022

Field surveys were undertaken in the summer and fall of 2022 to assess the fish habitat and species within five of the six watercourses identified on the Point Lepreau property (see **Figure 5.4**; Dillon and SOAR, 2023a). WC4 is located to the north of the West Study Area and not included in the habitat assessment. A summary of fish habitat characteristics and fish species observed is presented in **Table 5.14**.

Brook trout were observed within the upper portion of WC3; one ninespine stickleback was also caught in the lower reach of this watercourse. American eel was observed in all reaches of WC1 and the lower reach of WC2 during the July field surveys.

Table 5.14: Measured Mesohabitat Features, In-situ Water Quality and Fish Community Summary for Point Lepreau

Watercourse ID	Average Dimensions of Area Assessed (m)	Dominant Aquatic Habitat Type and Other Observations	*In-situ* Water Quality	Fish Passage and Presence/Absence
WC1 upper	Length of Reach: 22.3 m Wetted Width: 2.0 m Wetted Depth: 0.15 m	Watercourse Characteristics: First order tributary. 55% Riffle, 30% Run, 10% Pool, 5% Flat Substrate Composition: 5% Rock, 25% Rubble, 30% Gravel, 30% Sand, 10% Fines Aquatic and Riparian Vegetation: Algae, mosses, cattails, grasses, ferns, alder shrubs	Temp: 12.1-16.7 °C pH: 6.32-7.09 DO: 8.45-9.30 mg/L	American eel encountered during both field surveys. A perched culvert at the lower site and an abrupt drop in elevation at the confluence with the Bay of Fundy may prevent fish passage upstream for some species.
WC1 mid	Length of Reach: 20 m Wetted Width: 2.5 m Wetted Depth: 0.20 m	Watercourse Characteristics: First order tributary. 50% Riffle, 50% Pool Substrate Composition: 20% Boulder, 25% Rock, 25% Rubble, 10% Gravel, 10% Sand, 10% Fines Aquatic and Riparian Vegetation: Algae, mosses, grasses, ferns, alder shrubs	Temp: 12.8-15.6 °C pH: 7.09-7.31 DO: 6.69-9.94 mg/L	Numerous American eel of various sizes and age classes encountered during both field surveys. Cobble substrate, neutral pH and available cover present. A perched culvert at the lower site and an abrupt drop in elevation at the confluence with the Bay of Fundy may prevent fish passage upstream for some species.
WC1 lower	Length of Reach: 22 m Wetted Width: 4.0 m Wetted Depth: 0.15 m	Watercourse Characteristics: First order tributary. 75% Riffle, 25% Flat Substrate Composition: 10% Boulder, 10% Rock, 35% Rubble, 30% Gravel, 10% Sand, 5% Fines Aquatic and Riparian Vegetation: Algae, mosses, grasses, ferns, alder shrubs	Temp: 9.4-16.7 °C pH: 7.60-7.92 DO: 8.62-15.03 mg/L	Numerous American eel of various sizes and age classes encountered during both field surveys. Cobble substrate, neutral pH and available cover present. A perched culvert at the lower site and an abrupt drop in elevation at the confluence with the Bay of Fundy may prevent fish passage upstream for some species.

Watercourse ID	Average Dimensions of Area Assessed (m)	Dominant Aquatic Habitat Type and Other Observations	*In-situ* Water Quality	Fish Passage and Presence/Absence
WC2 upper	Length of Reach: 11.5 m Wetted Width: 2.5 m Wetted Depth: 0.09 m	Watercourse Characteristics: First order tributary. 75% Riffle, 10% Pool, 15% Flat Substrate Composition: 5% Boulder, 30% Rock, 30% Rubble, 10% Gravel, 15% Sand, 10% Fines. Aquatic and Riparian Vegetation: Algae, mosses, grasses, alder shrubs, mature conifers	Temp: 11.6-16.3 °C pH: 7.23-7.76 DO: 9.22-10.04 mg/L	No fish species encountered during field surveys. Cobble substrate, neutral pH and available cover present. A perched culvert at the lower site and an abrupt drop in elevation at the confluence with the Bay of Fundy may prevent fish passage upstream for some species.
WC2 mid	Length of Reach: 33 m Wetted Width: 3.0 m Wetted Depth: 0.10 m	Watercourse Characteristics: First order tributary. 80% Riffle, 10% Pool, 10% Flat Substrate Composition: 40% Bedrock, 5% Boulder, 10% Rock, 10% Rubble, 20% Gravel, 10% Sand, 5% Fines Aquatic and Riparian Vegetation: Algae, mosses, grasses, alder shrubs	Temp: 10.9-19.3 °C pH: 7.59-7.90 DO: 7.75-10.07 mg/L	No fish species encountered during field surveys. Cobble substrate, neutral pH and available cover present. Fish Passage - A perched culvert at the lower site and an abrupt drop in elevation at the confluence with the Bay of Fundy may prevent fish passage upstream for some species.
WC2 lower	Length of Reach: 31.5 m Wetted Width: 3.0 m Wetted Depth: 0.10 m	Watercourse Characteristics: First order tributary. 80% Riffle, 10% Run, 10% Flat Substrate Composition: 5% Boulder, 10% Rock, 15% Rubble, 45% Gravel, 15% Sand, 10% Fines Aquatic and Riparian Vegetation: Algae, mosses, grasses, alder shrubs	Temp: 14.1-15.8 °C pH: 7.57-8.14 DO: 10.65-13.07 mg/L	American eel were caught in July 2022. Cobble substrate, neutral pH and available cover present. A perched culvert at the lower site and an abrupt drop in elevation at the confluence with the Bay of Fundy may prevent fish passage upstream for some species.
WC3 upper	Length of Reach: 20 m Wetted Width: 2.0 m Wetted Depth: 0.14 m	Watercourse Characteristics: First order tributary. 35% Pool, 65% Riffle Substrate Composition:	Temp: 9.8 °C pH: 7.37 DO: 9.09 mg/L	Numerous brook trout of various sizes and age classes encountered during both field surveys.

Watercourse ID	Average Dimensions of Area Assessed (m)	Dominant Aquatic Habitat Type and Other Observations	*In-situ* Water Quality	Fish Passage and Presence/Absence
		5% Rock, 20% Rubble, 35% Gravel, 30% Sand, 10% Fines Aquatic and Riparian Vegetation: Algae, mosses, grasses, alder shrubs		Cobble substrate, suitable water quality and available cover present.
WC3 lower	—	Substrate not assessed (assumed to be mostly fines), suitable water quality and available cover present.	Temp: 6.8-15.5 °C pH: 6.50-7.62 DO: 8.72-9.06 mg/L	Ninespine stickleback observed July 21, 2022.
WC5	Length of Reach: 21 m Wetted Width: 1.1 m Wetted Depth: 0.20 m	Watercourse Characteristics: First order tributary. Acidic. Steep grade. Ephemeral/intermittent. 50% Riffle, 20% Run, 10% Rapid, 15% Pool, 5% Flat Substrate Composition: 10% Rock, 5% Gravel, 30% Sand, 55% Fines. Aquatic and Riparian Vegetation: Algae, mosses, grasses, ferns, mature conifers	Temp: 9.4-13.9 °C pH: 4.55-5.66 DO: 7.42-9.23 mg/L	No fish species encountered during field surveys. Potential for some tolerant fish species to be present seasonally. Watercourse is acidic, and ephemeral/ intermittent in nature. An abrupt drop in elevation at the confluence with the Bay of Fundy may prevent fish passage upstream for some species.
WC6	Length of Reach: 15 m Wetted Width: 1.5 m Wetted Depth: 0.05 m	Watercourse Characteristics: First order tributary. Ephemeral/intermittent. 20% Riffle, 20% Run, 50% Pool, 10% Flat Substrate Composition: 15% Rock, 25% Rubble, 20% Gravel, 20% Sand, 20% Fines Aquatic and Riparian Vegetation: Algae, mosses, grasses, ferns, mature conifers	Temp: 9.8-16.2 °C pH: 6.55-8.23 DO: 5.47-7.43 mg/L	No fish species encountered during field surveys. Potential for some fish species to be present seasonally. Watercourse is ephemeral/ intermittent in nature. An abrupt drop in elevation at the confluence with the Bay of Fundy may prevent fish passage upstream for some species.

Source: Dillon and SOAR (2023a).

5.3.4.3 Aquatic Species at Risk and their Habitat

As part of the Dillon and SOAR (2023b) study, an Atlantic Canada Conservation Data Centre (AC CDC) report was requested for the West Study Area to identify records of species-at-risk (SAR) and species of conservation concern (SoCC) within a 5 kilometre and a 100-kilometre radius of the study area (see **Appendix C2**). SAR are species designated as Endangered, Threatened, or of Special Concern under the federal *SARA* or any species listed as Endangered, Threatened, or Special Concern under the NB *SARA.* SoCC are species listed with sub-national conservation ranks (S-Rank) as S1 - S3S4 by the AC CDC. See **Appendix C1** for descriptions of each of the S-Ranks.

No records of freshwater species existed within the 5-kilometre radius, but seven freshwater SAR, and eight SoCC have historically been observed within 100 kilometres of the study areas.

American eel were observed during the 2022 field surveys and are known to occur at the site. They are not listed on Schedule 1 of the federal *SARA*, but are a culturally important species, listed as Threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and NB *SARA*, and are under consideration for addition to Schedule 1.

Although not observed during field surveys, the **Atlantic salmon** (Inner Bay of Fundy population [IBoF] and Outer Bay of Fundy population [OBoF]), **Atlantic sturgeon** (*Acipenser oxyrinchus* - Maritimes population), and **shortnose sturgeon** (*Acipenser brevirostrum*) freshwater distribution ranges overlap with the study areas. However, due to the barriers to fish passage and unsuitable habitat for these species, they are unlikely utilize streams identified on the Point Lepreau site.

The **yellow lampmussel** (*Lampsilis cariosa*) also has a distribution range overlapping with the study areas. It is usually found on level, sand and gravel bottoms in medium to large rivers, but may also be found in lakes and reservoirs on sandy bottoms with sparse vegetation (DFO, 2010). Although this species is known to occur within 100 kilometres of the study areas, it was not found in the 2022 field surveys.

5.4 Terrestrial Environment

The following sections provide an overview of the existing conditions for vegetation, avifauna, and terrestrial wildlife within and near the Project site. Conditions described are based on background biodiversity records and recent field studies completed by Stantec (2021a) and Dillon and SOAR (2023b).

As part of the baseline characterization of the Project site, Dillon and SOAR, in collaboration with Boreal Environmental and Maqamigew Anqotumeg, completed a terrestrial habitat baseline characterization (Dillon and SOAR, 2023b). The study aimed for a collaborative relationship to braid IK with conventional western scientific knowledge in a manner that is culturally relevant and respectful to the Wolastoqiyik.

SAR and SoCC are addressed in each section where applicable, based on the 2022 AC CDC report for SAR and SoCC within 5 kilometres and 100 kilometres of the West Study Area (see **Appendix C2**).

5.4.1 Vegetation

5.4.1.1 Regional Context

Point Lepreau is in the Fundy Coastal Ecodistrict, which is the only ecodistrict within the Fundy Coast Ecoregion (Zelazny, 2007). This ecoregion extends along the entire southern coastline of New Brunswick. The ecoregion has a cool and moist maritime climate that supports primarily coniferous forest. Red spruce (*Picea rubens*), balsam fir (*Abies balsamea*), black spruce (*Picea mariana*), white spruce (*Picea glauca*), and tamarack (*Larix laricina*) are the abundant forest cover tree species within this ecoregion. The most common hardwood species within the ecoregion are white birch (*Betula papyrifera*), American mountain ash (*Sorbus americana*), red maple (*Acer rubrum*), and lesser amounts of yellow birch (*Betula alleghaniensis*).

Due to fog, abundant precipitation, and low soil temperatures limiting the frequency of regional wildfires, fire-dependent species such as jack pine (*Pinus banksiana*) and eastern white pine (*Pinus americana*) occur only within a few areas of the ecoregion. Similarly, the tolerant hardwood forest assemblage of yellow birch, sugar maple (*Acer saccharinum*), and American beech (*Fagus grandifolia*) that is common elsewhere within southern New Brunswick is rare within the Fundy Coastal ecoregion as the soil drainage and summer weather is not suitable. Within NB Power's Point Lepreau property boundary, the terrestrial habitat consists mostly of mature-overmature softwood and young-immature softwood, with lesser amounts of hardwood and mixedwood stands of varying ages (Stantec, 2021a; **Figure 5.5**).

5.4.1.2 Pre-Development Baseline Conditions

Site-specific IK for the Lepreau Peninsula was not documented prior to the development of the PLNGS. The WNNB *Strategic Rights Plan* (WNNB, 2019) describes the terrestrial landscape conditions within their territory in New Brunswick during the 1700s as:

"The Wəlastəkwiyik/Wolastoqiyik relied on a diversity of plants for food, medicine, fuel for heating and cooking, as well as for construction of dwellings, transportation equipment, and tools. Plants of particular dietary importance included fiddleheads, butternuts, berries, groundnuts, and cultivars like maize. Important medicines included muskrat root/calamus root, golden thread, and red willow, and principal ceremonial plants included sweet grass, cedar, and tobacco" (WNNB 2019 and sources cited within).

Species that have been previously identified as culturally important to Indigenous peoples (NB Power, 2022) are listed in **Appendix D1**. This list will be further refined and verified through engagement with First Nations communities during the EIA process. Species that are significant to the Wolastoqiyik have been identified in the botanical inventory for the site (Dillon and SOAR, 2023b), provided in **Appendix D2.** It should be noted that all native flora are considered to have value; while not all plants are used traditionally, they all have value and purpose.

5.4.1.3 Baseline Conditions 2022

Field surveys were conducted in 2022 to document and characterize terrestrial vegetation and habitats within the West and Northeast Study Areas (Dillon and SOAR, 2023b). Delineation of vegetation communities, a forestry inventory, and botanical inventory were completed as part of the terrestrial field surveys.

LEGEND

- WATERCOURSE (DILLON)
- WETLAND [2]
- NORTHEAST STUDY AREA
- WEST STUDY AREA
- NB POWER PROPERTY BOUNDARY
- FOREST COVER

VEGETATION

- ALDER-TALL SHRUB
- COASTAL-BEACH
- DISTURBED-ANTHROPOGENIC
- IMMATURE BALSAM FIR-BIRCH
- MATURE BALSAM FIR-BIRCH
- MATURE BALSAM FIR
- MEADOW
- OLD RED SPRUCE-BALSAM FIR
- OLD SPRUCE

NOTE(S)

1. ALL LOCATIONS ARE APPROXIMATE
2. WETLANDS SHOWN WITHIN THE STUDY AREA BOUNDARIES ARE FIELD DELINEATED WETLANDS, PROVIDED BY DILLON (2022).

REFERENCE(S)

1. BASEMAP SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN, GEOBASE, IGN, KADASTER NL, ORDNANCE SURVEY, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY
SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY
2. COORDINATE SYSTEM: NAD 1983 CSRS NEW BRUNSWICK STEREOGRAPHIC

CLIENT
Énergie NB Power

NEW BRUNSWICK POWER

PROJECT
ARC CLEAN TECHNOLOGY ADVANCED SMALL MODULAR REACTOR COMMERCIAL DEMONSTRATION UNIT - POINT LEPREAU, NEW BRUNSWICK

TITLE
TERRESTRIAL HABITAT FOREST COVER

CONSULTANT
wsp

YYYY-MM-DD	2023-06-28
DESIGNED	----
PREPARED	SO
REVIEWED	JW
APPROVED	TS

PROJECT NO.	CONTROL	REV.	FIGURE
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0930-07020-7000-001-ENA-A-00

Nine vegetation communities, excluding the wetland communities described in **Section 5.3.3** were identified. There were six terrestrial communities identified in the West Study, equaling 50.6 hectares. The Northeast Study Area is comprised of nine terrestrial communities of 26 hectares. Vegetation communities within the West Study Area and Northeast Study Area are listed in **Table 5.15** and described in **Appendix D3** (see also Dillon and SOAR, 2023b).

Table 5.15: Summary of Terrestrial Vegetation Communities

Type	West Study Area	Northeast Study Area
	Area (ha)	Area (ha)
Old Red Spruce-Balsam Fir (ORSBF)	16.8	3.5
Old Spruce (OSPR)	4.9	2.2
Mature Balsam Fir	N/A	7.0
Immature Balsam Fir-Heart-Leaved Birch (IBFHB)	1.7	4.1
Mature Balsam Fir-Heart-Leaved Birch (MBFHB)	2.1	2.9
Alder-Tall Shrub (ATS)	1.4	4.2
Disturbed-Anthropogenic (DIST)	13.8	2.7
Meadow (MDW)	N/A	1.2
Coastal-Beech (CB)	N/A	0.2
Total	**50.6**	**26**

A forest inventory to measure the volume of merchantable timber within the two study areas was completed. Balsam fir (*Abies balsamea*) had the greatest volume of merchantable timber across both study areas (Dillon and SOAR, 2023b). A summary of merchantable timber inventories is in **Table 5.16**.

Table 5.16: Forestry Inventory

Common Name	Volume (ha)	% Volume/species	Total Volume (m^3)
WEST STUDY AREA			
Red Spruce	49.1	28.1	2,109.7
White Spruce	0.4	0.3	19.1
Black Spruce	30.2	17.3	1,299.7
Balsam Fir	77.1	44.2	3,317.3
White Birch	17.7	10.2	762.2
Total	**174.6**	**100.0**	**7,508.1**
NORTHEAST STUDY AREA			
Red Spruce	46.3	20.6	1,079.1
White Spruce	0.9	0.4	21.8
Black Spruce	8.4	3.8	196.3
Balsam Fir	92.9	41.0	2,142.4
Eastern White Cedar	29.9	13.3	696.9
White Birch	33.2	14.8	774.3
Tamarack	13.6	6.1	316.6
Total	**224.4**	**100**	**5,227.4**

A botanical inventory of the West and Northeast Study Areas identified a total of 220 plant species (see **Appendix D2**). Of the identified species, 170 (77%) are listed as native plants and are Apparently Secure (S4) to Secure (S5) in Atlantic Canada (see **Appendix C1** for S-rank definitions). Forty-nine species (22%) identified are introduced to Atlantic Canada. Only a single SoCC species, Loesel's twayblade (*Liparis loeselii*), was observed. Six individuals of this species were observed in a ditch in the Northeast Study Area. This species is Vulnerable / Apparently Secure (S3S4) within the province. Thirty-six of the recorded species have Wəlastəkwey / Wolastoqey significance. The botanical inventory, with Wəlastəkwey / Wolastoqey names and significance, is presented in **Appendix D2**.

5.4.1.4 Vegetation Species at Risk

The AC CDC report lists occurrence records for only one botanical SAR within 5 kilometres of the Western Study Area: Van Brunt's Jacob's ladder (*Polemonium vanbruntiae*). Sixty-eight records of this species were reported. This species occurs in fens, forest edges, meadows, riparian shorelines, and swamps. SoCC occurrence records were returned for six other vascular plant and two moss species (**Appendix C2**). None of these observations were within the West Study Area, and no botanical SAR or SoCC were observed during field investigations.

5.4.2 Avifauna

The Project site is located within the Point Lepreau/Maces Bay Important Bird Area (IBA). IBAs are recognized as areas of international significance for conservation and biodiversity of birds and bird habitat. Point Lepreau marks the eastern boundary of the IBA, which extends west 14 kilometres to Pocologan Harbour. The marine areas of the IBA contain intertidal reef ledges bordered by mudflats and several shallow inlets. Several small islands are also present within the IBA. The IBA contains important spring staging areas for migrating brant (*Branta bernicla*). Other birds staging in the IBA include semipalmated plover (*Charadrius semipalmatus*), least sandpiper (*Calidris minutilla*), black scoter (*Melanitta americana*) and surf scoter (*Melanitta perspicillata*). The islands located in Maces Bay, including Salkeld Islands, support a large colony of approximately 1,000 nesting pairs of common eider (*Somateria mollissima*) (IBA Canada, n.d.).

5.4.2.1 Avifauna Records Review

A review of publicly available bird species databases was undertaken to develop a list of avian species recorded within or near the Point Lepreau property. A total of 157 species, including 14 SAR and 48 SoCC have been recorded within the vicinity of NB Power property at Point Lepreau. The list of species and their conservation status is provided in **Appendix E1**. The following historical records were available (Stantec, 2021a):

- Atlantic Canada Conservation Data Centre – A request to the AC CDC was made for species occurrences within 5 kilometres of the Project footprint. Fifty-four bird species records were returned, including 14 SAR and 40 SoCC (Dillon and SOAR, 2023b).
- Christmas Bird Count – Data from the nearest Christmas Bird Count survey location, located 25 kilometres away in Blacks Harbour, returned records of 71 bird species, including four SAR and 20 SoCC (Stantec, 2021a).
- Maritimes Breeding Bird Atlas (MBBA) – Data from the MBBA squares (19GK09, 19FK99) overlapping the NB Power property returned 86 species, including five SAR and 15 SoCC (Stantec, 2021a).

- North American Breeding Bird Survey – The nearest survey route (Route 56038), approximately 15 kilometres west of Point Lepreau in Pennfield and returned records of 59 bird species, including one SAR and no SoCC (Stantec, 2021a).

In addition to the historical information available, field surveys of the Project site have been initiated, with some of the surveys undertaken in 2021 (Stantec, 2021a).

5.4.2.2 Overwintering Marine Birds

Stantec (2021a) undertook overwintering marine bird surveys at three coastal locations at Point Lepreau. Forty-one species were identified, including four SAR and 14 SoCC (**Appendix E2**). Waterfowl were the most abundant type of bird recorded, with black scoter accounting for approximately 60% of waterfowl observations (Stantec, 2021a). Most bird observations within 300 metres of the survey stations were birds using available habitat for feeding and resting. Gulls were the species with the highest rate of recorded site usage, as 90% of gull observations being birds foraging, feeding, or resting within the survey station habitat (Stantec, 2021a).

5.4.2.3 Overwintering Land Birds

Overwintering land birds were documented at five roadside locations by Stantec (2021a) in winter of 2021. Twenty-five bird species were identified during the surveys, including three SAR and three SoCC (see **Appendix E3**). Most species documented were land birds and raptors with a few gull and waterfowl species also recorded during the survey. The most abundant species, accounting for 17% of observations, was American crow, which was commonly observed at the five survey stations. Approximately 71% of the birds observed during the land bird surveys were recorded as in-transit/flyover observations rather than actively utilizing nearby habitats.

5.4.2.4 Incidental Bird Species

Three incidental bird species, European starling (*Sturnus vulgaris*), horned lark (*Eremophilia alpestris*) and American pipit (*Anthus rubescens*), were observed incidentally outside of the timed survey periods during the winter bird surveys (Stantec, 2021a). The horned lark is considered to be an SoCC as it has a breeding S-Rank of S1B. However, it is secure during the migratory and nonbreeding seasons with S-Ranks of S5M and S4N.

5.4.3 Wildlife

In addition to providing terrestrial habitat for bird species, the Point Lepreau site has suitable habitat for mammal, herptile, and invertebrate species common to New Brunswick. Forested and wetland areas throughout the property, as well as anthropogenically altered areas and structures may provide habitat.

5.4.3.1 Pre-Development Conditions

The WNNB *Strategic Rights Plan* describe the pre-development conditions of Point Lepreau and the surrounding landscape contained an abundance of wildlife providing food, clothing, shelter, and everyday tools and equipment for the Wolastoqiyik:

"Many of the animals and birds harvested by the Wɔlastɔkwiyik/Wolastoqiyik includes large animals such as moose, bear and woodland caribou and smaller mammals that could be snared or trapped like snowshoe hare, beaver, and muskrat. Bird species included waterfowl such as ducks and their eggs and upland birds such as partridge and grouse. The Wɔlastɔkwiyik/ Wolastoqiyik relied on animals for far more than food. Their warm and durable hides were used for clothing, shelter, moccasins, canoes and bags; while intestines, rawhide, and sinew served as

cording for snowshoes and bow strings; bone for tools such as scrapers, and moose hair was used for embroidery" (WNNB 2019 and sources cited within).

Terrestrial wildlife species historically recorded at Point Lepreau include black bear (*Ursus americanus*), masked shrew (*Sorex cinereus*), meadow jumping mouse (*Zapus hudsonius*), meadow vole (*Microtus pennsylvanicus*), North American deer mouse (*Peromyscus maniculatus*), northern short-tailed shrew (*Blarina brevicauda*), red fox (*Vulpes vulpes*), snowshoe hare (*Lepus americanus*), southern red-backed vole (*Myodes gapperi*), striped skunk (*Mephitis mephitis*) and woodland jumping mouse (*Napaeozapus insignis*) (MacLaren Atlantic, 1977).

5.4.3.2 2021/2022 Baseline Surveys

Knowledge of the wildlife at the Point Lepreau property has been enhanced by incidental observations made during the 2021 bird surveys (Stantec 2021a) and through directed field surveys undertaken in 2022 by Dillon and SOAR (2023b). During the 2021 surveys, the following terrestrial wildlife species were observed: eastern chipmunk (*Tamias striatus*), moose (*Alces alces*), North American porcupine (*Erethizon dorsata*), red squirrel (*Tamiasciurus hudsonicus*), and white-tailed deer (*Odocoileus virginianus*) (Stantec, 2021a). These species are widespread throughout the province and are neither SoCC nor SAR. The 2022 terrestrial field surveys (Dillon and SOAR, 2023b) recorded observations of additional non-SAR species: American black bear, eastern coyote (*Canis latrans var.*), maritime garter snake (*Thamnophis sirtalis pallidulus*), North American beaver (*Castor canadensis*), northern flying squirrel (*Glaucomys sabrinus*), racoon (*Procyon lotor*), red fox, snowshoe hare, striped skunk. These species are widespread throughout the province and are neither SoCC nor SAR.

Acoustic surveys to determine bat presence were undertaken in the West and Northeast Study Areas in 2022 (Dillon and SOAR, 2023b). Acoustic monitors were deployed at two locations within each study area between June 3, 2022 and July 7, 2022. Two species of bat were recorded in the Northeast Study Area, while none were recorded in the West Study Area.

Bats identified in the Northeast Study Area included: big brown bat (*Eptesicus fuscus*) and hoary bat (*Lasiurus cinereus*). The big brown bat is a resident year-round species and has a conservation ranking of Vulnerable/Apparently Secure (S3S4). The hoary bat is a migratory species, which has experienced population declines in recent years and has been assessed by COSEWIC as Endangered (COSEWIC, 2023), but has not been listed under the federal *SARA* or NB *SARA*.

The number of calls for both species was low, with only a total of eight calls recorded. The low level of activity suggests that the study areas are not important for breeding bats or maternity roosting colonies (Dillon and SOAR, 2023b). A summary of bat call recordings is summarized in **Table 5.17.**

Table 5.17: Summary of Acoustic Bat Survey Calls

Species	Bat Detector				Total for All Sites
	West Study Area		Northeast Study Area		
	B1	B2	B3	B4	
Big brown bat	0	0	4	3	7
Hoary bat	0	0	0	1	1
Total call events all species	0	0	4	4	8
Average call events per detector night	0	0	0.03	0.03	0.05

5.4.3.3 Wildlife Species at Risk

Monarch Butterfly

The monarch butterfly (*Danaus plexippus*) is known to utilize the Point Lepreau property and Lepreau Peninsula as a stopover on its migration. Originating in southern Canada and the United States, monarch butterflies travel to overwintering sites in southern areas such as Mexico and California in the fall, returning in the spring. The monarch butterfly is largely associated with milkweed (*Asclepias* spp.) plants and can be observed feeding on plants during the summer. Milkweed can grow abundantly in open and disturbed environments, such as roadsides, fields, forest openings, and open wetlands. The monarch butterfly is listed as Special Concern under the federal *SARA* and Endangered under the NB *SARA*. It is considered to be Imperiled/Vulnerable (S2S3).

The point on the Lepreau Peninsula is a known location for the Saint John Naturalist Club for tagging monarchs as part of the Monarch Watch Program (Dillon and SOAR, 2023b). The club operates a bird observatory located at the tip of the Point Lepreau Peninsula. This area is a significant stopover for monarch butterflies migrating in late August and September. The butterflies pause their migration to rest and replenish their energy on fields of wildflowers and milkweed near the observatory before continuing south. Naturalist Club volunteers tag many of the monarch butterflies and share the information with Monarch Watch (a research program out of the University of Kansas) to contribute to on-going species and habitat protection.

During terrestrial field surveys in 2021, Stantec identified feeding and breeding habitat for monarch butterfly within the NB Power property at Point Lepreau (Stantec, 2021a). Additionally, monarchs were seen on numerous occasions within the Northeast Study Area during the 2022 field surveys (Dillon and SOAR, 2023b). Adult monarch butterflies were observed within the open meadow habitat, although no milkweed plants were observed and therefore breeding/laying habitat within the that area is not anticipated.

Bat Species

Three SAR bat species, tri-colored bat (*Perimyotis subflavus*), little brown myotis (*Myotis lucifugus*), and northern myotis (*Myotis septentrionalis*) were reported by AC CDC to have occurrence records within 1 kilometre of the study areas (Dillon and SOAR, 2023b). These three bat species are listed as Endangered under both the federal *SARA* and NB *SARA*. Their conservation status within New Brunswick is considered to be Critically Imperiled (S1). Little brown myotis, northern myotis and tri-colored bat can roost in tree cavities and habitat is associated with a variety of deciduous and coniferous forests. Foraging habitat for these species

is predominately associated with watercourses and wetlands, both within forests and forest edges. Additionally, little brown myotis will roost in abandoned buildings, barns, or attics.

A summary of SAR/SoCC wildlife records (non-avian) is presented in **Table 5.18**.

Table 5.18: Wildlife SAR (Butterfly and Bat Species) Observed Within 1 km of the Study Areas

Scientific Name	Common Name	Federal *SARA*	NB *SARA*	AC CDC S-rank
Perimyotis subflavus	Tri-colored Bat	Endangered	Endangered	S1
Myotis lucifugus	Little Brown Myotis	Endangered	Endangered	S1
Myotis septentrionalis	Northern Myotis	Endangered	Endangered	S1
Danaus plexippus	Monarch	Special Concern	Endangered	S2S3

5.5 Marine Environment

5.5.1 Marine Physical and Chemical Environment

Point Lepreau Peninsula extends into the Bay of Fundy, with coastal bays on either side of the peninsula, including Duck Cove to the east, Indian Cove to the west and Welsh Cove to the northwest (see **Figure 1.1**).

The Bay of Fundy is approximately 50 kilometres wide, 300 kilometres long, and has an average depth of 75 metres. The tidal range is large, increasing from approximately 6.0 metres near the entrance to the bay, to a maximum of 15.2 metres at the landward extremity. At Dipper Harbour, just to the east of Point Lepreau, the tidal range is typically 6.0 to 8.5 metres and can increase to 9.0 metres for large tides. Flushing time in the Bay has been estimated at 76 days (JWEL, 2003). The Point Lepreau site is in an area along the shores of the Bay of Fundy that is free of ice.

The general circulation in the Bay of Fundy is north-easterly along the Nova Scotia shore and southwesterly along the New Brunswick shore. Studies in the Bay of Fundy indicate tidal currents of about 1 metre per second (MacLaren Atlantic, 1976). Based on limited measurements taken in the area, the maximum current recorded was about 0.6 metres per second in 9.0 metres of water (falling tide) and varied according to the magnitude of the tide. Offshore tidal currents to the east of the site in deeper water were much stronger (JWEL, 2003).

The slope of the ocean bottom is steep close to shore except for Indian Cove, where tidal flats exist. The 15-metre depth contour is reached at about 250 metres to 300 metres from both the east and west shores. The main channel off Point Lepreau has a maximum depth of about 120 metres. From about 1 kilometre off Point Lepreau the depth increases gradually southeasterly to the middle of the Bay (JWEL, 2003).

The Lepreau Peninsula is oriented approximately north-south, protruding into the Bay of Fundy and modifying the ebb and flood tidal currents around it. The extreme tides in the Bay of Fundy result in extensive intertidal areas, particularly in shallow-water regions at the head of the Bay and at certain locations along both the New Brunswick and the Nova Scotian coasts. High turbidity, due primarily to suspended particulate matter, is greatest in the inner regions of the Bay and in coastal regions affected by seasonal runoff from rivers. The largest river discharging into the Bay is the Saint John River, draining a watershed of over 57,000 square kilometres. During the spring freshet, the influence of the river discharge on salinity and turbidity levels is

measurable for several kilometres west of the city of Saint John along the New Brunswick coast (JWEL, 2003).

5.5.1.1 Substrate

Bottom substrate in the vicinity of Point Lepreau is muddy sand (51%) mainly on the west side of the point. The remaining 49% is a sand-gravel-rock substrate, predominantly east of the point. A rocky shoreline extends for about 3 kilometres on either side of Point Lepreau, with extensive exposed bedrock (Washburn & Gillis *et al*., 1984).

5.5.1.2 Chemistry

Surface water temperatures range from 14.0°C in the summer to 0.5°C in winter. Salinity in the area of Point Lepreau is typically 22 parts per thousand to 28 parts per thousand during spring freshet (when the Saint John River and others contributes a substantive amount of freshwater), after which it can vary from 30 parts per thousand to 34 parts per thousand for the remainder of the year (JWEL, 2003).

5.5.2 Marine Biota

5.5.2.1 Plankton

Total annual primary production in the Bay of Fundy is 1,112,400 tonnes carbon take-up, considered to be provided primarily by phytoplankton (MacLaren Atlantic, 1976). Phytoplankton production is greatest in summer, with the lowest production occurring in the fall (Washburn & Gillis *et al.*, 1984). The Outer Bay (the area to the south and west of Saint John, including Point Lepreau) provides 85.6% of the total production in the Bay, 98% of which is contributed by phytoplankton. The remaining production is contributed by seaweeds (2%), saltmarsh (0.4%) and benthic microalgae (0.4%). In the Point Lepreau area, the highest phytoplankton abundance was found in Indian Cove and Welsh Cove, directly west of Point Lepreau. Phytoplankton production in the around Point is limited by turbidity and tidal currents.

Zooplankton populations in the Bay of Fundy are abundant and supported by high concentrations of phytoplankton and particulate organic matter (MacLaren Atlantic, 1976). Physical parameters, which also control primary production in the Bay, exert an overwhelming influence on the zooplankton in the system. Tidal range, vertical mixing, and suspended particulate matter concentrations increase from the Outer Bay to the Inner Bay, while depth, light penetration and salinity decrease. In the Outer Bay, the main food source for zooplankton is the substantial phytoplankton biomass. In the Inner Bay, higher levels of suspended inorganic particulate matter appear to limit phytoplankton production and support only a very low biomass of zooplankton. Within the Outer Bay, maximum concentrations of zooplankton occur at the mouth of the Bay, to the south of Saint John in the mid-Bay, and in Passamaquoddy Bay. Zooplankton production in the Point Lepreau area is considered to be low, likely due to the light-limited phytoplankton production (JWEL, 2003).

5.5.2.2 Marine Plants

The predominant intertidal seaweed in the Bay of Fundy is the knotted wrack (*Ascophyllum nodosum*) fucoid alga. Most of the remainder of the seaweed community is comprised of other fucoid algae such as bladder wrack (*Fucus vesiculosus*) and spiral wrack (*F. spiralis*). Subtidal zones are dominated by kelp (*Laminaria* spp.). On rocky shores in the Point Lepreau area, eight distinct marine plant communities have been recorded, each dominated by different marine plant

species. The supra-littoral zone is comprised of four communities dominated by either hairgrass (*Deschampia flexuosa*), seaside plantain (*Plantago maritima*), orange lichen (*Xanthoria parientina*) or black lichen (*Lichina pygmaea*). The supra-littoral fringe is dominated by spiral wrack. The mid-littoral zone represents the widest zone and comprises three communities, a narrow strip of bladder wrack, a very wide strip of knotted wrack and, at the lowest zone, a community dominated by agar (JWEL, 2003).

5.5.2.3 Marine Fish

Approximately 70 species of fish have been recorded in the Bay of Fundy, most of which are expected to occur in the Point Lepreau area. Fish found in the Bay of Fundy include resident species, which complete their entire life cycle in the Bay, and others that enter the Bay only during spawning or feeding migrations. Migrating fish species are mainly from the Scotian Shelf and the Gulf of Maine, but may include migrants from as far away as Chesapeake Bay (e.g., striped bass [*Morone saxatilis*]), the Sargasso Sea (e.g., American eel *[Angullia rostrata*]) and the coast of Labrador (e.g., Atlantic salmon [*Salmo salar*]) (JWEL, 2003).

The predominant commercial fisheries in the Bay of Fundy are American lobster (*Homarus americanus*), Atlantic herring (*Clupea harengus*), sea scallops (*Placopecten magellanicus*), crab (*Cancer* spp.) and various groundfish, including Atlantic cod (*Gadus morhua*), pollock (*Pollachius pollachius*), silver hake (*Merluccius bilinearis*), haddock (*Melanogrammus aeglefinus),* Atlantic halibut (*Hippoglossus hippoglossus*), monkfish (*Lophius americanus*), cusk (*Brosme brosme*), witch flounder (*Glyptocephalus cynoglossus*), winter flounder (*Pseudopleuronectes americanus*), American plaice (*Hippoglossoides platessoides*) and yellowtail flounder (*Limanda ferruginea*). Herring and haddock captured in the Bay are considered part of stocks for which the centre of reproduction is at the mouth of or outside the Bay. For these species, a limited amount of spawning activity may occur in the Bay of Fundy (JWEL, 2003).

Impingement and entrainments studies, which provide an indication of some of the species in the area and their relative abundance, have been undertaken by NB Power for the condenser cooling water intake for the PLNGS (SENES Consulting, 2015; Arcadis, 2016). SENES Consulting (2015) states that 40 taxa were identified, with the relative abundance of fish impinged on the travelling screens at the intake as Atlantic herring 77%, winter flounder 6%, red hake (*Urophycis chuss*) 5%, threespine stickleback (*Gasterosteus aculeatus*) 3% and other species 9%. For the invertebrates collected, their relative abundance was northern shrimp (*Pandalus borealis*) 27%, sea gooseberries 24%, sea spiders 16%, blue mussel (*Mytilus edulis*) 14%, and tunicates 13%. Twenty-one invertebrate taxa comprised the remaining 6% of the impinged invertebrates (SENES Consulting, 2015).

An entrainment study was undertaken in 2014 and 2015 to quantify the fish, eggs and larvae that were entrained in the cooling water system (Arcadis, 2016). A total of 31 taxa were entrained at the PLNGS, mostly invertebrates (61.2%), followed by fish eggs and fish larvae, as follows (Arcadis, 2016):

- Invertebrates were dominated by rock crab (58.9%) and northern shrimp (40.9%) as they both accounted for almost all entrainments. Atlantic lobster and short fin squid were entrained in considerably lower numbers (0.08% and 0.01% respectively).
- The identification of fish eggs was difficult for some species due to their very early stage of morphological development and over 77% were unidentified, but identified species

included fourbeard rockling (11.2%); gadids, merluccid hakes, rocklings, butterfish, and Gulfstream flounder (7.2%), *Urophycis* sp. (1.3%), silver hake (0.9%), and windowpane flounder (0.6%).

- Fish larvae entrainment was dominated by rock gunnel (46.2%), followed by Atlantic seasnail (20.7%), herring (8.2%), winter flounder (3.7%) and a non-identified species (3.4%).

5.5.2.4 Marine Mammals

Various species of large marine mammals use the Bay of Fundy. **Table 5.19** lists these and provides a brief comment as to the location and sighting frequency for each (JWEL, 2003).

Table 5.19: Marine Mammals in the Bay of Fundy

Common Name	Scientific Name	Comments
North Atlantic right whale	*Eubalaena glacialis*	Most endangered of all cetaceans. Summer use of the mouth of the Bay of Fundy (possible breeding) by a population of about 300 animals. Seldom sighted north of Grand Manan.
Fin whale	*Balaenoptera physalus*	Summer (June-July) use of the mouth of the Bay of Fundy, primarily seen in deeper waters south of Grand Manan Island.
Minke whale	*Balaenoptera acutorostrata*	Canadian East Coast population of approximately 2000 animals. Enter into Bay of Fundy during summer. Seen as far inshore as Blacks Harbour and Passamaquoddy Bay
Humpback whale	*Megaptera novaeangliae*	Fewer than 100 individuals using the southern reaches of the Bay of Fundy during the summer.
Blue whale	*Balaenoptera musculus*	Rare sightings near mouth of Bay of Fundy.
Sei whale	*Balaenoptera borealis*	Occasionally enters Bay of Fundy.
Atlantic pilot whale	*Globicephala melaena*	Follow squid into Bay of Fundy in late summer.
Killer whale	*Orcinus orca*	Occasionally enters Bay of Fundy during summer.
Harbour porpoise	*Phocoena phocoena*	Common in the Bay of Fundy, with a seasonal population between 4,000 and 8,000 animals.
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Occurs during summer in nearshore environments in Bay of Fundy.
Bottlenose dolphin	*Tursiops truncatus*	Occasionally enters Bay of Fundy in late summer.
Common dolphin	*Delphinus delphis*	Occasionally enters lower Bay of Fundy in summer.
Harbour seal	*Phoca vitulina*	Commonly seen along the Bay of Fundy coast in nearshore environments. Occurs year-round. Frequent user of the waters surrounding Point Lepreau.
Grey seal	*Halichoerus grypus*	Occur along the lower Bay of Fundy further offshore than harbour seals.
Harp seal	*Phoca groenlandica*	Rare visitors from the north.
Hooded seal	*Cystophora cristata*	Rare visitors from the north.

Source: JWEL, 2003

5.5.2.5 Marine Species at Risk

Table 5.20 provides a list of marine species in the Bay of Fundy that are currently listed in Schedule 1 under the federal *SARA*, or the NB *SARA*, and their Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status. The likelihood of each species being present near the Point Lepreau site has been categorized as either low or high based on habitat preferences and current geographic distribution (Stantec, 2018). Of the twelve species considered, one species, the harlequin duck, has a high potential to be present near the Project site and the peninsula in general during the winter (Stantec, 2018).

Table 5.20: Marine Species Present in the Bay of Fundy and Listed on Schedule 1 of the *SARA* (Stantec, 2018, updated 2023)

Common Name	Scientific Name	Federal *SARA* Status	COSEWIC Designation	Provincial Designation (NB *SARA*)	Likelihood of Frequenting Near Point Lepreau*
Fishes					
Atlantic salmon - Inner Bay of Fundy	*Salmo salar*	Endangered, Schedule 1, Critical Habitat Identified	Endangered	Endangered	Low
Atlantic wolffish	*Anarhichas lupus*	Special Concern, Schedule 1	Special Concern (2012)	Special Concern	Low
Shortnose sturgeon	*Acipenser brevirostrum*	Special Concern, Schedule 1	Special Concern (2015)	Special Concern	Low
White shark - Atlantic population	*Carcharodon carcharias*	Endangered, Schedule 1	Endangered (2021)	Endangered	Low
Marine Mammals					
Fin whale – Atlantic population	*Balaenoptera physalus*	Special Concern, Schedule 1	Special Concern	Special Concern	Low
North Atlantic right whale	*Eubalaena glacialis*	Endangered, Schedule 1	Endangered	Endangered	Low
Blue whale – Atlantic Population	*Balaenoptera musculus*	Endangered, Schedule 1	Endangered (2012)	Endangered	Low
Marine Birds					
Barrow's Goldeneye (Eastern Population)	*Bucephala islandica*	Special Concern, Schedule 1	Special Concern	Special Concern	Low
Harlequin Duck	*Histrionicus histrionicus*	Special Concern, Schedule 1	Special Concern	Endangered	High
Piping Plover (Melodus subspecies)	*Charadrius melodus melodus*	Endangered, Schedule 1	Endangered	Endangered	Low
Red Knot (rufa	*Calidris canutus rufa*	Not on Schedule	Endangered (2020)	Endangered	Low

Common Name	Scientific Name	Federal *SARA* Status	COSEWIC Designation	Provincial Designation (NB *SARA*)	Likelihood of Frequenting Near Point Lepreau*
subspecies)					
Roseate Tern	*Sterna dougallii*	Endangered, Schedule 1	Endangered	Endangered	Low
Marine Reptiles					
Leatherback Sea Turtle	*Dermochelys coriacea*	Endangered, Schedule 1	Endangered	Endangered	Low

* The likelihood of each species being present near the Point Lepreau site was categorized as either low or high based on habitat preferences and current geographic distribution.

5.5.2.6 Important Marine Conservation Areas

In 2006, the Musquash Estuary was designated as a Marine Protected Area (MPA) under the *Oceans Act.* The site is about 20 kilometres east of Point Lepreau.

5.6 Socio-economic Environment

The description of the socio-economic environment is supported by the work being undertaken as part of a Sustainability and Well-being Assessment. The scope of the assessment includes the characterization of baseline conditions related to social, economic and human health, including disaggregated information related to diverse populations, including Indigenous peoples. Much of the information presented in the following sections represents existing secondary data collected as part of the Sustainability and Well-being Assessment. This secondary information has not yet been reviewed by the public, stakeholder, or First Nation communities to which it pertains. Review and collection of primary data to address information gaps or more accurately reflect the communities is part of the on-going scope of the Sustainability and Well-being Assessment. Data are also presented in alignment with the previous Local Service Districts of Musquash and Lepreau as the new entity of Fundy Shores was created in January 2023.

5.6.1 Social Environment

Social conditions focus on the communities located in the Fundy Region in Saint John County and the Southwest New Brunswick (SWNB) region in Charlotte County, as well as the cities, towns, and parishes within those counties. The local governance structure in New Brunswick was reformed in January 2023. The following information regarding the communities mentioned is presented utilizing the pre-January 2023 structure due to the information available at the time of this report.

5.6.1.1 Population Characteristics

In 2021, the province of New Brunswick had a population of 775,610 (Statistics Canada, 2022). This represents a growth of 3.8% since 2016, which is considerably lower than the Canadian growth rate of 5.2% for the same period. There are three major urban areas: Saint John, Moncton and Fredericton, which together are home to over 47% of the province’s population, with estimated 2021 populations of 69,895, 79,470, and 63,116, respectively (Statistics Canada, 2022).

Saint John County stretches along the Bay of Fundy in southern New Brunswick with the majority of residents in the City of Saint John. The total population of Saint John County in 2021 was 76,558, a growth of 3.4% from 2016 (74,020) (Statistics Canada, 2022).

Charlotte County is the southwest-most county of New Brunswick, bordering the United States. Its 3,418.24 km^2 area is largely rural, but includes the towns of St Andrews, St. George and St. Stephen. As a census division in the 2021 Census of Population, Charlotte County had a population of 26,015 (Statistic Canada, 2022). The region's population has grown 2.3% since 2016 (Statistics Canada, 2022).

The Point Lepreau area includes the Lepreau Peninsula, which encompasses Lepreau and Musquash parishes, each corresponding to a census subdivision. There are no incorporated communities within the Point Lepreau site. The combined population of Musquash and Lepreau parishes in the 2021 census was 2,056 persons. Because data for individual communities are not available, it is difficult to make meaningful comparisons; however, the population in the Point Lepreau area increased by about 13% due to the in-migration of people (Statistics Canada 2022), probably associated with new subdivision developments and opportunities provided by the PLNGS.

The population in New Brunswick is aging, with the average age in 2021 being 44.7, an increase from the 2016 average age of 42.9 (Statistics Canada, 2022). The age groups 55-59 and 60–64 years make up the largest age groups in the province for both women+[3] (8.1%) and men+ (8%), followed by 65-69-year-olds, and 50-54-year-olds (Statistics Canada, 2022).

In Saint John County, 7.6% of the population were immigrants in 2021, and 2.2% were non-permanent residents (Statistics Canada, 2022). Notably, over half (52.6%) of immigrants in Saint John County were born in Asia. The total reported immigrant population in Charlotte County is 7.9% and non-permanent residents comprised 0.9% of the population. In contrast to Saint John County, only 19.2% of immigrants in Charlotte County were born in Asia; the highest rate of immigrants in Charlotte County were born in the Americas (45.5%), followed by Europe (33.5%) (Statistics Canada, 2022).

In 2021, English was the most spoken language at home in Saint John County, with 93.1% of the population reporting speaking English at home and 13% reporting knowing both official languages (Statistics Canada, 2022). In Charlotte County, 97.3% of the population reported speaking English at home and 8.6% reported knowing both official languages (Statistics Canada, 2022).

In Saint John County, 16.2% of the population did not have a certificate, diploma, or degree in 2021, which is below the provincial average (Statistics Canada, 2022). In Charlotte Country, 17.2% of the population did not have a certificate, diploma, or degree, which is higher compared to Saint John County and the province. Women+ had a higher rate of educational attainment than men+ overall, but lower rates of apprenticeship or trades certificates or diplomas (Statistics Canada, 2022).

[3] According to Statistics Canada (2022a), the category "women+" includes women and some non-binary persons, and the category "men+" includes men and some non-binary persons.

5.6.1.2 Community and Social Services

Community facilities available in the City of Saint John include fourteen English community centers, one French community center, four public libraries, seventeen cemeteries, and nineteen churches. Information on secondary sources on community facilities in Musquash, SWNB and Charlotte County is limited. The New Brunswick Provincial Government provides social services such as career development services, day activities for seniors, child protection, and family enhancement services. Many of these provincial services are available in the Fundy Region and Saint John County. There is limited information in secondary sources about community services provided on the regional or county level for the Fundy Region, Saint John County, SWNB and Charlotte County.

5.6.1.3 Education and Training

Saint John County hosts schools from two public school districts: the Anglophone South School District and the District Scolaire Francophone Sud, which offer French education. The City of Saint John is home to 28 elementary and secondary schools, three public post-secondary education institutions, seven organizations that offer adult education, and five language learning and English Second Language organizations. In terms of post-secondary education institutions, the City of Saint John hosts the Saint John Campus of the University of New Brunswick, and the New Brunswick Community College. One rural elementary school was identified in Musquash Parish. Limited information in secondary sources is readily available on youth and adult education in SWNB and Charlotte County. The County hosts schools from the Anglophone South School District. Several options for adult education are available in the SWNB region.

5.6.1.4 Housing and Infrastructure

The number of private dwellings has increased in New Brunswick between 2016 and 2021. In 2021 there were 366,136 private dwellings, an increase of 1.8% over 2016 (Statistics Canada, 2022). Despite this, higher rates of remote work, rising housing costs in other provinces, and historically low interest rates throughout the pandemic put increased pressure on the housing ownership market in New Brunswick (Southwest New Brunswick Service Commission and Turner Drake and Partners Ltd., 2022). Home prices and rental costs rose by 24.5% from 2020 to 2021 (Davis, 2021). The City of Saint John has also observed rapid housing price increases. In 2021, households need to reach the highest 30% income bracket to afford new home prices in the city. Home ownership prices are expected to continue to grow due in part to rising levels of interprovincial in-migration.

The rental market also faced increased pressure and low vacancy (below 3%) levels throughout the pandemic in all unit types except one-bedroom apartments (Southwest New Brunswick Service Commission and Turner Drake and Partners Ltd., 2022). Low vacancy means fewer units are available to renters, allowing landlords to raise rental prices (Southwest New Brunswick Service Commission and Turner Drake and Partners Ltd., 2022). Despite new rent control limits restricting increases to 3.8% in 2022, rents rose by an average of 7.9% in 2022 (Jones, 2022).

Saint John County is accessible for international and domestic travel via various transportation options. In terms of municipal public transportation, the City of Saint John provides a network of bus routes through Saint John Transit. SWNB has limited local transportation methods available. Charlotte Dial-A-Ride provides rides across Charlotte County for health appointments, access to work and education, grocery shopping, and social events, such as exercise classes.

The Fundy Regional Service Commission runs the recycling and compost programs in Greater Saint John, as well as the Crane Mountain Landfill; however, it does not collect waste from residents or businesses. Each community provides its own collection services. Waste management for SWNB, including Charlotte County, takes place at Hemlock Knoll a 1,000-acre site located in Lawrence Station. There is no available information regarding water infrastructure or treatment in SWNB, including Charlotte County. Municipalities are responsible for drinking water infrastructure and treatment, while the provincial government is responsible for wellfield protection. In addition to national and international newspapers, radios, and TV stations, many local media sources are available throughout New Brunswick. According to the New Brunswick Health Council, almost 100% of surveyed residents in Health Zone Two, including Saint John and Charlotte County have access to internet at home in 2020 (96.9%), which is equal to the provincial average. The Canadian Radio-Television and Communications Commission reports that 98.9% of people in New Brunswick had long-term evolution (LTE) wireless data transmission coverage in 2021.

NB Power has a diverse mix of generation resources and power purchase agreements. The utility serves the electric needs of the province with hydro, wind, biomass, solar, nuclear, natural gas, oil and coal resources. Over 50% of New Brunswick's energy requirements came from renewable sources in 2022/23. Combining those with the Point Lepreau Nuclear Generating Station results in approximately 75% of New Brunswickers' needs being served from low-carbon energy sources.

5.6.2 Economic Wellbeing

5.6.2.1 Provincial Profile: New Brunswick

The New Brunswick economy provides about 1.5% of Canada's gross domestic product, with a value of $31,629.8 million (2012 chained) in 2021 (Government of New Brunswick, 2022b). It is characterized by dependence upon service-producing industries followed by public sector and goods-producing industries.

New Brunswick's exports, with a value of $14.7 billion, make it the seventh largest exporting province in Canada. In 2021, the top exports of New Brunswick were petroleum spirit for motor vehicles ($4.47 billion), light petroleum distillates ($2.78 billion), wood ($943 million), petroleum bitumen ($739 million), and lobsters ($686 million) (Government of Canada, 2022). In 2021, New Brunswick imports were valued at $13.3 billion, making it the sixth largest importer in Canada. In 2021, top imports of New Brunswick were petroleum oils, oils from bituminous minerals ($8.28 billion), petroleum spirit for motor vehicles ($591 million), natural gas ($531 million), and crustaceans ($527 million) (Government of Canada, 2022).

According to the 2021 census data, there were 349,215 people employed, with 40,255 unemployed, and a labour force participation rate of 60.1%. The province had an unemployment rate of 10.3%, which was the same as the Canadian average (**Table 5.21**). The top occupational categories in New Brunswick are sales and service (26.0%); trades, transport and equipment operators and related (17.3%); business, finance and administration occupations (15.0%), and education, law and social, community and government services (13.2%) (Statistics Canada, 2022). The median total household income in 2020 was $70,000 (Statistics Canada, 2022).

Table 5.21: Employment and Income Statistics from Census of Population, 2021

Location	Unemployment Rate	Labour Force Participation	Median Household Income (2020)
Canada	10.3%	63.7%	$84,000
New Brunswick	10.3%	60.1%	$70,000
Saint John Census Metropolitan Area	9.8%	61.7%	$74,000
Charlotte County	12.2%	58.3%	$67,500
Lepreau Parish	13.8%	56.7%	$69,500
Musquash Parish	14.5%	58.8%	$82,000

Source: Statistics Canada, 2022.

5.6.2.2 Saint John Census Metropolitan Area

The Saint John Census Metropolitan Area (CMA) is located at the mouth of the Saint John River, and includes the city of Saint John, town of Rothesay, and seven villages. The city of Saint John is endowed with a natural harbour which is ice-free year-round and serves as the province's major shipment point for international trade. Consequently, activity associated with both transportation equipment manufacturing and the transport of passengers and cargo is an important and highly visible component of the Saint John CMA's industrial base. Other equally important economic sector includes service industries, forest products, and petroleum and chemical products. The municipalities surrounding the city of Saint John are primarily dormitory communities with most residents commuting to the city for employment.

In 2021, the labour force for Saint John CMA consisted of 66,705 people, with a participation rate of 61.7% and an unemployment rate of 9.8% (**Table 5.21**; Statistics Canada, 2022). As with New Brunswick as a whole, the top occupational categories are sales and service (27.1%); trades, transport and equipment operators and related (15.8%); business, finance and administration occupations (16.1%), and education, law and social, community and government services (12.7%) (Statistics Canada, 2022). The median total annual household income was $74,000 in 2021 (Statistics Canada, 2022).

5.6.2.3 Charlotte County

In 2021, the labour force for Charlotte County consisted of 12,725 people, with a participation rate of 58.3% and an unemployment rate of 12.2% (**Table 5.21**; Statistics Canada, 2022). As with New Brunswick as a whole, the top occupational categories are sales and service (21.1%); trades, transport and equipment operators and related (19.7%); education, law and social, community and government services (11.5%), and business, finance and administration occupations (11.2%) (Statistics Canada, 2022). The median total annual household income was $67,500 in 2021 (Statistics Canada, 2022).

5.6.2.4 Point Lepreau

Unemployment in the Point Lepreau area is higher than the provincial average. In 2021, the labour force for Lepreau Parish consisted of 400 people, with 345 employed and 55 unemployed; the workforce participation rate was 56.7% and unemployment rate was 13.8% (Statistics Canada, 2022). The labour force for Musquash Parish consisted of 620 people, with 530 employed and 90 unemployed; the workforce participation rate was 58.8% and unemployment rate was 14.5%. The main source of employment in the Lepreau Parish was sales and service occupations (20.0%), while in the Musquash Parish it was trades, transport and equipment operators and related occupations (24.2%; Statistics Canada, 2022). Fishing, fish processing and forestry-related industries have historically been the main sources of employment in the local impact region. In 2022, these industries accounted for 7.4% of the total labour force. A key contributor to the Point Lepreau economy is the PLNGS, which currently has 800 to 900 workers, generally from southern New Brunswick.

5.6.3 Historical and Existing Land Uses

5.6.3.1 Historical Land Uses

Prior to European settlement in New Brunswick, the Point Lepreau area was historically the territory of the Wolastoqiyik and Peskotomuhkati First Nations (JWEL, 2003). In August of 1974, archaeologists examined the east and west coastlines of the Lepreau Peninsula and found no signs of settlement by First Nations prior to the 1500s (MacLaren Atlantic, 1977). Three Mi'gmaq camps were known to have existed along the Bay of Fundy during the early 1800s. One of these camps was located on the west coastline of Point Lepreau just off the beach of Indian Cove (MacLaren Atlantic, 1977). The main purpose of these Mi'gmaq camps was the hunting of porpoise that were abundant off the coast (MacLaren Atlantic Ltd, 1977). The camp was abandoned in the late 1920s when the commercial fishing industry had rendered old methods of capture obsolete (MacLaren Atlantic, 1977).

In May of 1783, three thousand British settlers landed in Saint John and the timber trade along the eastern coastal areas became an economic focus (MacLaren Atlantic, 1977). Many of the small communities located in the Musquash and Lepreau parishes are remnants of this focused timber trade era. European patterns of land use also included the development of non-water travel routes, exploitation of subsurface mineral deposits and hunting (JWEL, 2003).

The 1977 environmental assessment of the PLNGS detailed land uses of local communities located in the parishes of Musquash and Lepreau around the Point Lepreau site prior to and during the construction period. These communities included Welch Cove, Maces Bay, the Village of Lepreau, Chance Harbour and Dipper Harbour (MacLaren Atlantic, 1977). Prior to the construction of the PLNGS, communities to the northwest of the site such as Welch Cove and Maces Bay had primarily residential land uses, with churches, schools, and household businesses also present (MacLaren Atlantic, 1977). To the northeast of the site, Dipper Harbour similarly had residential land uses along with local businesses such as a small gas station, a general store, a roadside food stand and a repair garage (MacLaren Atlantic, 1977). The Village of Lepreau north of the Point Lepreau site was characterized by commercial uses such as a mobile home sales outlet as well as residential buildings (MacLaren Atlantic, 1977). Overall, there was very little industrial or commercial land use near the site of the PLNGS other than in the city of Saint John (JWEL, 2003).

Construction of the PLNGS began in the fall of 19775 and the federal government, through the Atomic Energy Control Board (AECB) restricted land use within a 900-metre radius of the nuclear facility to exclude permanent habitation (MacLaren Atlantic, 1977). Within the 900-metre exclusion zone there were four homes overlooking Duck Cove. These properties were acquired by NB Power (then the New Brunswick Electrical Power Commission) and vacated prior to the commercial operation of the PLNGS (MacLaren Atlantic, 1977).

During the construction period, communities in the Musquash and Lepreau parishes experienced significant growth in building activity (MacLaren Atlantic, 1977). This significant growth ultimately brought about more stringent land use regulations (MacLaren Atlantic, 1977). In May 1975, the New Brunswick Department of Municipal Affairs implemented controls that created a restricted by-law over the Musquash and Lepreau parishes to ensure short-term control of development (MacLaren Atlantic, 1977). The by-law included a setback regulation that aimed to control the strip development along major arterial roads, a subdivision regulation that established a review process and basic building standards (MacLaren Atlantic, 1977). In December of 1975, the *Point Lepreau Basic Planning Statement* and complementary zoning regulation were instituted (MacLaren Atlantic, 1977). The planning statement identified the purpose of the regulation was “to retain the rural nature of the area and protect existing property from the ravages of undesirable, largely temporary development” (MacLaren Atlantic, 1977). The whole Lepreau-Musquash Planning Area was designated as a one-use residential zone; however, the term residential was extended to mean the existing land uses of the community (MacLaren Atlantic, 1977).

5.6.3.2 Present Land Uses

The *Point Lepreau Basic Planning Statement* has been replaced by the *Ministerial Regulation for the Lepreau Musquash Planning Area* under New Brunswick’s *Community Planning Act*. This regulation designated the Point Lepreau site and adjacent properties as mixed use. The intent of the regulation is to zone the area to establish a compatible mix of residential and non-residential uses (JWEL, 2003).

The region remains largely undeveloped with the exception of small communities located in Musquash and Lepreau parishes that are remnants of the timber trade. The climate, poor soil conditions and poor drainage limit agricultural use in the area (JWEL, 2003). Residential communities remain in Welch Cove, Maces Bay, Dipper Harbour and the Village of Lepreau. Some local communities cultivate small vegetable gardens for personal use. Many communities along the shore of the Lepreau Peninsula from Dipper Harbour to Welch Cove and Maces Bay are known fishing locations (JWEL, 2003). Non-commercial clam digging is performed at Dipper Harbour.

5.6.3.3 Adjacent Property Owners

The Point Lepreau site is adjacent to the properties indicated in **Table 5.25**.

Table 5.22: Adjacent Properties and Land Uses

PID	Location	Property Owner	Land Use
01213446	Northwest of the site	Private landowner	Mixed Use
15060791	Northwest of the site	Private landowner	Mixed Use
01214352	Northwest of the site	Private landowner	Mixed Use
01214345	Northwest of the site	Private landowner	Mixed Use

PID	Location	Property Owner	Land Use
01213180	Northwest of the site	Private landowner	Mixed Use
01213388	Northwest of the site	Private landowner	Mixed Use
55027429	Northwest of the site	New Brunswick Department of Transportation and Infrastructure	Mixed Use
00271205	Northwest of the site	Private landowner	Mixed Use
55005961	North of the site	Maces Bay Cemetery Corp Ltd.	Mixed Use
00275081	Northeast of site	Private landowner	Mixed Use
00275123	Northeast of site	Private landowner	Mixed Use
00276840	Northeast of site	Private landowner	Mixed Use
00275214	Northeast of site	Private landowner	Mixed Use

Source: Service New Brunswick, 2022.

5.6.3.4 Significant Features

There are four Class II provincial Protected Natural Areas within 10 kilometres of Point Lepreau: Round Meadow Cove, McPhersons Point, Salkeld Islands, and Dipper Harbour Back Cove. New River Beach Provincial Park is also located approximately 10 kilometres northwest of the property.

The Lepreau Musquash Planning Area attracts both tourists with special interests and local residents seeking a daily outing. Many visitors are attracted to the rough shorescape of Point Lepreau (MacLaren Atlantic, 1977; JWEL, 2003). On the Point of the Lepreau Peninsula, there is the Point Lepreau Bird Observatory, which is operated by the Saint John Naturalists Club. Bird counts are conducted at the observatory throughout the year, including during the spring and fall migration. Visitors come to the area to see the unique bogs or New River Beach Provincial Park that extends along the shoreline northwest of NB Power's current operations at Point Lepreau (JWEL, 2003). The forest and water area provide facilities for outdoor activities such as camping, beach bathing, picnicking and swimming (JWEL, 2003). The Reversing Falls in Saint John, and Maces Bay are popular river-kayaking sites, while sea kayaking is common along the Bay of Fundy coast (JWEL, 2003). Additionally, common shoreline activities in the Lepreau Musquash area include clam digging, gathering of dulse, seashell collecting and windsurfing (JWEL, 2003). Blueberry harvesting also takes places at the recreational and commercial level in Pocologan and Pennfield, northwest of the Project site (JWEL, 2003).

The NBDNRED issues hunting licences and validation tags for big game including deer, moose, and black bear, and manages trapping of furbearing animals. The Saint John and Charlotte counties overlap with Wildlife Management Zone 20. Residents who wish to hunt antlerless deer may apply to the "Antlerless Deer Draw". Non-resident hunters must hunt "bucks only". Residents and non-residents of New Brunswick must enter the appropriate Moose Draw (resident or non-resident) to hunt moose. Non-resident bear licences are valid for hunting in only one Wildlife Management Zone. Trappers must complete a 17-hour mandatory training program, obtain a licence and trap only during open season on their registered traplines or private property with written permission. The exception is for Indigenous trappers who may harvest animals at any time of the year as part of their treaty rights for sustenance and ceremonial purposes only.

5.6.4 Indigenous Peoples

At the time of reporting, formal studies documenting IK related to the Project have not yet been completed; therefore, the following is based on desktop research and secondary sources. Through the Sustainability and Well-being Assessment this information will be reviewed and updated by the First Nation communities and incorporated into the EIA report. The historic and modern use of local vegetation, fish, migratory birds, and wildlife by the First Nation community members will likely be outlined further in anticipated traditional knowledge reports expected from the First Nation communities.

Indigenous people living away from their communities are also being included in the Sustainability and Well-being Assessment.

The following text provides a summary of the secondary information collected through background research that will support the EIA. This information will be shared with First Nation communities for review and updating.

5.6.4.1 Population Characteristics

As of December 31, 2021, there were approximately 16,985 First Nations people in the province, 9,968 on reserve and 7,017 off reserve (Government of New Brunswick, 2023b). The 2021 census population of the First Nations within New Brunswick indicates that communities have between 36 to 2,062 members, with most First Nations noting a growth in population from 2016 to 2021, except for Amlamgog First Nation, L'nui Menikuk First Nation and Oinpegitjoig First Nation (Statistics Canada, 2022). All First Nations within New Brunswick reported low levels of movement within the province and to a different province between 2020 to 2021 (0% to 7%).

The average age was consistent across all First Nations (between 32.2 and 36.8 years), except for Ugpi'Ganjig (37.8), Oinpegitjoig First Nation (38.4) and Matawaskiye First Nation (41.4). However, in comparison to the provincial average (44.8), the average age is lower across all First Nations within New Brunswick (Statistics Canada, 2022).

English is the most commonly spoken language amongst all First Nations. Knowledge of both English and French are high across some the First Nations, notably Matawaskiye (68.8%), Tjipogtotjg (20.0%), Indian Island (17.4%), Esgenoôpetitj (25.9%) and Ugpi'Ganjig (29.0%) (Statistics Canada, 2022).

All surveyed First Nations within New Brunswick reported a higher rate of respondents without a certificate, diploma, or degree than the provincial average of 18.9% (Statistics Canada, 2022). Women+ reported higher rates of educational achievement for all First Nations than men+ in the college or non-university certificate category and university certificate or diploma at bachelor level or above category.

5.6.4.2 Economic Conditions

Labour force participation rates for census subdivisions representing a First Nation community range between 38% and 68% (Statistics Canada, 2022). Employment rates range between 30% and 64%, and are above the provincial average (54%) in Wotstak, Matawaskiye, Oinpegitjoig and Metepenagiag (Statistics Canada, 2022). The employment rate is below the provincial average in all other communities for which data were available. Unemployment is highest in Esgenoôpetitj (34%), L'nui Menikuk (29%) and Welamukotuk (26%) (Statistics Canada, 2022).

The distribution of the labour force across industries shows that public administration (23%), health care and social assistance (14%), as well as agriculture, forestry, fishing, and hunting are the industries capturing the largest share of the labour force of First Nation communities (Statistics Canada, 2022). Key differences to the provincial average include that public administration as well as agriculture, forestry, fishing, and hunting play a much larger role in First Nation communities, while retail trade and manufacturing play a smaller role.

There is significant variation in the income composition across the different communities. However, government transfers account for a larger share of income than the provincial average (22%) in all communities for which data are available (31% to 49%) except Matawaskiye (22%). Median employment income ranges from $11,600 (Esgenoôpetitj) to $31,400 (St. Basile) and is lower than the Provincial median ($33,200) in all First Nation communities in New Brunswick for which data is available (Statistics Canada, 2022). For the Province and the First Nation communities of Welamukotuk, Wotstak, Natoaganeg, and Esgenoôpetitj, median employment income is higher for men+ than for women+. In the First Nation communities Ugpi'Ganjig, Metepenagiag, Richibucto, Sitansisk, Neqotkuk, Matawaskiye and Bilijk median employment income is higher for women+ than for men+.

Average monthly shelter costs for dwellings provided by local government, First Nation, or Indian band range between $34 (Sitansisk) and $320 (Matawaskiye), which is below the provincial average monthly shelter costs for owned dwellings ($935) and rented dwellings ($870).

5.6.4.3 Community, Social and Health Services

Community and social services include community halls, community events, pow-wow grounds, parks, church, cultural centres, cemetery, youth centre, daycares, child and family services and social assistance services. These services vary between communities, but there is limited information available through secondary sources regarding community services and social services within the First Nations in the Province. First-hand knowledge of these services may be obtained from community members through the assessment currently being undertaken.

Each First Nation has various health services available, including services such as family health, dental care, optometry, chiropractic care and pharmaceutical services. Most communities in Wolastoqey have access to a family doctor, with Welamukotuk First Nation, Sitansisk, Matawaskiye Area averaging the lowest in the region (80%), slightly lower than the provincial average of 86.0% (New Brunswick Health Council, 2020). Unmet health needs rates are similar among the various communities, with slightly more youth (6.9%) reporting not speaking about their mental or emotional health needs to a professional than the provincial average (6.5%).

Most communities in the Mi'gmaq Nations have access to a family doctor, with Ugpi'Ganjig averaging the lowest in the region (84.6%), which is lower than the provincial average (86%). While Oinpegitjoig, Esgenoôpetitj, Metepenagiag, Natoaganeg, Tjipogtotjg, L'nui Menikuk, Elsipogtog and Amlamgog trend higher than the provincial average (86%) (New Brunswick Health Council, 2020). Unmet health needs rates are similar among the communities, with youth reporting not speaking about their mental or emotional health needs to a professional, the highest being Ugpi'Ganjig at (32.8%) compared to the provincial average of 6.5%. According to the New Brunswick Health Council (2020), the top barriers to health services for Wolastoqey and Mi'gmaq Nations include: financial barriers in getting the health care they need; health services

not available in their area and having to travel over 100 kilometres to use a health service, and language barriers when communicating with a health professional.

5.6.4.4 Education and Training

Primary education is available in most First Nation communities; however, in some areas students are required to attend schools in nearby municipalities. Limited information is available from secondary sources on youth and adult education, as well as capacity and utilization of existing schools. Post-secondary facilities are not available within the First Nation communities in New Brunswick. To support Indigenous students, several educational and training programs on a provincial level are available including Future Ready Wabanaki, Education Partnerships Program, Indigenous Skills and Employment Training Strategy, North Shore Micmac District Council's Post-Secondary Education Program, Post-Secondary Student Support Program and University and College Entrance Preparation Program.

5.6.4.5 Housing and Infrastructure

The number of private dwellings and their occupancy by usual residents have increased in all First Nations between 2016 and 2021, except for L'nui Menikuk First Nation (Statistics Canada, 2022). Most respondents across the First Nations noted that homes require regular maintenance and/or minor repairs. Neqotkuk First Nation was the only Nation that most respondents noted that homes required major repairs. The Wolastoqey First Nation is located within New Brunswick's transportation districts number 5 and 6, and accessible by highways. In terms of air connectivity, Matawaskiye is near Edmundston Airport, located 23 kilometres northwest of Matawaskiye First Nation via Route 2. Sitansisk First Nation is near Fredericton International Airport.

Mi'gmaq First Nation communities are all accessible via highway. Natoaganeg is 15 kilometres away from Miramichi-Chatham airport, which offers passenger and cargo flights. The nearest passenger railway station is also located in Miramichi. Oinpegitjoig is near the airport and passenger railway station in Bathurst, about 18 kilometres and 12 kilometres by road, respectively. Upi'ganjig is near the airport and passenger railway station are in Charlo, which is located 8 kilometres away along Route 134.

Waste services and facilities for the Wolastoqey First Nation communities are operated and managed by several organizations including the Regional Service Commission, the Nations themselves, and the Atlantic First Nations Water Authority (AFNWA). In December 2022, the AFNWA signed a service delivery transfer agreement with Indigenous Services Canada, giving AFNWA purview as a water utility for 17 First Nations in the Atlantic including Welamukotuk, Bilijk Neqotkuk, and Sitansisk First Nation as well as Mi'gmaq communities Esgenoôpetitj and Elsipogtog.

Waste services and facilities for Mi'gmaq communities are operated and managed by several organizations including Regional Service Commission, the Nations themselves, and the North Shore Micmac District Council. Limited secondary information is readily available regarding service operators, programs, and facility capacity.

NB Power provides energy generation, transmission, and distribution throughout the province, including to all First Nations communities.

According to the Canadian Radio-Television and Telecommunications Council's (2022) survey, all First Nation members in New Brunswick have mobile phone service coverage available. All

surveyed First Nation members also have long-term evolution (LTE) broadband available, except only 99.3% of surveyed Neqotkuk First Nation members have LTE broadband available. No secondary information is readily available regarding mobile or broadband service availability for urban First Nation communities; however, coverage is likely high since urban areas have greater coverage availability than rural areas in New Brunswick.

5.6.4.6 Health and Wellness

The First Nation Regional Health Survey is conducted by the First Nation Information Governance Centre, a non-profit First Nation organization. The 2018 survey, with national data from 2016-2017, found that adults with higher activity levels had higher frequencies of participating in local and community events (First Nations Information Governance Centre, 2018). A majority of First Nation adults and youths reported that good sleep and proper rest, good diet, happiness and contentment, and good social supports made them physically, emotionally, mentally, and spiritually healthy. As health is holistic across many First Nations and cultures, a feeling of having all components of health in balance is important to obtaining holistic senses of wellbeing. First Nations adults with higher education levels (post-secondary diploma, training, and/or university-level education) reported practicing higher levels of traditional medicine use. Family and a connection to community and home were the two most common reasons First Nations adults returned to their communities, while education and employment were the two most common reasons First Nations adults moved away from their communities.

Regarding emotional and mental health, participants were more likely to speak with an immediate family member, friend, mental health professional, or a traditional healer (First Nations Information Governance Centre, 2018). There were more responses for speaking with a traditional healer than a family doctor.

5.6.4.7 Indigenous Peoples' Use of Land and Resources

Indigenous peoples have existed in the area that makes up modern-day New Brunswick since time immemorial (Membertou Geomatic Solutions, 2016; Kopit Lodge and Elsipogtog First Nation, 2022), and the Point Lepreau site is located on the traditional lands of the Wolastoqey, Mi'gmaq, and Peskotomuhkati peoples. Many of the First Nation communities residing within the region historically would move seasonally and use different areas strategically throughout the year. In the winter months, First Nation communities would often retreat inland away from the coastal winds and would rely more on land mammals as food sources. In the summer months, some groups would travel to offshore locations by canoe to harvest marine life such as sea mammals, fish, and birds. Each First Nation community would adjust their harvesting practices to the local seasonal cycles of wildlife, marine life, and vegetation and possessed unique ecological knowledge of their territories (Canadian Museum of History, n.d.; Membertou Geomatic Solutions, 2016).

With the arrival of the first Europeans, this seasonal movement started to change. Over time there were increased restrictions and access to harvesting locations and resources as Treaties were developed and signed. Wolastoqiyik/Wəlastəkwiyik, the Mi'gmaq and the Peskotomuhkati/Passamaquoddy signed the Peace and Friendship Treaties of 1760 and 1761, which were agreements and obligations made with the intention of providing benefits for both the Crown and First Nations that were signatories. The 1760 treaty incorporated the contents of the treaties that had been co-developed and signed in 1726, 1749 and 1752, which recognized and guaranteed rights to harvest and use resources for commercial purposes.

The Indigenous occupation of the area is shared and understood through oral histories, IK, and archaeological work (Kopit Lodge and Elsipogtog First Nation, 2022). Some information about historical and modern land and resource use has been provided by Elsipogtog (L'sipuktuk) First Nation, which indicates “The northern coast of the Bay of Fundy, including near the Point Lepreau site has quartz and other mineral outcroppings that were used for tool production, and arrowheads and other artifacts have been found throughout the area. In addition to being historically significant, participants noted that the area is still used to some degree for such things as sweet grass harvesting and porcupine quill harvesting” (Kopit Lodge and Elsipogtog First Nation, 2022).

Six Wolastoqiyik communities (Bilijk Matawaskiye, Welamukotuk, Sitansisk, Neqotkuk, and Wotstak First Nations) are undergoing a process of reintroducing traditional foods through the Three Sisters (maize, beans, and squash). The plants used to begin these efforts were flint corn, butternut squash, and red scarlet runner beans. As the introduction of European staple foods (sugar, milk) have created ongoing issues with healthy food access for First Nation communities (and unhealthy relationships with food), health services managers for Wolastoqey Tribal Council are ensuring there are efforts at the community level to introduce ancestral knowledge to build healthier relationships with food. The health benefits of this go beyond nutritional food access and knowledge and can help with healing from intergenerational traumas through cultural knowledge and reconnecting with ancestral practices of knowing, doing, and being. Planting and growing the Three Sisters can also aid in maintain nitrogen levels in the soil (through beans), with the squash providing a natural mulch that can maintain water levels in the soil for plants.

There is a resurgence of traditional food practices for many Mi’gmaq peoples in more recent years, though this has often been a difficult movement due to the intergenerational trauma stemming from the residential school system. The residential school system resulted in shame and trauma in reconnecting with traditional food practices, such as the consumption of moose meat. Traditional foods were central to celebrations and ceremonies, which were all taken away or banned during the residential school period.

There was limited secondary data available on the status of food security and sovereignty for Peskotomuhkati Peoples at the time of preparation of this report. The Peskotomuhkati Peoples have faced many challenges with settlers, with the Nation having been deprived of almost all its traditional territory by the mid-1830s. Given this, there have been ongoing limitations to their access to both land and sea to be self sufficient with their food. Government regulations and commercial fishing from both the United States and Canada has reduced their food access and traditional practices. There are community concerns with chronic health conditions such as obesity and diabetes, as well as a life expectancy 30 years lower than the average American life expectancy.

Given this, the Peskotomuhkati Peoples have shifted their food production towards self-sufficiency for community healing. Traditionally, the Passamaquoddy practice wild food gathering, growing the Three Sisters, and depend upon the ocean to provide fish, foods, and other medicines for physical and cultural sustenance. They have engaged with consultants to restore Indigenous sea-run and saltwater fish in rivers and oceans as well.

5.6.5 Archaeology and Heritage Resources

Several studies on the archaeological potential of the Point Lepreau site have been conducted:

- A team of archaeologists examined the entire coastlines of the Point Lepreau site prior to the construction of the existing PLNGS facility and did not identify any archaeological materials (Maclaren Atlantic, 1977).
- Prior to the expansion of the SRWMF, a detailed pedestrian survey was completed for the enlarged footprint and several test pits were dug in two areas of archaeological potential (JWEL, 2001, 2003). No evidence of archaeological or heritage resources were observed.
- An archaeological study, undertaken recently for the proposed PLNGS Moderator Warehouse Project, south of the SRWMF, found no evidence of settlement in that local area (Stantec, 2021b).
- During site characterization activities in 2022, archaeological test pits were dug in the Duck Cove area by a licensed archaeologist with monitors present from each Nation. A quartz flake was found at one of the test pit locations. This cultural artifact is in the process of being catalogued with Archaeological Services and the site will be entered into the Provincial registry.

According to the New Brunswick Heritage and Archaeological Services Branch, there is one registered archaeological site on the NB Power property at Point Lepreau in the Duck Cove area, and two registered archaeological sites within 5 kilometres of the PLNGS. BgDo-1 is a general activity pre-contact site along the coastline near Maces Bay where a groundstone axe was found and BgDo-2 is the wreck of the HMS Plumper located between Duck Cove and Dipper (Fundy Engineering, 2020).

An archaeological impact assessment will be undertaken for the proposed Project, led by the New Brunswick Museum. Indigenous monitors and/or certified archaeological technicians from the Wolastoqey, Mi'gmaq, and Peskotomuhkati First Nations will also be participating in this assessment.

5.6.6 Human Physical Health

Health and wellbeing do not exist in isolation and are braided together with other elements, including social determinants, land use and access, and food and water quality. This section speaks predominantly with physical health of the population. The information presented here provides a baseline of human physical health in the area, but does not imply any connection to the current operations at PLNGS.

Many of the public health services for communities in the Saint John and Charlotte counties are provided by Horizon Health Network, the largest regional Health Authority in New Brunswick. Health services in New Brunswick are delineated by zones, and Fundy and SWNB Region both fall primarily under Health Zone Two (Saint John Region). **Table 5.23** provides a snapshot of population health outcome indicators for the Zone 2 using New Brunswick Health Council summary data (New Brunswick Health Council, 2022). The information provided is for residents aged 12 and over.

Table 5.23: Population Health Outcomes (Snapshot) for the Saint John Region

Indicator	Unit	Zone Value	Change Value*	New Brunswick Value	Year of Data**
Citizens' rating health as excellent or very good	%	40.9	↓	39.5	2020
Citizens rating mental health as excellent or very good	%	50.6	↓	49.8	2020
Citizens' report being satisfied or very satisfied with their life	%	90.1	↑	90.8	2020
Infant mortality	Rate per 1,000 births	4.2	↑	3.2	2016-2018
Life expectancy	Years	80.1	↓	80.7	2015-2017
Low birth weight (<2500 grams, excluding >500g)	%	5.8	↓	6.2	2018-2019
Mortality (preventable causes)	Rate per 100,000 population	142.5	↑	142.5	2015-2017
Mortality (treatable causes)	Rate per 100,000 population	79.4	↓	72.0	2015-2017
Premature mortality	Rate per 10,000 population	343.6	↑	317.0	2015-2017

Source: New Brunswick Health Council, 2022

* Indicates a change (↑ getting better, − no change, ↓ getting worse) from previous report for the Zone (New Brunswick Health Council, 2022).

** Vary by source date of original report publication (New Brunswick Vital Statistics have not been updated since 2015-2017).

The most common reasons for health care admission in the Saint John Region are birth, chronic obstructive pulmonary disease (COPD), heart failure, knee replacement, pneumonia, percutaneous coronary intervention, and newborn/neonate care (New Brunswick Health Council, 2022). The most common chronic health conditions for the area include high blood pressure or hypertension, arthritis, high cholesterol, anxiety, depression, chronic pain, gastric reflux, diabetes, asthma, and heart disease (New Brunswick Health Council, 2022). Most of the top ten chronic health conditions are similar to the provincial prevalence rates, with the exception of arthritis being slightly higher for the region than the provincial average. The top five causes of avoidable mortality for the area are: lung cancer, heart disease, COPD, diabetes, and stroke.

Access to primary health care services in the Saint John Region is generally higher than provincial averages. More than half of adults in the region (57%) and seniors (64%) reported being able to book an appointment with their doctor within five days of calling (New Brunswick Health Council, 2022). This region also has some of the shortest provincial wait times for emergency services, with 71% of people reporting a wait time of less than an hour to access emergency services. Compared to provincial averages, residents of the Saint John Region turn to their family doctor more frequently than to after-hours or walk-in clinics when they need health care services.

6.0 POTENTIAL INTERACTIONS BETWEEN THE PROJECT AND THE ENVIRONMENT

6.1 Assessment Approach and Scope

The Project is expected to interact with a range of environmental components during the site preparation, construction, and operation phases of the Project, as well as during decommissioning. There is also the possibility of impacts to the environment related to potential accidents and malfunctions, although these are unlikely will be mitigated. The likely effects of the Project on the environment will be fully analyzed as part of the EIA for all phases of the Project.

A preliminary assessment of the potential interactions between the Project and the environment has been undertaken, based on the information currently available.

Table 6.1: Potential Project-Environment Interactions

Project Phase	Site Preparation	Construction	Operation	Decommissioning	Accidents and Malfunctions
Atmospheric Environment					
Air Quality and Greenhouse Gases	×	×	×	×	×
Acoustic Environment	×	×		×	×
Geophysical Environment					
Geology and Soils	×	×	×	×	×
Freshwater Environment					
Surface Water Resources	×	×	×	×	×
Groundwater Resources	×	×	×	×	×
Wetlands	×	×	×	×	×
Freshwater Fish and Fish Habitat.	×	×	×	×	×
Terrestrial Environment					
Vegetation	×	×	×	×	×
Avifauna	×	×	×	×	×
Wildlife	×	×	×	×	×
Marine Environment					
Marine Physical and Chemical Environment		×	×	×	×
Marine Biota		×	×	×	×
Socio-economic Environment					
Social Environment	×	×	×	×	×
Economic Wellbeing	×	×	×	×	×

Project Phase	Site Preparation	Construction	Operation	Decommissioning	Accidents and Malfunctions
Land Use	×	×	×	×	×
Indigenous Peoples	×	×	×	×	×
Archaeology and Heritage Resources	×	×			
Human Physical Health			×		×

As discussed in **Section 1.1**, this document is intended to facilitate a formal determination regarding whether a Comprehensive EIA is required. As such, this registration document is not intended to be a thorough report of the results of an EIA study; however, it has been prepared with the intent to provide the general information required in order to register the undertaking under the *Environmental Impact Assessment Regulation - Clean Environment Act,* as described in in *A Guide to Environmental Assessment in New Brunswick* (NBDELG, 2018).

6.1.1 Valued Components

The approach used in this report focuses the assessment on environmental components of greatest concern to society or as indicators of environmental health. Valued components (VC) are aspects of the biophysical and human environment that have scientific, ecological, economic, social, cultural, archaeological, historical or other importance to regulators, Indigenous people, resource managers, scientists, or the public. A preliminary list of valued components has been developed based on knowledge the site and previous assessments, and outreach to First Nation communities and the public (see **Section 3.0**). This list will be further refined and validated through public and Indigenous engagement during a planned the Sustainability and Well-being Assessment and through the IK studies being undertaken, as well as regulatory consultation during the development of the guidelines and NB Power's Terms of Reference for the comprehensive EIA. VCs identified for this analysis include the following:

Geophysical Environment

- Geology and Soils

Atmospheric Environment

- Air Quality and Greenhouse Gases
- Acoustic Environment

Freshwater Environment

- Surface Water Resources
- Groundwater Resources
- Wetlands
- Freshwater Fish and Fish Habitat.

Marine Environment

- Marine Physical and Chemical Environment
- Marine Biota

Socio-economic Environment

- Social Environment
- Economic Wellbeing
- Land Use
- Indigenous Peoples
- Archaeology and Heritage Resources
- Human Physical Health

Terrestrial Environment

- Vegetation
- Avifauna
- Wildlife

6.1.2 Spatial and Temporal Boundaries

Spatial boundaries define the geographic extent within which the potential environmental effects of the Project are considered. The following areas are referenced to identify the potential direct and indirect effects of the Project on each VC, as well as to understand the context within which the effects could occur:

- **Project footprint** – This is established to identify areas of direct disturbance, including the footprint of the facility, access roads, laydown areas and any cleared areas, as indicated in **Figure 1.1**. Facility planning for the exact siting of the ARC SMR within the West Study Area is underway; therefore, the precise Project footprint is not yet confirmed**. Local assessment area (LAA)** – The LAA encompasses adjacent areas outside of the Project footprint where Project-related effects to VCs are reasonably expected to occur, and is the focus of data collection to characterize the existing environment. This includes the West Study Area and Northeast Study Area identified for the study of baseline conditions for biophysical VCs, and extends to local communities outside the boundaries of the Point Lepreau site (e.g., Dipper Harbour, Maces Bay).
- **Regional assessment area (RAA)** – The RAA includes areas outside of the LAA used to measure broader scale existing environment conditions, and provide regional context for the maximum predicted geographic extent of direct and indirect effects from the Project (e.g., changes to downstream water quality, migratory ranges, or changes to the economy). The RAA includes the study area for the assessment, which includes the Wolastoqey First Nations, Mi'gmaq First Nations, Peskotomuhkati First Nation, the 2012 Fundy Region and Saint John County, and the 2012 Southwest New Brunswick Region and Charlotte County.

Temporal boundaries encompass those periods during which VCs are likely to interact with, or be influenced by, the Project. The overall construction schedule (including site preparation and early mobilization) is estimated at approximately 4 years, with operation of the facility having a design life of approximately 60 years.

6.2 Potential Effects of the Project on the Biophysical Environment

This section identifies potential interaction of the Project with the environment during the site preparation and construction phases of the Project and during operation. Potential for accidents and malfunctions is outlined in **Section 6.4**.

6.2.1 Air Quality and Greenhouse Gases

6.2.1.1 Air Quality

Emissions of dust and combustion gases will occur predominantly during the site preparation and construction phases, and during decommissioning. They may occur to a lesser extent during the operation phase of the Project. Anticipated sources include vehicle movement, earthworks, and equipment and machinery operation. The magnitude, frequency and duration of these activities

and the incorporation of mitigation measures (i.e., administrative, engineering, and environmental controls) are such that maximum permissible ground level concentrations of various parameters (including carbon monoxide and total suspended particulates) are unlikely to exceed applicable regulatory limits outside of the Point Lepreau site boundary.

Project-related traffic volumes are expected to be at levels where combustion gas emissions are not likely to exceed applicable ambient air quality standards near site access roads, at the Project site or at PLNGS. Fugitive emissions associated with fuel storage and handling during construction, operation or decommissioning are expected to be low and unlikely to result in environmental effects of concern.

The operation of the Project (i.e., cooling towers) will result in the emission of water vapour into the atmospheric environment. Salt-laden water vapour emissions from the Project in combination with those from the PLNGS will be higher than those observed during historical operation of the PLNGS.

Potential airborne emissions during operations and their dispersion, and potential cumulative effects, will be quantified as part of the EIA. An Environmental Risk Assessment (ERA), consisting of a human health risk assessment (HHRA) and ecological risk assessment (EcoRA), will be completed for the proposed SMR to evaluate potential interactions with ecological and human receptors described in VC sections below. It is expected that releases will be well below regulatory limits with minimal impacts to air quality.

6.2.1.2 Greenhouse Gases

The intent of the Project is to support GHG reductions, the extent of which will be quantified as part of the EIA; thus, the overall impacts to GHG emissions will be positive. Potential clearing of vegetation within the Project footprint for construction of the SMR would result in the loss of a carbon sink, thereby reducing the ability of the area to absorb carbon dioxide from the atmosphere. Emissions reduction targets, considering the loss of vegetation, related to the Project will be calculated once the Project design is further developed.

Emissions of GHGs will be limited to those associated with vehicles and machinery during the site preparation and construction, operation and decommissioning phases of the SMR. The operation of the SMR itself will not emit GHGs, but backup power (e.g., diesel generators) would be the main source of emissions during operations. The net GHG reduction will be quantified in the EIA.

6.2.2 Acoustic Environment

The potential sources of noise from the Project during site preparation and construction, and during decommissioning are primarily related to heavy equipment at the site and vehicular traffic for transportation of materials and personnel to and from the site. The noise levels associated with heavy equipment are expected to be below the 65 dBA level at nearby receptors due to the buffering effect of both the wooded area and the distance from the proposed SMR construction site to human receptors.

The location most likely to see a change in noise level is the residential area along County Line Road (Route 790) which is the main access road to the facility. Increased noise levels from site preparation and construction activities and traffic will be similar to noise levels during maintenance outages and construction activities at the existing PLNGS. Exceptions would

include activities such as rock-hammering and/or blasting, if required. Blasting associated with construction of the SMR may result in temporary increased noise depending on the geological conditions encountered, and weather conditions during blasting. These activities would be of relatively short duration and noise-mitigating practices will be employed.

It is unlikely that increased traffic noise will be noticeable from the current levels during the operation phase of the Project due to the comparatively small size of the workforce required.

A Traffic Impact Analysis and a separate Air, Acoustic, and Light Assessment are being undertaken to characterize the existing acoustic baseline conditions and anticipated changes during site preparation and construction, and during decommissioning. The studies will also be used to assess anticipated acoustic effects for the remaining phases of the SMR development. Mitigation measures will be identified as required to address noise from the Project.

6.2.3 Geology and Soils

Portions of the Project site will be cleared, grubbed and graded, including temporary laydown areas, access roads and infrastructure corridors. Grubbing will disturb the first soil horizons along with the vegetation. The magnitude of changes and potential impacts to the *in-situ* soils and bedrock will depend on the final location of the Project footprint and the extent of the construction-related grubbing, excavation and blasting.

The disturbed geology and soils can also present risks from potential erosion and sediment release. Stabilization of soils and bedrock will be a key component before, during and after construction. Detailed mitigation measures will be developed in line with construction plans to reduce the risk of disturbed bedrock and soils within the Project footprint. During decommissioning the site will be graded and stabilized, as per the Decommissioning Plan to be prepared.

Implementation of the radiation protection philosophy for ARC SMR design ensures that radiation emissions to the environment will be minimal and below regulatory limits. On-going environmental monitoring and ERAs will be conducted as part of licensing requirements to confirm emissions during normal operating conditions are below regulatory limits and do not pose a risk to the surrounding geology and soils.

6.2.4 Surface Water Resources

Although siting of the Project will avoid direct impacts to surface water streams to the extent possible, there is potential for watercourse diversions, changes in surface flows (increase or decrease), and increased sediment loading during site preparation and construction activities. A WAWA Alteration Permit under the New Brunswick *Clean Water Act* will be required for any work within 30 m of a watercourse. There may also be permitting requirements from DFO depending on potential interactions with fish-bearing watercourses. Any stream diversion will be undertaken in accordance with the required *Fisheries Act* Authorization and a habitat offsetting plan will be developed and implemented.

Construction of the Project and the addition of impervious surfaces has the potential to increase run-off into nearby surface water features. Site preparation and construction, and decommissioning activities that expose soils and bedrock (excavation and grading), as well as vehicle operation on any roads near surface water bodies, have the potential to introduce sediment and other contaminants to the surface water bodies. During site preparation and

construction, and decommissioning, erosion and sediment control mitigation measures will be strictly applied in accordance with an Erosion and Sediment Control Plan.

Changes in groundwater (see **Section 6.2.5** below) have the potential to affect surface water flow. Currently evidence suggests that surface water-groundwater interaction does occur at the Project site, but that it is not substantial (GEMTEC, 2023b). This interaction and the potential changes that could occur will be evaluated further during conduct of the EIA. The operation of the Project, in particular those associated with the nuclear facility is likely to have emissions of small amounts of chemicals and radionuclides through waterborne effluents as part of its routine operations. These emissions will be controlled to ALARA levels well below regulatory limits. On-going environmental monitoring and ERAs will be conducted as a program referenced in the licensing basis to confirm emissions during normal operating conditions are below regulatory limits and do not pose a risk to the surface water resources.

Surface water withdrawal from the Hanson Stream Reservoir could increase the outflow by 8.9 L/s to supply the demineralized water system requirements. A water adequacy analysis for the reservoir was completed and it has been determined that this is unlikely to significantly affect the Hanson Stream supply capacity for the existing PLNGS facility.

6.2.5 Groundwater Resources

Baseline information indicates that groundwater is located a few meters below ground surface, depending on the local soil conditions and bedrock depth. It is likely that excavation during construction (to a depth of approximately 25 metres) will be below the groundwater table, altering the natural groundwater flow through the Project footprint. During site preparation and construction, shallow groundwater could be affected by contact with excess soils (sediment). Excess groundwater will likely be produced and will require management during construction A Groundwater Management Plan for excess groundwater intrusion will be developed, including pumping of water to vegetated areas to avoid sediment entering surface water streams and wetlands.

The construction of the ARC SMR unit and any impervious surfaces created may reduce groundwater infiltration and potentially change the flow of groundwater through surficial hydrographic units. This may require passive or active groundwater interception depending on the level of excavation and construction below grade.

On-going environmental monitoring and ERAs will be conducted as part of licensing requirements to confirm emissions during normal operating conditions are below regulatory limits and do not pose a risk to the groundwater resources at site.

6.2.6 Wetlands

Although siting of the Project will aim to avoid direct impacts to wetlands to the extent possible, there may be some direct impacts to the wetlands within the Project footprint. A WAWA Permit under the New Brunswick *Clean Water Act* will be required for any alteration to wetlands. There is the potential for a loss of wetland habitat, and possibly Indigenous culturally valued species. The extent of alteration will be determined and evaluated once the final Project footprint and area of site preparation and construction-related clearing and grubbing are determined. Compensation requirements through a WAWA Permit will limit the loss of wetland habitat and functions within the greater landscape, ensuring no net loss of wetland habitat.

Excavation and grading during site preparation and construction are likely to alter surface drainage and may lead to increased flows and sedimentation into adjacent wetlands. Drainage may be impeded due to infilling of wetlands. Vehicle operation on any roads near wetlands may risk sedimentation or deleterious substances entering wetland environments. The construction of civil structures and associated infrastructure and any impervious surfaces may increase surface water run-off into adjacent wetlands.

Emission of contaminants to the environment under normal operating conditions have potential to affect wetlands. These emissions will be controlled to ALARA levels well below regulatory limits through effective design provisions and operation of the plant, as well as through emissions monitoring. There is potential for accumulation in wetland sediments and uptake by plants and animals over time. Radiation protection measures will be in place for the operation phase of the Project. On-going environmental monitoring and ERAs will be conducted as under a program referenced in the licensing basis to confirm emissions during normal operating conditions are below regulatory limits and do not pose a risk to receiving environment.

6.2.7 Freshwater Fish and Fish Habitat

Six watercourses have been identified on the Point Lepreau property, five of which are located within the study areas. Although activities associated with the Project will avoid direct impacts to surface water streams to the extent possible, there is potential for changes in surface flows (increase or decrease), and increased sediment loading during site preparation and construction activities. The streams intersecting the West Study Area are most likely to be impacted; i.e., WC1, WC5 and WC6. Field investigations in 2022 (Dillon and SOAR, 2023) indicate that American eel are present in WC1 and there is potential for fish presence in WC5 and WC6. To avoid affecting fish or fish habitat, environmental protection measures will be implemented to reduce sediment or other potential contaminants from entering the streams during site preparation and construction, and during decommissioning activities. A WAWA Permit under the New Brunswick *Clean Water Act* will be required for any work within 30 metres of a watercourse. There may also be permitting requirements from DFO depending on potential interactions with fish-bearing watercourses.

The construction of a new switchyard or the expansion of the existing one has the potential for a stream crossing or stream diversion within the West Study Area. Any stream crossing will be undertaken with care using proven construction practices and worker oversight to avoid disturbance to the stream bed and riparian area. Any stream diversion will be undertaken in accordance with the required *Fisheries Act* Authorization and a habitat offsetting plan will be developed and implemented.

Additional water abstraction from Hanson Stream has the potential to affect freshwater fish and fish habitat in Hanson Stream. The nature and magnitude of this impact will be dependant on the amount of water withdrawn. A study to model potential water level changes in Hanson Stream, based on the expected requirements, will inform the assessment of impacts to fish and fish habitat DFO’s guidance on end of pipe screening will be implemented.

Emissions to the environment of chemicals and radionuclides through waterborne effluent are anticipated under normal operating conditions. These emissions will be controlled to ALARA levels well below regulatory limits through effective design provisions and operation of the plant, as well as through emissions monitoring. On-going environmental monitoring and ERAs will be conducted under a program referenced in the licensing basis to confirm emissions during

normal operating conditions are below regulatory limits and do not pose a risk to freshwater fish and fish habitat. An ecological risk assessment is currently in progress that will quantify the potential risk to aquatic species on the site (Arcadis, 2023).

6.2.8 Vegetation

The site preparation, construction, and commissioning phases are anticipated to result in permanent removal of existing native and introduced vegetation located within the construction footprint, including temporary laydown areas and access roads. The magnitude of impacts to vegetation will depend on the final Project footprint and the extent of the site preparation and construction-related clearing and grubbing. To the extent possible, the SMR facility will be sited so that much of the Project footprint is on previously disturbed areas, so that the removal of natural vegetation will be minimized. There may be potential for some plant species of Indigenous significance to be removed. This will be dependent on the final project footprint. The information shared as part of the Indigenous Land and Resource Use Study and IK studies will be used to mitigate potential impacts vegetation of cultural significance where possible.

Site clearing, blasting, and vehicle operation may also indirectly affect remaining vegetation near the perimeter of the footprint due to equipment emissions, fugitive dust, and the risk of spread and establishment of invasive and non-native vegetation species. Alteration of surface hydrology from grading may affect the soil and hydrology conditions and result in long-term changes to the vegetation composition in the areas surrounding the Project footprint. Site clean-up and stabilization activities will may also affect vegetation as these activities are likely to involve re-vegetating temporary laydown and access areas.

During the operation phase of the Project, vegetation may be indirectly impacted from the operation of the SMR unit and material handling as these activities may result in fugitive dust entering surrounding terrestrial habitat. This effect will likely to be negligible and limited to the Project footprint.

During decommissioning the site will be stabilized and revegetated with native vegetation, based on the pre-Project botanical surveys undertaken as part of the EIA. Monitoring of rehabilitation of the site will be undertaken.

Based on the results of the vegetation community delineation and botanical inventory, no SAR or SoCC vegetation is expected to be negatively affected due to the proposed activities. However, it has been recommended to conduct spring botanical surveys, which will provide confirmation on the presence or absence, and potential impacts to vegetation SAR. Detailed mitigation measures can be developed following the completion of additional vegetation surveys and determination of the Project footprint and layout.

6.2.9 Avifauna

Avian fauna, including migratory birds, have the potential to be affected during site preparation, construction, operation and decommissioning of the Project.

During site preparation and construction, impacts are anticipated to primarily be indirect through the loss of terrestrial habitat from vegetation clearing. The placement of civil structures and infrastructure associated with the Project is being planned so that much of the Project footprint is on previously disturbed areas, and the removal of natural vegetation will be minimized.

During site preparation, construction, and decommissioning there is a risk of audible and physical disturbance from blasting, vehicle operation, and construction. These impacts would be short duration and intermittent and likely low magnitude as avifauna would be able to disperse to habitats further from construction disturbance. Terrestrial avifauna habitat quality may also be negatively affected due to the risk of accidental spills or emissions, spread of invasive species, and changes to surface drainage affecting habitat composition.

Although the loss of terrestrial avifauna habitat is expected to be long-term, the magnitude will be non-limiting for species as the surrounding landscape has a variety of terrestrial habitats to support bird species. The risk to any birds remaining within clearing areas can be minimized using appropriate mitigation.

A non-intrusive pre-clearing nest survey for SAR or SoCC birds, and birds protected under Schedule 1 of the *Migratory Birds Convention Act, 1994*, specifically for Pileated Woodpecker as their nests are protected year-round, will be undertaken. Vegetation removal will occur outside of the breeding bird season (generally April 1st – August 31) to minimize harm to breeding birds, including harm to migratory birds and their nests. Additional mitigation is summarized in **Section 6.5**.

The activities conducted during the operation phase of the Project may potentially result in interactions between avifauna through general disturbance to birds from site and vehicle operations (i.e., noise and dust generation; lighting). The civil structures associated with the Project, both temporary and permanent may provide nesting and roosting platforms for gulls and other species known to nest on anthropogenic structures. Migratory birds will be considered in the design and location of cooling towers. General maintenance to the grounds around the SMR, such as vegetation management, may negatively affect avifauna using those areas but the impacts would likely be negligible due to the infrequency and limited physical extent of works.

There is potential for indirect effects on avifauna during operation of the facility from emissions and effluent discharges. As stated earlier, emissions and effluent discharges will be controlled to well below regulatory limits prior to release so as to mitigate potential negative effects to marine water quality, and the quality of marine habitat for seabirds using the area.

Emissions to the environment of chemicals and radionuclides through airborne and waterborne effluent is anticipated under normal operating conditions for the Project. Avifauna have the potential to be indirectly affected through uptake in their diet. The emissions will be controlled to be well below regulatory limits. On-going environmental monitoring and ERAs will be conducted under a program referenced in the licensing basis to confirm emissions during normal operating conditions are below regulatory limits and do not pose a risk to avifauna. An ecological risk assessment in currently in progress that will quantify the risk to avian fauna resident and migratory birds on the site (Arcadis, 2023).

6.2.10 Wildlife

Potential effects on wildlife and wildlife habitat are expected to be largely indirect, although there will be some direct habitat loss associated with the project footprint. During site preparation and construction, vegetation clearing on the natural areas of the site will permanently remove wildlife habitat. This removal will be minimized to the extent possible. Given the abundance of forested areas in the surrounding landscape and the small area of disturbance, the magnitude of impacts is projected to be marginal.

Similar to the anticipated impacts to avifauna, the site preparation, construction and decommissioning activities such as grubbing, blasting, grading and construction will likely result in temporary disturbance to wildlife. Dust and other contaminants that may be released or emitted from equipment and machinery may harm wildlife and deteriorate the quality of surrounding habitats. Additionally, wildlife may be attracted to any food waste stored on-site during the site preparation and construction phases.

Throughout the operation and maintenance phase, effects to wildlife are anticipated to be minor and intermittent disturbance from vehicle noise or on-site activity. Maintenance outages that require additional on-site activity will likely elevate the risk to wildlife from additional on-site activity and traffic.

Unavoidable vegetation removals and landscape alterations associated with site preparation and construction may reduce some habitat availability for the Monarch butterfly. There is an abundance of habitat suitable for the Monarch butterfly located south of the West Study Area at the tip of the Lepreau Peninsula (on the Point). There are also areas of Monarch habitat across the site in areas not proposed for development. The monarch was observed on numerous occasions in the Northeast Study Area in the open meadow habitat; however, no milkweed was observed in this area and as such, breeding/laying habitat within the study areas are not anticipated for the monarch. It is likely these individuals were noted in migration, given the study areas' coastal location. Meadows and ditches are also abundant within the greater landscape and therefore this habitat loss is expected to have a negligible impact on the Monarch migration.

Based on the absence of bats within the West Study Area, no direct adverse effects to bats from vegetation removal are anticipated. However, there may be some disturbance to bats in the surrounding area from noise, dust and light emissions during construction.

Emissions to the environment of chemicals and radionuclides through airborne and waterborne effluent is anticipated under normal operating conditions for the Project. These emissions will be controlled to ALARA levels well below regulatory limits through effective design provisions and operation of the plant as well as through emission monitoring. Wildlife species may be indirectly affected through uptake in their diet (especially aquatic species). The emissions will also be controlled to be well below regulatory limits. On-going environmental monitoring and ERAs will be conducted under a program referenced in the licensing basis to confirm emissions during normal operating conditions are below regulatory limits and do not pose a risk to wildlife. An ecological risk assessment in currently in progress to quantify the risk to wildlife resident on the site (Arcadis, 2023).

6.2.11 Marine Physical and Chemical Environment

Effects of the Project on the marine physical and chemical environment will be related to the intake and discharge of seawater for cooling purposes. Two options are currently under evaluation: once-through cooling or mechanical draft cooling towers. Once-through cooling would utilize the existing PLNGS infrastructure for water intake and outlet and may result in an increase in flow. The use of mechanical draft cooling towers will likely require a landward expansion of the existing PLNGS pumphouse forebay and associated pipeline infrastructure. Mechanical draft cooling towers may also require a new outlet to Indian Cove. A potential new outlet associated with the cooling towers and/or increased flows within the existing intake and outlet will be evaluated to determine implications for the existing *Fisheries Act* Authorization

and whether an amendment is required. This will be done as part of the EIA process with DFO as a member of the Technical Review Committee.

The use of mechanical draft cooling towers will result in blowdown which may contain biocides, anti-scaling components, dispersants, and neutralizers. The blowdown will be appropriately treated to meet the regulatory water quality requirements prior to release. Additional emissions from steam cycle demineralized blowdown and discharged treated grey water could potentially be added to the cooling tower makeup or blowdown streams. Discharges from the cooling system, and other waste streams from various treatment systems for the SMR will be treated to meet regulatory requirements prior to being released to the receiving environment and potentially affecting the surrounding water quality.

The cooling options have the potential to result in an increase in the water temperature of the receiving environment through the existing outlet. The potential temperature change will be quantified as the design progresses. The resultant temperature of the seawater at the outlet will vary according to conditions at the time of release (i.e., discharge rate, seasonality).

6.2.12 Marine Biota

There is potential for marine biota to be affected by the Project due to changing water quality as described in **Section 6.2.11**; however, given that releases will be incremental, and meet the regulatory standards for marine water quality, and that the Bay of Fundy is an extremely high energy tidal environment, they are unlikely to have an effect on marine fish and fish habitat. Potential increases in temperature of the water being released to the receiving environment will be quantified to understand potential effects on marine biota. Changes from the current baseline will likely be localized and is not expected to have a significant effect on marine biota.

The increased intake of marine water for either the mechanical draft cooling towers or for the once through cooling system may increase the likelihood of impingement of fish on debris screens, or mortality due to entrainment into the cooling water system. If required, a *Fisheries Act* Authorization or amendment of the current *Fisheries Act* Authorization will be sought and offsetting will be established through habitat restoration and enhancement.

Emissions to the environment of chemicals and radionuclides through waterborne effluent is anticipated under normal operating conditions of the SMR. These emissions will be controlled to ALARA levels well below regulatory limits through effective design provisions and operation of the plant, as well as through emissions monitoring. Marine biota may be indirectly affected through uptake in their diet. On-going environmental monitoring and ERAs will be conducted under a program referenced in the licensing basis to confirm that emissions during normal operating conditions are below regulatory limits and do not pose a risk to marine biota. An ERA is currently in progress that will quantify the risk to aquatic species (Arcadis, 2023); however, given the high-energy environment of the Bay of Fundy, marine biota are unlikely to be affected.

6.3 Potential Effects of the Project on the Socio-economic Environment

This section identifies potential interaction of the Project with the social, economic and cultural environment during the site preparation and construction phase of the Project, and during operation. Potential interactions in the event of accidents and malfunctions are outlined in **Section 6.4**.

The assessment of the effects of the Project on the socio-economic environment for the EIA will be informed by the Sustainability and Well-being Assessment currently being undertaken. This will take an integrated approach reflecting the inter-relations between social, economic, cultural aspects, human health and wellbeing and the biophysical environment. The understanding of these relationships will provide insight into the sustainability of the proposed development of the Project and how the wellbeing of the people and communities in the study area may be affected.

6.3.1 Social Environment

The site preparation, construction, operation, and decommissioning of the SMR is likely to result in an influx of workers to the region and the local area that could place some strain on the infrastructure and social services. During site preparation and construction, additional housing may be required, and associated electrical and water infrastructure. Social services, such as medical services and educational resources, may be under pressure to meet the requirements of additional workers and their families. Given the proximity of Saint John and the services available in the city, it is anticipated that the infrastructure and service requirements will be met.

The existing road network will be used for transportation of site preparation, construction, operation and decommissioning equipment and material, placing additional pressure on the roads. A Community Impact Assessment is underway to identify potential interactions of construction and operation of the SMR with traffic circulation and vehicular delays, safety, emergency vehicle access, and noise impacts.

6.3.2 Economy

The Project is likely to influence the broader socio-economic environment of New Brunswick, as well as have implication for the local economy and given its geographic location, that of the city of Saint John and westward to the town of St. Stephen. Specifically, the construction and operation of the specific nuclear power technology, which is part of a regional industrial strategy, is expected to have a positive benefit on the regional economy of southwestern New Brunswick. The construction and operation of the Project is anticipated to result in an increased demand for labour, resulting in hiring and contracting and training opportunities and increased demand for goods and services. Additional direct employment and procurement income is anticipated to result in induced business and employment effects in the region.

6.3.3 Land Use

Although the Project will not change the sectoral land use on adjacent properties, it has the potential to impact culturally significant use of adjacent lands. The alteration of the physical and visual landscape may affect how residents and tourists perceive the surrounding area for recreational activities, hunting and fishing. However, the placement of the Project at Point Lepreau will minimize this effect. The facility is designed to be compact, with a small footprint, so additional visual and physical landscape impacts will be minimized.

6.3.4 Indigenous Peoples

The development of the SMR has the potential to affect the traditional use of local resources by Indigenous peoples. The Project is being proposed within the boundaries of the existing NB Power property at Point Lepreau to limit further restriction of access for Indigenous peoples for harvesting, cultural, recreational and other resource uses.

NB Power is working with the First Nation communities to undertake studies documenting IK of the area and to assess the potential impact on communities' use of land and resources, and on social, economic and cultural health and wellbeing. Pre-existing impacts and cumulative effects that have already interfered with Indigenous Peoples' ability to exercise rights or to pass along Indigenous cultures and cultural practices will be considered. It is expected the IK studies will provide information related to impacts and identify and avoid sensitive harvesting areas and cultural resources. On-going engagement with First Nation communities will help to further identify impacts and appropriate mitigation.

6.3.5 Archaeology and Heritage Resources

There have been several archaeological studies completed at the Point Lepreau site contributing to heritage resources baseline information. An additional Archaeological Impact Assessment will be completed for the West Study Area where disturbance of the existing site is proposed. Archaeological resources identified during the assessment or during ground-truthing or site preparation or construction activity will be protected based on existing protocols for archaeological discovery. Further mitigation measures will be identified as needed.

6.3.6 Human Physical Health

An ERA is underway to examine the potential health risks to people and the environment resulting from normal operations of the proposed SMR (Arcadis, 2023). The ERA includes a human health risk assessment, which assesses risk to people who may spend time at or near the proposed site, and an ecological risk assessment, which assesses risk to plants and animals located on or near the proposed ARC SMR site. The ERA is being conducted using an approach that meets the Canadian Standards Association standards for ERAs at nuclear facilities, as well as CNSC regulatory documents for environmental protection measures for nuclear facilities in the EIA process (Arcadis, 2023).

The ERA is being conducted in multiple phases, with each successive phase presenting a more refined estimate as information becomes available. In the first phase, Phase 1, conservative assumptions were made about which receptors may be exposed to releases from the Project activities, how and where (pathways) they may be exposed, and the environmental concentrations that they may be exposed to. In Phase 1, estimated conservative radiological releases to air and water were taken from current technical design and engineering information reports combined with site-specific plans and knowledge (Arcadis, 2023).

The human health risk assessment assesses risk to off-site human receptors (members of the public), focusing on radiological contaminants. It is assumed that all on-site workers are protected under the existing, effective radiation protection and health and safety programs already in place at PLNGS (Arcadis, 2023).

The preliminary results of the Phase 1 ERA indicate that the radiological dose estimates for human health will fall well below the CNSC dose limit of 1 millisievert per year for all receptors (Arcadis, 2023). The Phase 1 ERA also looked at the combined doses to receptors from exposure to both the proposed SMR and the current operations of the PLNGS. When the doses resulting from the existing PLNGS are added to the estimated doses from the proposed SMR, the combined dose is still well below the CNSC dose limit of 1 millisievert per year for all human receptors (Arcadis, 2023). The Phase 1 ERA concludes that based on the available information,

the radiological releases from normal operations of the proposed SMR are not expected to result in undue risk to human health.

6.4 Accidents and Malfunctions

The potential for accidents and malfunctions will be considered in the assessment of effects of the Project on the environment as per *A Guide to Environmental Assessment in New Brunswick* (NBDELG, 2018). An accident is an unexpected occurrence or unintended action, and a malfunction can be defined as a failure of a piece of equipment, a device, or a system to function normally. In many cases the two may be interrelated, and they are not differentiated for assessment purposes.

While the possibility of accidents and malfunctions occurring exists, the objective of NB Power as the licensee and operator is to use proven practices for prevention and mitigation of accidents, with a heavy emphasis on design features to minimize the probability of such incidents and ensure the safety of workers and the public and protection of the environment. The Project will be designed, constructed, and operated to minimize the risk of any accident or malfunction occurring (**Section 4.8**).

The approach to the identification and assessment of potential accidents and malfunctions is described below, along with the approach to identification of potential effects on the environment and mitigation measures. The focus of the assessment is on those events that are considered credible in the context of the ARC SMR Project and have a reasonable probability of occurring considering the specific aspects of site conditions and Project design.

The assessment of potential accidents and malfunctions will consider both nuclear (i.e., radiological events) and conventional (i.e., non-radiological) events. Nuclear accidents and malfunctions are events that involve radioactive substances and could result in the release of radioactivity as well as non-radiological substances. Conventional accidents and malfunctions are events that involve only non-radiological substances and therefore have no potential for the release of radioactivity.

6.4.1 Nuclear-related Accidents

A nuclear-related accident is one in which the likelihood of nuclear contamination is increased beyond normal conditions. For example: operational events that can cause an unplanned forced outage; events that lead to reactor core damage; or events during refuelling or storage.

The risk associated with a nuclear accident in an ARC SMR is extremely low due to the implementation of the defence-in-depth approach, which focuses on first preventing abnormal operating conditions, then mitigating the effects of events through design of the project (see **Section 4.8** and **Figure 4.14**).

A systematic approach will be used to identify and assess potential malfunctions and accidents in the EIA through consideration of postulated initiating events associated with the design and operations of the Project.

The assessment of nuclear accidents in the EIA will rely on the Initial Safety Analysis Report (Kinectrics, 2023) and Site Evaluation Report (NB Power, 2023b), and will include:

- Identification of the hazard and hazard analysis;
- Description of the accident or malfunction scenario;

- Identification of potential impacts of bounding accidents and malfunctions; and
- Identification of mitigation in the Project design and processes to minimize potential impacts.

Specific information on the extensive list of postulated initiating events considered, and resulting hazards and demonstration of how the resulting safety requirements have been met is provided in the Initial Safety Analysis Report (Kinectrics, 2023). This analysis is also summarized in the Site Evaluation Report (NB Power, 2023b).

As described in **Section 4.8**, identified scenarios can be described and categorized as:

- **Anticipated Operating Occurrences**, which are expected to occur at least once during the operating lifetime of the facility, but, because of appropriate design provisions, does not cause any significant damage to items important to safety or lead to accident conditions.
- A **Design Basis Accident**, which are less likely to occur, for which the nuclear facility is designed limit the release of radioactive material to within authorized limits.
- A **Beyond Design Basis Accident**, which are unlikely to occur, but potentially more severe than a design basis accident.
- A **Severe Accident**, which is also unlikely to occur, but are considered in the design of the project to limit the release of radioactive material within authorized limits.

The CNSC has established requirements, safety goals, and radiological dose limits to ensure the safety of the public. The effect on ecological and human receptors from a nuclear accident will vary depending on the type and severity of the accident. An assessment of the impact to the environment will be completed as the design of the ARC SMR progresses to a level of detail to allow for confirmation that the effects will be less than those established in the bounding envelope. These studies will be evaluated in subsequent studies to support the EIA.

Mitigation of a nuclear accident is guided by levels 4 and 5 of the defence-in-depth approach, specifically: avoidance of conditions leading to severe core damage, confinement of radioactive materials, and minimization of radiological consequences. Systems which contribute to these mitigation measures may be found in **Section 4.8**, specifically in **Sections 4.8.1.4 and 4.8.1.5**.

Further the defence-in-depth approach measures related to safety, nuclear security measures for the ARC SMR are described in **Section 4.8.2** of this document to support the mitigation of accidents and malfunctions potentially initiated by threats. The ARC SMR has an integrated implementation of safety design provisions, nuclear security measures and nuclear material accounting processes designed to satisfy IAEA and CNSC safeguard requirements. They include:

- **Safety design provisions** – In the event of a threat to nuclear security, the nuclear safety requirements ensure safe shutdown of the reactor, removal of decay heat and monitoring of plant safety until the security event is stabilized and additional mitigation can be conducted (see **Section 4.8.1**).
- **Nuclear security measures** – There includes several layers of security for the plant designed to resist threats to the security of the plant including deterrence, detection, delay, an on-site security response and an off-site security response.

- **Nuclear material accounting** - The ARC SMR design includes intrinsic and extrinsic features that facilitate IAEA and CNSC surveillance, item accountancy verification, and minimize the attractiveness of this technology as a target for nuclear proliferation.

Overall, the risk from a nuclear event is extremely low, due to the safety and security measures implemented as standard practice in the nuclear industry. Care is used to both reduce the likelihood of occurrence as well as the consequence of potential emissions. The following provides an overview of some of the practices used to ensure the likelihood of an accident is highly unlikely and consequences are low:

- Design practices are well documented and based on various Canadian and international standards and regulations. Designs incorporate the concept of diversity, redundancy, separation and defence-in-depth. Equipment and system requirements for both normal and accident states are identified.
- The design considers a wide range of potential events from abnormal operating conditions to severe accidents. Both deterministic and probabilistic analyses are performed and internal and external hazards are considered. Deterministic simulations utilize sophisticated models to predict plant response and consequence of accidents. These are based on extensive research and development and are documented, verified and validated. Equipment assumed to operate under accidental conditions is specially qualified.
- Equipment and components are manufactured to the specified detailed requirements and proof is required as part of the procurement process.
- The standards for construction and installation are well documented and inspectors validate that procedures were followed. A rigorous process is followed to verify completion before systems are turned over from construction to commissioning.
- Extensive testing and commissioning are performed to demonstrate equipment and systems meet the performance requirements documented in the commissioning procedures. A rigorous process is followed to verify completion before systems are turned over to operation.
- Operating and maintenance staff are well trained. A plant simulator is used both for initial and refresher training. There is extensive set of operating procedures to cover the entire spectrum from normal operation to accident conditions. There is also extensive set of maintenance procedures.
- Systems required for safety undergo periodic testing during normal operation to demonstrate they meet the necessary reliability requirements.
- There is a well documented set of emergency preparedness procedures that are drilled regularly, and full-scale emergency preparedness exercises are implemented periodically, involving both on-site and off-site agencies.
- Operators of nuclear power plants require a corrective action program that identifies, categorizes, investigate and implement improvements. They share operating experience between stations to learn from others and perform benchmarking to look for improvement opportunities.

- Nuclear plants in Canada are members of the World Association of Nuclear Operators (WANO) that perform peer reviews and exchange best practices amongst the plants around the world.
- Nuclear plants have extensive reporting requirements specified by the regulator. These have a low significance reporting level.

6.4.2 Conventional Malfunctions and Accidents

Conventional malfunctions and accidents are those scenarios that could result in non-radiological consequences during site preparation, construction, operation and decommissioning.

A systematic approach will be undertaken to identify and assess potential malfunctions and accidents in the EIA through consideration of postulated initiating events and associated hazards and resulting mitigation and design controls defined as part of the Project. The assessment will include:

- Identification of the hazard and hazard analysis;
- Description of bounding accident or malfunction scenario(s);
- Identification of potential impacts of bounding accidents and malfunctions; and
- Identification of mitigation in the Project design and processes to minimize potential impacts.

Different initiating events may result in similar hazards (e.g., a spill may be caused during refuelling, failure of a piece of equipment, or a vehicle accident). The frequency and the severity of the consequence of the mitigated hazard or initiating event will be qualitatively described. Bounding scenario(s) will be described for each hazard with credible scenarios identified (i.e., having a reasonable likelihood of occurrence during the life of the Project).

A preliminary summary of mitigation included in the Project design to mitigate key conventional hazards are summarized in **Table 6.2**. These will be refined further as the design of the ARC SMR progresses to a level of detail to allow for confirmation that the effects will be less than those established in the bounding envelope.

Table 6.2: Key Conventional Hazards and Mitigation Measures

Hazard	Potential Mitigation
Spill of Fuel or Hazardous Material	▪ Follow standard vehicle operation, inspection, and maintenance procedures. ▪ Make spill kits available in vehicles and work areas. ▪ Promptly contain, clean up and report all spills or leaks. ▪ Store all fuels and lubricants in designated areas. ▪ Keep equipment well-maintained and free of fluid leaks (checks to be conducted). ▪ Refuel machinery and equipment away from watercourses, wetlands and water supply areas (including private wells), and where possible on an impermeable surface. ▪ Store dangerous goods in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements and applicable federal and provincial regulations. ▪ Supply diesel storage tanks for back-up generators with engineered secondary containment measures to contain any leaks or spills and prevent discharge to grade.

Hazard	Potential Mitigation
	▪ Comply with Transport Canada's *Transportation of Dangerous Goods Act*. ▪ Establish emergency response procedures for spill response, with trained personnel present on-site.
Sediment Release	▪ Limit the area and time soil is exposed without mitigation (e.g., mulching, seeding, rock cover) through work scheduling. ▪ Establish and maintain erosion and sedimentation control structures throughout construction activities. ▪ Inspect erosion and sedimentation control structures regularly, especially before and after heavy rain events. ▪ Control release of potentially sediment-laden water from dewatering of excavated areas (e.g., filtration through vegetation or engineered erosion control devices). ▪ Cover, or seed and revegetate, overburden storage piles and exposed topsoil as soon as practical. ▪ Construct engineered surface water drainage and diversion channels to direct flow around the construction site and away from watercourses and wetlands. ▪ Construction material (e.g., gravel) placed in or next to watercourses, where approved, will be free of debris, fine silt and sand, and chemical contaminants.
Collision	▪ Manage project-related traffic in accordance with the New Brunswick *Work Area Traffic Control Manual* (2009, revised 2021). ▪ Avoid peak traffic times when planning for required traffic delays, when possible and consider other traffic disruptions in the area. ▪ Establish construction traffic speed limits and general public speed limits during construction to reduce the risk of collisions with wildlife. ▪ Use flag persons, detours, safety barricades, fences, signs and/or flashers, as required. ▪ Follow standard vehicle operation, inspection, and maintenance procedures.
Fire	▪ Include firewater supply and storage as part of on-site facilities. ▪ Locate fuel storage for back-up diesel generators a specified distance away from the main building to prevent potential fire events from impacting the plant. ▪ Follow standard vehicle operation, inspection, and maintenance procedures. ▪ Store all dangerous goods in accordance with WHMIS requirements and applicable federal and provincial regulations. ▪ Develop and implement fire response plans to prevent and mitigate fire scenarios. ▪ The ARC SMR design includes an on-site emergency support center, technical support center and plans for emergency response (**Section 4.3.11.2**). ▪ Fire extinguishing system using a chemical fire suppression agent may be activated to douse the flames.

6.5 Summary of Effects, Mitigation and Monitoring

NB Power is committed to avoiding and minimizing adverse effects, maximizing Project benefits, and complying with the applicable approvals, standards, and guidelines. In order to achieve this, a comprehensive set of mitigation measures, monitoring programs and contingency planning will be implemented.

The approach taken by NB Power is, first, to avoid impacts where possible, second, to reduce unavoidable impacts and, thirdly, to compensate for significant unavoidable impacts. A critical element in avoiding impacts is the design of the facility, which includes a small footprint and

critical nuclear safety and security features, as described in **Section 4.8**. The design of the ARC SMR facility minimizes the risk of radiological contamination.

In addition to the design features, mitigation measures that have been identified for the various environmental components are summarized in **Table 6.3**. These will be reviewed and updated as EIA studies progress and integrated into various environmental management and emergency plans, including:

- Environmental Management Plan, and associated environmental protection plans (e.g., erosion and sedimentation control, stormwater management); and
- Emergency Preparedness Plan for emergencies such as unexpected accidents and facility malfunctions.

Post-construction monitoring of environmental effects will be undertaken in accordance with the requirements identified through the EIA process, as well as to meet regulatory requirements under the *NSCA*, and reflect input gained through consultation and engagement as part of the EIA.

Table 6.3: Summary of Potential Effects on the Environment from Routine Activities and Proposed Mitigation

Discipline	Potential Effects of the Project	Mitigation
Air Quality and GHGs	▪ Increase in emissions of dust and combustion gases during site preparation, construction, and operations. ▪ Decrease in regional GHG emissions due to use of non-emitting technology. ▪ Increase in emissions of GHGs during site preparation, construction, and operation. ▪ Removal of a carbon sink due to land clearing. ▪ Releases to air from routine Project activities.	▪ Apply dust suppressants (such as water or calcium chloride) during periods of heavy activity and/or dry periods to ensure that the airborne dust remains below the ambient standards. ▪ Follow standard vehicle operation, inspection, and maintenance procedures. ▪ Limit the extent of clearing, and restrict activities during windy weather to further mitigate dust emissions. ▪ Restore vegetation to the extent possible following construction. ▪ Maintain emissions to below regulatory limits.
Acoustic Environment	▪ Increase in noise, primarily related to blasting, heavy equipment and transportation during construction. ▪ Temporary increased noise resulting from accidents, malfunctions or unplanned events associated with Project activities.	▪ Keep project-related vehicles well maintained to mitigate noise generation. ▪ Develop and implement a noise complaints procedure. Noise monitoring and scheduling of noise producing activities may be implemented, if required, to minimize noise.
Geology and Soils	▪ Disturbance of the first soil horizons due to grubbing. ▪ Disturbance of soils and bedrock due to excavation and blasting. ▪ Decreased soil quality due to fugitive dust emissions. ▪ Decreased soil quality due to releases during operation.	▪ Stabilize soils and bedrock before, during and after construction. ▪ Limit disturbance footprint by using existing disturbed areas, where practical. ▪ Apply dust suppressants (such as water or calcium chloride) during periods of heavy activity and/or dry periods to ensure that the airborne dust remains below the ambient standards. ▪ Maintain emissions to below regulatory limits.
Surface Water Resources	▪ Temporary changes to surface water flows during construction. ▪ Permanent changes to surface water flow due to changing hydrology from impervious surfaces. ▪ Decrease in surface water quality due to construction run-off (sedimentation). ▪ Radionuclides entering the surface waters on-site from routine Project activities.	▪ Implement an Erosion and Sediment Control Plan to prevent erosion and sedimentation into surface waters. ▪ Maintain existing drainage flows and inputs through grading, where possible. ▪ Inspect and maintain vehicles and equipment to be free of leaks. ▪ Refuel equipment and setback stockpiles of excess material away from watercourses. ▪ Inspect and maintain vehicles and equipment to be free of leaks. ▪ Store all fuels and lubricants in designated areas away from watercourses, wetlands and water supply areas (including known private wells), where possible, except where secondary containment is provided.

Discipline	Potential Effects of the Project	Mitigation
		▪ Hydroseed exposed soils post-construction. ▪ Make spill kits available on vehicles and in work areas. ▪ Promptly contain and clean-up any spills or leaks. Report to the 24-hour environmental emergencies reporting system. ▪ Maintain emissions to below regulatory limits and monitor through the Environmental Monitoring Programs and incorporate into Environmental Risk Assessment (ERA) updates, as required. ▪ Establish emergency response procedures for spill response, with trained personnel present on-site.
Groundwater Resources	▪ Alteration of the natural groundwater flow through the Project footprint during construction and operation. ▪ Reduction of groundwater infiltration due to increased impervious surfaces. ▪ Radionuclides entering the groundwater from routine Project activities.	▪ Develop a Groundwater Management Plan for excess groundwater intrusion during construction and operation. ▪ Implement the Groundwater Management Plan in co-ordination with the Erosion and Sediment Control Plan to prevent impacts to adjacent wetlands and surface water features. ▪ Maintain emissions to below regulatory limits and monitor through the Environmental Monitoring Programs and incorporate into ERA updates, as required.
Wetlands	▪ Erosion and sedimentation into adjacent wetland habitats. ▪ Altered surface drainage affecting drainage regime of adjacent wetlands. ▪ Deterioration of wetland habitats from fugitive dust or vehicle emissions. ▪ Risk of spread and establishment of invasive species into wetlands. ▪ Increase of impervious surfaces may increase flashiness of flows into wetland systems.	▪ Avoid wetland infilling and impacts where possible, otherwise limit amount of wetland infilling and impacts to the smallest extent feasible. ▪ Ensure wetland alteration permits and approvals are received and available on-site. ▪ Conduct any work in wetlands during winter months when ground is frozen. ▪ Implement erosion and sediment control measures to limit sedimentation of wetlands. ▪ Maintain current drainage patterns or flows through surface grading, where possible. ▪ Refuel equipment away from wetlands. ▪ Locate material piles away from wetlands and protect with erosion and sediment control measures. ▪ Develop Environmental Management Plan and train construction staff on wetland conservation measures.

Discipline	Potential Effects of the Project	Mitigation
		▪ Develop and implement a stormwater management plan to manage run-off from impervious surfaces.
Freshwater Fish and Fish Habitat	▪ Erosion and sediment into nearby watercourses. ▪ Altered surface drainage may affect inputs and flows into nearby watercourses. ▪ Decrease of pervious surfaces may increase flashiness of flows into watercourses. ▪ Direct impacts to fish habitat from stream crossing or diversion.	▪ If required, a *Fisheries Act* authorization or extension of the current *Fisheries Act* authorization for PLNGS will be sought and offsetting for the death of fish through habitat restoration and enhancement undertaken. ▪ Implement an Erosion and Sediment Control Plan to prevent erosion and sedimentation into watercourses. ▪ Maintain existing drainage flows and inputs through grading, where possible. ▪ Use best available technologies for stream crossings (e.g., directional drilling), where practical. ▪ Inspect and maintain vehicles and equipment to be free of leaks. ▪ Refuel equipment away from watercourses. ▪ Locate any material piles away from watercourses and protected with ESC measures. ▪ Develop and implement a stormwater management plan to manage run-off from impervious surfaces.
Vegetation	▪ Loss of natural habitats and vegetation. ▪ Deterioration of adjacent natural habitats due to construction emissions and sedimentation. ▪ Spread of invasive species into natural habitats. ▪ Alteration of vegetation composition due to altered drainage patterns. ▪ Indirect effects of decreased soil quality due to radionuclide release during routine Project operation.	▪ Limit vegetation clearing, where possible. ▪ Identify presence of SAR/SoCC vegetation and develop protection measures, if necessary. ▪ Hydroseed exposed soils during site stabilization post-construction. ▪ Implement an Erosion and Sediment Control Plan to prevent erosion and sedimentation into natural habitats. ▪ Inspect, maintain, and wash vehicles and equipment. ▪ Implement an Environmental Management Plan and proper training for construction staff. ▪ Restore vegetation on-site post-construction, and implement a monitoring program to evaluate long-term impacts to vegetation. ▪ Maintain emissions to below regulatory limits and monitor through the Environmental Monitoring Programs and incorporate into ERA updates, as required.

Discipline	Potential Effects of the Project	Mitigation
		▪ Maintain facility to operational requirements outlined in the licensing basis.
Avian Fauna	▪ Non-limiting permanent loss of terrestrial avifauna habitat. ▪ Deterioration of adjacent natural habitats. ▪ Risk of harm or harassment to migratory bird nests. ▪ Risk of indirect harm or death from vegetation removals. ▪ Disturbance during construction phase due to vehicles, equipment, and lights. ▪ Unintended creation of nesting and roosting habitat for gulls and other species utilizing structures. ▪ Deterioration of marine aquatic environment, affecting marine birds.	▪ Limit vegetation clearing, where possible. ▪ Conduct clearing outside of breeding and nesting seasons, where possible. If clearing in breeding season is unavoidable, conduct non-intrusive breeding bird nest surveys prior to vegetation clearing. ▪ Implement an Erosion and Sediment Control Plan to prevent erosion and sedimentation into natural habitats. ▪ Limit construction-related disturbance (noise, lights) in proximity to natural habitats, where possible. ▪ Develop Environmental Management Plan and training of staff on bird management. ▪ Install bird deterrents on ARC unit or design to limit accessible platforms and ledges for nesting and roosting. ▪ Maintain emissions to below regulatory limits and monitor through the Environmental Monitoring Programs and incorporate into ERA updates, as required.
Wildlife	▪ Marginal permanent loss of terrestrial wildlife habitat. ▪ Disturbance to wildlife from construction-related sound and lights. ▪ Deterioration of adjacent wildlife habitat due to emissions and sedimentation. ▪ Risk of human-wildlife interactions during construction due to storage of food waste or other attractants.	▪ Limit vegetation clearing, where possible. ▪ Conduct vegetation clearing outside of sensitive periods for wildlife. ▪ Implement an Erosion and Sediment Control Plan to prevent erosion and sedimentation into natural habitats. ▪ Install construction fencing around Project site to prevent wildlife from entering. ▪ Inspect and maintain vehicles and equipment to be free of leaks and in well-maintained operating condition. ▪ Limit construction-related disturbance (noise, lights) in proximity to natural habitats, where possible. ▪ Design proper waste management to exclude wildlife. ▪ Develop Environmental Management Plan and train staff in wildlife management.
Marine Physical and	▪ Incremental effect of water withdrawal for use as make-up water for cooling.	▪ Tie intake and outlet for cooling towers into existing PLNGS infrastructure where practical. ▪ Treat effluents to meet regulatory water quality requirements.

Discipline	Potential Effects of the Project	Mitigation
Chemical Environment	▪ Degradation of the marine water quality in a localized area.	▪ Implement standard operation, inspection and maintenance procedures, and routine monitoring.
Marine Biota	▪ Change in marine habitat due to degradation of water quality. ▪ Mortality of fish and aquatic species due to impingement and entrainment.	▪ Ensure that intake structure meet DFO “best practice” requirements. ▪ Offset any harm through habitat restoration and enhancement, as required. ▪ Implement a post-construction monitoring program to quantify changes and apply compensation mechanisms, if required.
Social Environment	▪ Strain on local infrastructure and social services. ▪ Increased traffic, impacting traffic flow and infrastructure maintenance requirements.	▪ Avoid peak traffic times when planning for required traffic delays, when possible, and consider other traffic disruptions in the area. ▪ Smaller work force and extended operating cycle reduces traffic.
Economic Wellbeing	▪ Positive benefit to the regional economy. ▪ Increased job opportunities.	▪ None required.
Land Use	▪ Alteration of physical and visual landscape may affect culturally significant use of the land.	▪ Siting of the SMR close to the Point Lepreau site to minimize visual disturbance.
Indigenous Peoples	▪ Limited access to the site for traditional activities, including the marine areas around the site. ▪ Impacted or reduced local resources, i.e., plants or animals for harvesting and traditional use. ▪ Concerns of contamination related to the harvesting and consumption of county foods.	▪ Identify and avoid sensitive harvesting areas and cultural resources. ▪ Consult with First Nation communities to identify what mitigation that works best for their communities.
Archaeology and Heritage Resources	▪ Unexpected discovery of archaeological artifacts during site clearance and excavation.	▪ Completion of an Archaeological Impact Assessment of the proposed area to be developed for the ARC SMR and associated infrastructure. ▪ Develop protocols in the case of an unexpected discovery of archaeological artifacts.
Human Physical Health	▪ Radiological and non-radiological emissions affecting human health.	▪ ERA prepared to assess the risk to human health and determine if additional mitigation is required. ▪ Maintain emissions to below regulatory limits and monitor through the Environmental Monitoring Programs and incorporate into future ERA updates, as required. ▪ Maintain facility to operational requirements outlined in the licensing basis.

7.0 ON-GOING SITE CHARACTERIZATION AND ASSESSMENT

In 2020, NB Power commissioned an analysis of existing baseline information at the Point Lepreau site, to determine the adequacy of current information available to meet provincial and federal regulatory requirements for development of the ARC SMR. This is documented in *Baseline Environmental Desktop Analysis and Preliminary Siting Study for Advanced Small Modular Reactors* (Fundy Engineering, 2020). Existing information available in documents such as previous federal and provincial environmental assessments, PLNGS environmental risk assessments and annual reports were reviewed and evaluated against the federal *Tailored Impact Statement Guidelines for Nuclear Projects*, and information gaps were identified.

In addition to this, a compliance matrix was developed to identify gaps in the information required for the completion of a New Brunswick *Environmental Impact Assessment Regulation - Clean Environment Act* and to meet CNSC requirements contained in *REGDOC-1.1.1* and *REGDOC-2.9.1*. Scopes of work for a series of studies to meet these gaps in baseline information were developed, in consultation with specialists in the nuclear industry.

The anticipated studies related to the EIA and those that are already underway are summarized in **Table 7.1**. Where available at the time of writing, information from these studies is incorporated into this registration document. Identification of additional studies will be ongoing through the Project planning phase, and during the development of the EIA Terms of Reference, with input from regulators, First Nations and the public.

Table 7.1: Summary of Studies Being Undertaken

Anticipated / Ongoing Study	Scope of Study
Climate Change Assessment (CCA)	The CCA will support the safety case and environmental assessment for the Project. The CCA provides information to evaluate and mitigate potential impacts (i.e., effects) of climate change for proposed SMRs, the existing CANDU 6 reactor, and the existing SRWMF. The CCA will contain: ▪ A review of the climate variables that may affect the safety, accessibility, or operations of the proposed SMRs, the existing CANDU 6 reactor, or the SRWMF. ▪ A detailed description of the methods used to collect historical and projected climate data for the Point Lepreau Peninsula and surrounding marine environment. ▪ A description and analysis of climate data that can be used for safety cases and environmental assessment for the SMRs and PLNGS.
Terrestrial Environment - Species and Vegetation, Phases I & II	This Terrestrial Environment Study describes the terrestrial environment, including vegetation, wetlands and wildlife. Phases I & II specifically include the following surveys: ▪ Avian survey (spring/fall land birds, breeding birds, nightjars, marine birds, 12 months migratory bird survey); ▪ Bat field survey; ▪ Incidental wildlife and herptile observations, and ▪ Collection of baseline terrestrial flora, fauna, and food chain data. This information is intended to update and enhance existing information on the Lepreau Peninsula, focusing on the SMR study areas. In completing this scope of work, the goal was to bridge the gap between IK and scientific knowledge through the braiding of both knowledge streams where information was available. Historically, IK and the use of land and resources by Indigenous peoples was captured separately from environmental reporting.
Hydrological (Surface Water) Assessment	The hydrology assessment includes: ▪ Review of historical studies, drawings, and relevant site data, ▪ Description and characterization of the Point Lepreau site and proposed SMR study areas, ▪ Summary of the regional climatology, meteorology, and potential climate change impacts, ▪ Review and assessment of the Point Lepreau site hydrology for current and future climate change conditions, ▪ Assessment of surface water and groundwater interaction, ▪ Evaluation of potential impacts of the SMR on surface water, ▪ Evaluation of potential impacts of surface water on the SMR, and ▪ Summary of the quality assurance standards implemented during the investigations and assessments.
Geotechnical Assessment	The Geotechnical Assessment focuses on the two proposed study areas. The purpose is to determine the suitability of the site for typical foundation construction. Information for this stage is obtained from current and historical documents and by means of field reconnaissance. The following factors were considered in the evaluation, to account for both normal conditions and extreme conditions:

Anticipated / Ongoing Study	Scope of Study
	▪ Geological hazards; ▪ Geological subsurface conditions; ▪ Liquefaction potential; ▪ Feasible foundation types; ▪ Preliminary bearing capacity and other factors of foundation stability; ▪ Preliminary settlement ranges; ▪ Groundwater levels and regimes; ▪ Previous use of the site, and ▪ Site preparation requirements.
Geohydrological (Groundwater) Assessment	The scope of the hydrogeology assessment includes: ▪ Review existing site information (for both SMR and Point Lepreau property); ▪ Conduct a gap analysis with respect to current nuclear regulatory documents, and ▪ Characterize and assess current site hydrogeological conditions in the SMR study areas and Point Lepreau site, in particular the following: ▪ Groundwater occurrence, flow directions and gradients; ▪ Tidal and saltwater mixing/intrusion effects on site groundwater; ▪ Long-term variations in groundwater levels (monitoring well hydrograph); ▪ Define and update hydrostratigraphic units and their hydraulic or aquifer properties; ▪ Describe the types and occurrence of overburden soils and bedrock channels; ▪ Describe groundwater and naturally occurring surface water quality for chemical and radiological COPCs; ▪ Describe freshwater sediment quality; ▪ Assess surface water/groundwater interaction; ▪ Characterize current potable water supply wells in and around the Point Lepreau site; ▪ Comment on acid rock drainage potential and possible effects of blasting residues on site groundwater quality; ▪ Update a hydrogeological conceptual site model for the Point Lepreau site, including both study areas, including hydrostratigraphy, hydrogeological cross-sections, a summary of the hydrogeological regime; and ▪ Comments on expected effects of climate change.
Aquatic Environment - Freshwater	The 2022 freshwater aquatic baseline study describes the fish and fish habitat at the Point Lepreau site. The information provided is intended to update and enhance existing information on the Lepreau Peninsula, focusing on the SMR study areas. The report includes: a desktop review of existing information, and summer and fall freshwater aquatic environment field studies. In completing this scope of work, the goal was to bridge the gap between IK and scientific knowledge through the braiding of both knowledge streams where information was available. The field studies included the following: ▪ Fish habitat assessments; ▪ Fish presence; ▪ In-situ water quality; ▪ Benthic macroinvertebrates; ▪ Periphyton;

Anticipated / Ongoing Study	Scope of Study
	▪ Sediment; and ▪ eDNA sampling. Data on radionuclides in water, fish, and benthic invertebrate tissues from previous work conducted on the Point Lepreau site are summarized in this report, but radionuclide sampling was not part of the current scope of work. Similarly, freshwater (surface water) chemistry data from previous work on the Point Lepreau site is used to characterize the baseline conditions in this report.
Aquatic Environment - Marine	The study includes the development and implementation of a sampling program to characterize the marine environment near the existing Point Lepreau site. It includes water quality and sediment characterization.
Environmental Risk Assessment (ERA) Phase 1 & 2	The ERA consists of a HHRA that will assess the risks to human receptors and an EcoRA that will assess the risks to ecological receptors. Phase 1 of the ERA assesses the risk resulting from non-radioactive contaminants, radioactive contaminants, and physical stressors (e.g., heat, noise) during normal operations throughout the Project lifecycle. Phase 2 of the ERA will further refine the risk to human/ecological receptors under normal operating conditions.
Acoustic, Visual, Air Quality: Characterization and Assessment	Determination of the existing conditions associated with air quality (non-radiological emissions), noise, and light, followed by the assessment of potential for changes to baseline conditions based on activities associated with the various phases in the lifecycle of the SMR technologies (i.e., site preparation, construction, operation, decommissioning, abandonment).
Indigenous Land and Resource Use (Wolasteqey)	Completion of an Indigenous Resource and Land Use/IK Study. Each Nation has their own methodology and identifies what the work will contain.
IK Study (Peskotomuhkati)	Completion of an Indigenous Resource and Land Use/IK Study. Each Nation has their own methodology and identifies what the work will contain.
IK Study (Mi'kmaq)	Completion of an Indigenous Resource and Land Use/IK Study. Each Nation has their own methodology and identifies what the work will contain.
IK Study (Kopit Lodge)	Completion of an Indigenous Resource and Land Use/IK Study. Each Nation has their own methodology and identifies what the work will contain.
Physical and Cultural Heritage (Archaeology)	Completion of an archaeological survey for the SMR site conducted by the New Brunswick Museum with participation by Wolastoqey, Mi'gmaq, and Peskotomuhkati First Nations.
Sustainability and Well Being Assessment Phase I & II	Phase 1 includes the development of a working group comprised of local and regional stakeholders as well as Indigenous rights holders to co-develop an approach to carry out the assessment. It will include the development of a framework for measuring Project potential positive and negative effects on community sustainability and wellbeing. Phase II will be informed by Phase I and is expected to focus on community health, sustainability and wellbeing measures. Assessment methodologies will consider the interconnected impact of the Project on human and community health and evaluate how the Project contributes to overall sustainability and wellbeing. The scope of the assessment is to include the characterization of baseline conditions related to social, economic and human health, including disaggregated information related to diverse populations.
Dispersion Modelling of Radioactive and Hazardous Material	The study evaluates normal operations, design basis accidents, beyond design basis, and potential releases due to human events. The modelling is expected to include the assessment of the atmospheric, surface water, groundwater and dispersion into the soils of radiological hazards, and the consequent dose estimates over time of the proposed SMR facility.

Anticipated / Ongoing Study	Scope of Study
Transportation Planning	Characterization of the capacities and physical constraints of the existing road infrastructure along the primary route that would be used to transport oversized loads and also to evaluate the impact to the community from increased activity (including safety, noise, transportation delays) associated with the SMR development.
Adequacy of Site Sanitary Waste-Water Systems	The purpose of this study is to understand the capability of the existing systems in relation to current workforce at PLNGS, as well as projected workforce populations during the construction, operation, and maintenance phases/cycles of the Project. The output of this study will inform design requirements to upgrade existing or construct new sanitary waste-water systems.
External Hazards Report	Data collection and evaluation of various natural external events over the lifecycle of the proposed facility.
Hanson Stream Water Level Study	A study to model additional draw from Hanson Stream due to the Project and related water level changes to inform Habitat potential effects.

8.0 CONCLUSION

NB Power, with support of ARC, plans to construct and operate an advanced SMR at the NB Power property on the Lepreau Peninsula in New Brunswick, to the west of the existing PLNGS. The Project will involve site preparation, construction, operation, and eventually decommissioning of the SMR and supporting infrastructure at the property.

The construction and operation of an advanced SMR is needed to provide 100 to 150 megawatts (MWe) of low-carbon electricity to the New Brunswick grid, while also serving as the commercial demonstration of the performance of the ARC SMR design on the grid. The SMR should be sited at Point Lepreau because it has capacity, is well characterized, and is home to New Brunswick's only existing nuclear power plant, the PLNGS, is already licensed and operating. Like the PLNGS, NB Power is committed to constructing and operating the Project in an environmentally responsible manner, consistent with sustainability principles, and to ensure public and worker health and safety through the entire lifecycle of the project.

This registration document is being submitted to NBDELG to register the Project as an undertaking, with the understanding that the Project will be subject to a provincial EIA. This document contains preliminary information about the Project purpose and need, alternatives, a description of the ARC SMR technology, characterization of the baseline biophysical and human environment, potential project-environment interactions and proposed mitigation strategies. This registration document is not intended to be a thorough report of the results of an EIA study as described in *A Guide to Environmental Impact Assessment in New Brunswick* (NBDELG, 2018), but rather a preliminary document to facilitate the formal determination regarding whether a Comprehensive EIA is required to fully assess the nature and significance of the potential impacts of the Project.

Following a decision that a Comprehensive Review is required and receipt of EIA Guidelines from NBDELG, NB Power will provide the Minister with Terms of Reference outlining how the requirements in the guidelines will be met, and complete supplementary studies to inform the assessment, including a detailed assessment examining the predicted impacts of the project, the proposed mitigative measures, and the predicted residual net effect on the environment (NBDELG, 2018). Subsequent stages will also include numerous opportunities for consultation, engagement and input into the assessment.

Based on the preliminary assessment to date, it is understood that several Project-environment interactions will occur as a result of the Project, and may result in impacts to the environment, though significant effects are not anticipated once thorough mitigation, management and monitoring measures are well defined and implemented as a condition of the Project approval. This conclusion will be verified through the EIA process.

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APPENDIX A

Records of Indigenous Engagement and Public Engagement

A1. Summary of Indigenous Engagement Events (August 2018 to June 2023)

Communication date	First Nations Community / Indigenous Organization	Activity / Event Type
August, 2018	Mi'gmaq Chiefs and Councils	In-person / face-to-face
August, 2018	Wolastoqey Chiefs and Councils	In-person / face-to-face
August, 2018	Peskotomuhkati Chief	In-person / face-to-face
Jul 22, 2019	Assembly of First Nations	Conference / seminar
Sep 12, 2019	Union of New Brunswick Indians (UNBI)	In-person / face-to-face
Nov 14, 2019	Eel River Bar First Nation, Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Information session
Nov 15, 2019	Esgenoopetitj First Nation, Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Information session
Nov 18, 2019	Fort Folly First Nation, Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Information session
Nov 26, 2019	Eel Ground First Nation, Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Information session
Nov 26, 2019	Metepenagiag First Nation, Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Information session
Nov 27, 2019	Indian Island First Nation, Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Information session
Jul 14, 2020	Wolastoqey Nation in New Brunswick (WNNB)	In-person / face-to-face
Jul 17, 2020	Peskotomuhkati	In-person / face-to-face
Aug 20, 2020	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	In-person / face-to-face
Sep 10, 2020	Union of New Brunswick Indians (UNBI), Joint Economic Development Initiative (JEDI), North Shore Mi'gmaq District Council (NSMDC)	In-person / face-to-face
Sep 14, 2020	North Shore Mi'gmaq District Council (NSMDC)	In-person / face-to-face
Sep 17, 2020	Wolastoqey Nation in New Brunswick (WNNB)	In-person / face-to-face
Oct 06, 2020	Wolastoqey Tribal Council Inc, Wolastoqey Nation in New Brunswick (WNNB)	In-person / face-to-face
Nov 16, 2020	First Nation Power Authority (FNPA)	Conference / seminar
Nov 16, 2020	First Nation Power Authority (FNPA)	Online Event
May 12, 2021	Wolastoqey Nation in New Brunswick (WNNB)	Presentation
May 15, 2021	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Presentation
May 19, 2021	Saint Mary's First Nation	In-person / face-to-face
Jun 16, 2021	North Shore Mi'gmaq District Council (NSMDC)	In-person / face-to-face
Jun 23, 2021	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	In-person / face-to-face
Jul 15, 2021	Wolastoqey Communities (several)	Information session
Aug 23, 2021	Mi'gmawe'l Tplu'tagqnn Incorporated (MTI)	Site visit
Oct 15, 2021	First Nation Power Authority (FNPA)	Video Conference
Oct 15, 2021	First Nation Power Authority (FNPA)	Video Conference
Oct 17, 2021	North Shore Mi'gmaq District Council (NSMDC)	In-person / face-to-face
Oct 22, 2021	Mawiw Council	In-person / face-to-face
Oct 29, 2021	First Nation Power Authority (FNPA)	Video Conference
Nov 12, 2021	Mawiw Council	In-person / face-to-face
Nov 12, 2021	Union of New Brunswick Indians (UNBI)	In-person / face-to-face
Nov 15, 2021	First Nation Power Authority (FNPA)	Video Conference
Nov 15, 2021	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Nov 17, 2021	Joint Economic Development Initiative (JEDI)	Conference / seminar
Nov 18, 2021	Joint Economic Development Initiative (JEDI)	Video Conference
Nov 22, 2021	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Nov 23, 2021	Elsipogtog First Nation & KOPIT Lodge	Video Conference
Nov 24, 2021	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Dec 03, 2021	Elsipogtog First Nation & KOPIT Lodge	In-person / face-to-face
Dec 06, 2021	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Dec 06, 2021	Wolastoqey Nation in New Brunswick (WNNB)	In-person / face-to-face
Dec 07, 2021	Elsipogtog First Nation & KOPIT Lodge	In-person / face-to-face
Dec 08, 2021	North Shore Mi'gmaq District Council (NSMDC)	In-person / face-to-face

Dec 15, 2021	Elsipogtog First Nation & KOPIT Lodge	Video Conference
Dec 15, 2021	Peskotomuhkati Nation	Video Conference
Dec 15, 2021	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Dec 16, 2021	Peskotomuhkati Nation	Video Conference
Dec 20, 2021	Indigenous Advisory Council (IAC) for the NRCan SMR Action Plan	In-person / face-to-face
Dec 30, 2021	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Dec 30, 2021	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Dec 30, 2021	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Jan 07, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Jan 12, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Jan 14, 2022	First Nation Power Authority (FNPA)	Video Conference
Jan 18, 2022	Creative Fire, Atunda	Video Conference
Jan 18, 2022	Creative Fire	Video Conference
Jan 26, 2022	Peskotomuhkati Nation	Video Conference
Jan 28, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Jan 28, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Jan 31, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Feb 01, 2022	Joint Economic Development Initiative (JEDI)	Video Conference
Feb 01, 2022	Mawiw Council	In-person / face-to-face
Feb 01, 2022	Peskotomuhkati Nation	In-person / face-to-face
Feb 07, 2022	Joint Economic Development Initiative (JEDI)	Video Conference
Feb 07, 2022	SOAR Professional Services	Video Conference
Feb 09, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Feb 11, 2022	Indigenous Advisory Council (IAC) for the NRCan SMR Action Plan	Video Conference
Feb 14, 2022	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Feb 15, 2022	North Shore Mi'gmaq District Council (NSMDC), Indigenous Advisory Council (IAC) for the NRCan SMR Action Plan	Video Conference
Feb 17, 2022	The First Nations Major Project Coalition (FNMPC)	Video Conference
Mar 01, 2022	North Shore Mi'gmaq District Council (NSMDC), Indigenous Advisory Council (IAC) for the NRCan SMR Action Plan	In-person / face-to-face
Mar 02, 2022	Elsipogtog First Nation & KOPIT Lodge	In-person / face-to-face
Mar 03, 2022	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Mar 03, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Mar 11, 2022	Tobique First Nation	Video Conference
Mar 15, 2022	Peskotomuhkati Nation	In-person / face-to-face
Mar 23, 2022	Joint Economic Development Initiative (JEDI)	Online Event
Mar 24, 2022	Peskotomuhkati Nation	In-person / face-to-face
Mar 28, 2022	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Mar 29, 2022	Indigenous Clean Energy (ICE)	Online Event
Apr 01, 2022	North Shore Mi'gmaq District Council (NSMDC)	In-person / face-to-face
Apr 05, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Apr 05, 2022	Peskotomuhkati Nation	Field Visit
Apr 06, 2022	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Apr 11, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Apr 13, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Apr 21, 2022	PLATO Testing, North Shore Mi'gmaq District Council (NSMDC), SOAR Professional Services	Video Conference
Apr 22, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
May 02, 2022	Mawiw Council	Video Conference
May 04, 2022	North Shore Mi'gmaq District Council (NSMDC)	Community event / forum
May 12, 2022	PLATO Testing, North Shore Mi'gmaq District Council (NSMDC), SOAR Professional Services	Video Conference

May 13, 2022	Peskotomuhkati Nation	Video Conference
May 20, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
May 25, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
May 25, 2022	Peskotomuhkati Nation	Video Conference
May 26, 2022	Indigenous Works	Online Event
Jun 14, 2022	North Shore Mi'gmaq District Council (NSMDC), SOAR Professional Services, First Nations Power Authority (FNPA)	Industry event
Jun 28, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI), Wolastoqey Nation in New Brunswick (WNNB), Peskotomuhkati Nation	Video Conference
Jun 29, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Jun 30, 2022	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Jul 12, 2022	North Shore Mi'gmaq District Council (NSMDC)	In-person / face-to-face
Jul 12, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Jul 12, 2022	Mawiw Council	In-person / face-to-face
Jul 13, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Jul 19, 2022	North Shore Mi'gmaq District Council (NSMDC), Elephant Thoughts	Video Conference
Jul 19, 2022	North Shore Mi'gmaq District Council (NSMDC), SOAR Professional Services, Indigenous Advisory Council (IAC) for the NRCan SMR Action Plan	Video Conference
Jul 27, 2022	North Shore Mi'gmaq District Council (NSMDC), Elephant Thoughts	Training/workshops
Aug 04, 2022	Indigenous Advisory Council (IAC) for the NRCan SMR Action Plan	In-person / face-to-face
Aug 08, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Aug 18, 2022	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Aug 23, 2022	Peskotomuhkati (Passamaquoddy), Mi'gmawe'l Tplu'taqnn Incorporated (MTI), Wolastoqey Nation in New Brunswick (WNNB)	In-person / face-to-face
Aug 23, 2022	North Shore Mi'gmaq District Council (NSMDC)	Annual general meeting (AGM)
Aug 24, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Aug 24, 2022	Peskotomuhkati Nation	Video Conference
Aug 25, 2022	Joint Economic Development Initiative (JEDI)	Community event / forum
Sep 14, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Sep 27, 2022	Assembly of First Nations	Conference / seminar
Sep 28, 2022	Peskotomuhkati Nation	Video Conference
Sep 29, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Sep 29, 2022	Indigenous Works	Training/workshops
Oct 06, 2022	Peskotomuhkati Nation	In-person / face-to-face
Oct 07, 2022	Joint Economic Development Initiative (JEDI)	Video Conference
Oct 07, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Oct 12, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Oct 14, 2022	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Oct 18, 2022	North Shore Mi'gmaq District Council (NSMDC), SOAR Professional Services, Indigenous Advisory Council (IAC) for the NRCan SMR Action Plan	Video Conference
Oct 26, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Oct 28, 2022	North Shore Mi'gmaq District Council (NSMDC)	Tour
Nov 07, 2022	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Nov 09, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Nov 09, 2022	Peskotomuhkati Nation	Video Conference
Nov 09, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Nov 15, 2022	Elsipogtog First Nation & KOPIT Lodge	In-person / face-to-face
Nov 15, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	In-person / face-to-face
Nov 16, 2022	Elsipogtog First Nation & KOPIT Lodge	In-person / face-to-face
Nov 17, 2022	Joint Economic Development Initiative (JEDI)	Community event / forum

Nov 30, 2022	Peskotomuhkati Nation	Video Conference
Dec 01, 2022	Peskotomuhkati Nation	In-person / face-to-face
Dec 08, 2022	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Dec 14, 2022	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Dec 15, 2022	Elsipogtog First Nation & KOPIT Lodge	In-person / face-to-face
Jan 06, 2023	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Jan 25, 2023	Peskotomuhkati Nation	Video Conference
Jan 26, 2023	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Feb 03, 2023	North Shore Mi'gmaq District Council (NSMDC)	In-person / face-to-face
Feb 07, 2023	Pabineau First Nation	Video Conference
Feb 07, 2023	Elsipogtog First Nation & KOPIT Lodge, Mi'gmawe'l Tplu'taqnn Incorporated, Wolastoqey Nation in New Brunswick (WNNB), North Shore Mi'gmaq District Council (NSMDC), Peskotomuhkati	Multiple/various methods
Feb 10, 2023	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Feb 15, 2023	Joint Economic Development Initiative (JEDI)	Tradeshow
Feb 16, 2023	Pabineau First Nation, North Shore Mi'gmaq District Council (NSMDC)	In-person / face-to-face
Mar 01, 2023	North Shore Mi'gmaq District Council (NSMDC), SOAR Professional Services	Video Conference
Mar 01, 2023	Pabineau First Nation, North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Mar 16, 2023	Indigenous Advisory Council (IAC) for the NRCan SMR Action Plan	In-person / face-to-face and Video Conference
Mar 16, 2023	Saint Mary's First Nation	In-person / face-to-face
Mar 20, 2023	SOAR Professional Services	Video Conference
Mar 21, 2023	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Mar 23, 2023	Indigenous Works	Video Conference
Mar 27, 2023	North Shore Mi'gmaq District Council (NSMDC)	Video Conference
Mar 27, 2023	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
Mar 28, 2023	Peskotomuhkati Nation	Video Conference
Mar 28, 2023	Elsipogtog First Nation & KOPIT Lodge, Mi'gmawe'l Tplu'taqnn Incorporated, Wolastoqey Nation in New Brunswick (WNNB), North Shore Mi'gmaq District Council (NSMDC), Peskotomuhkati	Multiple/various methods
Mar 31, 2023	Mi'gmawe'l Tplu'taqnn Incroporated (MTI)	Video Conference
Apr 05, 2023	Pabineau First Nation, Kiewit	In-person / face-to-face
Apr 12, 2023	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
Apr 18, 2023	Mi'gmawe'l Tplu'taqnn Incroporated (MTI), North Shore Mi'gmaq District Council (NSMDC), MUIN	In-person / face-to-face
Apr 19, 2023	North Shore Mi'gmaq District Council (NSMDC)	In-person / face-to-face
Apr 25, 2023	Elsipogtog First Nation & KOPIT Lodge, Mi'gmawe'l Tplu'taqnn Incorporated, Wolastoqey Nation in New Brunswick (WNNB), North Shore Mi'gmaq District Council (NSMDC), Peskotomuhkati	In-person / face-to-face
Apr 27, 2023	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
May 10, 2023	Wolastoqey Nation in New Brunswick (WNNB)	Video Conference
May 18, 2023	Wolastoqey Nation in New Brunswick (WNNB)	Field Visit
May 23, 2023	Peskotomuhkati Nation	Video Conference
May 26, 2023	Mi'gmawe'l Tplu'taqnn Incorporated (MTI)	Video Conference
May 30, 2023	Elsipogtog First Nation & KOPIT Lodge, Mi'gmawe'l Tplu'taqnn Incorporated, Wolastoqey Nation in New Brunswick (WNNB), North Shore Mi'gmaq District Council (NSMDC), Peskotomuhkati	In-person / face-to-face, Video Conference
Jun 03, 2023	Indigenous Advisory Council (IAC) for the NRCan SMR Action Plan	Tour
Jun 04, 2023	SOAR Professional Services	Conference / seminar
Jun 13, 2023	Assembly of First Nations, North Shore Mi'gmaq District Council (NSMDC)	Conference / seminar

Appendix A2. Summary of Public Stakeholder Engagement Events (August 2018 to June 2023)

Communication Date	Stakeholder	Activity / Event Type
Aug 28, 2018	Lancaster Golden Seniors Club	In-person / face-to-face
Jan 13, 2019	Opportunities NB	In-person / face-to-face
Jan 17, 2019	PLNGS Community Liaison Committee	In-person / face-to-face
Jan 19, 2019	Association of Professional Engineers and Geoscientists of New Brunswick	In-person / face-to-face
Feb 15, 2019	Women in Nuclear (WIN)	In-person / face-to-face
Feb 19, 2019	Atlantic Canada Opportunities Agency (ACOA)	In-person / face-to-face
Mar 12, 2019	Coleson Cove Community Liaison Committee	In-person / face-to-face
Mar 19, 2019	Atlantic Coastal Action Program (ACAP), and their contact from ACAP	In-person / face-to-face
Mar 28, 2019	Fundy Engineering	In-person / face-to-face
Apr 13, 2019	Atlantica Centre for Energy	In-person / face-to-face
Apr 13, 2019	University of New Brunswick (UNBSJ)	In-person / face-to-face
May 07, 2019	Atlantica Centre for Energy	In-person / face-to-face
May 09, 2019	Opportunities NB	In-person / face-to-face
May 13, 2019	Government of New Brunswick, Climate Change Secertariat	In-person / face-to-face
May 15, 2019	PLNGS Community Group Liasion	In-person / face-to-face
Jun 06, 2019	PEI Department of Environment and Energy Maritime Electric	In-person / face-to-face
Jun 18, 2019	New Brunswick Department of Energy and Resource Development and Environment and Local Government	In-person / face-to-face
Jun 19, 2019	Atlantic Canada Opportunities Agency (ACOA)	In-person / face-to-face
Jun 20, 2019	Atlantica Centre for Energy	In-person / face-to-face
Jun 24, 2019	Canadian Nuclear Safety Commission (CNSC)	In-person / face-to-face
Jul 08, 2019	Organization of Canadian Nuclear Industries (OCNI)	In-person / face-to-face
Jul 18, 2019	PLNG Community Liaison Committee	In-person / face-to-face
Jul 26, 2019	Representatives from the Town of Rothesay, Town of Quispamsis, City of Saint John	In-person / face-to-face
Sep 18, 2019	Lancaster Golden Seniors Club	In-person / face-to-face
Sep 26, 2019	Atlantic Canada Opportunities Agency (ACOA)	In-person / face-to-face
Sep 28, 2019	Women in Nuclear (WIN)	In-person / face-to-face
Oct 17, 2019	PLNGS Community Liaison Committee	In-person / face-to-face
Oct 21, 2019	Atlantica Centre for Energy	In-person / face-to-face
Nov 23, 2019	Atlantica Centre for Energy Energy Fundamentals for Leaders	In-person / face-to-face
Nov 26, 2019	Ontario Power Generation (OPG) United States Nuclear Industry Council (USNIC)	In-person / face-to-face
Dec 18, 2019	Harbour View High School	In-person / face-to-face
Jan 01, 2020	Canadian Manufacturers and Exporters (CME)	Web Conference
Jan 28, 2020	Organization of Canadian Nuclear Industries (OCNI)	In-person / face-to-face
Feb 26, 2020	Canadian Nuclear Association (CNA)	In-person / face-to-face
May 06, 2020	Organization of Canadian Nuclear Industries (OCNI)	In-person / face-to-face
May 21, 2020	National Association of Insurance Commissioners (NAIC)	In-person / face-to-face
Jun 16, 2020	Saint John Region Chamber of Commerce, Atlantica Centre for Energy	In-person / face-to-face
Jun 25, 2020	United Nations Association in Canada (UNA), Atlantica Centre for Energy	Email
Jul 16, 2020	Citizen	Web Conference
Jul 27, 2020	Organization of Canadian Nuclear Industries (OCNI)	In-person / face-to-face

Aug 27, 2020	Organization for Economic Co-operation and Development (OECD) Natural Resources Canada (NRCAN)	In-person / face-to-face
Sep 09, 2020	International Brotherhood of Electrical Workers (IBEW) Natural Resources Canada (NRCAN)	In-person / face-to-face
Sep 18, 2020	New Brunswick Department of Aboriginal Affairs, Natural Resources Canada (NRCAN)	In-person / face-to-face
Sep 18, 2020	Canadian Nuclear Safety Commission (CNSC)	In-person / face-to-face
Sep 21, 2020	Atlantic Canada Opportunities Agency (ACOA)	In-person / face-to-face
Sep 22, 2020	Conseil économique du Nouveau-Brunswick	In-person / face-to-face
Sep 24, 2020	Gaia Project Natural Resources Canada (NRCAN)	In-person / face-to-face
Sep 30, 2020	Energy Storage Canada and Moltex	In-person / face-to-face
Oct 01, 2020	PLNGS Community Liaison Committee	In-person / face-to-face
Oct 05, 2020	Atlantic Canada Opportunities Agency (ACOA)	In-person / face-to-face
Oct 06, 2020	Government of PEI, Natural Resources Canada (NRCAN)	In-person / face-to-face
Oct 09, 2020	Citizen	In-person / face-to-face
Oct 13, 2020	Lancaster Golden Seniors Club	In-person / face-to-face
Oct 30, 2020	Organization of Canadian Nuclear Industries (OCNI), Interested suppliers	Online Event
Nov 05, 2020	Students in New Brunswick	Online Event
Nov 18, 2020	Canadian Nuclear Society (CNS)	In-person / face-to-face
Nov 20, 2020	University of New Brunswick (UNB)	Video Conference
Nov 21, 2020	Canada UK Colliquium (CUKC)	Video Conference
Nov 24, 2020	Canadian Manfucturers and Exporters (CME), Interested suppliers	Online Event
Dec 16, 2020	Conservation Council of New Brunswick	Video Conference
Jan 28, 2021	Organization of Canadian Nuclear Industries (OCNI), Interested suppliers	Online Event
Feb 17, 2021	General public	Online Event
Mar 26, 2021	Belledune / Dalhousie Community Liaison Committee (CLC)	Email
Apr 16, 2021	Conseil économique du Nouveau-Brunswick	Video Conference
Apr 29, 2021	Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS)	Video Conference
Apr 30, 2021	New Brunswick Community College (NBCC) - Moncton	In-person / face-to-face
May 10, 2021	Organization of Canadian Nuclear Industries (OCNI), Interested suppliers	Online Event
May 10, 2021	PLNGS Community Liaison Committee	Meeting
May 31, 2021	New Brunswick Community College (NBCC) - SJ	Video Conference
Jun 01, 2021	Atlantica Centre for Energy	Video Conference
Jun 01, 2021	New Brunswick Community College (NBCC) - SJ	Web Conference
Jun 24, 2021	Engineers Geoscientists Manitoba, Canadian Society of Senior Engineers (CSSE)	Video Conference
Jul 14, 2021	Members of Parliament for Tobique-Mactaquac, New Brunswick Southwest	Tour
Jul 29, 2021	Atlantica Centre for Energy	Video Conference
Jul 29, 2021	PLNGS Community Liaison Committee	Meeting
Aug 04, 2021	Mayor of St. George	In-person / face-to-face
Aug 23, 2021	General public	Open house/town hall/public meeting
Aug 25, 2021	General public	Open house/town hall/public meeting
Aug 26, 2021	General public	Open house/town hall/public meeting

Sep 02, 2021	Citizens and the Mayor of St. George	In-person / face-to-face
Sep 14, 2021	Belledune / Dalhousie Community Liaison Committee (CLC)	Video Conference
Sep 15, 2021	Canadian Nuclear Association (CNA), Industry participants	Conference / seminar
Sep 16, 2021	General public	Open house/town hall/public meeting
Sep 23, 2021	Lower Saint John River Hydro Community Liaison Committee (CLC) (Mactaquac)	Video Conference
Sep 24, 2021	Department of Education	Tour
Sep 28, 2021	Milltown Generating Station Community Liaison Committee (CLC)	Video Conference
Sep 29, 2021	Maritime Energy Association (MEA), Industry participants	Conference / seminar
Oct 01, 2021	University of Moncton (U de M)	Video Conference
Oct 06, 2021	Organization of Canadian Nuclear Industries (OCNI), Interested suppliers	Online Event
Oct 08, 2021	Saint John Naturalist Club	Field Visit
Oct 13, 2021	Climate Institute of Canada	In-person / face-to-face
Oct 15, 2021	Saskatchewan Power	Video Conference
Oct 17, 2021	Women in Nuclear (WIN)	Online Event
Oct 18, 2021	Saint Andrews, Town of, St. George, Town of, St. Stephen, Town of, Blacks Harbour, Village of	In-person / face-to-face
Oct 18, 2021	Students and teachers in New Brunswick, General public	Online Event
Oct 25, 2021	Moltex, ARC Clean Technology	In-person / face-to-face
Nov 05, 2021	Vancouver Island Engineering Society (VIES)	Online Event
Nov 12, 2021	Hampton High	Web Conference
Nov 15, 2021	Canadian Nuclear Society (CNS), Industry participants	Conference / seminar
Nov 16, 2021	Representatives (Saint John, City of), (Grand Bay-Westfield, Town of), (Quispamsis, Town of), (Rothesay, Town of)	Video Conference
Nov 18, 2021	Union of Municipalities New Brunswick (UMNB)	Online Event
Nov 24, 2021	Citizens and the Mayor of St. George	In-person / face-to-face
Nov 24, 2021	Fredericton Golden Club	In-person / face-to-face
Nov 30, 2021	Saskatchewan Power	Video Conference
Dec 02, 2021	Representatives (Saint John, City of), (Grand Bay-Westfield, Town of), (Quispamsis, Town of), (Rothesay, Town of)	Video Conference
Dec 03, 2021	Association francophone des municipalités du Nouveau-Brunswick (AFMNB)	Annual general meeting (AGM)
Dec 15, 2021	Saint John Region Chamber of Commerce	Video Conference
Jan 13, 2022	Government of Canada	Letter/mail
Jan 13, 2022	Association Of Consulting Engineering Companies - Saskatchewan (ACEC-SK)	Online Event
Jan 19, 2022	Saint John Naturalist Club	In-person / face-to-face
Jan 20, 2022	Opportunities NB	Web Conference
Jan 27, 2022	Natural Resources Canada (NRCAN)	Video Conference
Feb 03, 2022	New Brunswick Department of Energy and Resource Development	Video Conference
Feb 08, 2022	Citizen	Video Conference
Feb 11, 2022	Students and teachers in New Brunswick, General public	Online Event

Feb 11, 2022	Organization of Canadian Nuclear Industries (OCNI), Industry participants	Online Event
Feb 14, 2022	Atlantic Canada Opportunities Agency (ACOA), Indigenous Services Canada (ISC)	Video Conference
Feb 16, 2022	Association of Professional Engineers and Geoscientists New Brunswick (APEGNB)	Online Event
Feb 23, 2022	Saskatchewan Power	Video Conference
Feb 25, 2022	Science East, Atlantica Centre for Energy, The Gaia Project, The Centre of Excellence for Energy	Tour
Mar 01, 2022	General public	Open house/town hall/public meeting
Mar 03, 2022	General public	Open house/town hall/public meeting
Mar 04, 2022	New Brunswick Department of Energy and Resource Development	Video Conference
Mar 08, 2022	Reuters	Video Conference
Mar 15, 2022	Caledonia Regional High School	Tour
Mar 15, 2022	General public	Open house/town hall/public meeting
Mar 16, 2022	Society of Petroleum Engineers (SPE)	Conference / seminar
Mar 18, 2022	Harbour View High School	In-person / face-to-face
Mar 21, 2022	Students and teachers in New Brunswick, General public	Online Event
Mar 30, 2022	PLNGS Community Liaison Committee	Meeting
Mar 31, 2022	Natural Resources Canada (NRCAN)	Video Conference
Apr 12, 2022	Canadian Nuclear Association (CNA), Industry participants	Conference / seminar
Apr 20, 2022	NB Department of Natural Resources and Energy Development	Video Conference
May 11, 2022	Women in Energy	Community event / forum
May 18, 2022	Students across Canada	Online Event
May 18, 2022	Sustainable Saint John	Online Event
May 20, 2022	Opportunities NB	Video Conference
May 24, 2022	Reuters	Conference / seminar
May 27, 2022	Natural Resources Canada (NRCAN)	Video Conference
May 30, 2022	Natural Resources Canada (NRCAN)	Video Conference
Jun 01, 2022	Hatch	Video Conference
Jun 05, 2022	Canadian Nuclear Society (CNS), Industry participants	Online Event
Jun 10, 2022	NB Power 25 Year Club	Company-sponsored event
Jun 14, 2022	Opportunities NB, Canadian Manufacturers and Exporters, Interested suppliers	Industry event
Jun 21, 2022	Citizen	In-person / face-to-face
Jun 30, 2022	Natural Resources Canada (NRCAN)	Video Conference
Jul 13, 2022	Organization of Canadian Nuclear Industries (OCNI)	Video Conference
Jul 15, 2022	New Brunswick Department of Aboriginal Affairs	Video Conference
Jul 20, 2022	Department of Education	Video Conference
Aug 04, 2022	General public	Community event / forum
Aug 08, 2022	CleanTech Catalyst	Online Event
Aug 09, 2022	Boilermaker Industry	Conference / seminar
Aug 10, 2022	Department of Education	Tour
Aug 17, 2022	Atlantic Canada Opportunities Agency (ACOA)	Video Conference
Aug 18, 2022	PLNGS Community Liaison Committee	Meeting
Aug 18, 2022	NB Power Students	Online Event
Aug 21, 2022	Canadian Nuclear Society (CNS), Industry participants	Conference / seminar
Aug 24, 2022	Natural Resources Canada (NRCan)	Tour

Aug 25, 2022	General Public, Huddle	Radio
Aug 29, 2022	Organization of Canadian Nuclear Industries (OCNI)	Video Conference
Sep 06, 2022	Government of New Brunswick, Government of Saskatchewan, and SaskPower	Tour
Sep 09, 2022	Natural Resources Canada (NRCan)	Tour
Sep 13, 2022	Nuclear Energy Institute, Industry participants	Conference / seminar
Sep 19, 2022	Students and teachers in New Brunswick, General public	Online Event
Sep 20, 2022	IBEW Canada	Tour
Sep 20, 2022	Industry participants	Conference / seminar
Sep 22, 2022	Saint John Naturalist Club	Tour
Sep 25, 2022	Women in Nuclear (WIN)	Conference / seminar
Sep 28, 2022	Maritime Energy Association (MEA), Industry participants	Conference / seminar
Oct 03, 2022	Canadian Nuclear Society (CNS), Industry participants	Conference / seminar
Oct 04, 2022	Organization of Canadian Nuclear Industries (OCNI)	Video Conference
Oct 05, 2022	Atlantic Canada Opportunities Agency (ACOA)	Video Conference
Oct 07, 2022	Saint John Naturalist Club	Tour
Oct 09, 2022	World Association of Nuclear Operators (WANO)	Conference / seminar
Oct 13, 2022	Saint John Naturalist Club	Tour
Oct 17, 2022	Students and teachers in New Brunswick, General public	Presentation
Oct 20, 2022	Fundy Middle and High School	Tradeshow
Oct 20, 2022	Cumulative Effects Assessment and Environmental Management Atlantic	Conference / seminar
Oct 24, 2022	General public	Open house/town hall/public meeting
Oct 25, 2022	General public	Open house/town hall/public meeting
Oct 25, 2022	General public	Training/workshops
Oct 26, 2022	General public	Open house/town hall/public meeting
Oct 27, 2022	Women in Energy	Community event / forum
Nov 01, 2022	Fundy Shores School	In-person / face-to-face
Nov 02, 2022	Students in New Brunswick	Site visit
Nov 09, 2022	Fluor, Industry participants	Online Event
Nov 14, 2022	Atlantica Centre for Energy	Video Conference
Nov 21, 2022	Citizens	In-person / face-to-face
Nov 28, 2022	Harbour View High School	Site visit
Nov 29, 2022	Fundy Shores School	Training/workshops
Nov 29, 2022	PLNGS Community Liaison Committee	Meeting
Dec 01, 2022	Saint John High School	In-person / face-to-face
Dec 05, 2022	Building Trades of Alberta	In-person / face-to-face
Dec 09, 2022	Department of Education	Tour
Dec 14, 2022	University Network of Excellence in Nuclear Engineering (UNENE)	Training/workshops
Jan 15, 2023	NRCAN, Energy Central	Radio
Jan 16, 2023	Canadian Nuclear Safety Commission (CNSC)	Video Conference
Jan 26, 2023	Reuters	Online Event
Jan 31, 2023	Milltown Community Liaison Committee	Meeting
Feb 02, 2023	Canadian Nuclear Safety Commission (CNSC), Science East, Centre of Excellence for Energy (COEE)	Video Conference

Feb 06, 2023	Grand Manan, Village of, Saint John, City of, Grand Bay-Westfield, Town of, Hampton, Town of, Quispamsis, Town of, Rothesay, Town of, Saint Andrews, Town of, St. Stephen, Town of, McAdam, Village of, St. Martins, Village of, Campobello Island, Rural Community, Eastern Charlotte, Municipality of, Fundy Shores, Municipality of	Phone call
Feb 07, 2023	Canadian Nuclear Safety Commission (CNSC), Canadian Nuclear Association (CNA), Organization for Economic Co-operation and Development (OECD), Nuclear Energy Agency (NEA)	Video Conference
Feb 09, 2023	Fundy Shores, Municipality of	In-person / face-to-face
Feb 14, 2023	Standing Committee on Climate Change and Environmental Stewardship	Open house/town hall/public meeting
Feb 17, 2023	Association of Professional Engineers and Geoscientists New Brunswick (APEGNB)	Annual general meeting (AGM)
Feb 22, 2023	Canadian Nuclear Association (CNA), Industry participants	Conference / seminar
Feb 28, 2023	Eastern Charlotte, Municipality of	In-person / face-to-face
Feb 28, 2023	St. Martins, Village of	In-person / face-to-face
Mar 06, 2023	Saint Andrews, Town of	In-person / face-to-face
Mar 06, 2023	Eastern Charlotte Waterways, Fundy North Fisherman's Association	Video Conference
Mar 15, 2023	General public	Community event / forum
Mar 17, 2023	Students and teachers in New Brunswick, General public	Online Event
Mar 23, 2023	General public	Online Event
Mar 23, 2023	Canadian Manfucturers and Exporters (CME), Industry participants	Conference / seminar
Mar 23, 2023	PLNGS Community Liaison Committee	Meeting
Mar 24, 2023	Organization of Canadian Nuclear Industries (OCNI), Interested suppliers	Conference / seminar
Mar 27, 2023	Town of Grand Bay-Westfield	In-person / face-to-face
Mar 27, 2023	Muncipality of Campobello Island	In-person / face-to-face
Apr 04, 2023	Town of Quispamsis	In-person / face-to-face
Apr 11, 2023	Town of Hampton	In-person / face-to-face
Apr 11, 2023	Canadian Nuclear Association (CNA), Industry participants	Conference / seminar
Apr 12, 2023	Conference Board of Canada	Online Event
Apr 12, 2023	St. Malachy's Memorial High School	In-person / face-to-face
Apr 12, 2023	Electric Power Research Institute (EPRI), Industry participants	Conference / seminar
Apr 17, 2023	City of Saint John	In-person / face-to-face
Apr 17, 2023	Industry participants	Conference / seminar
Apr 19, 2023	Organization of Canadian Nuclear Industries (OCNI), Industry participants	Online Event
Apr 19, 2023	Simonds High School	In-person / face-to-face
Apr 20, 2023	Fundy Shores School	In-person / face-to-face
Apr 27, 2023	Saskatchewan Power, General public	Online Event
May 04, 2023	Reuters	Conference / seminar
May 08, 2023	Canadian Building Trades Union (CBTU)	Conference / seminar

May 09, 2023	Natural Resources Canada (NRCAN)	In-person / face-to-face
May 10, 2023	Saskatchewan Power, General public	Online Event
May 17, 2023	Project Management Institute New Brunswick Chapter (PMI NB)	Online Event
May 24, 2023	General public	Open house/town hall/public meeting
May 25, 2023	General public	Open house/town hall/public meeting
May 30, 2023	General public	Open house/town hall/public meeting
May 30, 2023	Citizens	In-person / face-to-face
Jun 04, 2023	Canadian Nuclear Society (CNS), Industry participants	Conference / seminar
Jun 08, 2023	Canadian Fluid Power Association (CFPA)	Conference / seminar
Jun 09, 2023	NB Power 25 Year Club	Community event / forum
Jun 13, 2023	St. Thomas University	In-person / face-to-face
Jun 14, 2023	Nuclear Procurement Issues Corporation (NUPIC), Industry participants, Interested suppliers	Conference / seminar

APPENDIX B

Wetland Functional Assessment Summary

Appendix B. Summary of Wetlands Functional Assessments (from Dillon and SOAR, 2023b)

Wetland Functions Assessment

Ratings for wetland function are summarized into grouped functions. There are five grouped functions that are rated as either lower, moderate, or higher: the hydrologic group, water quality support group, the aquatic support group, the aquatic habitat group, and the transition habitat group. The manual for Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC): Non-tidal wetlands and the WESP-AC function scoring calculator was used to determine what factors are affecting the function ratings. The hydrologic group function rating is a result of water storage and delay functioning: the effectiveness for delaying downslope movement of water or storing runoff. The water quality support group is influenced by sediment retention and stabilization functions, phosphorus retention, nitrate removal and retention, and carbon sequestration functions. The aquatic support group ratings can be credited to stream flow support, the capacity to support richness and abundance of aquatic invertebrates, the effectiveness for producing and exporting organic nutrients, and reducing or maintaining water temperatures. The aquatic habitat support group rating can be weighed by anadromous fish habitat ratings, resident fish habitat, amphibian and turtle habitat, waterbird feeding habitat, and waterbird nesting habitat. The transition habitat group function rating can be credited to the ability to support richness and abundance of songbird, raptors, mammals, pollinator insects, and diversity of native, hydrophytic plant species, assemblages, and functional groups. The factors leading to the higher function ratings attributing to the higher group ratings will be discussed below.

Table 1: Western Study Area Wetland Assess,emt

Wetland Area	Assessment
WWL2	The wetland functional assessment revealed that WWL2 had higher function ratings for the transition habitat group and aquatic support group. The wetland functions with higher ratings in WWL2 contributing to higher ratings of group functions will be discussed below. The higher rating for songbird, mammal, and raptor habitat in WWL2 had mainly to do with structural characteristics and lack of stressors along with landscape and waterscape attributes, proximity of WWL2 to ponded water and the fertilization effects of nitrogen fixers in the wetland. Shrub diversity, woody height diversity, interspersion of woody species height classes, variety of woody diameter classes, high vegetative ground cover, extensive microtopography, presence of snags, distance of 100-500 m to the nearest road, highly vegetated wetland buffer, and absence of human visitation to wetland, played a role in the higher wildlife habitat rating along with some landscape and waterscape attributes. The presence of downed wood, snags, extensive microtopography, lack of invasive species, no evidence of pesticide use, diversity of shrub and herbaceous species, presence of forbs, woody height form and diameter diversity, proximity to and presence of large surrounding natural areas functional indicators are credited to the higher rating for pollinator habitat. Lack of stressors that would effect plants, lack of invasive species, woody height and herbaceous species diversity, scattered and intermixed species interspersion, complex microtopography, terrestrial fertility (organic soils, presence of nitrogen fixers, and

Wetland Area	Assessment
	relatively long growing season), most of the wetland does not have surface water, and the amount of wilderness surrounding the wetland and proximity to it are function indicators all credited to the higher rating of WWL2 to support hydrophytic, native, vascular plant species. A persistent flow, indicating potential for supporting downstream summer flow, a histosol's ability to retain water longer than coarse grain soil, geomorphological attributes that could support groundwater input all influence higher rating of stream flow support. Historical accumulation of organics, export potential (measured by natural outflow and flow distance leading to more exporting of decomposed organic matter), ground cover implying more organic content, and factors contributing to nutrient availability and how long the ground is frozen are functional indicators credited to the higher organic nutrient export potential in WWL2. Ground irregularity, plant species richness, high vegetated ground cover, low stressor influence on WWL2, productivity in the wetland (wetland is a swamp, growing season length, deciduous plant cover per-surface-area cover, nitrogen fixing plant leaves, and tidal proximity) all contribute to the higher rating of the capacity to support or contribute to the diversity of invertebrate animals in WWL2. The higher rating for water cooling, a function of the aquatic support group, was influenced by the proximity of WWL2 to the toe of a slope, increasing the potential for groundwater discharge and most water in WWL2 is subsurface, protected by warming action of sun.
WWL3	The wetland functional assessment revealed that WWL3 had higher function ratings for transition habitat group, aquatic support group, water quality support group, and hydrologic group. The wetland functions with higher ratings in WWL3 contributing to the higher ratings of group functions will be discussed below. Water storage, a function solely attributing to the hydrologic group, rated higher in WWL3 because there is no outlet, allowing water either to be stored or to dissipate, deep peat can store great amounts of water below ground, a longer growing season compared to more northern regions implies water can be removed by vegetation, non-northern facing aspect implies ground is unfrozen longer than northern facing aspects, and a low internal gradient. All functions credited to the higher transition habitat group were rated higher. Songbird, raptor, and mammal habitat was higher mainly weighted by biotic and abiotic structural components of WWL3 (highly vegetated ground cover, extensive microtopography, large snags, shrubs, woody height, and woody diameter diversity, and height class interspersion) and larger landscape attributes (altered land is mostly pervious surface and a large tract of wilderness surrounding the wetland and within 5km), along with lack of stressors (no human visitation, presence of vegetated buffer, and distance to road and population center) and waterscape characteristics. The lack of pesticide use evidence, absence of invasive plants, proximity to large, vegetated tract, herbaceous and shrub richness, high ground irregularity in WWL3, downed wood and snags, and woody height form diversity all influenced the higher rating for the effectiveness of WWL3 to support pollinating insects. Factors favorable to lower competition and light penetration (lack of invasives, woody height form diversity, height class

Wetland Area	Assessment
	interspersion, herbaceous and shrub species richness, and ground irregularity), lack of stressors (unvisited core area, lack of invasives in buffer, 100 - 500 m distance to road, and absence of salt, sediment loading, and soil alteration in WWL3), terrestrial fertility (presence of nitrogen fixers, longer growing season compared to more northerly regions, organics in soils) and proximity to large wilderness contribute to the higher rating for WWL3 to support native, hydrophytic vascular plants, along with some landscape level factors. Sediment retention function in WWL3 was rated higher because of frictional forces, a lower internal gradient, and lack of an outlet. The higher rating of nitrate removal and retention was weighted heavily by a long upland edge providing denitrification opportunities, height class interspersion, a low internal gradient, some upland inclusions in WWL3, frictional resistance of vegetative ground cover and extensive microtopography promoting deposition of organic nitrogen, and lack of an outlet, along with other organic (deep peat substrate and WWL3 being an established wetland), interception/ erosion resistance (ratio of wetland to catchment area, vegetated ground cover, and long flow path of lotic features), and warmth (growing degree days, non-northern aspect, a natural slope that could have groundwater outflow into WWL3, and biotic structures) of WWL3 factors. Low internal gradient, ground irregularity, ground cover, facilitating organic deposition, detention time correlated with flow path length, ratio of wetland to contributing area, growing degree days either increasing infiltration or cold temperatures slowing decomposition of plants, along with absorption and desorption capacities of WWL3 contribute to the higher rating for phosphorus retention. The higher carbon sequestration rating is attributed to historical accumulation (presence of a bog in the complex, wetland is established, abundant moss coverage, organic soils, and no evidence of soil disturbance), physical accumulation (low internal gradient ability to slow runoff), and factors leading to slowed decomposition and limiting of methane. The capacity to support invertebrates and the effectiveness of WWL3 to cool water and produce and export organic nutrients were functions that rated higher leading to the higher rating of the aquatic support group. Ground irregularity, plant species richness, high vegetated ground cover, low stressor influence on WWL3, productivity in the wetland (wetland is a swamp, growing season length, deciduous plant cover per-surface-area cover, nitrogen fixing plant leaves, and tidal proximity) all contribute to the higher rating of the capacity to support or contribute to the diversity of invertebrate animals in WWL3. The higher rating for water cooling, a function of the aquatic support group, was influenced by the proximity of WWL3 to the toe of a slope, increasing the potential for groundwater discharge, WWL3 has a non-south/south-west facing aspect, and most of the water is below ground. Historical accumulation of organics, export potential (flow distance leading to more exporting of decomposed organic matter), ground cover implying more organic content, and factors contributing to how long the ground is frozen are functional indicators credited to the higher organic nutrient export potential in WWL3.

Wetland Area	Assessment
WWL4	The wetland functional assessment revealed that WWL4 had higher function ratings for transition habitat group and aquatic support group. All wetland functions had higher ratings in WWL4 contributing to the higher ratings of group functions will be discussed below. Songbird, raptor, and mammal habitat had a higher rating mainly from biotic and abiotic structural components of WWL4 (highly vegetated ground cover, extensive microtopography, large snags, woody height, and woody diameter diversity, and height class interspersion) and larger landscape attributes (altered land is mostly pervious surface and large tract of wilderness surrounding the wetland and within 5km, and the wetlands proximity to the wilderness), along with lack of stressors (no human visitation, presence of vegetated buffer, and distance to road and population center) and waterscape characteristics (majority of WWL4 drier, preferred by most songbirds, and presence of suitable beaver habitat). The pollinator habitat function, rated higher because of the lack of pesticide use in WWL4, presence of shrubs, mostly vegetated wetland buffer, large amount of forested area within 5 km, short distance to wilderness area, steep banks, richness of herbaceous species, absence of invasive plants, and richness of potential nesting areas (downed wood, large snags, steep banks, extensive microtopography, at least 80% of wetland without persistent surface water, and a mix of woody diameter classes) influenced the higher rating for the effectiveness of WWL4 to support pollinating insects. The effectiveness of WWL4 to support native, hydrophytic vegetation was influenced by terrestrial fertility (organics in soil, presence of nitrogen fixers, and length of growing season compared to more northern regions), factors favorable to competition and light (lack of invasives, extensive microtopography, wood height form and diversity, height class interspersion, herbaceous richness), along with lack of anthropogenic stressors (lack of invasives, 100-500 m distance to the nearest road, distance to population center, and no human visitation, salt, sediment inputs, or sediment disturbance), mostly vegetated buffer of the wetland, large amount of wilderness within 5 km of WWL4 and other size and proximity effects of surrounding wilderness. The capacity to support invertebrates, the effectiveness of WWL4 to cool water and produce and export organic nutrients were functions that rated higher leading to the higher rating of the water quality support group. Wetland structure (ground irregularity, plant species richness, high vegetated ground cover and woody height class interspersion), low stressor influence on WWL4, productivity in the wetland (shallow water in wetland, wetland is a swamp, growing season length, deciduous plant cover per-surface-area cover, nitrogen fixing plant leaves, and tidal proximity), landscape factors (less than 10% of CA has impervious surfaces and buffer extending 30 m from WWL4 is vegetated), and hydroperiod factors (seasonal water fluctuation can provide food for invertebrates and water levels needed for some life history stages) all contribute to the higher rating of the capacity to support or contribute to the diversity of invertebrate animals in WWL4. The higher rating for water cooling, a function of the aquatic support group, was influenced by heavily shaded waters, waters are predominately lotic, and at least 75% of water is below ground.

Wetland Area	Assessment
	Historical accumulation of organics in an established wetland, export potential (flow distance leading to more exporting of decomposed organic matter, narrow wetland width, most water in wetland is flowing), ground cover implying more organic content, shallow waters provide greater productivity potential, nutrient availability (presence of nitrogen fixers and water fluctuations) and factors contributing to how long the ground is frozen are functional indicators credited to the higher organic nutrient export potential in WWL4.
WWL5	The wetland functional assessment revealed that WWL5 had higher function ratings for transition habitat group, water quality support group, and hydrologic group. All wetland functions had higher ratings in WWL5 contributing to the higher ratings of group functions will be discussed below. The effectiveness of WWL5 to support native, hydrophytic vegetation was influenced by terrestrial fertility (organics in soil and length of growing season compared to more northern regions), lack of invasives, intermediate ground irregularity, along with lack of anthropogenic stressors, 100-500 m distance to the nearest road, distance to population center, mostly vegetated buffer of the wetland, large amount of wilderness within 5 km of WWL5 and other size and proximity effects of surrounding wilderness. The pollinator habitat function, rated higher because of the lack of pesticide use in WWL5, presence of shrubs, large amount of forested area within 5 km, short distance to wilderness area, absence of invasive plants, and richness of potential nesting areas (downed wood, large snags, steep banks, intermediate microtopography, and a mix of woody diameter classes) influenced the higher rating for the effectiveness of WWL5 to support pollinating insects. Sediment retention function in WWL5 was rated higher because of frictional forces (intermediate microtopography, low gradient, high vegetative ground cover, and no evidence of erosion to hamper sediment retention), size of the wetland versus runoff from the catchment area, a temporary natural outlet, and longer growing season than more northern regions allow for more infiltration if ground is not frozen. The higher phosphorus retention function rating in WWL5 was influenced by lack of standing water (moist sites have higher phosphorus retention potential), a natural, temporary outflow, deep peat substrate (higher potential to contain aluminum which aids in long-term retention of phosphorus), a low gradient , highly vegetative ground cover, intermediate microtopography, wetland to CA ratio can imply greater phosphorus retention, and a longer growing season than more northern regions increases the days that sediment bound-P can infiltrate the unfrozen ground. The higher carbon sequestration function rating in WWL5 is attributed to historical accumulation (wetland is established, presence of deciduous plant litter, moss coverage, absence of soil disturbance, and deep peat), physical accumulation (low internal gradient ability to slow runoff), and factors leading to slowed decomposition (moss

Wetland Area	Assessment
	coverage represents a considerable amount of carbon), physical accumulation (low gradient and natural outflow) and limiting of methane (lack of groundwater evidence and some larger trees representing large stores of carbon). Water storage, a function attributing to the higher rating of the hydrologic group, rated higher in WWL5 because of a longer growing season compared to more northern regions implies water can be removed by vegetation, a temporary, natural outflow, non-northern facing aspect implies ground is unfrozen longer than northern facing aspects, deep peat providing water storage, a low internal gradient, and intermediate microtopography.
WWL6	The wetland functional assessment revealed that WWL6 had higher function ratings for transition habitat group and aquatic support group. All wetland functions with higher ratings in WWL6 contributing to the higher ratings of group functions will be discussed below. Songbird, raptor, and mammal habitat was higher mainly weighted by biotic and abiotic structural components of WWL6 (highly vegetated ground cover, downed wood, woody height, and woody diameter diversity, and height class interspersion) and larger landscape attributes (altered land is mostly pervious surface and large tract of wilderness surrounding the wetland and within 5km, and the wetlands proximity to the wilderness), along with lack of stressors (no human visitation, presence of vegetated buffer, and distance to road and population center), presence of nitrogen fixers and waterscape characteristics (majority of WWL6 drier, preferred by most songbirds, and presence of suitable beaver habitat). The pollinator habitat function rated higher because of the lack of pesticide use in WWL6, mostly vegetated wetland buffer, large amount of forested area within 5 km, richness of herbaceous species, presence of forbs, absence of invasive plants, and richness of potential nesting areas (steep banks, vegetative ground cover, and at least 80% of wetland without persistent surface water) influenced the higher rating for the effectiveness of WWL6 to support pollinating insects. The effectiveness of WWL6 to support native, hydrophytic vegetation was influenced by terrestrial fertility (presence of nitrogen fixers and length of growing season compared to more northern regions), factors favorable to competition and light (lack of invasives, high deciduous cover, and herbaceous richness), along with lack of anthropogenic stressors (lack of invasives, 50-100 m distance to the nearest road, distance to population center, and no human visitation, salt inputs, or sediment disturbance), mostly vegetated buffer of the wetland, large amount of wilderness within 5 km of WWL6 and other size and proximity effects of surrounding wilderness. Wetland structure (plant species richness, high vegetated ground cover, and downed wood), low stressor influence on WWL6, productivity in the wetland (shallow water in wetland, wetland is a marsh, growing season length, deciduous plant cover per-surface-area cover, nitrogen fixing plant leaves, and tidal proximity), landscape factors (less than 10-25% of CA has impervious surfaces and buffer extending 30 m from WWL6 is bare or nearly bare if not perennial vegetation), and

Wetland Area	Assessment
	hydroperiod factors (seasonal water fluctuation can provide food for invertebrates and water levels needed for some life history stages) all contribute to the higher rating of the capacity to support or contribute to the diversity of invertebrate animals in WWL6. The higher rating for water cooling, a function of the aquatic support group, was influenced by 50-75% of the water in WWL6 is shaded, predominately lotic, and at least 75% is belowground, away from the influence of the sun. Export potential (flow distance leading to more exporting of decomposed organic matter, narrow wetland width, most water in wetland is flowing, and a 2-5% gradient), ground cover implying more organic content, shallow waters provide greater productivity potential, presence of nitrogen fixers, the wetland is established, and factors contributing to how long the ground is frozen are functional indicators credited to the higher organic nutrient export potential in WWL6.
WWL7	The wetland functional assessment revealed that WWL7 had higher function ratings for hydrologic group and water quality support group. All wetland functions with higher ratings in WWL7 contributing to the higher ratings of group functions will be discussed below. Connectivity in WWL7 (lack of an outlet and low gradient), long upland/wetland interface, WWL7 being an established wetland, among other factors causing warming (growing degree days, intermixing of height classes, and non-northern aspect), and erosion resistance function indicators are credited to the higher rating for nitrogen removal and retention. The higher carbon sequestration function rating in WWL7 is attributed to historical accumulation (wetland is established, presence of deciduous plant litter, absence of soil disturbance), physical accumulation (low internal gradient ability to slow runoff), and factors leading to slowed decomposition, and limiting of methane (lack of groundwater evidence). Water storage, a function attributing to the higher rating of the hydrologic group, rated higher in WWL7 because of a longer growing season compared to more northern regions implies water can be removed by vegetation, absence of an outflow, non-northern facing aspect implies ground is unfrozen longer than northern facing aspects, coarse grained soils providing water storage, and a low internal gradient.
WWL8	The wetland functional assessment revealed that WWL8 had higher function ratings for transition habitat group and aquatic support group. All wetland functions with higher ratings in WWL8 contributing to the higher ratings of group functions will be discussed below. Songbird, raptor and mammal habitat scored higher in WWL8 because of lack of anthropogenic stressor factors (no human visitation to core of the wetland, a vegetated buffer, and distance to population center), habitat structures (snags, intermediate microtopography, vegetative ground cover, and presence of bank habitat), woody diversity, landscape and waterscape features (size of wilderness surrounding the wetland, altered areas have a greater number of pervious ground

Wetland Area	Assessment
	areas than impervious, surface water % beneficial to songbird nesting, distance to ponded water) and some factors leading to productivity including width of vegetative area. The lack of pesticide use in WWL8, a highly vegetated buffer, large amount of forested area within 5 km, absence of invasive plants, high ground irregularity in WWL8, downed wood, intermediate micro-topographical features, presence of some bare ground, woody height form diversity, and richness of herbaceous stratum all influenced the higher rating for the effectiveness of WWL8 to support pollinating insects. The effectiveness of WWL8 to support native, hydrophytic vegetation was influenced by terrestrial fertility (nitrogen fixers, organics in soil, and length of growing season compared to more northern regions), aquatic fertility factors (inflowing streams could bring plant propagules, and 10-50 cm water fluctuation range), lack of invasives, herbaceous richness, intermediate ground irregularity, along with lack of anthropogenic stressors, landscape and wilderness area effects. Higher ratings of organic nutrient export potential and invertebrate habitat capacity contributed to the higher rating for aquatic support grouping. Historical accumulation of organics, export potential (measured by persistent outflow, vegetative width, outflow constriction and flow distance), ground cover implying more organic content, annual productivity is greater in shallower water depths, and factors contributing to nutrient availability all are credited to the higher organic nutrient export potential in WWL8. At least 75% of the wetland does not have surface water (water belowground), > 75% of water above ground is shaded, and < 5% of the water in WWL8 is ponded (less subject to being heated from the sun) are all function indicators credited to the effectiveness of WWL8 to either maintaining or reducing temperature of downslope waters, which is a function that added to the higher rating of the aquatic support function group.
WWL9	The wetland functional assessment revealed that WWL9 had higher function ratings for transition habitat group and aquatic support group. All wetland functions with higher ratings in WWL9 contributing to the higher ratings of group functions will be discussed below. Songbird, raptor and mammal habitat scored higher in WWL9 because of lack of anthropogenic stressor indicators (no human visitation to core of the wetland, a vegetated buffer, and distance to population center), habitat structures (snags, vegetative ground cover, and presence of bank habitat), woody diversity, landscape and waterscape features (size of wilderness surrounding the wetland, altered areas have a greater number of pervious ground areas than impervious, surface water % beneficial to songbird nesting, distance to ponded water, area of WWL9 with persistent surface water) and some factors leading to higher productivity scores including width of vegetative area. The lack of pesticide use in WWL9, a highly vegetated buffer, large amount of forested area within 5 km, absence of invasive plants, presence of forbs, high ground irregularity, downed wood, presence of snags and some bare ground, woody height form diversity, and richness of herbaceous stratum all influenced the higher rating for the effectiveness of WWL9 to support pollinating insects. The effectiveness of WWL9 to support native, hydrophytic vegetation was influenced by terrestrial fertility (nitrogen fixers, organics in soil, and length of growing season compared to more northern regions), aquatic fertility factors (inflowing

Wetland Area	Assessment
	streams could bring plant propagules, a 10-50 cm depth and fluctuation range), lack of invasives, herbaceous richness, low anthropogenic stressors (some erosion in contributing area, ditching and stormwater runoff) , along with landscape and wilderness area effects. Higher ratings for stream flow support, organic export, and water cooling contributed to the higher rating for the aquatic support group. Stream flow support group rated higher in WWL9, influencing the higher aquatic support group rating, because of a persistent outflow likely indicating the support of summer flow in hydrologically connected downstream systems, surface storage strength from a depth of water up to 50 cm, deep peat soils and a non-southern aspect, possibly having water persist longer into growing season via slower freshet and less evapotranspiration. Historical accumulation of organics, export potential (measured by persistent outflow, vegetative width, outflow constriction, and flow distance), ground cover implying more organic content, annual productivity is greater in shallower water depths, with depths in WWL9 ranging from 10-50 cm, and factors contributing to nutrient availability all are credited to the higher organic nutrient export potential in WWL9. The function indicators influencing the higher rating for the effectiveness of WWL9 to maintain water temperatures or reduce them were most of the water in WWL9 was shaded, belowground, and flowing.
WWL10	The wetland functional assessment revealed that WWL10 had higher function ratings for transition habitat group, hydrologic group, and water quality support group. All wetland functions with higher ratings in WWL10 contributing to the higher ratings of group functions will be discussed below. The pollinator habitat function rated higher because of the lack of pesticide use in WWL10, large amount of forested area within 5 km, short distance to wilderness area, absence of invasive plants, and richness of potential nesting areas (high ground irregularity, downed wood, some bare ground, steep banks, extensive microtopography) influenced the higher rating for the effectiveness of WWL10 to support pollinating insects. Sediment retention function in WWL10 was rated higher because of frictional forces and a lower internal gradient, no evidence of erosion to hamper sediment retention, size of the wetland versus runoff from the catchment area, internal flow distance of 50-100 m to allow sediment deposition, lack of an outlet, and longer growing season than more northern regions allow for more infiltration if ground is not frozen. Connectivity in WWL10 (lack of an outlet and low gradient), redox potential (long upland/wetland contact and frictional resistance), WWL10 being an established wetland, among other factors causing warming (growing degree days, and non-northern aspect), and erosion resistance function indicators are credited to the higher rating for nitrogen removal and retention. The higher carbon sequestration rating is attributed to historical accumulation (wetland is established, presence of deciduous plant litter, and no evidence of soil disturbance), physical accumulation (low internal gradient ability to slow runoff and most carbon entering would not be exported as

Wetland Area	Assessment
	there is no outlet), and factors leading to slowed decomposition (moss coverage represents a considerable amount of carbon) and limiting of methane (lack of groundwater evidence and some larger trees representing large stores of carbon). Water storage, a function attributing to the higher rating of the hydrologic group, rated higher in WWL10 because there is no outlet, allowing water either to be stored or to dissipate, a longer growing season compared to more northern regions implies water can be removed by vegetation, non-northern facing aspect implies ground is unfrozen longer than northern facing aspects, a low internal gradient, extensive microtopography, and an internal flow distance providing greater friction that a shorter distance at slowing/desynchronizing flow.
WWL12	The wetland functional assessment revealed that WWL12 had higher function ratings for transition habitat group, hydrologic group, and water quality support group. All wetland functions with higher ratings in WWL12 contributing to the higher ratings of group functions will be discussed below. The pollinator habitat function, rated higher because of the lack of pesticide use in WWL12, presence of shrubs, large amount of forested area within 5 km, short distance to wilderness area, absence of invasive plants, woody height form diversity, and richness of potential nesting areas (downed wood, some bare ground, steep banks, intermediate microtopography, and a mix of woody diameter classes) influenced the higher rating for the effectiveness of WWL12 to support pollinating insects. Sediment retention function in WWL12 was rated higher because of frictional forces (intermediate microtopography, low gradient, vegetative ground cover, and no evidence of erosion to hamper sediment retention), size of the wetland versus runoff from the catchment area, internal flow distance of 50-100 m to allow sediment deposition, lack of an outlet, and longer growing season than more northern regions allow for more infiltration if ground is not frozen. Connectivity in WWL12 (lack of an outlet and low gradient), redox potential (long upland/wetland contact and intermediate ground irregularity), a shallow peat substrate, WWL12 being an established wetland, among other factors causing warming (growing degree days, and non-northern aspect), and erosion resistance function indicators are credited to the higher rating for nitrogen removal and retention. The higher carbon sequestration rating is attributed to historical accumulation (wetland is established, presence of deciduous plant litter and shallow peat, and no evidence of soil disturbance), physical accumulation (low internal gradient ability to slow runoff), and factors leading to slowed decomposition (moss coverage represents a considerable amount of carbon) and limiting of methane (lack of groundwater evidence and some larger trees representing large stores of carbon).

Wetland Area	Assessment
	Water storage, a function attributing to the higher rating of the hydrologic group, rated higher in WWL12 because there is no outlet, allowing water either to be stored or to dissipate, a longer growing season compared to more northern regions implies water can be removed by vegetation, non-northern facing aspect implies ground is unfrozen longer than northern facing aspects, shallow peat providing water storage, a low internal gradient, intermediate microtopography, and an internal flow distance providing greater friction that a shorter distance at slowing/desynchronizing flow.
WWL13	The wetland functional assessment revealed that WWL13 had higher function ratings for transition habitat group, hydrologic group, and water quality support group. All wetland functions with higher ratings in WWL13 contributing to the higher ratings of group functions will be discussed below. The pollinator habitat function, rated higher because of the lack of pesticide use in WWL13, presence and diversity of shrubs, large amount of forested area within 5 km, short distance to wilderness area, absence of invasive plants, woody height form diversity, and richness of potential nesting areas (downed wood, large snags, vegetated ground cover, steep banks, intermediate microtopography, and a mix of woody diameter classes) influenced the higher rating for the effectiveness of WWL13 to support pollinating insects. The higher phosphorus retention function rating in WWL13 was influenced by lack of standing water (moist sites have higher phosphorus retention potential), deep peat substrate (higher potential to contain aluminum which aids in long-term retention of phosphorus), a low gradient, hydrologic throughflow roughness, ground cover, intermediate microtopography, wetland to CA can imply greater phosphorus retention, and a longer growing season than more northern regions increases the days that sediment bound-P can infiltrate the unfrozen ground. The higher carbon sequestration rating is attributed to historical accumulation (wetland is established, presence of deciduous plant litter, moss coverage and deep peat), physical accumulation (low internal gradient ability to slow runoff), and factors leading to slowed decomposition (moss coverage represents a considerable amount of carbon and growing season) and limiting of methane (lack of groundwater evidence and some larger trees representing large stores of carbon). Water storage, a function attributing to the higher rating of the hydrologic group, rated higher in WWL13 because of the roughness of water flow substrate, a longer growing season compared to more northern regions implies water can be removed by vegetation, non-northern facing aspect implies ground is unfrozen longer than northern facing aspects, deep peat providing water storage, a low internal gradient, intermediate microtopography, and an internal flow distance providing greater friction that a shorter distance at slowing/desynchronizing flow.

Wetland Area	Assessment
WWL15	The wetland functional assessment revealed that WWL15 had higher function ratings for transition habitat group, hydrologic group, and water quality support group. All wetland functions with higher ratings in WWL15 contributing to the higher ratings of group functions will be discussed below. The pollinator habitat function, rated higher because of the lack of pesticide use in WWL15, presence of shrubs, large amount of forested area within 5 km, short distance to wilderness area, absence of invasive plants, and richness of potential nesting areas (downed wood, large snags, steep banks, intermediate microtopography, and a mix of woody diameter classes) influenced the higher rating for the effectiveness of WWL15 to support pollinating insects. Sediment retention function in WWL15 was rated higher because of frictional forces (intermediate microtopography, low gradient, high vegetative ground cover, and no evidence of erosion to hamper sediment retention), size of the wetland versus runoff from the catchment area, internal flow distance of 50-100 m to allow sediment deposition, lack of an outlet, and longer growing season than more northern regions allow for more infiltration if ground is not frozen. Connectivity in WWL15 (lack of an outlet and low gradient), redox potential (long upland/wetland contact and intermediate ground irregularity), a deep peat substrate, WWL15 being an established wetland, among other factors causing warming (growing degree days, intermixing of height classes, and non-northern aspect), and erosion resistance function indicators are credited to the higher rating for nitrogen removal and retention. The higher phosphorus retention function rating in WWL15 was influenced by lack of standing water (moist sites have higher phosphorus retention potential), lack of an outlet, deep peat substrate (higher potential to contain aluminum which aids in long-term retention of phosphorus), a low gradient , highly vegetative ground cover, intermediate microtopography, wetland to CA ratio can imply greater phosphorus retention, and a longer growing season than more northern regions increases the days that sediment bound-P can infiltrate the unfrozen ground. The higher carbon sequestration rating is attributed to historical accumulation (wetland is established, presence of deciduous plant litter , moss coverage, absence of soil disturbance, and deep peat), physical accumulation (low internal gradient ability to slow runoff), and factors leading to slowed decomposition (moss coverage represents a considerable amount of carbon) and limiting of methane (lack of groundwater evidence and some larger trees representing large stores of carbon). Water storage, a function attributing to the higher rating of the hydrologic group, rated higher in WWL15 because of a longer growing season compared to more northern regions implies water can be removed by vegetation, absence of an outflow, non-northern facing aspect implies ground is unfrozen longer than northern facing aspects, deep peat providing water storage, a low internal gradient, intermediate microtopography, and an internal flow distance providing greater friction that a shorter distance at slowing/desynchronizing flow.

Wetland Area	Assessment
WWL16	The wetland functional assessment revealed that WWL16 had higher function ratings for transition habitat group, hydrologic group, and water quality support group. All wetland functions with higher ratings in WWL16 contributing to the higher ratings of group functions will be discussed below. The pollinator habitat function, rated higher because of the lack of pesticide use in WWL16, presence of shrubs, large amount of forested area within 5 km, short distance to wilderness area, absence of invasive plants, and richness of potential nesting areas (downed wood, large snags, steep banks, intermediate microtopography, and a mix of woody diameter classes) influenced the higher rating for the effectiveness of WWL16 to support pollinating insects. Sediment retention function in WWL16 was rated higher because of frictional forces (intermediate microtopography, low gradient, high vegetative ground cover, and no evidence of erosion to hamper sediment retention), size of the wetland versus runoff from the catchment area, internal flow distance of 50-100 m to allow sediment deposition, lack of an outlet, and longer growing season than more northern regions allow for more infiltration if ground is not frozen. Connectivity in WWL16 (lack of an outlet and low gradient), redox potential (long upland/wetland contact and intermediate ground irregularity), a deep peat substrate, WWL16 being an established wetland, among other factors causing warming (growing degree days, intermixing of height classes, and non-northern aspect), and erosion resistance function indicators are credited to the higher rating for nitrogen removal and retention. The higher phosphorus retention function rating in WWL16 was influenced by lack of standing water (moist sites have higher phosphorus retention potential), lack of an outlet, deep peat substrate (higher potential to contain aluminum which aids in long-term retention of phosphorus), a low gradient , highly vegetative ground cover, intermediate microtopography, wetland to CA ratio can imply greater phosphorus retention, and a longer growing season than more northern regions increases the days that sediment bound-P can infiltrate the unfrozen ground. The higher carbon sequestration function rating in WWL16 is attributed to historical accumulation (wetland is established, presence of deciduous plant litter, moss coverage, absence of soil disturbance, and deep peat), physical accumulation (low internal gradient ability to slow runoff), and factors leading to slowed decomposition (moss coverage represents a considerable amount of carbon) and limiting of methane (lack of groundwater evidence and some larger trees representing large stores of carbon). Water storage, a function attributing to the higher rating of the hydrologic group, rated higher in WWL16 because of a longer growing season compared to more northern regions implies water can be removed by vegetation, absence of an outflow, non-northern facing aspect implies ground is unfrozen longer than northern facing aspects, deep peat providing water storage, a low internal gradient, intermediate microtopography, and an internal flow distance providing greater friction that a shorter distance at slowing/desynchronizing flow.

Table 2: Northeast Study Area Wetland Assessment

Wetland Area	Assessment
NEWL1	The wetland functional assessment revealed that NEWL1 had higher function ratings for transition habitat, aquatic support, hydrologic, and water quality support groups. The wetland functions with higher ratings contributing to the higher ratings of group functions will be discussed below. Higher transition group function rating for NEWL1 is due largely to the effectiveness of the wetland in supporting pollinating insects, with abundance of nest sites in downed wood and large snags, a wider variety of woody plant species with varied diameter classes, absence of invasive plants, and low anthropogenic stressor inputs. The plant habitat function rating for NEWL1 was high largely due to terrestrial fertility, the large, forested tract around wetland, and low anthropogenic stressor inputs. Songbird, raptor, and mammal habitat ratings were higher owing to drier wetland conditions favorable for songbirds, large snags providing habitat and ample ground cover for ground-nesters and mammals. The transition habitat group function rated the highest of the group functions. Other group functions that had higher ratings [in descending order] were aquatic support, hydrologic, and water quality support. Water temperatures in the summer remaining cooler as water in wetland is subsurface, presence of abundant invertebrate habitat, carbon availability in peat, extensive ground cover implying high organic matter all contribute to the higher rating for the aquatic support group. Temporary surface flows, leading to increased storage when ground is unsaturated, deep peat soil texture, and factors leading to increased friction to water movement compound the effectiveness of NEWL1 to store water (higher hydrological group rating). The higher water quality support group rating owes itself to friction slowing water flow (caused by vegetative ground cover and low internal gradient offering frictional resistance) promoting sedimentation. Other factors contributing to the high rating of the water quality support group are moss coverage, deciduous tree litter, low internal gradient, deep peat (carbon sequestration), the area is mainly unflooded and has dense ground vegetation cover (phosphorus retention).
NEWL2	The wetland functional assessment revealed that NEWL2 had higher functional ratings in the transition habitat and aquatic habitat groups. The wetland functions with higher ratings contributing to the higher ratings of group functions will be discussed below. In NEWL2, the transition habitat group function rated higher because of the diversity of hydrophytic vegetation, the abundance and richness of songbirds, raptors, and mammals, and the wetland is effective at supporting pollinating insects. There are many nesting sites for pollinating insects in NEWL2 including snags, downed wood, bare ground,

Wetland Area	Assessment
	and habitat within ground microtopography. Higher plant diversity, a variety of woody diameter classes, and presence of forbs also play a role in the higher function scoring for supporting pollinating insects. Native plant habitat rated higher as invasive species cover is low, high woody height diversity is present, dominant herbaceous species richness is high, extensive microtopography possibly creating different flood frequencies and different moisture regimes, presence of nitrogen fixing plants, deep peat soil texture, NEWL2 having a mostly unvisited core area, and a low to moderate anthropogenic stressor inputs. The capacity of NEWL2 to support songbirds, raptors, and mammals comes mostly from complex habitat structure and landscape characteristics. Vegetative ground cover, extensive microtopography, presence of snags and downed wood provide wildlife habitat, woody height diversity support songbird richness. NEWL2 is a wetland complex, so is likely to support more species or varying life history strategies of similar species. The proximity of NEWL2 to a large vegetative tract and the amount of wilderness surrounding the wetland, with most of the altered land surface being pervious, could help support increased diversity of mammals and songbirds. The aquatic habitat group function rating was higher due to a higher function rating for the capacity of NEWL2 to support rearing or spawning anadromous fish habitat and tallied moderate function rating for amphibian and turtle habitat, resident fish habitat, waterbird feeding habitat, and waterbird nesting habitat wetland function ratings. The higher rating for the capacity of NEWL2 to support anadromous fish species came from its close proximity to the Bay of Fundy, it is known to contain anadromous fish (ACCDC report), the catchment area is > 75% vegetated having higher potential to provide terrestrial invertebrates as food versus unvegetated surroundings, and it acts as a filter increasing water quality. Most of the water in NEWL2 is shaded, NEWL2 has a persistent outflow, the diffuse characteristics and complexity of channels supports many life history strategies of different species of fish and invertebrates, and low anthropogenic stressors inputs all contribute to higher rated anadromous fish habitat.
NEWL3	The wetland functional assessment revealed that NEWL3 had higher function ratings for the transition habitat group and water quality support group. All the wetland functions that contributed to the higher function rating for transition habitat (songbird, raptor, and mammal habitat, pollinator habitat, and native plant habitat) in NEWL3 had higher function ratings. One out of four of the wetland functions contributing to the higher function rating of the water quality support group had a higher function rating in NEWL3: carbon sequestration wetland function. The wetland functions with higher function ratings contributing to the higher function ratings of group functions will be discussed below. The effectiveness of NEWL3 to support songbird, raptor, and mammal habitat was heavily influenced by the biotic and abiotic structural components of the wetland: variability of tree height in the wetland, shrub diversity, interspersion

Wetland Area	Assessment
	of height classes, varied tree types, vegetated ground cover, intermediate ground irregularity, and presence of large snags and downed wood. Landscape and waterscape characteristics of NEWL3 altered the effectiveness to support songbirds, mammals, and raptors including: the proximity to and the size of the large, vegetated tract of land surrounding the wetland and the disturbed/altered ground being permeable vs. impermeable, lack of surface water in the wetland and proximity to standing water. The unvisited core area by humans, highly vegetated buffer, greater than 1 km distance to a population center, and the [at least] 100 metre distance to the nearest road (all stressor related) contributes to the higher function rating of the songbird, mammal, and raptor habitat functioning. The capacity of NEWL3 to support pollinating insects was a result of the presence of forbs, absence of invasive plants, a variety of woody diameters, presence of large snags and downed wood, intermediate ground irregularity, and at least 80% vegetated ground cover, no accelerated inputs of contaminants to the site, and natural vegetated buffers and surrounding landscapes. The capacity of NEWL3 to support and contribute to a variety of native, hydrophytic vascular plants was credited to the large surrounding vegetative area, the amount of drier wetland area supporting more plant growth, high organics in soils, presence of nitrogen fixers increasing soil fertility, absence of invasives, high woody height diversity, high vegetation height class interspersion, intermediate ground irregularity and the lack of anthropogenic stressors. The high rating in the carbon sequestration wetland function contributing to the high rating in the water quality support function group for NEWL3 was affected by: presence of peat, presence of larger trees, presence of deciduous trees, a narrow outlet which could impound water and allow carbon to settle, lack of groundwater (can stimulate methane emissions), low internal gradient, and no evidence of soil or sediment alteration. Moderate ratings from wetland functions for sediment retention and stabilization, phosphorus retention, and nitrate removal and retention also contributed to the higher function rating of water quality support group.
NEWL4	The wetland functional assessment revealed that NEWL4 had higher function ratings for the transition habitat group and water quality support groups. All the wetland functions that contributed to the higher function rating for transition habitat group (songbird, raptor, and mammal habitat, pollinator habitat, and native plant habitat) in NEWL4 had higher function ratings. Two out of four of the wetland functions contributing to the higher function rating of the aquatic support group had higher function ratings in NEWL4: organic nutrient export and water-cooling functions. The wetland functions with higher ratings contributing to the higher ratings of group functions will be discussed below. Landscape and waterscape factors played a large role in the higher rating for songbirds, mammals, and raptors habitat function, followed by the biotic and abiotic structure of the wetland. The distance to and the size of the large nearby

Wetland Area	Assessment
	vegetated tract of land, as well as the amount of vegetated land within 5 km of NEWL4, ponded water being within 50-500 m of the wetland and a paucity of standing water played a role in higher rating for songbirds, mammals, and raptors habitat function. Structural components in NEWL4 included woody height diversity, shrub diversity, and varied tree types added complexity to habitat favorable to the wildlife mentioned above. A lack of human visitation, vegetated buffer around the wetland, and far distance from a population center implies low anthropogenic inputs. The capacity of NEWL4 to support pollinating insects was weighted mainly by the lack of invasive plants, high woody height form diversity, plant diversity, good nesting habitat in the form of snags, downed wood, intermediate ground irregularity and vegetative ground cover, low persistent water providing conditions for high plant diversity, and lack of stressors by way of no human visitation, vegetated buffer and influence of large, vegetated areas nearby. The capacity of NEWL4 to support or contribute to native hydrophytic, vascular plant species was weighted by the large amount of forest surrounding the wetland, probability of beaver activity with presence of beaver habitat, close proximity to a pond, the amount of drier wetland area, high organics in soils, presence of nitrogen fixers increasing soil fertility, absence of invasives, high woody height diversity, deciduous cover, high vegetation height class interspersion, intermediate ground irregularity and mild anthropogenic stressors. The fact that most water is underground or flowing, and > 75% of water is shaded contributed to the higher rating for the water cooling wetland function in NEWL4. The effectiveness of NEWL4 for producing and exporting organic nutrients was rated higher, adding to the higher aquatic support group rating from the presence of nitrogen fixing alders, a deep organic layer, NEWL4 has an outlet that can export dissolved organics in shallow flowing water, with the shallow water having more exposure to light than deeper water, having the potential to increase productivity.
NEWL5	The wetland functional assessment for NEWL5 had higher function ratings for the hydrologic group and water quality support group. The water storage and delay function contributed to the higher function rating for hydrology group in NEWL5. Three out of four of the wetland functions contributing to the higher function rating of the water quality support group had higher function ratings in NEWL5: carbon sequestration, sediment retention and stabilization, and nitrate removal and retention. The wetland functions with higher function ratings contributing to the higher function rating of group functions will be discussed below. The low internal gradient, the absence of an outlet, shallow peat substrate, intermediate ground micro-topography, and the large size of the wetland compared to its catchment contributed to the higher rating for the water storage and delay functioning in NEWL5. The low internal gradient, NEWL5 being an established wetland, peat substrate implying a favorable microclimate for particulate carbon retention, large sphagnum moss coverage, large diameter trees, 5-50 % sedge cover, and deciduous

Wetland Area	Assessment
	leaf little increasing carbon cycling are factors leading to the high rating for the effectiveness of NEWL5 to retaining particulate and organic carbon. Denitrification occurs along the long upland edge interface, presence of dense ground vegetation, organic soils, lack of a hydrological outlet, low internal gradient and the fact that NEWL5 is an established wetland are the main drivers of the higher rating for effectiveness of the wetland to retain particulate nitrate and convert nitrate and ammonium to nitrogen gas. Factors increasing frictional resistance of water, the lack of a wetland outlet, a low internal gradient, and no soil disturbance are the primary factors influencing the higher rating for sediment retention and stabilization function in NEWL5.
Wetland NEWL6	The wetland functional assessment for NEWL6 had higher function ratings for the hydrologic group, water quality support group, and transition habitat group. The wetland functions with higher ratings contributing to the higher ratings of group functions will be discussed below. The presence of shallow peat, absence of a wetland outlet, low internal gradient, faster warming aspect (not north facing so could become thawed quicker), and large size relative to catchment area (wetland is 10-100% the size of the catchment area) in NEWL6 are the main factors influencing the higher rating for the water storage and delay function which contributes to the high hydrology group rating. The factors leading to frictional slowing of water flow, the wetland size compared to the catchment, the absence of an outlet in NEWL6, a low internal gradient, and no evidence of soil alteration are factors leading to the higher function rating for sediment retention and stabilization. The continuous upland edge, higher organic content of soils in NEWL6, the lack of outlet, low internal gradient, and the fact that NEWL6 is an established wetland contributes to the nitrogen removal and retention higher function rating. The presence of peat as a favorable microclimate for carbon retention, the 50-95% sphagnum cover, the 5-50% *Carex* species cover, low internal gradient, lower soil disturbance, and deciduous tree presence contributes to the higher rating for carbon sequestration functioning. The capacity of NEWL6 to support pollinating insects was weighed mainly by the lack of invasive plants, high woody height form diversity, good nesting habitat in the form of snags, downed wood, bare earth, lack of pesticides used in the area, vegetated buffer and the proximity and size of large, vegetated areas nearby. Factors leading to terrestrial fertility (nitrogen fixation and organic carbon content of soils), lack of stressors (human visitation, lack of salt, sediment deposition and disturbance, no evidence of invasive plants along wetland upland interface, and distance to roads and population centers), and the amount of natural vegetation [30 m extending from wetland edge] contribute to the higher ranking of the capacity to support native, hydrophytic plant habitat in NEWL6.

Wetland Area	Assessment
NEWL7	The wetland functional assessment revealed that NEWL7 had higher function ratings for the transition habitat group and aquatic support group. The wetland functions with higher ratings in NEWL7 contributing to the higher ratings of group functions will be discussed below. Landscape features (size, proximity to, and greater surrounding proportion of natural vegetated tracts of land and altered land tends towards pervious surfaces), waterscape features (paucity of standing water benefiting habitat complexity for songbirds, 80% of wetland is not flooded all year, supporting more terrestrial biota, and suitable habitat for beavers being present had potential to support greater richness of birds) and lack of stressors (vegetated buffer present, lack of human visitation to core of NEWL7, and large distance to population center) are the main drivers of the higher rating for the capacity of NEWL7 to support songbird, raptor, and mammal habitat, along with the fertilizing effects of 25-50% cover of nitrogen fixers present increasing productivity and mostly dense ground cover vegetation providing ground nesting habitat. The capacity of NEWL7 to support pollinating insects was on account of the lack of invasive plants, high woody height form diversity, good nesting habitat in the form of downed wood, and bare earth, low persistent surface water, the lack of pesticides used in the area, presence of a vegetated buffer, the proximity and size of large, vegetated areas nearby, the presence of forbs and different woody diameter classes, lack of human visitation, and distance to population center. The effectiveness of NEWL7 to produce and export organic nutrients is mainly driven by its historical accumulation (established wetland with a shallow peat substrate), shallow water depths (increasing productivity in relation to hypothetically deeper waters), probability of leafy material exiting wetland via overhanging vegetation, extensive ground cover, non-northern aspect, the wetland is at the base of a hill, export potential (outflow, flowing water distance, outlet characteristics) all contribute to the potential organic matter export function of the wetland that amplifies the group rating for the aquatic support. The water cooling function that contributes to the aquatic support group rated higher because of the high amount of shaded waters in NEWL7, most water is flowing if present, and most of the wetland water is underground and away from the influence of the sun. The effectiveness of NEWL7 for extending flow duration into drier parts of the growing season was mainly by reason of the persistent surface outlet observed and the peat soils having potential to retain water for longer periods of time.
NEWL8	The wetland functional assessment revealed that NEWL8 had higher function ratings for the hydrologic group and the water quality support group. The wetland functions with higher ratings in NEWL8 contributing to the higher ratings of group functions will be discussed below.

Wetland Area	Assessment
	The low internal gradient, absence of an outlet, considerable amount of water that can be stored in peat substrate, southern facing aspect decreasing time the ground is frozen contributed to higher rating for water storage and delay functioning. The frictional slowing of water flow, high ratio of wetland storage basin to catchment, the absence of an outlet in NEWL8, a low internal gradient, and no evidence of soil alteration are factors leading to the higher function rating for sediment retention and stabilization. More than 75% of the upland edge interfaces with wetland, absence of an outlet, a low gradient paired with dense vegetation creating hydrological friction forces, the wetland size compared to catchment makes nutrient loading more likely, higher organic content of soils in NEWL8, fact that the wetland is establish and not new, and lack of outlet are all factors contributing to higher rating for nitrogen removal and retention higher function rating. The presence of peat as a favorable microclimate for carbon retention, the >95% sphagnum cover, low internal gradient, lower soil disturbance, the wetland is not new, no anaerobic ground water present to increase methane emissions, and deciduous tree presence, with some trees with large diameters present contributing to carbon storage are all factors adding up to the higher rating for carbon sequestration functioning rating.

APPENDIX C

Atlantic Canada Conservation Data Centre Report 2022

Appendix C1. Species at Risk and Species of Conservation Concern Definitions

- Species at Risk (SAR) are species designated as Endangered, Threatened, or of Special Concern under SARA or any species listed as Endangered, Threatened, or Special Concern under the NB SARA.
- Species of Conservation Concern (SoCC) are species listed with sub-national conservation ranks (S-Rank) as S1 - S3S4 by the AC CDC. A description of the S-Ranks is provided in **the** table below.

S-Rank	Definition
S1	**Critically Imperiled** - Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.
S2	**Imperiled** - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.
S3	**Vulnerable** - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4	**Apparently Secure** - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	**Secure** - Common, widespread, and abundant in the province.
SNR	**Unranked** - Provincial conservation status not yet assessed.
SU	**Unrankable** - Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA	**Not Applicable** - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S#	**Range Rank** - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
Breeding Status Qualifiers	
B	**Breeding** - Conservation status refers to the breeding population of the species in the province.
N	**Nonbreeding** - Conservation status refers to the non-breeding population of the species in the province.
M	**Migrant** - Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province.

Source: AC CDC, http://accdc.com/en/rank-definitions.html.

DATA REPORT 7328: West Lepreau, NB

Prepared 28 June 2022
by J. Pender, Data Manager

CONTENTS OF REPORT

Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; www.accdc.com) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The AC CDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the AC CDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename	Contents
WLepreauNB_7328ob.xls	Rare or legally-protected Flora and Fauna in your study area
WLepreauNB_7328ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
WLepreauNB_7328msa.xls	Managed and Biologically Significant Areas in your study area

1.2 RESTRICTIONS

The AC CDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting AC CDC data, recipients assent to the following limits of use:

a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c) The AC CDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
d) AC CDC data responses are restricted to the data in our Data System at the time of the data request.
e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
f) AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area.
g) The absence of a taxon cannot be inferred by its absence in an AC CDC data response.

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

Please direct any additional questions about AC CDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries	Sean Blaney	Senior Scientist / Executive Director	(506) 364-2658	sean.blaney@accdc.ca
Animals (Fauna)	John Klymko	Zoologist	(506) 364-2660	john.klymko@accdc.ca
Data Management, GIS	James Churchill	Conservation Data Analyst / Field Biologist		james.churchill@accdc.ca
Billing	Jean Breau	Financial Manager / Executive Assistant	(506) 364-2657	jean.breau@accdc.ca

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

New Brunswick. For information about rare taxa, protected areas, game animals, deer yards, old growth forests, archeological sites, fish habitat etc., or to determine if location-sensitive species (section 4.3) occur near your study site, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

Nova Scotia. For information about Species at Risk or general questions about Nova Scotia location-sensitive species please contact the Biodiversity Program at biodiversity@novascotia.ca. For questions about protected areas, game animals, deer yards, old growth forests, archeological sites, fish habitat etc., or to determine if location-sensitive species (section 4.3) occur near your study site please contact a Regional Biologist:

DIGB, ANNA, KING	Emma Vost	(902) 670-8187	Emma.Vost@novascotia.ca
SHEL, YARM	Sian Wilson	(902) 930-2978	Sian.Wilson@novascotia.ca
QUEE, LUNE	Peter Kydd	(902) 523-0969	Peter.Kydd@novascotia.ca
HALI, HANT	Shavonne Meyer	(902) 893-0816	Shavonne.Meyer@novascotia.ca
Central Region	Jolene Laverty	(902) 324-8953	Jolene.Laverty@novascotia.ca
COLC, CUMB	Kimberly George	(902) 890-1046	Kimberly.George@novascotia.ca
ANTI, GUYS	Harrison Moore	(902) 497-4119	Harrison.Moore@novascotia.ca
INVE, VICT	Maureen Cameron-MacMillan	(902) 295-2554	Maureen.Cameron-MacMillan@novascotia.ca
CAPE, RICH, PICT	Elizabeth Walsh	(902) 563-3370	Elizabeth.Walsh@novascotia.ca

Prince Edward Island. For information about rare taxa, protected areas, game animals, fish habitat etc., please contact Garry Gregory, PEI Department of Environment, Energy and Climate Action: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

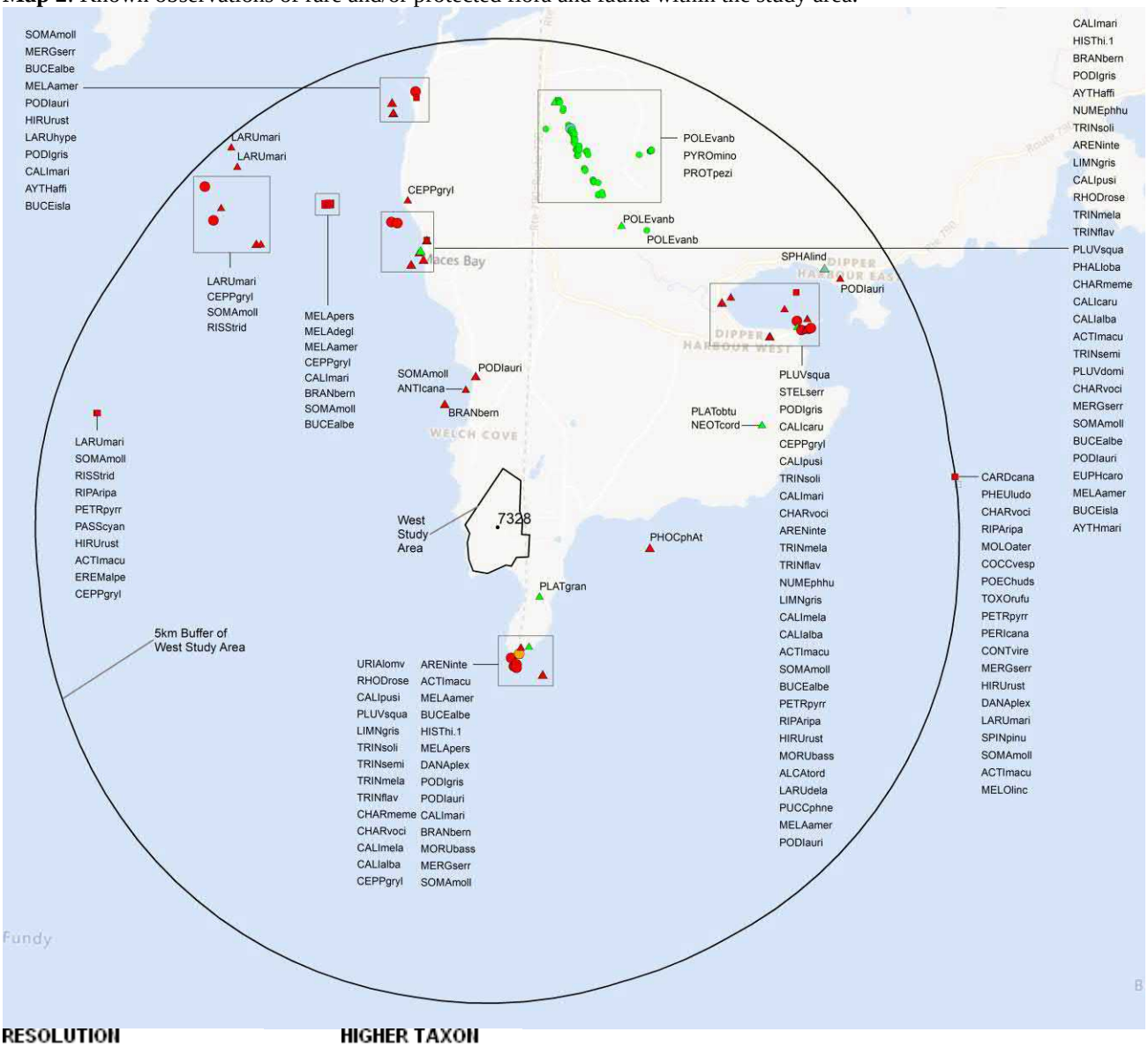
2.1 FLORA

The study area contains 79 records of 7 vascular, 2 records of 2 nonvascular flora (Map 2 and attached: *ob.xls), excluding 'location-sensitive' species.

2.2 FAUNA

The study area contains 768 records of 58 vertebrate, 2 records of 1 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List), excluding 'location-sensitive' species. Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within the study area.



RESOLUTION

- 4.7 within 50s of kilometers
- 4.0 within 10s of kilometers
- 3.7 within 5s of kilometers
- 3.0 within kilometers
- 2.7 within 500s of meters
- 2.0 within 100s of meters
- 1.7 within 10s of meters

HIGHER TAXON

- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora

3.0 SPECIAL AREAS

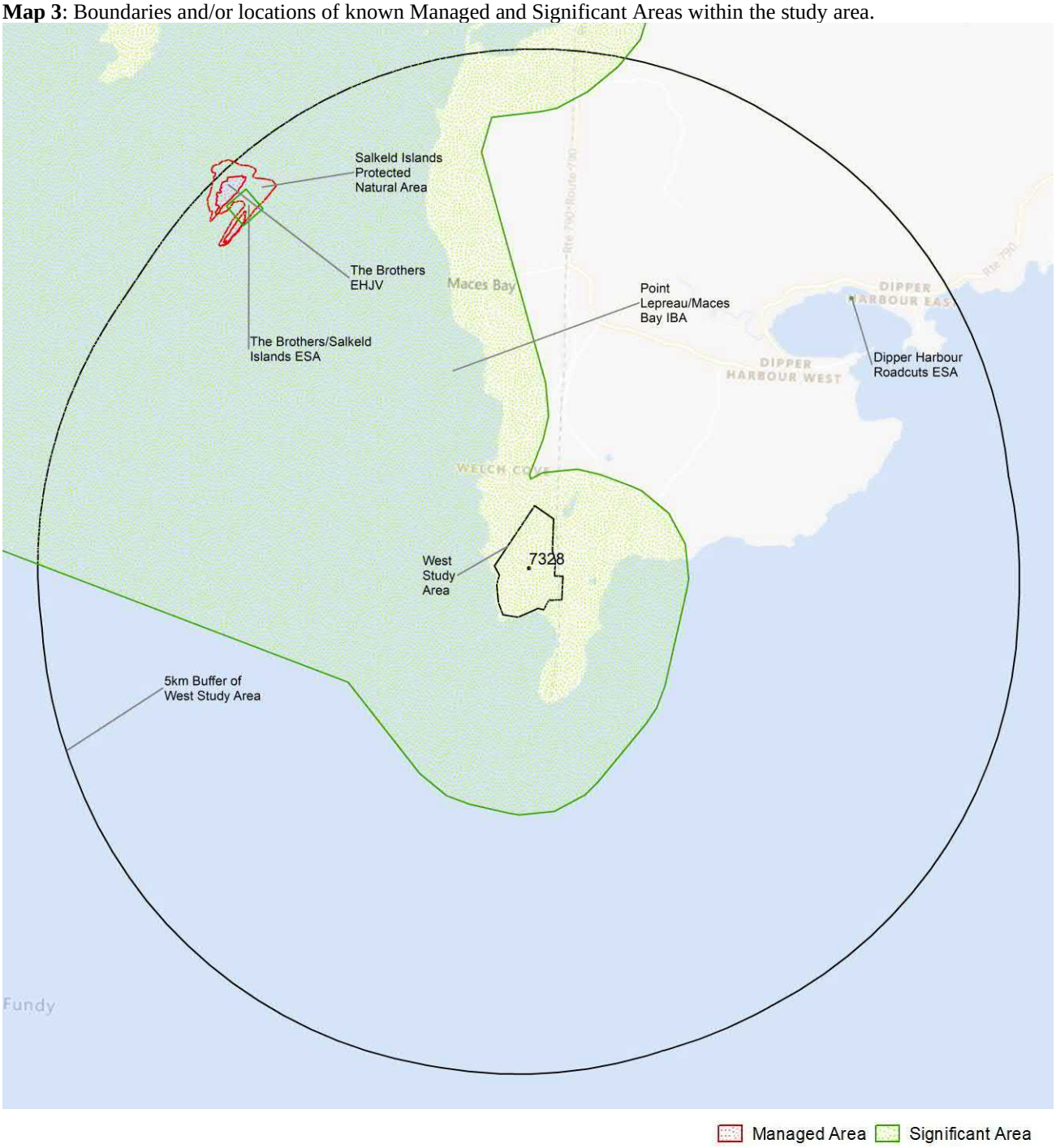
3.1 MANAGED AREAS

The GIS scan identified 2 managed areas in the vicinity of the study area (Map 3 and attached file: *msa.xls).

3.2 SIGNIFICANT AREAS

The GIS scan identified 3 biologically significant sites in the vicinity of the study area (Map 3 and attached file: *msa.xls).

Map 3: Boundaries and/or locations of known Managed and Significant Areas within the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding "location-sensitive" species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S2	1	4.9 ± 1.0
N	*Protopannaria pezizoides*	Brown-gray Moss-shingle Lichen				S3S4	1	4.7 ± 0.0
P	*Polemonium vanbruntiae*	Van Brunt's Jacob's-ladder	Threatened	Threatened	Threatened	S1	68	3.8 ± 0.0
P	*Puccinellia phryganodes ssp. neoarctica*	Creeping Alkali Grass				S2S3	1	4.2 ± 0.0
P	*Rhodiola rosea*	Roseroot				S3	5	1.4 ± 0.0
P	*Pyrola minor*	Lesser Pyrola				S3	1	4.7 ± 0.0
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	2	0.9 ± 0.0
P	*Neottia cordata*	Heart-leaved Twayblade				S3S4	1	3.3 ± 0.0
P	*Platanthera obtusata*	Blunt-leaved Orchid				S3S4	1	3.3 ± 0.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Charadrius melodus melodus*	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	3	1.4 ± 0.0
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2B	3	4.3 ± 0.0
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	45	1.4 ± 0.0
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	56	1.5 ± 0.0
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Threatened	S2B	9	4.2 ± 0.0
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S2S3B,S3M	1	3.2 ± 1.0
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern	Special Concern	S2S3N,S3M	2	3.2 ± 2.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S3B	2	5.4 ± 7.0
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	1	5.4 ± 7.0
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S3M	1	3.3 ± 0.0
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern	Special Concern	S3N	29	1.5 ± 0.0
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Threatened	S3S4B	1	5.4 ± 7.0
A	*Phocoena phocoena*	Harbour Porpoise	Special Concern		Spec.Concern	S4	1	1.8 ± 1.0
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S2N,S3M	16	1.5 ± 0.0
A	*Calidris canutus rufa*	Red Knot rufa subspecies - Tierra del Fuego / Patagonia wintering population	E,SC	Endangered	Endangered	S2M	3	3.3 ± 0.0
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S4S5M	63	1.4 ± 0.0
A	*Grus canadensis*	Sandhill Crane				S1B	1	1.6 ± 0.0
A	*Rissa tridactyla*	Black-legged Kittiwake				S1B	2	4.8 ± 7.0
A	*Alca torda*	Razorbill				S1B	1	4.3 ± 2.0
A	*Aythya marila*	Greater Scaup				S1B,S2N,S4M	2	3.2 ± 1.0
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	2	3.4 ± 5.0
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	1	4.8 ± 7.0
A	*Branta bernicla*	Brant				S1N,S2S3M	10	1.5 ± 0.0
A	*Calidris alba*	Sanderling				S1N,S3S4M	29	1.4 ± 0.0
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B	1	4.4 ± 7.0
A	*Melanitta americana*	American Scoter				S1S2N,S3M	27	1.5 ± 0.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2B	7	4.3 ± 0.0
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S4S5M	11	1.4 ± 0.0
A	*Larus hyperboreus*	Glaucous Gull				S2N	1	5.0 ± 0.0
A	*Melanitta perspicillata*	Surf Scoter				S2N,S4M	5	1.7 ± 0.0
A	*Melanitta deglandi*	White-winged Scoter				S2N,S4M	2	4.2 ± 17.0
A	*Toxostoma rufum*	Brown Thrasher				S2S3B	1	5.4 ± 7.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Somateria mollissima*	Common Eider				S2S3B,S2S3N,S4M	47	1.6 ± 0.0
A	*Larus delawarensis*	Ring-billed Gull				S2S3B,S4N,S5M	2	4.3 ± 0.0
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	4	3.3 ± 0.0
A	*Larus marinus*	Great Black-backed Gull				S3	15	4.3 ± 0.0
A	*Spinus pinus*	Pine Siskin				S3	2	5.4 ± 7.0
A	*Charadrius vociferus*	Killdeer				S3B	27	1.4 ± 0.0
A	*Tringa semipalmata*	Willet				S3B	3	1.4 ± 0.0
A	*Cepphus grylle*	Black Guillemot				S3B	9	1.8 ± 1.0
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	1	5.4 ± 7.0
A	*Passerina cyanea*	Indigo Bunting				S3B	1	4.8 ± 7.0
A	*Molothrus ater*	Brown-headed Cowbird				S3B	1	5.4 ± 7.0
A	*Mergus serrator*	Red-breasted Merganser				S3B,S4S5N,S5M	4	1.6 ± 0.0
A	*Numenius phaeopus hudsonicus*	Whimbrel				S3M	7	3.3 ± 0.0
A	*Arenaria interpres*	Ruddy Turnstone				S3M	40	1.4 ± 0.0
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	49	1.4 ± 0.0
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	2	1.4 ± 0.0
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	32	1.4 ± 0.0
A	*Bucephala albeola*	Bufflehead				S3N	42	1.5 ± 0.0
A	*Calidris maritima*	Purple Sandpiper				S3N	51	1.4 ± 0.0
A	*Uria lomvia*	Thick-billed Murre				S3N,S3M	1	1.8 ± 1.0
A	*Perisoreus canadensis*	Canada Jay				S3S4	2	5.4 ± 7.0
A	*Poecile hudsonicus*	Boreal Chickadee				S3S4	4	5.4 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S4M	29	1.4 ± 0.0
A	*Melospiza lincolnii*	Lincoln's Sparrow				S3S4B,S4M	3	5.4 ± 7.0
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	46	1.4 ± 0.0
A	*Morus bassanus*	Northern Gannet				SHB	5	1.5 ± 0.0
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Special Concern	S2S3?B	2	1.5 ± 0.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species "location sensitive". Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are indicated below with "YES".

New Brunswick

Scientific *Name*	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
Chrysemys picta picta	Eastern Painted Turtle	Special Concern		No
Chelydra serpentina	Snapping Turtle	Special Concern	Special Concern	No
Glyptemys insculpta	Wood Turtle	Threatened	Threatened	No
Haliaeetus leucocephalus	**Bald Eagle**		**Endangered**	**YES**
Falco peregrinus pop. 1	**Peregrine Falcon - anatum/tundrius pop.**	**Special Concern**	**Endangered**	**YES**
Cicindela marginipennis	Cobblestone Tiger Beetle	Endangered	Endangered	No
Coenonympha nipisiquit	Maritime Ringlet	Endangered	Endangered	No
Bat hibernaculum or bat species occurrence		[Endangered][1]	[Endangered][1]	No

1 *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NB Species at Risk Act.

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
417	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
154	eBird. 2014. eBird Basic Dataset. Version: EBD_relNov-2014. Ithaca, New York. Nov 2014. Cornell Lab of Ornithology, 25036 recs.
54	Boyne, A.W. 2000. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 168 recs.
48	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
43	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
38	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
19	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
15	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
10	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
10	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
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3	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
3	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
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2	Honeyman, K. 2019. Unique Areas Database, 2018. J.D. Irving Ltd.
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1	Bird Studies Canada. 2020. Important Bird and Biodiversity Areas in Canada database (Retrieved: 28 July, 2020 from https://www.ibacanada.com/explore.jsp?lang=EN). IBA Program.
1	Boyne, A.W. 2000. Harlequin Duck Surveys. Canadian Wildlife Service, Sackville, unpublished data. 5 recs.
1	Canadian Wildlife Service. 2019. Canadian Protected and Conserved Areas Database (CPCAD). December 2019. ECCC.https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/protected-conserved-areas-database.html.
1	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
1	Clayden, S.R. 2007. NBM Science Collections. Pers. comm. to D. Mazerolle, 1 rec.
1	eBird. 2020. eBird Basic Dataset. Version: EBD_relNov-2019. Ithaca, New York. Nov 2019, Cape Breton Bras d'Or Lakes Watershed subset. Cornell Lab of Ornithology.
1	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.

# recs	CITATION
1	Pike, E., Tingley, S. & Christie, D.S. 2000. Nature NB Listserve. University of New Brunswick, listserv.unb.ca/archives/naturenb. 68 recs.
1	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
1	Thomas, A.W. 1996. A preliminary atlas of the butterflies of New Brunswick. New Brunswick Museum.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 44153 records of 158 vertebrate and 1340 records of 69 invertebrate fauna; 7208 records of 319 vascular, 1361 records of 162 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including “location-sensitive” species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	148	33.1 ± 1.0	NB
A	*Myotis septentrionalis*	Northern Myotis	Endangered	Endangered	Endangered	S1	33	34.2 ± 1.0	NB
A	*Perimyotis subflavus*	Tricolored Bat	Endangered	Endangered	Endangered	S1	39	34.8 ± 0.0	NB
A	*Eubalaena glacialis*	North Atlantic Right Whale	Endangered	Endangered	Endangered	S1	8	25.8 ± 0.0	NB
A	*Osmerus mordax pop. 2*	Rainbow Smelt - Lake Utopia Large-bodied population	Endangered	Threatened	Threatened	S1	2	28.1 ± 10.0	NB
A	*Charadrius melodus melodus*	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	27	1.4 ± 0.0	NB
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	35	32.3 ± 0.0	NB
A	*Dermochelys coriacea pop. 2*	Leatherback Sea Turtle - Atlantic population	Endangered	Endangered	Endangered	S1S2N	5	6.7 ± 0.0	NB
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy population	Endangered	Endangered	Endangered	S2	19	14.4 ± 0.0	NB
A	*Salmo salar pop. 7*	Atlantic Salmon - Outer Bay of Fundy population	Endangered		Endangered	SNR	356	8.9 ± 1.0	NB
A	*Rangifer tarandus pop. 2*	Caribou - Atlantic-Gasp ├⌐sie population	Endangered	Endangered	Extirpated	SX	4	48.5 ± 1.0	NB
A	*Lanius ludovicianus*	Loggerhead Shrike	Endangered	Endangered		SXB	1	54.6 ± 1.0	NB
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B	31	44.2 ± 7.0	NB
A	*Asio flammeus*	Short-eared Owl	Threatened	Special Concern	Special Concern	S1S2B	17	45.0 ± 0.0	NB
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened	Threatened	S1S2B	18	15.5 ± 4.0	NB
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened	Threatened	S1S2B	160	12.2 ± 7.0	NB
A	*Hydrobates leucorhous*	Leach's Storm-Petrel	Threatened			S1S2B	148	21.9 ± 0.0	NB
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S2B	65	18.2 ± 7.0	NB
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Threatened	Threatened	S2B	22	24.8 ± 7.0	NB
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2B	1147	4.3 ± 0.0	NB
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2S3	871	27.0 ± 0.0	NB
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	401	24.8 ± 7.0	NB
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Threatened	S3B	1308	12.2 ± 7.0	NB
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened		Threatened	S3B,S3N	2	61.4 ± 1.0	NB
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	706	1.4 ± 0.0	NB
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S3M	95	17.5 ± 0.0	NB
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S4N	67	14.6 ± 0.0	NB
A	*Coturnicops noveboracensis*	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B,SUM	3	84.9 ± 7.0	NB
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	211	1.5 ± 0.0	NB
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Threatened	S2B	1364	4.2 ± 0.0	NB
A	*Balaenoptera physalus*	Fin Whale	Special Concern	Special Concern		S2S3	19	20.3 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S2S3B,S3M	137	3.2 ± 1.0	NB
A	*Bucephala islandica*	Barrow's Goldeneye	Special Concern	Special Concern	Special Concern	S2S3N,S3M	50	3.2 ± 2.0	NB
A	*Acipenser brevirostrum*	Shortnose Sturgeon	Special Concern	Special Concern	Special Concern	S3	10	35.3 ± 10.0	NB
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	108	11.7 ± 1.0	NB
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S3B	687	5.4 ± 7.0	NB
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B	269	9.2 ± 0.0	NB
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	230	5.4 ± 7.0	NB
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	297	12.0 ± 7.0	NB
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S3M	230	3.3 ± 0.0	NB
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern	Special Concern	S3N	270	1.5 ± 19.0	NB
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Threatened	S3S4B	760	5.4 ± 7.0	NB
A	*Phocoena phocoena*	Harbour Porpoise	Special Concern		Spec.Concern	S4	246	1.8 ± 1.0	NB
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	109	28.2 ± 1.0	NB
A	*Anarhichas lupus*	Atlantic Wolffish	Special Concern	Special Concern	Special Concern	SNR	1	44.3 ± 0.0	NB
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S1?	8	93.1 ± 0.0	NS
A	*Fulica americana*	American Coot	Not At Risk			S1B	12	24.8 ± 7.0	NB
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk	Special Concern	Endangered	S1B,S3M	615	4.7 ± 0.0	NB
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	32	35.2 ± 3.0	NB
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1S2B	19	46.6 ± 0.0	NB
A	*Buteo lineatus*	Red-shouldered Hawk	Not At Risk			S1S2B	54	36.0 ± 0.0	NB
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B,SUM	5	44.5 ± 1.0	NB
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk			S2	2	50.8 ± 1.0	NB
A	*Chlidonias niger*	Black Tern	Not At Risk			S2B	347	56.6 ± 4.0	NB
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S2N,S3M	729	1.5 ± 0.0	NB
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3	3	8.9 ± 1.0	NB
A	*Desmognathus fuscus pop. 2*	Northern Dusky Salamander - Quebec / New Brunswick population	Not At Risk			S3	44	31.1 ± 1.0	NB
A	*Megaptera novaeangliae*	Humpback Whale	Not At Risk			S3	39	24.4 ± 0.0	NB
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	367	25.8 ± 0.0	NB
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	3	40.3 ± 1.0	NB
A	*Haliaeetus leucocephalus*	Bald Eagle	Not At Risk		Endangered	S4	1625	1.5 ± 0.0	NB
A	*Lynx canadensis*	Canada Lynx	Not At Risk		Endangered	S4	8	40.3 ± 50.0	NB
A	*Canis lupus*	Grey Wolf	Not At Risk		Extirpated	SX	3	27.3 ± 1.0	NB
A	*Puma concolor pop. 1*	Cougar - Eastern population	Data Deficient		Endangered	SU	43	12.7 ± 1.0	NB
A	*Calidris canutus rufa*	Red Knot rufa subspecies - Tierra del Fuego / Patagonia wintering population	E,SC	Endangered	Endangered	S2M	410	3.3 ± 0.0	NB
A	*Morone saxatilis*	Striped Bass	E,SC			S3S4B,S3S4N	13	36.5 ± 0.0	NB
A	*Odobenus rosmarus pop. 5*	Atlantic Walrus - Nova Scotia - Newfoundland - Gulf of St Lawrence population	X			SX	1	82.3 ± 5.0	NS
A	*Thryothorus ludovicianus*	Carolina Wren				S1	30	18.8 ± 7.0	NB
A	*Vireo flavifrons*	Yellow-throated Vireo				S1?B	15	23.5 ± 0.0	NB
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S4S5M	1408	1.4 ± 0.0	NB
A	*Aythya americana*	Redhead				S1B	8	17.5 ± 0.0	NB
A	*Gallinula galeata*	Common Gallinule				S1B	25	16.3 ± 0.0	NB
A	*Grus canadensis*	Sandhill Crane				S1B	14	1.6 ± 0.0	NB
A	*Bartramia longicauda*	Upland Sandpiper				S1B	54	14.8 ± 7.0	NB
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B	61	17.9 ± 7.0	NB
A	*Leucophaeus atricilla*	Laughing Gull				S1B	90	26.9 ± 0.0	NB
A	*Rissa tridactyla*	Black-legged Kittiwake				S1B	63	4.8 ± 7.0	NB
A	*Uria aalge*	Common Murre				S1B	150	25.8 ± 0.0	NB
A	*Alca torda*	Razorbill				S1B	193	4.3 ± 2.0	NB
A	*Fratercula arctica*	Atlantic Puffin				S1B	190	19.8 ± 0.0	NB
A	*Progne subis*	Purple Martin				S1B	196	34.5 ± 7.0	NB
A	*Aythya marila*	Greater Scaup				S1B,S2N,S4M	43	3.2 ± 1.0	NB

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A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S2S3M	51	10.8 ± 0.0	NB
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	204	3.4 ± 5.0	NB
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	29	4.8 ± 7.0	NB
A	*Sterna paradisaea*	Arctic Tern				S1B,SUM	164	27.5 ± 1.0	NB
A	*Chroicocephalus ridibundus*	Black-headed Gull				S1N,S2M	42	26.9 ± 0.0	NB
A	*Branta bernicla*	Brant				S1N,S2S3M	547	1.5 ± 0.0	NB
A	*Calidris alba*	Sanderling				S1N,S3S4M	1004	1.4 ± 0.0	NB
A	*Butorides virescens*	Green Heron				S1S2B	31	29.7 ± 0.0	NB
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B	66	28.5 ± 1.0	NB
A	*Empidonax traillii*	Willow Flycatcher				S1S2B	109	19.4 ± 2.0	NB
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B	23	4.4 ± 7.0	NB
A	*Troglodytes aedon*	House Wren				S1S2B	29	32.8 ± 7.0	NB
A	*Calidris bairdii*	Baird's Sandpiper				S1S2M	174	30.1 ± 1.0	NB
A	*Melanitta americana*	American Scoter				S1S2N,S3M	811	1.5 ± 0.0	NB
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2B	498	4.3 ± 0.0	NB
A	*Cistothorus palustris*	Marsh Wren				S2B	367	15.9 ± 0.0	NB
A	*Mimus polyglottos*	Northern Mockingbird				S2B	153	14.8 ± 7.0	NB
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	66	12.2 ± 7.0	NB
A	*Mareca strepera*	Gadwall				S2B,S3M	171	12.2 ± 7.0	NB
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S4S5M	282	1.4 ± 0.0	NB
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	33	34.3 ± 7.0	NB
A	*Phalacrocorax carbo*	Great Cormorant				S2N	335	8.6 ± 3.0	NB
A	*Somateria spectabilis*	King Eider				S2N	57	16.0 ± 9.0	NB
A	*Larus hyperboreus*	Glaucous Gull				S2N	160	5.0 ± 0.0	NB
A	*Melanitta perspicillata*	Surf Scoter				S2N,S4M	107	1.7 ± 0.0	NB
A	*Melanitta deglandi*	White-winged Scoter				S2N,S4M	44	4.2 ± 17.0	NB
A	*Asio otus*	Long-eared Owl				S2S3	17	21.9 ± 6.0	NB
A	*Picoides dorsalis*	American Three-toed Woodpecker				S2S3	7	37.4 ± 7.0	NB
A	*Toxostoma rufum*	Brown Thrasher				S2S3B	74	5.4 ± 7.0	NB
A	*Icterus galbula*	Baltimore Oriole				S2S3B	184	15.9 ± 0.0	NB
A	*Somateria mollissima*	Common Eider				S2S3B,S2S3N,S4M	2096	1.6 ± 0.0	NB
A	*Larus delawarensis*	Ring-billed Gull				S2S3B,S4N,S5M	297	4.3 ± 0.0	NB
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	304	3.3 ± 0.0	NB
A	*Calcarius lapponicus*	Lapland Longspur				S2S3N,SUM	38	28.0 ± 1.0	NB
A	*Larus marinus*	Great Black-backed Gull				S3	573	4.3 ± 0.0	NB
A	*Picoides arcticus*	Black-backed Woodpecker				S3	42	25.7 ± 7.0	NB
A	*Loxia curvirostra*	Red Crossbill				S3	118	11.1 ± 0.0	NB
A	*Spinus pinus*	Pine Siskin				S3	252	5.4 ± 7.0	NB
A	*Prosopium cylindraceum*	Round Whitefish				S3	2	90.7 ± 10.0	NB
A	*Salvelinus namaycush*	Lake Trout				S3	4	27.3 ± 0.0	NB
A	*Sorex maritimensis*	Maritime Shrew				S3	1	89.6 ± 0.0	NS
A	*Spatula clypeata*	Northern Shoveler				S3B	149	16.6 ± 0.0	NB
A	*Charadrius vociferus*	Killdeer				S3B	840	1.4 ± 0.0	NB
A	*Tringa semipalmata*	Willet				S3B	277	1.4 ± 0.0	NB
A	*Cepphus grylle*	Black Guillemot				S3B	822	1.8 ± 1.0	NB
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	186	15.5 ± 6.0	NB
A	*Myiarchus crinitus*	Great Crested Flycatcher				S3B	301	14.8 ± 7.0	NB
A	*Piranga olivacea*	Scarlet Tanager				S3B	113	27.1 ± 7.0	NB
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	653	5.4 ± 7.0	NB
A	*Passerina cyanea*	Indigo Bunting				S3B	111	4.8 ± 7.0	NB
A	*Molothrus ater*	Brown-headed Cowbird				S3B	239	5.4 ± 7.0	NB
A	*Setophaga tigrina*	Cape May Warbler				S3B,S4S5M	120	12.0 ± 7.0	NB
A	*Mergus serrator*	Red-breasted Merganser				S3B,S4S5N,S5M	391	1.6 ± 0.0	NB
A	*Anas acuta*	Northern Pintail				S3B,S5M	55	17.3 ± 1.0	NB

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A	*Anser caerulescens*	Snow Goose				S3M	6	32.1 ± 1.0	NB
A	*Numenius phaeopus hudsonicus*	Whimbrel				S3M	486	3.3 ± 0.0	NB
A	*Arenaria interpres*	Ruddy Turnstone				S3M	794	1.4 ± 0.0	NB
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	2731	1.4 ± 0.0	NB
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	373	1.4 ± 0.0	NB
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	924	1.4 ± 0.0	NB
A	*Phalaropus fulicarius*	Red Phalarope				S3M	132	31.5 ± 15.0	NB
A	*Bucephala albeola*	Bufflehead				S3N	1135	1.5 ± 19.0	NB
A	*Calidris maritima*	Purple Sandpiper				S3N	285	1.4 ± 0.0	NB
A	*Uria lomvia*	Thick-billed Murre				S3N,S3M	67	1.8 ± 1.0	NB
A	*Perisoreus canadensis*	Canada Jay				S3S4	232	5.4 ± 7.0	NB
A	*Poecile hudsonicus*	Boreal Chickadee				S3S4	221	5.4 ± 7.0	NB
A	*Eptesicus fuscus*	Big Brown Bat				S3S4	32	25.4 ± 1.0	NB
A	*Synaptomys cooperi*	Southern Bog Lemming				S3S4	18	53.6 ± 1.0	NB
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B	545	12.2 ± 7.0	NB
A	*Vireo gilvus*	Warbling Vireo				S3S4B	237	18.4 ± 7.0	NB
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S4M	1147	1.4 ± 0.0	NB
A	*Melospiza lincolnii*	Lincoln's Sparrow				S3S4B,S4M	257	5.4 ± 7.0	NB
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	885	16.1 ± 1.0	NB
A	*Setophaga striata*	Blackpoll Warbler				S3S4B,S5M	111	12.2 ± 7.0	NB
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	1200	1.4 ± 0.0	NB
A	*Morus bassanus*	Northern Gannet				SHB	854	1.5 ± 0.0	NB
C	*Quercus macrocarpa - Acer rubrum / Onoclea sensibilis - Carex arcta Forest*	Bur Oak - Red Maple / Sensitive Fern - Northern Clustered Sedge Forest				S2	1	92.3 ± 0.0	NB
C	*Acer saccharinum / Onoclea sensibilis - Lysimachia terrestris Forest*	Silver Maple / Sensitive Fern - Swamp Yellow Loosestrife Forest				S3	1	67.6 ± 0.0	NB
C	*Acer saccharum - Fraxinus americana / Polystichum acrostichoides Forest*	Sugar Maple - White Ash / Christmas Fern Forest				S3S4	1	62.7 ± 0.0	NB
I	*Bombus bohemicus*	Ashton Cuckoo Bumble Bee	Endangered	Endangered		S1	13	38.0 ± 5.0	NB
I	*Gomphurus ventricosus*	Skillet Clubtail	Endangered	Endangered	Endangered	S2	57	81.8 ± 0.0	NB
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Special Concern	S2S3?B	250	1.5 ± 0.0	NB
I	*Bombus suckleyi*	Suckley's Cuckoo Bumble Bee	Threatened			SH	1	43.2 ± 5.0	NB
I	*Cicindela marginipennis*	Cobblestone Tiger Beetle	Special Concern	Endangered	Endangered	S2S3	115	91.3 ± 0.0	NB
I	*Ophiogomphus howei*	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2S3	17	34.2 ± 0.0	NB
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Special Concern	S3	1	83.9 ± 0.0	NB
I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S3	72	60.5 ± 1.0	NB
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern		S4	100	22.5 ± 0.0	NB
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle	Special Concern			SH	16	35.0 ± 0.0	NB
I	*Appalachina sayana sayana*	Spike-lip Crater Snail	Not At Risk			S3?	1	45.6 ± 1.0	NB
I	*Conotrachelus juglandis*	Butternut Curculio				S1	3	95.8 ± 0.0	NB
I	*Haematopota rara*	Shy Cleg				S1	1	97.4 ± 1.0	NB
I	*Tharsalea dorcas*	Dorcas Copper				S1	1	61.9 ± 0.0	NB
I	*Erora laeta*	Early Hairstreak				S1	4	72.3 ± 2.0	NS
I	*Polites origenes*	Crossline Skipper				S1?	7	76.5 ± 0.0	NB
I	*Icaricia saepiolus*	Greenish Blue				S1S2	4	32.2 ± 0.0	NB
I	*Pachydiplax longipennis*	Blue Dasher				S1S2	3	9.7 ± 0.0	NB
I	*Encyclops caeruleus*	Cerulean Long-horned Beetle				S2	1	99.4 ± 0.0	NB
I	*Scaphinotus viduus*	Bereft Snail-eating Beetle				S2	1	66.7 ± 0.0	NB
I	*Brachyleptura circumdata*	Dark-shouldered Long-horned Beetle				S2	6	92.0 ± 0.0	NB
I	*Satyrium calanus*	Banded Hairstreak				S2	12	38.8 ± 0.0	NB

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I	*Satyrium calanus falacer*	Falacer Hairstreak				S2	1	98.4 ± 1.0	NB
I	*Strymon melinus*	Gray Hairstreak				S2	7	16.1 ± 2.0	NB
I	*Tabanus vivax*	Vivacious Horse Fly				S2S3	1	83.5 ± 0.0	NB
I	*Ophiogomphus colubrinus*	Boreal Snaketail				S2S3	35	8.7 ± 1.0	NB
I	*Sphaeroderus nitidicollis*	Polished Snail-eating Beetle				S3	1	92.8 ± 0.0	NB
I	*Lepturopsis biforis*	Two-spotted Long-horned Beetle				S3	1	39.3 ± 1.0	NB
I	*Orthosoma brunneum*	Moist Long-horned Beetle				S3	3	89.9 ± 0.0	NS
I	*Elaphrus americanus*	Boreal Elaphrus Beetle				S3	1	92.1 ± 0.0	NB
I	*Semanotus terminatus*	Light Long-horned Beetle				S3	1	89.1 ± 0.0	NB
I	*Desmocerus palliatus*	Elderberry Borer				S3	9	39.3 ± 1.0	NB
I	*Agonum excavatum*	Excavated Harp Ground Beetle				S3	1	92.1 ± 0.0	NB
I	*Clivina americana*	America Pedunculate Ground Beetle				S3	1	92.1 ± 0.0	NB
I	*Olisthopus parmatus*	Tawny-bordered Harp Ground Beetle				S3	1	92.8 ± 0.0	NB
I	*Tachys scitulus*	Handsome Riverbank Ground Beetle				S3	1	92.1 ± 0.0	NB
I	*Carabus maeander*	Meander Ground Beetle				S3	1	53.2 ± 0.0	NB
I	*Coccinella hieroglyphica kirbyi*	a Ladybird Beetle				S3	1	39.3 ± 1.0	NB
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	4	39.3 ± 1.0	NB
I	*Stenocorus vittiger*	Shrub Long-horned Beetle				S3	1	92.1 ± 0.0	NB
I	*Gnathacmaeops pratensis*	Meadow Flower Longhorn Beetle				S3	5	39.3 ± 1.0	NB
I	*Pogonocherus mixtus*	Mixed-spotted Flatface Sawyer				S3	1	39.3 ± 1.0	NB
I	*Badister neopulchellus*	Red-black Spotted Beetle				S3	1	92.1 ± 0.0	NB
I	*Gonotropis dorsalis*	Birch Fungus Weevil				S3	1	89.1 ± 0.0	NB
I	*Naemia seriata*	Seaside Lady Beetle				S3	7	20.6 ± 0.0	NB
I	*Saperda lateralis*	Red-edged Long-horned Beetle				S3	2	34.1 ± 0.0	NB
I	*Epargyreus clarus*	Silver-spotted Skipper				S3	15	35.3 ± 0.0	NB
I	*Hesperia sassacus*	Indian Skipper				S3	18	28.9 ± 1.0	NB
I	*Euphyes bimacula*	Two-spotted Skipper				S3	20	20.0 ± 0.0	NB
I	*Satyrium acadica*	Acadian Hairstreak				S3	16	38.5 ± 2.0	NB
I	*Plebejus idas*	Northern Blue				S3	2	6.7 ± 0.0	NB
I	*Plebejus idas empetri*	Crowberry Blue				S3	25	6.5 ± 0.0	NB
I	*Argynnis aphrodite*	Aphrodite Fritillary				S3	16	21.5 ± 0.0	NB
I	*Boloria bellona*	Meadow Fritillary				S3	47	32.3 ± 4.0	NB
I	*Nymphalis l-album*	Compton Tortoiseshell				S3	27	27.4 ± 2.0	NB
I	*Gomphurus vastus*	Cobra Clubtail				S3	78	67.0 ± 0.0	NB
I	*Celithemis martha*	Martha's Pennant				S3	11	28.3 ± 0.0	NB
I	*Ladona exusta*	White Corporal				S3	11	37.8 ± 0.0	NB
I	*Enallagma pictum*	Scarlet Bluet				S3	10	44.0 ± 0.0	NB
I	*Ischnura kellicotti*	Lilypad Forktail				S3	17	37.9 ± 0.0	NB
I	*Arigomphus furcifer*	Lilypad Clubtail				S3	22	79.3 ± 0.0	NB
I	*Alasmidonta undulata*	Triangle Floater				S3	27	37.2 ± 1.0	NB
I	*Atlanticoncha ochracea*	Tidewater Mucket				S3	131	36.5 ± 1.0	NB
I	*Striatura ferrea*	Black Striate Snail				S3	1	97.2 ± 1.0	NB
I	*Neohelix albolabris*	Whitelip Snail				S3	2	90.8 ± 0.0	NB
I	*Spurwinkia salsa*	Saltmarsh Hydrobe				S3	34	32.8 ± 0.0	NB
I	*Pantala hymenaea*	Spot-Winged Glider				S3B	12	10.9 ± 0.0	NB
I	*Somatochlora forcipata*	Forcipate Emerald				S3S4	17	39.2 ± 1.0	NB
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S3S4	7	73.1 ± 1.0	NB
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	SH	1	42.2 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened		S1?	123	67.8 ± 0.0	NS
N	*Anzia colpodes*	Black-foam Lichen	Threatened	Threatened		S1S2	13	48.1 ± 1.0	NB
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S2	126	50.3 ± 13.0	NB
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Special Concern	S1	451	41.0 ± 5.0	NB
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	19	7.3 ± 0.0	NB
N	*Imbribryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1	1	37.3 ± 1.0	NB
N	*Sphagnum macrophyllum*	Sphagnum				S1	6	22.7 ± 0.0	NB
N	*Coscinodon cribrosus*	Sieve-Toothed Moss				S1	1	36.4 ± 0.0	NB
N	*Sticta fuliginosa*	Peppered Moon Lichen				S1	3	85.7 ± 0.0	NS
N	*Coccocarpia palmicola*	Salted Shell Lichen				S1	8	69.1 ± 0.0	NS
N	*Peltigera collina*	Tree Pelt Lichen				S1	3	49.9 ± 10.0	NB
N	*Peltigera malacea*	Veinless Pelt Lichen				S1	1	71.4 ± 0.0	NS
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S1?	1	79.3 ± 3.0	NS
N	*Pseudocalliergon trifarium*	Three-ranked Spear Moss				S1?	1	29.0 ± 0.0	NB
N	*Dichelyma falcatum*	a Moss				S1?	1	43.6 ± 1.0	NB
N	*Dicranum bonjeanii*	Bonjean's Broom Moss				S1?	1	98.8 ± 1.0	NB
N	*Oxyrrhynchium hians*	Light Beaked Moss				S1?	1	83.5 ± 0.0	NS
N	*Plagiothecium latebricola*	Alder Silk Moss				S1?	1	31.6 ± 0.0	NB
N	*Niphotrichum ericoides*	Dense Rock Moss				S1?	1	79.4 ± 3.0	NB
N	*Platylomella lescurii*	a Moss				S1?	1	54.2 ± 1.0	NB
N	*Euopsis granatina*	Lesser Rockbud Lichen				S1?	1	98.2 ± 1.0	NS
N	*Heterodermia squamulosa*	Scaly Fringe Lichen				S1?	9	36.3 ± 0.0	NB
N	*Pilophorus fibula*	New England Matchstick Lichen				S1?	1	19.9 ± 0.0	NB
N	*Spilonema revertens*	Rock Hairball Lichen				S1?	4	95.5 ± 0.0	NS
N	*Peltigera venosa*	Fan Pelt Lichen				S1?	1	52.6 ± 0.0	NB
N	*Cladonia oricola*	Cladonia Lichen				S1?	2	15.5 ± 0.0	NB
N	*Pallavicinia lyellii*	Lyell's Ribbonwort				S1S2	3	47.2 ± 1.0	NB
N	*Reboulia hemisphaerica*	Purple-margined Liverwort				S1S2	1	53.2 ± 1.0	NB
N	*Solenostoma obovatum*	Egg Flapwort				S1S2	1	50.5 ± 0.0	NB
N	*Brachythecium acuminatum*	Acuminate Ragged Moss				S1S2	2	79.3 ± 3.0	NS
N	*Ptychostomum salinum*	Saltmarsh Bryum				S1S2	1	7.2 ± 1.0	NB
N	*Tortula obtusifolia*	a Moss				S1S2	1	80.4 ± 0.0	NB
N	*Ditrichum pallidum*	Pale Cow-hair Moss				S1S2	2	85.3 ± 3.0	NS
N	*Drummondia prorepens*	a Moss				S1S2	1	92.7 ± 0.0	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S1S2	2	81.7 ± 0.0	NB
N	*Timmia norvegica*	a moss				S1S2	1	91.5 ± 0.0	NB
N	*Tomentypnum falcifolium*	Sickle-leaved Golden Moss				S1S2	1	8.5 ± 1.0	NB
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1S2	2	7.2 ± 1.0	NB
N	*Hamatocaulis vernicosus*	a Moss				S1S2	3	61.8 ± 100.0	NB
N	*Haplocladium microphyllum*	Tiny-leaved Haplocladium Moss				S1S2	1	85.3 ± 3.0	NS
N	*Pilophorus cereolus*	Powdered Matchstick Lichen				S1S2	2	19.9 ± 0.0	NB
N	*Calypogeia neesiana*	Nees' Pouchwort				S1S3	1	62.0 ± 1.0	NB
N	*Fuscocephaloziopsis connivens*	Forcipated Pincerwort				S1S3	1	51.0 ± 0.0	NB
N	*Cephaloziella elachista*	Spurred Threadwort				S1S3	1	28.7 ± 5.0	NB
N	*Porella pinnata*	Pinnate Scalewort				S1S3	2	68.1 ± 1.0	NB
N	*Amphidium mougeotii*	a Moss				S2	3	50.0 ± 1.0	NB
N	*Anomodon viticulosus*	a Moss				S2	6	35.9 ± 1.0	NB
N	*Cynodontium strumiferum*	Strumose Dogtooth Moss				S2	1	54.6 ± 8.0	NB
N	*Dicranella palustris*	Drooping-Leaved Fork Moss				S2	3	84.3 ± 100.0	NB
N	*Didymodon ferrugineus*	Rusty Beard Moss				S2	1	60.8 ± 1.0	NB
N	*Ditrichum flexicaule*	Flexible Cow-hair Moss				S2	1	50.0 ± 1.0	NB
N	*Anomodon tristis*	a Moss				S2	1	76.1 ± 1.0	NB
N	*Hypnum pratense*	Meadow Plait Moss				S2	1	31.9 ± 0.0	NB

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N	*Isothecium myosuroides*	Slender Mouse-tail Moss				S2	15	8.2 ± 0.0	NB
N	*Meesia triquetra*	Three-ranked Cold Moss				S2	2	77.8 ± 0.0	NS
N	*Physcomitrium immersum*	a Moss				S2	1	68.1 ± 1.0	NB
N	*Platydictya jungermannioides*	False Willow Moss				S2	1	8.2 ± 0.0	NB
N	*Seligeria calcarea*	Chalk Brittle Moss				S2	1	50.0 ± 1.0	NB
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S2	8	4.9 ± 1.0	NB
N	*Tayloria serrata*	Serrate Trumpet Moss				S2	1	67.6 ± 1.0	NB
N	*Tetraplodon mnioides*	Entire-leaved Nitrogen Moss				S2	3	7.2 ± 1.0	NB
N	*Thamnobryum alleghaniense*	a Moss				S2	1	91.4 ± 0.0	NB
N	*Tortula mucronifolia*	Mucronate Screw Moss				S2	1	36.3 ± 0.0	NB
N	*Ulota phyllantha*	a Moss				S2	8	7.2 ± 1.0	NB
N	*Anomobryum julaceum*	Slender Silver Moss				S2	1	87.6 ± 0.0	NB
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S2	30	72.7 ± 0.0	NS
N	*Leptogium milligranum*	Stretched Jellyskin Lichen				S2	5	82.4 ± 0.0	NS
N	*Nephroma laevigatum*	Mustard Kidney Lichen				S2	14	49.9 ± 10.0	NB
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S2	2	52.6 ± 0.0	NB
N	*Andreaea rothii*	Dusky Rock Moss				S2?	1	55.3 ± 0.0	NB
N	*Ptychostomum pallescens*	Tall Clustered Bryum				S2?	2	36.9 ± 1.0	NB
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S2?	2	80.5 ± 2.0	NB
N	*Dicranum spurium*	Spurred Broom Moss				S2?	3	13.3 ± 0.0	NB
N	*Schistostega pennata*	Luminous Moss				S2?	1	84.3 ± 100.0	NB
N	*Seligeria diversifolia*	a Moss				S2?	2	87.6 ± 0.0	NB
N	*Sphagnum angermanicum*	a Peatmoss				S2?	2	10.3 ± 10.0	NB
N	*Plagiomnium rostratum*	Long-beaked Leafy Moss				S2?	2	89.3 ± 3.0	NS
N	*Imshaugia placorodia*	Eyed Starburst Lichen				S2?	1	80.8 ± 0.0	NS
N	*Ptychostomum cernuum*	Swamp Bryum				S2S3	2	42.7 ± 0.0	NB
N	*Buxbaumia aphylla*	Brown Shield Moss				S2S3	2	54.6 ± 8.0	NB
N	*Calliergonella cuspidata*	Common Large Wetland Moss				S2S3	13	35.9 ± 1.0	NB
N	*Drepanocladus polygamus*	Polygamous Hook Moss				S2S3	1	96.3 ± 1.0	NB
N	*Palustriella falcata*	Curled Hook Moss				S2S3	1	50.0 ± 1.0	NB
N	*Didymodon rigidulus*	Rigid Screw Moss				S2S3	3	36.5 ± 0.0	NB
N	*Fissidens bushii*	Bush's Pocket Moss				S2S3	4	36.5 ± 0.0	NB
N	*Neckera complanata*	a Moss				S2S3	4	36.5 ± 0.0	NB
N	*Orthotrichum elegans*	Showy Bristle Moss				S2S3	2	41.9 ± 2.0	NB
N	*Codriophorus fascicularis*	Clustered Rock Moss				S2S3	1	47.1 ± 0.0	NB
N	*Bucklandiella affinis*	Lesser Rock Moss				S2S3	1	67.1 ± 0.0	NS
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2S3	4	29.0 ± 0.0	NB
N	*Seligeria campylopoda*	a Moss				S2S3	1	61.8 ± 100.0	NB
N	*Sphagnum centrale*	Central Peat Moss				S2S3	2	69.9 ± 5.0	NS
N	*Sphagnum subfulvum*	a Peatmoss				S2S3	5	8.5 ± 1.0	NB
N	*Taxiphyllum deplanatum*	Imbricate Yew-leaved Moss				S2S3	1	7.2 ± 1.0	NB
N	*Zygodon viridissimus*	a Moss				S2S3	3	46.5 ± 3.0	NB
N	*Schistidium agassizii*	Elf Bloom Moss				S2S3	2	41.9 ± 2.0	NB
N	*Loeskeobryum brevirostre*	a Moss				S2S3	6	50.0 ± 1.0	NB
N	*Sphaerophorus globosus*	Northern Coral Lichen				S2S3	9	82.1 ± 0.0	NS
N	*Polychidium muscicola*	Eyed Mossthorns Woollybear Lichen				S2S3	4	52.7 ± 0.0	NB
N	*Cynodontium tenellum*	Delicate Dogtooth Moss				S3	1	7.2 ± 1.0	NB
N	*Hypnum curvifolium*	Curved-leaved Plait Moss				S3	4	51.5 ± 5.0	NB
N	*Schistidium maritimum*	a Moss				S3	7	7.2 ± 1.0	NB
N	*Hymenostylium recurvirostrum*	Curve-beak Beardless Moss				S3	1	99.7 ± 0.0	NS
N	*Solorina saccata*	Woodland Owl Lichen				S3	1	52.6 ± 0.0	NB
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S3	2	99.0 ± 0.0	NS
N	*Normandina pulchella*	Rimmed Elf-ear Lichen				S3	10	67.8 ± 0.0	NS
N	*Cladonia strepsilis*	Olive Cladonia Lichen				S3	4	47.6 ± 2.0	NB

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N	*Hypotrachyna catawbiensis*	Powder-tipped Antler Lichen				S3	31	47.6 ± 2.0	NB
N	*Scytinium lichenoides*	Tattered Jellyskin Lichen				S3	1	52.7 ± 0.0	NB
N	*Leptogium laceroides*	Short-bearded Jellyskin Lichen				S3	2	97.2 ± 0.0	NS
N	*Peltigera membranacea*	Membranous Pelt Lichen				S3	4	81.1 ± 0.0	NS
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S3	1	47.6 ± 2.0	NB
N	*Aulacomnium androgynum*	Little Groove Moss				S3?	10	8.2 ± 0.0	NB
N	*Ptychostomum inclinatum*	Blunt-tooth Thread Moss				S3?	1	85.3 ± 3.0	NS
N	*Dicranella rufescens*	Red Forklet Moss				S3?	1	99.8 ± 4.0	NB
N	*Rhytidiadelphus loreus*	Lanky Moss				S3?	2	59.0 ± 10.0	NB
N	*Sphagnum lescurii*	a Peatmoss				S3?	4	51.1 ± 0.0	NB
N	*Sphagnum inundatum*	a Sphagnum				S3?	2	65.4 ± 0.0	NB
N	*Cystocoleus ebeneus*	Rockgossamer Lichen				S3?	1	98.2 ± 0.0	NS
N	*Scytinium subtile*	Appressed Jellyskin Lichen				S3?	2	47.6 ± 2.0	NB
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	2	79.3 ± 3.0	NS
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3S4	1	93.0 ± 8.0	NB
N	*Brachytheciastrum velutinum*	Velvet Ragged Moss				S3S4	3	49.6 ± 0.0	NB
N	*Dicranella cerviculata*	a Moss				S3S4	3	7.2 ± 1.0	NB
N	*Dicranum majus*	Greater Broom Moss				S3S4	8	7.2 ± 1.0	NB
N	*Fissidens bryoides*	Lesser Pocket Moss				S3S4	2	61.0 ± 5.0	NB
N	*Elodium blandowii*	Blandow's Bog Moss				S3S4	1	41.3 ± 0.0	NB
N	*Heterocladium dimorphum*	Dimorphous Tangle Moss				S3S4	1	41.9 ± 2.0	NB
N	*Isopterygiopsis muelleriana*	a Moss				S3S4	5	49.6 ± 0.0	NB
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	3	50.0 ± 1.0	NB
N	*Orthotrichum speciosum*	Showy Bristle Moss				S3S4	1	92.7 ± 0.0	NS
N	*Physcomitrium pyriforme*	Pear-shaped Urn Moss				S3S4	4	85.3 ± 3.0	NS
N	*Pogonatum dentatum*	Mountain Hair Moss				S3S4	2	7.2 ± 1.0	NB
N	*Sphagnum torreyanum*	a Peatmoss				S3S4	6	22.5 ± 0.0	NB
N	*Sphagnum austinii*	Austin's Peat Moss				S3S4	2	23.1 ± 1.0	NB
N	*Sphagnum contortum*	Twisted Peat Moss				S3S4	1	47.8 ± 0.0	NB
N	*Sphagnum quinquefarium*	Five-ranked Peat Moss				S3S4	2	50.0 ± 1.0	NB
N	*Splachnum rubrum*	Red Collar Moss				S3S4	1	61.0 ± 1.0	NB
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3S4	5	7.2 ± 1.0	NB
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3S4	2	7.2 ± 1.0	NB
N	*Weissia controversa*	Green-Cushioned Weissia				S3S4	4	50.5 ± 1.0	NB
N	*Abietinella abietina*	Wiry Fern Moss				S3S4	2	47.0 ± 0.0	NB
N	*Trichostomum tenuirostre*	Acid-Soil Moss				S3S4	5	36.5 ± 0.0	NB
N	*Rauiella scita*	Smaller Fern Moss				S3S4	1	82.6 ± 1.0	NB
N	*Pannaria rubiginosa*	Brown-eyed Shingle Lichen				S3S4	17	67.3 ± 0.0	NB
N	*Pseudocyphellaria holarctica*	Yellow Specklebelly Lichen				S3S4	29	46.9 ± 0.0	NB
N	*Hypogymnia vittata*	Slender Monk's Hood Lichen				S3S4	2	85.6 ± 0.0	NS
N	*Scytinium teretiusculum*	Curly Jellyskin Lichen				S3S4	1	88.6 ± 0.0	NS
N	*Cladonia terrae-novae*	Newfoundland Reindeer Lichen				S3S4	5	10.1 ± 0.0	NB
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	1	69.2 ± 0.0	NB
N	*Nephroma parile*	Powdery Kidney Lichen				S3S4	4	52.6 ± 0.0	NB
N	*Nephroma resupinatum*	a lichen				S3S4	1	94.8 ± 0.0	NS
N	*Protopannaria pezizoides*	Brown-gray Moss-shingle Lichen				S3S4	13	4.7 ± 0.0	NB
N	*Usnea strigosa*	Bushy Beard Lichen				S3S4	7	49.8 ± 0.0	NB
N	*Fuscopannaria sorediata*	a Lichen				S3S4	9	68.9 ± 0.0	NB
N	*Pannaria conoplea*	Mealy-rimmed Shingle Lichen				S3S4	59	66.8 ± 0.0	NS
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	36	47.4 ± 0.0	NB
N	*Peltigera neopolydactyla*	Undulating Pelt Lichen				S3S4	1	47.6 ± 2.0	NB
N	*Grimmia anodon*	Toothless Grimmia Moss				SH	2	38.6 ± 10.0	NB

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N	*Leucodon brachypus*	a Moss				SH	4	46.2 ± 100.0	NB
N	*Thelia hirtella*	a Moss				SH	2	79.3 ± 3.0	NS
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	62	28.9 ± 0.0	NB
P	*Polemonium vanbruntiae*	Van Brunt's Jacob's-ladder	Threatened	Threatened	Threatened	S1	74	3.8 ± 0.0	NB
P	*Fraxinus nigra*	Black Ash	Threatened			S3S4	320	10.1 ± 0.0	NB
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Endangered	S1	27	47.0 ± 0.0	NB
P	*Symphyotrichum anticostense*	Anticosti Aster	Special Concern	Special Concern	Endangered	S3	2	33.4 ± 0.0	NB
P	*Antennaria parlinii ssp. fallax*	Parlin's Pussytoes				S1	7	64.4 ± 0.0	NB
P	*Antennaria howellii ssp. petaloidea*	Pussy-Toes				S1	4	35.7 ± 1.0	NB
P	*Bidens discoidea*	Swamp Beggarticks				S1	3	92.4 ± 0.0	NB
P	*Hieracium paniculatum*	Panicled Hawkweed				S1	16	66.6 ± 0.0	NS
P	*Senecio pseudoarnica*	Seabeach Ragwort				S1	18	50.5 ± 0.0	NB
P	*Betula michauxii*	Michaux's Dwarf Birch				S1	12	91.2 ± 0.0	NS
P	*Barbarea orthoceras*	American Yellow Rocket				S1	3	47.9 ± 10.0	NB
P	*Cardamine parviflora*	Small-flowered Bittercress				S1	13	36.1 ± 1.0	NB
P	*Cardamine concatenata*	Cut-leaved Toothwort				S1	3	55.1 ± 0.0	NB
P	*Draba arabisans*	Rock Whitlow-Grass				S1	7	45.7 ± 0.0	NB
P	*Draba glabella*	Rock Whitlow-Grass				S1	8	37.6 ± 1.0	NB
P	*Mononeuria groenlandica*	Greenland Stitchwort				S1	6	30.8 ± 0.0	NB
P	*Chenopodiastrum simplex*	Maple-leaved Goosefoot				S1	6	57.9 ± 1.0	NB
P	*Blitum capitatum*	Strawberry-Blite				S1	4	39.1 ± 1.0	NB
P	*Callitriche terrestris*	Terrestrial Water-Starwort				S1	1	82.1 ± 0.0	NB
P	*Hypericum virginicum*	Virginia St. John's-wort				S1	3	43.8 ± 0.0	NB
P	*Viburnum acerifolium*	Maple-leaved Viburnum				S1	11	66.6 ± 1.0	NB
P	*Corema conradii*	Broom Crowberry				S1	1	36.7 ± 10.0	NB
P	*Vaccinium boreale*	Northern Blueberry				S1	1	21.6 ± 0.0	NB
P	*Vaccinium corymbosum*	Highbush Blueberry				S1	8	63.2 ± 5.0	NB
P	*Vaccinium uliginosum*	Alpine Bilberry				S1	3	91.2 ± 0.0	NS
P	*Euphorbia polygonifolia*	Seaside Spurge				S1	10	46.4 ± 0.0	NB
P	*Hylodesmum glutinosum*	Large Tick-trefoil				S1	1	74.6 ± 1.0	NB
P	*Lespedeza capitata*	Round-headed Bush-clover				S1	9	96.2 ± 0.0	NB
P	*Gentiana rubricaulis*	Purple-stemmed Gentian				S1	15	36.0 ± 0.0	NB
P	*Lomatogonium rotatum*	Marsh Felwort				S1	3	25.7 ± 0.0	NB
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S1	3	19.3 ± 0.0	NB
P	*Lycopus virginicus*	Virginia Bugleweed				S1	2	59.2 ± 0.0	NB
P	*Pycnanthemum virginianum*	Virginia Mountain Mint				S1	4	69.9 ± 0.0	NB
P	*Decodon verticillatus*	Swamp Loosestrife				S1	1	97.7 ± 1.0	NS
P	*Lysimachia hybrida*	Lowland Yellow Loosestrife				S1	16	67.8 ± 0.0	NB
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	16	36.7 ± 1.0	NB
P	*Primula laurentiana*	Laurentian Primrose				S1	11	68.1 ± 0.0	NS
P	*Crataegus jonesiae*	Jones' Hawthorn				S1	5	45.8 ± 0.0	NB
P	*Rubus flagellaris*	Northern Dewberry				S1	2	8.0 ± 0.0	NB
P	*Galium brevipes*	Limestone Swamp Bedstraw				S1	2	36.5 ± 0.0	NB
P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S1	8	50.0 ± 1.0	NB
P	*Agalinis tenuifolia*	Slender Agalinis				S1	7	95.4 ± 0.0	NB
P	*Gratiola lutea*	Golden Hedge-hyssop				S1	5	22.8 ± 5.0	NB
P	*Pedicularis canadensis*	Canada Lousewort				S1	21	43.6 ± 0.0	NB
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S1	24	45.2 ± 0.0	NB
P	*Carex atlantica ssp. atlantica*	Atlantic Sedge				S1	3	91.3 ± 0.0	NS
P	*Carex merritt-fernaldii*	Merritt Fernald's Sedge				S1	2	49.2 ± 0.0	NB
P	*Carex salina*	Saltmarsh Sedge				S1	2	34.8 ± 1.0	NB
P	*Carex waponahkikensis*	Dawn-land Sedge				S1	1	45.6 ± 0.0	NB
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	11	74.6 ± 0.0	NB
P	*Carex saxatilis*	Russet Sedge				S1	14	36.9 ± 10.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Cyperus diandrus*	Low Flatsedge				S1	4	95.3 ± 1.0	NB
P	*Eleocharis flavescens var. olivacea*	Bright-green Spikerush				S1	4	69.9 ± 1.0	NB
P	*Sisyrinchium angustifolium*	Narrow-leaved Blue-eyed-grass				S1	11	37.2 ± 1.0	NB
P	*Juncus greenei*	Greene's Rush				S1	1	17.0 ± 0.0	NB
P	*Juncus subtilis*	Creeping Rush				S1	1	74.1 ± 5.0	NB
P	*Allium canadense*	Canada Garlic				S1	1	70.0 ± 0.0	NB
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S1	8	97.9 ± 0.0	NB
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	3	49.1 ± 10.0	NB
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S1	13	49.0 ± 0.0	NB
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S1	6	51.1 ± 0.0	NB
P	*Bromus pubescens*	Hairy Wood Brome Grass				S1	6	92.2 ± 0.0	NB
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1	23	66.2 ± 0.0	NB
P	*Danthonia compressa*	Flattened Oat Grass				S1	9	75.9 ± 0.0	NS
P	*Dichanthelium dichotomum*	Forked Panic Grass				S1	20	61.4 ± 1.0	NB
P	*Glyceria obtusa*	Atlantic Manna Grass				S1	6	33.9 ± 0.0	NB
P	*Potamogeton friesii*	Fries' Pondweed				S1	4	35.5 ± 5.0	NB
P	*Potamogeton nodosus*	Long-leaved Pondweed				S1	8	85.9 ± 0.0	NB
P	*Potamogeton strictifolius*	Straight-leaved Pondweed				S1	2	56.7 ± 0.0	NB
P	*Xyris difformis*	Bog Yellow-eyed-grass				S1	6	43.8 ± 0.0	NB
P	*Asplenium ruta-muraria var. cryptolepis*	Wallrue Spleenwort				S1	4	49.7 ± 0.0	NB
P	*Huperzia selago*	Northern Firmoss				S1	3	92.0 ± 5.0	NS
P	*Sceptridium oneidense*	Blunt-lobed Moonwort				S1	4	66.3 ± 0.0	NB
P	*Sceptridium rugulosum*	Rugulose Grapefern				S1	1	67.3 ± 1.0	NB
P	*Selaginella rupestris*	Rock Spikemoss				S1	29	65.7 ± 7.0	NS
P	*Cuscuta campestris*	Field Dodder				S1?	3	98.2 ± 10.0	NB
P	*Polygonum aviculare ssp. neglectum*	Narrow-leaved Knotweed				S1?	6	64.3 ± 0.0	NB
P	*Alisma subcordatum*	Southern Water Plantain				S1?	5	66.8 ± 0.0	NB
P	*Carex laxiflora*	Loose-Flowered Sedge				S1?	1	82.6 ± 5.0	NS
P	*Wolffia columbiana*	Columbian Watermeal				S1?	3	88.0 ± 0.0	NB
P	*Euphrasia farlowii*	Farlow's Eyebright				S1S2	1	35.9 ± 1.0	NB
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S1S2	11	48.4 ± 0.0	NB
P	*Potamogeton bicupulatus*	Snailseed Pondweed				S1S2	5	30.4 ± 0.0	NB
P	*Spiranthes cernua*	Nodding Ladies'-Tresses				S1S3	29	17.0 ± 0.0	NB
P	*Spiranthes arcisepala*	Appalachian Ladies'-tresses				S1S3	6	40.9 ± 0.0	NB
P	*Neottia bifolia*	Southern Twayblade			Endangered	S2	14	87.4 ± 0.0	NB
P	*Sanicula trifoliata*	Large-Fruited Sanicle				S2	1	71.6 ± 5.0	NB
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S2	5	35.9 ± 1.0	NB
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2	7	22.5 ± 1.0	NB
P	*Viburnum dentatum*	Southern Arrow-Wood				S2	1	83.4 ± 1.0	NS
P	*Viburnum dentatum var. lucidum*	Northern Arrow-Wood				S2	182	29.2 ± 0.0	NB
P	*Astragalus eucosmus*	Elegant Milk-vetch				S2	4	60.8 ± 0.0	NB
P	*Quercus macrocarpa*	Bur Oak				S2	101	36.5 ± 0.0	NB
P	*Nuphar x rubrodisca*	Red-disk Yellow Pond-lily				S2	9	37.5 ± 1.0	NB
P	*Polygaloides paucifolia*	Fringed Milkwort				S2	13	32.7 ± 1.0	NB
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S2	45	29.2 ± 0.0	NB
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S2	3	57.1 ± 5.0	NB
P	*Carex albicans var. emmonsii*	White-tinged Sedge				S2	5	25.9 ± 0.0	NB
P	*Cyperus lupulinus ssp.*	Hop Flatsedge				S2	51	91.3 ± 0.0	NB

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	macilentus								
P	*Calypso bulbosa var. americana*	Calypso				S2	4	44.6 ± 0.0	NB
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S2	5	72.9 ± 5.0	NB
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	5	32.9 ± 1.0	NB
P	*Platanthera huronensis*	Fragrant Green Orchid				S2	2	75.5 ± 1.0	NB
P	*Puccinellia nutkaensis*	Alaska Alkaligrass				S2	10	25.2 ± 1.0	NB
P	*Schizaea pusilla*	Little Curlygrass Fern				S2	39	10.1 ± 0.0	NB
P	*Coryphopteris simulata*	Bog Fern				S2	3	91.2 ± 0.0	NS
P	*Toxicodendron radicans var. radicans*	Eastern Poison Ivy				S2?	10	60.4 ± 0.0	NB
P	*Symphyotrichum novi-belgii var. crenifolium*	New York Aster				S2?	9	35.2 ± 0.0	NB
P	*Humulus lupulus var. lupuloides*	Common Hop				S2?	3	94.5 ± 0.0	NB
P	*Rubus x recurvicaulis*	arching dewberry				S2?	5	49.0 ± 5.0	NB
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2S3	1	48.7 ± 0.0	NB
P	*Symphyotrichum racemosum*	Small White Aster				S2S3	10	72.1 ± 0.0	NB
P	*Alnus serrulata*	Smooth Alder				S2S3	39	66.6 ± 1.0	NB
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2S3	2	35.7 ± 1.0	NB
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	62	34.9 ± 0.0	NB
P	*Aphyllon uniflorum*	One-flowered Broomrape				S2S3	22	8.5 ± 0.0	NB
P	*Persicaria careyi*	Carey's Smartweed				S2S3	8	40.0 ± 10.0	NB
P	*Hepatica americana*	Round-lobed Hepatica				S2S3	9	53.0 ± 1.0	NB
P	*Ranunculus sceleratus*	Cursed Buttercup				S2S3	7	30.4 ± 0.0	NB
P	*Cephalanthus occidentalis*	Common Buttonbush				S2S3	48	66.2 ± 0.0	NB
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2S3	4	36.5 ± 0.0	NB
P	*Euphrasia randii*	Rand's Eyebright				S2S3	38	7.8 ± 0.0	NB
P	*Dirca palustris*	Eastern Leatherwood				S2S3	1	96.4 ± 1.0	NB
P	*Viola novae-angliae*	New England Violet				S2S3	14	20.5 ± 15.0	NB
P	*Carex comosa*	Bearded Sedge				S2S3	5	77.3 ± 0.0	NS
P	*Carex rostrata*	Narrow-leaved Beaked Sedge				S2S3	2	45.1 ± 0.0	NB
P	*Carex vacillans*	Estuarine Sedge				S2S3	4	35.2 ± 1.0	NB
P	*Juncus ranarius*	Seaside Rush				S2S3	1	36.5 ± 0.0	NB
P	*Allium tricoccum*	Wild Leek				S2S3	29	61.7 ± 0.0	NB
P	*Corallorhiza maculata var. occidentalis*	Spotted Coralroot				S2S3	3	49.2 ± 0.0	NB
P	*Corallorhiza maculata var. maculata*	Spotted Coralroot				S2S3	3	84.0 ± 1.0	NB
P	*Elymus canadensis*	Canada Wild Rye				S2S3	3	36.5 ± 0.0	NB
P	*Piptatheropsis canadensis*	Canada Ricegrass				S2S3	6	66.6 ± 1.0	NB
P	*Puccinellia phryganodes ssp. neoarctica*	Creeping Alkali Grass				S2S3	18	4.2 ± 0.0	NB
P	*Poa glauca*	Glaucous Blue Grass				S2S3	1	36.4 ± 2.0	NB
P	*Potamogeton vaseyi*	Vasey's Pondweed				S2S3	5	35.3 ± 1.0	NB
P	*Isoetes tuckermanii ssp. acadiensis*	Acadian Quillwort				S2S3	9	33.7 ± 0.0	NB
P	*Botrychium tenebrosum*	Swamp Moonwort				S2S3	1	72.4 ± 0.0	NB
P	*Panax trifolius*	Dwarf Ginseng				S3	3	41.1 ± 0.0	NB
P	*Artemisia campestris ssp. caudata*	Tall Wormwood				S3	94	36.5 ± 0.0	NB
P	*Nabalus racemosus*	Glaucous Rattlesnakeroot				S3	69	34.1 ± 0.0	NB
P	*Solidago racemosa*	Racemose Goldenrod				S3	1	81.0 ± 0.0	NB
P	*Tanacetum bipinnatum ssp. huronense*	Lake Huron Tansy				S3	14	46.4 ± 1.0	NB

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P	*Pseudognaphalium macounii*	Macoun's Cudweed				S3	8	36.4 ± 0.0	NB
P	*Impatiens pallida*	Pale Jewelweed				S3	1	99.5 ± 0.0	NB
P	*Boechera stricta*	Drummond's Rockcress				S3	5	36.4 ± 1.0	NB
P	*Turritis glabra*	Tower Mustard				S3	1	36.5 ± 0.0	NB
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S3	8	36.4 ± 0.0	NB
P	*Cardamine maxima*	Large Toothwort				S3	20	36.5 ± 0.0	NB
P	*Sagina nodosa*	Knotted Pearlwort				S3	37	8.3 ± 1.0	NB
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S3	2	18.5 ± 0.0	NB
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	7	9.8 ± 1.0	NB
P	*Stellaria longifolia*	Long-leaved Starwort				S3	6	30.4 ± 0.0	NB
P	*Oxybasis rubra*	Red Goosefoot				S3	4	35.9 ± 0.0	NB
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	4	26.2 ± 0.0	NB
P	*Cornus obliqua*	Silky Dogwood				S3	195	61.0 ± 0.0	NB
P	*Lonicera oblongifolia*	Swamp Fly Honeysuckle				S3	22	22.3 ± 6.0	NB
P	*Viburnum lentago*	Nannyberry				S3	92	66.3 ± 0.0	NB
P	*Rhodiola rosea*	Roseroot				S3	62	1.4 ± 0.0	NB
P	*Astragalus alpinus*	Alpine Milk-vetch				S3	1	36.5 ± 0.0	NB
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S3	1	49.3 ± 50.0	NB
P	*Bartonia paniculata*	Branched Bartonia				S3	1	80.9 ± 0.0	NS
P	*Bartonia paniculata ssp. iodandra*	Branched Bartonia				S3	20	10.3 ± 0.0	NB
P	*Gentianella amarella ssp. acuta*	Northern Gentian				S3	6	36.4 ± 5.0	NB
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	7	32.8 ± 5.0	NB
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S3	32	28.9 ± 0.0	NB
P	*Myriophyllum humile*	Low Water Milfoil				S3	11	61.7 ± 0.0	NB
P	*Myriophyllum quitense*	Andean Water Milfoil				S3	71	35.8 ± 0.0	NB
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	50	23.7 ± 7.0	NB
P	*Utricularia resupinata*	Inverted Bladderwort				S3	19	21.9 ± 0.0	NB
P	*Fraxinus pennsylvanica*	Red Ash				S3	125	33.4 ± 0.0	NB
P	*Rumex pallidus*	Seabeach Dock				S3	16	9.8 ± 1.0	NB
P	*Rumex occidentalis*	Western Dock				S3	1	91.9 ± 1.0	NB
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S3	24	52.8 ± 0.0	NB
P	*Primula mistassinica*	Mistassini Primrose				S3	11	31.4 ± 1.0	NB
P	*Pyrola minor*	Lesser Pyrola				S3	3	4.7 ± 0.0	NB
P	*Clematis occidentalis*	Purple Clematis				S3	9	36.5 ± 0.0	NB
P	*Ranunculus flabellaris*	Yellow Water Buttercup				S3	21	30.4 ± 0.0	NB
P	*Amelanchier canadensis*	Canada Serviceberry				S3	18	22.8 ± 1.0	NB
P	*Crataegus scabrida*	Rough Hawthorn				S3	5	49.6 ± 0.0	NB
P	*Rubus occidentalis*	Black Raspberry				S3	10	36.0 ± 0.0	NB
P	*Salix candida*	Sage Willow				S3	2	99.1 ± 1.0	NB
P	*Salix myricoides*	Bayberry Willow				S3	2	44.0 ± 0.0	NB
P	*Salix nigra*	Black Willow				S3	143	35.5 ± 1.0	NB
P	*Salix interior*	Sandbar Willow				S3	15	36.5 ± 0.0	NB
P	*Comandra umbellata*	Bastard's Toadflax				S3	1	36.5 ± 0.0	NB
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S3	5	59.8 ± 1.0	NB
P	*Valeriana uliginosa*	Swamp Valerian				S3	1	66.1 ± 1.0	NB
P	*Viola adunca*	Hooked Violet				S3	6	36.5 ± 0.0	NB
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S3	125	23.7 ± 7.0	NB
P	*Carex adusta*	Lesser Brown Sedge				S3	4	36.5 ± 0.0	NB
P	*Carex arcta*	Northern Clustered Sedge				S3	37	36.5 ± 0.0	NB
P	*Carex conoidea*	Field Sedge				S3	36	20.6 ± 1.0	NB
P	*Carex garberi*	Garber's Sedge				S3	2	56.0 ± 1.0	NB
P	*Carex granularis*	Limestone Meadow Sedge				S3	3	62.9 ± 0.0	NB
P	*Carex gynocrates*	Northern Bog Sedge				S3	4	73.9 ± 0.0	NB
P	*Carex hirtifolia*	Pubescent Sedge				S3	2	77.9 ± 0.0	NB

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P	*Carex livida*	Livid Sedge				S3	2	36.4 ± 2.0	NB
P	*Carex ormostachya*	Necklace Spike Sedge				S3	4	82.1 ± 0.0	NB
P	*Carex plantaginea*	Plantain-Leaved Sedge				S3	1	97.5 ± 0.0	NB
P	*Carex prairea*	Prairie Sedge				S3	1	68.1 ± 5.0	NS
P	*Carex rosea*	Rosy Sedge				S3	26	36.5 ± 0.0	NB
P	*Carex sprengelii*	Longbeak Sedge				S3	2	99.7 ± 0.0	NB
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S3	17	51.0 ± 1.0	NB
P	*Carex vaginata*	Sheathed Sedge				S3	10	69.3 ± 6.0	NB
P	*Cyperus esculentus var. leptostachyus*	Perennial Yellow Nutsedge				S3	69	36.5 ± 0.0	NB
P	*Cyperus squarrosus*	Awned Flatsedge				S3	41	68.5 ± 0.0	NB
P	*Eriophorum gracile*	Slender Cottongrass				S3	8	38.2 ± 0.0	NB
P	*Blysmopsis rufa*	Red Bulrush				S3	4	36.5 ± 0.0	NB
P	*Elodea nuttallii*	Nuttall's Waterweed				S3	9	62.2 ± 0.0	NB
P	*Juncus vaseyi*	Vasey Rush				S3	1	28.0 ± 0.0	NB
P	*Najas gracillima*	Thread-Like Naiad				S3	11	28.6 ± 0.0	NB
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	22	32.4 ± 0.0	NB
P	*Neottia auriculata*	Auricled Twayblade				S3	9	31.6 ± 1.0	NB
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	49	0.9 ± 0.0	NB
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	19	36.5 ± 0.0	NB
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S3	11	55.9 ± 1.0	NB
P	*Agrostis mertensii*	Northern Bent Grass				S3	1	35.9 ± 1.0	NB
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	1	59.5 ± 0.0	NB
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S3	10	53.0 ± 0.0	NB
P	*Leersia virginica*	White Cut Grass				S3	34	73.1 ± 0.0	NB
P	*Schizachyrium scoparium*	Little Bluestem				S3	16	61.7 ± 0.0	NB
P	*Zizania aquatica*	Southern Wild Rice				S3	2	36.5 ± 0.0	NB
P	*Zizania aquatica var. aquatica*	Eastern Wild Rice				S3	3	79.4 ± 0.0	NB
P	*Adiantum pedatum*	Northern Maidenhair Fern				S3	7	25.9 ± 0.0	NB
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3	18	35.9 ± 0.0	NB
P	*Anchistea virginica*	Virginia chain fern				S3	39	75.5 ± 1.0	NB
P	*Woodsia alpina*	Alpine Cliff Fern				S3	6	50.0 ± 1.0	NB
P	*Woodsia glabella*	Smooth Cliff Fern				S3	1	65.1 ± 1.0	NB
P	*Isoetes tuckermanii ssp. tuckermanii*	Tuckerman's Quillwort				S3	24	16.7 ± 0.0	NB
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3	7	34.6 ± 1.0	NB
P	*Huperzia appressa*	Mountain Firmoss				S3	3	39.4 ± 1.0	NB
P	*Sceptridium dissectum*	Dissected Moonwort				S3	24	33.9 ± 0.0	NB
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S3	4	35.1 ± 0.0	NB
P	*Botrychium simplex*	Least Moonwort				S3	5	40.8 ± 0.0	NB
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S3	7	35.0 ± 1.0	NB
P	*Selaginella selaginoides*	Low Spikemoss				S3	6	8.7 ± 0.0	NB
P	*Crataegus submollis*	Quebec Hawthorn				S3?	15	33.5 ± 1.0	NB
P	*Platanthera hookeri*	Hooker's Orchid				S3?	24	36.5 ± 0.0	NB
P	*Bidens hyperborea*	Estuary Beggarticks				S3S4	1	36.5 ± 0.0	NB
P	*Solidago altissima*	Tall Goldenrod				S3S4	3	60.2 ± 1.0	NB
P	*Symphyotrichum boreale*	Boreal Aster				S3S4	18	29.3 ± 0.0	NB
P	*Betula pumila*	Bog Birch				S3S4	25	36.5 ± 0.0	NB
P	*Mertensia maritima*	Sea Lungwort				S3S4	58	6.4 ± 10.0	NB
P	*Subularia aquatica ssp. americana*	American Water Awlwort				S3S4	12	30.2 ± 0.0	NB
P	*Lobelia cardinalis*	Cardinal Flower				S3S4	383	23.7 ± 7.0	NB
P	*Callitriche hermaphroditica*	Northern Water-starwort				S3S4	6	56.4 ± 0.0	NB
P	*Viburnum edule*	Squashberry				S3S4	4	36.5 ± 0.0	NB
P	*Crassula aquatica*	Water Pygmyweed				S3S4	12	50.7 ± 0.0	NB
P	*Penthorum sedoides*	Ditch Stonecrop				S3S4	67	29.0 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Elatine americana*	American Waterwort				S3S4	8	36.1 ± 1.0	NB
P	*Hedysarum americanum*	Alpine Hedysarum				S3S4	3	36.5 ± 0.0	NB
P	*Fagus grandifolia*	American Beech				S3S4	199	23.4 ± 1.0	NB
P	*Geranium robertianum*	Herb Robert				S3S4	35	36.5 ± 0.0	NB
P	*Stachys hispida*	Smooth Hedge-Nettle				S3S4	4	62.5 ± 0.0	NB
P	*Stachys pilosa*	Hairy Hedge-Nettle				S3S4	5	36.5 ± 0.0	NB
P	*Teucrium canadense*	Canada Germander				S3S4	6	48.3 ± 0.0	NB
P	*Utricularia radiata*	Little Floating Bladderwort				S3S4	70	17.7 ± 0.0	NB
P	*Utricularia gibba*	Humped Bladderwort				S3S4	35	21.8 ± 0.0	NB
P	*Fraxinus americana*	White Ash				S3S4	137	23.4 ± 1.0	NB
P	*Epilobium strictum*	Downy Willowherb				S3S4	21	20.6 ± 1.0	NB
P	*Fallopia scandens*	Climbing False Buckwheat				S3S4	30	34.2 ± 0.0	NB
P	*Rumex persicarioides*	Peach-leaved Dock				S3S4	3	53.9 ± 0.0	NB
P	*Littorella americana*	American Shoreweed				S3S4	35	27.6 ± 5.0	NB
P	*Thalictrum confine*	Northern Meadow-rue				S3S4	70	36.5 ± 0.0	NB
P	*Drymocallis arguta*	Tall Wood Beauty				S3S4	13	36.5 ± 0.0	NB
P	*Rosa palustris*	Swamp Rose				S3S4	159	22.4 ± 0.0	NB
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S3S4	16	41.9 ± 0.0	NB
P	*Galium boreale*	Northern Bedstraw				S3S4	7	36.5 ± 0.0	NB
P	*Galium labradoricum*	Labrador Bedstraw				S3S4	18	21.8 ± 1.0	NB
P	*Salix pedicellaris*	Bog Willow				S3S4	66	21.7 ± 1.0	NB
P	*Geocaulon lividum*	Northern Comandra				S3S4	13	8.8 ± 1.0	NB
P	*Parnassia glauca*	Fen Grass-of-Parnassus				S3S4	2	36.5 ± 0.0	NB
P	*Agalinis neoscotica*	Nova Scotia Agalinis				S3S4	68	39.2 ± 0.0	NB
P	*Limosella australis*	Southern Mudwort				S3S4	11	48.6 ± 0.0	NB
P	*Ulmus americana*	White Elm				S3S4	125	30.2 ± 0.0	NB
P	*Boehmeria cylindrica*	Small-spike False-nettle				S3S4	145	23.7 ± 7.0	NB
P	*Juniperus horizontalis*	Creeping Juniper				S3S4	44	10.2 ± 0.0	NB
P	*Carex capillaris*	Hairlike Sedge				S3S4	6	36.4 ± 2.0	NB
P	*Carex eburnea*	Bristle-leaved Sedge				S3S4	1	65.4 ± 0.0	NB
P	*Carex exilis*	Coastal Sedge				S3S4	109	9.8 ± 0.0	NB
P	*Carex haydenii*	Hayden's Sedge				S3S4	73	11.0 ± 1.0	NB
P	*Carex lupulina*	Hop Sedge				S3S4	109	56.9 ± 0.0	NB
P	*Carex tenera*	Tender Sedge				S3S4	52	36.5 ± 0.0	NB
P	*Carex wiegandii*	Wiegand's Sedge				S3S4	34	9.6 ± 0.0	NB
P	*Carex recta*	Estuary Sedge				S3S4	8	21.7 ± 0.0	NB
P	*Carex atratiformis*	Scabrous Black Sedge				S3S4	2	36.4 ± 0.0	NB
P	*Cladium mariscoides*	Smooth Twigrush				S3S4	77	14.9 ± 0.0	NB
P	*Cyperus dentatus*	Toothed Flatsedge				S3S4	128	23.4 ± 0.0	NB
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S3S4	9	47.6 ± 0.0	NB
P	*Rhynchospora capitellata*	Small-headed Beakrush				S3S4	21	55.1 ± 0.0	NB
P	*Trichophorum clintonii*	Clinton's Clubrush				S3S4	25	27.7 ± 0.0	NB
P	*Bolboschoenus fluviatilis*	River Bulrush				S3S4	58	37.3 ± 0.0	NB
P	*Triglochin gaspensis*	Gasp ├ Arrowgrass				S3S4	21	8.3 ± 0.0	NB
P	*Lilium canadense*	Canada Lily				S3S4	60	33.4 ± 0.0	NB
P	*Triantha glutinosa*	Sticky False-Asphodel				S3S4	6	36.5 ± 0.0	NB
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	14	29.3 ± 0.0	NB
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	18	9.6 ± 0.0	NB
P	*Neottia cordata*	Heart-leaved Twayblade				S3S4	21	3.3 ± 0.0	NB
P	*Platanthera obtusata*	Blunt-leaved Orchid				S3S4	41	3.3 ± 0.0	NB
P	*Platanthera obtusata ssp. obtusata*	Blunt-leaved Orchid				S3S4	1	58.8 ± 0.0	NB
P	*Calamagrostis pickeringii*	Pickering's Reed Grass				S3S4	116	8.7 ± 0.0	NB
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S3S4	3	35.7 ± 2.0	NB
P	*Eragrostis pectinacea*	Tufted Love Grass				S3S4	12	36.5 ± 0.0	NB
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S3S4	7	36.4 ± 0.0	NB
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3S4	12	36.4 ± 1.0	NB
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3S4	35	36.4 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3S4	28	10.3 ± 0.0	NB
P	*Cryptogramma stelleri*	Steller's Rockbrake				S3S4	3	36.5 ± 0.0	NB
P	*Asplenium viride*	Green Spleenwort				S3S4	16	31.1 ± 0.0	NB
P	*Dryopteris fragrans*	Fragrant Wood Fern				S3S4	4	36.0 ± 0.0	NB
P	*Equisetum palustre*	Marsh Horsetail				S3S4	8	44.1 ± 0.0	NB
P	*Polypodium appalachianum*	Appalachian Polypody				S3S4	12	30.4 ± 1.0	NB
P	*Polygonum oxyspermum ssp. raii*	Ray's Knotweed				SH	1	90.8 ± 5.0	NS
P	*Montia fontana*	Water Blinks				SH	4	23.2 ± 1.0	NB
P	*Solidago caesia*	Blue-stemmed Goldenrod				SX	2	39.1 ± 1.0	NB
P	*Celastrus scandens*	Climbing Bittersweet				SX	1	97.4 ± 100.0	NB
P	*Carex swanii*	Swan's Sedge				SX	76	49.6 ± 1.0	NB

5.1 SOURCE BIBLIOGRAPHY (100 km)

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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4	Beardmore, T. 2017. 2017 Butternut observations. Natural Resources Canada.
4	Cameron, R.P. 2018. Degelia plumbea records. Nova Scotia Environment.
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4	Clayden, S.R. 2012. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 57 recs.
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4	LaPaix, R.W. 2014. Trans-Canada Energy East Pipeline Environmental Assessment, Records from 2013-14. Stantec Consulting, 5 recs.
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4	Majka, C.G. & McCorquodale, D.B. 2006. The Coccinellidae (Coleoptera) of the Maritime Provinces of Canada: new records, biogeographic notes, and conservation concerns. Zootaxa. Zootaxa, 1154: 49–68. 7 recs.
4	Marx, M. & Kenney, R.D. 2001. North Atlantic Right Whale Database. University of Rhode Island, 4 recs.
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3	Newell, R.E. 2006. Rare plant observations in Digby Neck. Pers. comm. to S. Blaney, 6 recs.
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2	Cowie, F. 2007. Electrofishing Population Estimates 1979-98. Canadian Rivers Institute, 2698 recs.
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1	Clayden, S.R. 2020. Email regarding Blue Felt Lichen (Pectenia plumbea) occurrences in New Brunswick, from Stephen Clayden to Sean Blaney. pers. comm., 2 records.
1	Dadswell, M.J. 1979. Status Report on Shortnose Sturgeon (Acipenser brevirostrum) in Canada. Committee on the Status of Endangered Wildlife in Canada, 15 pp.
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1	Houghton, Andrew. 2021. Email to Sean Blaney re: nesting Snapping Turtle, NB. pers. comm.
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1	LaPaix, R.W.; Crowell, M.J.; MacDonald, M. 2011. Stantec rare plant records, 2010-11. Stantec Consulting, 334 recs.
1	Maass, W.S.G. & Yetman, D. 2002. Assessment and status report on the boreal felt lichen (Erioderma pedicellatum) in Canada. Committee on the Status of Endangered Wildlife in Canada, 1 rec.
1	MacFarlane, Wayne. 2018. Skunk Cabbage observation on Long Island, Kings Co. NB. Pers. comm., 1 records.

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1	MacKinnon, D.S. 2013. Email report of Peregrine Falcon nest E of St. Martins NB. NS Department of Environment and Labour, 1 record.
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1	McAlpine, D.F. 2020. Email to John Klymko about Epargyreus clarus record from Grand Bay, NB. Pers. comm.
1	McIlraith, A.L. 1986. Additions to the flora of Kent Island, New Brunswick. Rhodora 88:441-443, 1 record.
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1	Porter, C.J.M. 2014. Field work data 2007-2014. Nova Scotia Nature Trust, 96 recs.
1	Sabine, D.L. & Goltz, J.P. 2006. Discovery of Utricularia resupinata at Little Otter Lake, CFB Gagetown. Pers. comm. to D.M. Mazerolle, 1 rec.
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1	Semple, John. 1996. Department of Biology, Univers..., 2nd Ed.
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1	Speers, L. 2001. Butterflies of Canada database. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 190 recs.
1	Taylor, Eric B. 1997. Status of the Sympatric Smelt (genus Osmerus) Populations of Lake Utopia, New Brunswick. Committee on the Status of Endangered Wildlife in Canada, 1 rec.
1	Toner, M. 2001. Lynx Records 1973-2000. NB Dept of Natural Resources, 29 recs.
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1	Toner, M. 2011. Wood Turtle sighting. NB Dept of Natural Resources. Pers. com. to S. Gerriets, Sep 2, photo, 1 rec.
1	Torenvliet, Ed. 2010. Wood Turtle roadkill. NB Dept of Transport. Pers. com. to R. Lautenschlager, Aug. 20, photos, 1 rec.
1	Tummer, Kevin. 2016. Email communication (April 30, 2016) to John Klymko regarding Snapping Turtle observation in Nova Scotia. Pers. Comm.
1	Walker, E.M. 1942. Additions to the List of Odonates of the Maritime Provinces. Proc. Nova Scotian Inst. Sci., 20. 4: 159-176. 2 recs.
1	Watts, T. 2021. Emails to Sean Blaney regarding Black Tern colony at King Brook Lake, Charlotte Co. and Third Lake, York Co., NB. Peskotomuhkati Nation at Skutik, 2 records.
1	Webster, R.P. 2006. Survey for Suitable Salt Marshes for the Maritime Ringlet, New Populations of the Cobblestone Tiger Beetle, & New Localities of Three Rare Butterfly Species. New Brunswick WTF Report, 28 recs.
1	Webster, R.P. Email to John Klymko detailing records of butterflies collected by Reggie Webster in June 2017. Webster, R.P. 2017.
1	Webster, R.P. Reggie Webster's records of Encyclops caerulea . pers. collection. 2018.
1	White, S. 2018. Notable species sightings, 2016-2017. East Coast Aquatics.
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1	Wong, Sarah. 2020. Two Chimney Swift observation made by Sarah Wong. pers. comm. to Sean Blaney.

APPENDIX D

Vegetation Lists for the Point Lepreau Site

Appendix D1. Species of Cultural Importance to Indigenous Peoples (Source: NB Power 2022)

Goldenrod
Yarrow
Virginia Rose Hips
Raspberry
Burdock Root
Bladder Wrack
Black Berries
Balsam Fir
Saint John's Wort
Blueberries
Old Man's Beard
Viper's Bugloss
Mullein
Milk Thistle
Heal All
Sarsaparilla
Red Clover
Plantain
Horsetail
Labrador Tea
Goose Berry
Cattail head
Cattail root
Red Osier Dogwood
Pineapple Weed (wild chamomile)
Pearly Everlasting
Wild Strawberry
Cinnamon Fern
Dwarf Raspberry
Species
Low Bush Cranberry
Cedar
Juniper
Wild Oregano
Sphagnum Moss
Sweet Grass
Beach Pea

Appendix D2. Observed Botanical Species with Wolastoqey Names and Significance
Source: From Dillon and SOAR (2023b)

Scientific Name	Common Name	AC CDC S-Rank[1]	Wəlastəkwey / Wolastoqey Name as identified in SRP[2]	Wəlastəkwey / Wolastoqey Significance as identified in SRP or by Chkwabun Sappier
Abies balsamea	Balsam fir	S5	Stahkwən (ok) Pohpokhawihkw (pitch)	●
Achillea millefolium	Common Yarrow	SNA		
Agrostis scabra	Rough Bent Grass	S5		
Agrostis stolonifera	Creeping Bent Grass	S5		
Alisma triviale	Northern Water Plantain	S5		●
Alnus incana	Speckled Alder	S5	tuhp/tohp	●
Amelanchier bartramiana	Bartram's Serviceberry	S5		
Anaphalis margaritacea	Pearly Everlasting	S5		
Angelica sylvestris	Woodland Angelica	SNA		
Antennaria neglecta	Field Pussytoes	SNA		
Anthoxanthum odoratum	Large Sweet Vernal Grass	SNA		
Aralia nudicaulis	Wild Sarsaparilla	S5	Məkahkewihkwan (əl)	●
Aronia melanocarpa	Black Chokeberry	S5		
Artemisia vulgaris	Common Wormwood	SNA		
Athyrium filix-femina	Common Lady Fern	S5		
Atriplex prostrata	Thin-leaved Orache	S5		
Betula cordifolia	Heart-leaved Birch	S5	Məsəsn (ək)	●
Bolboschoenus maritimus	Saltmarsh Bulrush	S5		
Cakile edentula	American Searocket	S5		
Calamagrostis canadensis	Bluejoint Reed Grass	S5		
Calystegia sepium	Calystegia sepium	S5		
Callitriche palustris	Marsh Water-starwort	S5		
Calopogon tuberosus	Tuberous Grass Pink	S4		
Cardamine pensylvanica	Pennsylvania Bittercress	S5		

Scientific Name	Common Name	AC CDC S-Rank[1]	Wəlastəkwey / Wolastoqey Name as identified in SRP[2]	Wəlastəkwey / Wolastoqey Significance as identified in SRP or by Chkwabun Sappier
Carex arctata	Black Sedge	S5		
Carex brunnescens	Brownish Sedge	S5		
Carex canescens	Silvery Sedge	S5		
Carex crawfordii	Crawford's Sedge	S5		
Carex crinita	Fringed Sedge	S5		
Carex disperma	Two-seeded Sedge	S5		
Carex echinata	Star Sedge	S5		
Carex flava	Yellow Sedge	S5		
Carex leptalea	Bristly-stalked Sedge	S5		
Carex magellanica	Boreal Bog Sedge	S5		
Carex novae-angliae	New England Sedge	S5		
Carex pauciflora	Few-Flowered Sedge	S4S5		
Carex pseudocyperus	Cyperuslike Sedge	S5		
Carex scoparia	Broom Sedge	S5		
Carex silicea	Seabeach Sedge	S4		
Carex stipata	Awl-fruited Sedge	S5		
Carex stricta	Tussock Sedge	S5		
Carex tribuloides	Blunt Broom Sedge	S4		
Carex trisperma	Three-seeded Sedge	S5		
Centaurea nigra	Black Knapweed	SNA		
Centaurea stoebe	Spotted Knapweed	SNA		
Chaenorhinum minus	Dwarf Snapdragon	SNA		
Chamaedaphne calyculata	Leatherleaf	S5		
Chelone glabra	White Turtlehead	S5		
Circaea alpina	Small Enchanter's Nightshade	S5		
Cirsium muticum	Swamp Thistle	S5		
Clintonia borealis	Yellow Bluebead Lily	S5		

Scientific Name	Common Name	AC CDC S-Rank[1]	Wəlastəkwey / Wolastoqey Name as identified in SRP[2]	Wəlastəkwey / Wolastoqey Significance as identified in SRP or by Chkwabun Sappier
Claytosmunda claytoniana	Interrupted Fern	S5		
Cypripedium acaule	Pink Lady's-Slipper	S5		
Dactylis glomerata	Orchard Grass	SNA		
Danthonia spicata	Poverty Oat Grass	S5		
Deschampsia cespitosa	Tufted Hair Grass	S5		
Dianthus armeria	Deptford Pink	SNA		
Dichanthelium acuminatum	Woolly Panic Grass	SNA		
Diervilla lonicera	Northern Bush Honeysuckle	S5		
Doellingeria umbellata	Hairy Flat-top White Aster	S5		•
Drosera rotundifolia	Round-leaved Sundew	S5		
Dryopteris campyloptera	Mountain Wood Fern	S5		
Dryopteris carthusiana	Spinulose Wood Fern	S5		
Dryopteris cristata	Crested Wood Fern	S5		
Dryopteris intermedia	Evergreen Wood Fern	S5		
Echium vulgare	Common Viper's Bugloss	SNA		
Eleocharis palustris	Common Spikerush	S5		
Elymus repens	Quack Grass	SNA		
Empetrum nigrum	Black Crowberry	S5		
Endotropis alnifolia	alder-leaved buckthorn	S5		
Epilobium ciliatum	Northern Willowherb	S5		
Epipactis helleborine	Helleborine	SNA		
Equisetum arvense	Field Horsetail	S5		
Equisetum fluviatile	Water Horsetail	S5		
Equisetum sylvaticum	Woodland Horsetail	S5		
Equisetum variegatum	Variegated Horsetail	S4		

Scientific Name	Common Name	AC CDC S-Rank[1]	Wəlastəkwey / Wolastoqey Name as identified in SRP[2]	Wəlastəkwey / Wolastoqey Significance as identified in SRP or by Chkwabun Sappier
Erigeron canadensis	Canada Horseweed	S5		
Erigeron strigosus	Rough Fleabane	S5		
Eriophorum virginicum	Tawny Cottongrass	S5		
Eriophorum vaginatum	Tussock Cottongrass	S5		
Euthamia graminifolia	Grass-leaved Goldenrod	S5		●
Fallopia cilinodis	Fringed Black Bindweed	S5		
Fragaria virginiana	Wild Strawberry	S5	Pskihkwimins (ək)	●
Galeopsis tetrahit	Common Hemp-nettle	SNA		
Galium mollugo	Smooth Bedstraw	SNA		
Galium palustre	Common Marsh Bedstraw	S5		
Gaultheria hispidula	Creeping Snowberry	S5		
Gaultheria procumbens	Eastern Teaberry	S5		
Gaylussacia baccata	Black Huckleberry	S5	psuwimin	●
Geum rivale	Water Avens	S5		
Glyceria borealis	Northern Manna Grass	S5		
Glyceria canadensis	Canada Manna Grass	S5		
Glyceria melicaria	Slender Manna Grass	S5		
Glyceria striata	Fowl Manna Grass	S5		
Gnaphalium uliginosum	Marsh Cudweed	SNA		
Gymnocarpium dryopteris	Common Oak Fern	S5		
Hieracium murorum	Wall Hawkweed	SNA		
Hordeum jubatum	Foxtail Barley	S5		
Hypericum boreale	Northern St John's-Wort	S5		
Hypericum fraseri	Fraser's St. John's-wort	S5		
Hypericum perforatum	Common St. John's-wort	SNA		

Scientific Name	Common Name	AC CDC S-Rank[1]	Wəlastəkwey / Wolastoqey Name as identified in SRP[2]	Wəlastəkwey / Wolastoqey Significance as identified in SRP or by Chkwabun Sappier
Hypopitys monotropa	Pinesap	S4		
Ilex mucronata	Mountain Holly	S5		
Iris versicolor	Harlequin Blue Flag	S5		
Jacobaea vulgaris	Tansy Ragwort	SNA		
Juncus articulatus	Jointed Rush	S5		
Juncus balticus	Baltic Rush	S5		
Juncus brevicaudatus	Narrow-Panicled Rush	S5		
Juncus effusus	Soft Rush	S5		●
Juncus filiformis	Thread Rush	S5		
Juncus gerardi	Black-Grass Rush	S5		
Juncus tenuis	Slender Rush	S5		
Juniperus communis	Common Juniper	S5		
Kalmia angustifolia	Sheep Laurel	S5		
Kalmia polifolia	Pale Bog Laurel	S5		
Larix laricina	Tamarack	S5	pqomus/Pkwəmos	●
Lathyrus japonicus	Beach Pea	S5		
Leucanthemum vulgare	Oxeye Daisy	SNA		
Leymus mollis	Sea Lyme Grass	S5		
Linaria vulgaris	Butter-and-Eggs	SNA		
Linnaea borealis	Twinflower	S5		
Liparis loeselii	Loesel's Twayblade	S3S4		
Lonicera canadensis	Canada Fly Honeysuckle	S5		
Lonicera villosa	Mountain Fly Honeysuckle	S5		
Lotus corniculatus	Garden Bird's-foot Trefoil	SNA		
Luzula multiflora	Common Woodrush	S5		

Scientific Name	Common Name	AC CDC S-Rank[1]	Wəlastəkwey / Wolastoqey Name as identified in SRP[2]	Wəlastəkwey / Wolastoqey Significance as identified in SRP or by Chkwabun Sappier
Luzula pallescens	Pale European Woodrush	SNA		
Lycopus uniflorus	Northern Water Horehound	S5		
Lysimachia borealis	Northern Starflower	S5		
Lysimachia terrestris	Swamp Yellow Loosestrife	S5		
Maianthemum canadense	Wild Lily-of-The-Valley	S5		
Maianthemum trifolium	Three-leaved False Soloman's Seal	S5		
Matricaria discoidea	Pineapple Weed	SNA		
Melilotus albus	White Sweet-clover	SNA		
Moehringia lateriflora	Blunt-leaved Sandwort	S5		
Hypopitys monotropa	Pinesap	S4		
Monotropa uniflora	Convulsion-Root	S5		
Myrica gale	Sweet Gale	S5		
Nuttallanthus canadensis	Canada Toadflax	SNA		
Oclemena acuminata	Whorled Wood Aster	S5		
Oclemena nemoralis	Bog Aster	S5		
Oenothera perennis	Perennial Evening Primrose	S5		
Onoclea sensibilis	Sensitive Fern	S5		
Osmunda regalis	Royal Fern	S5		
Osmundastrum cinnamomeum	Cinnamon Fern	S5		●
Oxalis montana	Common Wood Sorrel	S5		●
Persicaria maculosa	Spotted Lady's-thumb	SNA		
Phalaris arundinacea	Reed Canary Grass	S5		
Phegopteris connectilis	Northern Beech Fern	S5		

Scientific Name	Common Name	AC CDC S-Rank[1]	Wəlastəkwey / Wolastoqey Name as identified in SRP[2]	Wəlastəkwey / Wolastoqey Significance as identified in SRP or by Chkwabun Sappier
Picea mariana	Black spruce	S5	Kawatəkw	●
Picea rubens	Red Spruce	S5		●
Pilosella aurantiaca	Orange Hawkweed	SNA		
Pilosella caespitosa	Meadow Hawkweed	SNA		
Plantago major	Common Plantain	SNA		●
Plantago maritima	Seaside Plantain	S5		●
Platanthera clavellata	Club Spur Orchid	S4S5		
Platanthera dilatata	White Bog Orchid	S4		
Platanthera orbiculata	Small Round-leaved Orchid	S4		
Poa compressa	Canada Blue Grass	SNA		
Poa nemoralis	Wood Blue Grass	SNA		
Poa pratensis	Kentucky Blue Grass	S5		
Populus balsamifera	Balsam Poplar	S5		
Potamogeton epihydrus	Ribbon-leaved Pondweed	S5		
Potentilla anserina	Common Silverweed	S5		
Potentilla norvegica	Rough Cinquefoil	S5		
Prunella vulgaris	Common Self-heal	S5		
Pteridium aquilinum	Bracken Fern	S5		●
Ranunculus acris	Common Buttercup	SNA		
Ranunculus repens	Creeping Buttercup	SNA		
Raphanus raphanistrum	Wild Radish	SNA		
Rhinanthus minor	Little Yellow Rattle	SNA		
Rhododendron canadense	Rhodora	S5		
Rhododendron groenlandicum	Common Labrador Tea	S5		●
Ribes glandulosum	Skunk Currant	S5	Katesiminaks	●
Ribes hirtellum	Smooth Gooseberry	S5	Katesiminaks	●

Scientific Name	Common Name	AC CDC S-Rank[1]	Wəlastəkwey / Wolastoqey Name as identified in SRP[2]	Wəlastəkwey / Wolastoqey Significance as identified in SRP or by Chkwabun Sappier
Ribes lacustre	Bristly Black Currant	S5	Katesiminaks	●
Rosa nitida	Shining Rose	S5		
Rosa virginiana	Virginia Rose	S5		
Rubus chamaemorus	Cloudberry	S4	Sakwətemin (ək)	
Rubus hispidus	Bristly Dewberry	S5	Sakwətemin (ək), sosoqimins	●
Rubus pubescens	Dwarf Red Raspberry	S5	saqtemin, minsoss, Minsəss (ək) sosoqimins	●
Rumex crispus	Curled Dock	SNA		
Sagina procumbens	Procumbent Pearlwort	S5		
Salix bebbiana	Bebb's Willow	S5	konusehs	●
Salix discolor	Pussy Willow	S5	konusehs	●
Sarracenia purpurea	Northern Pitcher Plant	S5		
Schoenoplectus acutus	Hardstem Bulrush	S4S5		
Schoenoplectus tabernaemontani	Softstem Bulrush	S5		●
Scirpus cyperinus	Common Woolly Bulrush	S5		
Scirpus microcarpus	Small-fruited Bulrush	S5		
Scorzoneroides autumnalis	Autumn Hawkbit	SNA		
Scutellaria galericulata	Marsh Skullcap	S5		
Senecio vulgaris	Common Ragwort	SNA		
Sisyrinchium montanum	Mountain Blue-eyed-grass	S5		
Solanum dulcamara	Bittersweet Nightshade	SNA		
Solidago canadensis	Canada Goldenrod	S5		●
Solidago puberula	Downy Goldenrod	S5		●

Scientific Name	Common Name	AC CDC S-Rank[1]	Wəlastəkwey / Wolastoqey Name as identified in SRP[2]	Wəlastəkwey / Wolastoqey Significance as identified in SRP or by Chkwabun Sappier
Solidago rugosa	Rough-stemmed Goldenrod	S5		●
Sorbus americana	American Mountain Ash	S5		
Spiranthes romanzoffiana	Hooded Ladies'-Tresses	S4		
Spiraea alba	White Meadowsweet	S5		●
Symphyotrichum puniceum	Purple-stemmed Aster	S5		
Thalictrum pubescens	Tall Meadow-Rue	S5		
Parathelypteris noveboracensis	New York Fern	S5		
Thuja occidentalis	Eastern White Cedar	S5	Kakskus/Kakskohs	●
Trifolium arvense	Rabbit's-foot Clover	SNA		
Trifolium campestre	Low Hop Clover	SNA		
Trifolium pratense	Red Clover	SNA		
Trifolium repens	White Clover	SNA		
Typha angustifolia	Narrow-Leaved Cattail	SNA		
Typha latifolia	Broad-leaved Cattail	S5	segidebigakde'gil / Pkuwahqiyasq	●
Vaccinium angustifolium	Late Lowbush Blueberry	S5	Saht (iyil)	●
Vaccinium myrtilloides	Velvet-leaved Blueberry	S5	Saht (iyil)	●
Vaccinium oxycoccos	Small Cranberry	S5	Sun-un-ul [bog], sihkimin(ol)[rock] / Sowən (ol)	●
Vaccinium vitis-idaea	Mountain Cranberry	S4S5		
Veronica serpyllifolia	Thyme-Leaved Speedwell	SNA		
Veronica officinalis	Common Speedwell	SNA		

Scientific Name	Common Name	AC CDC S-Rank[1]	Wəlastəkwey / Wolastoqey Name as identified in SRP[2]	Wəlastəkwey / Wolastoqey Significance as identified in SRP or by Chkwabun Sappier
Viburnum nudum	Northern Wild Raisin	S5		
Vicia cracca	Tufted Vetch	SNA		
Viola cucullata	Marsh Blue Violet	S5		

[1]S-Rank in New Brunswick as identified by Atalantic Canada Conservation Data Centre where S1=Critically Imperiled, S2=Imperiled, S3=Vulnerable,S4=Apparently Secure and S5=Secure.

[2]Wəlastəkwey / Wolastoqey name and significance as detailed in the 2019 Strategic Rights Plan.

Appendix D3. Description of Vegetation Community Types

Source: From Dillon and SOAR (2023b)

Old Red Spruce-Balsam Fir (ORSBF)

Old red spruce-balsam fir is a late-successional, multi-aged coniferous dominated vegetation community types (VCT). This vegetation community tended to be structurally complex and located on undulating ridges where soils are shallow, rocky, and well drained. The overstory was dominated by mature red spruce ranging in age from approximately 80 to 200+ years old and a co-dominant understory consisting of mature balsam fir ranging in age from 55 to 125 years old. The older balsam fir trees in the 70 + year age class were generally in decline and were the primary source of coarse woody debris and snags throughout this vegetation type, while the younger balsam fir cohort formed dense thickets and patches under the broken canopy of mature red spruce. The average height of mature red spruce ranged from 16 to 18 m and co-dominant mature balsam fir heights ranged from 12 to 14 m. Canopy openings and gaps in the canopy were common throughout this community type. Larger openings in the canopy contained small dense patches of balsam fir and lesser amounts of red spruce, 0.25 to 5 m in height.

The ground vegetation layer was most developed in small canopy gaps where lambkill (Kalmia angustifolia) and Canada bunchberry (*Cornus canadensis*) were the most prevalent species; however, goldthread (*Coptis trifolia*) and wild lily of the valley (Maianthemum canadense) occured on more mesic microsites. Bryophyte cover was continuous, consisting mostly of Schreber's moss (*Pleurozium schreberi*) and stair-step moss (*Hylocomium splendens*). Drier microsites in ridge top positions were often covered in reindeer (Cladonia rangiferina) and caribou moss (*Cladonia stellaris*) rather than Schreber's moss.

This VCT is expected to maintain an uneven-aged structure as it develops due to the longevity of red spruce. This VCT is self- perpetuating through gap disturbance if natural disturbance regimes are not controlled (i.e., spruce budworm).

Old Spruce (OSPR)

Old spruce is a late-successional, even-aged coniferous dominated VCT approximately 110 years old. Similar to ORSBF, this VCT tended to be structurally complex and located on undulating ridges where soils are shallow and rocky but conditions appeared to be drier, indicating that soils are shallower and rapidly drained. Balsam fir was noticeably sparse within this VCT when compared to ORSBF, representing less than 5% of the tree cover, while mature red and black spruce represented over 95% of the tree cover. Mature trees were short at 17 m, but ranged in diameter-at-breast-height (dbh) from approximately 16 to 30 centimetres (cm). Openings and gaps in the canopy were common throughout this VCT. Canopy closure was relatively low at approximately 60%. Large snags and coarse woody debris were abundant.

Openings in the canopy contained regenerating to sapling-staged black and red spruce, 0.25 to 5 m in height. The ground vegetation layer was not well developed, with predominant cover of lambkill and Canada bunchberry. Schreber's moss, and to a lesser extent reindeer moss and caribou moss, formed a continuous layer.

Mature Balsam Fir (MBF)

Mature balsam fir (MBF) is an even-aged VCT dominated by balsam fir, estimated around 80 years old (Photo 3; Appendix E). The underlying soil tended to be deeper, with moisture conditions mesic when compared to conditions found within the West Study Area. Species composition typically included 80% balsam fir, 15% heart-leaved birch (*Betula papyrifera*), and 5% red spruce. Mature balsam fir ranged from 18 to 40 cm dbh and from 15 to 19 m in height. Large snags were abundant due to the advanced age of the balsam fir and heart-leaved birch. It was evident by the abundance of declining large mature balsam fir trees that this VCT was entering the re-initiation stage of development where gaps and openings will form in the canopy, allowing for the regeneration of balsam fir.

Canopy cover was approximately 70%, allowing for the development of a relatively continuous herbaceous layer dominated by bunchberry. Other herbaceous species in the strata included lily of the valley, starflower (*Lysimachia terrestris*), twinflower (*Linnaea borealis*), and wild sarsaparilla (*Aralia nudicaulis*). Bryophyte cover was discontinuous, consisting of patchy cover. Prevalent bryophyte species cover included Schreber's and stair-step moss.

Immature Balsam Fir-Heart-Leaved Birch (IBFHB)

Immature balsam fir-heart-leaved birch (MBFHB) is an even-aged VCT dominated by dense closed canopy balsam fir and heart-leaved birch approximately 60 years old. Underlying soil was shallow and well drained. Species composition consisted of 75% balsam fir and 25% heart-leaved birch. Growth and development of this VCT has been suppressed due to the density of the trees, as a result average tree height and dbh were low (14 m and 14 cm, respectively). Canopy cover was approximately 90%, consequently not enough sunlight reaches the forest floor to allow for the development of a robust shrub and herbaceous vegetation. Bryophyte layer is very sparse, with the only species observed being broom moss (*Dicranum* spp).

Mature Balsam Fir-Heart-Leaved Birch (MBFHB)

Mature balsam fir-heart-leaved birch (MBFHB) is a late-successional uneven-aged VCT dominated by mature balsam fir ranging in age from 70 to 90 years old. As with most upland vegetation types, the underlying soil was shallow and well drained. Species composition consisted of 60% balsam fir, 30% heart-leaved birch, and 10% red spruce. Canopy closure was highly variable and tree heights ranged between 11 and 17 m. The heart-leaved birch component tends to be younger and less developed, colonizing larger gaps created during high wind events and pest infestations. Regenerating to the sapling stage, balsam fir, red spruce, and velvet-leafed blueberry (*Vaccinium myrtilloides*) were the most abundant species in the shrub strata. The herbaceous layer tended to be patchy and most abundant in gaps where bunchberry, wild lily-of-the-valley, twinflower, wild sarsaparilla, and starflower were present. Schreber's moss and stair-step moss formed a continuous bryophyte layer.

Alder-Tall Shrub (ATS)

Alder-tall shrub (ATS) is an early-successional VCT associated with past disturbance. ATS consisted of speckled alder that had colonized in an abandoned quarry and unmaintained developed areas. Where soil exists, it was very thin, rocky, and rapidly drained. Ground cover typically consisted of various forb and graminoid species such as common speedwell (Veronica officinalis), meadow hawkweed (*Pilosella caespitosa*), orange hawkweed (*Pilosella aurantiaca*), flat topped white aster (*Doellingeria umbellata*), rough-stemmed goldenrod (*Solidago rugosa*), Canada goldenrod (*Solidago canadensis*), ox-eye daisy

(*Leucanthemum vulgare*), and poverty oatgrass (*Danthonia spicata*). Juniper haircap moss (*Polytrichum juniperinum*) was the only bryophyte species observed.

Disturbed-Anthropogenic (DIST)

Disturbed-anthropogenic (DIST) included storage facilities, parking lots and unpaved roads, ancillary buildings and quarries. For the most part, these areas were barren, consisting of coarse aggregate, gravel, and large quarried rock, with soil nearly absent. DIST was nearly denuded of vegetation and subject to frequent disturbance such as grading, excavation, and vehicular traffic; however, areas within DIST that experienced less frequent disturbance have been colonized by herbaceous and woody vegetation. Where woody vegetation has begun to colonize, speckled alder dominated the vegetation cover and growth. Herbaceous cover had sparse and patchy distribution, consisting of native and non-native forbs and graminoid species such as poverty oat grass, garden bird's-foot trefoil (Lotus corniculatus), white sweet-clover (Melilotus albus), rabbit's-foot clover (*Trifolium arvense*), alsike clover (*Trifolium hybridum*), common viper's bugloss (*Echium vulgare*), Canada toadflax (*Nuttallanthus canadensis*), and field horsetail (*Equisetum arvense*).

Meadow (MDW)

The meadow (MDW) VCT was likely abandoned pasture that has been maintained in the current state through periodic mowing. Shrub species, white meadowsweet (*Spiraea alba*), and speckled alder had colonized a narrow band along the forest edge, but graminoid and forbs species still dominated. Herbaceous cover had sparse and patchy distribution, consisting of native and non-native forbs and graminoid species such as rough bent grass (*Agrostis scabra*), Kentucky blue grass (*Poa pratensis*), creeping bent grass (Agrostis stolonifera), poverty oat grass, Canada blue grass (*Poa compressa*), large sweet vernal grass (*Anthoxanthum odoratum*), garden white sweet-clover, alsike clover, smooth bedstraw (*Galium mollugo*), quack grass (*Elymus repens*), wild strawberry (*Fragaria virginiana*), fringed black bindweed (*Fallopia cilinodis*), grass-leaved goldenrod (*Euthamia graminifolia*), and autumn hawkbit (*Scorzoneroides autumnalis*).

Coastal-Beach (CB)

The coastal-beach (CB) VCT consisted of shoreline and barrier beaches of sand and cobble that were subject to periodic storm surges and intense wave action. This VCT formed a narrow band above the high tide line where material accrues through deposition during storm events. The transition to upland was abrupt due to the rocky shoreline, except where this VCT forms at the mouth of streams, where brackish wetlands and lagoons formed behind the barrier beach. Coastal herbaceous species (halophytes) such as lyme grass (*Leymus mollis*), beach pea (*Lathyrus japonicus*), seabeach sedge (*Carex silicea*), and hedge false bindweed (*Calystegia sepium*) were the most common species.

APPENDIX E

Bird Lists for the Point Lepreau Site

Appendix E1. Historical avifauna records near Point Lepreau (Stantec, 2021a)

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank	Data Sources
Alder Flycatcher	*Empidonax alnorum*	-	-	-	S5B	BBS, MBBA
American Black Duck	*Anas rubripes*	-	-	-	S5B, S4N	BBS, CBC, MBBA
American Crow	*Corvus brachyrhynchos*	-	-	-	S5	BBS, CBC, MBBA
American Golden-Plover	*Pluvialis dominica*	-	-	-	S2S3M	AC CDC
American Goldfinch	*Spinus tristis*	-	-	-	S5	BBS, CBC, MBBA
American Redstart	*Setophaga ruticilla*	-	-	-	S5B	BBS, MBBA
American Robin	*Turdus migratorius*	-	-	-	S5B	BBS, CBC, MBBA
American Tree Sparrow	*Spizelloides arborea*	-	-	-	S5N	CBC
American Woodcock	*Scolopax minor*	-	-	-	S5B	MBBA
Bald Eagle	***Haliaeetus leucocephalus***	**-**	**Not at Risk**	**Endangered**	**S4**	**AC CDC, BBS, CBC, MBBA**
Baltimore Oriole	*Icterus galbula*	-	-	-	S2S3B	CBC
Bank Swallow	***Riparia riparia***	**Schedule 1, Threatened**	**Threatened**	**Endangered**	**S2B**	**AC CDC, MBBA**
Barn Swallow	***Hirundo rustica***	**Schedule 1, Threatened**	**Threatened**	**Threatened**	**S2B**	**AC CDC, MBBA**
Barred Owl	*Strix varia*	-	-	-	S5	MBBA
Barrow's Goldeneye	***Bucephala islandica***	**Schedule 1, Special Concern**	**Special Concern**	**Special Concern**	**S2S3N, S3M**	**AC CDC**
Bay-breasted Warbler	*Setophaga castanea*	-	-	-	S4B, S4S5M	MBBA
Belted Kingfisher	*Megaceryle alcyon*	-	-	-	S5B	BBS, CBC, MBBA
Black Guillemot	*Cepphus grylle*	-	-	-	S3B	AC CDC, CBC, MBBA
Black Scoter	*Melanitta americana*	-	-	-	S1S2N,S3M	AC CDC, CBC

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank	Data Sources
Black-and-White Warbler	*Mniotilta varia*	-	-	-	S5B	BBS, MBBA
Black-bellied Plover	*Pluvialis squatarola*	-	-	-	S3S4M	AC CDC
Black-capped Chickadee	*Poecile atricapillus*	-	-	-	S5	BBS, CBC, MBBA
Black-legged Kittiwake	*Rissa tridactyla*	-	-	-	S1B	AC CDC, CBC, MBBA
Black-throated Blue Warbler	*Setophaga caerulescens*	-	-	-	S5B	BBS
Black-throated Green Warbler	*Setophaga virens*	-	-	-	S5B	BBS, MBBA
Blue Jay	*Cyanocitta cristata*	-	-	-	S5	BBS, CBC, MBBA
Blue-Headed Vireo	*Vireo solitarius*	-	-	-	S5B	BBS, MBBA
Bohemian Waxwing	*Bombycilla garrulus*	-	-	-	S4N	CBC
Bonaparte's Gull	*Chroicocephalus philadelphia*	-	-	-	S5M	CBC
Boreal Chickadee	*Poecile hudsonicus*	-	-	-	S3S4	MBBA
Brant	*Branta bernicla*	-	-	-	S1N,S2S3M	AC CDC
Brown Creeper	*Certhia americana*	-	-	-	S5	MBBA
Brown Thrasher	*Toxostoma rufum*	-	-	-	S2S3B	AC CDC, MBBA
Brown-headed Cowbird	*Molothrus ater*	-	-	-	S3B	AC CDC
Bufflehead	*Bucephala albeola*	-	-	-	S3N	AC CDC, CBC
Canada Goose	*Branta canadensis*	-	-	-	SUB, S5M	MBBA
Canada Jay	*Perisoreus canadensis*	-	-	-	S3S4	MBBA
Canada Warbler	***Cardellina canadensis***	**Schedule 1, Threatened**	**Special Concern**	**Threatened**	**S3S4B**	**AC CDC**
Cedar Waxwing	*Bombycilla cedrorum*	-	-	-	S5B	BBS, MBBA
Chestnut-sided Warbler	*Setophaga pensylvanica*	-	-	-	S5B	BBS, MBBA

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank	Data Sources
Chipping Sparrow	*Spizella passerina*	-	-	-	S5B	BBS, CBC, MBBA
Cliff Swallow	*Petrochelidon pyrrhonota*	-	-	-	S2B	AC CDC, MBBA
Common Eider	*Somateria mollissima*	-	-	-	S2S3B, S2S3N, S4M	AC CDC, MBBA, CBC
Common Goldeneye	*Bucephala clangula*	-	-	-	S4B, S4N, S5M	CBC
Common Grackle	*Quiscalus quiscula*	-	-	-	S5B	BBS, CBC, MBBA
Common Loon	*Gavia immer*	-	Not at Risk	-	S4B, S4N	CBC
Common Merganser	*Mergus merganser*	-	-	-	S5B, S4N	CBC
Common Murre	*Uria aalge*	-	-	-	S1B	CBC
Common Raven	*Corvus corax*	-	-	-	S5	BBS, CBC, MBBA
Common Redpoll	*Acanthis flammea*	-	-	-	S5N	CBC
Common Yellowthroat	*Geothlypis trichas*	-	-	-	S5B	BBS, MBBA
Cooper's Hawk	*Accipiter cooperii*	-	Not at Risk	-	S1S2B	CBC
Dark-eyed Junco	*Junco hyemalis*	-	-	-	S5	BBS, MBBA, CBC
Double-crested Cormorant	*Phalacrocorax auritus*	-	Not at Risk	-	S5B	MBBA
Downy Woodpecker	*Dryobates pubescens*	-	-	-	S5	BBS, CBC, MBBA
Eastern Bluebird	*Sialia sialis*	-	Not at Risk	-	S4B	MBBA
Eastern Phoebe	*Sayornis phoebe*	-	-	-	S5B	BBS
Eastern Wood-Pewee	***Contopus virens***	**Schedule 1, Special Concern**	**Special Concern**	**Special Concern**	**S3B**	**AC CDC, MBBA**
European Starling	*Sturnus vulgaris*	-	-	-	SNA	BBS, CBC, MBBA
Evening Grosbeak	***Coccothraustes vespertinus***	**Schedule 1, Special Concern**	**Special Concern**	**-**	**S3B, S3S4N, SUM**	**AC CDC, CBC**

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank	Data Sources
Glaucous Gull	*Larus hyperboreus*	-	-	-	S2N	AC CDC, CBC
Golden-crowned Kinglet	*Regulus satrapa*	-	-	-	S5	BBS, CBC, MBBA
Gray Catbird	*Dumetella carolinensis*	-	-	-	S4B	BBS, CBC, MBBA
Great Black-backed Gull	*Larus marinus*	-	-	-	S3	CBC, MBBA
Great Blue Heron	*Ardea herodias*	-	-	-	S4B	BBS, MBBA
Great Cormorant	*Phalacrocorax carbo*	-	-	-	S2N	CBC
Great Horned Owl	*Bubo virginianus*	-	-	-	S4	MBBA
Greater Scaup	*Aythya marila*	-	-	-	S1B, S2N, S4M	AC CDC, CBC
Greater Yellowlegs	*Tringa melanoleuca*	-	-	-	S1?B, S4S5M	AC CDC
Hairy Woodpecker	*Dryobates villosus*	-	-	-	S5	BBS, CBC, MBBA
Harlequin Duck	***Histrionicus histrionicus***	**Schedule 1, Special Concern**	**Special Concern**	**Endangered**	**S1B, S1S2N, S2M**	**AC CDC, CBC**
Harris's Sparrow	*Zonotrichia querula*	-	Special Concern	-	SNA	CBC
Hermit Thrush	*Catharus guttatus*	-	-	-	S5B	BBS, MBBA
Herring Gull	*Larus argentatus*	-	-	-	S5	BBS, CBC, MBBA
Hooded Merganser	*Lophodytes cucullatus*	-	-	-	S4S5B, S5M	CBC, MBBA
Horned Grebe	***Podiceps auritus***	**Schedule 1, Special Concern**	**Special Concern**	**Special Concern**	**S3N**	**AC CDC, CBC**
Horned Lark	*Eremophila alpestris*	-	-	-	S1B, S4N, S5M	AC CDC, MBBA
Iceland Gull	*Larus glaucoides*	-	-	-	S4N	CBC
Indigo Bunting	*Passerina cyanea*	-	-	-	S3B	AC CDC, MBBA

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank	Data Sources
Killdeer	*Charadrius vociferus*	-	-	-	S3B	AC CDC, MBBA
Least Flycatcher	*Empidonax minimus*	-	-	-	S4S5B	BBS
Lesser Black-backed Gull	*Larus fuscus*	-	-	-	SUN	CBC
Lesser Scaup	*Aythya affinis*	-	-	-	S1B, S4M	AC CDC
Lesser Yellowlegs	*Tringa flavipes*	-	Threatened	-	S3M	AC CDC
Lincoln's Sparrow	*Melospiza lincolnii*	-	-	-	S3S4B, S4M	MBBA
Long-tailed Duck	*Clangula hyemalis*	-	-	-	S4N	CBC
Magnolia Warbler	*Setophaga magnolia*	-	-	-	S5B	BBS, MBBA
Mallard	*Anas platyrhynchos*	-	-	-	S5B, S4N	MBBA, CBC
Merlin	*Falco columbarius*	-	Not at Risk	-	S5B	BBS, MBBA
Mourning Dove	*Zenaida macroura*	-	-	-	S5B, S4N	BBS, CBC, MBBA
Mourning Warbler	*Geothlypis philadelphia*	-	-	-	S4B, S5M	BBS
Nashville Warbler	*Leiothlypis ruficapilla*	-	-	-	S4S5B, S5M	BBS, MBBA
Nelson's Sparrow	*Ammospiza nelsoni*	-	Not at Risk	-	S4B	MBBA
Northern Cardinal	*Cardinalis cardinalis*	-	-	-	S4	CBC
Northern Flicker	*Colaptes auratus*	-	-	-	S5B	BBS, MBBA
Northern Gannet	*Morus bassanus*	-	-	-	SHB	AC CDC
Northern Harrier	*Circus hudsonius*	-	Not at Risk	-	S4B, S4S5M	CBC, MBBA
Northern Parula	*Setophaga americana*	-	-	-	S5B	BBS, MBBA
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	-	-	-	S1S2B	AC CDC
Osprey	*Pandion haliaetus*	-	-	-	S4S5B, S5M	BBS
Ovenbird	*Seiurus aurocapilla*	-	-	-	S5B	BBS, MBBA
Palm Warbler	*Setophaga palmarum*	-	-	-	S5B	BBS, MBBA
Pectoral Sandpiper	*Calidris melanotos*	-	-	-	S3M	AC CDC
Peregrine Falcon	***Falco peregrinus***	**-**	**Not at Risk**	**Endangered**	**S1B, S3M**	**AC CDC, MBBA**
Pileated Woodpecker	*Dryocopus pileatus*	-	-	-	S5	BBS, CBC, MBBA

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank	Data Sources
Pine Siskin	*Spinus pinus*	-	-	-	S3	AC CDC, CBC, MBBA
Pine Warbler	*Setophaga pinus*	-	-	-	S5B	BBS, CBC
Piping Plover	***Charadrius melodus***	**Schedule 1, Endangered**	**Endangered**	**Endangered**	**S1B**	**AC CDC**
Purple Finch	*Haemorhous purpureus*	-	-	-	S4S5B, SUN, S5M	BBS, CBC, MBBA
Purple Sandpiper	*Calidris maritima*	-	-	-	S3N	AC CDC, CBC
Razorbill	*Alca torda*	-	-	-	S1B	AC CDC, CBC
Red Knot	***Calidris canutus***	**Schedule 1, Endangered**	**Endangered**	**Endangered**	**S2M**	**AC CDC**
Red-breasted Merganser	*Mergus serrator*	-	-	-	S3B, S4S5N, S5M	AC CDC, CBC, MBBA
Red-breasted Nuthatch	*Sitta canadensis*	-	-	-	S5	BBS, CBC, MBBA
Red-eyed Vireo	*Vireo olivaceus*	-	-	-	S5B	BBS, MBBA
Red-necked Grebe	*Podiceps grisegena*	-	Not at Risk	-	S2N, S3M	AC CDC, CBC
Red-necked Phalarope	***Phalaropus lobatus***	**Schedule 1, Special Concern**	**Special Concern**	**-**	**S3M**	**AC CDC**
Red-throated Loon	*Gavia stellata*	-	-	-	S4N, S5M	CBC
Red-winged Blackbird	*Agelaius phoeniceus*	-	-	-	S4B	BBS, CBC
Ring-billed Gull	*Larus delawarensis*	-	-	-	S2S3B, S4N, S5M	AC CDC, CBC
Rock Pigeon	*Columba livia*	-	-	-	SNA	BBS, CBC
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	-	-	-	S3B	AC CDC
Rough-legged Hawk	*Buteo lagopus*	-	Not at Risk	-	S4N	CBC
Ruby-crowned Kinglet	*Regulus calendula*	-	-	-	S4S5B	MBBA
Ruby-throated Hummingbird	*Archilochus colubris*	-	-	-	S5B	BBS, MBBA
Ruddy Turnstone	*Arenaria interpres*	-	-	-	S3M	AC CDC
Ruffed Grouse	*Bonasa umbellus*	-	-	-	S5	MBBA

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank	Data Sources
Rusty Blackbird	***Euphagus carolinus***	**Schedule 1, Special Concern**	**Special Concern**	**Special Concern**	**S2S3B, S3M**	**AC CDC**
Sanderling	*Calidris alba*	-	-	-	S1N, S3S4M	AC CDC
Sandhill Crane	*Antigone canadensis*	-	-	-	S1B	AC CDC
Savannah Sparrow	*Passerculus sandwichensis*	-	-	-	S4S5B, S5M	BBS, MBBA
Semipalmated Sandpiper	*Calidris pusilla*	-	-	-	S3M	AC CDC
Sharp-shinned Hawk	*Accipiter striatus*	-	Not at Risk	-	S4B, S5M	CBC
Short-billed Dowitcher	*Limnodromus griseus*	-	-	-	S3M	AC CDC
Solitary Sandpiper	*Tringa solitaria*	-	-	-	S2B, S4S5M	AC CDC
Song Sparrow	*Melospiza melodia*	-	-	-	S5B	BBS, CBC, MBBA
Spotted Sandpiper	*Actitis macularius*	-	-	-	S3S4B, S4M	AC CDC, MBBA
Surf Scoter	*Melanitta perspicillata*	-	-	-	S2N, S4M	CBC
Swainson's Thrush	*Catharus ustulatus*	-	-	-	S4S5B	MBBA
Tennessee Warbler	*Leiothlypis peregrina*	-	-	-	S4B, S5M	MBBA
Thick-billed Murre	*Uria lomvia*	-	-	-	S3N, S3M	AC CDC
Tree Swallow	*Tachycineta bicolor*	-	-	-	S4B	BBS, MBBA
Tufted Titmouse	*Baeolophus bicolor*	-	-	-	SNA	CBC
Turkey Vulture	*Cathartes aura*	-	-	-	S4B	AC CDC, MBBA
Veery	*Catharus fuscescens*	-	-	-	S4B	BBS
Whimbrel	*Numenius phaeopus hudsonicus*	-	-	-	S3M	AC CDC
White-breasted Nuthatch	*Sitta carolinensis*	-	-	-	S4	CBC
White-throated Sparrow	*Zonotrichia albicollis*	-	-	-	S5B	BBS, CBC, MBBA
White-winged Crossbill	*Loxia leucoptera*	-	-	-	S5	CBC, MBBA

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank	Data Sources
White-winged Scoter	*Melanitta deglandi*	-	-	-	S2N, S4M	CBC
Willet	*Tringa semipalmata*	-	-	-	S3B	AC CDC
Winter Wren	*Troglodytes hiemalis*	-	-	-	S5B	BBS, MBBA
Wood Duck	*Aix sponsa*	-	-	-	S4B	BBS
Yellow Warbler	*Setophaga petechia*	-	-	-	S5B	BBS, MBBA
Yellow-bellied Flycatcher	*Empidonax flaviventris*	-	-	-	S4S5B, S5M	MBBA
Yellow-bellied Sapsucker	*Sphyrapicus varius*	-	-	-	S5B	BBS
Yellow-rumped Warbler	*Setophaga coronata*	-	-	-	S5B	BBS, MBBA

Notes:
SAR indicated by shaded cells

Appendix E2. Species recorded during overwintering marine bird surveys (Stantec, 2021a)

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank
American Black Duck	*Anas rubripes*	-	-	-	S5B,S4N
American Crow	*Corvus brachyrhynchos*	-	-	-	S5
American Kestrel	*Falco sparverius*	-	-	-	S4B, S4S5M
American Robin	*Turdus migratorius*	-	-	-	S5B
Bald Eagle	***Haliaeetus leucocephalus***	**-**	**Not at Risk**	**Endangered**	**S4**
Black Guillemot	*Cepphus grylle*	-	-	-	S3B
Black Scoter	*Melanitta americana*	-	-	-	S1S2N, S3M
Black-capped Chickadee	*Poecile atricapillus*	-	-	-	S5
Bufflehead	*Bucephala albeola*	-	-	-	S3N
Common Eider	*Somateria mollissima*	-	-	-	S2S3B, S2S3N, S4M
Common Goldeneye	*Bucephala clangula*	-	-	-	S4B, S4N, S5M
Common Loon	*Gavia immer*	-	Not at Risk	-	S4B, S4N
Common Merganser	*Mergus merganser*	-	-	-	S5B, S4N
Common Murre	*Uria aalge*	-	-	-	S1B
Common Raven	*Corvus corax*	-	-	-	S5
Common Redpoll	*Acanthis flammea*	-	-	-	S5N
Double-crested Cormorant	*Phalacrocorax auritus*	-	Not at Risk	-	S5B
Great Black-backed Gull	*Larus marinus*	-	-	-	S3
Harlequin Duck	***Histrionicus histrionicus***	**Endangered**	**Special Concern**	**Endangered**	**S1B, S1S2N, S2M**

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank
Herring Gull	*Larus argentatus*	-	-	-	S5
Horned Grebe	***Podiceps auritus***	**Schedule 1, Special Concern**	**Special Concern**	**Special Concern**	**S3N**
Iceland Gull	*Larus glaucoides*	-	-	-	S4N
Long-tailed Duck	*Clangula hyemalis*	-	-	-	S4N
Mallard	*Anas platyrhynchos*	-	-	-	S5B, S4N
Merlin	*Falco columbarius*	-	Not at Risk	-	S5B
Northern Gannet	*Morus bassanus*	-	-	-	SHB
Northern Goshawk	*Accipiter gentilis*	-	Not at Risk	-	S4
Peregrine Falcon	***Falco peregrinus***	**Schedule 1, Special Concern**	**Not at Risk**	**Endangered**	**S1B, S3M**
Pine Grosbeak	*Pinicola enucleator*	-	-	-	S2B, S4S5N, S4S5M
Purple Sandpiper	*Calidris maritima*	-	-	-	S3N
Razorbill	*Alcatorda*	-	-	-	S1B
Red-breasted Merganser	*Mergus serrator*	-	-	-	S3B, S4S5N, S5M
Red-necked Grebe	*Podiceps grisegena*	-	Not at Risk	-	S2N, S3M
Red-throated Loon	*Gaviastellata*	-	-	-	S4N, S5M
Ring-billed Gull	*Larus delawarensis*	-	-	-	S2S3B, S4N, S5M
Ruffed Grouse	*Bonasa umbellus*	-	-	-	S5

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank
Sharp-shinned Hawk	*Accipiter striatus*	-	Not at Risk	-	S4B, S5M
Song Sparrow	*Melospiza melodia*	-	-	-	S5B
Surf Scoter	*Melanitta perspicillata*	-	-	-	S2N, S4M
Unidentified Alcid	-	-	-	-	-
Unidentified Gull	-	-	-	-	-
Unidentified Merganser	-	-	-	-	-
Unidentified Scoter	-	-	-	-	-
Unidentified Waterfowl	-	-	-	-	-
White-winged Scoter	*Melanitta deglandi*	-	-	-	S2N, S4M

Notes:
SAR indicated by shaded cells,

Appendix E3. Species recorded during overwintering land bird surveys (Stantec, 2021a)

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank
American Crow	*Corvus brachyrhynchos*	-	-	-	S5
American Goldfinch	*Spinus tristis*	-	-	-	S5
American Kestrel	*Falco sparverius*	-	-	-	S4B, S4S5M
American Robin	*Turdus migratorius*	-	-	-	S5B
Bald Eagle	***Haliaeetus leucocephalus***	-	**Not at Risk**	**Endangered**	**S4**
Black-capped Chickadee	*Poecile atricapillus*	-	-	-	S5
Blue Jay	*Cyanocitta cristata*	-	-	-	S5
Canada Goose	*Branta canadensis*	-	-	-	SUB, S5M
Common Raven	*Corvus corax*	-	-	-	S5
Dark-Eyed Junco	*Junco hyemalis*	-	-	-	S5
Downy Woodpecker	*Dryobates pubescens*	-	-	-	S5
Evening Grosbeak	***Coccothraustes vespertinus***	**Schedule 1, Special Concern**	**Special Concern**	-	**S3B, S3S4N, SUM**
Golden-crowned Kinglet	*Regulus satrapa*	-	-	-	S5
Great Black-backed Gull	*Larus marinus*	-	-	-	S3
Hairy Woodpecker	*Dryobates villosus*	-	-	-	S5
Herring Gull	*Larus argentatus*	-	-	-	S5
Iceland Gull	*Larus glaucoides*	-	-	-	S4N
Northern Goshawk	*Accipiter gentilis*	-	Not at Risk	-	S4

Common Name	Scientific Name	SARA Status	COSEWIC Status	NB SARA Status	AC CDC Rank
Northern Shrike	*Lanius borealis*	-	-	-	S4N
Peregrine Falcon	***Falco peregrinus***	**Schedule 1, Special Concern**	**Not at Risk**	**Endangered**	**S1B, S3M**
Pine Grosbeak	*Pinicola enucleator*	-	-	-	S2B, S4S5N, S4S5M
Pine Siskin	*Spinus pinus*	-	-	-	S3
Red-breasted Nuthatch	*Sitta canadensis*	-	-	-	S5
Song Sparrow	*Melospiza melodia*				S5
Unidentified Gull	-	-	-	-	-
Unidentified Passerine	-	-	-	-	-
White-winged Crossbill	*Loxia leucoptera*	-	-	-	S5

Notes:
SAR indicated by shaded cells.