MILL MODERNIZATION and GREEN ENERGY GENERATION

Environmental Impact Assessment

Irving Pulp & Paper, Limited

REVERSING FALLS MILL

SAINT JOHN, NEW BRUNSWICK

21 MAY 2024

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PROJECT TITLE:	Mill Modernization and Green Energy Generation Project Environmental Impact Assessment

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PROFESSIONAL SEAL:

EXECUTIVE SUMMARY

Pulp and Paper Mills have existed at Reversing Falls near the mouth of the Saint John River (Wolastoq) in Saint John, New Brunswick since 1836. In 1946, Irving Pulp & Paper, Limited (IPP) acquired the Reversing Falls Mill (*i.e.*, the Mill). The Mill is a fundamental contributor to New Brunswick's natural resource-based economy because it is at the center of the supply chain and is the largest consumer of residual wood chips and biomass in the province. Presently, the Mill produces approximately 1 000 Air Dry Metric Tonnes (ADMT) of softwood Kraft pulp each day using a variety of physical and chemical processes. The Mill is a top industrial employer in New Brunswick and the largest employer among the more than 20 J.D. Irving, Limited (JDI) forest products divisions across the province.

The global market for supplying softwood Kraft pulp is extremely aggressive and IPP is a relatively small player in that market. Therefore, it is essential for IPP to invest in more efficient and higher quality producing technologies to remain viable and competitive on the global stage. Since 2006, IPP has invested over $950 million in infrastructure upgrades at the Mill while not realizing any Kraft pulp production increases. All the recent modernization work has prepared the Mill for a production capacity increase. Through that production increase, IPP will become one of the top ten producers of softwood Kraft pulp in the world.

The Mill Modernization and Green Energy Project (*i.e.*, the Project) will comprise over $1.1 billion in private capital investment by IPP to replace 1970s era equipment with current best-available technology. That equipment includes:

- new multiple-effect evaporators to recover more water and solids during the Kraft pulp production process;
- a new recovery boiler to improve heat recovery, reduce air emissions, and eliminate the use of heavy fuel oil (*i.e.*, Bunker C) at the Mill;
- a new turbine(s) and green energy generator(s) to generate up to 140 MW of green energy of which up to half will be available for sale to local markets; and
- expanding the recausticizing plant to improve chemical recovery efficiency.

Through this Project, IPP will regain its competitive advantage by increasing production capacity to 1 800 ADMT, improving production reliability, further reducing their environmental footprint, and reducing overall Kraft pulp production costs.

As per the Environmental Impact Assessment Regulation [**87-83**] of the New Brunswick *Clean Environment Act* [**R.S.N.B. 1973, c C-6**] the Project requires Environmental Impact Assessment (EIA) review. EIA is a planning tool used by the proponent and regulatory authorities. The purpose of an EIA is to identify and evaluate the potential impacts that the Project may have on the environment. Best-Management Practices (BMPs) are developed during the process to mitigate any identified potential environmental impacts. The New Brunswick Department of the Environment and Local Government (NBDELG) oversees the EIA process that is conducted by a Technical Review Committee (TRC). The TRC is comprised of representatives from various local, provincial, and federal government departments. The inclusive and participatory review process also includes First Nations engagement and public consultation.

IPP's engineering team spent considerable time and monumental effort developing this Project over the past several years. As a result, this Project will yield tremendous long-term environmental, economic, and community benefits.

Extremely large privately funded construction projects are rare in New Brunswick. This Project represents a generational (50 yr+) investment in Greater Saint John's economy, the New Brunswick Forest Products Industry, and the green economy. It is the most significant investment in the Canadian Forest Products Industry since 1993 when a new Kraft pulp mill opened in Grande Prairie, Alberta. During construction, about $539 million will be spent directly and indirectly on labour, $711 million will be contributed to the provincial Gross Domestic Product (GDP), and municipal tax inducements will amount to $172 million. During operation, the Mill's production will increase the annual contribution to provincial GDP by about $80 million and it will induce an annual tax revenue increase of about $17 million.

This Project involves installing current best-available technology. When completed, the new recovery boiler will be the most efficient in North America, if not the world. The new equipment will enhance the Mill's environmental performance by reducing air emissions on a normalized basis per tonne of Kraft pulp produced. Air emissions of nitrogen dioxide, fine particulate matter, sulphur dioxide, total reduced sulphur, and total suspended particles will be reduced by up to 40 %, 35 %, 49%, 97 %, and 37 %, respectively. Auxiliary fuel in the recovery boiler and expanded recausticizing plant will be clean burning natural gas, thus reducing GreenHouse Gas (GHG) emissions by eliminating the Mill's use of heavy fuel oil (*i.e.*, Bunker C).

The new highly efficient recovery boiler will produce more than double the steam quantity output of the 1970s era unit it will replace. The high-pressure steam generated through biomass combustion in the new recovery boiler will be distributed to the steam turbine(s) that will turn the new green energy generator(s). Up to 140 MegaWatts (MW) of clean green electricity will be generated and the Mill will become completely energy self-sufficient. Through use of energy optimization processes, the Mill will only use up to 70 MW of the generated green electricity. Because the new steam turbine(s) and green energy generator(s) will produce less carbon intensive electricity, annual GHG emissions from the Mill per tonne of Kraft pulp produced will be reduced by 50 %.

Up to 70 MW of excess green energy produced at the Mill will be made available for sale to local markets. That excess green energy, which will be enough to annually power up to 24 400 typical Canadian homes, can assist NB Power with decarbonizing their electricity generation by replacing non-renewable, high CO_2-emitting, fossil-fuel generated electricity with clean, green, renewable generated electricity. This could increase the utility's renewables electricity generation composition by up to 14 %.

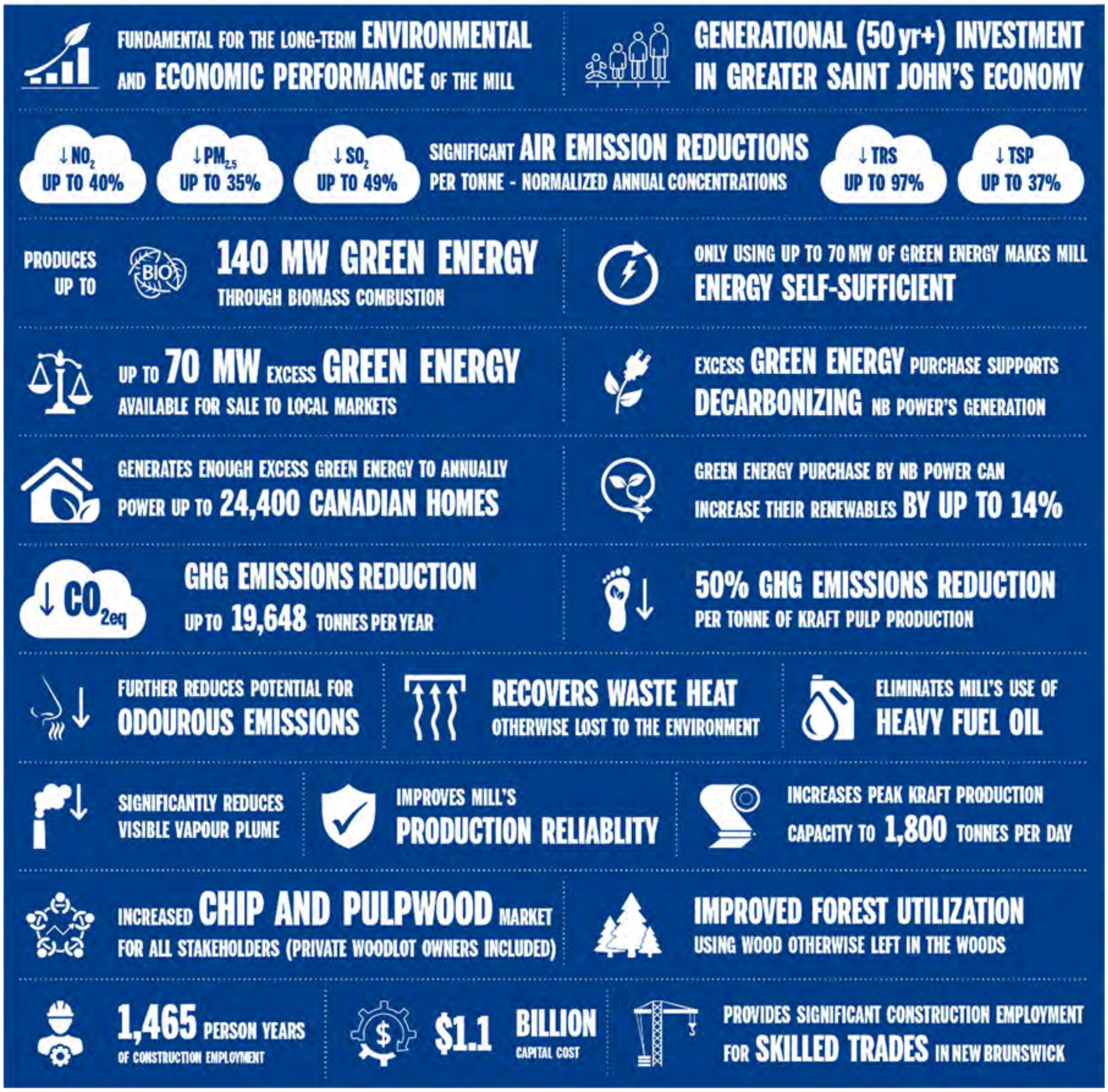
Recognizing that residential development has built up around the Mill since the late 1800s, IPP has continuously made investments in the Mill to significantly reduce odourous emissions and impacts to its neighbours. Through considerable additional technological investments, the potential for odourous emissions from the Mill will be further reduced. This will be done through the enhanced collection and incineration of dilute non-condensable gases, non-condensable gases, and stripper off-gases.

Presently, a water vapour plume is visible from the Mill's recovery boiler stack and is primarily associated with wet scrubbing technology that it employs to reduce air emissions. The flue gas stack associated with the new recovery boiler will use dry technology to scrub the air emissions. Using dry scrubbing technology will significantly reduce the visible vapour plume from the recovery boiler stack.

The increase in production from the Mill will require an increase in the volume of softwood wood chips supplied to the Mill. The increased volume of wood chips required is not expected to increase the area of forest harvested in New Brunswick. The increased volume of wood chips will be obtained from other existing sources. For example, the present supply of pulpwood exceeds demand. Improved forest utilization from all stakeholders, including private woodlot owners, will involve using the tops of trees and trees that are rotten, crooked, or forked that are currently being left in the woods to decompose. Reducing waste residual biomass left in the woods to decompose is an added benefit of this Project. Increased wood supply will also be obtained by harvesting mature managed stands planted by JDI almost 50 years ago. Managed stands yield more volume than natural stands by up to four times. There will also be some redirecting of wood chips to the Mill and an increase in imports of wood chips and pulpwood.

The Project will provide a significant opportunity during construction for skilled tradespeople, such as ironworkers, millwrights, carpenters, boilermakers, pipefitters, masons, and labourers. About 1 465 person years of construction employment will be generated by the Project. As a result, many skilled workers will have an opportunity to work at home in New Brunswick as opposed to having to work remotely in places like northern Alberta where large-scale industrial projects have occurred in the past several decades.

OVERALL PROJECT BENEFITS

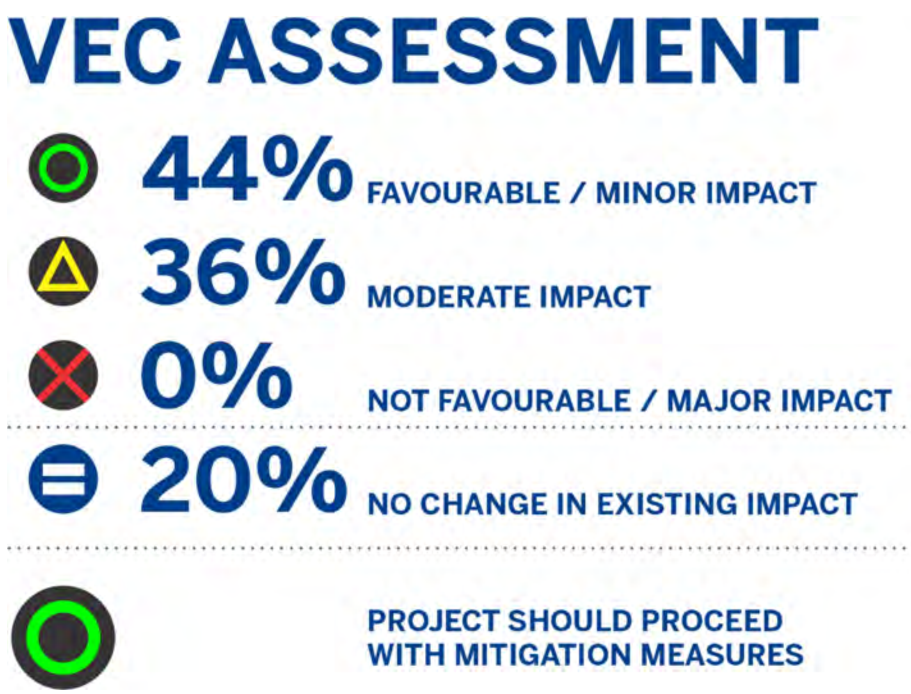


Several different locations were considered for building and operating the Project components. Based on a detailed and prescriptive analysis, it was determined that the best location for the recovery boiler, multi-effect evaporators, and steam turbine(s) and green energy generator(s) is the east side of the Mill site in an existing parking area near Bridge Road. The optimal location for the recausticizing plant expansion is on the west side of the Mill site peninsula near the existing recausticizing plant.

This EIA document provides a detailed Project description and narrative on the baseline environment. Components of the existing environment that are described include the physio-chemical environment, the biological environment, and the socio-economic environment. The baseline environmental data were overlain by three Project stages (*i.e.*, construction, operation and maintenance, and mishaps, errors, and / or unforeseen events) to identify potential environmental interactions. Based on that process, 12 Valued Environmental Components (VECs) were identified. The VECs that were assessed in detail within the EIA include:

- physio-chemical environment:
  - air quality;
  - sound emissions;
  - surface water quality and quantity; and
  - groundwater quality and quantity;
- biological environment:
  - terrestrial flora and fauna;
  - aquatic flora and fauna; and
- socio-economic environment:
  - labour and economy;
  - archaeological and cultural resources;
  - transportation network;
  - aesthetics;
  - recreation and tourism; and
  - health and safety.

A visual impact assessment process like a traffic light was used for characterizing potential environmental interactions. All told, 162 specific possible environmental interactions were assessed. Of those, 44 % were assigned green lights, 36 % were given yellow lights, and 20 % yielded no changes. Red lights (*i.e.*, not favourable or major impacts) were not assigned to any of the potential interactions. The ultimate Project impact assessment, which is based on the summation of all possible environmental interactions for the 12 VECs, produced a green light. The ultimate outcome of this Project will be environmentally beneficial and should proceed as detailed within this EIA document.



A Project-specific Environmental Protection Plan (EPP) will be developed to mitigate the potential impacts identified. The EPP will prescribe BMPs that will be used throughout Project construction and during operation and maintenance to safeguard the environment. The Project-specific EPP will be a dynamic document used by Project personnel in the field and at the corporate level for ensuring commitments made in the EIA are implemented and monitored.

The EIA process is an open and transparent process that involves First Nations engagement and public consultation. The process assures individuals and / or groups that may be potentially affected by the Project are made aware of the registration, are able to obtain information on the Project, and are able to express any and / or all concerns they may have.

IPP began First Nations engagement in November 2022 through the issuance of letters regarding the Project. Since then, IPP has undertaken several forms of in-person and virtual engagement. For example, in early 2023, IPP gave presentations that provided a recent history of upgrades and modernization work at IPP, the current Mill operation, and draft forward-looking plans for the mill modernization and green energy generation project. In June 2023, a draft version of the EIA document was shared with the Wolastoquey Nation in New Brunswick and the Mi'qmawe'l Tplu'taqnn Inc.

This EIA document is available for public comment until 12 July 2024. As a good environmental steward and neighbour, IPP intends to hold a voluntary public open house. Tentatively, the open house will be conducted near the Mill at a date and location yet to be determined. Visual aids will be on display and attendees will have the opportunity to discuss the Project with IPP staff. Attendees will also be able to submit written questions during the open house for inclusion in a Public Consultation report that will be submitted to the NBDELG.

Comments, questions, and concerns regarding the EIA document can also be forwarded to the Environmental Consultant:

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ACRONYMS

AB:	Alberta
ADMT:	Air Dry Metric Tonnes
ACAPSJ:	Atlantic Coastal Action Program Saint John Chapter
ACCDC:	Atlantic Canada Conservation Data Centre
a.k.a.:	also known as
AM:	(*ante meridiem*) before midday
AMSL:	Above Mean Sea Level
ANB:	Ambulance New Brunswick
ASHRAE:	American Society of Heating, Refrigeration, and Air-Conditioning Engineers
ATC:	Approval To Construct
ATO:	Approval To Operate
BAT:	Best-Available Technology
BC:	British Columbia
BMPs:	Best-Management Practices
℅:	Care Of
c.f.:	(*confer*) compare or consult
CAAQS:	Canadian Ambient Air Quality Standards
$CaCO_3$:	calcium carbonate or lime mud
CaO:	calcium oxide or quick lime

$Ca(OH)_2$:	calcium hydroxide
CCME:	Canadian Council of the Ministers of the Environment
CDD:	Canadian Disaster Database
CFIA:	Canadian Food Inspection Agency
CH:	Caledonia Highlands
CMA:	Census Metropolitan Area
CN:	Canadian National
CNCG:	Concentrated Non-Condensable Gases
Co.:	Corporation
CO:	Carbon monoxide
CO_2:	Carbon dioxide
CO_{2eq}:	Carbon dioxide equivalents
COMEX:	COMmunity EXpress
COSEWIC:	Committee On Status of Endangered Wildlife in Canada
cm:	centimetre
CRI:	Canadian Rivers Institute
dBA:	A-weighted deciBels (*i.e.*, relative loudness)
DDT:	Dichloro-Diphenyl-Trichloroethane
DFO:	Department of Fisheries and Oceans
DNCG:	Dilute Non-Condensable Gases
e.g.:	(*exempli gratia*) for example
ECCC:	Environment and Climate Change Canada
EIA:	Environmental Impact Assessment
EMO:	Emergency Management Organization
EP:	Environmental Professional
EPP:	Environmental Protection Plan
ERP&ECP:	Emergency Response Plan & Environmental Contingency Plan
ESA:	Environmentally Significant Area
ESP:	ElectroStatic Precipitator
et al.:	(*et alii*) and others
etc.:	(*et cetera*) and so forth
ETF:	Environmental Treatment Facility
EY:	Ernst and Young

FGC:	Fellow of Geoscience Canada
FMA:	Forest Management Agreement
f*SARA*:	federal *Species At Risk Act*
g:	gams
GDP:	Gross Domestic Product
GHG:	GreenHouse Gases
GHGRP:	GreenHouse Gas Reporting Program
GIS:	Geographical Information System
GP:	General Partnership
ha:	hectare
H_2O:	water
H_2S:	Hydrogen Sulphide
hr:	hour
i.e.:	(*id est*) namely / that is
IAAC:	Impact Assessment Agency of Canada
IBA:	Important Bird Area
ID:	IDentification
IH:	Heavy Industrial
IPCC:	International Panel on Climate Change
IPP:	Irving Pulp and Paper
ISO:	International Standards Organization
JDI:	J.D. Irving, Limited
JOHSC:	Joint Occupational Health and Safety Committee
kg:	kilogram
km:	kilometre
km^2:	square kilometres
kPa:	kiloPascal
kt:	kilotonne
kV:	kiloVolt
kW:	kiloWatt
L:	Litre
L.P.:	Limited Partnership
LED:	Light-Emitting Diode

LNG:	Liquefied Natural Gas
LOS:	Level Of Service
Ltd.:	Limited
m:	metres
m^2:	square metres
m^3:	cubic metres
max:	maximum
MB:	Manitoba
MBBR:	Moving Bed Biofilm Reactor
mg:	milligram
min:	minute; minimum
mm:	millimetre
MMEs:	Multiple-Effect Evaporators
MO:	MOncton
Mt:	Megatonnes
MTI:	Mi'gmawe'l Tplu'taqnn Inc.
MW:	MegaWatt
mya:	million years ago
n:	statistical value that refers to the number of observations
N:	North; Nitrogen
n.b.:	(*nota bene*) note well / take note
Na:	sodium
Na_2CO_3:	sodium carbonate
Na_2S:	sodium sulphide
Na_2SO_4:	sodium sulphate
NaOH:	sodium hydroxide
NAP:	Northern APpalachian
NAPS:	National Air Pollution Surveillance
NB:	New Brunswick
NBAPC:	New Brunswick Aboriginal Peoples Council
NBCC:	National Building Code of Canada, New Brunswick Community College
NBDAA:	New Brunswick Department of Aboriginal Affairs
NBDELG:	New Brunswick Department of Environment and Local Government

NBDJPS:	New Brunswick Department of Justice and Public Safety
NBDNRED:	New Brunswick Department of Natural Resources and Energy Development
NBDTI:	New Brunswick Department of Transportation and Infrastructure
NBSK:	Northern Bleached Softwood Kraft pulp
NBSR:	New Brunswick Southern Railway
NCASI:	National Council for Air and Stream Improvement, Inc.
NCGs:	Non-Condensable Gases
NFPA:	National Fire Protection Association
NGO:	Non-Governmental Organization
NL:	Newfoundland
NO_2:	Nitrogen Oxides
NPRI:	National Pollutant Release Inventory
NRC:	National Research Council, Natural Resources Canada
NS:	Nova Scotia
NT:	Northwest Territories
NU:	Nunavut
O_3:	Ozone
OHSA:	*Occupational Health and Safety Act*
ON:	Ontario
P.Eng.:	Professional Engineer
P.Geo.:	Professional Geoscientist
PB:	Passamaquoddy Bay
PB:	Power Boiler
PDF:	Portable Document Format
PE:	Prince Edward Island
PID:	Property IDentifier
PM:	Particulate Matter or (*post meridiem*) after midday
$PM_{2.5}$:	Particulate Matter less than 2.5 microns
PM_{10}:	Particulate Matter less than 10 microns
PNB:	Province of New Brunswick
PO:	Post Office
ppb:	parts per billion
PPE:	Personal Protective Equipment

PPH:	Pounds Per Hour
ppm:	parts per million
p*SARA*:	provincial *Species At Risk Act*
PSC:	Public Safety Commission
PSJ:	Port Saint John
QC:	Quebec
RB:	Recovery Boiler
RCP:	Representative Concentration Pathways
RDCC:	Resource Development Consultation Coordinator
s:	seconds
SARA:	*Species At Risk Act*
SRES:	Special Report on Emission Scenarios
SJFD:	Saint John Fire Department
SJPF:	Saint John Police Force
SJTC:	Saint John Transit Commission
SJW:	Saint John Water
SK:	Saskatchewan
SOGs:	Stripper Off-Gases
sp.:	specific species name cannot be specified
std. dev.:	standard deviation
StatsCan:	Statistics Canada
SO_2:	Sulfur Dioxide
t:	tonnes (*i.e.*, 1 000 kg)
™:	Trade Mark
T&SO:	Transmission & System Operator
TRC:	Technical Review Committee
TRS:	Total Reduced Sulphur
TSP:	Total Suspended Particulates
TSS:	Total Suspended Solids
UNESCO:	United Nations Educational, Scientific, and Cultural Organization
UNFCCC:	United Nations Framework Convention on Climate Change
US:	United States
USEPA:	United States Environmental Protection Agency

VEC:	Valued Environmental Component
VOCs:	Volatile Organic Compounds
yr:	year
YK:	Yukon
YSJ:	Saint John Airport
W:	West
WAWA:	Watercourse And Wetland Alteration
WMO:	World Meteorological Organization
WWNB:	Wolastoqey Nation in New Brunswick
°:	degrees
°C:	degrees Celsius
%:	percent
µg:	micrograms
>:	greater than
≥:	greater than or equal to
<:	less than
≤:	less than or equal to
~:	approximately
±:	plus or minus
$:	dollars
$_{(aq)}$:	aqueous phase
$_{(g)}$:	gaseous phase
$_{(l)}$:	liquid phase
$_{(s)}$:	solid phase

1.0 PROPONENT

1.1 PROPONENT NAME

The proponent for this Project is Irving Pulp & Paper, Limited (IPP), which is a division of J.D. Irving, Limited (JDI).

1.2 PROPONENT ADDRESS

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1.3 PROPONENT CONTACT

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1.4 PRINCIPAL CONTACT FOR PURPOSES OF ENVIRONMENTAL IMPACT ASSESSMENT

Fundy Engineering & Consulting Ltd. (Fundy Engineering) prepared this Environmental Impact Assessment (EIA) Registration Document with support from several other consultants, including: Dillon Consulting Limited; Englobe Corp.; and Jupia Consultants Inc. The principal contact at Fundy Engineering with respect to this EIA is:

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1.5 PROPERTY OWNERSHIP

The proposed Project will occur at the Reversing Falls Mill at the mouth of the Saint John River in Saint John, New Brunswick (NB). Several land parcels comprise the 73.8 hectare (ha) Reversing Falls Mill and they are shown in Figure 1. The properties are all owned by the Proponent and its affiliates. A summary of the properties and their sizes is provided in Table 1 and detailed Service New Brunswick database Property IDentification (PID) reports are included in Appendix I.

Table 1. List of properties in Saint John, New Brunswick that comprise the Reversing Falls Mill.

PID	Owner	Lessee(s)	Size (ha)	Description
55162416	Irving Pulp & Paper, Limited	Air Liquide Canada Inc.	48.7	Pulp mill and land
55223739	Irving Pulp & Paper, Limited		18.0	Water lot parcel A
55232649	Irving Pulp & Paper, Limited		0.15	Pulp mill and land
55232656	Irving Consumer Products Limited		1.68	Tissue mill
55233001	Irving Pulp & Paper, Limited		2.52	Water lot parcel B
55176762	Irving Pulp & Paper, Limited		0.33	Mill access
55119432	Irving Pulp & Paper, Limited		0.05	Parking
00035741	Irving Pulp & Paper, Limited		2.0	Parking
00035170	Irving Pulp & Paper, Limited		0.25	Weigh scales
00034082	Irving Pulp & Paper, Limited		0.06	Mill access
00033621	Irving Pulp & Paper, Limited		0.05	Parking
		TOTAL	**73.8**	

Figure 1. Aerial photograph, circa 2021, showing the properties that comprise the Reversing Falls Mill at the mouth of the Saint John River in Saint John, New Brunswick.

2.0 PROJECT DESCRIPTION

2.1 PROJECT NAME

For the purposes of this EIA, the Project is referred to as:

MILL MODERNIZATION
AND
GREEN ENERGY GENERATION

2.2 PROJECT OVERVIEW

Pulp and Paper Mills have existed at Reversing Falls near the mouth of the Saint John River (Wolastoq) in Saint John, New Brunswick since 1836 [*Fundy Engineering*, 2014a and 2014b]. In 1946, IPP purchased mill at Reversing Falls (Figure 2) from the Port Royal Pulp & Paper Co. Ltd. In 1958, Kimberly-Clark opened a tissue mill at Reversing Falls, which was acquired by JDI in 1987. The pulp mill and tissue mill are collectively referred to as the Reversing Falls Mill or the Mill throughout this document. A detailed facility profile is provided in *NBDELG* [2021], which is also included in Appendix II.

Figure 2. The Reversing Falls Mill, circa 2024, is located near the mouth of the Saint John River (Wolastoq) in Saint John, New Brunswick.

2.2.1 Previous Mill Modernization

The Mill has undergone numerous upgrades as part of previous modernization work to become the world-class Northern Bleached Softwood Kraft pulp and premium tissue facility that it is today. Enhanced environmental performance has been and continues to be a focus of modernization. Those upgrades include:

- **1958** - Kraft mill production process added;
- **1977** - sulphite production process halted;
- **1996** - environmental improvement project, which included:
  - a new fibreline:
    - oxygen delignification (*i.e.*, installing a more environmentally friendly delignification system); and
    - wash presses to reduce water discharge; and
  - modernized evaporators:
    - reverse osmosis to reduce water discharge and improve quality; and
    - condensate stripping to improve water quality discharge;
- **1999** - Moving Bed Biofilm Reactor (MBBR);
- **2006 to 2012** - Phase I modernization (Figure 3) at capital cost of $140 million included a lime kiln (*i.e.*, to replace two lime kilns that were approaching the end of their life and that had significant impacts on air and water emissions) and odour abatement (*i.e.*, to reduce odourous sulphur emissions) [*IPP*, 2004] and railcar chip unloading conveyors;
- **2014 to 2016** - Phase II modernization (Figure 4) at a capital cost of $195 million included a pulp digester (*i.e.*, to improve the chip cooking process) and chip handling (*i.e.*, to reduce fugitive dust emissions) [*Fundy Engineering*, 2014a];
- **2019 to 2022** - Phase III modernization (Figure 5) at a capital cost of $315 million included a pulp dryer and warehousing [*Fundy Engineering*, 2016] and parking upgrades; and
- **2022 to 2025** - Phase IIIB modernization (Figure 6) at a capital cost of $300 million included an environmental treatment facility to ensure high quality water release and water use reduction to significantly reduce water consumption in the pulp manufacturing process [*Fundy Engineering*, 2022].

The Mill currently has approval to collectively produce approximately 1 000 Air Dry Metric Tonnes (ADMT) of pulp each day using a variety of physical and chemical processes and approximately 200 machine dry tonnes per day of tissue (Figure 7). The Mill is a fundamental contributor to New Brunswick's Forest Products Cluster (NBFPC) because it is at the center of the supply chain (Figure 8) and is the largest consumer of residual wood chips and biomass in the province (*i.e.*, woodlands and sawmills depend on the pulp mill to handle their byproducts). A highly skilled staff of about 480 work at the facility including operators, chemists, engineers, technicians and technologists, mechanics, electricians, and administrators. The Mill is a top industrial employer in New Brunswick and the largest employer among the more than 20 JDI forest products divisions across the province.

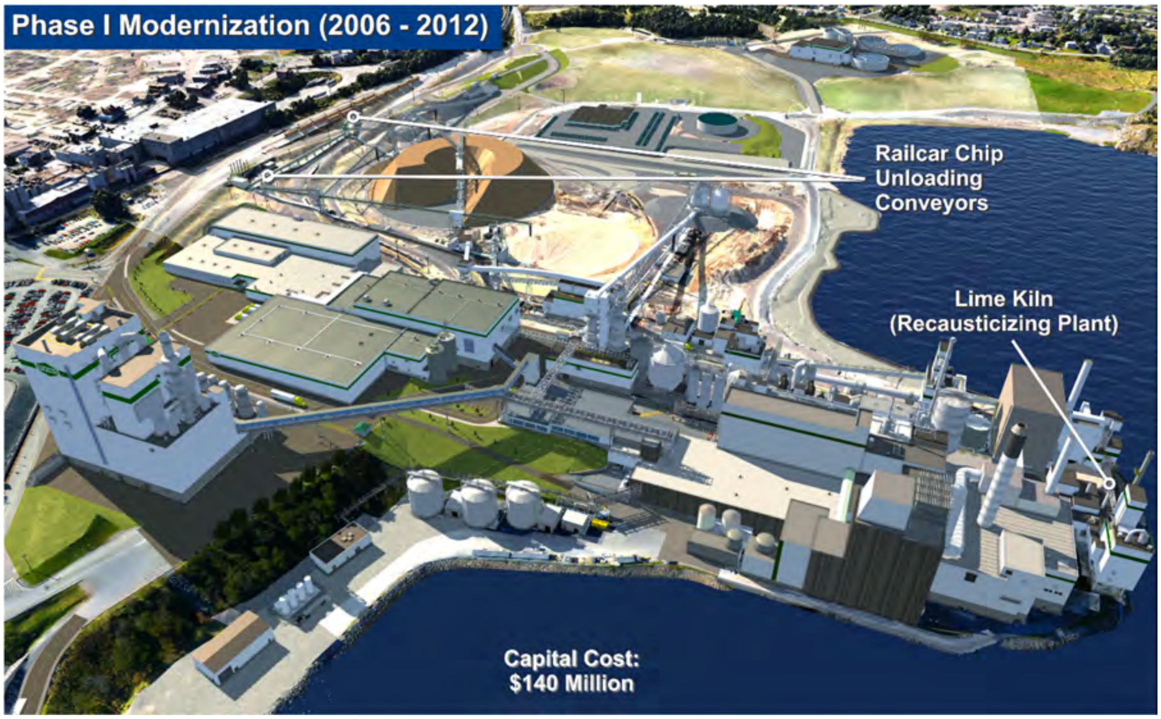


Figure 3. Three-dimensional model of the Reversing Falls Mill in Saint John, New Brunswick highlighting the Phase I Modernization completed between 2006 and 2012.

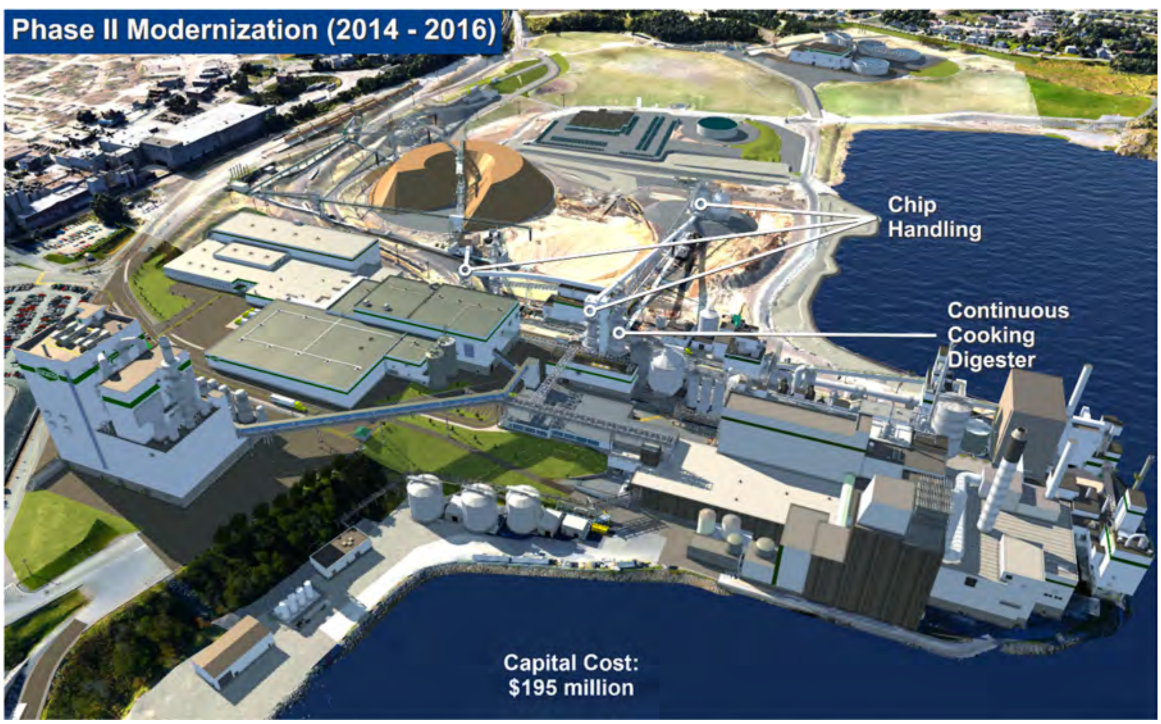


Figure 4. Three-dimensional model of the Reversing Falls Mill in Saint John, New Brunswick highlighting the Phase II Modernization completed between 2014 and 2016.

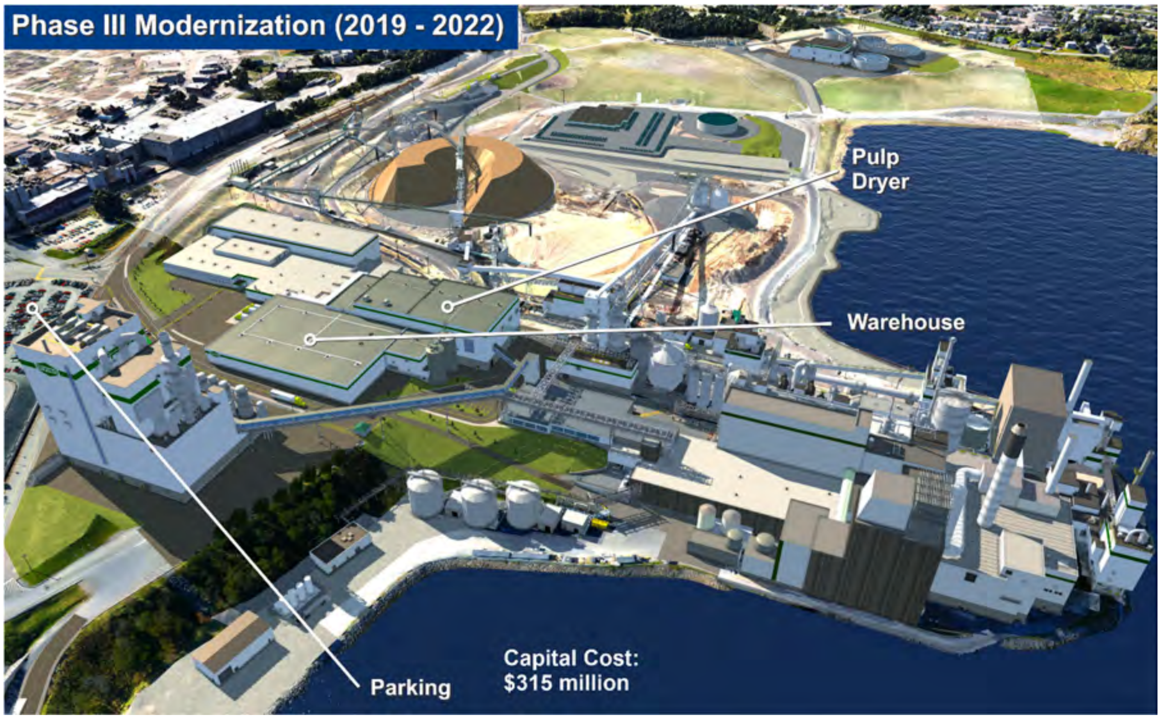


Figure 5. Three-dimensional model of the Reversing Falls Mill in Saint John, New Brunswick highlighting the Phase III Modernization completed between 2019 and 2022.

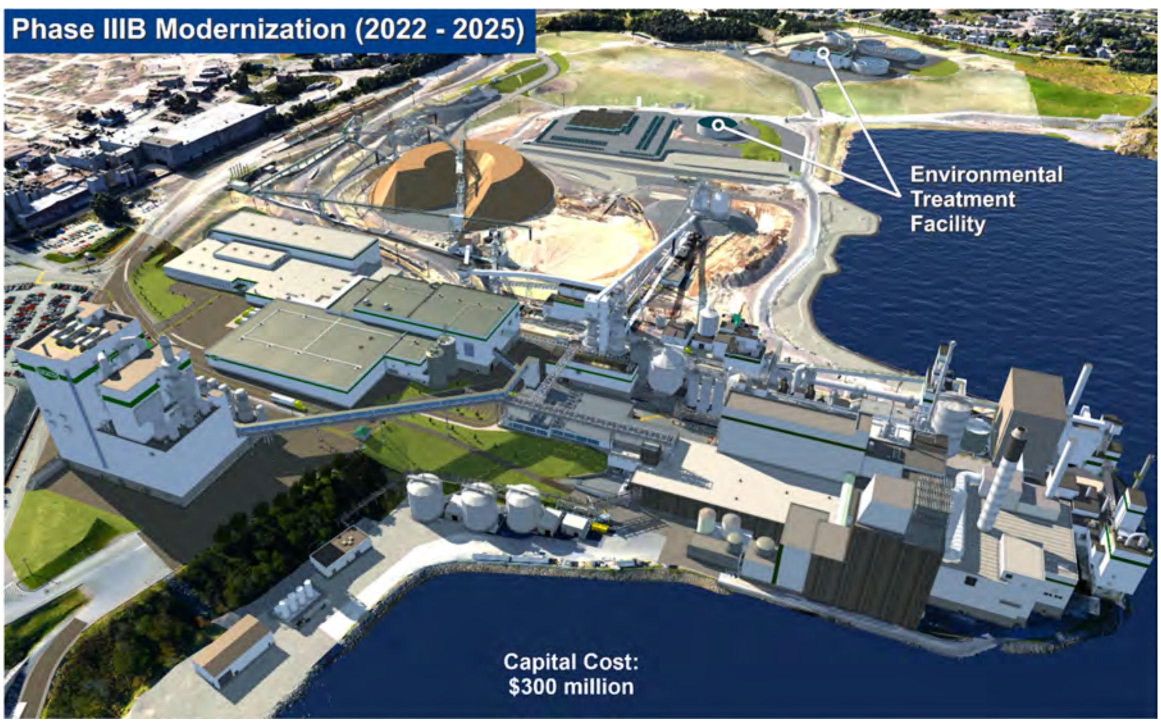


Figure 6. Three-dimensional model of the Reversing Falls Mill in Saint John, New Brunswick highlighting the Phase IIIB Modernization currently being completed.

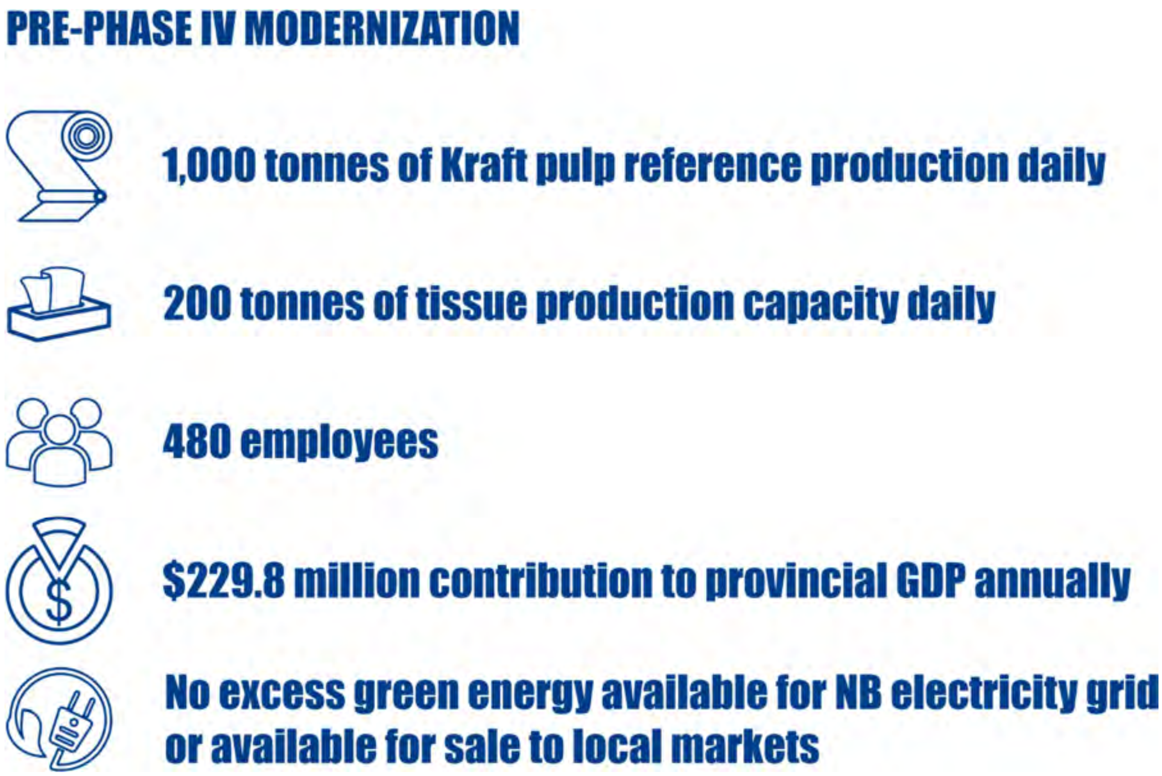


Figure 7. Production highlights for the Reversing Falls Mill in Saint John, New Brunswick pre-Phase IV modernization.

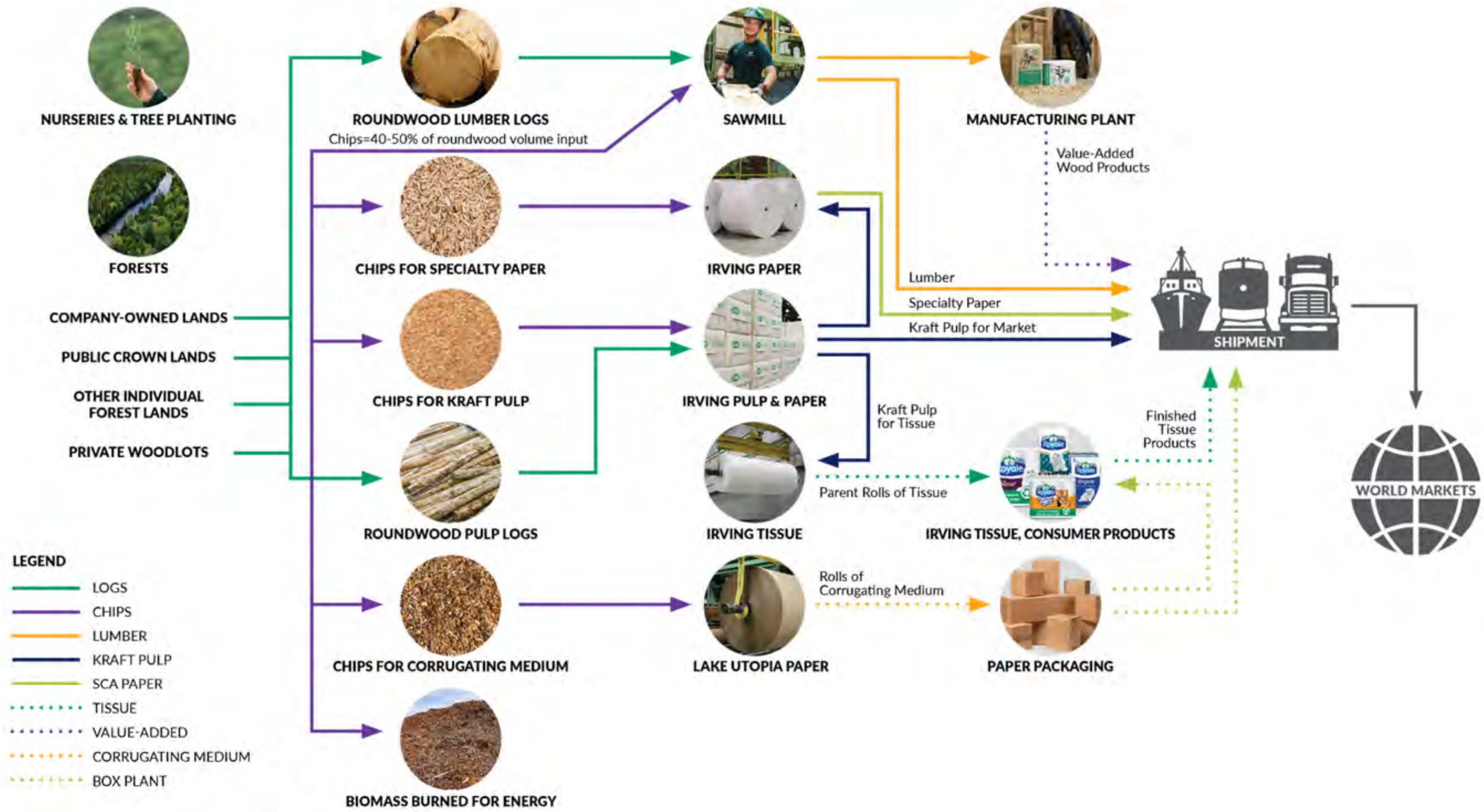


Figure 8. Irving Pulp & Paper, Limited is at the center of the JDI Group of Companies' forest products supply chain.

2.2.2 Current Mill Modernization (Simplified Project Description)

This section provides a Project overview and for many readers it should be sufficient to understand the modernization work that will be completed. For a more detailed Project description (*i.e.*, for members of the Technical Review Committee), readers are referred to Section 2.6.

This Project, considered Phase IV of the Mill's overall modernization since 2006 (*i.e.*, refer to Section 2.2.1), will complete the Mill's asset renewal, enhance its environmental performance, improve its production capacity, and safeguard its future as the anchor of the NBFPC. It will move the Mill's annual capacity in the global market for Kraft pulp from about 335 000 tonnes to 575 000 tonnes boosting output from fourth quartile to first quartile producer (Figure 9).

Phase IV of the Mill's overall modernization capitalizes on the three previous modernization phases and will completely transform the Mill by using Best-Available Technology (BAT). Although the three previous phases have not yielded any production increase from the Mill, they ultimately prepared the Mill for a production increase as part of this Project. This Project represents the largest Canadian forestry products industry investment since 1993 when a new Kraft pulp mill opened in Grande Prairie, Alberta. Once complete, the Reversing Falls Mill will be one of, if not the top environmentally performing Kraft mills in the world. Undertaking this work demonstrates JDI's commitment to continuous environmental improvement and highlights the generational investments the company has made and continues to make in Saint John's economy and the NBFPC.

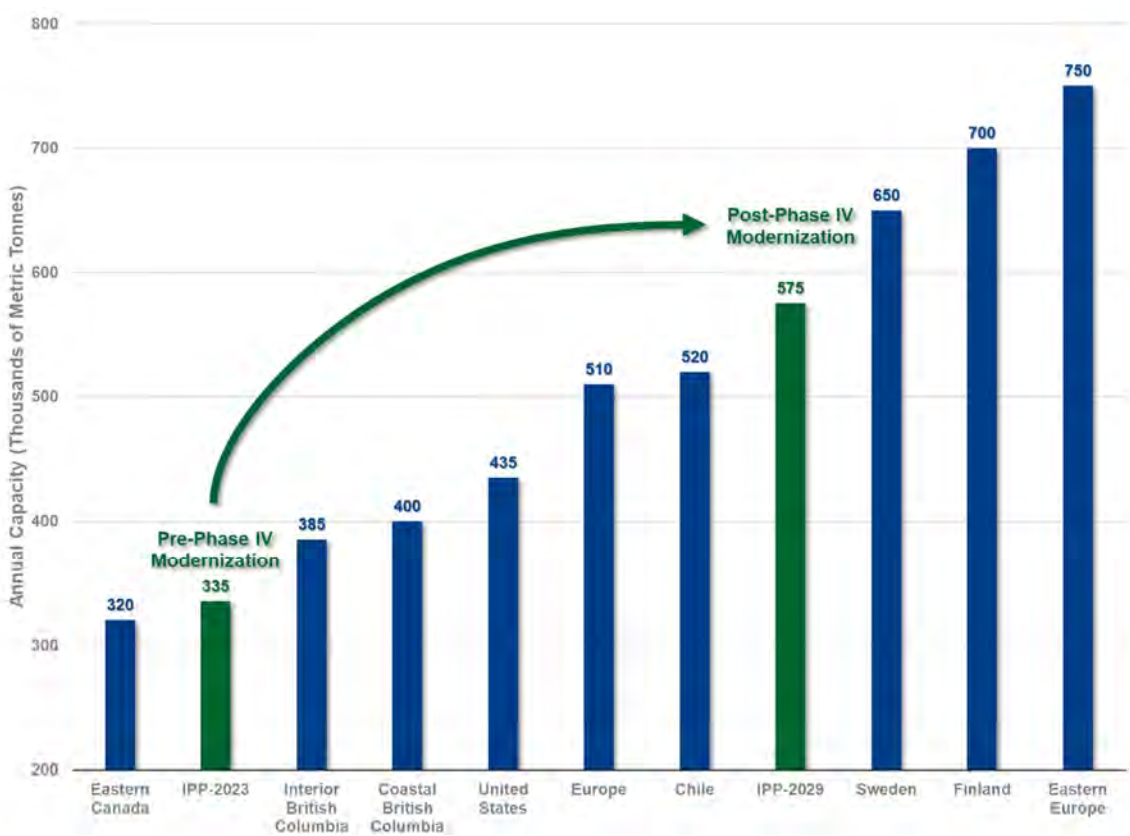


Figure 9. Outlook for market Kraft pulp, circa June 2023, showing the movement of the Reversing Falls Mill from pre-Phase IV Modernization to post-Phase IV Modernization. Source: *Hawkins Wright* [2023].

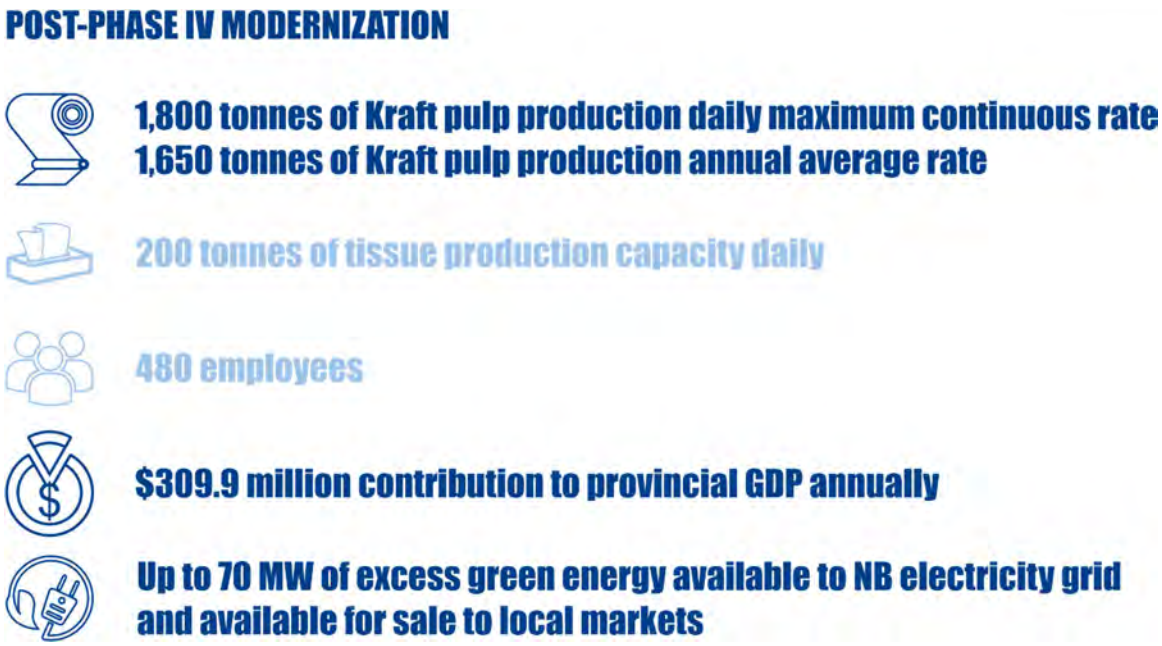


Figure 10. Production highlights for the Reversing Falls Mill in Saint John, New Brunswick post-Phase IV modernization. Items in light blue indicate no change.

The subsections below provide an overview of the main Project components. More detailed information is included in Section 2.6.

2.2.2.1 New Recovery Boiler

Patented in 1884 by Carl Dahl [*Dahl*, 1884], the Kraft pulping process accounts for most pulp produced globally. G.H. Tomlinson developed the Kraft Recovery Boiler (RB) technology with Babcock and Wilcox in 1929 [*Babcock & Wilcox*, 2005]. The first RB was sold and placed into service at Quebec's Windsor Mill on 27 June 1934 [*Tomlinson*, 1975]. The use of RB technology that is based on the Windsor Mill's installation is the primary reason why the Kraft pulping process dominates the global paper industry. Today, RBs of similar technology are in use throughout the pulp and paper industry, including at the Reversing Falls Mill, to recycle more than 95 % of the cooking fluids used and to recover a significant portion of the waste heat generated in the Kraft pulp production process.

The RB is a critical component of the Kraft pulping process as it nearly makes the manufacturing process a closed cycle. In the absence of an RB, the manufacture of Kraft pulp would be environmentally and economically impractical. The RB's purpose is to reclaim cooking fluids and solids used in the manufacture of the Kraft pulp and to recover and repurpose waste heat, which would otherwise be lost to the environment. The reclaimed cooking materials are reused in the Kraft pulp manufacturing process and the recovered organics / wood waste are used to produce steam for supplying in-mill demands and to produce turbine-generated electricity.

The average life-expectancy of an RB is 50 years with a rebuild and renovation frequency of every 10 years to 15 years. Rebuilds are undertaken because the RB is generally the most capital-intensive component of a Kraft pulp mill, so longevity is imperative. Currently, there are 58 Kraft mills operating in North America. Some of those mills have multiple RBs for a total of 77 units operating across the continent (Figure 11). The median age of those RBs is 43 years. The oldest RB at 76 years is at the Kruger Wayagamack Coated Paper Mill in Trois-Rivières, Québec (Figure 12). This Project involves the complete replacement of the existing RB at the Mill. As a result, the RB at the Reversing Falls Mill will be the newest to be built in Canada since a new RB was built in 2006 at North America's newest Kraft mill in Grande Prairie, Alberta.

The Reversing Falls Mill's 1971-era RB is nearing the end of its useful life. Since the Mill's RB was installed, many technological improvements have occurred. Those improvements, such as a switch to cleaner auxiliary fuel systems (*i.e.*, moving away from Bunker C heavy fuel oil) and enhanced automation, have resulted in decreased GreenHouse Gas (GHG) and other air emissions. Improved energy efficiency, which is another improvement of modern RBs, results in increased steam and power production. Older RBs, such as those used at the Mill, burn spent cooking fluids at a lower concentration and operate at lower pressures than modern RB. Increasing the spent cooking fluids concentration and increasing the operating pressure yields increased efficiency through cogeneration of steam and power.

Figure 11. Kraft market pulp mills operating in North America circa 2022. Source: FisherSolve® from Fisher International Inc.

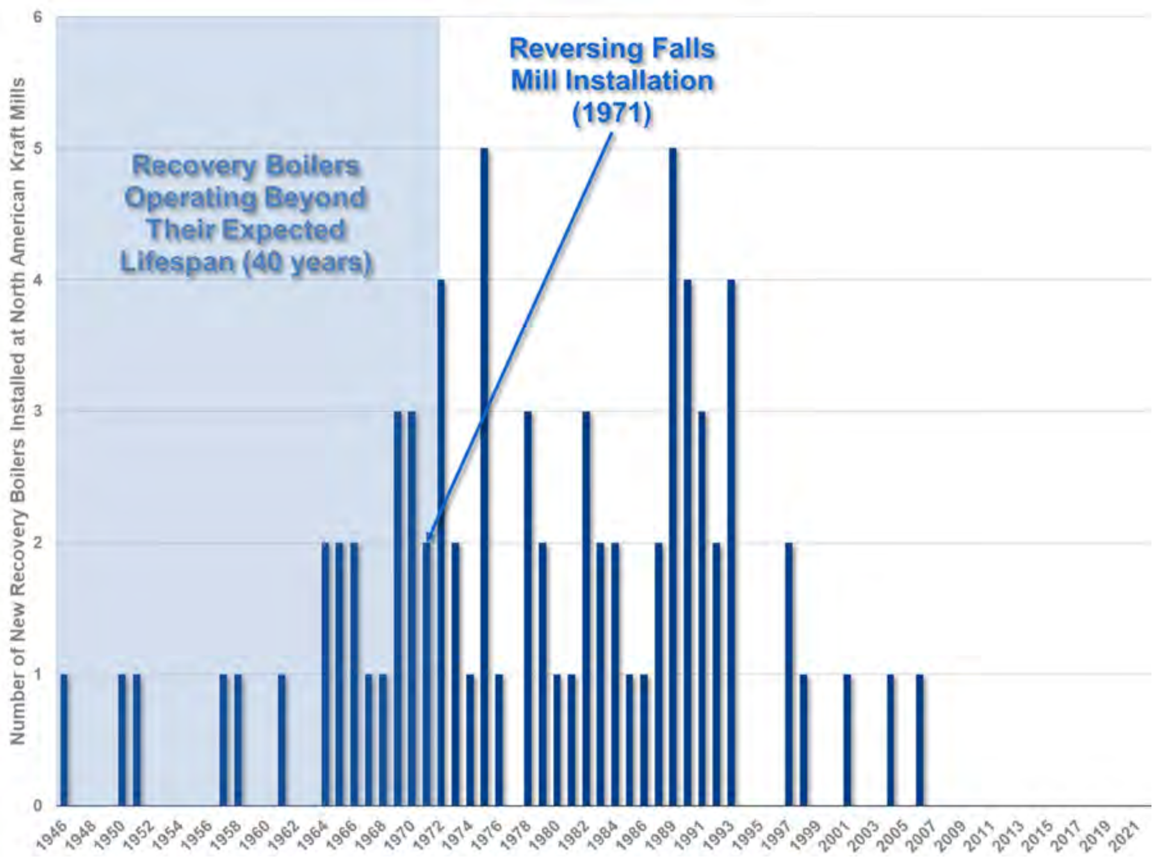


Figure 12. Recovery boilers by year built for Kraft pulp mills operating in North America circa 2022. Source: FisherSolve® from Fisher International Inc. and may not include all information for North American mills.

Modern Kraft mills are nearly self-sufficient in the production of cooking fluids required for the manufacture of pulp (*n.b.*, only small amounts of sodium, sulphur, and inorganic compounds must be added to compensate for losses) and many are energy self-sufficient and capable of producing surplus green energy that can be fed to the energy grid. The production of surplus green energy from modern Kraft mills is primarily a result of higher dry solids concentration in the spent cooking fluids (*i.e.*, ~ 80 % versus ~ 65 %), pre-heating feedwater to maximize steam generation, recovering heat from the combustion of vent gases (*e.g.*, non-condensable gases and stripper off-gases, *etc.*), and the addition of heat from other sources within the mill. Essentially, the combustion of spent cooking fluids does double duty; it provides renewable energy and drives the pulp manufacturing process.

Emissions from the new RB will pass through two ElectroStatic Precipitators (ESPs) before being released through a new flue gas stack. The ESPs will remove significant amounts of particulate matter in the emissions. The flue gas stack will use dry versus wet technology to scrub the air emissions, which will reduce the visible plume.

The size of the RB dictates the overall pulp production of a mill. Since the technology was first used at Quebec's Windsor Mill, the size of RBs has grown from about 120 tonnes per day ($t \cdot day^{-1}$) of dry solids combustion to about 10 000 $t \cdot day^{-1}$. The Reversing Falls Mill's existing RB places an upper limit on pulp production to approximately 1 000 ADMT. The new RB will be designed such that the Mill will have a maximum daily production capacity of 1 800 ADMT of Kraft pulp each day (*n.b.*, the annual average will be 1 650 ADMT).

2.2.2.2 New Steam Turbine(s) and Green Energy Generator(s)

Biomass is a substantial renewable resource derived from living organisms and / or their by-products that is used as a fuel to produce heat, steam, and electric power. It is a climate change mitigation option because biomass absorbs carbon dioxide (CO_2) from the atmosphere during its growth and then emits an equal amount of CO_2 when it is processed to generate electricity (*i.e.*, the use of biomass is generally considered to mitigate climate change due to the short-term terrestrial carbon cycle between plants and the atmosphere and the avoided emission of fossil fuels). It also displaces the use of conventional fossil fuels that would otherwise be required to generate heat. In 2018, there were 36 operational co-generation units at pulp and paper mills across Canada using biomass [*NRC*, 2021a].

Pulp and paper mills have been recognized as having under-utilized resources for producing green energy through the combustion of biogenic carbon (*i.e.*, biomass). That green energy is produced from biomass fuels, such as energy-rich residuals from wood and pulp and paper manufacturing. The primary combustion residuals from wood processing are bark, wood chips, sanding dust, edgings, sawdust, and slabs. That residue is generally ground up (*i.e.*, hogged) to make a dense homogenous fuel that is then combusted in the biomass / bark boiler.

The existing bark boiler at the Mill uses hog fuel to produce power (*n.b.*, the bark boiler is not linked to the pulping process but is instead used to contribute to the overall steam generation in addition to a Power Boiler (PB) and to manage changing steam demands of the pulp production process). The primary combustion residuals from pulp processing are lignin and other organic compounds separated from the pulp. Those materials are combusted in the RB to produce steam for energy production at the Mill. The Mill's current RB produces nearly enough green energy for the Mill to be self-sufficient.

As RB technology has improved, higher pressures and more excess steam generation have been made possible. The increased steam generation from the new RB will require a new turbine or turbines capable of accepting the higher-pressure steam to cogenerate steam and power for the Mill (*n.b.*, the decision on whether one or two steam turbines will be installed with the same maximum production will be determined during detailed engineering). Although the Mill does not necessarily require higher steam generation and pressure to operate, a new condensing turbine and generator (or turbines and generators) will allow for additional power generation. The exhaust steam from that system will be at a pressure that is still suitable for use in other areas of the Kraft pulping process.

For this Project, high pressure steam from the new RB coupled with steam from the #3 PB will be used to turn the blades of the new turbine(s). A new generator (or generators) connected to the turbine(s) will then be used to produce electricity. The new generator(s) will produce up to 140 MegaWatts (MW) of electricity, which is more than enough green electricity to operate the entire Mill (*i.e.*, up to 70 MW). Up to 70 MW of excess electricity produced by the generator(s) will be sold as green energy to the connected NB Power electricity grid. The existing steam turbines and generators currently supplying most of the Mill's electricity will be taken out of service but will remain in place.

2.2.2.3 New Multiple-Effect Evaporators

The initial step in the recovery of chemicals from the Kraft pulping process is the concentration of organic and inorganic solids within the water used to wash the cooked pulp so that it can be effectively combusted in the RB. The solids concentration is done by recovering much of the water within evaporators. That recovered water will then be reused within the overall Kraft pulp production process. For this Project, the existing multiple-effect evaporators at the Mill will be replaced with new multiple-effect evaporators. Those units will be used to recover water and concentrate the spent cooking fluids.

2.2.2.4 Recausticizing Plant Expansion

A recausticizing plant expansion will be required to handle the increased volume of smelt (*i.e.*, inorganics collected at the bottom of the RB) generated by the new RB under the higher pulp production rate. The plant expansion will nearly double the Mill's recausticizing capacity. The recausticizing plant expansion will be part of the cooking fluid regeneration cycle; it will be used to regenerate the fluids used in the chip cooking process. A new lime kiln, lime slaker, and causticizers are the major components of the recausticizing plant expansion. These new components will be similar in construction, capacity, and operation as the current recausticizing plant at the Mill, increasing the capacity for future Kraft pulp production.

2.2.2.5 Decommissioning #2 Power Boiler

Currently, the Mill has two PBs, #2 PB and #3 PB, which with the RB collectively produce the steam for the two existing turbines to generate 30 MW of power. This is nearly sufficient to operate the existing electricity demands of the Mill. The #2 PB is only run as a backup for the #3 PB. The #3 PB and new RB will produce steam for the new turbine to generate ample power for the entire Mill to operate and the surplus will be sold as green power to the connected NB Power electricity grid.

The Mill's #2 PB currently operates as an emergency back-up for steam generation. The fuel used to operate the #2 PB is Bunker C heavy fuel oil. Because the #2 PB is only used on a limited basis, there is no installed air emissions control. This Project presents an opportunity to take the #2 PB offline and decommission it, which will reduce the amount of fossil carbon dioxide emitted from the Mill (*i.e.*, from the combustion of Bunker C heavy fuel oil).

2.2.2.6 Project Benefits Summary

IPP's engineering team spent considerable time and monumental effort developing the Project. This Project will yield significant long-term environmental, economic, and community benefits. Below is a list of benefits this Project will yield, which are also summarized in the infographic of Figure 13.

- The Project will ensure the Mill's global competitiveness by increasing daily maximum production capacity from 1 000 ADMT to 1 800 ADMT of Kraft pulp and places the Mill as one of the top 10 producers of softwood Kraft pulp in the world.
- This Project is fundamental for the long-term environmental and economic performance of the Mill.

  - The new recovery boiler will be one of the most efficient in North America, if not the world, when completed.
  - Installing current best-available technology will enhance the Mill's environmental performance by reducing air emissions per tonne of pulp produced, including:
    - reductions in greenhouse gases associated with the combustion of heavy fuel oil (*i.e.*, Bunker C) by eliminating its use at the Mill and replacing it with cleaner burning natural gas; and
    - reductions in annual air emissions, on a normalized basis, of nitrogen dioxide, fine particulate matter, sulphur dioxide, total reduced sulphur, and total suspended particulates, respectively, by up to 40 %, 35 %, 49 %, 97 %, and 37 %.
  - It will propel the Mill from a fourth quartile to first quartile Kraft producer by using higher quality producing technologies that make it more efficient.
- This Project represents a generational (50 year+) investment in Greater Saint John's economy, the New Brunswick forest products industry, and the green economy.
- The steam turbine(s) and green energy generator(s) will produce up to 140 MW of green electricity through biomass combustion.
  - Energy use by the Mill will be optimized and up to 70 MW of the green energy will be used by the Mill to make it energy self-sufficient.
  - Up to 70 MW of excess green energy will be available for sale to local markets depending on seasonal heating needs at the Mill.
  - Purchase of the excess green energy by NB Power will:
    - help decarbonize the utility's electricity generation by replacing fossil-fuel generated electricity with green energy generated through the Kraft pulping process;
    - increase the utility's purchased renewables electricity generation composition by up to 14 %; and
    - be enough to annually power up to 24 400 typical Canadian homes.
- The steam turbine(s) and green energy generator(s) will produce less carbon intensive electricity (*i.e.*, by up to 82 %) resulting in an annual GHG emissions reduction from the Mill of 19 648 t CO_{2eq}.
  - GHG emissions per tonne of Kraft pulp produced at the Mill will be reduced by 50%.
- Odours from the Mill will be further reduced through considerable technological investments that will result in enhanced collection and incineration of dilute non-condensable gases, non-condensable gases, and stripper off-gases.
- The Mill's overall thermal efficiency will be improved by repurposing waste heat that would otherwise be lost to the environment.
  - The waste heat will be repurposed for various uses including producing steam for electricity generation and heating various equipment and operational spaces throughout the Mill.
- The new flue gas stack will use dry versus wet technology to scrub the air emissions, which will significantly reduce the visible water vapour plume from the recovery boiler stack.

- The installed best-available technology will improve the Mill's production reliability by reducing downtime.
- The Project will increase the demand from all stakeholders, private woodlot owners included, for chips and pulpwood.
- Wood that is otherwise left in the woods today will be used at the Mill thus improving forest utilization throughout the province.
- This Project represents the largest Canadian forestry products industry investment since 1993 when a new Kraft mill opened in Grande Prairie, Alberta.
    - This will be one of the largest industrial construction projects in New Brunswick's history with an estimated capital expenditure of $1.1 billion.
        - There will be significant local spending on construction materials and contracts will be optimized to best utilize New Brunswick trades.
- About 1 465 person years of construction employment will be generated by the Project.
    - It will provide significant opportunity for skilled tradespeople, such as ironworkers, millwrights, carpenters, boilermakers, pipefitters, masons, and labourers to be employed locally as opposed to having to work remotely in places like northern Alberta.

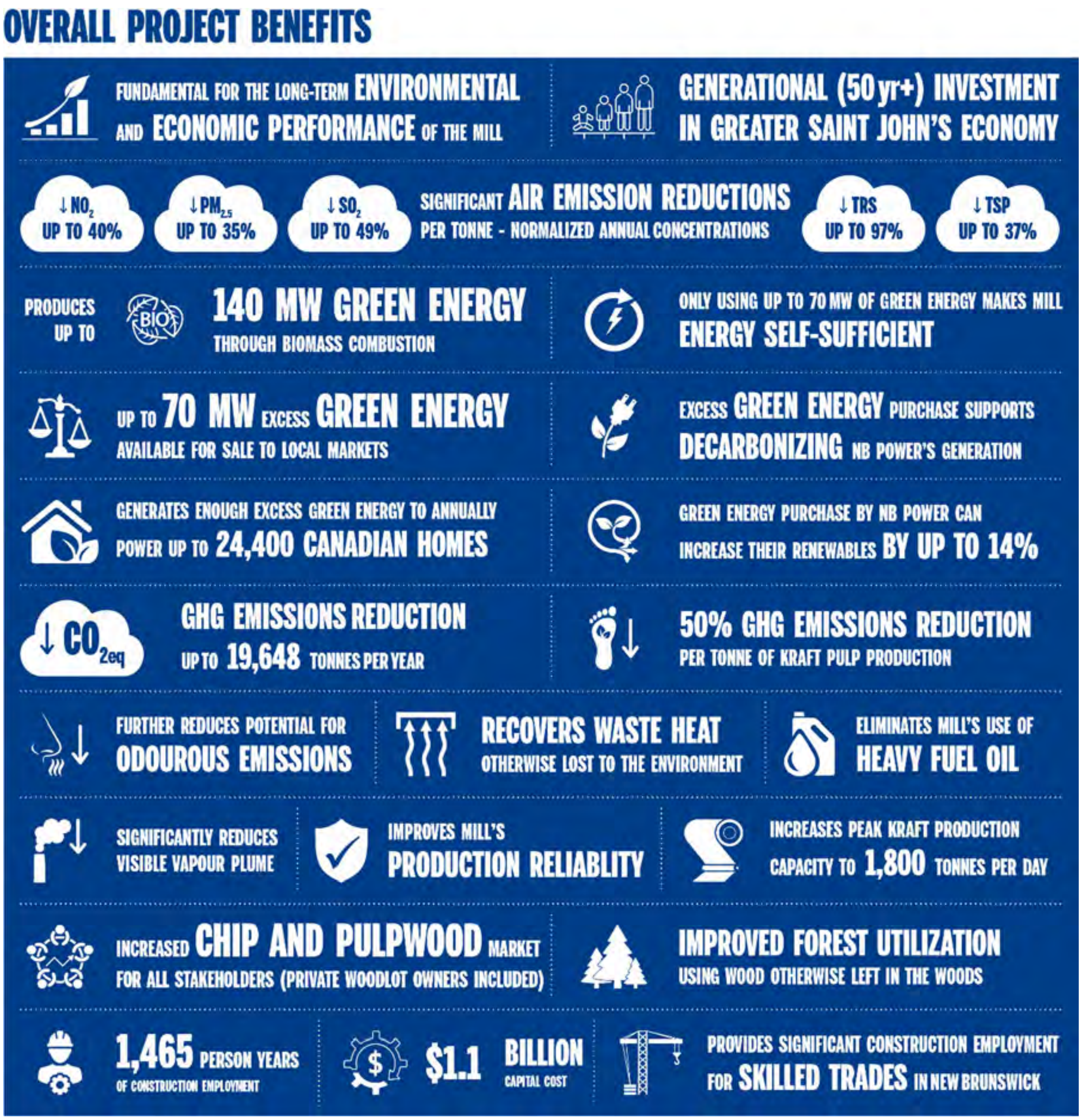


Figure 13. Overall benefits of the Phase IV modernization project planned for the Reversing Falls Mill in Saint John, New Brunswick.

2.3 PURPOSE OF THIS ENVIRONMENTAL IMPACT ASSESSMENT

The purpose of an EIA is to identify and evaluate the potential impacts that the proposed Project may have on the environment. As per Schedule A, item b) (*i.e.*, all electric power generating facilities with a production rating of three megawatts or more) and item k) (*i.e.*, all facilities for the commercial processing or treatment of timber resources…) of the Environmental Impact Assessment Regulation [**87-83**] of the New Brunswick *Clean Environment Act* [**R.S.N.B. 1973, c. C-6**], the Project triggers EIA review. This EIA was prepared by Fundy Engineering & Consulting Ltd. (Fundy Engineering) and other specialty consultants noted in Section 1.4 on behalf of IPP (℅ Ms. Renée Morais). The EIA identifies potential environmental impacts this Project may pose and presents measures to mitigate those potential environmental impacts. The *NBDELG* [2018] guide to EIAs was used in the preparation of this document as was the *NBDELG* [2014] sector guidelines for timber processing projects.

2.4 PROJECT PURPOSE / RATIONALE / NEED

As previously noted, RBs are a critical component to the environmental and economic operation of a Kraft pulp mill. The Mill's existing RB is 1970s era technology. RBs typically have an expected lifespan of about 40 years. Through regular maintenance and rebuilds, IPP has been able to safely maintain their RB beyond 40 years; however, technological improvements in RBs have now made it necessary to replace the RB if the Mill is to continue competing on the world stage for Kraft pulp.

The NBFPC is an integral component of the province's natural resource-based economy and has been for more than 200 years [*Parenteau*, 2013]. It started with mast-making, moved to a square timber trade, advanced to dimensioned lumber, and then into pulp and paper manufacturing. Responsible forest management has provided for a sustainable forest industry in the province. Today, more than 6 million hectares of forested lands are managed throughout the province.

There are more than 900 small- and medium-sized enterprises (*n.b.*, excluding the most indirect companies such as lawyers, accountants, consultants, *etc.*) directly connected to the forest products industry supply chain and have operations in 77 % of New Brunswick's communities [*Jupia Consultants Inc.*, 2023; Appendix III]. Annually, the NBFPC generates more Gross Domestic Product (GDP) than all other export-focused industries in New Brunswick. In 2019, the revenue generated in exporting wood pulp, paper and paper products, softwood lumber, paperboard containers, disposable diapers, and prefabricated wood and manufactured buildings and components was $2.9 billion. In the same year, the cluster induced $1.11 billion in the province's household spending, including:

- $182 million on food expenditures (*i.e.*, groceries and restaurants);
- $263 million on shelter costs;
- $242 million on transportation;
- $77 million on recreation; and
- $77 million on health and personal care (*n.b.*, this excludes publicly delivered health care).

In 2019, the NBFPC induced an estimated $674 million in tax revenue (*n.b.*, adding in forestry royalty payments, the provincial and local governments received an estimated $458 million).

New Brunswick's 2021 forest products GDP contribution per capita ranked it #1 in Canada as shown in Figure 14. During that same year, the NBFPC directly employed 11 800 and supported over 23 000 full-time equivalent jobs. One in 18 workers in New Brunswick has a job related to the forestry sector (*e.g.*, planters, harvesters, truck drivers, labourers, chemists, technicians, engineers, biologists, administrative staff, *etc.*). Between 2020 and 2023, the NBFPC made $2.02 billion in capital investments (*n.b.*, this includes investments in equipment repair and related expenses). Those investments represented 41 % of the capital expenditure across New Brunswick's entire manufacturing sector.

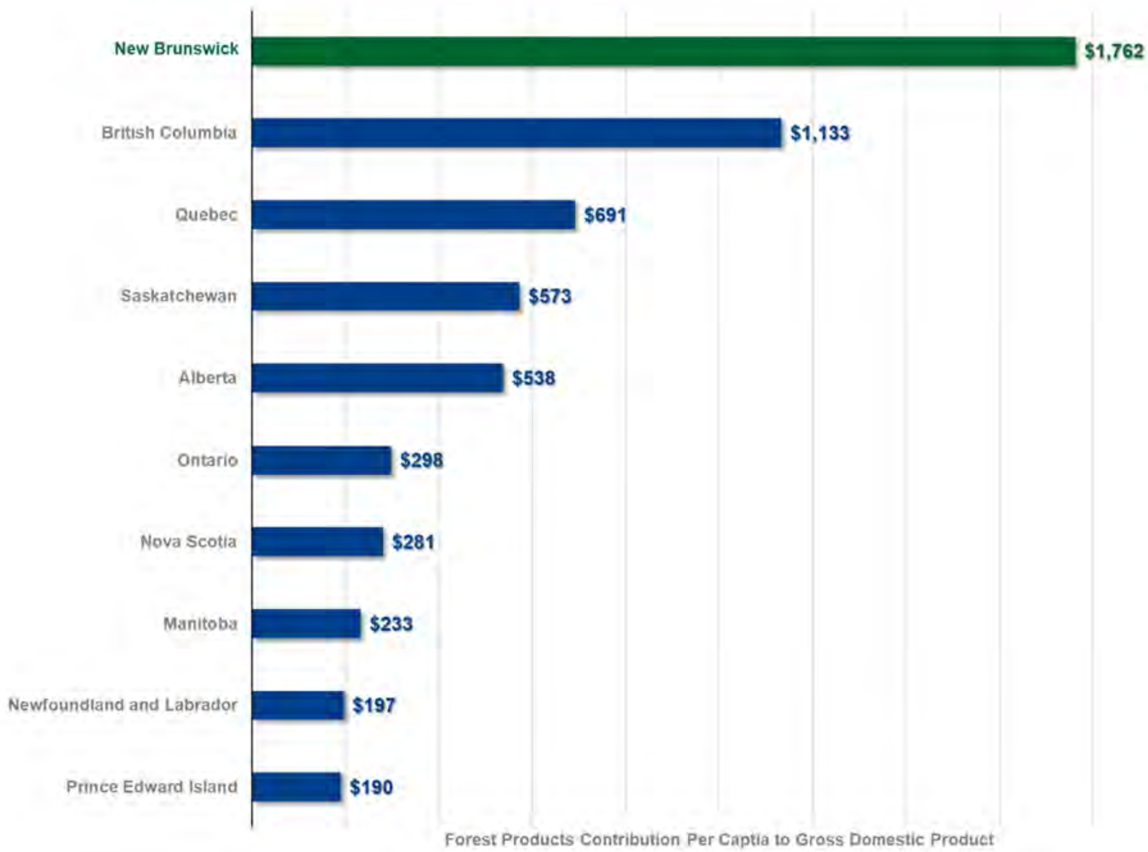


Figure 14. 2021 Contribution of the forest products sector to provincial Gross Domestic Product per capita excluding indirect and induced effects. Data source: Statistics Canada Table 36-10-0402-01.

Saint John is the hub of the NBFPC where about one out of every 25 people is employed in a forest-related industry. One of the largest NBFPC employers in Saint John is the Mill, which has a daily operational labour force of approximately 480. Those employees provide a crucial link in the use of the province's wood resource by processing sawmill by-products (*i.e.*, wood chips and biomass). In 2022, the Mill made more than $158 million in purchases of goods and services from NB suppliers [*Jupia Consultants Inc.*, 2023; refer to Appendix III] and the employees contribute considerably to the Greater Saint John community and economy. For example, in 2022 the Mill induced an estimated $89.5 million in household spending in the Saint John region and the rest of the province.

The global market for supplying Kraft pulp to paper and allied product manufacturers is extremely aggressive. For IPP to remain viable in that competitive market, it is essential that they continuously upgrade major equipment with more efficient and higher quality producing technologies. This Project is a critical upgrade that is fundamental to the long-term economic and environmental performance of the Mill. It will allow the Mill to regain its competitive advantage by increasing production capacity and reducing costs. As a result, this Project will maintain a livelihood for thousands of New Brunswickers by ensuring that the Mill, which is an anchor of the NBFPC (*i.e.*, it provides both a vast upstream and downstream network of independent enterprises), remains efficient to ensure effective productivity, product quality, and profitability in an environmentally sustainable manner.

In March 2014, the Province of New Brunswick announced a new forestry management strategy [*PNB*, 2014]. The strategy was designed to encourage investment, maintain thousands of jobs, create thousands of new jobs, and manage Crown forests in a sustainable way that allows New Brunswick pulp mills to remain competitive globally. On the heels of the announcement, JDI committed to modernization investments at the Mill. Two further modernization phases (*i.e.*, Phases II and III) would prepare the Mill for a production capacity increase tied to the forest management strategy. An additional modernization phase (*i.e.*, Phase IV) announced would increase the Mill's production capacity from 1 000 ADMT per day to 1 800 ADMT per day. The Project described within this document is that additional modernization phase.

The NBFPC has survived recessions, increased manufacturing costs (*i.e.*, electricity rates), infestations (*i.e.*, spruce budworm), changing regulatory regimes, and environmental improvements (*e.g.*, reduction in GHG emissions, more stringent water and air emission limits, *etc.*).

JDI has a vertically integrated and sustainable Forest Supply Chain that operates several sawmills, pulp and paper mills, and tissue mills (Figure 15). Sustainable forest management means JDI has access to a secure and growing wood supply from a healthy and productive forest that meets the needs of the downstream Forest Supply Chain by balancing short-term needs (*i.e.*, one to five years) with a long-term vision (*i.e.*, over 80 years). In addition to managing a secure and sustainable wood supply, JDI forest management also provides for the requirements of clean water, biodiversity conservation, recreation, and aesthetics. JDI is the second largest private timberland owner in North America and relies on that land for a secure portion of their wood supply. They own and manage 1.3 million hectares of private Freehold timberland in New Brunswick, Maine, and Nova Scotia, and manage 1.1 million hectares of Crown Licensed lands in New Brunswick. Crown License 6 and 7 lands have been managed by JDI since 1982. License 6 and 7 lands managed by JDI are under a 25 year evergreen Forest Management Agreement (FMA), which enables a wood supply agreement with the Province of New Brunswick. The FMA was renewed in 2023. JDI is also able to access supply of wood from other private sources, such as small local landowners, and other Crown lands with long-term tenure associated with their manufacturing operations. Annually, JDI harvests about 1.6 % of the lands they own or manage with a plan to make sure the forest is growing more wood than is harvested, which ensures a sustainable supply of wood fibre to downstream mills.

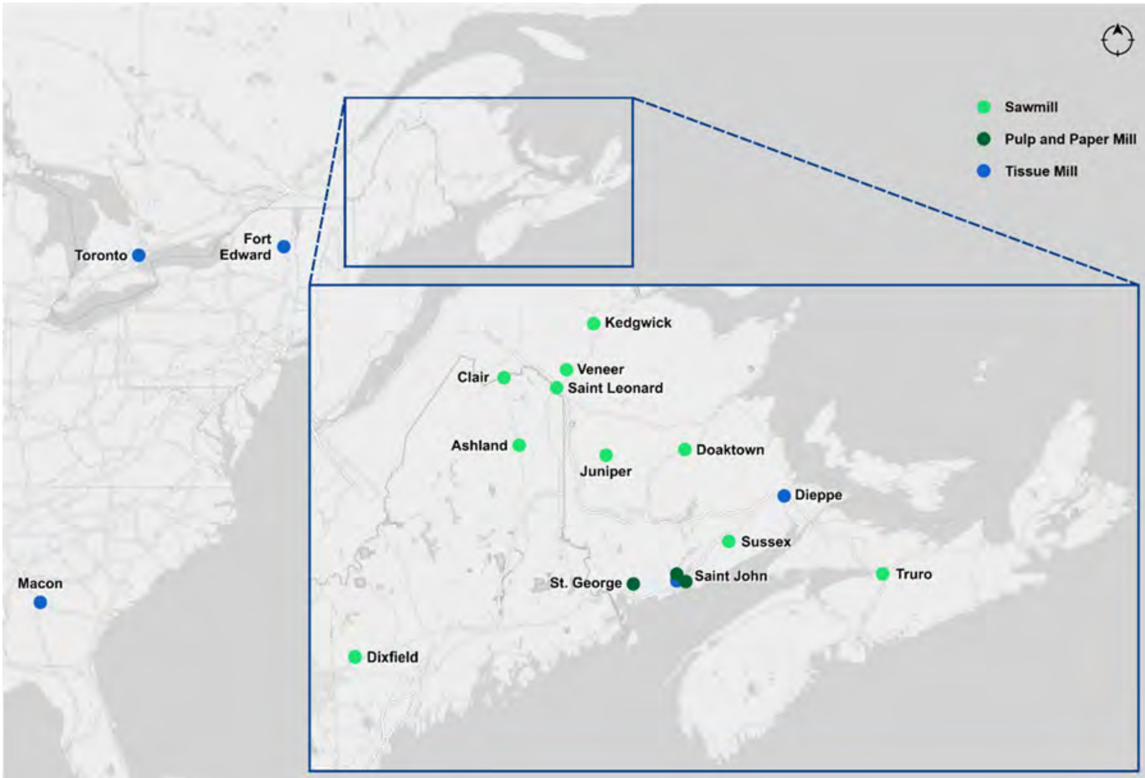


Figure 15. Map of JD Irving, Limited's forestry-based operations.

JDI is one of the only companies remaining in North America that sustains a Forest Supply Chain from seedling to the forest products purchased at retail outlets. In 1957, JDI planted its first tree in the Black Brook District of northwestern New Brunswick. Since then, they have been a leader in planting and growing trees. Annually, they plant millions of trees to regenerate some of the forest they harvest (*n.b.*, almost 18 million trees were planted in 2023). On 27 July 2018, the company planted their one billionth tree (*n.b.*, this is a Canadian record for a private company). Since the 1980s, JDI has been planting better trees because of its tree improvement program, which is focused on identifying and breeding the best families of six native confer trees found in New Brunswick, Maine, and Nova Scotia. Some of the traits that the company's tree breeding program focuses on are faster growth, higher yield, straightness, lumber quality, insect resistance, and resiliency to climate change. As the amount of forest land is limited, focusing on faster growing trees with higher yield allows for more growth on less land.

Planted areas grown from JDI's seedlings, on average, yield four times the volume of wood compared to naturally regenerated forest stands (Figure 16). For example, after 50 years of growth, a naturally regenerated forest will yield about 100 m^3 of wood per hectare compared to about 400 m^3 of wood yielded per hectare from a managed forest. Through this sustainable forest management program, the wood supply on JDI's Freehold land will double by 2050. The four-times increase in yield achieved on each planted hectare is why planting trees is critical to their strategy of growing more wood than they harvest. An added benefit of greater yield is that there is also a greater amount of carbon sequestration with trees that are more adaptable to a changing climate that occurs as shown in Figure 16.

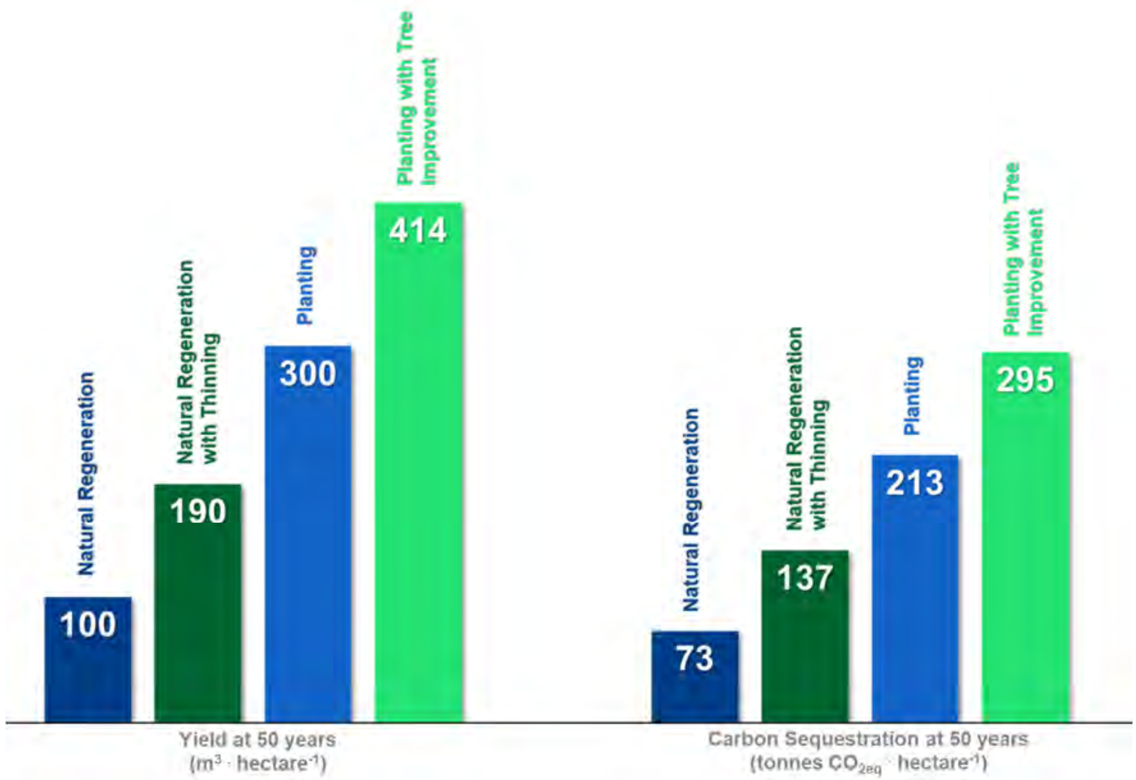


Figure 16. Comparison of wood yield and carbon sequestration for four different management types based on JDI's research.

Woodlands operated by JDI are managed for softwood and hardwood timber production. All their forestry operations are annually and independently audited according to International Standards Organization (ISO) 14001 environmental standards and certified under the Sustainable Forestry Initiative® forest certification program. JDI has maintained Sustainable Forestry Initiative® certification since 2003.

The production increase planned for the Reversing Falls Mill following the Phase IV Modernization is directly linked to changes and improvements in the industry. This includes JDI's long term focus on silviculture (*i.e.*, planted and pre-commercially thinned 'managed' stands that improve yield) and improved utilization of the forest resource (*i.e.*, taking advantage of the unutilized pulpwood portion of harvested trees that are presently left in the woods in much of the region). The production increase is not expected to result in an increase in the forest area harvested in the province.

Presently, the supply of pulpwood (*i.e.*, the portion of the tree too small, too rotten, or too poor of quality to produce dimensional lumber) for producing wood chips exceeds demand. A portion of the excess pulpwood supply is a result of recent past changes in the industry. Those changes included an economic downturn, not continuously investing in improved technology, increasing electricity rates, high labour costs, and a lower demand for market pulp due to competition with cheap, fast-growing eucalyptus pulp from South America (*n.b.*, eucalyptus competes with the hardwood market, but does not impact the softwood market). Those changes led to the closure of several pulp or paper mills over the past two decades in New Brunswick, Nova Scotia, Maine, and southern Quebec as shown in Figure 17. As a result of these mill closures, regional pulpwood supply exceeds demand.

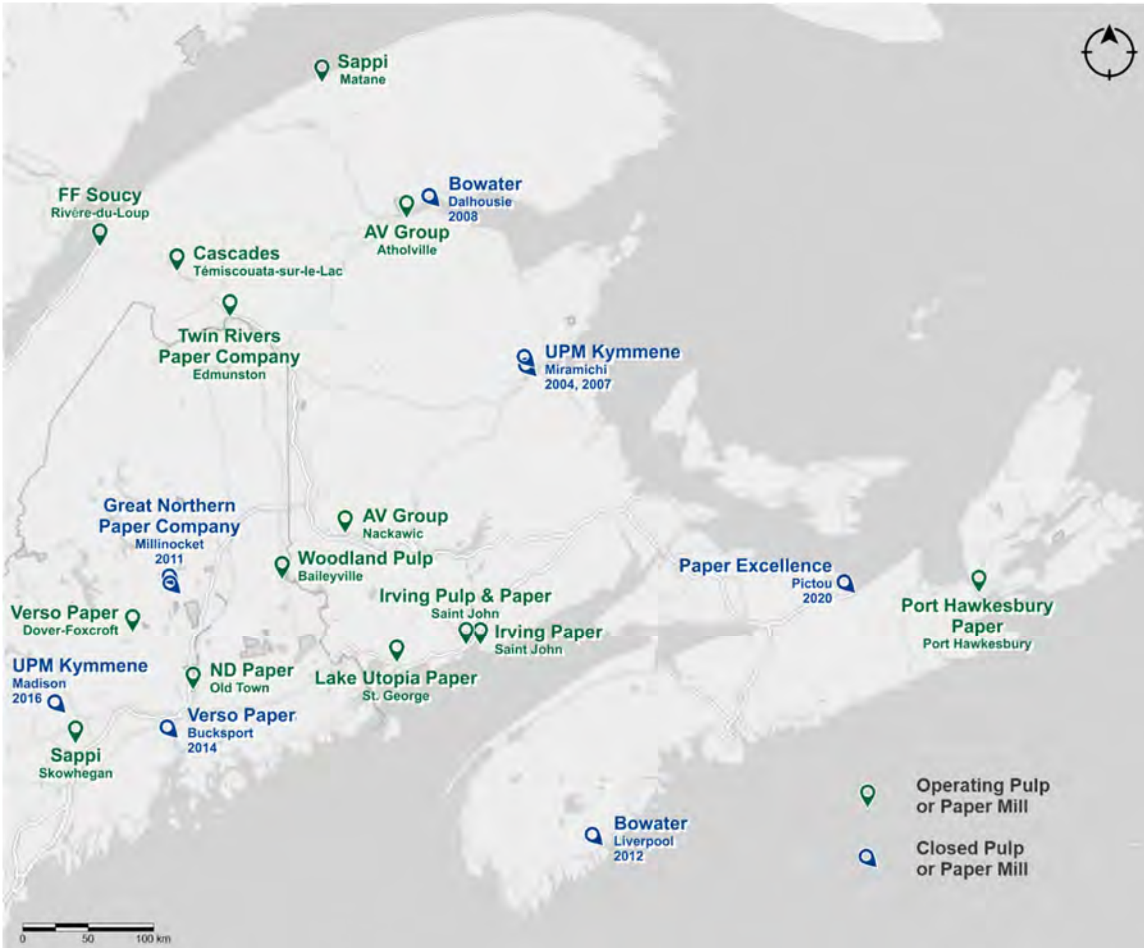


Figure 17. Operating versus closed pulp or paper mills in New Brunswick, Nova Scotia, Maine, and southern Quebec circa 2022.

There is also an expected increase in wood supply because of silviculture practices. The first forest stands planted and pre-commercially thinned on Crown License 6 and 7 by JDI in the early 1980s are approaching mature harvest age. Harvesting those managed trees, which yield between two to four times the harvest volume per hectare as naturally grown trees, will translate into an increased amount of fibre available for producing forest products from the same, or even less, amount of harvested area.

As much of every tree as possible that is harvested from the forest is used by JDI within their Forest Supply Chain as shown in Figure 18. Approximately 70 % of softwood (*i.e.*, spruce / fir) trees harvested in the region are of suitable size for producing dimensional lumber used in construction. The most significant secondary residual wood product from the production of lumber is wood chips (*n.b.*, only 40 % to 50 % of each log is sawn into dimensional lumber), which are used as the raw material for the pulp and paper process. Wood chips used for manufacturing pulp are also derived from wood from the portion of a tree that is not suitable for making dimensional lumber (*i.e.*, approximately 30 %) because it is either too small (*i.e.*, the tops of trees), rotten, or deformed (*i.e.*, crooked or forked).

Other residual wood products produced during the manufacture of dimensional lumber and wood chips, are bark, sawdust, and shavings, which are used for green energy generation, either as “hog fuel” or wood pellets. When the mass balance of harvested softwood trees is calculated, wood chips are the largest product produced from the average softwood tree in the region.

Presently pulpwood (*e.g.*, tops of trees, crooked and forked trees, *etc.*) that could be used for producing wood chips for pulping is left in the woods in much of the region to biodegrade because there is a lack of economically feasible markets (*n.b.*, this can be problematic because the biodegradation can generate methane, which is a GHG). A modernized pulp mill at Reversing Falls enables an economically feasible use of this surplus pulpwood, which will allow for the full utilization of the forest resource in the region from Crown lands as well as large and small private landowners.

As noted above, due to public and private investments in silviculture, managed stands are maturing and the yield from those areas is expected to increase. The potential exists to increase the sustainable wood supply, without increasing the area harvested, by harvesting those higher yielding managed stands. Through this Project, a balance in supply and demand for future harvest increases and a use for existing surplus pulpwood will be created for all landowners.

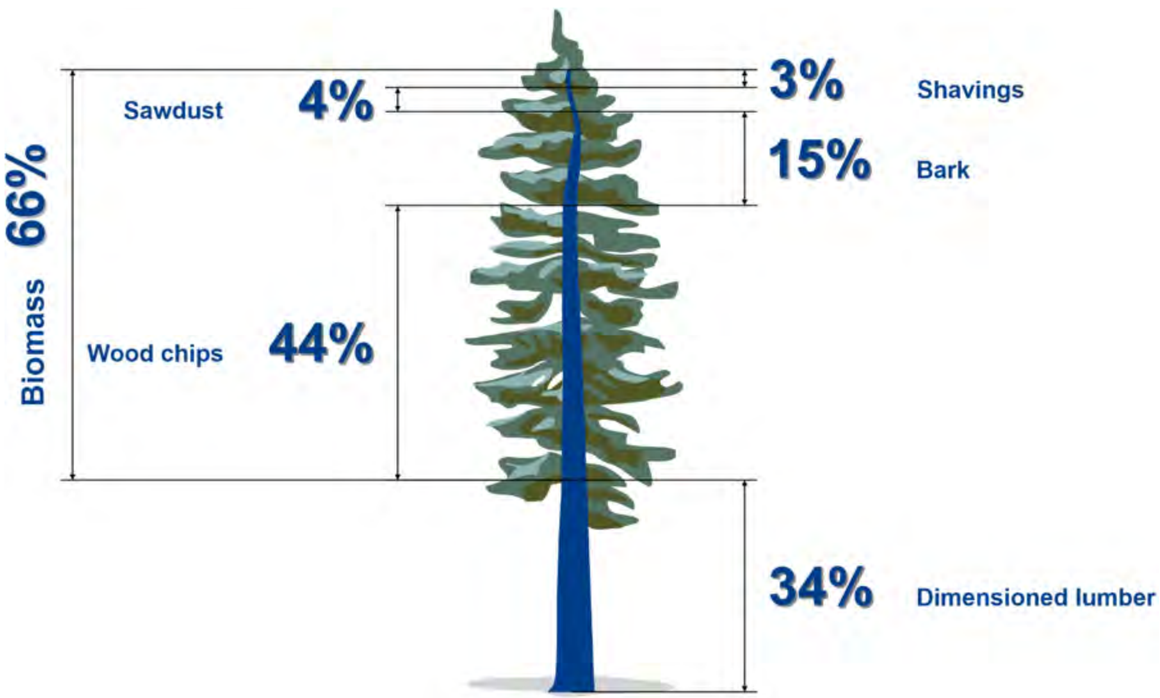


Figure 18. The mass balance of an average softwood (*i.e.*, spruce / fir) tree harvested in the region. The JDI Forest Supply Chain is organized to use as much of every tree as possible, leaving little to waste.

2.5 PROJECT LOCATION

Operationally, it is necessary to locate the Project near existing Mill processes. The pulp production portion of the Mill is located on a peninsula with limited available footprint and suitable geological conditions to support the structures and integrate them into the existing production process. Through extensive engineering effort, the Project will be constructed on the peninsula within the Mill's existing footprint. The permanent Project infrastructure will be constructed and operated entirely within the boundaries of Mill on PID 55162416 (Figure 19 and Figure 20). Approximate central coordinates for the Project are 45° 15′ 45.67″ N and 66° 05′ 32.37″ W.

Figure 19. Oblique view showing the locations of the major new equipment proposed for the Reversing Falls Mill in Saint John, New Brunswick.

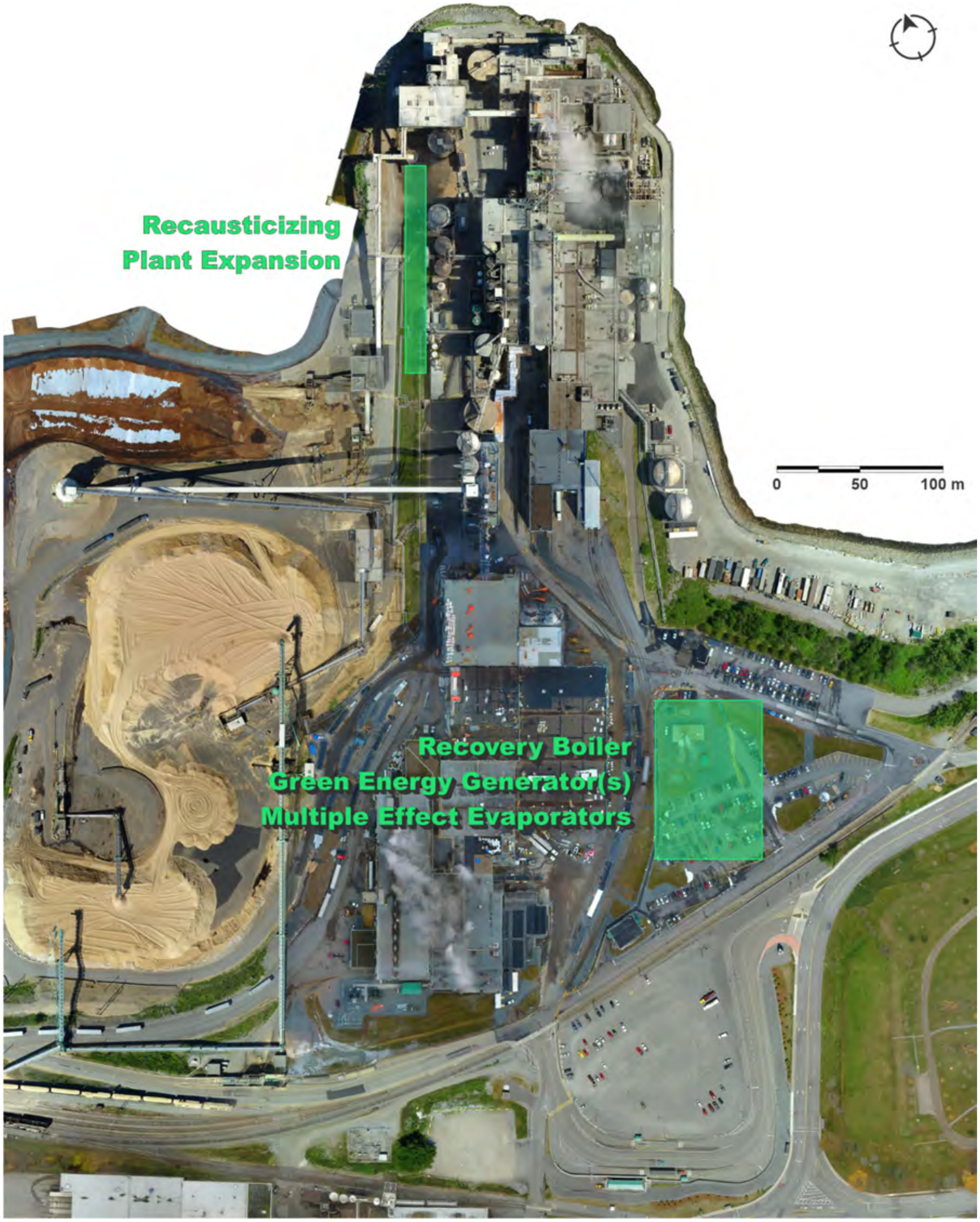


Figure 20. Aerial view showing the general location of the major new equipment (*i.e.*, shown as green boxes) proposed for the Reversing Falls Mill in Saint John, New Brunswick.

2.6 PROJECT DETAILS (DETAILED PROJECT DESCRIPTION)

As shown in Figure 21, the main steps in the manufacturing of Kraft pulp at the Mill are: woodchip cooking; screening and washing pulp; bleaching pulp; pressing and drying pulp; and bale finishing. The Kraft manufacturing process is the same today as when it was first developed more than a century ago. A benefit of Kraft pulping is that most chemicals used in the manufacturing process can be regenerated through a chemical recovery cycle. Below is a brief description of the overall pulp manufacturing process that occurs at the Mill.

Woodchips arrive at the Mill by truck and rail after logs are processed at regional sawmills for producing dimensioned lumber. The woodchips are screened, impregnated with cooking fluids (*i.e.*, sodium hydroxide and sodium sulfide), and then cooked under pressure for several hours. The impregnation and cooking process dissolves as much of the lignin as possible and separates out the cellulose used for producing pulp. The pulp extracted from the cooking process is washed and screened to recover the spent cooking fluids and to reduce the carryover of dissolved organic material to the oxygen delignification process. After further washing, the pulp is bleached, dried, formed into sheets, and then baled for use.

The spent cooking fluids from the washing and oxygen delignification process, which contain about 50 % of the organic material that was originally in the wood chips plus most of the spent cooking fluids, are evaporated to a high dryness using evaporators. The remaining spent cooking fluids are then sprayed into the RB. The organics within the spent cooking fluids are combusted within the RB to produce heat (*n.b.*, the lignin has a higher heating value than other major components of wood, such as hemicellulose and sugars, extractives, and organic acids), which is subsequently used to produce steam for in-Mill demands and for generating electricity via a steam turbine. Inorganics from the spent cooking fluids accumulate at the bottom of the RB are removed to regenerate the cooking fluids.

There is a need for improved recovery of energy and chemicals from the manufacture of Kraft pulp. This is due to increasingly high energy and chemical costs, stringent environmental regulations that limit particulate and gaseous emissions, solid waste disposal, and mill effluent discharge. The chemical recovery process at the Reversing Falls Mill is the focus of this EIA and is the final component of the Mill's overall modernization. Figure 22 shows a simplified process flow of the cooking fluids recovery process at a Kraft pulp mill. The cooking fluids recovery process has three main functions:

1) minimize the environmental impact of wastes from the pulping process;
2) recycling pulping chemicals (*i.e.*, sodium hydroxide, and sodium sulphide); and
3) co-generating steam and carbon-neutral / green electricity.

Because only preliminary design has been completed for the Project, sizes of tanks, other equipment, processing capacities, flowrates, *etc.* described in the sections below have yet to be finalized. It is important to note that there are no new processes or types of equipment involved with this Project. It strictly involves replacing 1970s era technology with current BAT. That equipment is larger, improves efficiency and productivity, and has enhanced environmental performance.

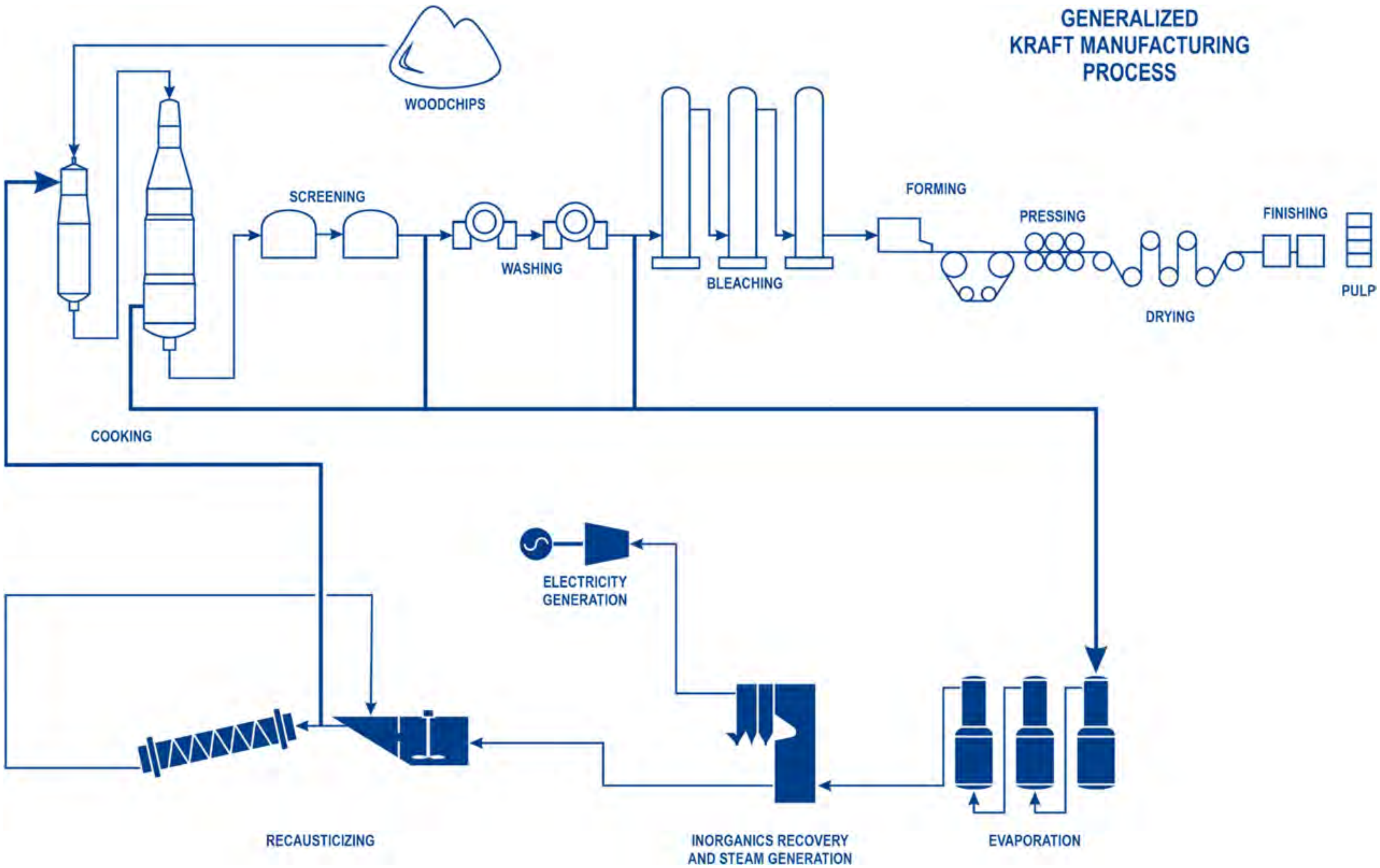


Figure 21. The main steps in manufacturing pulp at a Kraft mill. The equipment coloured white represents the pulp production line while the equipment coloured in blue represents the chemical recovery process and the equipment that will be replaced as part of the mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

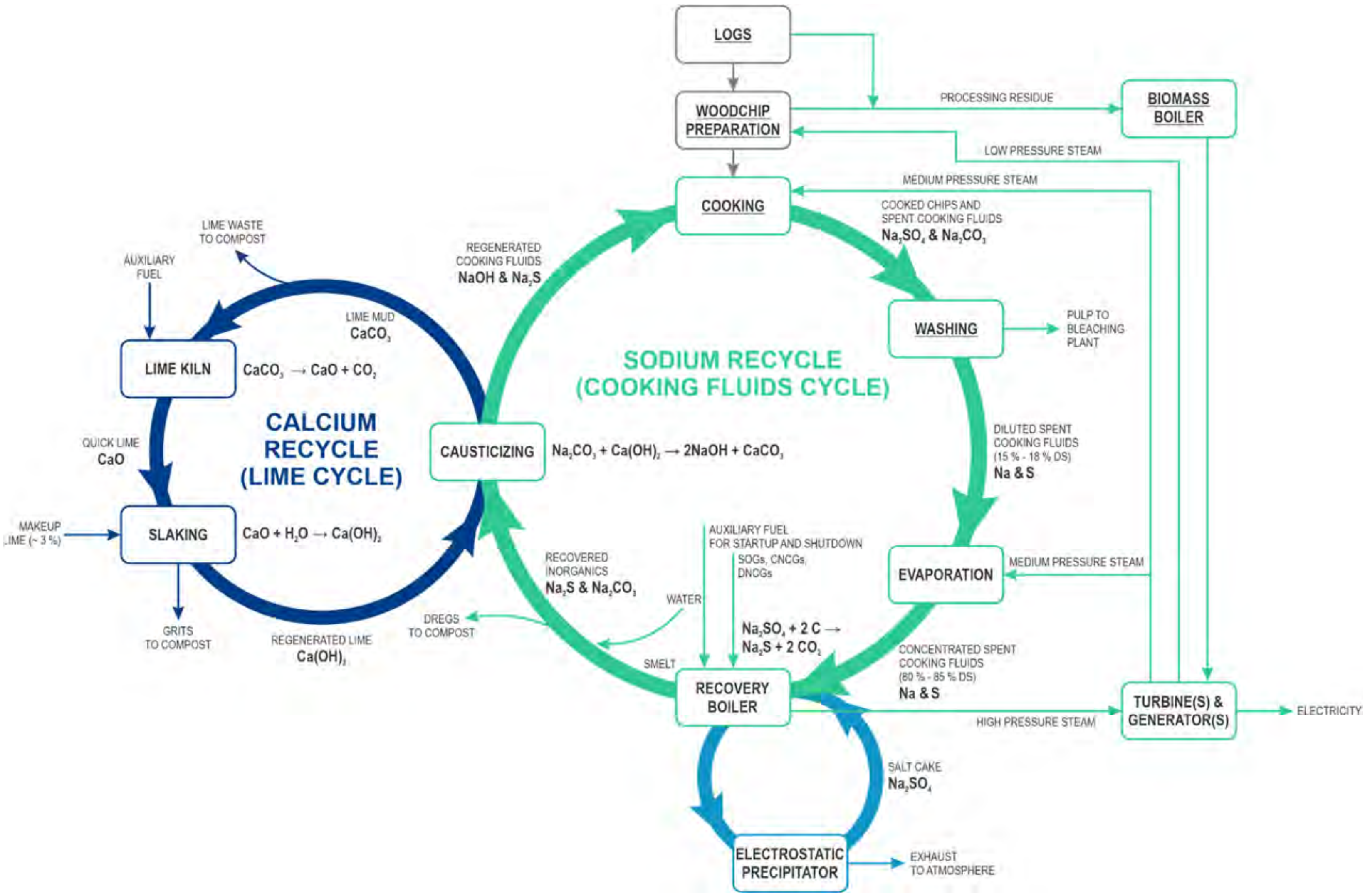


Figure 22. The Kraft pulp cooking fluids and lime recycling process. The boxes with underlined text represent existing equipment at the Reversing Falls Mill in Saint John, New Brunswick that will not be replaced while the boxes with non-underlined text represent existing equipment that will be replaced or new equipment that will be installed as part of the mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

2.6.1 New Recovery Boiler

In a Kraft pulp mill, the RB performs several essential functions:

1) evaporation of the remaining free water in the concentrated spent cooking fluids;
2) combustion of organic constituents in the concentrated spent cooking fluids;
3) recovery of inorganic chemicals used in the pulping process for later reuse;
4) reduction of oxidized sulphur to sulphide; and
5) generation of superheated steam that can be used for operations throughout the mill including electricity generation.

There are two main sections of an RB, a furnace section, and a convective heat transfer section. The lower furnace section of the RB is where concentrated spent cooking fluids are sprayed and where the firing of the organics (*i.e.*, those parts of wood not extracted for pulp) in those fluids occurs. Heat transfer to the boiler water to produce high pressure steam is completed in the upper convective heat transfer section of the RB. RBs are relatively tall to allow sufficient cooling of the combustion gases by the convective heat transfer water walls and to provide sufficient residence time for the combustion of solid particles and the completion of chemical reactions for the overall recovery process (*n.b.*, the total height of the RB is determined by the radiant heat transfer surface required to cool the gases to a suitably low temperature).

A process flow diagram for the new RB is shown in (Figure 23) and is meant to aid in understanding the operation description provided below. Figure 24 shows a three-dimensional conceptual model of the RB and the green energy generator(s).

The new RB furnace will comprise three distinct zones: 1) a lower reduction zone; 2) a middle drying zone; and 3) an upper oxidation zone. The middle drying zone is where the concentrated spent cooking fluids will be introduced as a coarse mist to the furnace using spray guns. Any remaining free water in the spray will be evaporated and the organics will be ignited. The number of guns, the nozzle spray pattern, and the droplet size will all be optimized during detailed design to ensure fast drying and combustion and to eliminate the potential for liquids reaching the smelt bed of the lower reduction zone. There are many chemical reactions that occur within these three zones, which are detailed in *Vakkilainen* [2005].

Combustion air will be introduced to the furnace using a forced draft fan at three different levels along all four walls of the RB. Primary air (*i.e.*, ~ 23 % of the total air supplied) will enter near the furnace floor. Secondary air (*i.e.*, ~ 52 % of the total air supplied) and tertiary air (*i.e.*, ~ 25 % of the total air supplied) will be introduced to the furnace below and above, respectively, the concentrated spent cooking fluids spray guns. Combustion gases will be removed from the lower section of the furnace using an induced draft fan. The furnace fans will be operated at a balanced draft with a slight negative pressure. The upper section of the furnace will provide space for combustion of the organics to occur and heat to be absorbed to generate steam. The new RB will be equipped with BAT, including sensors for monitoring fluid dynamics within the furnace region. The monitoring will be done to improve the upper furnace gas mixing to reduce carbon monoxide (CO) and Total Reduced Sulphur (TRS).

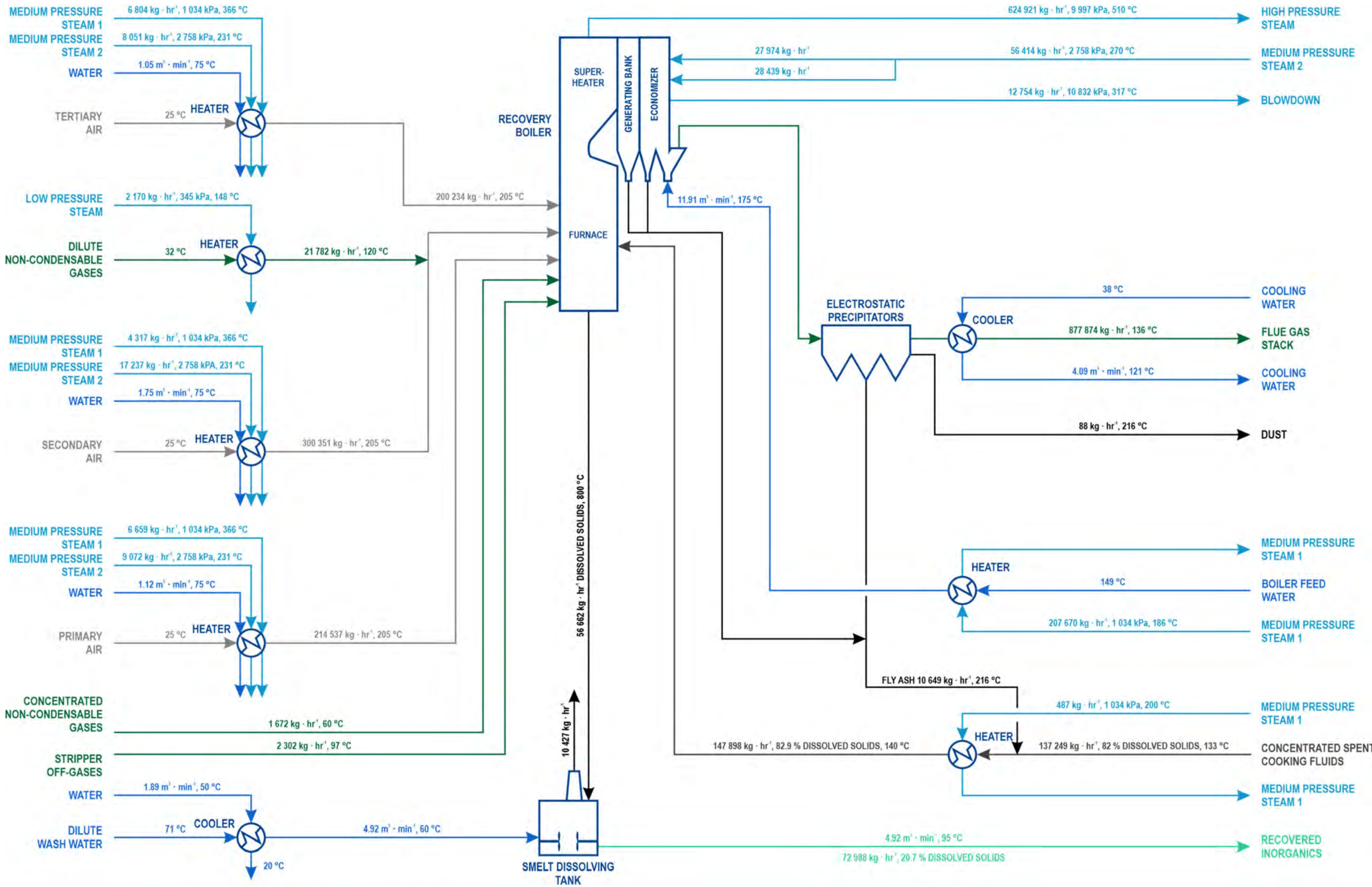


Figure 23. Process flow diagram for the new recovery boiler proposed for the Reversing Falls Mill in Saint John, New Brunswick.

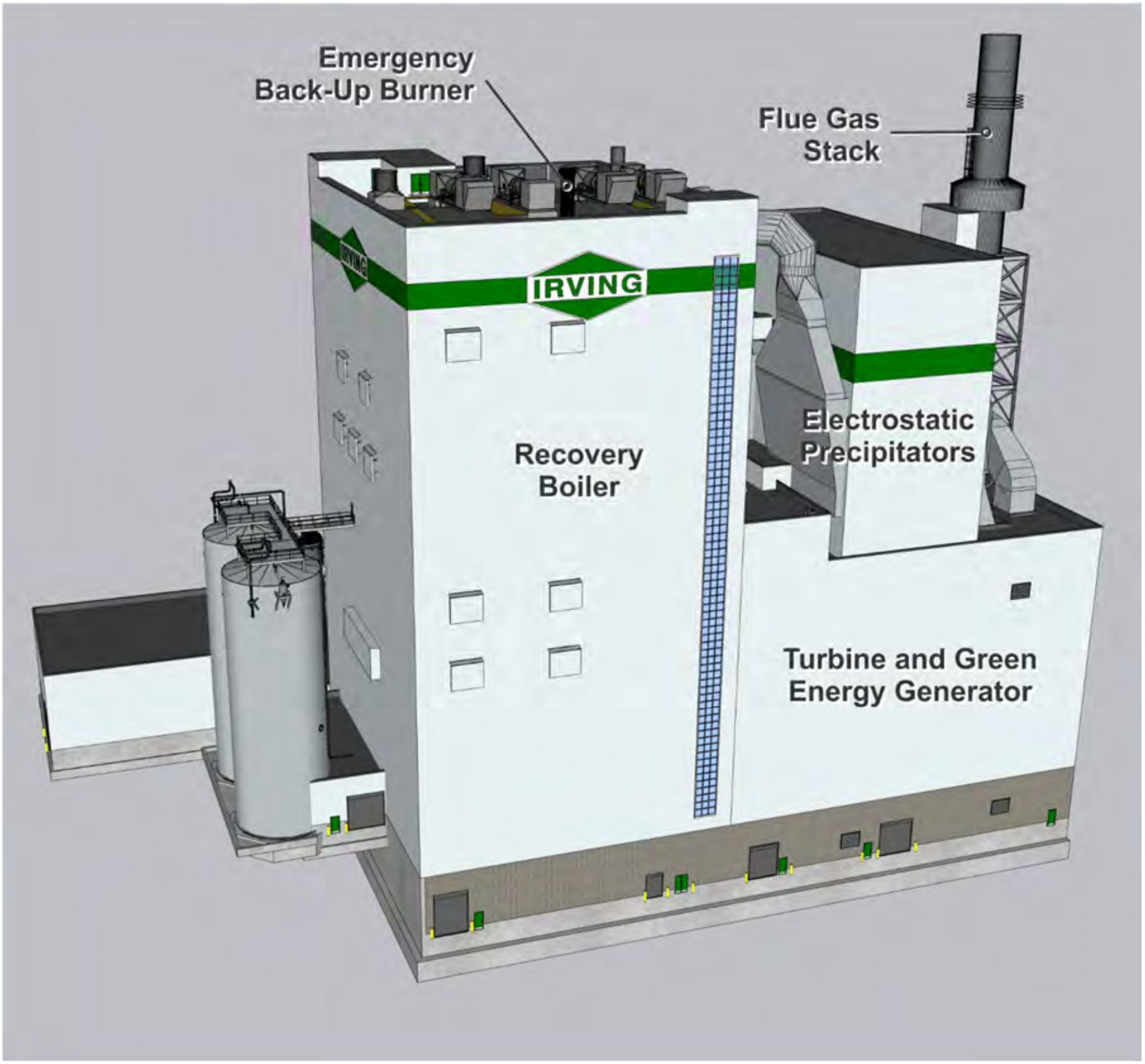


Figure 24. Three-dimensional conceptual model showing the new recovery boiler and green energy generator(s) proposed for the Reversing Falls Mill in Saint John, New Brunswick.

Concentrated spent cooking fluids will be discharged from the evaporators at a rate of about 1.4×10^5 kg · hr^{-1} at a temperature around 133 °C (Figure 23). The concentrated spent cooking fluids will have a Dissolved Solids (DS) concentration of ~ 82 %. The fly ash collected from the ESPs will be mixed with this flow to produce a DS concentration of ~ 82.9 % before passing through a heater. Medium pressure steam exhausted from the new turbine(s) will be used within that indirect contact heater to heat the flow to about 140 °C. The anticipated composition of the concentrated spent cooking fluids fed to the RB is summarized in Figure 25. On average, the concentrated spent cooking fluids will have a higher heating value of 15.8 GJ · t^{-1} DS.

Monitoring will be done on the concentrated spent cooking fluids sent to the RB to ensure DS concentrations are within the acceptable range for combustion within the furnace. If the DS concentration does not meet the acceptable range, the concentrated spent cooking fluids will be automatically diverted from the RB back to the spent cooking fluids storage tank.

The inorganics contained in the concentrated spent cooking fluids (*i.e.*, sodium, and sulphur) and carbonaceous material sprayed into the furnace will be much heavier than combustion / flue gases. As a result, those materials will settle as char on the furnace floor within the lower reduction zone. The organic carbon in the char will burn off as CO_2 and CO leaving behind a molten smelt on the furnace floor. The molten smelt will primarily comprise a mixture of sodium sulphide and sodium carbonate (Na_2CO_3) with small amounts of sodium sulphate (Na_2SO_4). The conversion of sodium salts within the RB is as follows:

$$2NaOH_{(s)} + CO_{2(g)} \rightarrow Na_2CO_{3(s)} + H_2O_{(l)} \quad (1)$$

where sodium hydroxide in contact with carbon dioxide yields sodium carbonate and water. The reduction of makeup chemical is as follows:

$$Na_2SO_{4(s)} + 4C_{(s)} \leftrightarrow Na_2S_{(s)} + 4CO_{(g)} \quad (2)$$

where sodium sulphate in contact with organic carbon yields sodium sulphide and carbon monoxide.

The molten smelt will be continuously discharged from the furnace floor through spouts that will direct the smelt to a dissolving tank where it will be mixed with dilute wash water collected from the pulp washing process (Figure 23). It is estimated that inorganics recovered from the smelt dissolving tank will be discharged at a DS concentration of 20.7 % at a rate of 7.3×10^4 kg · hr^{-1}.

A small amount of the inorganics will form a fine dust within the furnace and flow through the furnace with the combustion gases. Those inorganics will be collected by the ESP and can be returned to the concentrated spent cooking fluids and sent back to the RB (Figure 23). A small volume of inorganics will also collect on heat transfer surfaces within the economizer, generating bank, and superheater of the RB. Those inorganics will be removed by automatically activated soot blowers that direct medium pressure steam exhausted from the turbine(s) through nozzles to dislodge deposits. The dislodged particles and anything big enough that is carried through the furnace will be collected in ash hoppers and returned to the concentrated spent cooking fluids and sent back to the RB.

The convective heat transfer section of the RB is where superheated steam will be generated. The new RB, as with the majority of RBs manufactured since 1984, will be a single drum design. The single drum design is a significant improvement over the Mill's current RB two drum design because:

- it eliminates a source of water leakage to the furnace as the water is located outside the furnace;
- the steam drum shell wall thickness is thinner allowing for faster startup and shutdown;
- combustion gas flow to the steam generator bank is better distributed and the heating surface arrangement is simpler; and
- water circulation is enhanced and safer due to separated and unheated downcomers.

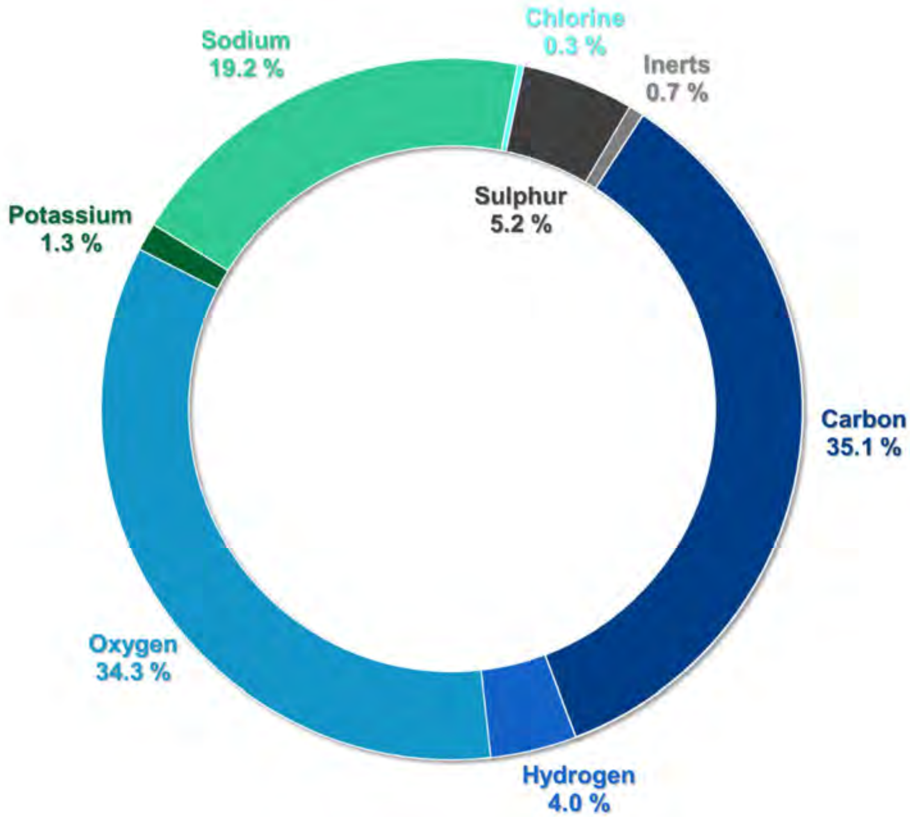


Figure 25. Anticipated composition of the concentrated spent cooking fluids fed to the new recovery boiler at the Reversing Falls Mill in Saint John, New Brunswick.

Feedwater will be fed to the RB through a header on the economizer at a rate of 11.9 $m^3 \cdot min^{-1}$ at 175 °C (Figure 23). The feedwater will be preheated within the economizer using flue gas. Water / vapour separation will occur in the steam drum. The separated vapour will be further heated in the superheater to produce superheated steam. The superheated steam will exit the boiler through the outlet of the superheater as high-pressure steam.

The primary source of odourous emissions from the Mill are Dilute and Concentrated Non-Condensable Gases (DNCGs and CNCGs), Stripper Off-Gases (SOGs), and dissolving tank vent gases. Through this Project, most of those gases will be collected throughout the Mill and burned within the new RB (Figure 23). It is estimated that the flow to the new RB for DNCGs, CNCGs, and SOGs will be, respectively, 2.2×10^4 kg · hr^{-1} at 120 °C, 1.7×10^3 kg · hr^{-1} at 60 °C, and 2.3×10^3 kg · hr^{-1} at 97 °C.

The new RB building (Figure 24), which will house the RB and ancillary equipment described below, will occupy about 3 256 m^2 (*i.e.*, 75.2 m × 43.3 m) and will be about 76.2 m tall. The building will also house the new turbine(s), green energy generator(s), and evaporators. It will be a steel-framed structure with steel cladding founded on an engineered concrete slab. The slab will be structurally supported by piles with a 35.6 cm flange width.

2.6.1.1 Auxiliary Fuel System

The auxiliary fuel system for the new RB will consist of startup / shutdown burners and ignitors, load burners, fuel piping and controls, and a flame safety system. The auxiliary fuel used for starting up and shutting down the new RB will be natural gas. Compared to the existing RB's technology (*i.e.*, Bunker C heavy fuel oil burners), there will be an overall reduction in GHG emissions from the new RB by using natural gas as an auxiliary fuel.

The auxiliary fuel system startup / shutdown burners and ignitors will be located near the bottom of the furnace just above the primary air level but below the concentrated spent cooking fluid sprayers. The eight burners will be used during startup of the RB to bring the furnace section of the boiler to a temperature and pressure suitable for combustion of concentrated spent cooking fluids. Once the furnace achieves approximately 30 % of the rated steam flow, concentrated spent cooking fluids will be introduced to the RB. After combustion of the concentrated spent cooking fluids has stabilized within the RB, the natural gas burners will be extinguished. At that point, the turbine(s) and generator(s) will be warmed and valved into the steam supply to start generating electricity. Natural gas will be used within the RB during shutdown.

Normally, the combustion of concentrated spent cooking fluids is suitable to sustain RB operation. Load burners located above the concentrated spent cooking fluid sprayers at the tertiary air level will be used during periods of marginal spent cooking fluid combustion. Those may be short periods when concentrated spent cooking fluid availability is not sufficient to meet the desired steam load from the RB (*e.g.*, during periods of low pulp production, *etc.*) or periods when the DS concentration of the feed flow is not suitable for combustion.

2.6.1.2 Air Heaters

There will be four air heaters used with the new RB (Figure 23). Three of the air heaters will be used to pre-heat the primary, secondary, and tertiary air supplies to the furnace section of the RB from ambient to about 205 °C. Medium pressure steam exhausted from the new turbine(s) and warmed cooling water from other Mill processes, such as flue gas waste heat from the flue gas cooler, will be used within the indirect contact air heaters.

A dedicated indirect contact air heater will also be used to warm the flow of the DNCGs from approximately 32 °C to 120 °C (Figure 23). Low pressure steam exhausted from the new turbine(s) will be used to warm that flow, which will then be injected separately with the secondary air supply before introduction to the RB.

2.6.1.3 Feed Water Heater

Water will be fed to the RB for the purpose of generating steam (Figure 23). It is estimated that water will be fed to the RB at a rate of 11.9 $m^3 \cdot min^{-1}$. The feed water, at an initial temperature of 149 °C will be heated to 175 °C using medium pressure steam exhausted from the new turbine(s) prior to entering the RB.

2.6.1.4 Electrostatic Precipitators

An ESP is a filter-free device used to capture Particulate Matter (PM). Two ESPs will be used to capture PM entrained in the flue gas leaving the RB (Figure 23). Distribution laminates consisting of several perforated plates to help maintain suitable flow distribution will introduce the flue gas to the ESPs. The gas will then encounter discharge electrodes that will generate an electrostatic field within the flowing gas. PM within the stream of flue gas will become negatively charged as it passes through the electrostatic field. As the gas continues to flow through the ESPs, it will flow past positively charged collection plates. The negatively charged PM will migrate towards the collection plates where they will adhere. The collection plates will be periodically vibrated to dislodge the PM (*i.e.*, fly ash) so that it falls into collection hoppers below.

The PM removed by the dry ESPs will primarily be sodium sulfate and sodium carbonate with lesser concentrations of chloride and potassium. The collection efficiency of the ESP for this Project is estimated to be > 99 % and most often the unit will operate at a collection efficiency of 99.9 %. At full production, it is estimated that the amount of fly ash and dust, respectively, removed from the ESPs will be about 1.1×10^4 kg · hr^{-1} and 88 kg · hr^{-1}.

2.6.1.5 Flue Gas Cooler

The flue gas will exit the ESPs at a temperature of about 216 °C (Figure 23). It will then go through a cooler prior to being sent to the stack for discharge to the atmosphere. Water will be fed to the indirect contact cooler at a rate of about 3.9 m^3 · min^{-1}, which will reduce the temperature of the flue gas to about 136 °C. The flue gas cooler recovers the waste heat, which is then used in the first stage of combustion air pre-heating.

2.6.1.6 Flue Gas Stack

The flue gas stack for the new RB will be approximately 91 m tall (Figure 24). The amount of flue gas discharged from the stack will be about 8.8×10^5 kg · hr^{-1} (Figure 23). Because of the highly efficient ESPs and the use of dry versus wet scrubbing technology, the stack will produce a very limited visible vapour plume. Figure 26 shows a similar flue gas stack in operation at the Rauma bioproduct mill in Finland.

Performance of the ESPs will be determined from the stack emissions by measuring the outlet PM concentration, which will be monitored with an opacity meter and other indicators of performance (*e.g.*, inlet gas temperature, gas flow rate, material collection rate, *etc.*).

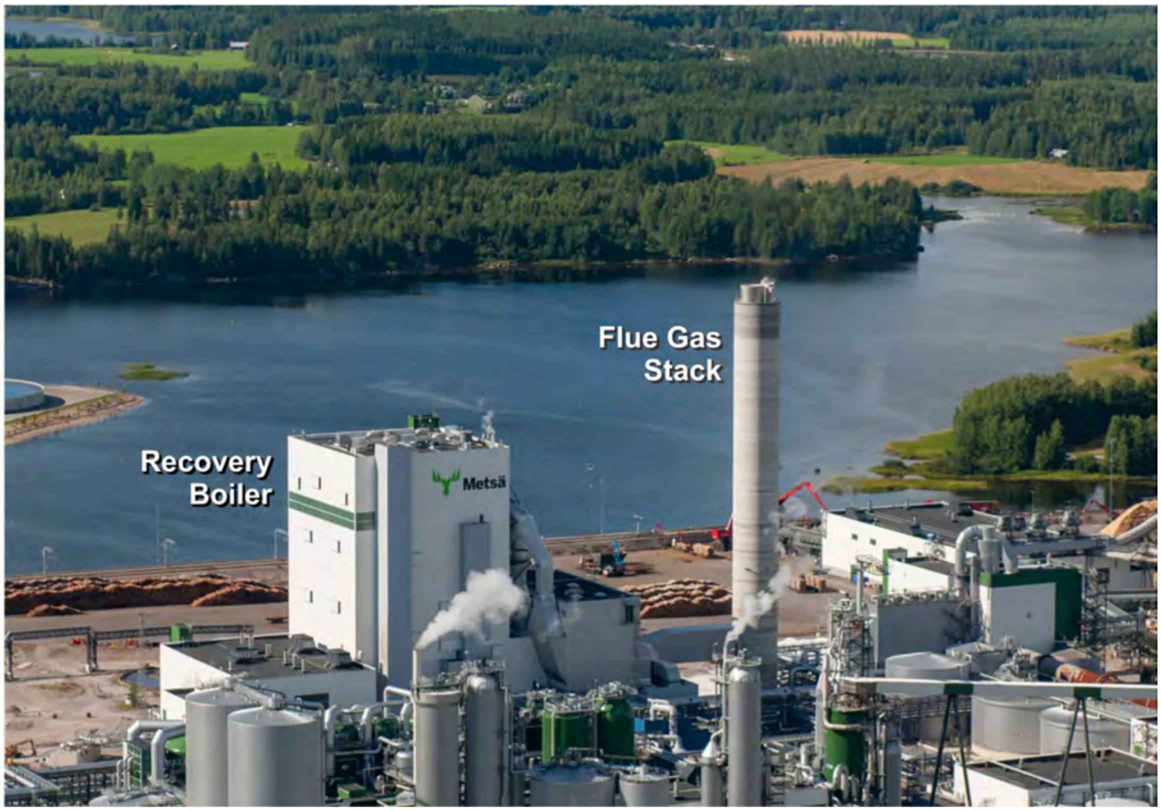


Figure 26. Photograph showing daytime operation of the recovery boiler flue gas stack at the Äänekoski bioproduct mill in Finland. Source: Metsä Group website.

2.6.1.7 Emergency Backup Burner

In the extremely rare event that the #3 PB and the RB trip while the Mill is operating, a new emergency backup burner will start-up. The burner's ignition source will be natural gas. When in operation, there will be no visible flame because the burner will be enclosed within a stack. The stack will be located on top of the new recovery boiler building (Figure 24). The purpose of the emergency backup burner is to ensure NCGs and SOGs are incinerated, thus preventing any release to the atmosphere.

2.6.1.8 Smelt Dissolving Tank and Scrubber Stack

The molten smelt that accumulates on the floor of the RB furnace will be decanted at about 800 °C to a dissolving tank through water cooled spouts (Figure 23). At full production, it is estimated that 5.7×10^4 kg · hr^{-1} of molten smelt will be discharged from the RB to the dissolving tank. Dilute wash water collected from the process at a rate of about 4.9 $m^3 \cdot min^{-1}$ will be mixed with the smelt via side wall mounted agitators within the dissolving tank. Part of that dilute wash water will be used to supply steam jets that will break up the smelt as it enters the dissolving tank. The materials collected from the dissolving tank will be used for the regeneration of pulp cooking fluids at the Mill.

The tank will be equipped with a gas scrubbing system. Dilute wash water collected from the recausticizing process will also be used within the gas scrubbing system to remove particulates in the exhaust steam. The gas scrubbing system will also have a heat recovery system that will reheat the condenser condensate from the turbine(s). The vent gases, stripped of moisture, will then be directed to the new RB for incineration.

2.6.2 New Multiple-Effect Evaporators

It is necessary to concentrate the solids within the spent cooking fluids to make heat recovery from combustion as efficient as possible; however, the concentration should not exceed 85 % because the viscosity will reach a level where clogging of spray guns, *etc.* could become an issue. The existing Multiple-Effect Evaporators (MEEs) are insufficient to achieve the dryness of the spent cooking fluids (*i.e.*, dissolved solids concentrations between 80 % and 85 %) required for delivery to the new RB under the new production rate. The new MEEs will concentrate the spent cooking fluids from about 15 % DS to ~ 82 % DS.

The MEEs will be connected in series and will use direct and indirect heating from steam to evaporate water within the spent cooking fluids (Figure 27). The MEEs will be a falling film type that use tubes arranged vertically as the heat transfer surface. Medium pressure steam from the RB will be fed to the first effect. Water will be boiled throughout the series of effects. Each subsequent effect will be at a lower pressure than the previous effect because the boiling point of water decreases as pressure decreases. Therefore, $P_1 > P_2 > \ldots P_n$ and $T_1 > T_2 > \ldots T_n$. Low pressure steam and medium pressure stream will be supplied to the process at a rate, respectively, of 1.1×10^5 kg · hr^{-1} at 178 °C and 5.3×10^4 kg · hr^{-1} at 216 °C.

The concentrated spent cooking fluids from the overall process will be discharged at a rate of about 2.3 $m^3 \cdot min^{-1}$ at 140 °C and with a DS concentration of about 82 % (Figure 27). Three different condensate streams will be collected separately (*i.e.*, A, B, and C). Steam condensates will be recovered from the first effect at a rate of about 2.9 $m^3 \cdot min^{-1}$ at a temperature of around 123 °C. Clean process condensates will be collected in the remaining effects while foul process condensates will be collected in the final effect. The clean process condensates recovered at a rate of approximately 13.3 $m^3 \cdot min^{-1}$ and temperature around 80 °C will be reintroduced to pulp production processes at the Mill. The foul condensate collected at a rate of about 4.7 $m^3 \cdot min^{-1}$ and a temperature of 79 °C will be sent to the integrated stripping column to remove impurities allowing it to be reused in the process. The SOGs will then be sent to the environmental treatment facility for processing.

NCGs and SOGs collected from the evaporation process will be sent for incineration (Figure 27). NCGs will be collected at a rate of 3 000 kg · hr^{-1} at a temperature of 114 °C while SOGs will be collected at a rate of 960 kg · hr^{-1} at a temperature of 90 °C to 115 °C.

Once the new MEEs (Figure 28; *n.b.*, their location relative to the RB is shown in Figure 24) are commissioned, started up, all systems are tested to determine suitability for operation, and they are tied-in to the Mill, the existing MEEs will no longer be required, but will remain in place. The old MEEs may be removed from the site later to free up space at the Mill.

The new MEEs will occupy a space at the Mill of about 1 499 m^2 (*i.e.*, 42.7 m × 35.1 m). The new evaporators will be up to 30.5 m tall.

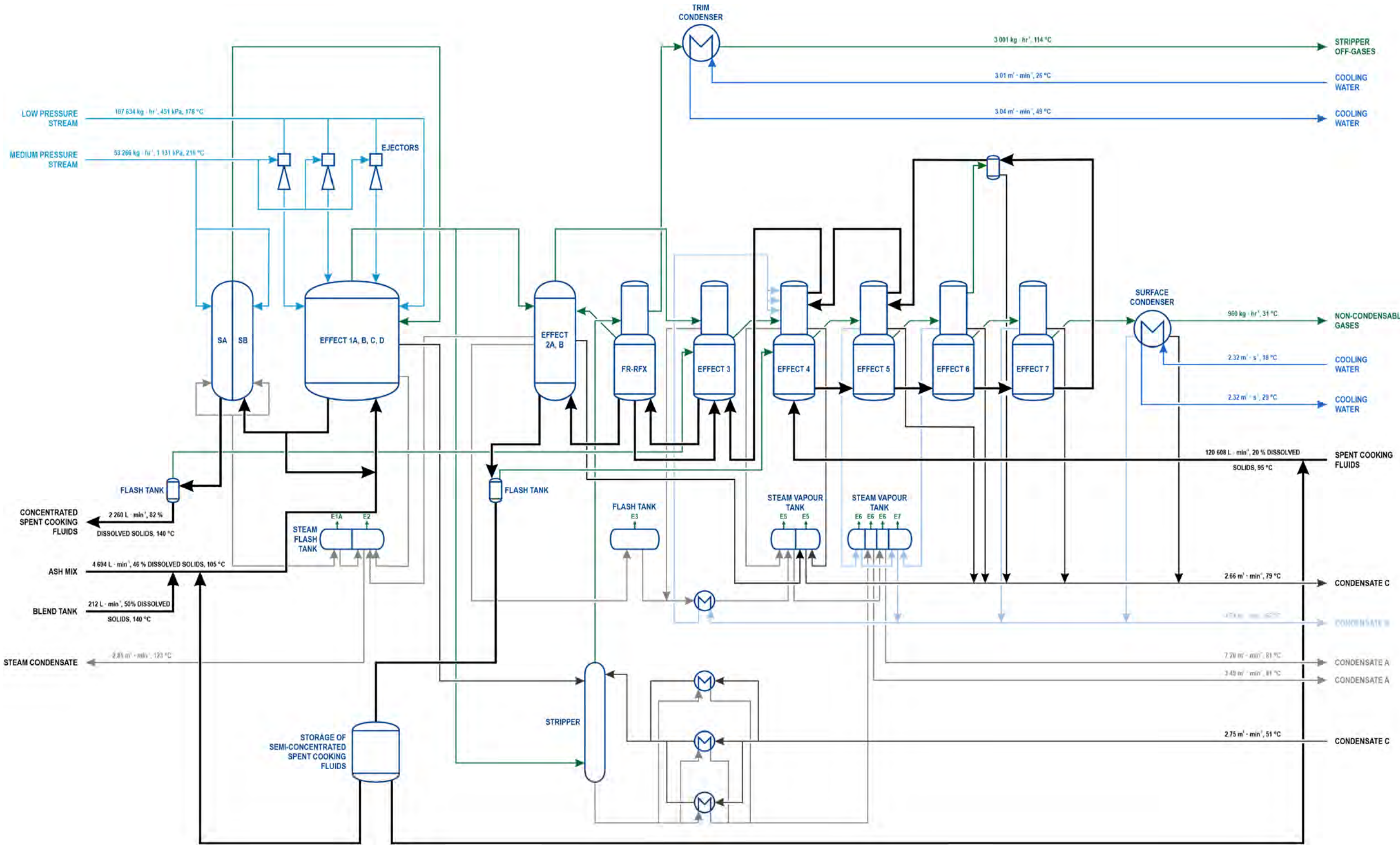


Figure 27. Process flow diagram for the new multiple effect evaporators proposed for the Reversing Falls Mill in Saint John, New Brunswick.

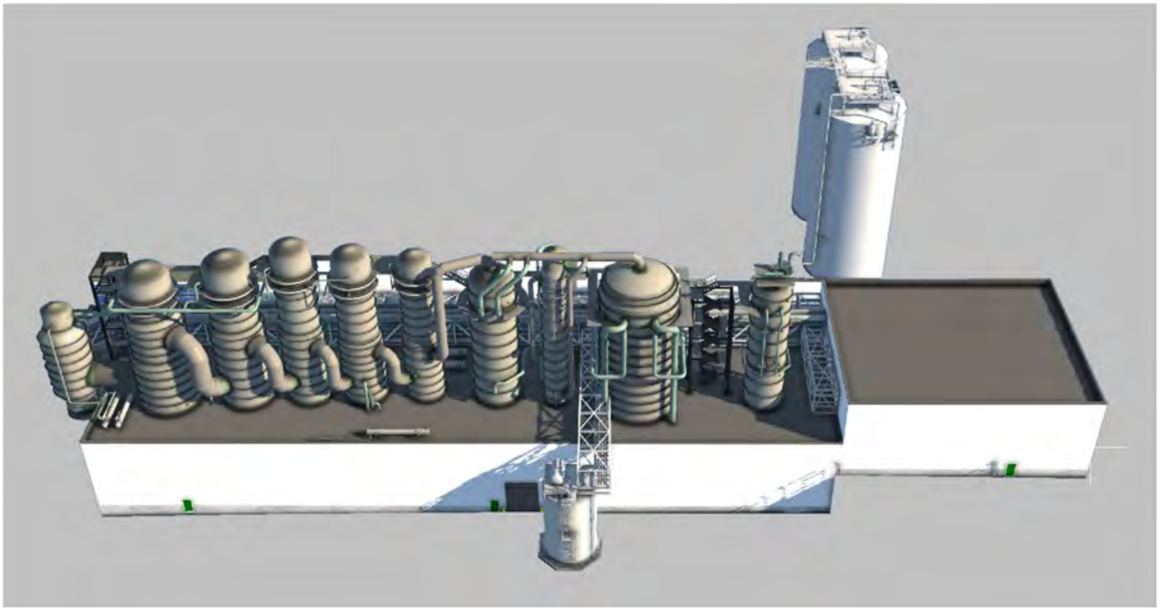


Figure 28. Three-dimensional conceptual model showing the new multiple-effect evaporators proposed for the Reversing Falls Mill in Saint John, New Brunswick.

2.6.2.1 Cooling Water and Condensers

Cooling water for the surface condenser of the MEEs will be sourced from the cooling water intake that was previously approved for the Environmental Treatment Facility and Water Use Reduction Project at the Mill [*Fundy Engineering*, 2022]. It is expected that the extraction rate from the cooling water intake for the surface condenser, as shown in Figure 27, will be about 139.2 $m^3 \cdot min^{-1}$. Normally, no water will be required for the trim condenser, but when it is, it will be negligible.

2.6.3 New Turbine(s) and Green Energy Generator(s)

Currently, most of the power required for operating the Mill is generated onsite by the combustion of biomass in the bark boiler and the combustion of concentrated spent cooking fluids in the RB. During normal operation, the Mill currently imports some power continuously from the connected NB Power electricity grid. This continuous use of power from the connected NB Power electricity grid will change because of this Project. That is because the new highly efficient RB will produce more than double the steam quantity output. The high-pressure steam will be distributed to the new green energy generator(s). Steam will be exhausted from the new green energy generator(s) at pressure that will be suitable for other in-Mill processes. The converting of heat energy into electricity will more than double because of this Project. Some power from the grid will still be required during high-demand procedures, such as Mill start-up and shutdown periods because no steam will be available to spin the turbine(s).

The new green energy generator(s) shown in Figure 24 will produce up to 140 MW of electricity (*i.e.*, up to 1.1 Terawatt hours annually). About 70 MW will be used to operate the Mill and the surplus electricity generated will be sold as green power to the NB Power grid. As shown in the process flow diagram of Figure 29, high pressure steam from the new RB and the existing #3 PB will be sent to the turbine(s). The working principle will be according to the classical Clausius-Rankine process whereby the high-pressure steam from the RB and #3 PB will be used to rotate the blades of the turbine(s). The rotor of the connected generator will spin as the turbine rotates and that mechanical energy will be converted by the electromagnetic stator of the generator to electricity.

2.6.3.1 Cooling Water and Condenser

Cooling water for the condenser of the green energy generator(s) will be sourced from the cooling water intake that was previously approved for the Environmental Treatment Facility and Water Use Reduction Project at the Mill [*Fundy Engineering*, 2022]. It is expected that the extraction rate from the cooling water intake for the condenser, as shown in Figure 29, will be about 2.5 $m^3 \cdot s^{-1}$.

2.6.3.2 NB Power Grid Connection

The new green energy generator(s) will produce more electricity than required for the Mill to operate. The surplus electricity generated at the Mill will be sold as green power to the NB Power electricity grid. The Mill currently has access to the NB Power electricity grid through a transmission line that connects with the Mill. There may be some alterations required to that connection to allow the flow of electricity from the Mill to the NB Power grid. Any alterations required to the electrical connection will be determined during detailed design and in consultation with representatives of NB Power as described in Section 6.4.1.

Through this Project, the Mill will become a New Brunswick electricity grid generator versus an electricity grid net consumer. In September 2022, the Province released the report, "*Our Pathway Towards Decarbonization and Climate Resilience, New Brunswick's Climate Change Action Plan 2022-2027*" [*PNB*, 2022]. The Plan commits to powering the province with clean and renewable energy, including clean fuels, such as geothermal, renewable natural gas, and biomass. This Project will assist the province with decarbonizing the electricity grid by offering an additional source of green energy (*i.e.*, biomass combustion).

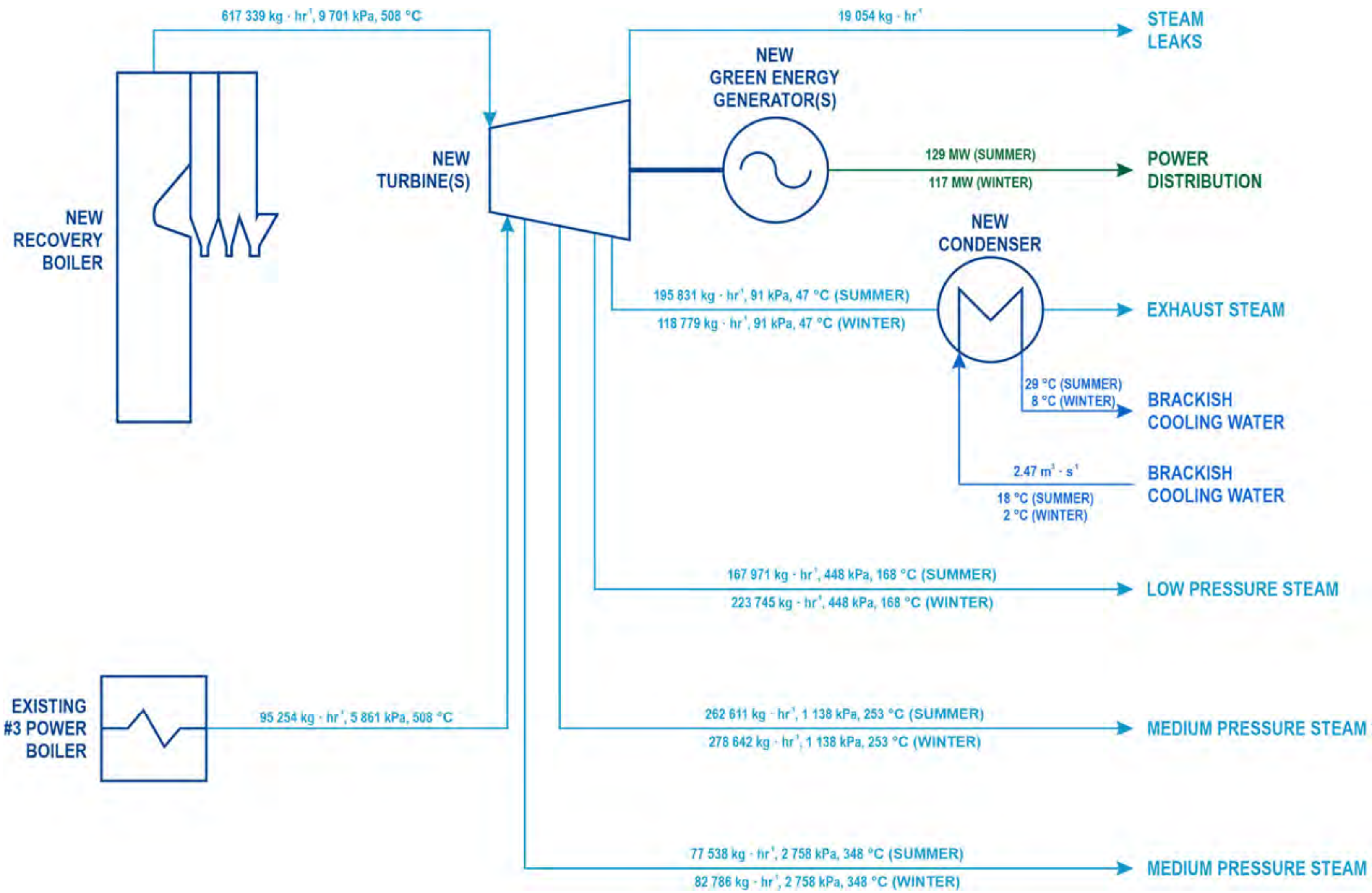


Figure 29. Process flow diagram for the new turbine(s) and green energy generator(s) proposed for the Reversing Falls Mill in Saint John, New Brunswick.

The new turbine(s) will have a mechanical efficiency of 98 % and a thermal efficiency of 85 %. During the summer, it is estimated that the average power generated will be 129 MW while during the winter it will be about 117 MW (Figure 29). The difference in power generated is attributed to the amount of steam extracted from the turbine(s) (*i.e.*, more steam will be required to heat the woodchips, to evaporate additional water in the MEEs, and for space heating within the Mill during the winter leaving less for green energy generation).

Medium pressure steam exhausted from the turbine(s) will be used for other in-Mill processes including the:

- tissue machine;
- RB feedwater heaters;
- RB intermediate heaters;
- RB air preheaters;
- RB utilities;
- RB and #3 PB soot blower;
- #3 PB blower;
- chlorine dioxide generator;
- oxygen delignification process;
- digester and impregnation bin;
- evaporators;
- pulp machine; and
- various other users.

Low pressure steam exhausted from the turbine(s) will be used for other in-Mill processes including:

- hot water heating;
- chip handling (*i.e.*, screw conveyors);
- the evaporators;
- the impregnation bin;
- the deaerators;
- the chlorine dioxide generator;
- DNCG collection;
- Mill heating and ventilation;
- RB utilities; and
- various other users.

The new building (Figure 24) for the turbine(s) and generator(s) will take up about 1 347 m^2 (*i.e.*, 31.1 m × 43.3 m) at the Mill site.

2.6.4 Recausticizing Plant Expansion

To support the future daily pulp production rate of the Mill (*i.e.*, 1 800 ADMT), the recausticizing plant will require expansion. In a Kraft pulp mill, the recausticizing plant performs two essential functions:

1) regenerates lime from lime mud; and
2) provides regenerated cooking materials to start the pulping process anew (Figure 22).

Some equipment used for the existing recausticizing plant may be sufficiently sized and do not require rebuild, replacement, or supplement (*e.g.*, dregs filters, centrifuges, clarifiers, *etc.*). New equipment that will be required for the recausticizing plant expansion is described in the sections below.

A process flow diagram for the recausticizing plant expansion is shown in (Figure 30) and is meant to aid in understanding the operation description provided below. Figure 31 shows a three-dimensional conceptual model of the recausticizing plant expansion.

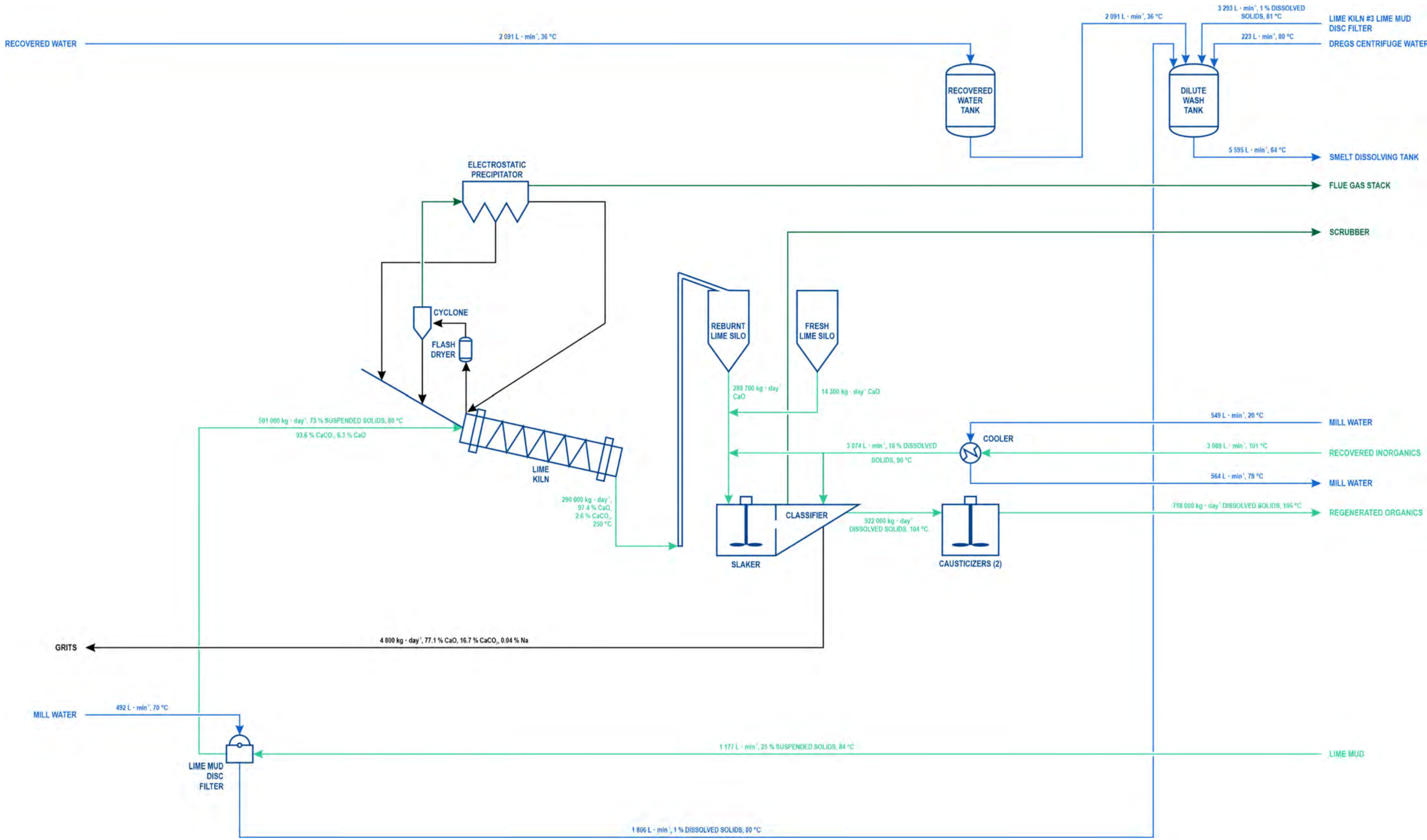


Figure 30. Process flow diagram for the recausticizing plant expansion proposed for the Reversing Falls Mill in Saint John, New Brunswick.

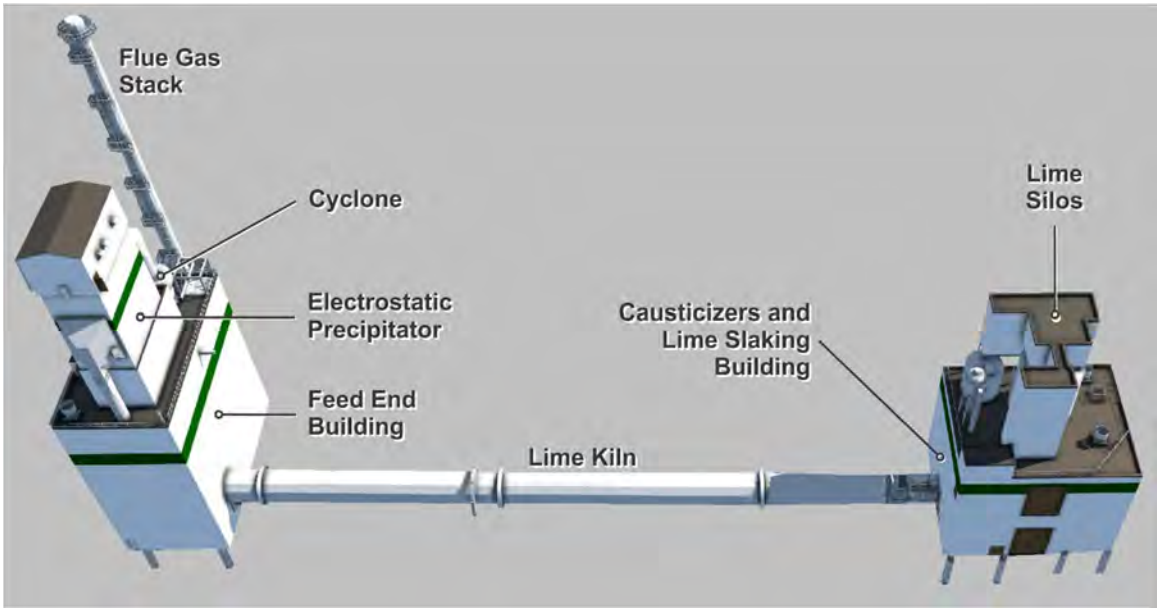


Figure 31. Three-dimensional conceptual model showing the recausticizing plant expansion proposed for the Reversing Falls Mill in Saint John, New Brunswick.

2.6.4.1 Lime Slaker and Classifier

The lime slaker and classifier are connected as a single unit as shown in Figure 30. The recovered inorganics (*i.e.*, sodium sulphide and sodium carbonate) from the smelt dissolving tank that are mixed with dilute wash water and have been clarified using existing equipment will be sent to the lime slaker. Prior to entering the lime slaker, the inorganics stream will pass through a cooler that will be supplied with Mill water at a rate of about 550 $L \cdot min^{-1}$. The recovered inorganics stream, which will have a DS concentration of about 18 %, will enter the lime slaker at a rate of about 3.1 $m^3 \cdot min^{-1}$ at a temperature of about 90 °C.

The lime slaker, which is a reaction vessel, is where the clarified recovered inorganics will be mixed with and react with reburnt lime and fresh lime to create a slurry. Fresh lime is required to make up for small losses during the Kraft pulp manufacturing process and because the system is purged to keep metals from accumulating in the lime cycle. About 3.0×10^5 $kg \cdot day^{-1}$ of quick lime will be fed to the lime slaker (Figure 30). It is estimated that 97 % of that lime will be supplied from the new lime kiln, while 3 % will be fresh lime.

A high-efficiency agitator within the lime slaker will keep the inorganics and lime in suspension while they move through the slaking process (Figure 22). The following chemical reaction takes place in the lime slaker:

$$CaO_{(s)} + H_2O_{(l)} \rightarrow Ca(OH)_{2(s)} \quad (3)$$

whereby the quick lime is converted to calcium hydroxide ($Ca(OH)_2$) also known as lime water (Figure 22). The reaction is exothermic and gives off a considerable amount of heat. Steam generated within the lime slaker and classifier will be sent to atmosphere after going through a scrubber.

Slurry from the lime slaker will flow into the classifier section where large solids, referred to as grit, will be removed (Figure 30). The grit will settle to the bottom of the classifier where it will either be removed by a screw conveyor. The grit-free slurry will move from the classifier to the causticizers with a DS concentration of about 9.2 × 105 kg · day^{-1} and a temperature around 104 °C.

It is estimated that 1 100 kg · day^{-1} of grits will be removed from the new classifier. The girts will comprise approximately 77.1 % quick lime, 16.7 % lime mud, and 0.04 % sodium (Na). As described in Section 2.6.4.1, the grits removed from the classifier, as is currently done with grits removed from the existing recausticizing plant, will be collected, and sent to a composting facility to make the material suitable for other uses.

2.6.4.2 Causticizers

The slurry from the lime slaker and classifier will move to the causticizers where a uniform mixture with minimum suspended solids will be created (Figure 30). The following chemical reaction takes place in the causticizers:

$$Ca(OH)_{2(s)} + Na_2CO_{3(aq)} \rightarrow 2NaOH_{(aq)} + CaCO_{3(s)} \quad (4)$$

Whereby the calcium hydroxide mixes with sodium carbonate (Na_2CO_3) contained in the slurry to produce sodium hydroxide (NaOH) and calcium carbonate ($CaCO_3$) (Figure 22).

Efficiency of the causticizing process (*i.e.*, ensuring that chemical reactions proceed as far as possible to completion) will be increased by passing through a series of two multi-compartment continuous flow agitated causticizers. The efficiency of the causticizers will be around 80 %. The causticized slurry will be directed to a feed tank prior to going through a pressure filter (Figure 30). The pressure filter separates the clean white liquor from the lime mud and the lime mud fed to a lime mud disc filter.

2.6.4.3 Lime Mud Disc Filter

A lime mud rotary drum vacuum disc filter will be located immediately upstream of the lime kiln (Figure 30). This filter will be used for final lime washing and thickening before lime enters the kiln. Mill water will be introduced to the filter at a rate of about 492 L · min^{-1} at a temperature of ~ 70 °C. Lime mud with a suspended solids concentration of about 75 % leaving the filter will be directed to the lime kiln at a rate of about 5.0 × 10^5 kg · day^{-1} at a temperature of ~ 80 °C. That lime mud is primarily calcium carbonate. Water removed from the lime mud disc filter at a rate of 1.8 m^3 · min^{-1} will be directed to a dilute wash tank. That water will have a DS concentration of about 1 % and will be at a temperature of ~ 80 °C.

2.6.4.4 Recovered Water Tank

A new water tank will store water recovered from multiple sources in the Mill, including vacuum pumps (*i.e.*, seal water), compressors (*i.e.*, cooling water), coolers, and slaker scrubbers. Water will be introduced to the tank at about 2.1 m^3 · min^{-1} at a temperature of ~ 36 °C (Figure 30).

2.6.4.5 Dilute Wash Tank

As noted in Section 2.6.4.3, water removed by the lime mud disc filter will be directed to a new dilute wash tank (Figure 30). Collected recovered water described in Section 2.6.4.4, water collected from the existing lime kiln mud disc filter, and water collected from the existing dregs centrifuges will also be directed to the dilute wash tank. Water collected from the existing lime kiln with a DS concentration of around 1 % at a temperature of ~ 81 °C will enter the tank at a rate of about 3.3 $m^3 \cdot min^{-1}$. Water collected from the centrifuges will enter the tank at a rate of about 0.2 $m^3 \cdot min^{-1}$ at a temperature of 80 °C. Water contained in the dilute wash tank will be directed to the smelt dissolving tank at a rate of about 5.6 $m^3 \cdot min^{-1}$ at a temperature of ~ 64 °C.

2.6.4.6 Lime Kiln

A new 2.9×10^5 kg · day^{-1} direct-contact rotary lime kiln will be installed for this Project (Figure 31). The addition of this new lime kiln will result in an overall Mill lime kiln capacity of 5.7×10^5 kg · day^{-1}. The new lime kiln will be used to complete the following chemical reaction:

$$CaCO_{3(s)} \rightarrow CaO_{(s)} + CO_{2(g)} \tag{5}$$

whereby calcium carbonate is converted to quick lime (CaO) and carbon dioxide (Figure 22). This new lime kiln is required to handle the additional calcium carbonate that will be produced during the increased production capacity at the Mill.

The new lime kiln, with buildings attached to each end, will be installed in the location of two older lime kilns (*i.e.*, circa 1961 and 1972) that were previously decommissioned as part of modernization work undertaken in 2005 and 2006 [*IPP*, 2004]. Those two formerly decommissioned lime kilns will be removed as part of this Project.

The new lime kiln will have a feed building at one end and a firing building at the other end. The 258 m^2 (*i.e.*, 24 m × 22 m) firing building will be about 19 m tall while the 288 m^2 (*i.e.*, 24 m × 14 m) feed building will be about 24 m tall. The lime kiln will be approximately 3.6 m diameter steel tube lined with refractory bricks. It will have a slight incline (*i.e.*, between 1.5 ° and 3 °) and will be slowly rotated (*i.e.*, between 0.5 revolutions per minute and 2 revolutions per minute) by an electric motor on a set of riding rings. The riding rings will be supported on concrete piers as shown in Figure 31.

The lime mud will be fed to the kiln at the uphill end and will slowly travel to the discharge end (*i.e.*, typical travel time will be several hours). A burner at the discharge end will create a cylindrical flame within the kiln. Heat will transfer from the flame and the combustion gases flowing through the kiln will dry, heat, and calcinate the lime (*n.b.*, the calcination of lime commences at a temperature around 300 °C). The reburnt quick lime containing minimal amounts of calcium carbonate (*i.e.*, ~ 2.6 %) will be collected at the discharge end of the kiln at a rate of about 2.9×10^5 kg · day^{-1} and a temperature of about 250 °C (Figure 30).

Emissions from the lime kiln will be treated using a new electrostatic precipitator prior to release to the atmosphere through a new flue gas stack (Figure 30 and Figure 31).

2.6.4.6.1 Fuel Source

The new lime kiln will require a significant quantity of heat, much of it at high temperature, to complete the calcination process (*n.b.*, typical temperatures are about 1 230 °C at the feed end and around 220 °C at the discharge end). The burner of the new lime kiln will be fueled by natural gas with the potential to burn alternative fuels in the future. Although natural gas and Bunker C heavy fuel oil are both fossil fuels, natural gas is the cleanest burning conventional fuel. As a result, it produces considerably lower levels of GHG emissions compared to Bunker C heavy fuel oil, which was the standard fuel source for lime kilns. SOGs can also be burnt in the lime kiln.

2.6.4.6.2 Flash Dryer

As the lime mud is fed to the lime kiln, a flash dryer will be used to dry the lime mud to < 1 % moisture content (Figure 30). The flue gases collected from the new lime kiln will be mixed with the lime mud in the flash dryer before transfer to a cyclone.

2.6.4.6.3 Cyclone

A cyclone will be used to separate the lime kiln flue gases and water vapour from the lime mud as shown in Figure 30. The dried lime mud will then be directed to the feed end of the new lime kiln while the lime kiln flue gases and water vapour will be directed to a new lime kiln dedicated ESP.

2.6.4.6.4 Electrostatic Precipitator

Fine particles and water vapour within the lime kiln flue gases will be removed by passing the flue gases through an ESP. Particles collected from the ESP will be directed to the feed end of the new lime kiln (Figure 30 and Figure 31).

2.6.4.6.5 Flue Gas Stack

The expanded recausticizing plant will have a dedicated flue gas stack (Figure 31). The new flue gas stack will have an outlet diameter of about 1.32 m and the outlet will be sited about 76.2 m above ground elevation, which will match the stack height of the existing lime kiln.

2.6.4.7 Reburnt Lime Silo

Approximately 2.8×10^5 kg · day^{-1} of quick lime and small amounts of calcium carbonate, ~ 7 500 kg · day^{-1}, collected from the new lime kiln at a temperature of about 250 °C will be stored in the reburnt lime silo (Figure 30). The collected reburnt lime will be used in conjunction with a small amount of fresh lime (*i.e.*, ~ 3 %) as feed to the new lime slaker and classifier as described in Section 2.6.4.1.

2.6.4.8 Makeup Lime Silo

The small amount of makeup for quick lime lost to pulp production (*i.e.*, contained within ash, grits, and dregs removed from the Kraft process) will be obtained from purchased fresh lime that will be stored in a makeup lime silo (Figure 30). Fresh quick lime, at a rate of about 1.4 × 10^4 kg · day^{-1}, will be mixed with reburnt quick lime prior to introduction to the lime slaker as described in Section 2.6.4.1.

2.6.5 Equipment to be Decommissioned, Removed, and / or Repurposed

Some existing operational Mill equipment will be decommissioned but remain in place until such time as space is needed at the Mill (Figure 32). For siting new Mill equipment, some formerly decommissioned Mill equipment will also be removed. The sections below provide further information on equipment decommissioning and / or removal.

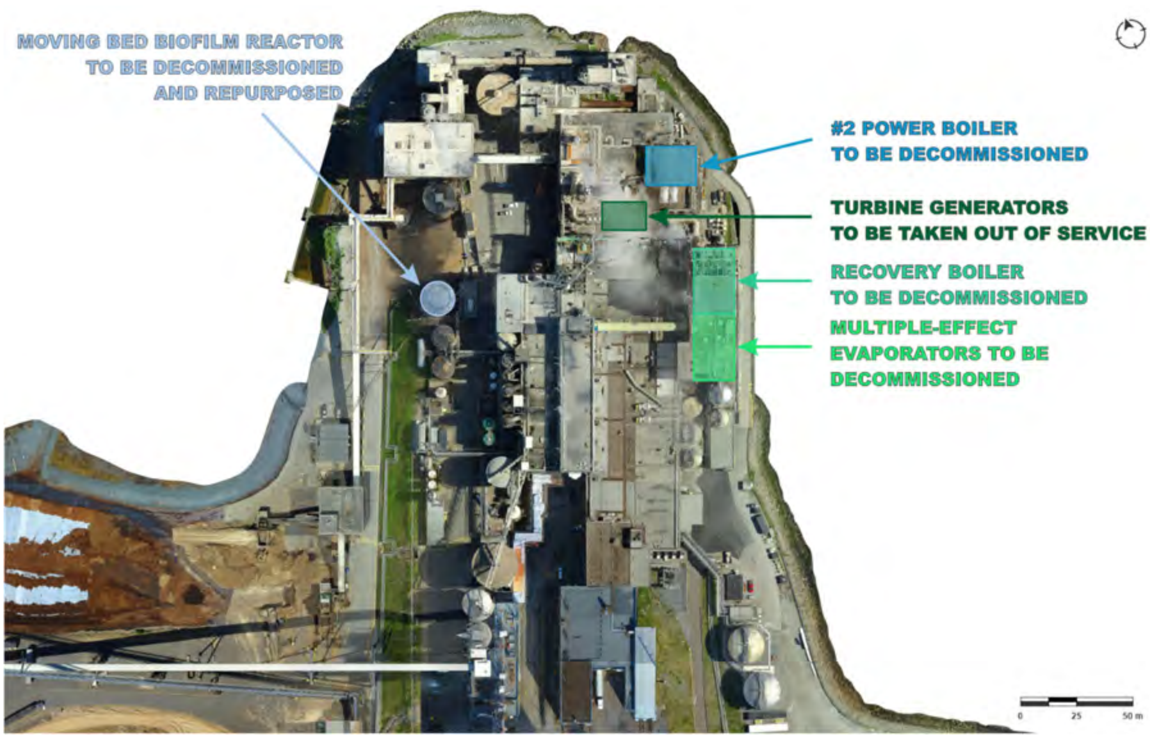


Figure 32. Aerial photograph circa 2022 showing equipment at the Reversing Falls Mill in Saint John, New Brunswick that will be decommissioned or taken out of service, if not previously, removed and / or repurposed.

2.6.5.1 Recovery Boiler

The existing RB is a 1971-era two-drum, low-odor, Babcock & Wilcox unit. Once the new RB is in operation, there will no longer be any use for the existing RB that is located on the Mill Cove side of the Mill (Figure 32). Therefore, the existing RB will be decommissioned. The RB building and associated equipment will remain in place until such time as additional space may be required at the Mill site.

2.6.5.2 Teller Scrubber

The existing Teller scrubber will be permanently decommissioned as it will no longer serve its originally intended function and is currently used as a hot water heater only. Although the Teller scrubber will be decommissioned, it may remain in place.

2.6.5.3 #2 Power Boiler

The Mill's #2 PB currently operates as an emergency back-up for steam generation. Once the new RB is commissioned, started up, tested, and brought online, there will be no need for the #2 PB because the new RB and #3 PB will provide enough steam to generate ample power for the entire Mill. Therefore, the #2 PB will be taken offline and decommissioned (Figure 32).

2.6.5.4 Back-Pressure Steam Turbines

The two existing steam turbines that are connected to the existing RB, #2 PB, and #3 PB will be taken out of service once the new turbine(s) is (are) online (Figure 32). Again, there are no plans to remove the units as part of this Project.

2.6.5.5 Multiple-Effect Evaporators

The existing MEEs are located adjacent to the existing RB (Figure 32). Those MEEs are too small, and the wrong technology required to achieve the dryness of the spent cooking fluids required for delivery to the new RB. Therefore, they will be decommissioned once the new MEEs are put into service, but they will remain in place.

2.6.5.6 Moving Bed Biofilm Reactor

Once the Environmental Treatment Facility and Water Use Reduction Project [*Fundy Engineering*, 2022] is brought online, the existing moving bed biofilm reactor will be redundant. That unit will be decommissioned and repurposed during upgrading of other systems within the Mill.

2.6.6 Utilities and Ancillary Equipment

2.6.6.1 Power and Back-Up Power

Under normal operations in the future, the new turbine(s) will provide all power for the Mill. If the RB and #3 PB go down simultaneously or if the turbine(s) and generator(s) go down, back-up power would be supplied via the NB Power transmission line that connects with the Mill. Should power be unavailable from NB Power, the Mill has numerous existing automatic back-up power sources (*i.e.*, diesel power generators) that will be used to operate all necessary infrastructure.

2.6.6.2 Exterior Lighting

For employee safety and for process and security monitoring, new exterior lighting will be installed on the exterior of the new buildings and structures (*i.e.*, evaporators, recovery boiler, and green energy generator(s) building). The light fixtures will be installed about every 9 m along the exterior approximately 4.6 m above grade. Those luminaries will be Light-Emitting Diodes (LEDs) that shine downwards (*i.e.*, Streetworks OVF or equivalent). All new exterior luminaries will be switched with lighting sensors such that they turn on in low-light conditions and turn off during optimum daylight conditions. Standard practice will be for them to operate continuously during low-light conditions.

The design and selection of exterior lighting for this Project balances employee safety criteria with requirements to minimize the effect on the environment and neighbours. Awareness of light pollution (*i.e.*, sky glow), light trespass (*i.e.*, spill light), and veiling luminance (*i.e.*, glare) are all being considered in the lighting design. The lighting design will be such that light trespass will be minimized. As a result, occupants of neighbouring spaces will be minimally affected because of the lighting system's ability to contain light within its intended area. To minimize light trespass, luminaires will be tilted or aimed away from neighbouring spaces as noted above. Luminaries will also be selected to minimize glare and up-lighting, which can affect avians.

2.6.6.3 Aeronautical Obstruction Lighting

Although none of the stacks at the Mill currently have aeronautical obstruction lighting, it is possible that the new RB flue gas stack (Figure 24) will require lighting. Consultations will be undertaken with Transport Canada to confirm this. If required, it is expected that a lighting system approved by Transport Canada will be installed.

2.6.6.4 Fire Prevention and Life Safety Equipment

New fire prevention equipment will be constructed in accordance with the National Fire Code and the National Fire Protection Association (NFPA) requirements. Automatic sprinkler systems will be included, where applicable, to provide the necessary level of fire protection. Portable fire extinguishers will also be installed in specific areas.

Like other operational areas of the Mill, H_2S monitors and alarms will be installed in several areas around the multiple-effect evaporators and the recovery boiler. That equipment will warn employees of the presence of trace amounts of H_2S and signal operations of required steps to follow to reduce the concentrations.

As noted previously, considerable technological improvements have been realized for RBs. Although they require regular maintenance to ensure efficient and smooth operation of the RB, the smelt spouts are one of the most dangerous components of an RB for operators to work around because of the extremely high temperatures. To minimize direct human contact with molten smelt from the recovery boiler during regular cleaning, remote robotic technology will be used.

2.6.6.5 Design Standards

The Project will be designed, constructed, operated, maintained, and abandoned using accepted standards and methods that are in accordance with the applicable *Acts*, permits, authorizations, regulations, and guidelines. Those standards and methods will reflect current legislation (*i.e.*, abandonment will reflect those standards and methods at some future date).

All materials, equipment, and installation labour supplied for this Project will be in accordance with all the requirements governing New Brunswick jurisdictional codes. All work performed will conform to the most recent codes of the organizations listed in Table 2. All contractors working on the Project will possess the necessary permits, certifications, and / or licenses to undertake Project work. The primary codes of reference that contractors will focus on are also listed in Table 2.

Table 2. Jurisdictional organizations and contractor's codes of reference for the mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Acronym	Description	Project Applicable Component(s)
PROJECT JURISDICTIONAL ORGANIZATIONS		
ACI	American Concrete Institute	
AISC	American Institute of Steel Construction	
ANSI	American National Standards Institute	
ASCE	American Society of Civil Engineers	
ASME	American Society of Mechanical Engineers	
ASTM	American Society for Testing and Materials	
CGSB	Canadian Government Standards Board	
CSA	Canadian Standards Association	
FM	Factory Mutual	
MSS	Manufacturers Standardization Society	
TEMA	Tubular Exchange Manufacturers' Association	
TIAC	Thermal Insulation Association of Canada	
ULC	Underwriter Laboratory of Canada	
PROJECT CONTRACTOR'S CODES OF REFERENCE*		
ABMA	American Bearing Manufacturers' Association	Bearings
ACI	American Concrete Institute	Reinforced concrete
AGMA	American Gear Manufacturers' Association	Speed reducers
ANSI	American National Standards Institute	Piping and electrical equipment
API	American Petroleum Institute	Tanks
ASCE	American Society of Civil Engineers	Structural loading for buildings and structures
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers	Heating, ventilation, and air conditioning equipment
ASME	American Society of Mechanical Engineers	Boilers and pressure vessels
ASTM	American Society for Testing Materials	Materials specifications
AWWA	American Water Works Association	Underground piping and potable water
CEC	Canadian Electrical Code	All electrical equipment
CEMA	Conveyor Equipment Manufacturers' Association	Conveyors
CSA	Canadian Standards Association	Electrical equipment, turbines, concrete, and steel structures
CWB	Canadian Welding Bureau	Welding
EEMAC	Electrical and Electronic Manufacturers' Association of Canada	Electrical equipment
ICEA	Insulated Cable Engineers Association	Electrical cables
IEC	International Electric Commission	Electric motors and electric equipment
IEEE	Institute of Electrical and Electronic Engineers	Electrical equipment and grounding
ISA	Instrument Society of America	Instrumentation
NBC	National Building Code of Canada (2010)	Buildings and structures
NEMA	National Electrical Manufacturers' Association	Electrical enclosures
NFPA	National Fire Protection Association	Fire protection
OSHA	Occupational Safety and Health Administration	Safety regulations for NB
SCAN	Scandinavian Pulp, Paper, and Board Testing Committee	Process control
SSPC	Structural Steel Painting Council	Painting
TAPPI	Technical Association of the Pulp and Paper Industry	Equipment
TEMA	Tubular Exchange Manufacturers' Association	Tubular exchangers
TIMA	Thermal Insulation Manufacturing Association	Insulation

NOTES:
*regarding Country of Origin, codes and standards are to be applicable to the manufacture of equipment / materials

2.7 Project Alternatives

Although there are several components to this final phase of the Mill's modernization, the RB is the essential item, and the others are ancillary to it. With respect to the RB, there were three options considered:

1) do nothing (*i.e.*, the null alternative);
2) replace / rebuild major components of the existing RB; or
3) build a new RB.

Those three Project alternatives are described below.

2.7.1 Null Alternative

The null alternative (*i.e.*, the do-nothing approach) was considered to compare other alternatives for the various Project components (*n.b.*, the baseline environment represents the null alternative). Under this alternative, the Project would not be undertaken, and the Mill's capacity would continue to be limited, threatening its survival in the global Kraft market. As noted previously, the RB is the heart of a Kraft pulp mill as it makes the process of manufacturing pulp environmentally and economically sustainable. Doing nothing is not a feasible option and was not considered further.

2.7.2 Rebuild Recovery Boiler

Many Asian, Nordic, and South American producers of Kraft pulp have undergone significant upgrades to make them more economically viable and environmentally sustainable. For example, Slovakia's largest integrated mill, Ružomberok, installed a new RB that was started up on September 2014 [*Mondi SCP*, 2015]. That new RB results in increased pulp production and allows the mill to produce more green energy while reducing its overall carbon footprint. As shown in Figure 9, production from this Mill is within the second quartile for global production. IPP must invest in upgrades at the Reversing Falls Mill to remain competitive with the other mills throughout the world that have undergone modernization by de-bottlenecking cooking fluids recovery operations and increasing energy efficiency. An RB of that capacity would not fit in the current RB's footprint and that RB is already operating at double its original design.

Although the existing RB could be rebuilt, it would pose significant challenges to the Mill's pulp production and existing contracts in place with customers. Rebuilding the RB would impose a lengthy pulp production outage for the Mill of between 45 days and 60 days whereas installing a new RB would only result in a pulp production outage measured in several days.

Rebuilding the RB would require continued purchase of electricity from the NB Power electricity grid during operations. That is because the rebuilt RB would not be able to produce steam at the pressures needed for the cogeneration of steam and increased electricity. As a result, there would not be an overall reduction in GHG emissions.

Because of the economic and environmental downsides of rebuilding the existing RB, such as not reducing GHG emissions related to the burning of Bunker C heavy fuel oil and not participating in cogeneration opportunities, this alternative was rejected.

2.7.3 New Recovery Boiler

Canada's pulp and paper mills are facing the challenge of competing in the global market for Kraft pulp. Reducing operating costs, such as energy, is imperative. One way to improve energy efficiency is to strategically capture energy that was previously lost. RB technology advances have made that capture possible. RBs of today can be used for cogeneration where high pressure steam produced within the RB is directed to a turbine for generating electricity and the exhausted steam remains at a level suitable for other in-Mill uses. By-products created during debarking and pulp processing operations are used to generate green energy.

The massive upgrade of the Södra Cell Värö mill in Sweeden that was completed in 2016 increased that mill's production by 64 % to a maximum of 700 000 ADMT $\cdot$ yr^{-1}. The upgrade, which included the installation of a new RB to replace the 1972-era RB, was done partially to improve the mill's competitiveness. The new RB allows that mill to generate about 180 MW of electricity.

Improved productivity enhances a mill's competitiveness. To accomplish this, mills are modernizing their equipment and increasing production capacity to improve competitiveness. Between 1999 and 2002, 121 pulp and paper mills were shuttered across North America [*P&PC*, 2003]. Many of the remaining mills are now focused on improving their production capacity through modernization.

Modernization, through the installation of a new RB, yields several other environmental benefits in addition to the generation of green energy. Those advantages include:

- overall reduction in air emissions on a per tonne production basis;
- enhanced odour collection, including fugitive emissions, to reduce small amounts of organic sulphur compounds, such as mercaptan and dimethyl sulphide, which both produce a characteristic smell to humans at extremely low concentrations;
- reduced GHG emissions by switching to cleaner burning auxiliary fuel;
- improved thermal efficiency; and
- generation of green electricity for use on the NB grid.

Because of the considerable economic and environmental benefits of building a new RB at the Mill, it was selected as the option to pursue.

2.7.4 Location

During preliminary design, the Project Team looked at all available locations at and around the Mill site for building the new equipment.

For the RB, they considered an area adjacent to Mill Cove (Figure 33), but it presented structural foundation challenges and there was no available space for constructing the Project. The machine hall where the two decommissioned pulp dryers are located was considered, but there was insufficient space. They also considered the area where the former Simm's Brush Factory was located and Wolastoq Park (*n.b.*, the parkland is owned by JDI). Those two locations were discounted because of their distance to associated areas of the Mill and, in the case of Wolastoq Park, it would result in the loss of a usable greenspace.

For the new recausticizing plant, the wood yard was considered as an option (Figure 33); however, that site presented significant deep structural foundation challenges and it is located too far from existing processes, so it was rejected (*i.e.*, there are efficiencies and operational advantages of operating both recausticizing plants at the same location).

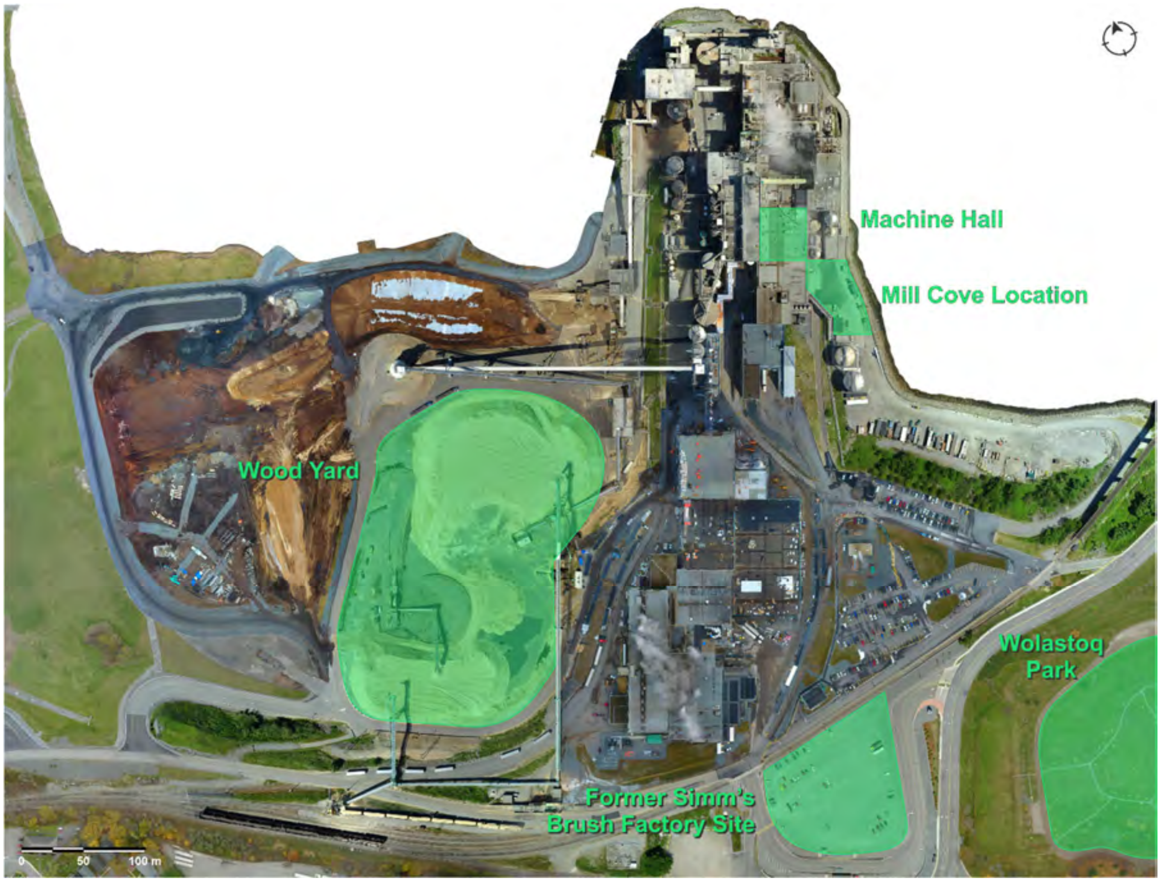


Figure 33. Locations considered for siting the Project equipment at the Reversing Falls Mill in Saint John, New Brunswick.

2.8 PROJECT STAGES

The proposed Project will proceed in several Stages. Each of those Stages is described below. Environmental permitting, monitoring, and compliance are a necessary component for all Stages of the proposed Project.

2.8.1 Stage I - Project Environmental Permitting, Monitoring, and Compliance

IPP is committed to environmental excellence. The Mill operates under an Environmental Management System (EMS), which is registered to the ISO 14001 environmental standard. As part of the EMS, and to meet Provincial and Federal Regulations, IPP has established, implemented, and maintains an operational Emergency Response Plan and Environmental Contingency Plan (ERP&ECP) at the Mill (*n.b.*, the most recent is Version 11, Revision 1 issued on 2 August 2022). The ERP&ECP identify how personnel are required to respond to potential emergency situations and potential incidents promptly and to prevent or mitigate any associated adverse environmental impacts. Specific procedures within the ERP&ECP include, but are not limited to:

- environmental incident procedures;
- spill response;
- environmental incident reporting guidelines; and
- contingency procedures related to site specific tasks.

All employees and contractors working at the Mill are required to participate in a safety and environmental orientation program. IPP issues all participants of that program an environmental incident response procedure card that outlines the 3Cs that must be followed at the Mill in the event of an incident (*i.e.*, Contain, Contact, and Clean-up). Project personnel will also be required to adhere to the Project-specific Environmental Protection Plan (EPP) that will be developed prior to completing any onsite construction works related to the Project.

Standard operating procedures, basic care procedures, and contingency procedures will be developed for the new recovery boiler and green energy generation project. Those procedures will be incorporated into IPP's existing EMS. On a go-forward basis, IPP will ensure that all Project personnel implement, comply with, and follow those new procedures included in the EMS.

2.8.1.1 Existing Approvals

The Mill currently has Approvals To Operate (ATOs) as per the Air Quality Regulation [**97-133**] of the New Brunswick *Clean Air Act* [**S.N.B. 1997, c C-5.2**] (*i.e.*, ATO I-11603) and Water Quality Regulation [**82-126**] of the New Brunswick *Clean Environment Act* [**R.S.N.B. 1973, c C-6**] (*i.e.*, ATO I-11495). Copies of those ATOs are included in Appendix IV. Both ATOs are for reference production rates from the Mill of up to 1 000 ADMT of bleached Kraft pulp and 200 machine dry tonnes per day of tissue. Environmental monitoring at the Mill will continue to occur on a routine and a long-term basis as set out in the existing ATOs. Compliance will be ensured through the regular reporting, as outlined in the ATOs, to the regulatory authority.

2.8.2 Stage II - Project Construction

No greenfield lands are required as the Project will be confined to the boundaries of the existing active Mill site. Project construction is anticipated to take 48 months. An approximate quantity summary of the main Project construction materials is provided in Table 3. Although not an exhaustive list, the heavy equipment that may be used during Project construction is summarized in Table 4. The various aspects of Project construction are described in the sections that follow.

Table 3. Summary of the main construction materials for the mill modernization and green energy generation project proposed for the Reversing Falls Mill in Saint John, New Brunswick.

Component	Approximate Quantity
Fill and gravel	10 200 m^3
Concrete	18 000 m^3
Rebar	28 000 tonnes
Structural steel	5 500 tonnes
Mechanical equipment	4 500 tonnes
Electrical equipment	45 tonnes and 24 500 m of wire
Piping	45 700 m

Table 4. Typical list of heavy equipment anticipated for use during construction of mill modernization and green energy generation project proposed for the Reversing Falls Mill in Saint John, New Brunswick.

Equipment Use / Type	Typical Task
CONSTRUCTION TRAILER MOBILIZATION, SURVEYING, AND GENERAL LABOUR	
Semi-trailer truck	Moving trailers to site
Pick-up support truck or van	Transport of equipment and personnel
MATERIAL EXCAVATION, BACKFILLING, AND SPREADING AND SERVICES INSTALLATION	
Dump truck	Hauling excavated material and backfill
Semi-trailer truck and float	Floating equipment to and from the site
Compactor / roller	Fill compaction
Loader	Material movement
Bulldozer	Material movement
Tracked excavator	Material movement
Micro-tunnelling machine	Installation of cooling water intake pipe
STRUCTURAL FOUNDATIONS	
Crawler crane (27 t to 440 t) equipped with fixed or hanging lead configuration	Driving piles
Carry deck (8 t to 22 t)	Movement of heavy equipment about the site
Semi-trailer truck and float	Floating equipment to and from the site
Semi-trailer truck and trailer	Delivering materials to the site (*e.g.*, sheet piling, piles, *etc.*)
Welding truck	Base-stations for welding equipment
Forklift / loader	Movement of pre-cast members about the site and materials handling
Concrete truck	Hauling concrete to the site
Concrete pumper truck	Movement of concrete about the site
Concrete pumps and vibratory equipment	Placing and compacting of concrete
STEEL MEMBERS AND BUILDING ENVELOPES	
Semi-trailer truck and trailer	Transport of structural steel and building materials to the site
Semi-trailer truck and float	Floating equipment to and from the site
Crane (110 t to 650 t)	Movement and placement of structural steel members
Truck crane (40 t to 90 t)	Movement and placement of structural steel members
Hydraulic boom truck (10 t to 40 t)	Movement and placement of building materials

Equipment Use / Type	Typical Task
Welding truck	Base-stations for welding equipment
Self-propelled elevating work platforms	Safely positioning personnel in above-ground areas
Forklift / loader	Movement of pre-cast members about the site, materials unloading, and materials handling
EQUIPMENT INSTALLATION	
Semi-trailer truck and trailer	Transport of equipment to the site
Container handler	Moving containers around the site
Semi-trailer truck and tilt bed trailer	Moving containers and equipment into the buildings
Semi-trailer truck and flatbed trailer	Moving equipment into the buildings
Rough terrain crane (130 t)	Installing equipment inside the buildings
Tower crane	Installing equipment
Crawler crane (750 t)	Installing flue gas stacks
Crawler crane (100 t)	Installing equipment inside the buildings
Heavy transporter	Moving equipment from Port Saint John to the site
Crane (50 t)	Setting equipment on transporter
Rough terrain crane (150 t)	Setting heavy equipment into place
Hydraulic crane (500 t)	Lifting cooling water pipeline rack into place
Warehouse forklift	Movement and storage of equipment in the buildings
Self-propelled elevating work platforms	Safely positioning personnel in above-ground areas
Telehandler (2 250 kg capacity)	Safely positioning personnel in above-ground areas
GENERAL CONSTRUCTION EQUIPMENT	
Compressors	Operating pneumatic tools
Pumps	Pumping water from excavations
Generators	Supplying localized power
Heaters	Heating work areas
Lighting plants	Lighting work areas
Asphalt paving machine	Laying asphalt
Loader with sweeper	Sweeping roadway surfaces

2.8.2.1 Temporary Infrastructure and Supporting Facilities

Prior to and throughout Project construction, numerous contractor trailers will be brought on to the Mill site. Those trailers will serve as construction offices for various aspects of Project development. Temporary services will be connected to those trailers. Locations proposed along with tentative numbers for contractor trailers are shown in Figure 34.

There are several surface parking lots on the Mill property. As shown in Figure 34, IPP will be preparing additional parking lots for this Project. Contractors bringing their own vehicle to the site will be required to park their vehicle in the parking lot they are assigned.

Materials being delivered to the Project site can enter using one of the two Mill entrances (Figure 34). Those entrances will also be used by heavy equipment going to and from the Project site and by Project personnel. Laydown required for large Project infrastructure will be confined to the wood yard area of the Mill site. Those areas may also be used for the storage of general construction materials.

Temporary washroom facilities may be brought onsite for the duration of Project construction. Any temporary washrooms will be maintained by licensed and approved third-party contractors who will be required to regularly service the facilities.

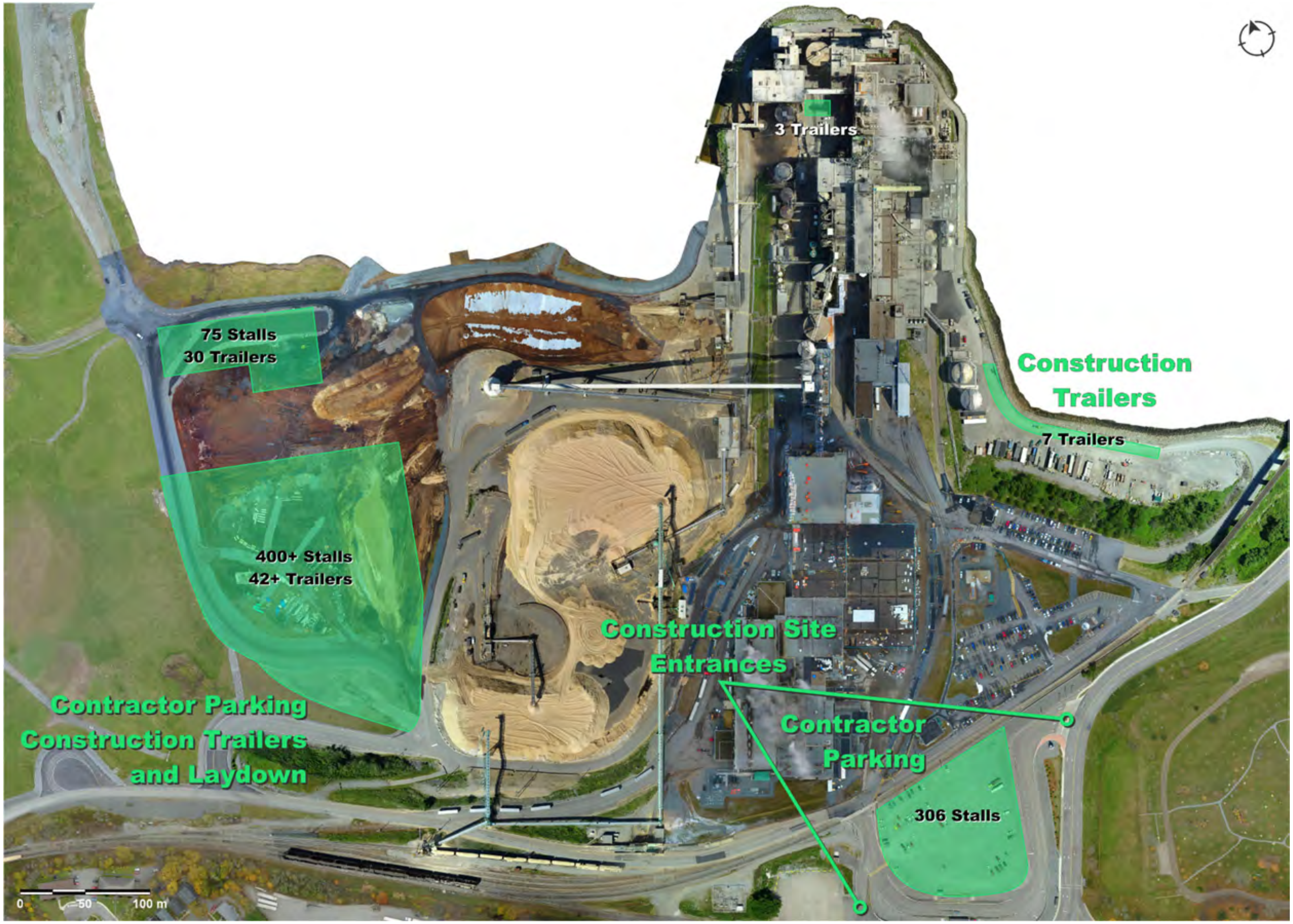


Figure 34. Aerial photograph of the Reversing Falls Mill, circa 2022, in Saint John, New Brunswick showing construction and parking areas and entrances for construction of the Phase IV Mill Modernization project.

2.8.2.2 Services and Excavations

No green field areas are involved in this Project. The buildings and equipment will be founded on piles, bedrock, and natural till that is at or very near the surface. It is expected that excavation will be minimal. Some of the site will need to be built up using clean rock and / or pit run gravel. It is estimated that about 10 200 m^3 will be required, which will be sourced from Gulf Operators' Bald Mountain site (*n.b.*, a private roadway already exists between the two sites, which will eliminate truck traffic associated with this activity on local roadways).

2.8.2.3 Structural Foundations

The new infrastructure (*i.e.*, the RB, MEEs, new turbine(s) and green energy generator(s), and the recausticizing plant expansion) will be founded on engineered concrete slabs. The slabs will be supported directly on soil or by steel or concrete piles. When piles are driven, suitable notification will be provided to neighbours in advance of the work.

The piles will be driven into the ground using a crane equipped with a fixed or hanging lead configuration pile driver. It is likely that a hydraulic hammer will be used; however, a diesel hammer may also be used depending on hydraulic hammer availability. The piles will be connected at grade using cast in place concrete pile caps.

The footings and foundations for the various components will be poured using concrete produced off-site at approved facilities.

2.8.2.4 Work Hours

During construction, onsite activities will be continuous. The construction shift schedule will vary to meet the overall Project schedule requirements and will include the following shifts:

- ~ 8 AM to 6 PM Monday through Thursday (*i.e.*, four 10 hour shifts);
- 8 AM to 4 PM Monday through Friday (*i.e.*, five 8 hour shifts);
- 8 AM to 6 PM Tuesday through Saturday; (*i.e.*, five 10 hour shifts) and
- 8 AM to 4 AM or 7 PM to ~ 3 AM Monday through Saturday (*i.e.*, five 20 hour shifts).

Loud work that has the potential to disturb neighbours (*e.g.*, pile driving, *etc.*), will normally be done between the regular work hours of 7 AM to 7 PM Monday through Friday. Crews working outside of those regular work hours will be sensitive to neighbours and will, whenever practical, confine loud work to regular work hours.

Tie-in work (*i.e.*, connecting the new units to the Mill), which requires the Mill to be shutdown, will be completed 24 hours · day^{-1}, seven days a week in order to limit the overall duration of the shutdown.

2.8.2.5 Labour

It is estimated that approximately 2.93 million person hours of work (*i.e.*, ~ 1 465 person years) will be generated through Project construction (*i.e.*, construction trades and supervision). That is in addition to the estimated 300 000 hours of professional engineering and 330 000 hours of indirect staff and professionals.

During the year of peak construction (*i.e.*, month 31 through month 42; Figure 35) up to 1 014 people will be working onsite (*n.b.*, this assumes the shortest construction period whereby overall construction would be completed in four years; however, the most likely scenario will be an overall construction period of between four and six years). About 82 % of those people (*i.e.*, 832) will be working days while the other 18 % will be working nights. As a comparison, there are > 1 000 people onsite completing work during routine shutdowns that occur at the Mill every 18 months. During the four years of construction, an average of 228 people will be working onsite around the clock.

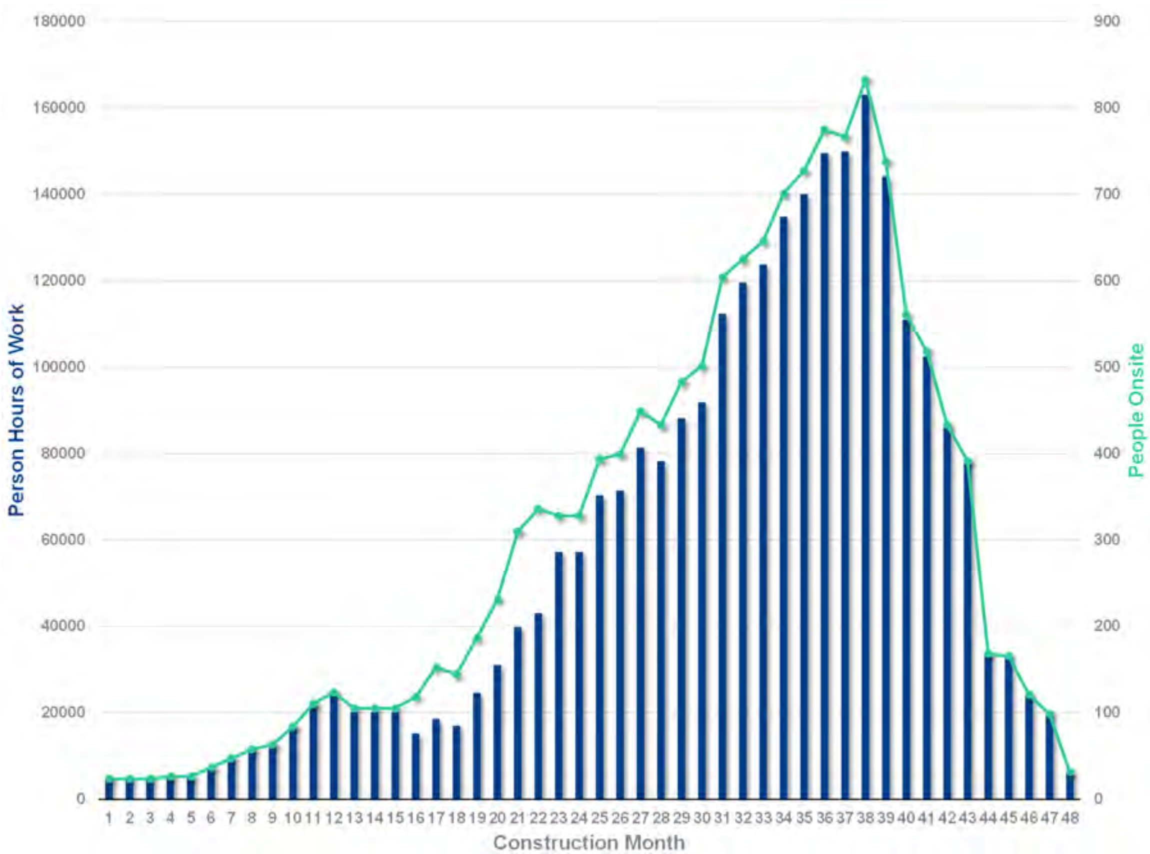


Figure 35. Estimated labour required to construct the mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick. Note: this labour projection assumes the shortest construction period whereby overall construction would be completed in four years; however, the most likely scenario will be an overall construction period of between four and six years.

2.8.2.6 Site Access

Access to the Mill for routine deliveries and shipping (*e.g.*, chemicals, wood chips, Kraft pulp, *etc.*) by road and rail will not be affected by Project construction. Operational and maintenance personnel for regular Mill processes will continue to access the site via the main Mill entrances (Figure 34). Project construction equipment and personnel will also enter and exit the site through the existing Mill access points.

2.8.2.7 Traffic

The Mill is constantly undergoing routine maintenance operations and planned upgrades. That work results in regular peaks and valleys in local area traffic. The existing all-weather road networks are designed to accommodate those fluctuations. It is not anticipated that there will be any issues with offsite traffic during Project construction.

During peak Project construction (*i.e.*, a 48 month period), truck traffic to and from the Mill will slightly increase as materials are delivered. Reasonable efforts will be made to ensure that increased traffic loads on local truck routes are confined to non-peak travel times (*i.e.*, not during morning or evening rush hour traffic). During the movement of over-sized and / or heavy loads, there may be a requirement to have traffic controls in place, such as flagging crews or police escorts.

2.8.2.8 Safety

Employee and contractor safety is a vital part of the culture at IPP. For example, one of IPP's goals is to provide a safe and healthy work environment for all employees, contractors, and visitors. As previously noted, all employees and contractors working at the Mill are required to take part in a safety and environmental orientation program. Participants are provided a safety and environmental booklet and environmental reporting procedure wallet card that explains the safety and environmental protocols in place at the Mill. Employees and contractors are required to adhere to the established safety practices, which include:

- lockout tagout for isolating equipment;
- confined space and special entry;
- barrier tapes; and
- Mill alarms and evacuation.

All Project personnel will be required to participate in the Mill safety and environmental orientation program in addition to any Project-specific orientation. They will also be required to use specific and appropriate safety policies. For example, contractors working inside any tanks or vessels must adhere to the confined space and special entry policy.

Safety concerns identified by Project personnel will be resolved as they arise; however, as per the New Brunswick *Occupational Health and Safety Act* [**S.N.B. 1983, c O-0.2**] (*OHSA*) the Mill operates with a Joint Occupational Health and Safety Committee (JOHSC). The JOHSC addresses safety concerns as necessary. Depending on the number of contractors on site and the duration of the Project construction stage, a contractor JOHSC may be formed to address safety concerns brought forward by contract employees. In addition to the safety practices in place, all other safety standards and / or requirements under the *OHSA* will be followed and enforced.

2.8.2.9 Commissioning and Tie-In

Once construction is complete, and prior to commissioning, the new RB will be chemically cleaned with a weak solution of hydrochloric acid (HCl) and then passivated with a phosphate soap solution. Following that, the steam piping to the turbine(s) and generator(s) will be cleaned using high-velocity steam blows that will be exhausted through sound attenuation silencers. After the steam piping is cleaned, the systems will be started on water and the recovery boiler controls will be tuned.

The Project will be tied-in to the Mill to integrate it into the cooking fluid recovery cycle. That component of the work will be done will the Mill is shutdown. Start-up will only take place once all mechanical, piping, electrical, and instrumentation checkouts and commissioning exercises are completed.

After completing a mechanical checkout, the MEEs will be run and checked using clean water. Circulating units and instrumentation will be checked for leaks, equipment integrity, function and operating parameters, instrument loop tuning, instrument set levels, and as many other checks as possible prior to introducing spent cooking fluids. Once the water commissioning is completed, steam will be introduced, and the system will be pressurized to allow further testing and tuning of the control loops and equipment function. Once the commissioning team is satisfied with the operation of the controls and the integrity of the equipment, the system will be ready for the introduction of spent cooking fluids. A bleed stream will be fed from the existing dilute spent cooking fluids tanks and the MEEs will undergo a simulation production run evaporating the fluids through to the new 50 % and 83 % solids tanks. The concentrated spent cooking fluids can then be diluted and recycled back to the diluted spent cooking fluids tanks as needed to allow complete and safe commissioning of the new MEEs.

Mechanical checks and Instrumentation loop checks will be performed on the recausticizing plant once construction is complete. Those checks will ensure that all field instrumentation is operating correctly before startup. The recausticizing process will then be simulated to ensure that the plant operates as designed for plant-specific processes. Following that, integrity testing will be conducted to verify whether the systems are free of leaks prior to start-up. Piping systems will be leak checked using water. Existing Mill facilities will be used for the commissioning process, including the water supply, air supply, natural gas supply, and effluent treatment system. Once the commissioning process is completed, the recausticizing plant will be started up.

2.8.3 Stage III - Project Operation and Maintenance

Once commissioned and approved, the new Project equipment will operate continuously to meet customer demands. Like other Mill operations, these processes will operate 24 hours per day, 7 days a week, and ~ 355 days per year under normal operating conditions. The only exception to this will be during planned maintenance shutdowns (*n.b.*, Mill-wide maintenance shutdowns occur every 18 months). Although the number of full-time permanent operations and maintenance employees used for the Project will be the same as for the existing recovery boiler, twin turbine generators, and evaporators, there may be some minor adjustments accounting for process efficiency improvements and extended training.

To achieve the 80 % increase in production, the following will be required:

- importing an additional 480 000 tonnes of wood chips per year:
    - 370 000 tonnes by truck[1] (*i.e.*, an additional 20 556 chip trucks); and
    - 110 000 tonnes by rail[2] (*i.e.*, an additional 3 929 railcars);
- importing an additional 55 515 tonnes of supporting products per year:
    - 37 605 tonnes by truck[3] (*i.e.*, an additional 1 504 trucks); and
    - 17 910 tonnes by rail[4] (*i.e.*, an additional 199 railcars); and
- exporting an additional 319 098 tonnes of Kraft pulp per year:
    - 143 130 tonnes by truck[5] (*i.e.*, an additional 5 301 trucks); and
    - 175 968 tonnes by rail[6] (*i.e.*, an additional 1 833 railcars).

Overall, the above will result in an annual increase of 27 361 trucks either entering or leaving the Mill and 5 961 railcars either entering or leaving the Mill.

The environmental enhancements associated with this Project are expected to mitigate potential adverse environmental effects, such as air quality. Once operational, performance of the Project equipment will be rigorously monitored to ensure it is achieving regulatory requirements in issued permits, approvals, and / or authorizations. The Project equipment will be routinely maintained, primarily during the annual Mill-wide shutdowns, or as required.

As with other Mill operations, best-management practices and modern environmental protection measures will be employed throughout the 50 year operational lifespan of the Project. Throughout operations, monitoring of air quality will be undertaken by IPP personnel and / or accredited third-party laboratories to assess compliance with regulations.

2.8.3.1 Emissions to Air

Table 5 summarizes the sources of contaminants of interest to air (*i.e.*, NO_2, $PM_{2.5}$, SO_2, TRS, and TSP) at the Mill pre- and post-Project. As noted in the summary, some sources will be decommissioned (*i.e.*, MBBR vent and #2PB and incinerator stack), some sources will be captured and redirected (*i.e.*, dilute spent cooking fluid tank vents), and some sources will be new (*i.e.*, new lime kiln stack and new recovery boiler flue gas stack).

[1] A truck carries an average of 18 tonnes of wood chips
[2] A rail car carries an average of 28 tonnes of wood chips
[3] A truck carries an average of 26 tonnes of supporting products
[4] A rail car carries an average of 90 tonnes of supporting products
[5] A truck carries an average of 27 tonnes of Kraft pulp
[6] A rail car carries an average of 96 tonnes of Kraft pulp

Table 5. Summary of emissions to pre- and post-Project (*i.e.*, mill modernization and green energy generation) at the Reversing Falls Mill in Saint John, New Brunswick.

Emission Source	Source Details					Pre-Project Emission Rate (g · s^{-1})					Status	Post-Project Emission Rate (g · s^{-1})				
	Stack Diameter (m)	Stack Height Above Grade (m)	Exhaust Temperature (°C)	Exhaust Flow Rate (m3 · hr^{-1})	Exhaust Flow Velocity (m · s^{-1})	NO_2	$PM_{2.5}$	SO_2	TRS	TSP		NO_2	$PM_{2.5}$	SO_2	TRS	TSP
Dilute spent cooking fluid #1 tank vent	0.36	18.0	81.7	39.7	0.1	--	--	--	0.005	--	To be captured and sent to new recovery boiler					
Dilute spent cooking fluid #2 tank vent	0.36	18.0	79.9	35.3	0.1	--	--	--	0.005	--	To be captured and sent to new recovery boiler					
Moving bed biofilm reactor stack	0.70	17.0	54.0	9 371	6.8	--	--	--	0.010	--	To be decommissioned					
Existing recovery boiler teller scrubber stack	2.74	67.0	65.8	482 735	22.7	16.379	1.626	0.195	0.334	3.264	To be replaced with new recovery boiler flue gas stack					
Existing lime kiln stack	1.60	66.4	276	84 057	11.6	2.846	0.923	0.023	0.042	2.218	To remain	2.846	0.923	0.023	0.042	2.218
#3 power boiler stack (wood waste / bark boiler)	2.90	67.0	58.5	324 938	13.7	13.643	0.351	7.156	--	0.697	To remain	13.643	0.351	7.156	--	0.697
#2 power boiler and incinerator stack	2.20	84.8	260	129 100	9.4	1 hr / 24 hr: 5.706 Annual: 0.266	1 hr / 24 hr: 1.612 Annual: 0.075	1 hr / 24 hr: 42.106 Annual: 1.966	--	1 hr / 24 hr: 2.880 Annual: 0.134	To be decommissioned					
Tissue machine #1 Yankee hood dryer	1.40	3.2	85.5	33 717	6.1	0.113	0.001	0.001	--	0.017	To remain	0.113	0.001	0.001	--	0.017
Tissue machine #2 Yankee hood dryer	1.02	2.2	213	74 880	25.7	0.113	0.001	0.001	--	0.017	To remain	0.113	0.001	0.001	--	0.017
Fibreline sump ventilation fan exhaust	0.25	42	20	5 649	31.0	--	--	--	0.002	--	To remain	--	--	--	0.002	--
New lime kiln stack	1.32	59.9	266	150 629	30.6	--	--	--	--	--	New	1.625	0.216	7.341	0.032	0.260
New recovery boiler flue gas stack	4.00	96.3	136	959 299	21.2	--	--	--	--	--	New	38.494	3.202	--	0.285	4.758

2.8.3.2 Discharges to Water

There will be no new process wastewater produced because of this Project. All process wastewater will be treated within the environmental treatment facility described the EIA of *Fundy Engineering* [2022], which received Ministerial approval on 19 July 2022.

2.8.3.3 Solid Waste

IPP produces no solid waste from its manufacturing process; it is believed to be the only pulp and paper company in North America that operates without a solid waste landfill. No solid waste from the manufacturing process, other than what would be considered household waste, is sent to the landfill. Process waste, which includes limestone, boiler ash, biosludge, and grits, and dregs are kept out of the landfill. IPP has worked with local agronomists, farmers, and composting facilities to make processing waste suitable for other uses. Investments and treatments at the Mill have allowed the lime and ash residues to be supplied to local farmers since 2004. All the residual products from the site either maintain a approved Canadian Food Inspection Agency (CFIA) label or are used in composting. The compost generated is considered “Category A”, the highest compost grade available, and could be certified organic.

2.8.4 Stage IV - Project Decommissioning

The Project has a predicted lifespan of 50 years. Environmental protection measures are continually evolving and improving. Therefore, specific protection measures regarding the decommissioning / abandonment of the Project cannot adequately or appropriately be made at this time. The decommissioning / abandonment will be subject to future study for assessing the environmental impacts and how the activities can be done in an environmentally appropriate manner.

2.8.5 Stage V - Mishaps, Errors, and / or Unforeseen Events

With any Project, there is always the possibility of a mishap, errors, and / or unforeseen events. Those instances may happen during this Project and the Proponent will mitigate them by taking a systematic approach to safeguarding public and personnel health and safety by establishing a safe culture during Project implementation.

The Mill’s Emergency Response Plan and Environmental Contingency Plan will be used throughout the life of the Project (*n.b.*, the most recent version of the Plan was issued in August 2022). That Plan, which is part of IPP’s EMS, is designed to assist employees with helping to prevent and respond appropriately to anticipated environmental emergencies that could result in discharges to the environment. The objectives of the plan are to:

- ensure protection of employees;
- prevent the unlawful discharge of materials from entering the air, soil, groundwater, or surface water environments;
- provide guidance to help in responding to environmental discharges to the air, water, or soil to minimize the impact of such discharges;
- comply with the legal requirements by authorities; and

- maintain healthy relations with all concerned.

Where required, Environmental Protection Plan procedures will be developed specifically for this Project and may include contingency measures if mishap, errors, and / or unforeseen events occur.

2.9 PROJECT SCHEDULE

Project construction activities are expected to begin immediately following the granting of a successful EIA determination and issuance of all applicable construction permits. A high-level construction schedule is shown in Figure 36 and assumes a construction start date of January 2025. The actual construction date will be aligned with the receipt of approvals, as required, for construction to proceed. The schedule also assumes the shortest construction period whereby overall construction would be completed in four years; however, the most likely scenario will be an overall construction period of between four and six years.

Year 2 of the Project will comprise demolition, excavation, and foundation construction. Buildings will be erected, and services will be integrated during Year 2 and Year 3. Installation of mechanical and electrical equipment will begin in Year 3 and continue into Year 4 and Year 5 when architectural finishes will be applied, the equipment will be commissioned and then started up. The actual operational date may vary between 2028 to 2030.

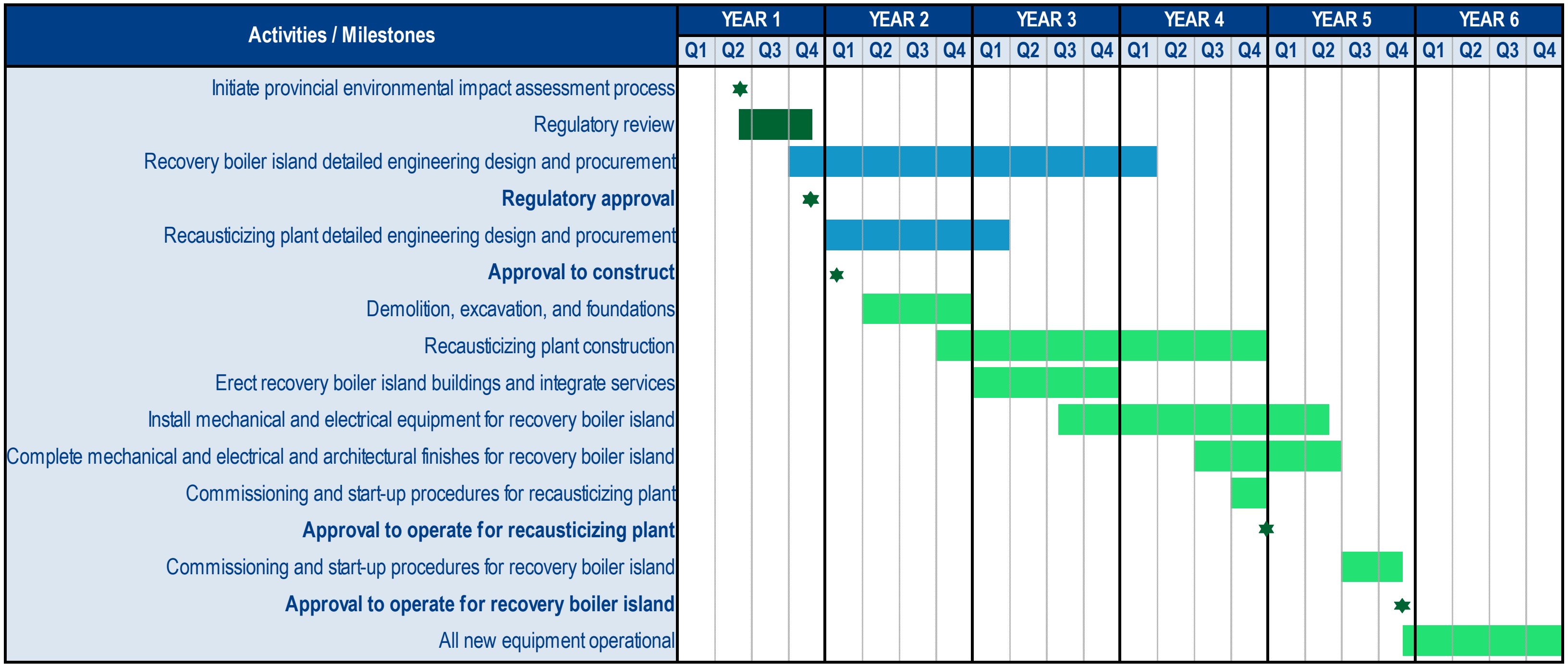


Figure 36. High-level project Gantt chart for the mill modernization and green energy generation project planned for the Reversing Falls Mill in Saint John, New Brunswick. Note: this schedule assumes the shortest construction period whereby overall construction would be completed in four years; however, the most likely scenario will be an overall construction period of between four and six years.

3.0 DESCRIPTION OF THE EXISTING / BASELINE ENVIRONMENT

This section describes the existing environment, pre-Project, at and in the vicinity of the Reversing Falls Mill. The information contained in this section is considered baseline information for this Project and can be used for comparison to post-Project data to assess any potential impacts. Within this section, "regional" refers to the City of Saint John, which includes the rural, suburban, and urban centers around the Reversing Falls Mill. Those areas include, but are not limited to, the west side (*i.e.*, Carleton, Lancaster, and Fairville), the east side (*i.e.*, Simonds and Loch Lomond), the north end (*i.e.*, Pokiok, Millidgeville, Mount Pleasant, and Portland), and the south end (*i.e.*, central peninsula and Uptown). Where specifically defined, the term "local" refers to the Mill site proper and the area immediately surrounding the site (*i.e.*, a 500 m buffer with a particular focus on Milford).

3.1 PHYSIO-CHEMICAL ENVIRONMENT

3.1.1 Climate

Saint John exists within the Fundy Coast ecoregion of New Brunswick [*Hinds*, 2000]. According to the Köppen-Geiger climate classification, the region is characterized by a humid continental climate [*Peel et al.*, 2007]. The Bay of Fundy, which is a large heat sink that never fully freezes or warms (*i.e.*, temperatures average between 8 °C and 12 °C), influences the climate by generally providing cool summers and mild winters compared to inland locations.

Monthly climate data between 1947 and 2021 are available for the meteorological station at the Saint John Airport (YSJ). That station is part of the World Meteorological Organization (WMO) climate monitoring system (WMO ID 71609; 45.32°N 65.89°W, elevation 108.8 m). During that period, the mean annual temperature was 5.2 °C ± 0.77 °C (Figure 37) with a monthly daily minimum of - 7.7 °C ± 2.36 °C in January to a monthly daily maximum of 17.1 °C ± 0.86 °C in August [*ECCC*, 2022a]. The warmest and coolest years on record were 1953 and 1948, respectively, when the mean annual temperature was 6.9 °C and 3.8 °C. The extreme minimum mean daily temperature of - 36.7 °C was measured on 11 February 1948. In contrast, the extreme maximum mean daily temperature of 34.4 °C was measured on 22 August 1976.

Precipitation (*i.e.*, rain, drizzle, freezing drizzle, hail, snow, *etc.*) is generally well distributed throughout all months and the majority (> 80 %) falls in the form of rain. Mean annual precipitation between 1947 and 2021 (Figure 38) was 1 391 mm with a mean monthly low of 91 mm in August to a mean monthly high of 152 mm in December [*ECCC*, 2022a]. The driest year on record was 2001 when there was only 799 mm of precipitation. Conversely, the wettest year was 1979 when 1 975 mm of precipitation fell. The most extreme daily rainfall of 154.4 mm was measured on 13 November 1975. The greatest snowfall of 58.2 cm was recorded on 12 December 1960. Snow depth, during the seven months with snowfall, averages 8.6 cm and almost 158 days each year experience some form of precipitation.

Marine fog, which varies seasonally and is more common during the summer, averages 590 hours · year^{-1} in the region; however, visibility is normally good at > 9 km about 77 % of the time [*ECCC*, 2022a]. Annual sunshine is approximately 1 947 hours ranging from

97 hours in November to 226 hours in July. The extreme amount of daily sunshine (*i.e.*, 15.2 hours) occurred on 26 June 1978.

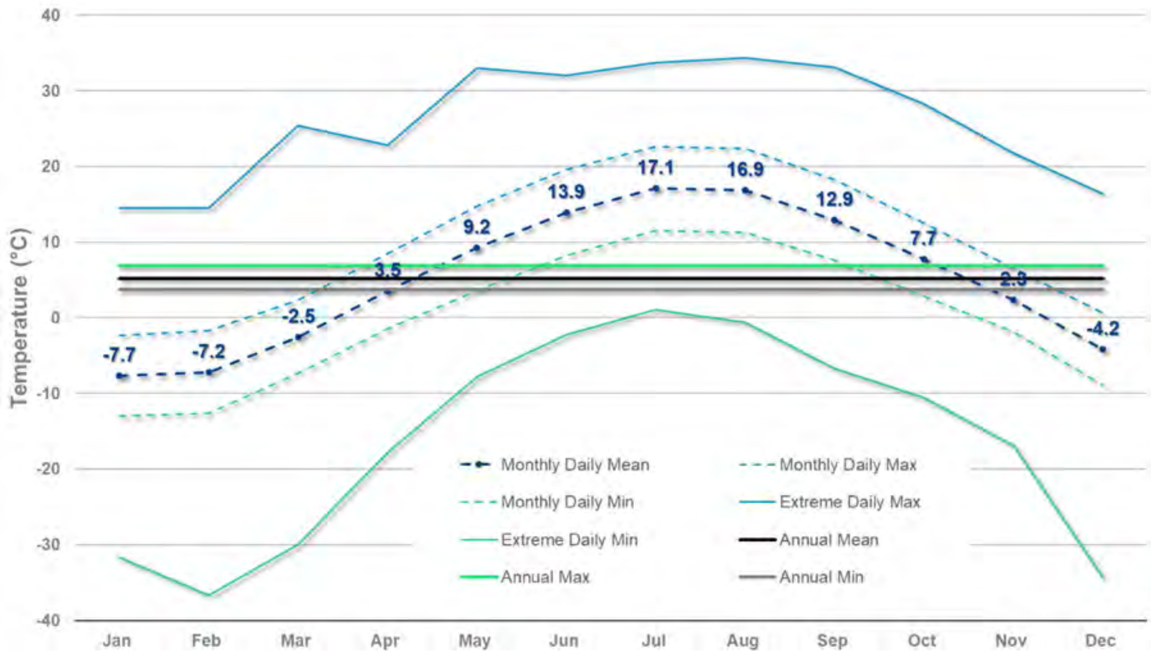


Figure 37. Compilation of mean daily temperatures measured at the YSJ meteorological station between 1947 and 2021.

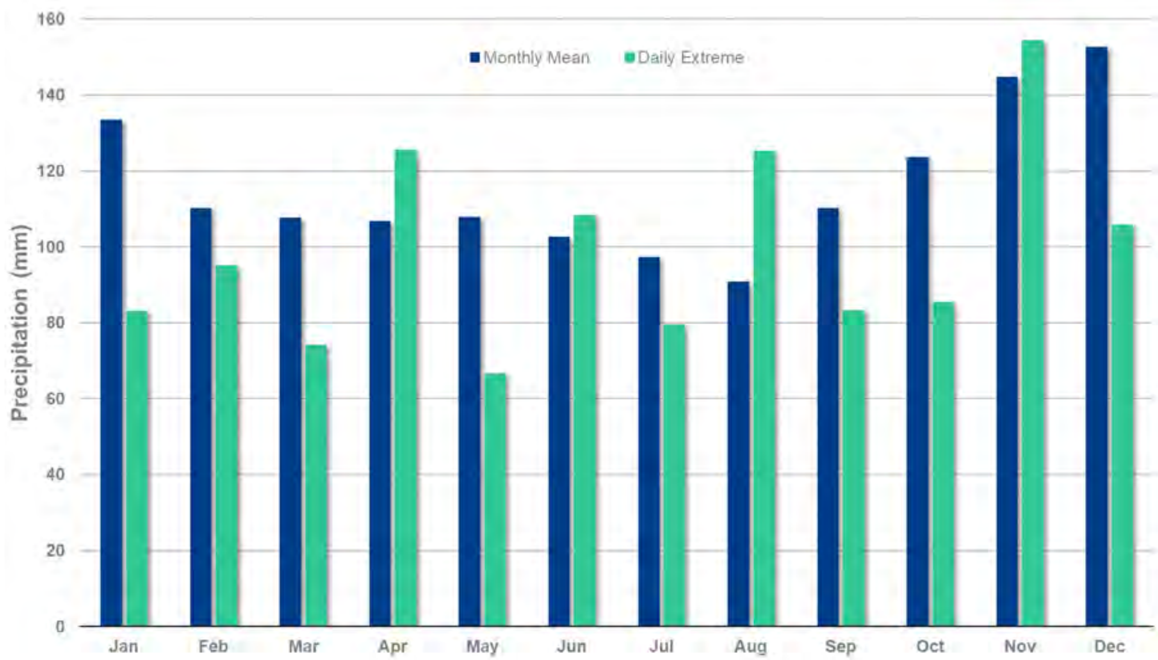


Figure 38. Compilation of mean daily precipitation measured at the YSJ meteorological station between 1947 and 2021.

Average wind speed measurements at YSJ are not available for the same period as the data previously discussed. Data are only available between 1981 and 2010. Wind speed varies from 12.1 km · hour^{-1} in August to 18.6 km · hour^{-1} in March yielding an annual average of 16.1 km · hour^{-1} [*ECCC*, 2022a]. The winds predominantly blow from the south (*i.e.*, off the Bay of Fundy), but are also frequent from the northwest (*i.e.*, off the land towards the Bay of Fundy). Winds tend to be the strongest in the winter and weakest in the summer (Figure 39). The maximum hourly wind speed of 111 km · hour^{-1} was measured on 9 January 1978. The most extreme wind gusts of 146 km · hour^{-1} (south winds) were recorded on 2 February 1976 during the *Groundhog Day Gale*.

Figure 39. Compilation of wind speeds measured for the 30 year period between 1981 and 2010 at Saint John Station A (*i.e.*, Saint John airport).

3.1.2 Air Quality

3.1.2.1 Objectives

The NBDELG recognizes several air quality objectives and standards; some are regulated while others are voluntary. Table 6 summarizes the air quality objectives as per the Air Quality Regulation [**97-133**] under New Brunswick *Clean Air Act* [**S.N.B. 1997, c. C-5.2**]. The air quality objective provided for ground-level ozone is the national objective because there is not a legally binding limit in New Brunswick.

Table 6. New Brunswick ambient air quality objectives as per the Air Quality Regulation [**97-133**] under the New Brunswick *Clean Air Act* [**S.N.B. 1997, c. C-5.2**].

Pollutant	Units	Averaging Period			
		1 hr	8 hr	24 hr	1 yr
Carbon Monoxide (CO)	ppm	30	13	--	--
Hydrogen Sulphide (H_2S)	ppb	11	--	3.5	--
Nitrogen Dioxide (NO_2)	ppb	210	--	105	52
Ozone (O_3)* - Ground Level	ppb	82	--	25	15
Sulphur Dioxide (SO_2)†	ppb	339 (169.5)	--	113 (56.5)	23 (11.5)
Total Suspended Particulates (TSP)	$\mu g \cdot m^{-3}$	--	--	120	70

NOTES:
*National ambient air quality objective (*i.e.*, acceptable level)
†Objectives are 50 % lower in Saint John, Charlotte, and Kings Counties (*i.e.*, shown in brackets)

3.1.2.2 Monitoring

Air quality monitoring in Saint John began in the early 1970s. The air quality-monitoring program was established to assess the airshed with respect to various common industrial pollutants. In Saint John today, air quality is monitored at three NBDELG sites. The quality assured data from the NBDELG sites can be accessed from Environment Canada's National Air Pollution Surveillance (NAPS) Program website. Mean annual data, where available, for carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), and particulate matter ($PM_{2.5}$) are available from the NAPS. Those data are plotted in Figure 40. Generally, there has been a continual improvement in Saint John's air quality over time.

Carbon monoxide data have only been monitored in Uptown Saint John (Figure 40). These data (n = 33 years between 1980 and 2021) show that CO concentrations in the Saint John airshed have historically been 0.5 parts per million (ppm) ± 0.33 ppm. The mean annual CO concentrations have ranged from a maximum of 1.40 ppm (1983) to a minimum of 0.16 ppm (2017, 2018, 2019, and 2020). The overall trend for the period indicates that CO concentrations have been slowly declining. This is attributed to advances in air emissions technology and the subsequent decrease in CO emissions from industry and vehicles.

Like mean annual CO concentrations, mean annual concentrations of NO_2 have exhibited a downward trend in Saint John (Figure 40). The Uptown monitoring site has the largest number of datum points (n = 31). The mean annual concentration for that site between 1981 and 2019 was 9.2 ppb ± 4.23 parts per billion (ppb) and ranged from a low of 3.0 ppb in 2009 to a high of 19.0 ppb in 1987. All mean annual concentrations are well below the 52 ppb air quality objective limit set by the NBDELG.

Sulfur dioxide concentrations have also exhibited a downward trend in Saint John. Uptown Saint John, where data are the most complete, yielded a 39 year (*i.e.*, between 1974 and 2021) annual mean of 5.1 ppb ± 5.09 ppb (Figure 40). Mean annual concentrations in east Saint John were slightly higher at 6.0 ppb ± 5.00 ppb (n = 34).

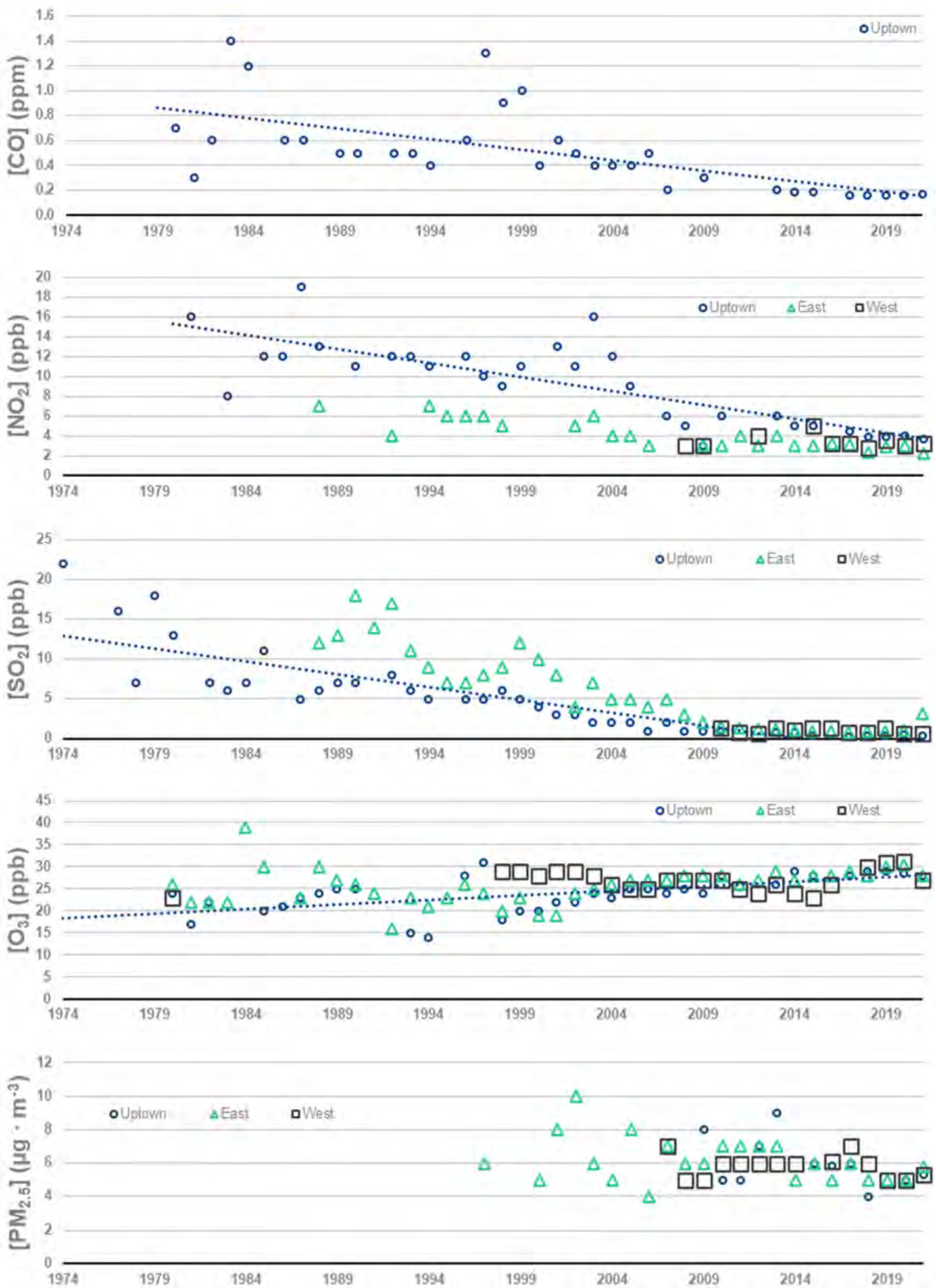


Figure 40. Mean annual air quality data as measured at NBDELG monitoring locations in Uptown, east, and west Saint John, New Brunswick between 1974 and 2021.

Ozone data are available at the sites starting in 1980 (Figure 40). There has been an overall upward trend in Uptown and east Saint John, but a slight downward trend in west Saint John. Almost all annual values have been above the NB air quality objective of 15 ppb. The mean annual concentration in Uptown, east Saint John, and west Saint John was calculated to be 24.0 ppb ± 4.16 ppb (n = 34), 25.7 ppb ± 4.01 ppb (n = 41), and 26.4 ppb ± 1.98 ppb (n = 20), respectively.

Particulate Matter in the 2.5 micron or less range (*i.e.*, $PM_{2.5}$) started being measured at the NBDELG monitoring sites in 1997 (Figure 40). The highest annual concentrations were measured in east Saint John with a mean of 6.2 $\mu g \cdot m^{-3}$ ± 1.34 $\mu g \cdot m^{-3}$ (n = 23). Mean annual concentrations in Uptown and west Saint John were, respectively, 6.02 $\mu g \cdot m^{-3}$ ± 1.47 $\mu g \cdot m^{-3}$ (n = 11) and 5.8 $\mu g \cdot m^{-3}$ ± 0.68 $\mu g \cdot m^{-3}$ (n = 14). Although the levels are rather static, they are considerably below the annual air quality objective limit of 70 $\mu g \cdot m^{-3}$ set by the NBDELG.

3.1.2.3 National Pollutant Release Inventory Reporting

In addition to air quality monitoring sites, many industrial facilities are required, as per the *Canadian Environmental Protection Act, 1999* [**S.C. 1999, c. 33**], to annually report their emissions to the National Pollutant Release Inventory (NPRI) administered by Environment Canada. The NPRI is Canada's legislated, publicly accessible inventory of pollutant releases (*i.e.*, to air, water, and land), disposals, and recycling transfers. In greater Saint John, there are at least ten facilities (Figure 41) that are required, based on meeting thresholds, to report air emissions. Those numbers complement our understanding of the air quality for greater Saint John. The most recent data available for greater Saint John facilities area (*i.e.*, 2021) are summarized in Table 7 [*NPRI*, 2022].

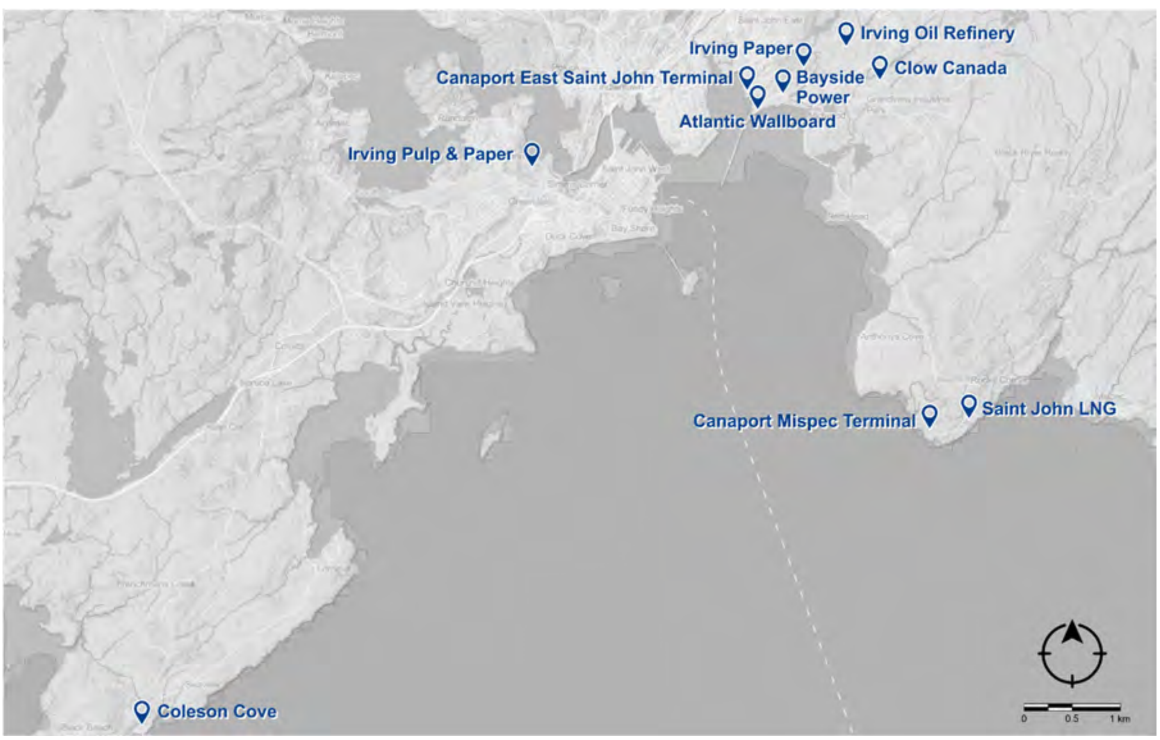


Figure 41. Facilities in greater Saint John that are required to annually report emissions to Environment Canada's National Pollutant Release Inventory tracking database.

Table 7. Total air emissions data, circa 2021, for facilities in greater Saint John that reported to Environment Canada's National Pollutant Release Inventory tracking database.

Reporting Facility	Total Air Emissions ($t \cdot yr^{-1}$)*						
	CO	NO_2	PM	PM_{10}	$PM_{2.5}$	SO_2	VOCs
Atlantic Wallboard L.P.	24.7	29.52	13.3	--	--	--	--
Bayside Power L.P.	--	248	13.2	13.2	13.2	--	--
Clow Canada	--	--	--	--	--	--	16.5
Irving Oil Commercial G.P. - Canaport Mispec Terminal	--	--	--	--	--	--	56.4
Irving Oil Commercial G.P. - Canaport East Saint John Terminal	--	--	--	--	--	--	19.556
Irving Oil Commercial G.P. – Refinery	1 203.3	3 645.2	400.4	273.6	178	2 062.1	288.8
Irving Paper Limited	54	180		3.931	1.272		45.11
Irving Pulp & Paper, Limited	**2 158.5**	**969.5**	**184.9**	**142.6**	**86.2**	**465.1**	**234.1**
NB Power Generation Corp. - Coleson Cove Generating Station	51.779	432.3	4.43	4.43	4.297	4 598.6	0.207
Saint John LNG	--	--	--	0.832 3	0.832 3	--	--

NOTES:
*includes stack / point sources, storage / handling emissions, fugitive emissions, spills, road dust, and other emissions

3.1.2.4 Greenhouse Gas Reporting Program

GHG emissions (*i.e.*, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride, and nitrogen trifluoride) are believed to be contributors to accelerated climate change. GHG emissions summaries are available between 1990 and 2019 for all provinces, territories, and Canada, and for the World between 1990 and 2018. The emissions summaries comprise total emissions from: energy activities (*i.e.*, stationary combustion sources, transportation, and fugitive sources); industrial processes (*e.g.*, mineral products, chemical industry, metal production, *etc.*); solvent and other product use; agriculture (*i.e.*, fermentation, manure management, soils management, and field burning); and waste activities (*i.e.*, wastewater handling, incineration, and landfills) [*ECCC*, 2022b]. The data are summarized in Table 8.

Although there have been efforts to curb and reduce GHG emissions, global GHG emissions continue to steadily increase (Table 8 and Figure 42). This is largely due to the increase in emissions from developing countries. Comparatively, Canadian emissions exhibited a sharp downward trend between 2007 and 2009, which was likely due to increased awareness and the implementation of newer technologies to reduce GHG emissions; however, since 2009, emissions have been on the upswing. All provinces, except for Alberta, British Columbia, Manitoba, Saskatchewan, and Newfoundland, (*i.e.*, all large fossil fuel extracting provinces) and Nunavut and the Yukon (*i.e.*, developing provinces), have shown a decrease in GHG emissions. Between 1990 and 2019, New Brunswick's GHG emissions decreased by about 24 % while Canada's overall emissions increased.

To assess Canada's overall environmental performance and contribution to GHG emissions, the Canadian Government announced the introduction of the Greenhouse Gas Emissions Reporting Program (GHGRP) in March 2004. Through the GHGRP, all facilities that emit the equivalent of 10 000 tonnes or more of GHGs in carbon dioxide equivalent units (CO_{2eq}) per year from stationary combustion, industrial processes, venting, flaring, fugitives, and onsite transportation, waste, and wastewater sources are required to report. Facilities falling below the threshold are not obligated to report, but they may do so voluntarily.

Table 8. Provincial and territorial, national, and global greenhouse gas emissions data for five-year increments since 1990 and for the last three years with available data. Data from *ECCC* [2022b] and *WRI* [2021].

Region	Kilotonnes of Carbon Dioxide Equivalent Units (kt CO_{2eq})									Change*
	1990	1995	2000	2005	2010	2015	2017	2018	2019	
AB	171 785	201 223	227 744	235 479	247 714	278 394	271 013	272 494	27 5846	161 %
BC	51 783	60 178	64 991	62 973	59 023	59 247	63 168	65 529	65 689	127 %
MB	18 599	19 873	21 184	20 634	19 696	21 223	22 167	22 986	22 647	122 %
NB	**16 256**	**17 657**	**20 921**	**20 042**	**18 249**	**13 703**	**13 298**	**13 060**	**12 426**	**76 %**
NL	9 549	8 637	9 242	10 521	9 996	11 020	11 144	10 943	11 091	116 %
NS	19 602	19 084	22 319	23 153	20 423	16 735	16 178	16 775	16 223	83 %
NT	1 787	2 106	1 537	1 630	1 420	1 738	1 319	1 417	1 377	77 %
NU**	--	--	527	584	598	637	748	747	733	139 %
ON	180 048	180 698	209 698	205 679	174 292	162 874	157 594	163 437	163 233	91 %
PE	1 866	1 848	2 106	2 042	1 945	1 656	1 743	1 728	1 756	94 %
QC	86 371	85 418	86 512	87 574	80 476	79 137	81 164	82 501	83 698	97 %
SK	43 327	58 995	66 197	67 838	68 323	76 201	75 992	76 214	74 835	173 %
YK	550	580	534	568	647	529	564	645	690	126 %
Canada	601 524	656 297	733 511	738 717	702 803	723 094	716 090	728 475	730 245	121 %
NB†	**2.70 %**	**2.69 %**	**2.85 %**	**2.71 %**	**2.60 %**	**1.89 %**	**1.86 %**	**1.79 %**	**1.70 %**	**--**
World	32 645 910	33 703 460	35 607 730	40 300 030	44 758 580	46 760 470	47 990 470	48 939 710	--	150 %
Canada‡	1.84 %	1.95 %	2.06 %	1.83 %	1.57 %	1.55 %	1.49 %	1.49 %	--	--

NOTES:
*Percentage change between 1990 emissions and 2019 emissions except for Nunavut, which is between 2000 and 2019 (*n.b.*, Nunavut's GHG emissions were included as part of the Northwest Territories in 1990 and 1995), and the World, which is between 1990 and 2018
**Nunavut's GHG emissions were included as part of the Northwest Territories in 1990 and 1995
†New Brunswick's emissions contribution to Canada's emissions
‡Canada's emissions contribution to the World's emissions

Figure 42. Global and Canadian annually reported greenhouse gas emissions in Megatonnes (Mt) of carbon dioxide equivalent units (CO_{2eq}).

Since 2004, several industrial facilities in New Brunswick have reported their GHG emissions to the GHGRP. During that time, GHG emissions reporting in the province have collectively decreased by 43 % from about 22 000 kt · yr^{-1} CO_{2eq} in 2004 to ~ 12 400 kt · yr^{-1} CO_{2eq} in 2019. Industrial emissions reductions, which are a significant portion of overall emissions, have resulted from [*ECCC*, 2022b; *NBDELG*, 2022]:

- closing coal- and oil-fired NB Power electricity generating stations (*i.e.*, Grand Lake Generating Station in 2010 and Dalhousie Generating Station in 2012);
- restructuring the forestry sector;
- investing in improved technology and energy efficiency; and
- switching to cleaner burning fuels (*e.g.*, natural gas versus Bunker C, *etc.*).

Figure 43 shows the total CO_{2eq} emissions from 20 industrial facilities in New Brunswick that reported to the GHGRP between 2016 and 2020. The four largest contributors to total CO_{2eq} emissions, which represent > 80 % of the reported emissions, are the Belledune Generating Station, the Irving Oil Refinery, the Coleson Cove Generating Station, and Bayside Power. Belledune, which is the second largest industrial facility in New Brunswick, is a coal-fired electricity generating station that is scheduled to be shuttered in 2030 to meet the Federal Government's initiative to mitigate climate change. By that time, New Brunswick expects to reduce its total emissions to 10 700 kt annually [*NBDELG*, 2022]. Based on *Action 31* in the *Province's Climate Action Plan* and the New Brunswick *Climate Change Act* [**S.N.B. 2018, c. 11**], New Brunswick is committed to further reducing it GHG emissions.

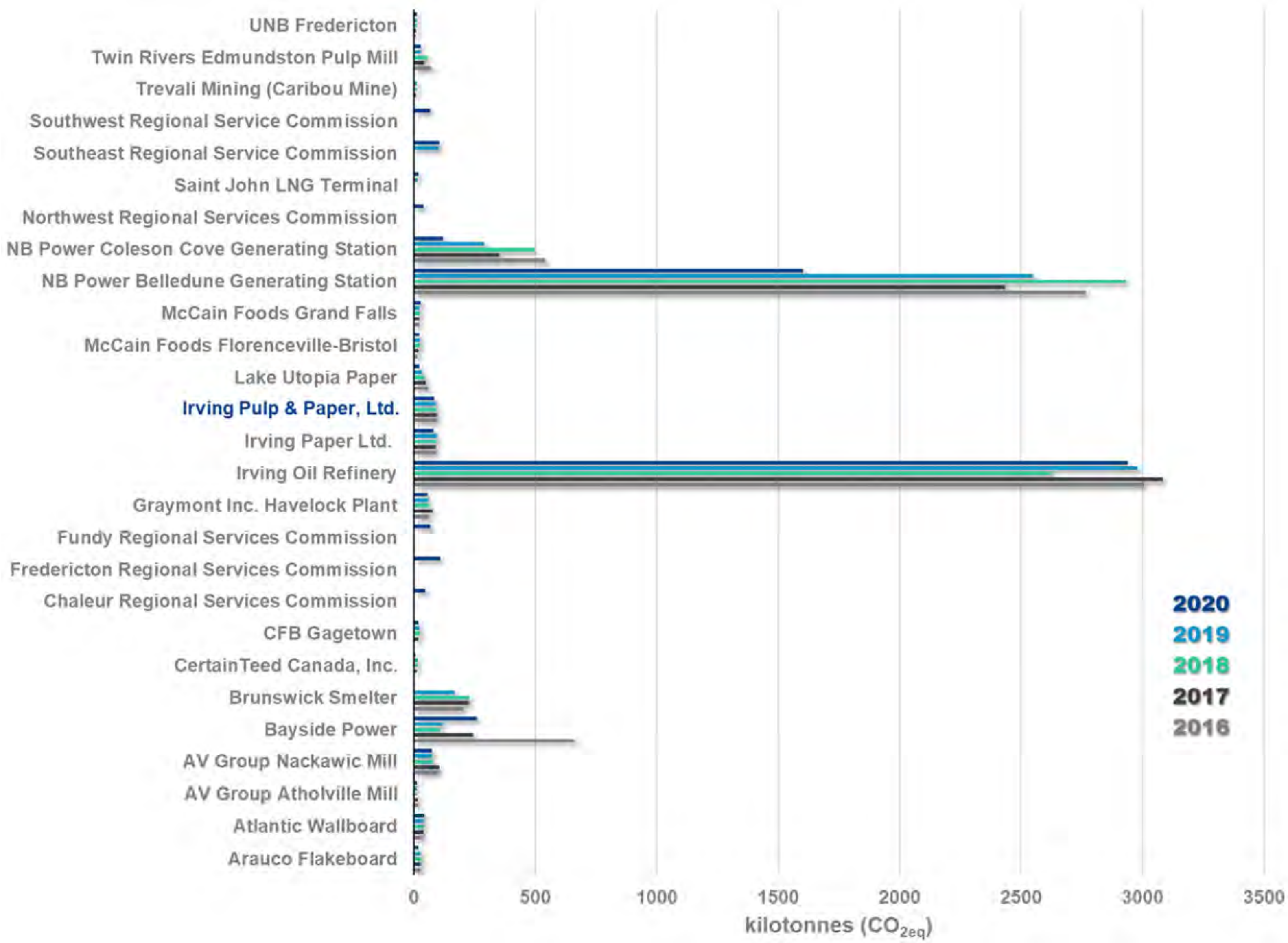


Figure 43. Reported total carbon dioxide equivalents (CO_{2eq}), in kilotonnes, for New Brunswick facilities that reported to the Greenhouse Gas Emissions Reporting Program between 2016 and 2020.

In the early 1990s, JDI began developing initiatives for their pulp and paper mills to meet or exceed the Kyoto Protocol targets. Through significant investments, GHG emissions were collectively reduced at those mills by over 65 % between 2009 and 2015. That reduction far exceeded the Kyoto targets.

In 2015, Canada committed to a 30 % reduction in GHG emissions from 2005 levels by 2030. That commitment was ratified under the 2016 Paris Climate Accord. JDI's pulp and paper mills met the Paris Climate Accord reduction target in 2010, which was five years before it was established. The company has continued to reduce its pulp and paper mill emissions and in 2021, GHG emissions had been reduced by 54 % over 2005 levels.

3.1.3 Sound Levels

Saint John has pockets of heavy industrialized areas (*e.g.*, the Irving Oil Refinery, the East Saint John Terminals, Saint John Harbour, the IPP Mill, *etc.*). Dense urban residential neighbourhoods are found within the older parts of the city that surround the industrialized areas (*i.e.*, people wanted to be close to their places of work). The Mill is surrounded by various types of public and private infrastructure, such as major highways and thoroughfares and railways. Collectively, these activities and uses result in ambient sound levels typical of an industrial and urban setting.

3.1.4 Topography

Saint John is in the south-central portion of New Brunswick along the north shore of the Bay of Fundy at the mouth of the Saint John River. The Mill is located on the western bank of a narrow steep-sided gorge (*i.e.*, ~ 120 m wide with 20 m high rock banks) where the river enters Saint John Harbour. Strong tides within the Bay cause the water flow within the Saint John River to reverse direction twice a day, which gives the gorge its name of Reversing Falls / Rapids. Regional topography is hilly. Two coastal mountain ranges, the St. Croix Highlands from the west and the Caledonia Highlands to the east, converge as they run along the Bay of Fundy (*i.e.*, the two ranges are divided by the Saint John River). Locally, Milford is somewhat rugged ridge and valley topography.

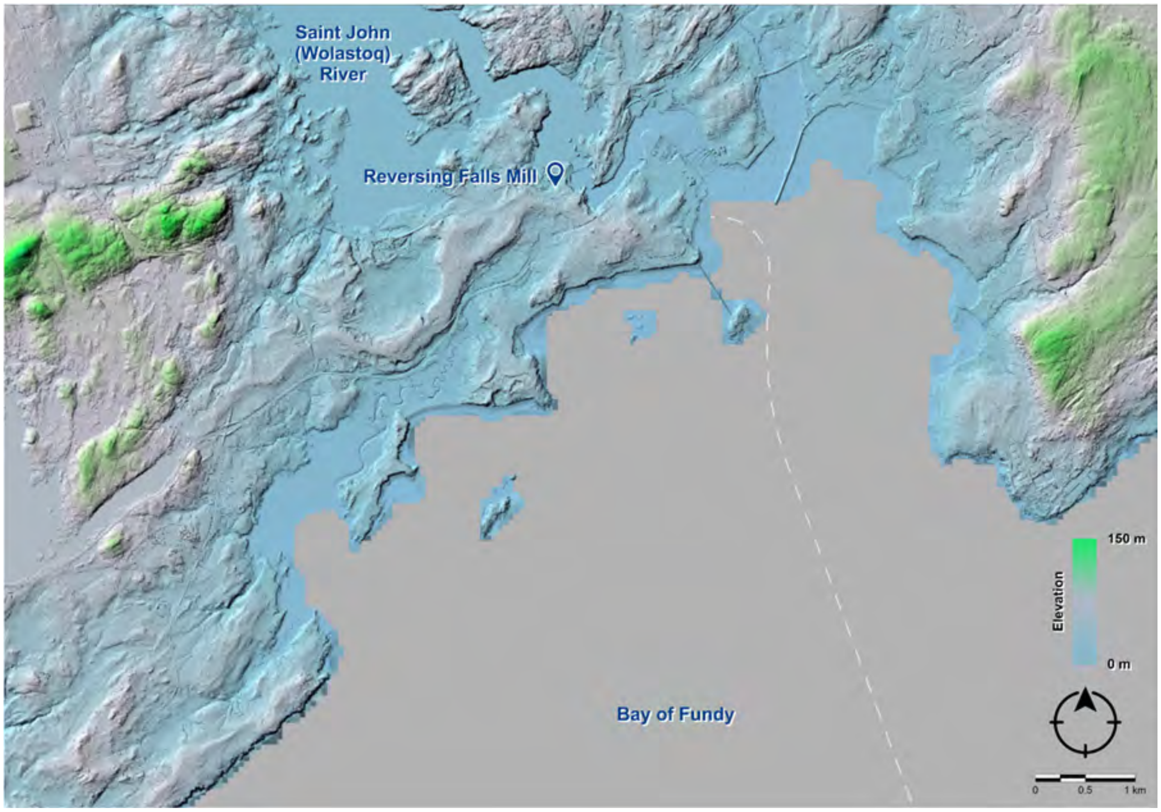


Figure 44. General topography in the vicinity of the Reversing Falls Mill at the mouth of the Saint John River in Saint John, New Brunswick.

Elevations in the Milford area range from ~ 0 m (*i.e.*, at the lower end of the Reversing Falls) to ~ 45 m (*i.e.*, at the Milford Memorial Community Centre). Generally, slopes range from about 2 % to 15 %, but can be considerably greater along the banks of the Saint John River. Bedrock outcroppings and bedrock bluffs are regionally prominent.

The Mill exists in a topographically low area on the banks of the Saint John River (Figure 44). Elevations on the Mill site range from about 0 m to 30 m. The Project site exists at a ground elevation of about 2 m and is bordered by existing Mill process equipment.

3.1.5 Hydrology

The City of Saint John is located within the 55 400 km^2 Saint John River watershed. The Mill is located on the western bank of the Wolastoq / W'alustuk (*i.e.*, the Maliseet name for the Saint John River, which means Bountiful Beautiful River) at Reversing Falls. Review of the watercourse and wetland mapping from the NBDELG's GeoNB online GIS tool shows that there are no mapped streams or wetlands on the Mill site (Figure 45). Ground-truthing by Fundy Engineering in October 2013 confirmed that there are no onsite watercourses or wetlands. Although much of the Saint John River valley experiences some flooding during the spring freshet, the Mill site is not prone to flooding; however, unprecedented flooding during the 2018 spring freshet did pose a risk to Mill infrastructure, which is being mitigated through the raising of the river's banks around Lee Cove. Site drainage is northeast towards the Saint John River.

Since 1966, Environment and Climate Change Canada has operated a continuous recording hydrometric station on the Saint John River at Saint John (01AP005) [*ECCC*, 2022c]. The station monitors water levels at the mouth of the Saint John River (*n.b.*, it is located 1 km upstream of the Mill on the eastern bank of the river). Water level data from 1966 through 2021 show a relatively standard hydrograph (Figure 46); water levels rise and fall in response to precipitation events and tides as the station is located near the mouth of the river. Large peaks are observed in April / May during the spring freshet. The highest water level recorded at the station during the spring freshet prior to 2018 was 5.31 m in 1971 (Table 9). The river set a new peak record on 7 May 2018 when it crested at 5.73 m.

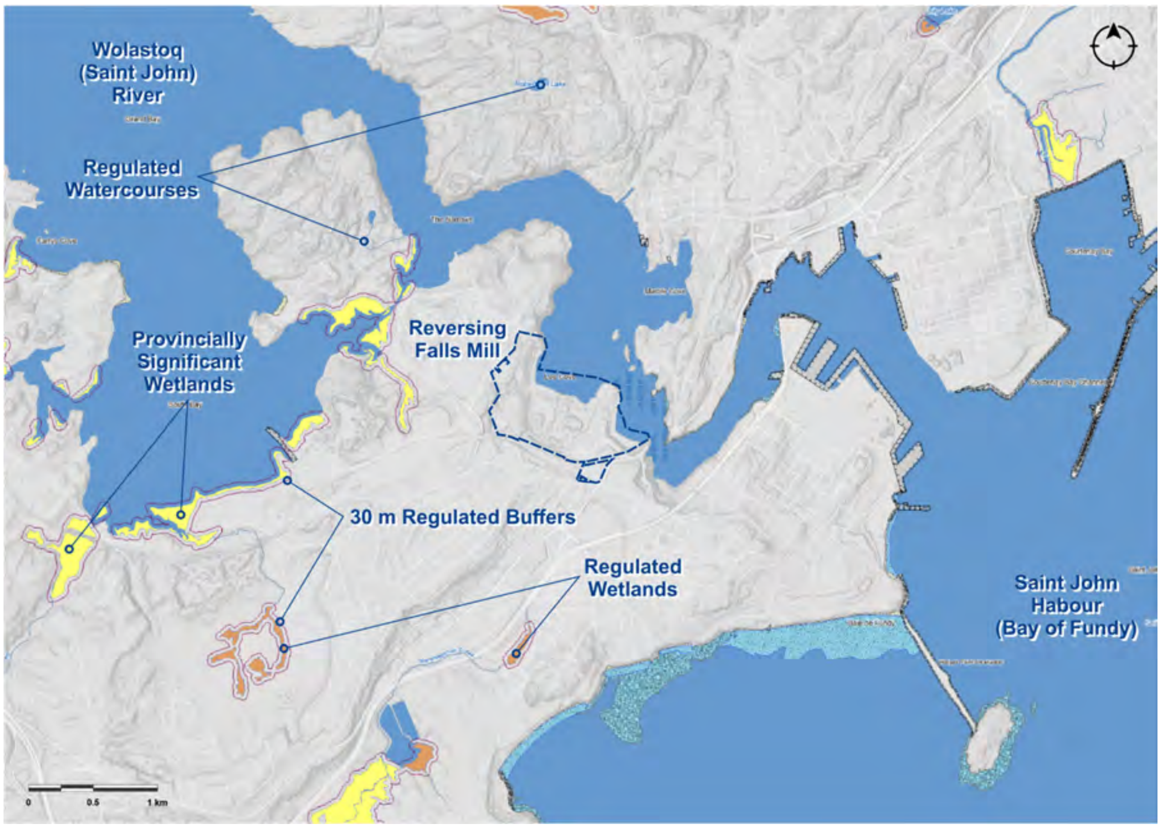


Figure 45. Aerial photograph, circa 2021, showing regulated watercourses and wetlands in the vicinity of the Reversing Falls Mill at the mouth of the Saint John River in Saint John, New Brunswick.

The 673 km long Saint John River yields a mean discharge through the Reversing Falls of about 990 $m^3 \cdot s^{-1}$ [*Hughes Clarke*, 2000]. The peak discharge during the spring freshet is up to 6 800 $m^3 \cdot s^{-1}$.

The mouth of the Saint John River is also affected by the tides of the Bay of Fundy, which experiences the World's highest tides. The semi-diurnal tides, on a cycle of about 12.42 hours, are generally in the range of 6.49 m. The tides within the Bay of Fundy vary based on tidal constituents (*e.g.*, moon and sun gravitational effects, bathymetry, weather, *etc.*). Tidal levels have been measured within Saint John Harbour since May 1896. As noted in Table 10, the mean water level within the Harbour is 4.38 m above chart datum and the mean tidal range is 6.49 m. The extreme high-water level measured at Saint John was 9.14 m above chart datum, which has occurred twice since 1896; on 2 February 1976 (*i.e.*, the *Groundhog Day Gale*) and on 10 January 1997. Conversely, the extreme low water level was 0.40 m below chart datum and occurred on 26 January 1944. The extreme tidal range is 9.54 m.

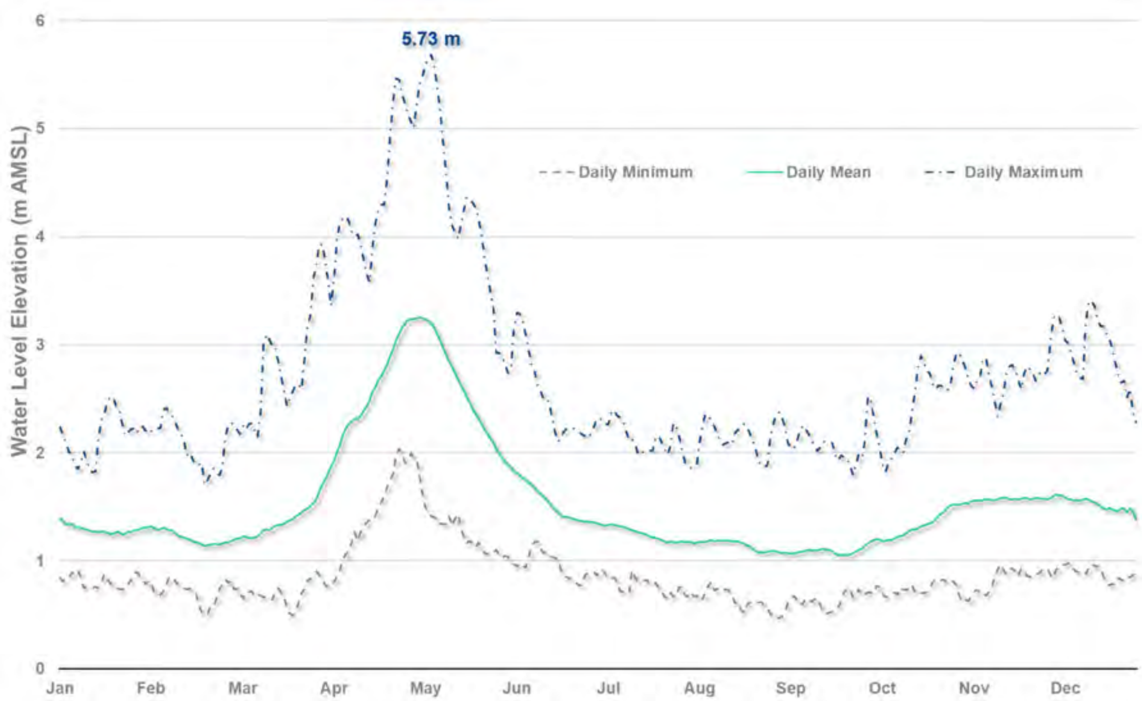


Figure 46. Minimum, mean, and maximum daily water level measurements as recorded at Environment Canada's hydrometric station on the Saint John River at Saint John, New Brunswick between 1 January 1966 and 31 December 2021.

Table 9. River stages at Saint John, New Brunswick for the Saint John River.

River Stage	Water Level (m)
Ordinary high-water mark	3.69
Flood stage	4.20
1973 maximum level	5.31
2018 maximum level	5.73

Table 10. Tide levels, relative to chart datum, for Saint John Harbour, New Brunswick.

Tide	Relative to Chart Datum (m)
Extreme high-water level	9.14
Large tide higher high-water level	8.99
Mean tide higher high-water level	7.59
Mean water level	4.38
Mean tide lower water level	1.10
Large tide lower low-water level	- 0.09
Extreme low-water level	- 0.40

3.1.6 Geology

3.1.6.1 Bedrock

The Reversing Falls Mill lies within the Caledonia Highland physiographic region of New Brunswick [*Rampton et al.*, 1984]. The Caledonia Zone is underlain by a Middle Proterozoic quartzite-carbonate sequence and a succession of Late Proterozoic volcanic and associated intrusive rocks. A Cambrian to Early Ordovician platformal sequence containing a distinctive Acado-Baltic trilobite fauna unconformity overlies Precambrian rocks. The Caledonia Zone is generally considered to represent a crustal fragment rifted from the margin of Gondwana during the opening of the Early Paleozoic Iapetus Ocean.

Bedrock geology of the local area is described in Table 11 and shown in Figure 47. Underlying most of the Mill site are metamorphic and igneous rocks from the following four formations: Ashburn; Brookville Gneiss; Fairville Granite; and an unnamed formation of deformed granitoid rocks [*Johnson et al.*, 2005]. Rocks of the formations are typically Cambrian (*i.e.*, 505 million years ago (mya) to 545 mya) and Neoproterozoic in age (*i.e.*, 545 mya to 1 000 mya). Bedrock exposure in the area is prominent.

Table 11. Descriptions of the bedrock geology in the vicinity of the Reversing Falls Mill at the mouth of the Saint John River in Saint John, New Brunswick.

Group	Formation	Age	Description
Green Head	Ashburn	Middle Neoproterozoic	White to grey and light green, generally banded and locally stromatolitic marble; black to brown pelite; massive spotted hornfels; white to grey fine-grained quartzite; minor marble-pebble conglomerate and mica schist
New River Plutonic Suite	Brookville Gneiss	Middle Neoproterozoic	Dark grey to pinkish grey fine-grained to medium-grained, banded, and locally magmatitic paragneiss with minor calc-silicate, marble, or quartzite layers; grey medium-grained granodioritic to tonalitic orthogneiss with locally abundant biotite schlieren and amphibolite; the gneisses are locally intruded granodiorite, pegmatite, and diabase
Golden Grove Plutonic Suite	Fairville Granite	Neoproterozoic / Cambrian	Pink to orange coarse-grained granite gradational to granodiorite; commonly feldspar megacrystic and elongate enclaves of fine-grained dioritic rocks
Golden Grove Plutonic Suite	Deformed Granitoid Rocks	Neoproterozoic / Cambrian	Grey strongly deformed monzogranite to granodiorite with augen of feldspar and quartz
Golden Grove Plutonic Suite	Indiantown Gabbro	Neoproterozoic / Cambrian	Green to grey medium- to coarse-grained gabbro
Saint John	Ratcliffe Brook, Glen Falls, Hanford Brook, Forest Hills, Kings Square, Silver Falls, Reversing Falls	Cambrian to early Ordovician	Red beds; white quartzite and black sandstone; grey sandstone and shale; grey to black shale and impure limestone; grey fine-grained sandstone and micaceous shale and siltstone; black shale and fine-grained sandstone; black carbonaceous shale

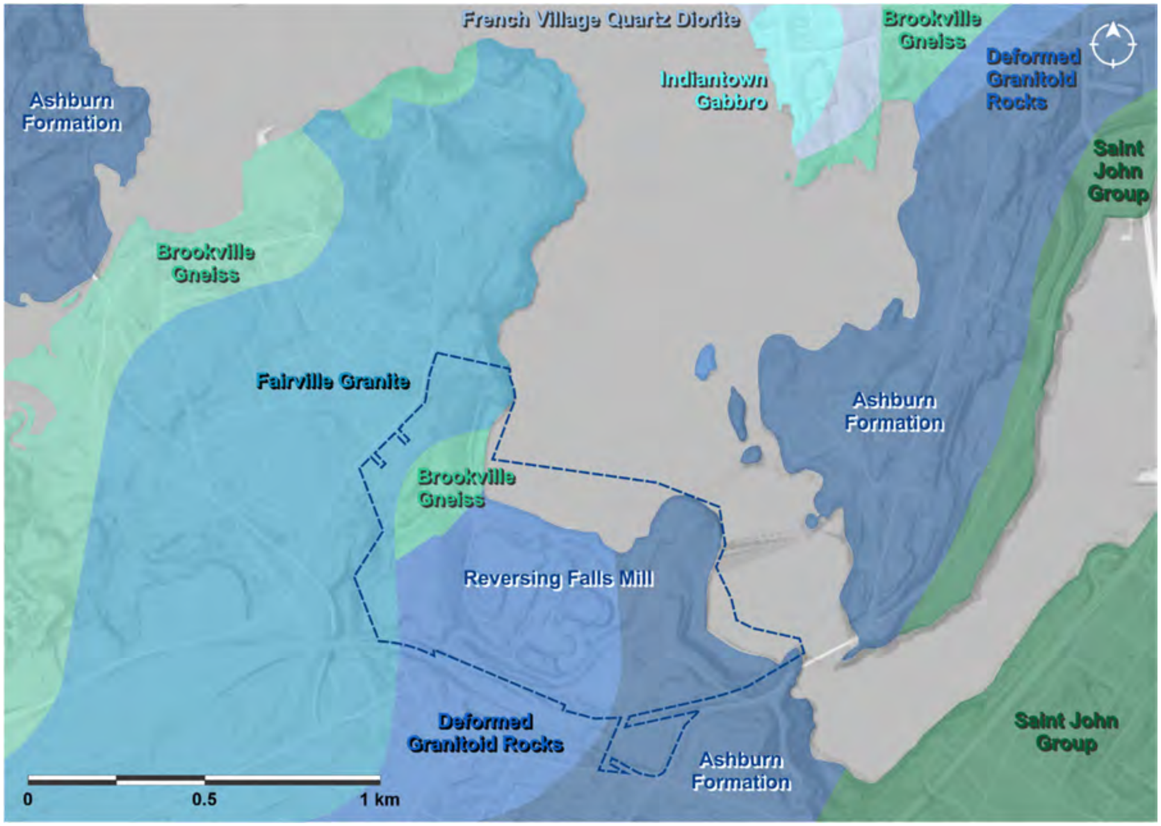


Figure 47. Bedrock geology in the vicinity of the Reversing Falls Mill at the mouth of the Saint John River in Saint John, New Brunswick. See text for bedrock geology descriptions.

3.1.6.2 Surficial

Surficial geology of the local area is described in Table 12 and shown in Figure 48. The Milford area is generally overlain by Late Wisconsinan and / or early Holocene sediments [*Rampton et al.*, 1984]. Those blankets and veneers of marine sediments are typically 0.5 m to 3 m thick and are generally comprised of sand, silt, and some gravel and clay. The materials were deposited in shallow marine water, locally deep, which submerged coastal areas and sections of many valleys during and following Late Wisconsinan deglaciation.

Table 12. Descriptions of the surficial geology in the vicinity of the Reversing Falls Mill at the mouth of the Saint John River in Saint John, New Brunswick.

Type	Description
Late Wisconsinan blanket morainal sediments	Morainal blankets generally 0.5 m to 3 m thick that are comprised typically of loamy lodgement till, minor ablation till, silt, sand, gravel, and rubble; the till is mainly stony with more than 35 % of clasts pebble-sized and larger; the sediments were deposited directly by Late Wisconsinan ice or with minor reworking by water
Late Wisconsinan veneer morainal sediments	Morainal veneer is discontinuous over rock that is < 0.5 m thick and comprised typically of loamy lodgement till, minor ablation till, silt, sand, gravel, and rubble; the till is mainly stony with more than 35 % of clasts pebble-sized and larger; the sediments were deposited directly by Late Wisconsinan ice or with minor reworking by water
Pre-Quartenary rock	Rock of various lithologies and all ages; generally weathered and partially disintegrated, glacially moulded surfaces; few localities show glacially scoured and polished surfaces
Late Wisconsinan and / or Early Holocene blanket marine sediments	Marine sediments of sand, silt, gravel, and clay; deposited in shallow marine water, locally deep, which submerged coastal areas and sections of many valleys during and following Late Wisconsinan deglaciation; blankets and plains of sand, silt, some gravel and clay are generally 0.5 m to 3 m thick

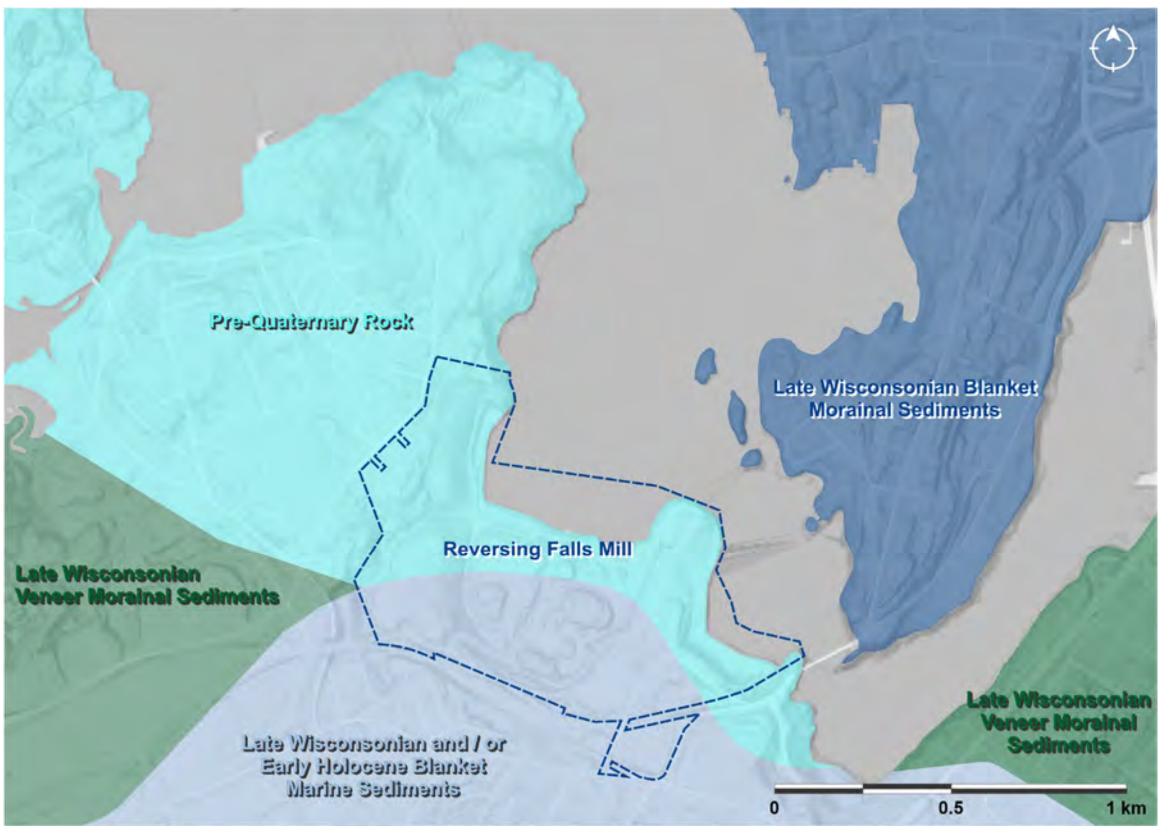


Figure 48. Surficial geology in the vicinity of the Reversing Falls Mill at the mouth of the Saint John River in Saint John, New Brunswick. See text for surficial geology descriptions.

3.1.7 Hydrogeology

Approximately 64 % of New Brunswick's population is reliant on groundwater for supplying domestic freshwater [*NRC*, 2005]. Individual water well owners in the province depend on small aquifers, typically composed of thin glacial sand and gravel deposits, to supply their potable water. Regional groundwater availability maps exist for most of Canada and are generalizations of large quantities of data collected for a region [*NRC*, 2005]. In Saint John, aquifers are typically able to supply a flow rate < 24 L · min^{-1} (Figure 49); however, localized groundwater availability can only be determined through onsite investigations.

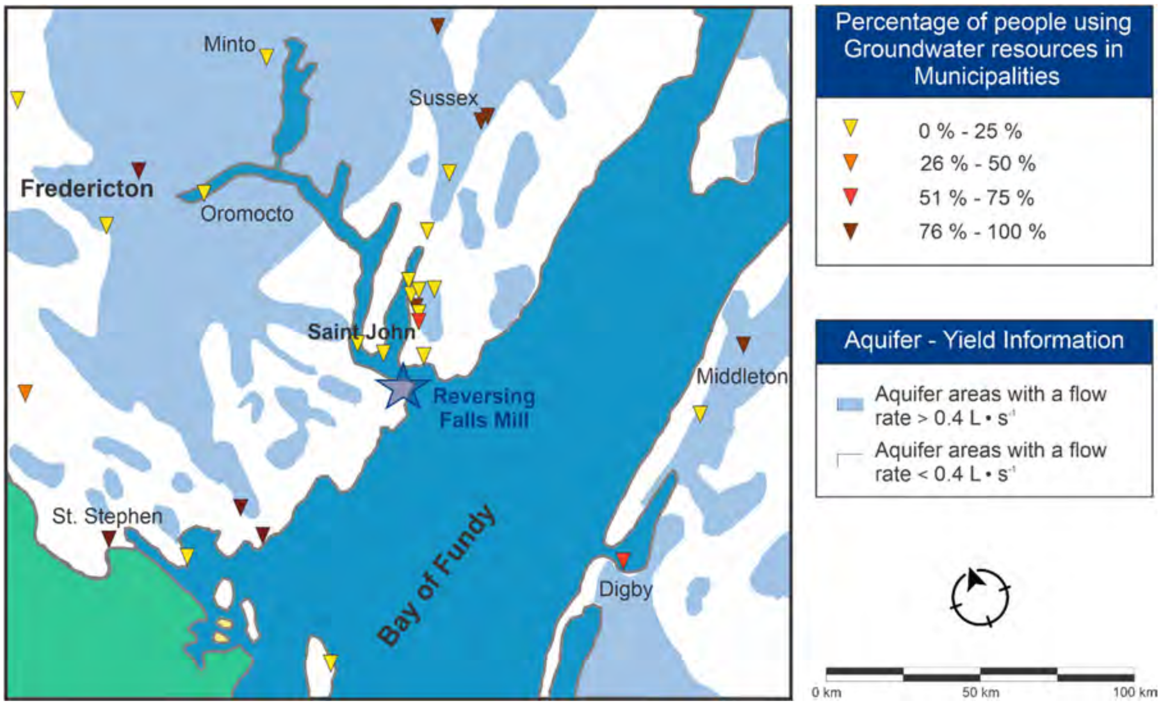


Figure 49. Groundwater availability map for Saint John, New Brunswick and the surrounding area.

Residential, commercial, and industrial properties in Milford and surrounding areas are mostly reliant on municipal water for supplying potable water and / or process water. Municipal water for residents in east Saint John is derived from the Loch Lomond reservoir, a surface water source. Municipal water for residents in west Saint John is derived either from the Loch Lomond reservoir or the South Bay Wellfield, a groundwater source. Untreated industrial water for east-side businesses is derived from Loch Lomond while those on the west-side is derived from the Spruce Lake Watershed, a surface water source.

A groundwater well records search was performed within a 1 km radius of the Mill site (*n.b.*, the NBDELG's database is not considered complete and there may be more private wells in the area). The records search yielded nine well logs (*n.b.*, not all well logs provide all data assessed below, which is the reason n varies). The general location of those wells is shown in Figure 50. All of the wells are installed in a confined aquifer and Table 13 and Figure 51 provides a summary of the data obtained from the NBDELG's groundwater well database. For the complete data set, please refer to Appendix V. Based on our review of properties, only one residence on Kingsville Road appears to obtain their potable groundwater from an onsite groundwater well. All other properties in the area appear to be connected to the municipal system.

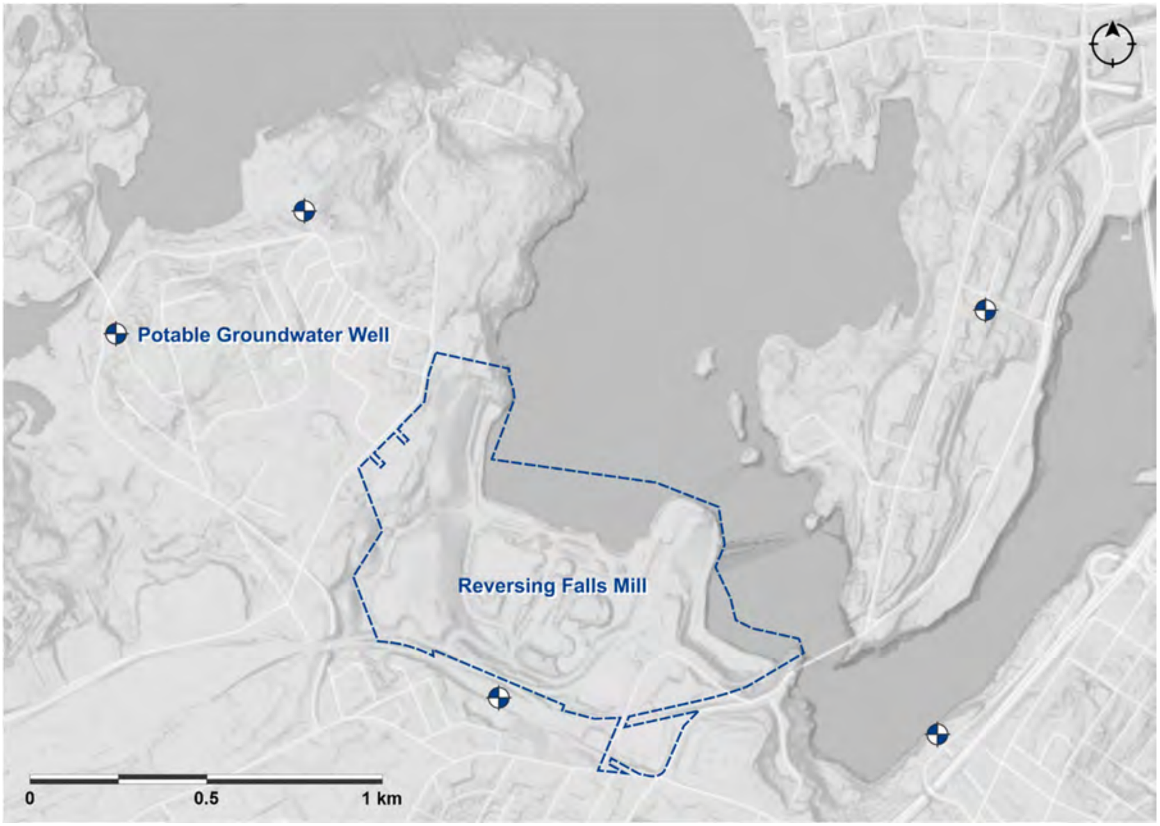


Figure 50. General location of the groundwater well records that were reviewed within 1 km radius of the Reversing Falls Mill at the mouth of the Saint John River in Saint John, New Brunswick.

Table 13. Summary of the groundwater well records within a 1 km radius of the Reversing Falls Mill at the mouth of the Saint John River in Saint John, New Brunswick.

Parameter*	*n*	Mean ± Std. Dev.	Min	Max
Well depth (m)	9	78.5 ± 34.52	36.9	121.9
Casing length (m)	9	38.6 ± 31.3	6.1	86.3
Bedrock depth (m)	7	25.0 ± 20.93	0.6	56.4
Safe yield (L · min^{-1})	9	277.6 ± 349.69	4.6	910.0
Static water level (m)	9	52.4 ± 52.12	0	121.9

Notes:
*As determined by the Water Well Driller(s) during installation

No water quality data were included in the NBDELG's groundwater well database.

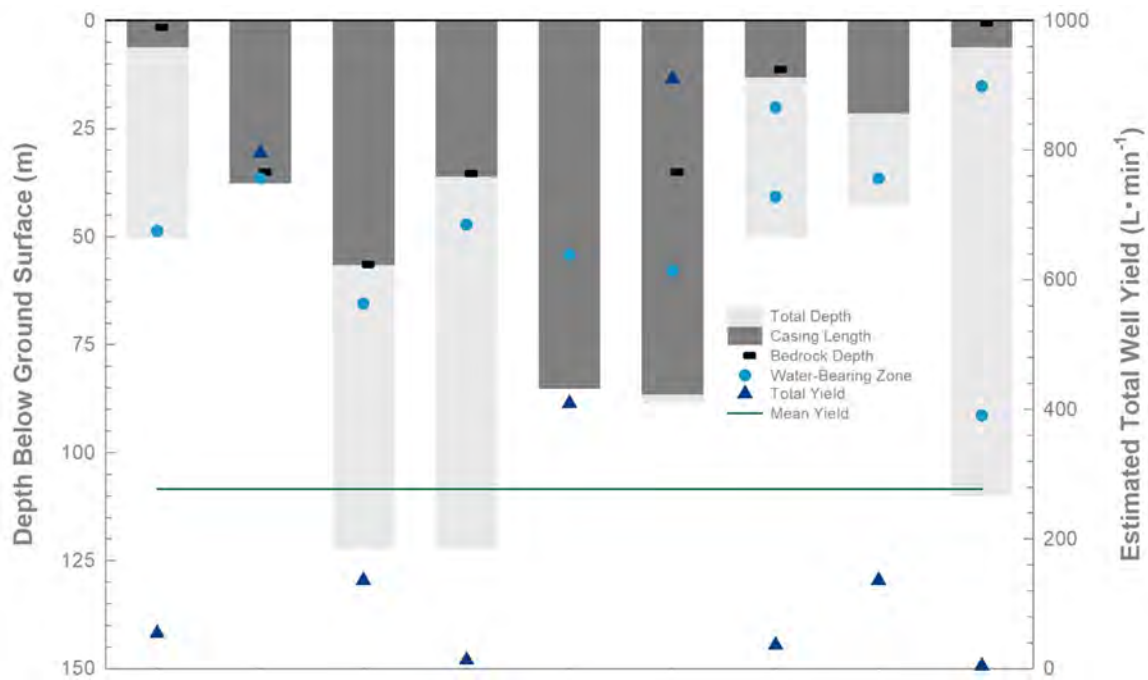


Figure 51. Compilation of the nine groundwater well records within 1 km radius of the Reversing Falls Mill at the mouth of the Saint John River in Saint John, New Brunswick.

3.1.8 Hydrography

The Mill exists at the mouth of the Saint John River. Locally, the confluence is known as Reversing Falls and is where the river runs through a narrow gorge and over a bedrock sill before entering Saint John Harbour [*Metcalfe et al.*, 1976]. The Bay of Fundy's semi-diurnal tides force the flow of water from the river to reverse for a short period of time when the tide is high. A series of underwater ledges create an intensely turbulent, jet-like flow through the narrow gorge and produces recirculating eddies upstream and downstream. The underwater bedrock sill / ledges can also pose a significant navigation hazard, so vessels typically wait until a slack high tide to go through the Reversing Falls.

A portion of the hydrographic chart for Saint John to Grand Bay in the vicinity of the Mill (*i.e.*, Union Point) is shown in Figure 52. Depths in the center of the channel for the portion shown range from as deep as 47 m off Lee Cove to as shallow as 3.7 m through the Reversing Falls. Figure 53 shows the bathymetry of the Saint John River extending from Pleasant Point upstream of the Mill to downstream just below the Harbour Bridge at the Navy Island Terminal in three dimensions.

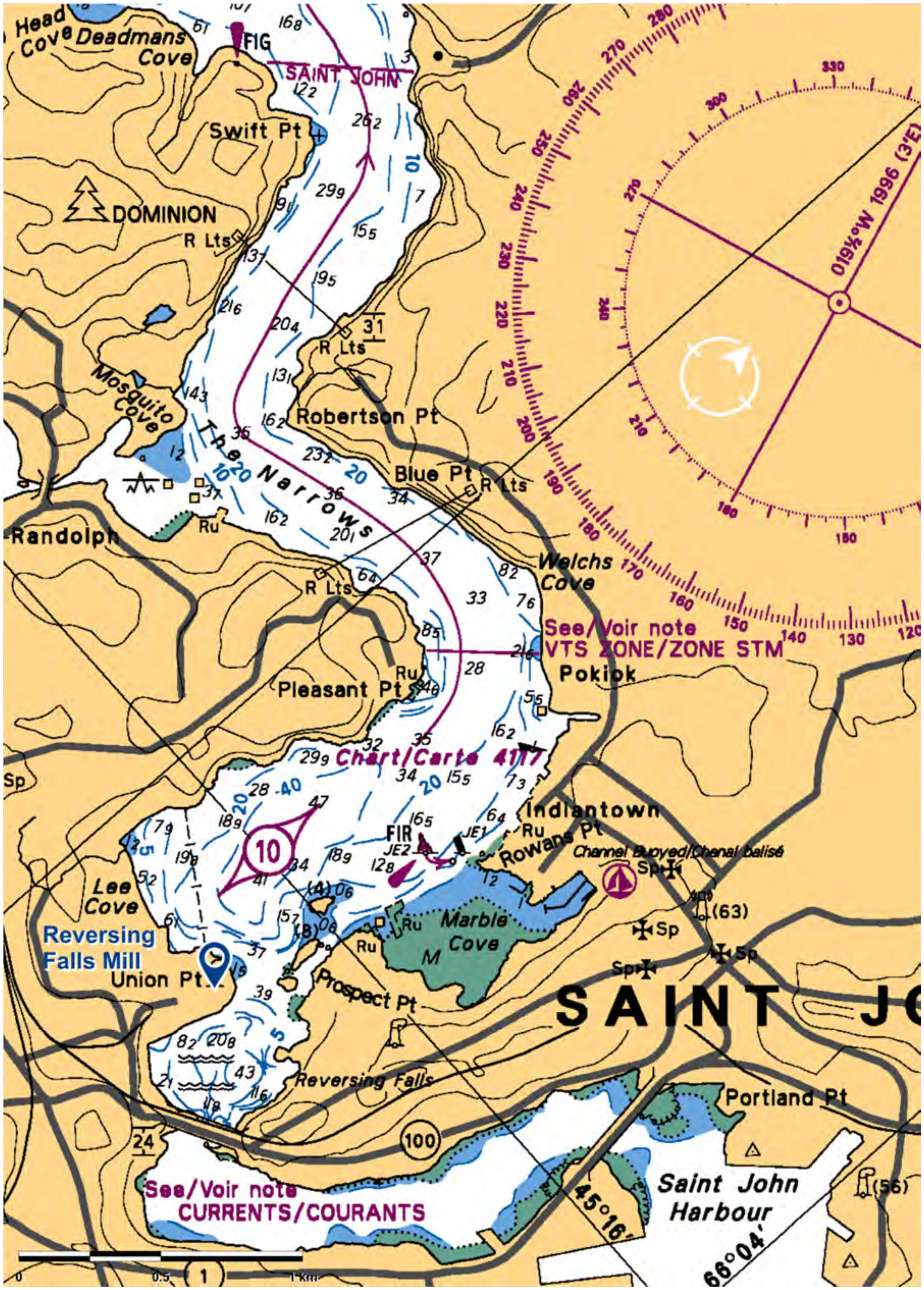


Figure 52. Portion of the Saint John to Grandy Bay, New Brunswick hydrographic chart 4141. Depths are in metres.

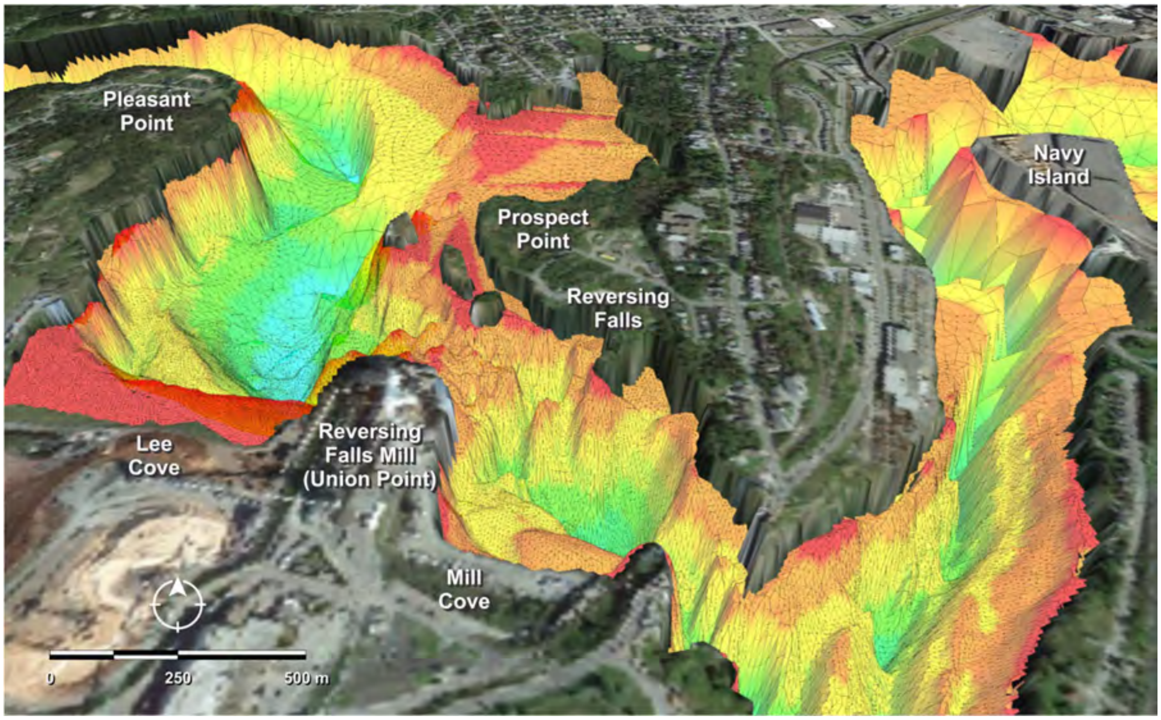


Figure 53. Bathymetry of the Saint John River in the vicinity of the Reversing Falls Mill in Saint John, New Brunswick. From *Fundy Engineering* [2022].

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 Federal Species At Risk

Federally listed species at risk that exist in New Brunswick and could potentially be impacted by the Project are noted in Table 14. Those terrestrial and aquatic species identified under the federal *Species At Risk Act* (f*SARA*) [**S.C. 2002, c. 29**] and by the Committee On the Status of Endangered Wildlife In Canada (COSEWIC) as being at risk in New Brunswick are listed. Listing of a species in Table 14 does not indicate that it is either present or absent at the Project site (*n.b.*, the purpose of listing the species is to identify what could be present and the sections below narrow the focus). Presence and absence information is provided in the sections below. The order of risk level under the f*SARA* and by the COSEWIC is as follows: special concern; threatened; endangered; extirpated; and extinct.

Table 14. Terrestrial and aquatic flora and fauna listed as being species at risk under the f*SARA* and by the COSEWIC that could potentially be affected by the proposed Project at the Reversing Falls Mill in Saint John, New Brunswick.

Common Name	Scientific Name	f*SARA* Status	COSEWIC Status
Vascular Plants, Mosses, and Lichens			
Black foam lichen	*Anzia colpodes*	Threatened	Threatened
Blue felt lichen	*Degelia plumbea*	Special concern	Special concern
Vole ears lichen	*Erioderma mollissimum*	Endangered	Endangered
Boreal felt lichen	*Eridoerma pedicellatum*	Endangered	Endangered

Common Name	Scientific Name	fSARA Status	COSEWIC Status
Prototype quillwort	*Isoetes prototypus*	Special concern	Special concern
Butternut	*Juglans cinerea*	Endangered	Endangered
Beach pinweed	*Lechea maritime*	Special concern	Special concern
Wrinkled shingle lichen	*Pannaria lurida*	Threatened	Threatened
Furbish's lousewort	*Pedicularis furishiae*	Endangered	Endangered
Eastern waterfan	*Peltigera hydrothyria*	Threatened	Threatened
Anticosti aster	*Symphyotrichum anticostense*	Special Concern	Special concern
Gulf of St. Lawrence aster	*Symphyotrichum laurentianum*	Threatened	Threatened
Molluscs			
Dwarf wedgemussel	*Alasmidonta heterodon*	Extirpated	Extirpated
Brook floater	*Alasmidonta varicosa*	Special concern	Special concern
Yellow lampmussel	*Lampsilis cariosa*	Special concern	Special concern
Reptiles			
Snapping turtle	*Chelydra serpentina*	Special concern	Special concern
Eastern painted turtle	*Chrysemys picta*	Special concern	Special concern
Wood turtle	*Glyptemys insculpta*	Threatened	Threatened
Birds			
Eastern whip-poor-will	*Antrostomus vociferus*	Threatened	Threatened
Short-eared owl	*Asio flammeus*	Special concern	Threatened
Barrow's goldeneye	*Bucephala islandica*	Special concern	Special concern
Red knot *rufa* subspecies	*Calidris canutus rufa*	Endangered	Endangered
Canada warbler	*Cardellina canadensis*	Threatened	Special concern
Bicknell's thrush	*Catharus bicknelli*	Threatened	Threatened
Chimney swift	*Chaetura pelagica*	Threatened	Threatened
Piping plover *melodus* subspecies	*Charadrius melodus melodus*	Endangered	Endangered
Common nighthawk	*Chordeiles minor*	Threatened	Special concern
Evening grosbeak	*Coccothraustes vespertinus*	Special concern	Special concern
Olive-sided flycatcher	*Contopus cooperi*	Threatened	Special concern
Eastern wood-pewee	*Contopus virens*	Special concern	Special concern
Yellow rail	*Coturnicops noveboracensis*	Special concern	Special concern
Bobolink	*Dolichonyx oryzivorus*	Threatened	Special concern
Rusty blackbird	*Euphagus carolinus*	Special concern	Special concern
Barn swallow	*Hirundo rustica*	Threatened	Special concern
Harlequin duck	*Histrionicus histrionicus*	Special concern	Special concern
Wood thrush	*Hylocichla mustelina*	Threatened	Threatened
Least bittern	*Ixobrychus exilis*	Threatened	Threatened
Eskimo curlew	*Numenius borealis*	Endangered	Endangered
Red-necked phalarope	*Phalaropus lobatus*	Special concern	Special concern
Bank swallow	*Riparia riparia*	Threatened	Threatened
Roseate tern	*Sterna dougallii*	Endangered	Endangered
Eastern meadowlark	*Sturnella magna*	Threatened	Threatened

Common Name	Scientific Name	f*SARA* Status	COSEWIC Status
Arthropods			
Bohemian cuckoo bumble bee	*Bombus bohemicus*	Endangered	Endangered
Yellow-banded bumble bee	*Bombus terricola*	Special concern	Special concern
Cobblestone tiger beetle	*Cicindela marginipennis*	Endangered	Special concern
Transverse lady beetle	*Coccinella transversoguttata*	Special Concern	Special concern
Maritime ringlet	*Coenonympha nipisiquit*	Endangered	Endangered
Monarch butterfly	*Danaus plexippus*	Special concern	Endangered
Skillet clubtail	*Gomphus ventricosus*	Endangered	Special concern
Pygmy snaketail	*Ophiogomphus howei*	Special concern	Special concern
Fishes			
Shortnose sturgeon	*Acipenser brevirostrum*	Special concern	Special concern
White shark	*Carcharodon carcharias*	Endangered	Endangered
Rainbow smelt (Lake Utopia)	*Osmerus mordax*	Endangered	Endangered
Harbour porpoise	*Phocoena phocoena*	Special concern	Special concern
Atlantic salmon (IBOF pop.)	*Salmo salar*	Endangered	Endangered
Terrestrial Mammals			
Little brown bat	*Myotis lucifugus*	Endangered	Endangered
Northern bat	*Myotis septentrionalis*	Endangered	Endangered
Tri-colored bat	*Perimyotis subflavus*	Endangered	Endangered

The Atlantic Canada Conservation Data Centre (ACCDC) databases were queried for known observation data of federally protected species within a 5 km radius of the Project site (*i.e.*, refer to Appendix VI). According to the ACCDC data, 21 species listed under the f*SARA* and by the COSEWIC have been observed (Figure 54).

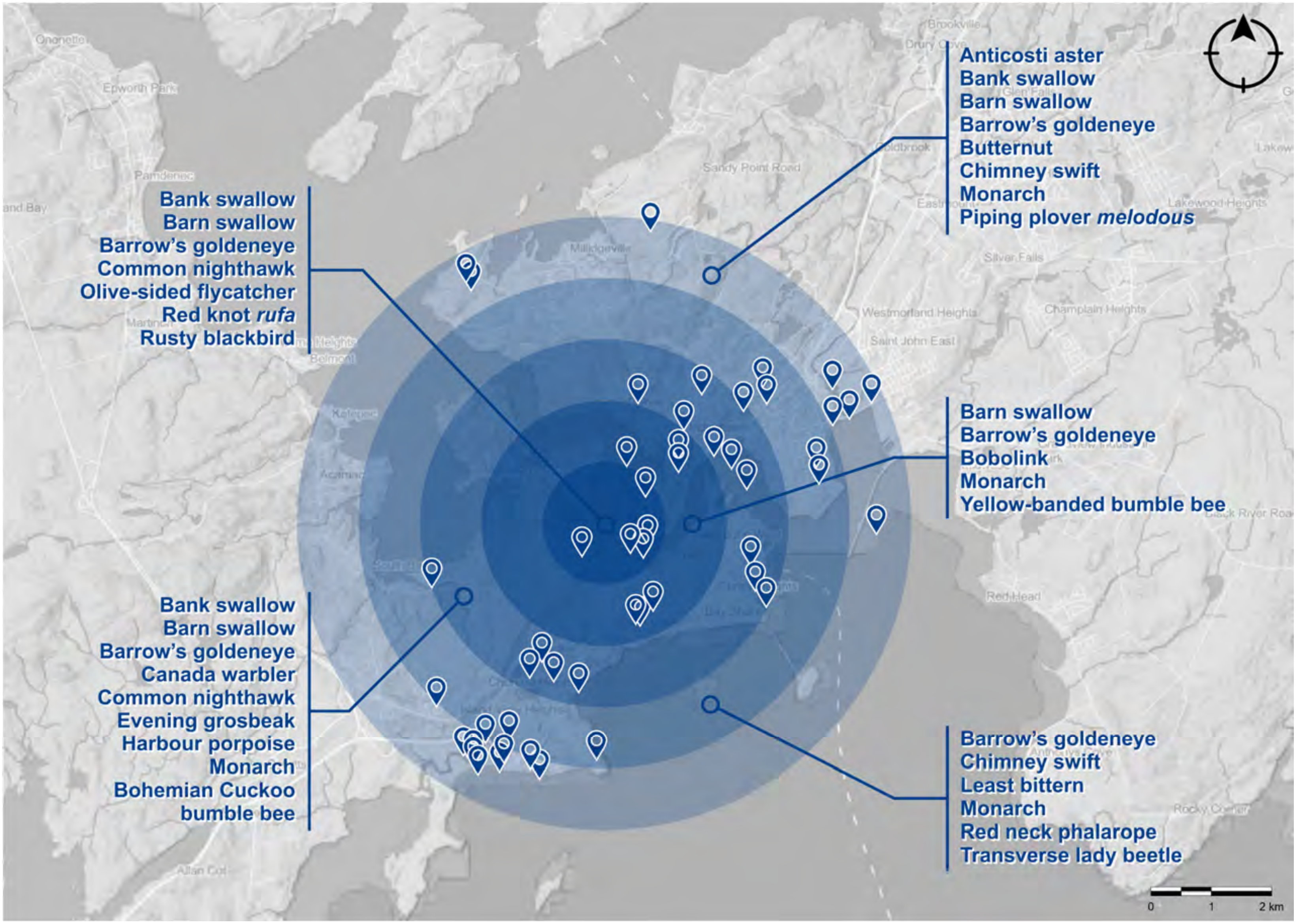


Figure 54. Map showing the recorded observations of species listed under the f*SARA* and by the COSEWIC within a 5 km radius of the Reversing Falls Mill in Saint John, New Brunswick. Data obtained from the ACCDC.

3.2.1.1 Snapshots of Federal Species At Risk Locally Present

Detailed information provided below on the protected species was obtained from the species profiles on the f*SARA* [*SARA*, 2023] and COSWEIC [*COSEWIC*, 2023] websites.

The Anticosti aster (Figure 55), which is ranked as a species of special concern under the f*SARA* and by the COSEWIC (Table 14), is a 10 cm to 75 cm tall, herbaceous plant that spreads by long rhizomes to form loose clonal colonies. It originated by hybridization of the New York aster (*Symphyotrichum novi-belgii*) and the rush aster (*Symphyotrichum boreale*). The plants have long-stalked flower heads composed of purple ray (*i.e.*, petal-like) florets and yellow disk florets. Its leaves are stiff, narrow, and somewhat leathery in texture, often arched, and have smooth or minutely toothed margins. It is a ranked species because it is a rare regional endemic species of postglacial origin that grows in association with many other plant species of conservation concern within regionally significant calcareous river shore communities.

The bank swallow (Figure 55) is a small (*i.e.*, 12 cm to 14 cm long with a 25 cm to 29 cm wingspan) slender insectivorous songbird that is highly social at all times of the year and is conspicuous at colonial breeding sites. At those sites, it excavates nesting burrows about 75 cm long in eroding vertical banks, such as riverbanks, lake and ocean bluffs, aggregate pits, road cuts, and stockpiles of soil, using its conical bill, feet, and wings. It is ranked as threatened under the f*SARA* and by the COSEWIC (Table 14) because of the severe long-term population decline over the last 40 years resulting primarily from the loss of breeding and foraging habitat. The bank swallow has a white underbelly and is brown on top. It has a dark band across the chest that extends down the middle of the chest. It can be distinguished in flight from other swallows by its quick, erratic wing beats and its almost constant buzzy, chattering vocalizations.

The barn swallow (Figure 55) is the most widespread swallow species in the world. The population of over 190 million individuals globally is considered stable. Because there have been considerable declines in the presence for the past several decades, the barn swallow is listed as threatened under the f*SARA* and as a species of special concern by the COSEWIC (Table 14). It is a distinctive passerine that has blue upperparts, a long, deeply forked tail that is curved, and pointed wings. This 17 cm to 19 cm long bird is commonly found in open areas with low vegetation, such as pasture, meadows, and farmland. They build a cup nest from mud pellets in barns or other similar structures and feed on insects caught while in flight.

Barrow's goldeneye (Figure 55) is ranked as a species of special concern under the f*SARA* and by the COSEWIC (Table 14). It is a medium-sized monogamous diving duck that breeds and winters primarily in Canada. About 400 of these birds over-winter in Atlantic Canada. They breed in tree cavities and rock crevices and their nests are usually placed within 1 km to 2 km from water and between 2 m and 15 m above the ground. During the breeding season it feeds on aquatic insects and crustaceans of inland waters. During winter, they are partial to coastal waters where they feed on molluscs and crustaceans.

Under f*SARA* the bobolink (Figure 55) is considered a threatened species and is a species of special concern by the COSEWIC (Table 14). The bobolink is a medium sized passerine bird that averages 18 cm long with a conical bill, a wingspan of about 29 cm, rigid sharply pointed tail feathers, long hind toenails, and weighs approximately 40 g.

Males have black bellies with lighter backs, while the females are light beige with brown streaks. They are ground nesters. Since the mid-1900s, bobolinks have experienced an average annual decline of 3.8 %. The loss of these birds is primarily caused by changes in land-use, but it is suspected that some decline is attributed to winter kill.

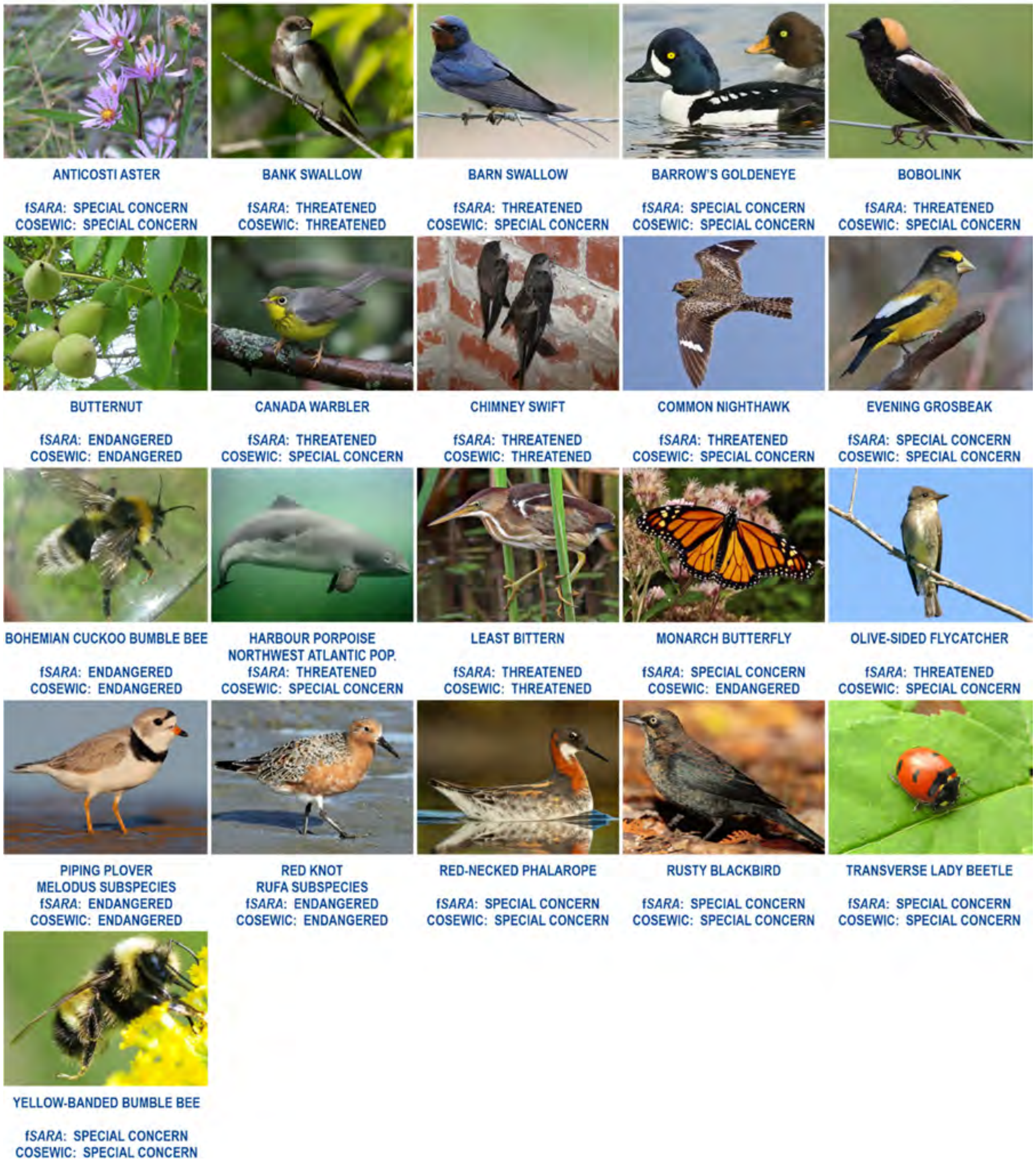


Figure 55. Photographs of species listed under the f*SARA* and by the COSEWIC that have been observed within a 5 km radius of the Reversing Falls Mill in Saint John, New Brunswick.

The butternut is a small to medium-sized tree with a broad and irregularly shaped crown that is rarely more than 30 m tall and 90 cm in diameter (Figure 55). This tree is mainly encountered as a minor component of deciduous stands, but large pure populations do exist on certain floodplains. It grows best in rich, fertile, moist, and well-drained soils often found along streams. The most prominent threat to butternut trees is the butternut canker, a lethal fungal pathogen. Other threats include wood harvesting, forest conversion, hybridization with Japanese Walnut, and low genetic diversity. In New Brunswick, it is estimated that there are only between 7 000 and 17 000 individuals. This has prompted the Butternut to be ranked as endangered under the f*SARA* and by the COSEWIC (Table 14).

The Canada warbler (Figure 55) is a small passerine songbird (*i.e.*, 12 cm to 15 cm long), with black stripes that form around the collar. The males are more brightly coloured than the females and have blue-grey upperparts with yellow throats and breasts. The Canada warbler has a wide range of habitat that includes moist mixed forest, riparian shrub forest, regenerating stands, and in old growth forests with open canopies. There is no explicit reason for the decline in the species population, but loss of primary forest is likely a significant factor. The drastic population decline has led to the Canada Warbler being listed as a species of special concern by the COSEWIC and a threatened species under the f*SARA* (Table 14).

The chimney swift is a medium-sized (*i.e.*, 12 cm to 15 cm), sooty gray bird with very long, slender wings and very short legs. There are no subspecies of the chimney swift, but like all swifts, it is incapable of perching and can only cling vertically to surfaces (Figure 55). They build nests of twigs stuck together with saliva, in chimneys and other vertical surfaces in dim, enclosed areas including air vents, wells, hollow trees, and caves. They forage overall urban and suburban areas, rivers, lakes, forest, and fields in search of flying insects. Although the global chimney swift population is relatively healthy, they have been impacted in Atlantic Canada due to severe storm events and the reduction in nesting habitat (*i.e.*, chimneys are not as prevalent as they once were). This has caused them to be listed as threatened under the f*SARA* and by the COSEWIC (Table 14).

The common nighthawk (Figure 55), a medium-sized bird with long, narrow, pointed wings and a slightly notched long tail, is ranked as a species of special concern under the COSEWIC and as a threatened species under the f*SARA* (Table 14). While in flight, their distinguishing feature is a wide white stripe across the long feathers at the edge of their wings. They nest in a wide variety of open, vegetation-free habitats, including dunes, beaches, recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and riverbanks. They are also known to inhabit mixed and coniferous forests. Causes of population decline are unknown, but it may be partly attributed to the decline of their main food source (*i.e.*, insects).

Evening grosbeak (Figure 55) populations have been fluctuating since the 1970s (*i.e.*, 77 % to 90 % decline) and this is likely because of a few different reasons. These songbirds are often found in flocks across Canada's forests where they forage in treetops for insect larvae, such as the spruce budworm (*Choristoneura fumiferana*). Variation in spruce budworm populations that occur every 25 years to 40 years, window strikes, loss of mature and old-growth forests, and roads salts are all key factors that have led to a decline in the species' population. This large finch is stocky and boldly coloured with a greenish-yellow bill. Male evening grosbeaks have a brown head with a yellow supercilium and a black tail and wings. Females are typically greyish brown with some yellow along the nape and flanks. Their wings and tail are often white. The evening grosbeak is a species of special concern under f*SARA* and by the COSEWIC (Table 14).

The Bohemian cuckoo (Figure 55) is a medium-sized bumble bee (*i.e.*, 12 mm to 18 mm long) that is ranked as endangered under the f*SARA* and by the COSEWIC (Table 14). It has a white-tipped abdomen. Unlike most bumble bees, this bee lacks pollen baskets on their hind legs. This is because they do not bring pollen back to their colony. They also do not produce workers as they are parasite bees and take over existing colonies of other bumble bees. They occur in a diversity of habitats such as open meadows, urban areas, and woodlands. The decline in their host species on which they depend, the use of pesticides, habitat loss, climate change, and pathogens introduced from managed bee colonies are the primary reasons for their sharp decline and the reason they are ranked as endangered.

The harbour porpoise (Figure 55) is one of the smallest and shortest-lived whales; they generally do not exceed 1.7 m long a weight of 65 kg or more than 20 years. These mottled greyish-white porpoises are widely distributed over the continental shelves of the temperature northern hemisphere. Estimates peg the population of harbour porpoises in eastern Canada to be about 50 000. These relatively shy and solitary animals do not respond well to intensive human activities in coastal waters. The primary threat to the harbour porpoise in eastern Canada is bycatch in bottom-set gill nets used by groundfishers. Other threats include habitat degradation, loss of habitat, and environmental contamination. The harbour porpoise is listed as a threatened species under the f*SARA* and as a species of special concern by the COSEWIC (Table 14).

The least bittern (Figure 55) is the smallest heron in the Western Hemisphere (*i.e.*, only 30 cm in length). The bird has a dark crown and back, buff wing patches, and broad buff streaks on its white underside. This shy bird is hard to find and is often only detected by its cuckoo-like call. The species prefers to nest near pools of open, large marshes dominated by dense tall aquatic vegetation (*i.e.*, cattails) interspersed with clumps of woody vegetation. Habitat loss and degradation is the leading threat to the least bittern. Species numbers appear stable globally, but in Canada they are continuing to decline (*n.b.*, the Canadian population is estimated at 1 000 pair). It is difficult to assess the rate at which this species is decreasing because the bird is so hard to find. The least bittern is considered a threatened species under the f*SARA* and by the COSEWIC (Table 14).

The monarch butterfly is considered a species of special concern under the f*SARA* and as an endangered species by the COSEWIC (Table 14). The caterpillars are striped, yellow, black, and white, the chrysalis is gold-green, and the butterfly is bright orange with heavy black veins (Figure 55). The eastern population, found throughout Atlantic Canada, is the largest of the populations (*i.e.*, outnumbering the western and central groups). The population is estimated in the tens of millions; however, the population can have drastic ups and downs each year depending on the climate. This species tends to be present wherever milkweed (*Asclepius sp.*) and wildflowers, such as goldenrod (*Solidago sp*.), asters (*Aster sp*.), and purple loosestrife (*Lythrum salicaria*), exist. Populations are currently in decline due to the loss of milkweed, their primary food source.

The olive-sided flycatcher (Figure 55) is a small (*i.e.*, 18 cm to 20 cm long), but stout songbird ranked as a threatened species under the f*SARA* and as a species of special concern by the COSEWIC (Table 14). The songbird has a deep-olive brown back with white on its throat, breast, center belly, under tails, and white tufts are observed on the wings and each side of the rump. The wings are also dark with pale bars. The olive-sided flycatcher prefers areas along the edges of coniferous or mixed forests with tall trees or snags for perching, alongside open areas, or in burned forest with standing trees. One of the biggest threats to the olive-sided flycatcher is habitat loss, largely due to human disturbance. Additionally, the decline in insect populations during the breeding period has been another factor leading to population loss.

Endangered species is the rank given to the piping plover *melodus* subspecies (Figure 55) under the f*SARA* and by the COSEWIC (Table 14). It is a small shorebird that is known to breed along the shores of New Brunswick. They nest above the normal high-water mark on exposed sand or gravel beaches. Their nests are most often associated with small cobble and other small beach debris on ocean beaches, sand spits, and barrier beaches. They arrive on the breeding grounds in late April or early May. In 2001, there were 230 pairs and 43 individuals in the Atlantic region. Predation on eggs and chicks, human disturbance, and habitat loss and degradation are significant to the loss in the *melodus* subspecies populations. Climate change will also become a threat as more severe storms and rising sea levels are expected to reduce quality habitat.

The red knot (Figure 55) is a medium-sized shorebird (*i.e.*, 25 cm long) that looks like a sandpiper. The red knot *rufa* subspecies has a long straight bill, small head, with long tapered wings, and long legs. Feathers on the face, neck, breast and much of the underparts are a rufous chestnut red. Feathers on the upper part of the body are dark brown or black with rufous and grey. It has a significant migration route that extends from the Canadian Arctic to the southern tip of South America. One of the most important areas for these migrants is the north shore of the St. Lawrence. Over the past 15 years, the *rufa* subspecies has experienced a 70 % decline. The most common threat to the species is the depletion of horseshoe crab eggs in Delaware Bay due to overfishing, which is a critical food source the subspecies needs during their final push into the Canadian Arctic. Other threats to the species also include habitat loss and degradation. The red knot *rufa* subspecies is listed as endangered by the COSEWIC and under the f*SARA* (Table 14).

The red-necked phalarope (Figure 55) is a small shorebird easily recognized by its red-orange-coloured feathers along the sides and base of its neck. The rest of its feathers are blueish grey and white. During migration and during the winter months, the shorebird concentrates on sea areas where their prey is forced to the surface of the water. There is still not a lot known about the decline of the species, but there are various factors thought to be contributing factors. Changing climate, the build-up of contaminants in arctic environments, increased industrial activities, and loss of vegetation from increasing snow goose populations all have negative impacts on this phalarope species. Currently, the red-necked phalarope is listed as a species of special concern under f*SARA* and by the COSEWIC (Table 14).

Under the *fSARA* and by the COSEWIC, the rusty blackbird (Figure 55) is considered a species of special concern (Table 14). It is a medium-sized passerine, with a tail that is as long as its wings. *Euphagus carolinus* has pale yellow eyes and a slightly curved black bill. During the breeding the season, the male sports black feathers with a green gloss on its body, and a violet gloss on its head. Meanwhile, the female is simply brownish grey. During the winter however, both sexes are a rusty colour. The rusty blackbird prefers to inhabit areas such as forest wetlands, that have slow-moving streams, peat bogs, sedge meadows, marshes, swamps, beaver ponds, and pasture edges. In Canada, the rusty blackbird occurs in all provinces and territories, and is believed to have declined by approximately 85 % since the mid-1960s due to habitat alteration.

The transverse lady beetle (Figure 55) is a small, round beetle (*i.e.*, 5 mm to 7.8 mm long) that is native to North America. Adults have orange to red wing coverings with black markings, consisting of a black band and four elongate spots, which distinguish them from other species. This species was once one of the more common and widespread lady beetles in North America, playing an important role as a biological control agent of aphids and other insect pests. They are habitat generalists and occupy a wide ecological niche across a wide variety of habitats and temperature regimes. They are very mobile, display low site fidelity, and readily engage in short and long (*i.e.*, up to 120 km) distance dispersal. No specific range-wide causes of their decline are currently known, but possible threats include negative interactions with non-native lady beetle species. The f*SARA* and COSWEIC rank the Transverse Lady Beetle as a species of special concern (Table 14).

The yellow-banded bumble bee (Figure 55) is medium-sized (*i.e.*, 12 mm to 18 mm long) with a distinct yellow and black abdominal band pattern found on its queens, males, and workers. It has a short tongue relative to other bumble bee species and will compete with other bees for food, pollen, and nectar. It is also known to nectar-rob by reaching through holes bitten in the base of flowers. This species is a habitat generalist and can use a variety of nectaring plants and environmental conditions. It generally nests underground in abandoned rodent burrows or decomposing logs. Their decline is suspected to be from a combination of factors including the introduction of pathogens from managed bee colonies, pesticide use, climate change, and habitat loss. The yellow-banded bumble bee is ranked as a species of special concern under the f*SARA* and by the COSEWIC (Table 14).

3.2.1.2 Snapshots of Bats

Although the ACCDC reports did not yield any bat observations, little brown bats, northern myotis, and tri-colored bats (*i.e.*, Figure 56) are anecdotally known to have been seen in the Saint John area. All three are small-bodied bats typical of the plain-nosed bats.

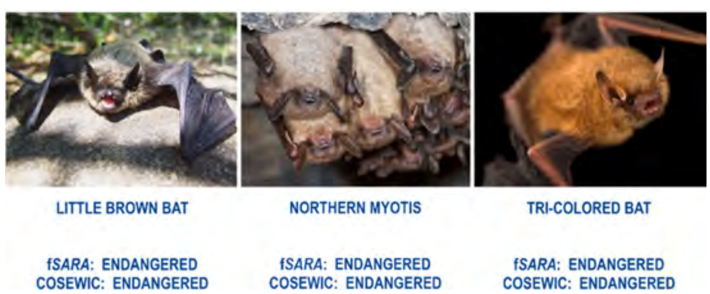


Figure 56. Photographs of three bat species listed under the f*SARA* and by the COSEWIC as being endangered and are anecdotally known to have been observed within a 5 km radius of the Reversing Falls Mill in Saint John, New Brunswick.

These insectivores live in three different roosting sites: day roosts; night roosts; and hibernation roosts. Hibernation roosting populations have been decimated in recent years. It is estimated that about 6.5 million bats of several species, but primarily the little brown bat, have died in eastern Canada and the northeastern US because of white-nose syndrome (*i.e.*, *Pseudogymnoascus destructans*). Populations in some hibernacula have fallen by more than 75 %. Species modelling has shown that this species could be extirpated by 2030 if declines continue. Their precipitous declines have resulted in their ranking under the f*SARA* as endangered. Unaffected, these bats often live well beyond 10 years of age.

These bats generally range from 6 cm to 10 cm long, weigh less than 10 g, and have an average wingspan under 30 cm. The little brown bats' distinguishing feature is a short and blunt tragus (*i.e.*, the inner side of the external ear). The northern myotis has a long, slender, and pointed tragus and ears that extend beyond the nose when pressed forward. The tri-colored bat is distinguished by their distinctive tri-colored hairs.

3.2.2 Provincial Species At Risk

Provincially listed species at risk that exist in New Brunswick and could potentially be impacted by the Project are noted in Table 15. Those terrestrial and aquatic species identified under the provincial *Species At Risk Act* (p*SARA*) [**R.S.N.B. 2012, c 6**] as being at risk in New Brunswick are listed. Listing of a species in Table 15 does not indicate that it is either present or absent at the Project site. Presence and absence information is provided in the sections that follow. The order of risk level under the p*SARA* is as follows: special concern; threatened; endangered; and extirpated.

Table 15. Terrestrial and aquatic flora and fauna listed as being at risk in New Brunswick under the p*SARA*.

Common Name	Scientific Name	p*SARA* Status
Vascular Plants, Mosses, and Lichens		
Blue felt lichen	*Degelia plumbea*	Special concern
Parker's pipewort	*Eriocaulon parkeri*	Endangered
Vole ears lichen	*Erioderma mollissimum*	Endangered
Boreal felt lichen Atlantic population	*Erioderma pedicellatta*	Endangered
Prototype quillwort	*Isoetes prototypus*	Endangered
Butternut	*Juglans cinerea*	Endangered
Beach pinweed	*Lechea maritima*	Endangered
Southern twayblade	*Listera australis*	Endangered
Wrinkled shingle lichen	*Pannaria lurida*	Endangered
Furbish's lousewort	*Pedicularis furbishiae*	Endangered
Van Brunt's Jacob's-ladder	*Polemonium vanbruntiae*	Threatened
Pinedrops	*Pterospora andromedea*	Endangered
Anticosti aster	*Symphyotrichum anticostense*	Endangered
Gulf of St. Lawrence aster	*Symphyotrichum laurentianum*	Endangered
Molluscs		
Dwarf wedgemussel	*Alasmidonta heterodon*	Extirpated
Brook floater	*Alasmidonta varicosa*	Special concern
Yellow lampmussel	*Lampsilis cariosa*	Special concern
Reptiles		
Loggerhead sea turtle	*Caretta caretta*	Endangered
Snapping turtle	*Chelydra serpentina*	Special concern
Leatherback sea turtle Atlantic population	*Dermochelys coriacea*	Endangered

Common Name	Scientific Name	p*SARA* Status
Wood turtle	*Glyptemys insculpta*	Threatened
Birds		
Short-eared owl	*Asio flammeus*	Special concern
Barrow's goldeneye Eastern population	*Bucephala islandica*	Special concern
Red knot *rufa* subspecies	*Calidris canutus rufa*	Endangered
Whip-poor-will	*Caprimulgus vociferus*	Threatened
Bicknell's thrush	*Catharus bicknelli*	Threatened
Chimney swift	*Chaetura pelagica*	Threatened
Piping plover *melodus subspecies*	*Charadrius melodus melodus*	Endangered
Common nighthawk	*Chordeiles minor*	Threatened
Olive-sided flycatcher	*Contopus cooperi*	Endangered
Eastern wood-pewee	*Contopus virens*	Special concern
Yellow rail	*Coturnicops noveboracensis*	Special concern
Bobolink	*Dolichonyx oryzivorus*	Threatened
Rusty blackbird	*Euphagus carolinus*	Special concern
Peregrine falcon *anatum / tundrius*	*Falco peregrinus anatum / tundrius*	Endangered
Bald eagle	*Haliaeetus leucocephalus*	Endangered
Barn swallow	*Hirundo rustica*	Threatened
Harlequin duck Eastern population	*Histrionicus histrionicus*	Endangered
Wood thrush	*Hylocichla mustelina*	Threatened
Least bittern	*Ixobrychus exilis*	Threatened
Eskimo curlew	*Numenius borealis*	Endangered
Horned grebe Western population	*Podiceps auritus*	Special concern
Bank swallow	*Riparia riparia*	Endangered
Roseate tern	*Sterna dougallii*	Endangered
Eastern meadowlark	*Sturnella magna*	Threatened
Canada warbler	*Wilsonia canadensis*	Threatened
Arthropods		
Bohemian cuckoo bumble bee	*Bombus bohemicus*	Endangered
Cobblestone tiger beetle	*Cicindela marginipennis*	Endangered
Transverse lady beetle	*Coccinella transversoguttata*	Endangered
Maritime ringlet	*Coenonympha nipisiquit*	Endangered
Monarch	*Danaus plexippus*	Endangered
Skillet clubtail	*Gomphus ventricosus*	Endangered
Pygmy snaketail	*Omphiogomphus howei*	Special concern
Fishes		
Shortnose sturgeon	*Acipenser brevirostrum*	Special concern
Atlantic sturgeon Maritimes populations	*Acipenser oxyrinchus*	Threatened
Thorny skate	*Amblyraja radiata*	Special concern
Atlantic wolffish	*Anarhichas lupus*	Special concern
American eel	*Anguilla rostrata*	Threatened

Common Name	Scientific Name	p*SARA* Status
Cusk	*Brosme brosme*	Endangered
White shark Atlantic population	*Carcharodon carcharias*	Endangered
Atlantic cod Laurentian south population	*Gadus morhua*	Endangered
Atlantic cod southern population	*Gadus morhua*	Endangered
American plaice Maritime population	*Hippoglossoides platessoides*	Threatened
Mako shortfin Atlantic population	*Isurus oxyrinchus*	Threatened
Porbeagle	*Lamna nasus*	Endangered
Winter skate southern Gulf of St. Lawrence population	*Leucoraja ocellata*	Endangered
Winter skate Georges Bank-Western Scotian Shelf-pop.	*Leucoraja ocellata*	Special concern
Smooth skate Laurentian-Scotian population	*Malacoraja senta*	Special concern
Striped bass Bay of Fundy population	*Morone saxitilis*	Endangered
Striped bass southern Gulf of St. Lawrence population	*Morone saxitilis*	Special concern
Rainbow smelt Lake Utopia large-bodied population	*Osmerus mordax*	Threatened
Rainbow smelt Lake Utopia small-bodied population	*Osmerus mordax*	Threatened
Blue shark Atlantic population	*Prionace glauca*	Special concern
Atlantic salmon Inner Bay of Fundy population	*Salmo salar*	Endangered
Atlantic salmon Outer Bay of Fundy population	*Salmo salar*	Endangered
Atlantic salmon Gaspe-S. Gulf of St. Lawrence pop.	*Salmo salar*	Special concern
Acadian redfish Atlantic population	*Sebastes fasciatus*	Threatened
Spiny dogfish Atlantic population	*Squalus acanthias*	Special concern
Atlantic bluefin tuna	*Thunnus thynnus*	Endangered
Mammals		
Blue whale - Atlantic population	*Balaenoptera musculus*	Endangered
Fin whale Atlantic population	*Balaenoptera physalus*	Special concern
Eastern gray wolf	*Canis lupus*	Extirpated
North Atlantic right whale	*Eubalaena glacialis*	Endangered
Wolverine	*Gulo gulo*	Extirpated
Canada lynx	*Lynx canadensis*	Endangered
Little brown *Myotis*	*Myotis lucifugus*	Endangered
Northern *Myotis*	*Myotis septentrionalis*	Endangered
Atlantic walrus	*Odobenus rosmarus rosmarus*	Extirpated
Tri-colored bat	*Perimyotis subflavus*	Endangered
Harbour porpoise Northwest Atlantic population	*Phocoena phocoena*	Special concern
Woodland caribou – Atlantic (Gaspesie) population	*Rangifer tarandus caribou*	Extirpated

The ACCDC databases were queried for known observation data of provincially protected species within a 5 km radius of the Project site (*i.e.*, refer to Appendix VI). According to the ACCDC data, 20 species listed under the p*SARA* have been observed (Figure 57).

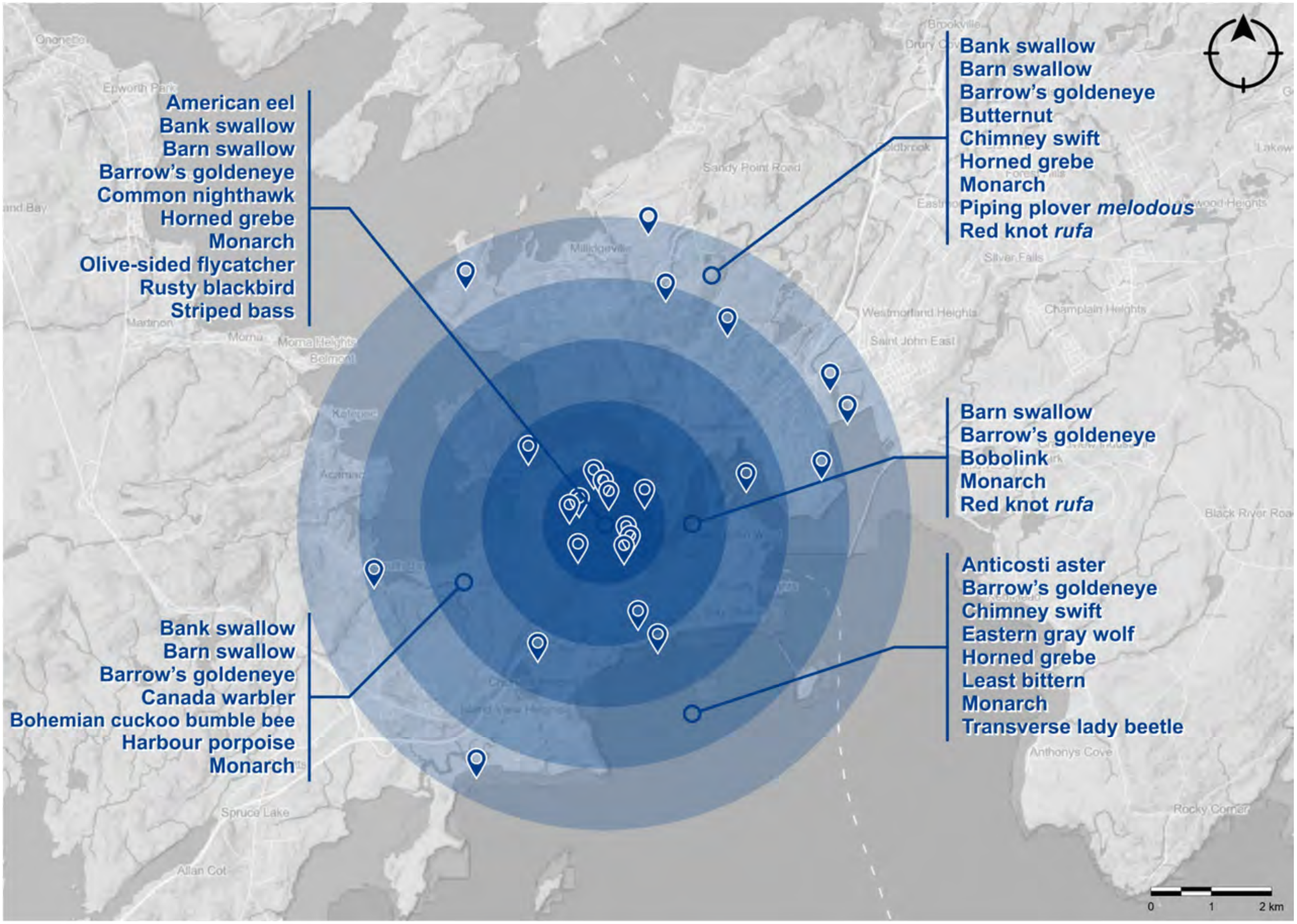


Figure 57. Map showing the recorded observations of species listed under the p*SARA* within a 5 km radius of the Reversing Falls Mill in Saint John, New Brunswick. Data obtained from the ACCDC.

3.2.2.1 Snapshots of Provincial Species at Risk Locally Present

Those 20 species listed under the p*SARA* that have been observed within 5 km of the Reversing Falls Mill in Saint John, New Brunswick are shown in Figure 58. Descriptions of those species are also provided if not previously described in Section 3.2.1.1. Detailed information provided below on the protected species was obtained from the species profiles on the f*SARA* [*SARA*, 2023], COSWEIC [*COSEWIC*, 2023], and regulatory agency websites.

The American eel (Figure 58) is a long freshwater fish with a serpentine body, deeply embedded scales, and a single dorsal, caudal, and anal fin that extends around the tail to the ventral side. They grow to a length of between 0.4 m and 1 m long. Its native Canadian range includes all freshwater, estuaries, and coastal marine waters that are accessible to the Atlantic Ocean. Spawning, which occurs only once for an individual between 8 years and 23 years of age, happens only in the Sargasso Sea. The larvae are passively, but widely dispersed by surface currents of the Gulf Stream. Populations of this eel species are affected by climate change, dams and other barriers, biological and chemical contaminants, and commercial fishing. Because of this, they are listed under the p*SARA* as threatened (Table 15).

The Eastern gray wolf (Figure 58) is native to the wilderness and remote areas of North America. Mortality caused by human activity, such as hunting and trapping, road-kills, industrial, agricultural, and residential developments, and the abundance of prey have all affected the Eastern gray wolf's numbers and geographic range. In New Brunswick, the Eastern gray wolf is listed under the p*SARA* as being extirpated (Table 15). Eastern gray wolves are territorial and wolf packs fiercely defend their turf. They feed on a wide variety of animals and birds. Because they have been eliminated in many areas of their original geographic range, many of those populations that remain are heavily protected. They are an often feared and maligned species that has a characteristic howl.

The horned grebe (Figure 58) is listed under the p*SARA* as being of Special Concern (Table 15). It is a small (*i.e.*, 31 cm to 38 cm long) duck-like waterbird that is not commonly observed in New Brunswick. The horned grebe generally nests in freshwater and occasionally in brackish water on small permanent or semi-permanent ponds, but it also uses marshes and shallow bays on lake borders. They generally winter in marine habitats, mainly estuaries and bays. Their diet consists primarily of aquatic insects and fish in the summer and fish, crustaceans, and marine worms in the winter. It is particularly vulnerable to changes in water quality near its breeding sites.

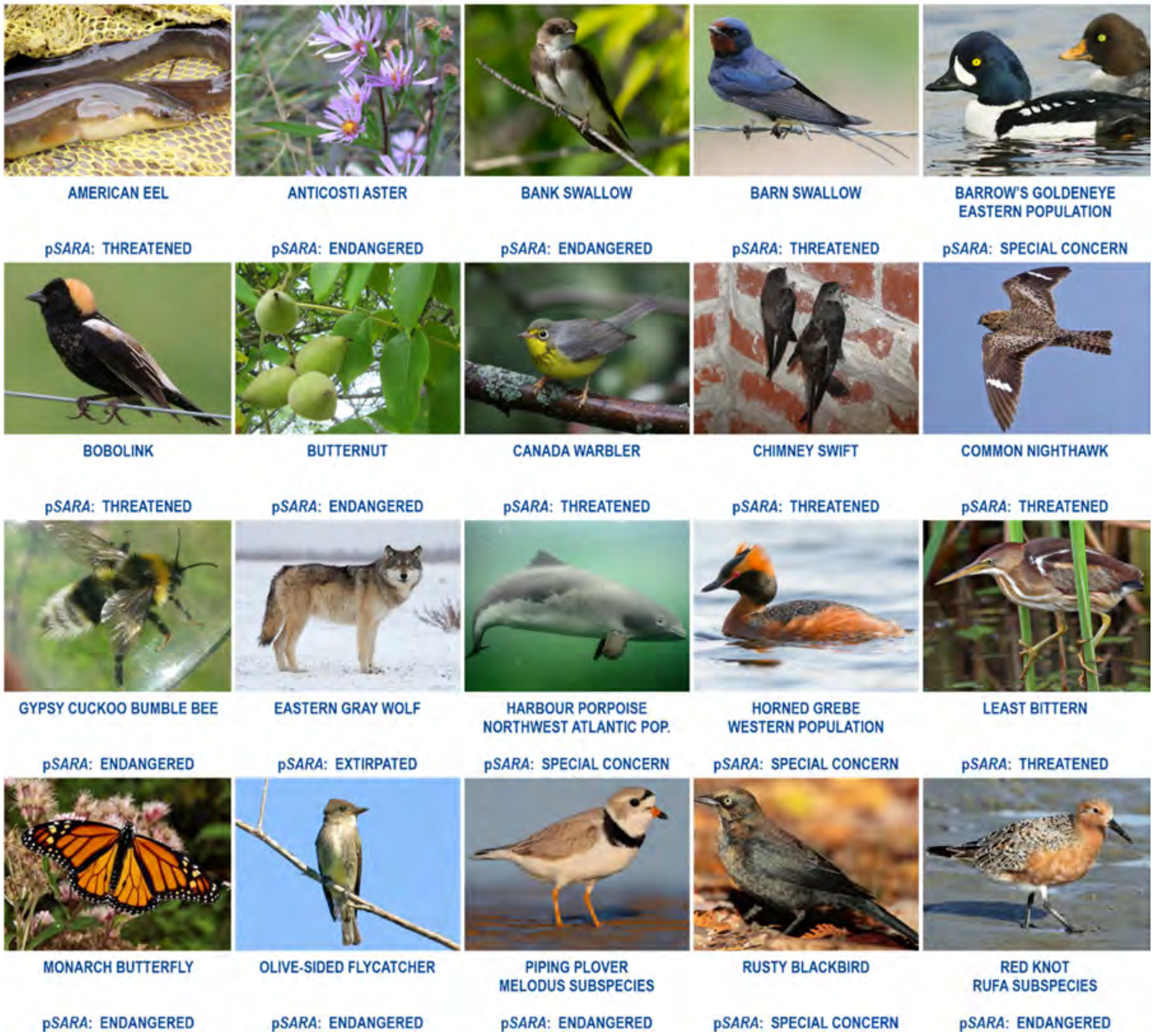


Figure 58. Photographs of species listed under the p*SARA* that have been observed within a 5 km radius of the Reversing Falls Mill in Saint John, New Brunswick.

3.2.2.2 Snapshots of Some Traditionally Important Fishes

Although the ACCDC databases do not include observations of the Outer Bay of Fundy population of the Atlantic salmon and the Maritimes population of the Atlantic Sturgeon, they are anecdotally known to have been observed within a 5 km radius of the Reversing Falls Mill. Therefore, brief snapshots of these two species are provided below.

Atlantic salmon is a prized anadromous sport fish. Between 1997 and 2012, there was a 64 % decline in the abundance of the Outer Bay of Fundy Atlantic salmon(Figure 59), which resulted in it being listed under the p*SARA* as endangered (Table 15). This population occupies about 20 rivers extending northward from the St. Croix River along the New Brunswick / Maine border to just east of the Saint John River Estuary. They are particularly sensitive to environmental stressors and require clean, cool, flowing water free from chemical or organic pollution. The IBOF species prefers natural stream channels with rapids and pools, a gravel bottom, and water temperatures between 15 °C and 25 °C in summer. Migration to sea occurs in May or June and spawning occurs in October to December.

The Maritimes population of the Atlantic sturgeon (Figure 59) is listed under the p*SARA* as being threatened (Table 15). Like all sturgeons, the Atlantic has an internal skeleton composed of cartilage, a bottom-oriented mouth bordered by fleshy barbels, and a set of bony armour (*i.e.*, scutes) in rows along its body. Distinguishing features of this anadromous sturgeon are its arrangement of scutes, an elongated body, and a slightly upturned snout. Mature females can grow to a length of between 2 m and 3 m and weigh between 100 kg and 200 kg. Males are typically smaller and generally only reach a length of between 1.4 m and 2.1 m. The spawning and rearing habitat of these long-lived fish are often affected by anthropogenic activities.

Figure 59. Photographs of fish listed under the p*SARA* that are considered traditionally important and have anecdotally been observed within a 5 km radius of the Reversing Falls Mill in Saint John, New Brunswick.

3.2.3 Location-Sensitive Species

The New Brunswick Department of Natural Resources and Energy Development (NBDNRED) considers several species in the province as “location-sensitive”. The ACCDC databases show three location-sensitive species for the area: bald eagle; peregrine falcon; and wood turtle (Figure 60). Bat hibernacula also appear on the location-sensitive query (*i.e.*, refer to Appendix VI). The three bat species that would use those hibernacula are described in Section 3.2.1.2.

Figure 60. Photographs of location-sensitive species included in the ACCDC data report within a 5 km radius of the Reversing Falls Mill in Saint John, New Brunswick.

The bald eagle (Figure 60) is a large bird of prey with a distribution across North America and generally found near large bodies of open water that are near an abundant food supply and old-growth trees for nesting. Between the 1940s and 1970s, their numbers considerably declined due to intense hunting, unintentional poisonings (*e.g.*, DDT and lead shot), and habitat destruction. Juveniles are dark brown with white streaking throughout, while adults support the white head and tail. At maturity, the bald eagle has a wingspan between 1.8 m and 2.3 m and can weigh up to 6 kg. Although bald eagle numbers have drastically increased over the past few decades to the point where they are no longer a species listed under the f*SARA* or by the COSEWIC, they are still listed as being endangered under the p*SARA*.

The *anatum* subspecies of the peregrine falcon (Figure 60) is a high-speed bird of prey slightly smaller and more streamlined than a hawk. Great declines in peregrine falcon populations were observed following the introduction of the pesticide Dichloro-Diphenyl-Trichloroethane (DDT); however, their populations began to increase following DDT restrictions that were established in 1970. It is estimated that there are 500 pair in Canada. Because of this low number, they are listed as an endangered species under the p*SARA* and as a species of special concern under the f*SARA*. They are now listed as a species not at risk by the COSEWIC. Peregrine falcon nests are usually scrapes made on cliff ledges near wetlands. Their nesting territory is about a 1 km radius around the nest and their home range extends to a radius of up to 27 km. They prefer open habitats such as wetlands, but they are known to hunt over open forest.

The wood turtle (Figure 60) inhabits a broad range of habitats. They prefer to be near areas of moderately flowing water (*e.g.*, streams, creeks, and rivers), and they favour riparian areas with open canopies. During the summer, the wood turtle prefers to be on the ground in forested areas. In spring and fall they prefer to be near water, and they overwinter in the water. The wood turtle appears to select habitats, rather than randomly using areas. The damming of watercourses, loss and degradation of riparian habitat, road mortality, and the pet trade all threaten the wood turtle population. They are considered sensitive to pollution as evidenced by their disappearance from low-quality watercourses. Pesticides and insecticides also threaten the population. No New Brunswick population is known to exceed 100 individuals. Although evidence suggests that populations are common and stable, the wood turtle is ranked as a threatened species under the p*SARA*, f*SARA*, and by the COSEWIC.

3.2.4 Other Locally Observed Species

ACCDC databases were also queried for known observation data of provincially ranked flora and fauna within a 5 km radius of the Project site. Those species identified in the sections above are not included here. Because there are many wildlife enthusiasts in the region, the listing of flora and fauna is extensive. The full list of the flora and fauna within 5 km of the site is provided in Table 15 and the ACCDC report can be found in Appendix VI. Interpretation of the ACCDC S-rank system is provided in Table 17.

A visual representation of the 61 observed flora species is provided in Figure 61. Similarly, a visual representation of the 74 observed fauna species is provided in Figure 62 and Figure 63.

Table 16. List of provincially ranked flora and fauna identified by the ACCDC as being observed within 5 km of the Reversing Falls Mill in Saint John, New Brunswick.

Common Name	Scientific Name	S-rank	NB GS Rank
Flora			
Pussy-toes	*Antennaria howellii ssp. petaloidea*	S1	Extremely rare
Cream-flowered rockcress	*Arabis pycnocarpa*	S3	Uncommon
Tall wormwood	*Artemisia campestris ssp. caudata*	S3	Uncommon
Green spleenwort	*Asplenium viride*	S3S4	Uncommon to common
Alpine milk-vetch	*Astragalus alpinus*	S3	Uncommon
Strawberry-blite	*Blitum capitatum*	S1	Extremely rare
Drummond's rockcress	*Boechera stricta*	S3	Uncommon
Slim-stemmed reed grass	*Calamagrostis stricta*	S3S4	Uncommon to common
Common large wetland moss	*Calliergonella cuspidata*	S2S3	Rare to uncommon
Large toothwort	*Cardamine maxima*	S3	Uncommon
Scabrous black sedge	*Carex atratiformis*	S3S4	Uncommon to common
Saltmarsh sedge	*Carex salina*	S1	Extremely rare
Russet sedge	*Carex saxatilis*	S1	Extremely rare
Spotted coralroot	*Corallorhiza maculata*	S3S4	Common to uncommon
Broom crowberry	*Corema conradii*	S1	Extremely rare
Sieve-toothed moss	*Coscinodon cribrosus*	S1	Extremely rare
Steller's rockbrake	*Cryptogramma stelleri*	S3S4	Uncommon to common
Buttonbush dodder	*Cuscuta cephalanthi*	S2S3	Rare to uncommon
Toothed flatsedge	*Cyperus dentatus*	S3S4	Uncommon to common
Small yellow lady's slipper	*Cypripendium parviflorum var.makasin*	S2	Rare
Rigid screw moss	*Didymodon rigidulus*	S2S3	Rare to uncommon
Fragrant wood fern	*Dryopteris fragrans*	S3S4	Uncommon to common
Canada wild rye	*Elymus canadensis*	S2S3	Rare to uncommon
Tufted love grass	*Eragrostis pectinacea*	S3S4	Uncommon to common
Bush's pocket moss	*Fissidens bushii*	S2S3	Rare to uncommon
Black ash	*Fraxinus nigra*	S3S4	Uncommon to common
Limestone swamp bedstraw	*Galium brevipes*	S1	Extremely rare
Blunt-leaved bedstraw	*Galium obtusum*	S2S3	Rare to uncommon
Toothless grimmia moss	*Grimmia anodon*	SH	Undetected
American false pennyroyal	*Hedeoma pulegioides*	S2S3	Rare to uncommon
Woolly beach-heath	*Hudsonia tomentosa*	S3	Uncommon
Seaside rush	*Juncus ranarius*	S2S3	Rare to uncommon
Canada lily	*Lilium canadense*	S3S4	Uncommon to common
Loesel's twayblade	*Liparis loeselii*	S3S4	Uncommon to common
Glaucous rattlesnakeroot	*Nabalus racemosus*	S3	Uncommon
Heart-leaved twayblade	*Neottia cordata*	S3S4	Uncommon to common
Red goosefoot	*Oxybasis rubra*	S3	Uncommon
Blunt-leaved orchid	*Platanthera obtusata*	S3S4	Uncommon to common
Glaucous blue grass	*Poa glauca*	S2S3	Rare to uncommon
Appalachian polypody	*Polypodium appalachianum*	S3S4	Uncommon to common

Common Name	Scientific Name	S-rank	NB GS Rank
White-stemmed pondweed	*Potamogeton praelongus*	S3S4	Uncommon to common
Richardson's pondweed	*Potamogeton richardsonii*	S3S4	Uncommon to common
Macoun's cudweed	*Pseudognaphalium macounii*	S3	Uncommon
Tall clustered bryum	*Ptychostomum pallescens*	S2?	Rare
Bur oak	*Quercus macrocarpa*	S2	Rare
Cursed buttercup	*Ranunculus sceleratus*	S2S3	Rare to uncommon
Roseroot	*Rhodiola rosea*	S3	Uncommon
Northern dewberry	*Rubus flagellaris*	S1	Extremely rare
Knotted pearlwort	*Sagina nodosa*	S3	Uncommon
Hooked scorpion moss	*Scorpidium scorpioides*	S2S3	Rare to uncommon
Narrow-leaved blue-eyed-grass	*Sisyrinchium angustifolium*	S1	Extremely rare
Blue-stemmed goldenrod	*Solidago caesia*	SX	Extinct or extirpated
Long-leaved starwort	*Stellaria longifolia*	S3	Uncommon
Thread-leaved pondweed	*Stuckenia filiformis*	S3S4	Uncommon to common
New York aster	*Symphyotrichum novi-belgii var. crenifolium*	S2?	Rare
Mucronate screw moss	*Tortula mucronifolia*	S2	Rare
Sticky false-asphodel	*Triantha glutinosa*	S3S4	Uncommon to common
Acid-soil moss	*Trichostomum tenuirostre*	S3S4	Uncommon to common
Gaspé arrowgrass	*Triglochin gaspensis*	S3S4	Uncommon to common
Tower mustard	*Turritis glabra*	S3	Uncommon
Northern yellow-eyed-grass	*Xyris montana*	S3S4	Uncommon to common
Fauna			
Spotted sandpiper	*Actitis macularius*	S3S4B, S4M	
Northern pintail	*Anas acuta*	S3B, S5M	
Snow goose	*Anser caerulescens*	S3M	
Ruddy turnstone	*Arenaria interpres*	S3M	
Aphrodite fritillary	*Argynnis aphrodite*	S3	Uncommon
Long-eared owl	*Asio otus*	S2S3	
Lesser scaup	*Aythya affinis*	S1B, S4M	
Redhead	*Aythya americana*	S1B	
Greater scaup	*Aythya marila*	S1B, S4M, S2N	
Brant	*Branta bernicla*	S1N, S2S3M	
Snowy owl	*Bubo scandiacus*	S1N, S2S3M	
Bufflehead	*Bucephala albeola*	S3M	
Red-shouldered hawk	*Buteo lineatus*	S1S2B	
Green heron	*Butorides virescens*	S1S2B	
Lapland longspur	*Calcarius lapponicus*	S2S3N, SUM	
Sanderling	*Calidris alba*	S3S4M, S1N	
Baird's sandpiper	*Calidris bairdii*	S1S2M	
Purple sandpiper	*Calidris maritima*	S3N	
Pectoral sandpiper	*Calidris melanotos*	S3M	
Semipalmated sandpiper	*Calidris pusilla*	S3M	
Buff-breasted sandpiper	*Calidris subruficollis*	S4	

Common Name	Scientific Name	S-rank	NB GS Rank
Black guillemot	*Cepphus grylle*	S3B	
Killdeer	*Charadrius vociferus*	S3B	
Black-headed gull	*Chroicocephalus ridibundus*	S1N, S2M	
Marsh wren	*Cistothorus palustris*	S2B	
Ladybird beetle	*Coccinella hieroglyphica kirbyi*	S3	Uncommon
Black-billed cuckoo	*Coccyzus erythropthalmus*	S3B	
Elderberry borer	*Desmocerus palliatus*	S3	Uncommon
Willow flycatcher	*Empidonax traillii*	S1S2B	
Horned lark	*Eremophila alpestris*	S1B, S4N, S5M	
American coot	*Fulica americana*	S1B	
Wilson's snipe	*Gallinago delicata*	S3S4B, S5M	
Longhorned beetle	*Gnathacmaeops pratensis*	S3	Uncommon
Parenthesis lady beetle	*Hippodamia parenthesis*	S3	Uncommon
Baltimore oriole	*Icterus galbula*	S2S3B	
Ring-billed gull	*Larus delawarensis*	S2S3B, S4N, S5M	
Glaucous gull	*Larus hyperboreus*	S2N	
Great black-backed gull	*Larus marinus*	S3	
Longhorned beetle	*Lepturopsis biforis*	S3	Uncommon
Laughing gull	*Leucophaeus atricilla*	S1B	
Short-billed dowitcher	*Limnodromus griseus*	S3M	
Hudsonian godwit	*Limosa haemastica*	S3M	
Red crossbill	*Loxia curvirostra*	S3	Uncommon
Gadwall	*Mareca strepera*	S2B, S3M	
American scoter	*Melanitta americana*	S3M, S1S2N	
Lincoln's sparrow	*Melospiza lincolnii*	S3S4B, S4M	
Red-breasted merganser	*Mergus serrator*	S3B, S5M, S4S5N	
Northern mockingbird	*Mimus polyglottos*	S2B	
Brown-headed cowbird	*Molothrus ater*	S3B	
Great-crested flycatcher	*Myiarchus crinitus*	S3B	
Whimbrel	*Numenius phaeopus hudsonicus*	S3M	
Black-crowned night-heron	*Nycticorax nycticorax*	S1S2B	
Compton tortoiseshell	*Nymphalis l-album*	S3	Uncommon
Ruddy duck	*Oxyura jamaicensis*	S1B, S2S3M	
Canada jay	*Perisoreus canadensis*	S3S4	
Cliff swallow	*Petrochelidon pyrrhonota*	S2B	
Great cormorant	*Phalacrocorax carbo*	S2N	
Wilson's phalarope	*Phalaropus tricolor*	S1B	
Rose-breasted grosbeak	*Pheucticus ludovicianus*	S3B	
American golden-plover	*Pluvialis dominica*	S2S3M	
Black-bellied plover	*Pluvialis squataroia*	S3S4M	
Red-necked grebe	*Podiceps grisegena*	S2N, S3M	
Common eider	*Somateria mollissima*	S2S3B, S2S3N, S4M	
Northern shoveler	*Spatula clypeata*	S3B	

Common Name	Scientific Name	S-rank	NB GS Rank
Pine siskin	*Spinus pinus*	S3	
Common tern	*Sterna hirundo*	S3B, SUM	
Lesser yellowlegs	*Tringa flavipes*	S3M	
Greater yellowlegs	*Tringa melanoleuca*	S1B	
Willet	*Tringa semiplamata*	S3B	
Solitary sandpiper	*Tringa solitaria*	S2B, S4S5M	
House wren	*Troglodytes aedon*	S1S2B	
Brown thrasher	*Toxostoma rufum*	S2S3B	
Eastern kingbird	*Tyrannus tyrannus*	S3S4B	
Yellow-throated vireo	*Vireo flavifrons*	S1?B	

Table 17. The Atlantic Canada Conservation Data Centre's Sub-national (*i.e.*, provincial) rarity rank (S-rank) of species and S-rank definitions.

ACCDC S-rank	Qualifier*	Definition
SX		**Presumed extirpated:** species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
S1		**Critically imperiled:** critically imperiled in the province because of extreme rarity (*i.e.*, often five 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 (*i.e.*, 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 (*i.e.*, 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).
SH		**Possibly extirpated:** (historical) species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20 to 40 years. A species or community could become SH without such a 20 to 40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
	B	**Breeding:** conservation status refers to the breeding population of the species in the province.
	N	**Non-breeding:** conservation status refers to the non-breeding population of the species in the province.

ACCDC S-rank	Qualifier*	Definition
	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.
	?	**Inexact or uncertain:** denotes inexact or uncertain numeric rank (*n.b.*, the ? qualifies the character immediately preceding it in the S-rank.)

NOTES:
*A breeding status is only used for species that have distinct breeding and / or non-breeding populations in the province. A breeding-status S-rank can be coupled with its complementary non-breeding-status S-rank if the species also winters in the province, and / or a migrant-status S-rank if the species occurs regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. The two (or rarely, three) status ranks are separated by a comma (*e.g.*, "S2B, S3N" or "SHN, S4B, S1M").

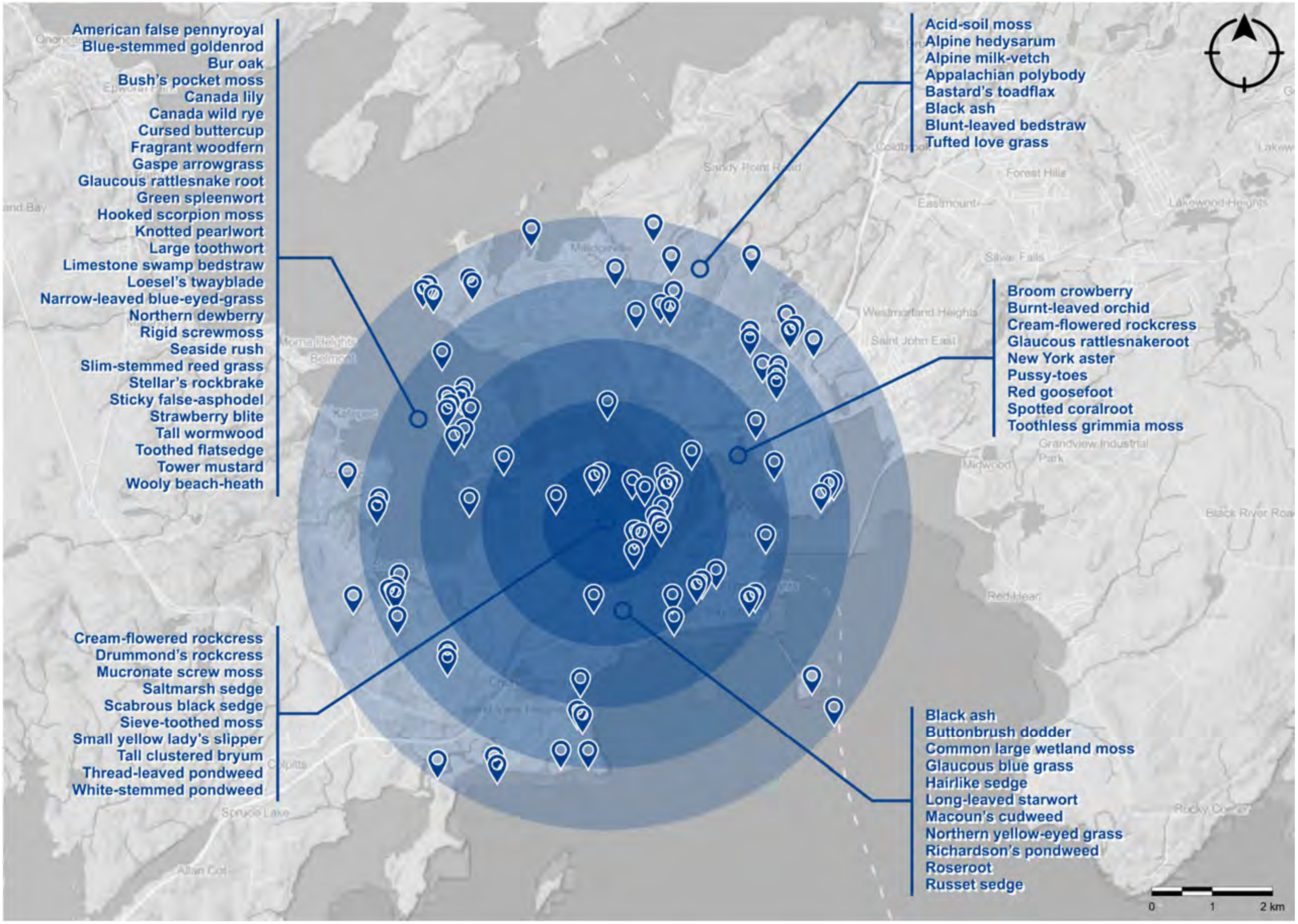


Figure 61. Map showing the observed flora species within a 5 km radius of the Reversing Falls Mill in Saint John, New Brunswick. Data obtained from the ACCDC.

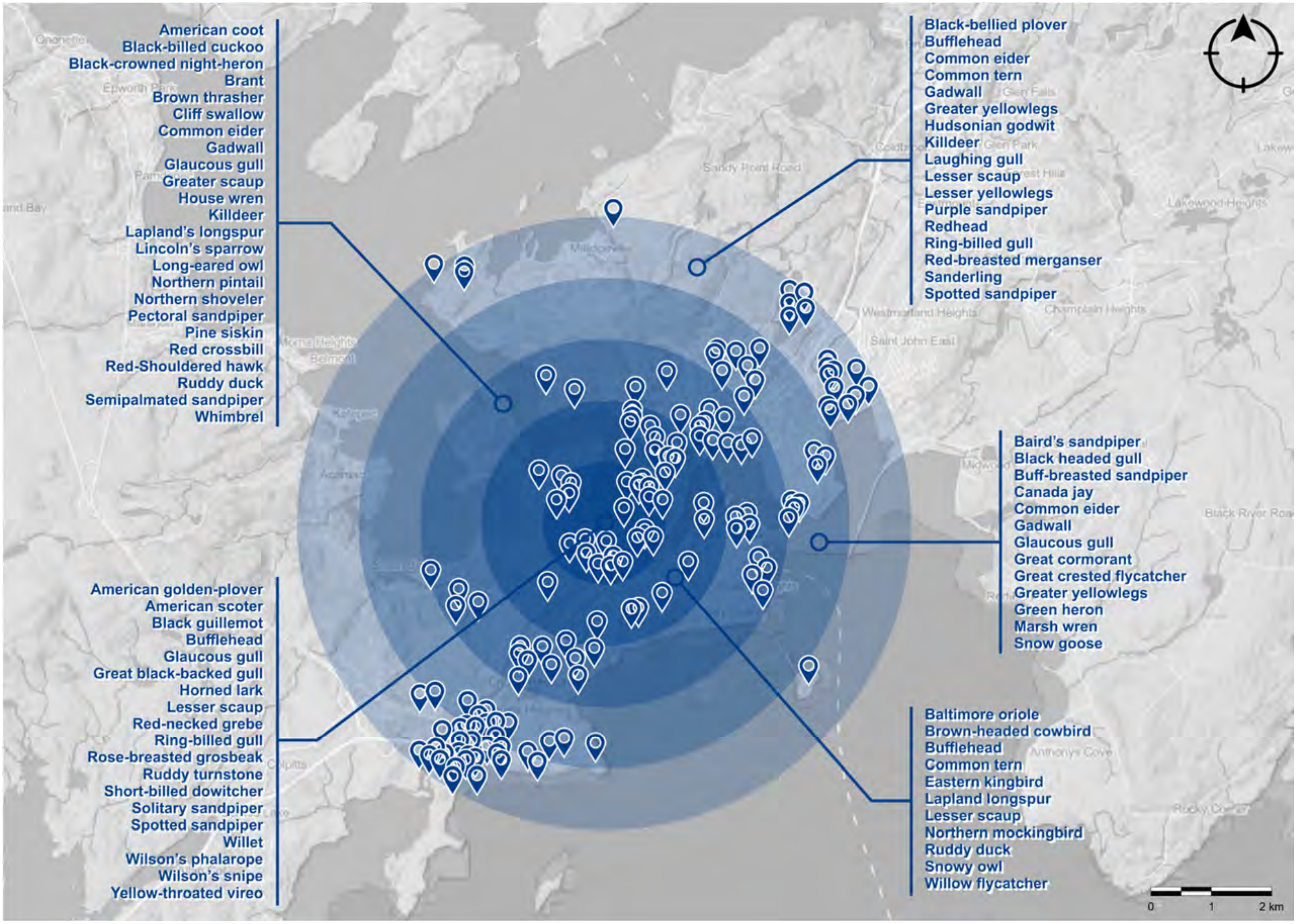


Figure 62. Map showing the observed birds within a 5 km radius of the Reversing Falls Mill in Saint John, New Brunswick. Data obtained from the ACCDC.

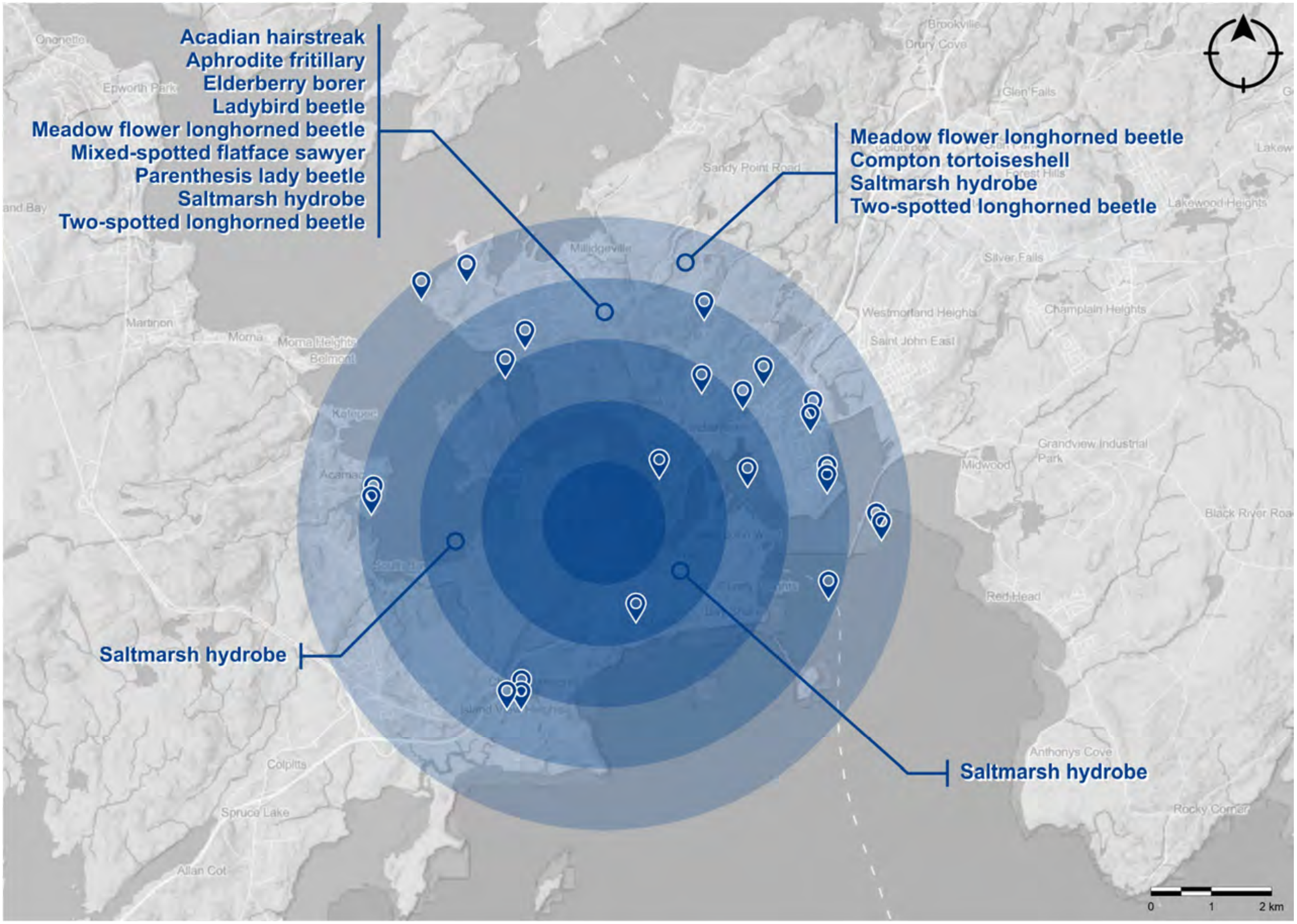


Figure 63. Map showing observed mammals, arthropods, and molluscs within a 5 km radius of the Reversing Falls Mill in Saint John, New Brunswick. Data obtained from the ACCDC.

During the site visits, no terrestrial flora and fauna species of special concern were noted (*n.b.*, the site is nearly devoid of vegetation). None of the areas where proposed equipment will be constructed and operated are virgin lands. It is possible that species listed above either live in adjacent areas or may migrate through the area on occasion.

The Canadian Rivers Institute (CRI), in their 2011 State of the Environment Report on the Saint John River, report that 53 ± fish species occur within the Saint John River system. Species that have been reported within the Lower Saint John River (*i.e.*, from Oak Point to Reversing Falls) are summarized in Table 18. Those species considered culturally important to Wolastoqiyik and may be vulnerable are noted.

Table 18. Fish species observed within the Lower Saint John River (*i.e.*, from Oak Point to Reversing Falls) as reported in *Kidd et al.* [2011]. Species in bold are considered culturally important to Wolastoqiyik.

Common Name	Scientific Name	Data Source
Shortnose sturgeon	*Acipenser brevirostrum*	Historical records and CRI surveys
Atlantic sturgeon	***Acipenser oxyrinchus***	**Historical records and CRI surveys**
Blueback herring	***Alosa aestivalis***	**Historical records and CRI surveys**
Alewife	***Alosa pseudoharengus***	**Historical records and CRI surveys**
American shad	***Alosa sapidissima***	**Historical records**
Brown bullhead catfish	*Ameiurus nebulosus*	Historical records and CRI surveys
American eel	*Anguilla rostrata*	Historical records and CRI surveys
Fourspine stickleback	*Apeltes quadracus*	Historical records and CRI surveys
Atlantic menhaden	*Brevoortia tyrannus*	Historical records
Longnose sucker	*Catostomus catostomus*	Historical records and CRI surveys
White sucker	*Catostomus commersonii*	Historical records and CRI surveys
Lake whitefish	*Coregonus clupeaformis*	Historical records
Slimy sculpin	*Cottus cognatus*	Historical records and known from tributaries
Chain pickerel	*Esix niger*	Historical records and CRI surveys
Banded killifish	*Fundulus diaphanous*	Historical records and CRI surveys
Threespine stickleback	*Gasterosteus aculeatus*	Historical records and CRI surveys
Redbreast sunfish	*Lepomis auritus*	Historical records and CRI surveys
Pumpkinseed sunfish	*Lepomis gibbosus*	Historical records and CRI surveys
Yellowtail flounder	*Limanda ferruginea*	Historical records
Burbot	*Lota lota*	Historical records and known from tributaries
Common shiner	*Luxilus cornutus*	Historical records and CRI surveys
Atlantic silverside	*Menidia menidia*	Historical records
Atlantic tomcod	*Microgadus tomcod*	Historical records and CRI or DNR studies
Smallmouth bass	*Micropterus dolomieu*	Historical records and CRI surveys
White perch	*Morone americana*	Historical records and CRI surveys
Striped bass	*Morone saxatilis*	Historical records and CRI or DNR studies
Golden shiner	*Notemigonus crysoleucas*	Historical records and CRI surveys
Rainbow trout	*Oncorhynchus mykiss*	Known from tributaries
Rainbow smelt	***Osmerus mordax***	**Historical records and CRI surveys**
Yellow perch	*Perca flavescens*	Historical records and CRI surveys
Sea lamprey	***Petromyzon marinus***	**Known from tributaries**
Ninespine stickleback	*Pungitius pungitius*	CRI surveys
Blacknose dace	*Rhinichthys atratulus*	Historical records and known from tributaries
Atlantic salmon	***Salmo salar***	**Historical records and known from tributaries**
Brook trout	*Salvelinus fontinalis*	Historical records and known from tributaries
Creek chub	*Semotilus atromaculatus*	Historical records and known from tributaries
White hake	*Urophycis tenuis*	Historical records

No independent assessment was undertaken by the Proponent with respect to the existing fish habitat characteristics or the fish species that may be present in the area. Instead, information collected from others is presented here.

Several CRI researchers and representatives with the Saint John Chapter of the Atlantic Coastal Action Program (ACAPSJ) were contacted regarding fishes and invertebrates that may use the area in and around Reversing Falls. Although none of those individuals contacted have specifically conducted research within Reversing Falls, they have done work in nearby areas. A species summary for those various locations, shown in Figure 64, is provided in Table 19.

There is known to be a recreational sport fishery for striped bass within Reversing Falls.

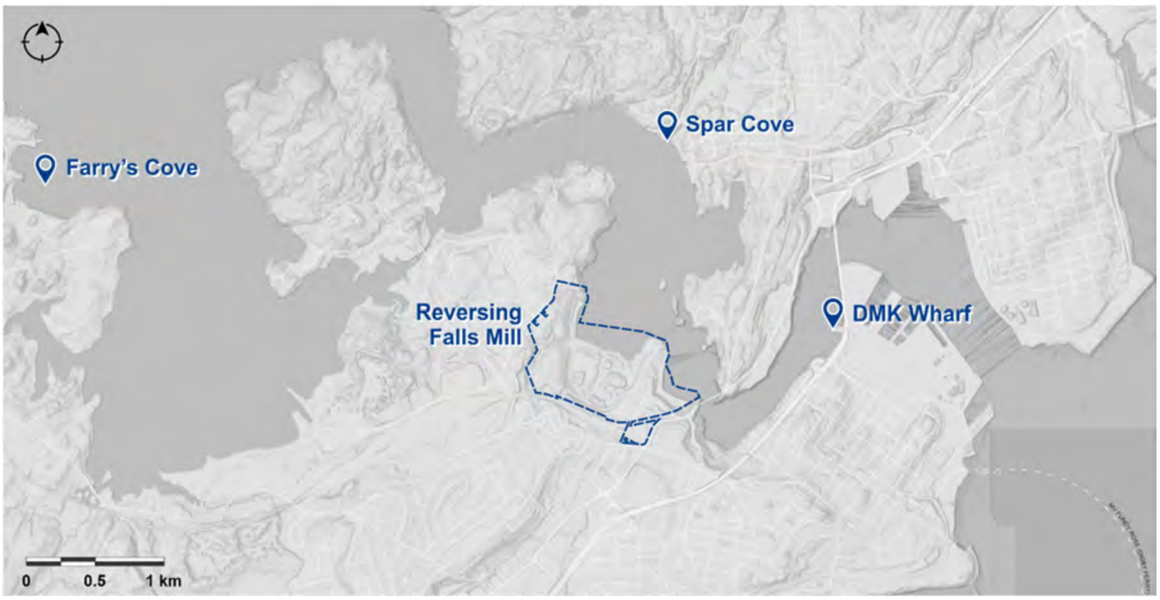


Figure 64. Areas of the Lower Saint John River that have been investigated by various researchers and where species observations are available.

Table 19. Species that have been observed in areas of the Lower Saint John River near the proposed Project at Reversing Falls in Saint John, New Brunswick. Refer to Figure 64.

Location	Common Name	Species Name
DMK Wharf*	Green crab	*Carcinus maenas*
	Atlantic tomcod	*Microgadus tomcod*
	Rainbow smelt	*Osmerus mordax*
	Atlantic pollock	*Pollachius virens*
Spar Cove*	Herring	*Alosa spp.*
	Green crab	*Carcinus maenas*
	Sand shrimp	*Crangon septemspinosa*
	Banded killifish	*Fundulus diaphanous*
	Mummichog	*Fundulus heteroclitus*
	Atlantic silverside	*Menidia menidia*
	Atlantic tomcod	*Microgadus tomcod*
	White perch	*Morone americana*
	Winter flounder	*Pseudopleuronectes americanus*
Farry's Cove*	Herring	*Alosa spp.*
	American eel	*Anguilla rostrata*
	Fourspine stickleback	*Apeltes quadracus*
	White sucker	*Catostomus commersonii*
	Banded killifish	*Fundulus diaphanous*
	Mummichog	*Fundulus heteroclitus*
	Threespine stickleback	*Gasterosteus aculeatus*
	Atlantic silverside	*Menidia menidia*
	Atlantic tomcod	*Microgadus tomcod*
	Rainbow smelt	*Osmerus mordax*
	Northern pipefish	*Syngnathus fuscus*

NOTES:
*Data collected by Bethany Reinhart from fyke nets and seine trawls

3.2.5 Environmentally Significant and Managed Areas

The ACCDC query yielded eight Environmentally Significant Areas (ESAs) and five managed areas within 5 km of the Reversing Falls Mill (Figure 65), including:

- Manawagonish Island Important Bird Area (IBA);
- Saint's Rest Marsh and Beach IBA;
- Fern Ledges ESA;
- Greenhead Cave ESA;
- Reversing Falls and Outcrop Islands ESA;
- Saint John Cambrian-Precambrian Border ESA;
- Harbell's Cave ESA;
- Howe's Cave ESA; and
- Courtenay Forebay ESA.

Manawagonish Island is a 20 ha island about 1 km long × 250 m wide (Figure 65). The partially wooded island has rocky shores, coastal cliffs, and many small inlets. Originally, the island was covered with typical coastal forest (*i.e.*, spruce and fir), but because of increasing bird populations, the vegetation cover on the Island has changed. In 2007, the Nature Trust of New Brunswick, with help from the Government of New Brunswick and small businesses, installed five poles and 20 platforms for birds to build their nests on the Island. About 2 % to 3 % of the Atlantic Coast population of double-crested cormorants (*Phalacrocorax auritus*) inhabits the Island. This colony of *auritus* is among the three largest in the Maritimes. Herring gulls (*Larus sp.*), great black-backed gulls (*L. marinus*), and glossy ibis (*Plegadis falcinellus*) also nest on the Island. This is the only known Canadian breeding spot for *falcinellus*. Manawagonish Island and its associated satellite island Thumb Cap / Thrumcap Island are owned by the Nature Trust of New Brunswick.

Saint's Rest Marsh and Beach IBA (Figure 65) is an internationally renowned bird-staging area as it is one of the largest salt marshes on the Bay of Fundy's north shore. Glossy ibis from Manawagonish Island are sometimes sighted there. Due to efforts of the Nature Trust of NB who erected several nesting platforms within the IBA, the great blue heron (*Ardea herodias*) population has been on the rise within the Marsh. A small peat bog is also found within this 49 ha IBA. Globally significant numbers (*i.e.*, > 1 % and > 3 %, respectively) of semipalmated sandpipers (*Calidris pusilla*) and semipalmated plovers (*Charadrius semipalmatus*) visit this IBA during the fall migration.

The Fern Ledges ESA (Figure 65) is located along the shoreline of Seaside Park in west Saint John between Bay Shore and Duck Cove. The site is significant for fossils. Rock outcrops there, which include exposures of Pennsylvanian gray sandstone and shale, are accessible at low tide. Most of the fossil-bearing beds worked in the 1860s are underwater. This site is the type locality for at least 40 species of fossils, particularly plant and invertebrate fossils, that are maintained in the New Brunswick Museum's collection.

Greenhead Cave is a cave located midway up a massive shoreline cliff on Green Head Island (Figure 65). A survey of the cave in 1978 reported a length of 64 m and a depth of 26.7 m. Most of the Island is owned by the City of Saint John and has been labeled as an ESA as the Cave is used by bats as a hibernaculum. In the 1800s, the Island was the site of a lime quarry. Kiln foundations, wharf timbers, and foundation walls of homes still exist on the city-owned lands.

Three small bedrock islands, Goat Island (0.4 ha), Middle Island (0.5 ha), and Crow Island (0.3 ha), comprise the Reversing Falls and Outcrop Islands ESA (Figure 65). These Islands are owned by the Crown and are uninhabited. They exist at Reversing Falls / Rapids where the Saint John River flows through a narrow gorge before emptying into the Bay of Fundy. The rocks here form the contact of two ancient geologic terranes, Brookville and Caledonia, which are separated by the Caledonia Fault. This ESA and the Saint John Cambrian-Precambrian Border ESA are among the top 12 geosites within the Stonehammer Geopark. The majority of Uptown Saint John is built atop the contact between Cambrian and Precambrian age rocks. Outcrops are common throughout Uptown.

The Saint John Cambrian – Precambrian ESA (Figure 65) represents the contact between the sedimentary rocks of the Saint John Group and igneous rocks from the early Cambrian period. The transition from Precambrian to Cambrian represents one of the most interesting times in the evolution of life; the sparse diversity of Precambrian life was suddenly replaced by an expansion of life forms representing almost every major group of taxa seen today. This ESA is a classic site for Cambrian fossils, such as trilobites, brachiopods, echinoderms, and other arthropods.

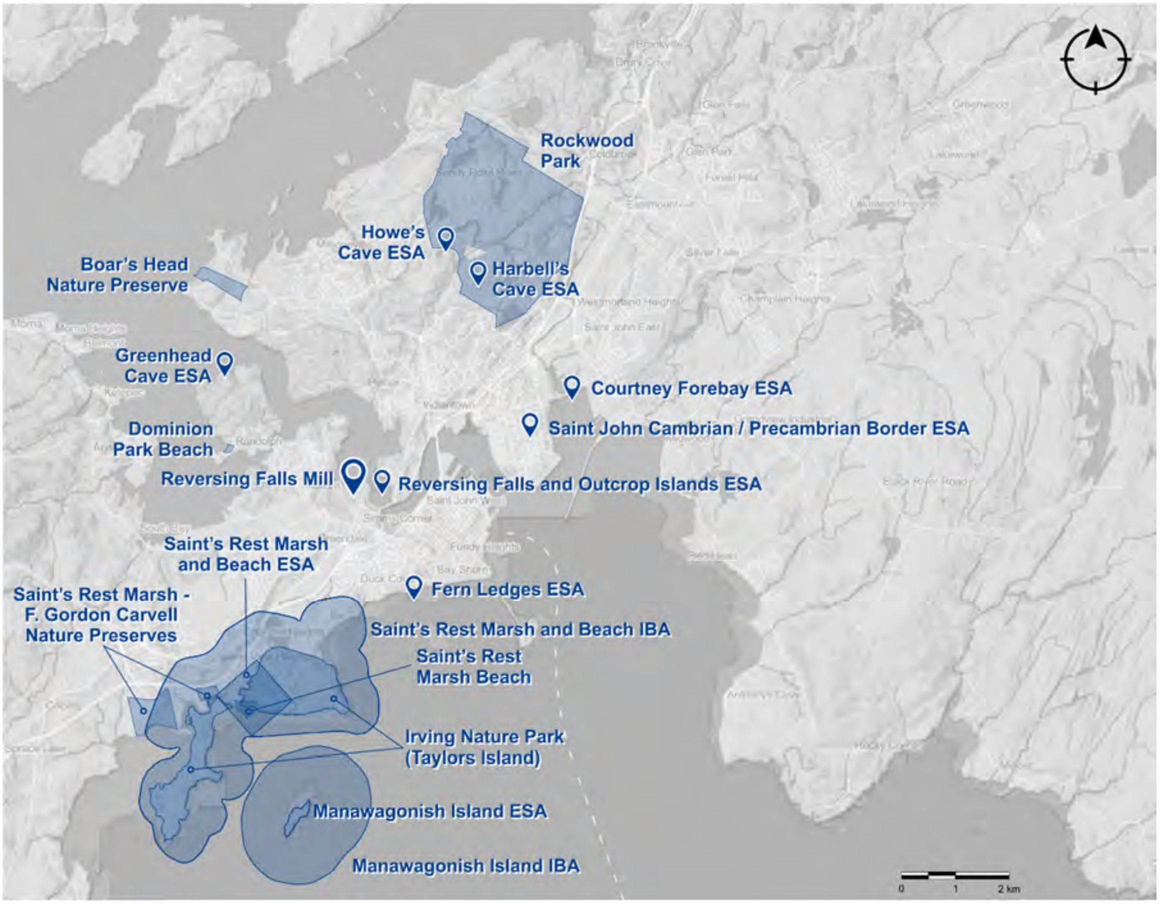


Figure 65. Map showing the environmentally significant and managed areas within a 5 km radius of the Reversing Falls Mill in Saint John, New Brunswick. Data obtained from the ACCDC.

The Harbell's Cave ESA and Howe's Cave ESA are both located within Rockwood Park (Figure 65). Both limestone caves are used by bats in the winter as hibernaculum. Harbell's Cave is about 74 m long and has a stream with several waterfalls flowing through it and Howe's Cave is about 120 m long. Both caves are frequented by naturalists because of their ease of access and being within the park.

The Courtenay Forebay ESA (Figure 65) is a significant area for waterfowl in Saint John. Bald eagles have also been observed preying on waterfowl within the Forebay. It is a unique 43 ha urban wetland that is frequented by birders. The Saint John chapter of the Atlantic Coastal Action Program has been a strong advocate for cleanup efforts related to the Forebay and Marsh Creek, which flows into the wetland.

The managed areas within 5 km of the Reversing Falls Mill include:

- Rockwood Park;
- Dominion Park Beach;

- Boar’s Head Nature Preserve;
- Saint’s Rest Marsh Beach;
- F. Gordon Carvell Nature Preserves; and
- Irving Nature Park / Taylors Island.

Rockwood Park (Figure 65) is located entirely within Saint John and at 890 ha is one of Canada’s largest urban parks. There are over 50 km of trails and nature paths throughout the park that provide visitors with an opportunity to view the unique natural beauty of the area including the rock formations, caves, and waterfalls that are part of the Stonehammer Geopark. Rockwood Park is used year-round for a plethora of activities, including skiing, snowshoeing, geocaching, swimming, camping, dining, hiking, paddling, fishing, playing, and exploring. Rockwood Park Golf Course is also located within the park.

Dominion Park is located on Green Head Island (Figure 65). This Park is home to an urban, freshwater, sandy swimming beach. Visitors can also hike trails, rock climb, kayak, and go to a treetop aerial adventure park. Because of the historic use of the area as a limestone quarry following the Great Fire of 1877, the area is part of the larger Stonehammer UNESCO Global Geopark. It pays homage to one of the last historic lime kiln operations in southern New Brunswick. In 1890, geologist George Matthew found an approximately 1 billion-year-old stromatolite fossil near Dominion Park. That fossil represented the first evidence of when life began on Earth.

Boars Head Nature Preserve (Figure 65) is managed by the Nature Trust of New Brunswick. It comprises 27 ha of land along 150 m of shoreline of Kennebecasis Bay near the confluence with the Saint John River. It is one of the last natural areas in the Millidgeville area of Saint John. The Preserve, which was formerly known as “The Farms” (*i.e.*, the Bullock family walked their cattle down a trail and into the nearby fields), contains red spruce groves, cedar and alder wetlands, and is home to the very rare Anticosti aster and the extremely rare maidenhair spleenwort.

Saint’s Rest Marsh Beach are lands associated with the Saint’s Rest Marsh Beach ESA (Figure 65). Similarly, the F. Gordon Carvell Nature Preserves are 49 ha of land primarily associated with the Saint’s Rest Marsh and Beach IBA. The areas represent one of the largest salt marshes on the Bay of Fundy’s north shore and includes a diversity of habitat, including salt marsh, coastal mixed forest, rocky shoreline, and mudflats. Much of the lands were dyked by French settlers for farming prior to being reclaimed by the Bay of Fundy (*n.b.*, some of the dykes are still visible). Gravel extraction operations on Saint’s Rest Marsh Beach led to the failure of the dyke system and the reclaiming of the lands by the Bay of Fundy. The lands that form the F. Gordon Carvell Nature Preserves were operated as part of the Carvell Dairy Farm, the last working farm to operate in west Saint John.

The 243 ha Irving Nature Park (Figure 65) was created by JDI in 1992 to help protect an environmentally important area of southern New Brunswick. It is a peninsula of volcanic rock that has a long sandy beach along the Bay of Fundy side and a saltmarsh on the inland side. The area is a traditional staging area for birds migrating between the Arctic and South America. More than 250 species of birds have been observed during a single migration season. Eight walking trails on the island (*i.e.*, Taylor’s Island) allow visitors to experience the area’s fragile ecosystems. Upkeep, educational programs, and beautification of the park are fully funded by JDI.

Although not a particular location on a map, the Greater Saint John region is home to the Stonehammer UNSECO Global Geopark. As North America's first UNESCO Global Geopark, Stonehammer showcases the areas exceptional geological heritage and the region's people, society, and culture. The Geopark includes geological stories from the late Precambrian period to the most recent Ice Age. There are at least 60 geosites located within the Geopark, which are areas with interesting rock formations that are accessible to visit. Those geosites include: Norton's Moosehorn Creek; Rockwood Park; Irving Nature Park; Reversing Falls; Dominion Park; Lepreau Falls Provincial Park; and the Fundy Trail.

3.3 Socio-Economic Environment

3.3.1 Population and Demographics

In 2021, the population of the Saint John Census Metropolitan Area (CMA) was 130 613 [*StatsCan*, 2022a]. Approximately 2.6 % of the population identifies as being First Nations. Between 2016 and 2021, the population within the CMA increased by 3.5 % from 126 202, which was primarily a result of immigration and positive interprovincial migration. Recently, the Province has been experiencing the highest rate of population growth increase since 1976 [*GNB*, 2022a].

Compared to Canada, New Brunswick's population is relatively older as illustrated in Figure 66. The Baby Boomer Generation (*i.e.*, aged between 56 and 75) is the dominant age of New Brunswickers (*i.e.*, n = 36 790). In 2021, the median age of New Brunswicker's was 46.2, which is the second highest across Canada (*n.b.*, Canada's median age was 41.1) with only Newfoundland and Labrador at 47.8 having an older median age. Based on current population trends, it is expected that those 55 and older will account for a higher proportion of the population than people aged 15 to 54 by the mid-2040s [*GNB*, 2022b]. Women represent a greater proportion of the population 25 years+ while men are the dominant group for those < 25 years old (Figure 67). About 90 % and 3.5 % of the population, respectively, identifies English and French as their mother tongue.

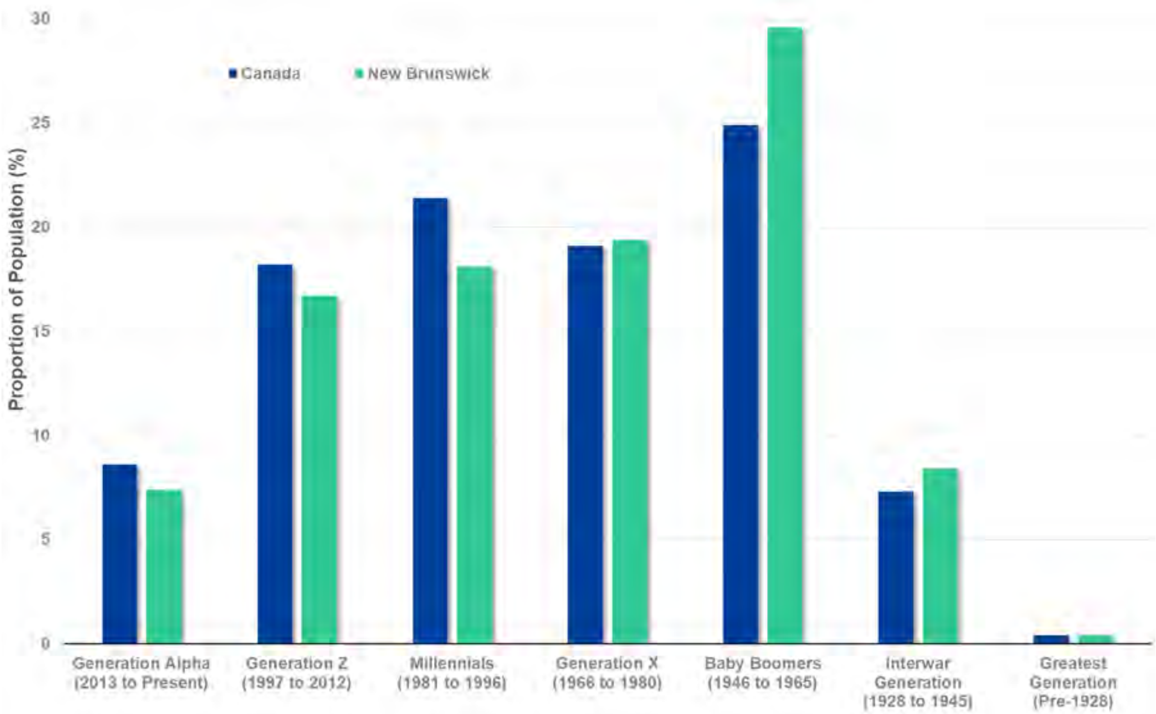


Figure 66. 2021 Statistics Canada data for New Brunswick's age class generations compared to Canada's age class generations.

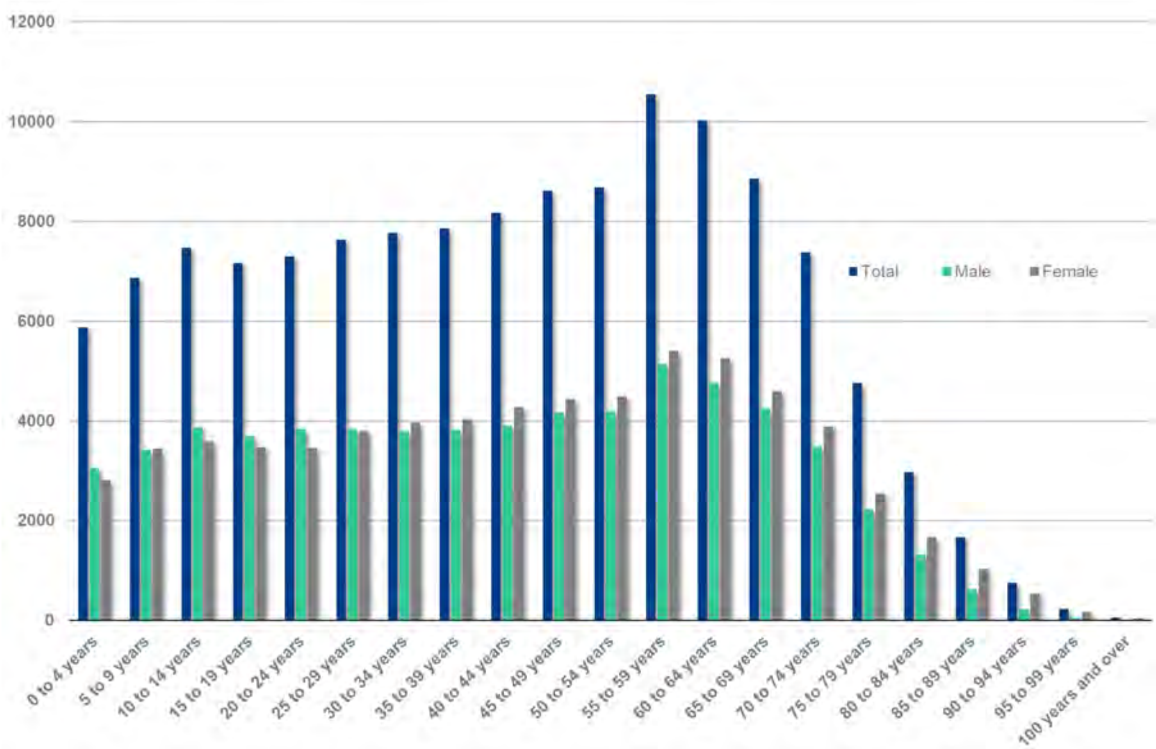


Figure 67. 2021 Statistics Canada demographics of the Saint John Census Metropolitan Area of New Brunswick.

At 3 510 km^2, the Saint John CMA represents about 4.9 % of New Brunswick's landmass. In 2021, the total number of private dwellings within the CMA was 55 865 and the average number of persons occupying each household was 2.3 [*StatsCan*, 2022a]. Although there are urban, suburban, and rural areas of the CMA, residential development is considered scatterized [*Urban Strategies*, 2011]. The population density is ~ 37.2 persons · km^{-2}.

3.3.2 Economy and Labour

In 2021, the Province's Gross Domestic Product (GDP) was $31.9 billion chained to 2012 dollars [*StatsCan*, 2022b]. The labour force at that time was about 389 465 [*StatsCan*, 2022a]. New Brunswick has a resource-based economy that is largely dependent on forestry, mining, and fishing. Tourism, agriculture, small-scale manufacturing, and a growing service sector provide balance and diversity. Real economic growth tends to be at or above the regional average for the Atlantic Provinces and is largely due to oil refining, telecommunications, computer software development, and natural gas distribution.

New Brunswick's monthly unemployment rate for January 2013 through June 2023 is shown in Figure 68. Unemployment was its greatest in June 2020 when it hit 12.1 %. That high unemployment rate coincided with the onset of the global COVID-19 pandemic and when health security restrictions and measures were the most stringent. During the decade shown, unemployment was at its lowest in May 2017 when it was 5.1 %. The largest economic region for employment in New Brunswick is typically the southeast (*i.e.*, Albert, Westmorland, and Kent Counties), which includes the Moncton census metropolitan area.

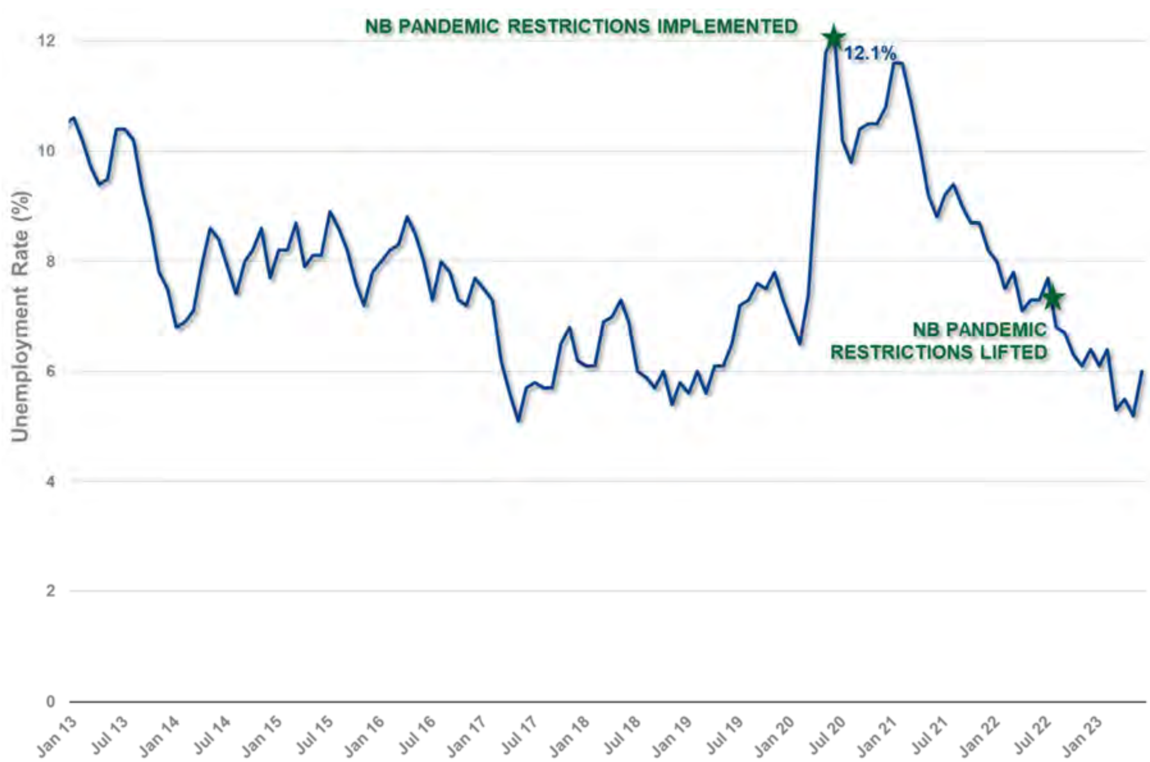


Figure 68. New Brunswick three-month moving average seasonally adjusted unemployment rate between January 2013 and June 2023 based on data from New Statistics Canada (Table 14-10-0380-01).

The workforce (*i.e.*, people aged between 15 and 64) comprises about 64.8 % of the Canadian population. Within that group, 21.8 % of individuals are close to retirement age (*i.e.*, between 55 and 65). 2016 was the first year that the number of individuals ≥ 65 exceeded those ≤ 15. Since then, those ≥ 65 has continued to grow. These numbers show that Canada's workforce is aged and will likely create challenges within the workforce. Such challenges include knowledge transfer, retaining experienced employees, and workforce renewal.

The most recent labour force survey data available for the Saint John CMA are from 2017 [*StatsCan*, 2022a]. A summary of the labour force by employment sectors is provided in Table 22. In 2017, the top five industries that employed people were: health care and social assistance; retail trade; construction; manufacturing; and educational services. IPP employees would largely be considered part of the manufacturing sector (*i.e.*, some would be part of administrative support and management).

Table 20. Statistics Canada labour force employment according to the North American Industry Classification System 2017 for the Saint John Census Metropolitan Area of New Brunswick.

Industry Sector*	Number of Employees	Percentage of Total Employees
Health care and social assistance	10 565	16.2
Retail trade	8 335	12.8
Construction	4 845	7.4
Manufacturing	4 650	7.1
Educational services	4 450	6.8
Professional, scientific, and technical services	4 220	6.5
Public administration	4 030	6.2
Accommodation and food services	4 025	6.2
Administrative and support, waste management, and remediation services	3 690	5.7
Transportation and warehousing	2 965	4.6
Other services, except public administration	2 840	4.4
Finance and insurance	2 375	3.6
Wholesale trade	2 055	3.2
Utilities	1 430	2.2
Information and cultural services	1 360	2.1
Arts, entertainment, and recreation	970	1.5
Real estate and rental and leasing	930	1.4
Agriculture, forestry, fishing, and hunting	900	1.4
Mining, quarrying, and oil and gas extraction	355	0.5
Management of companies and enterprises	170	0.3
TOTAL	**65 160**	**100**

NOTES: *North American Industry Classification System

Saint John is located within the Southwest Economic Region of New Brunswick, which encompasses Charlotte, Kings, and Saint John Counties (*i.e.*, 12 % of New Brunswick's land area). In 2021, the region was home to about 173 757 people [*StatsCan*, 2022a]. Saint John County where the Mill is located comprises about 44.1 % of the Southwest Economic Region's population as summarized in Table 21. Although the County recently underwent a population increase, it experienced a 6 % population reduction between 1991 and 2021.

Table 21. Southwest New Brunswick Statistics Canada population data by County and Census Year.

County / Region	Area (km²)	1991	1996	2001	2006	2011	2016	2021	% Change*
Saint John County	**1 462**	**81 460**	**79 305**	**76 407**	**74 621**	**76 550**	**74 020**	**76 558**	**- 6.0**
Charlotte County	3 424	26 610	27 335	27 366	26 898	26 549	25 428	26 015	- 2.2
Kings County	3 482	62 120	64 720	64 208	65 824	69 665	68 941	71 184	14.6
Southwest economic	8 368	170 190	171 360	167 981	167 343	172 764	168 389	173 757	2.1
New Brunswick	72 908	723 900	738 135	729 498	729 997	751 171	747 101	775 610	7.1

NOTES: *Between 2021 and 1991

The Southwest Economic Region of New Brunswick has a relatively balanced economy. Over one quarter of employment in the region is within the sales and service occupations (Table 22). After the public sector is accounted for, most individuals are employed in the trades, manufacturing, and construction.

Table 22. 2021 Statistics Canada labour force employment according to the National Occupational Classification system for the Southwest Economic Region of New Brunswick.

Occupational Classification	Number of Employees	Percentage of Total Employees
Sales and service	22 735	26.5
Trades, transport, and equipment operators	14 930	17.4
Business, finance, and administration	13 235	15.4
Education, law and social, community and government	10 925	12.7
Health	7 875	9.2
Natural and applied sciences and related	6 140	7.2
Manufacturing and utilities	4 380	5.1
Natural resources, agriculture, and related	3 095	3.6
Art, culture, recreation, and sport	1 560	1.8
Legislative and senior management	815	1
TOTAL	**85 690**	**100**

Some of the largest employers in the Southwest Economic Region of New Brunswick are:

- Horizon Health Network;
- Anglophone South School District;
- Bell Aliant;
- Irving Oil;
- J.D. Irving, Limited;
- Cooke Aquaculture Inc.;
- University of New Brunswick;
- Wyndham Worldwide Canada; and
- City of Saint John.

3.3.3 Wages and Income

As expected, incomes vary across New Brunswick [*StatsCan*, 2022a]. Table 23 summarizes the median before and after-tax incomes for individuals and households in New Brunswick, the Saint John CMA, and the southwest Economic Region. The data suggest that individuals and households in the Saint John CMA earn more than the average New Brunswicker and those within the Southwest Economic Region.

Table 23. Statistics Canada 2020 economic characteristics for individuals and families living in New Brunswick, the Saint John Census Metropolitan Area, and the Southwest Economic Region of New Brunswick.

Economic Characteristic	New Brunswick	Saint John CMA	Southwest Economic Region
Individuals			
Median income before tax	$37 600	$40 000	$38 800
Average income before tax	$45 920	$50 360	$46 680
Median income after-tax	$34 000	$35 600	$34 800
Average income after-tax	$38 800	$41 680	$40 560
Households			
Median income before tax	$70 000	$74 000	$72 000
Average income before tax	$85 400	$93 700	$90 400
Median income after-tax	$62 000	$65 000	$63 600
Average income after-tax	$72 000	$77 600	$75 300

Although the average individual and households within the Saint John CMA earn wages greater than New Brunswickers, in 2020, there were 10 615 individuals in the Saint John CMA (*i.e.*, 8.1 % of individuals) living in poverty [*StatsCan*, 2022c]. The majority (*i.e.*, 2 020 individuals) were between the ages of 55 and 64 (Figure 69), or those nearing retirement age.

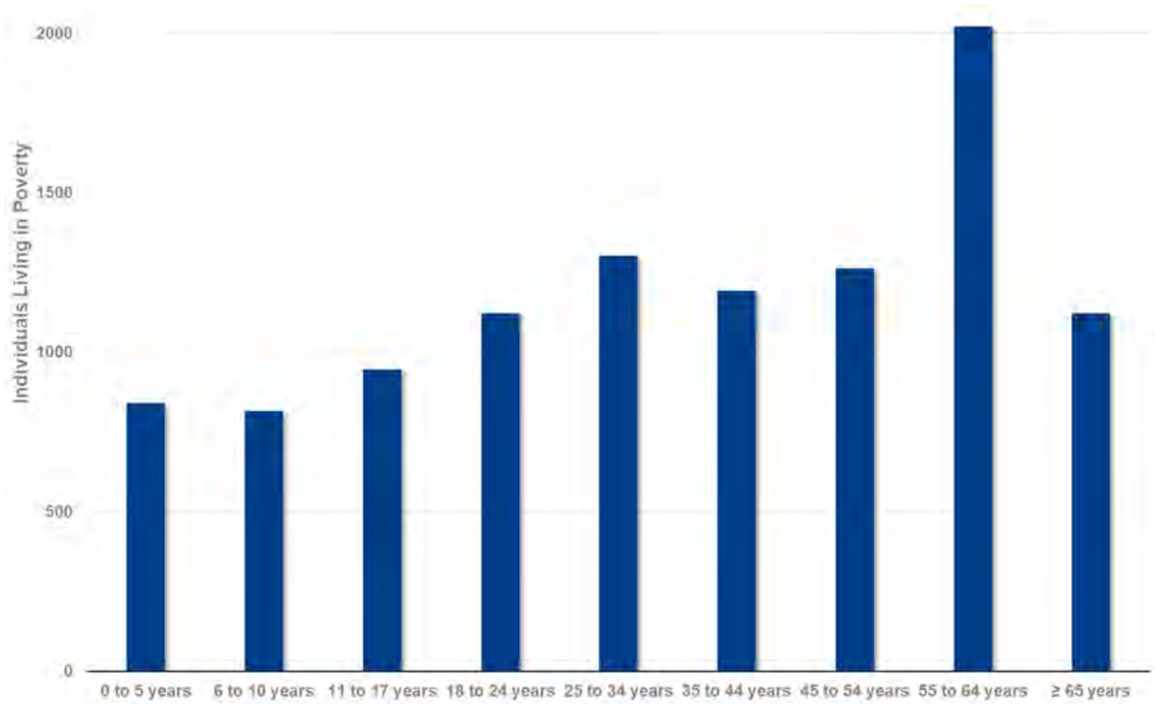


Figure 69. Statistics Canada 2020 age demographics of those living in poverty for the Saint John census metropolitan area, New Brunswick.

3.3.4 Archaeological and Cultural Features

Due to the historical industrial use of this land, the potential for significant archaeological and / or cultural resources to be present at the Project site is very low. However, because there is a remote possibility that a find could be made, the Project-specific EPP will explicitly identify the processes that must be followed by Project personnel in the event of a find.

Archaeological predictive modelling was requested for the Project site through the New Brunswick Department of Tourism, Heritage, and Culture. The results are presented in Appendix VII and summarized in Figure 70. The information shows that two First Nations pre-contact sites located on either side of the Reversing Falls Bridge. (*n.b.*, those sites were previously disturbed). The modelling from the province also suggests that there is a high potential to encounter First Nations material and remnants of historic settlement adjacent to the Saint John River.

An historic portage route used by First Nations for bypassing the Reversing Falls is shown in Figure 70 as is an historic portage route in the artificial channel that now separates Greenhead from the mainland. An archaeological site on an elevated rock promontory with unimpeded panoramic views is associated with that portage route. The 5 100 m^2 Bentley Street Archaeological Site, which was designated as a protected archaeological site in 1998, is located nearby. The site has associations with about 4 000 years of First Nations history and thousands of artifacts have been recovered from the site, including stone tools and soapstone bowls. The artifacts collected suggest that the site was used for ceremonial purposes and was connected to sites at Portland Point and Marble Cove.

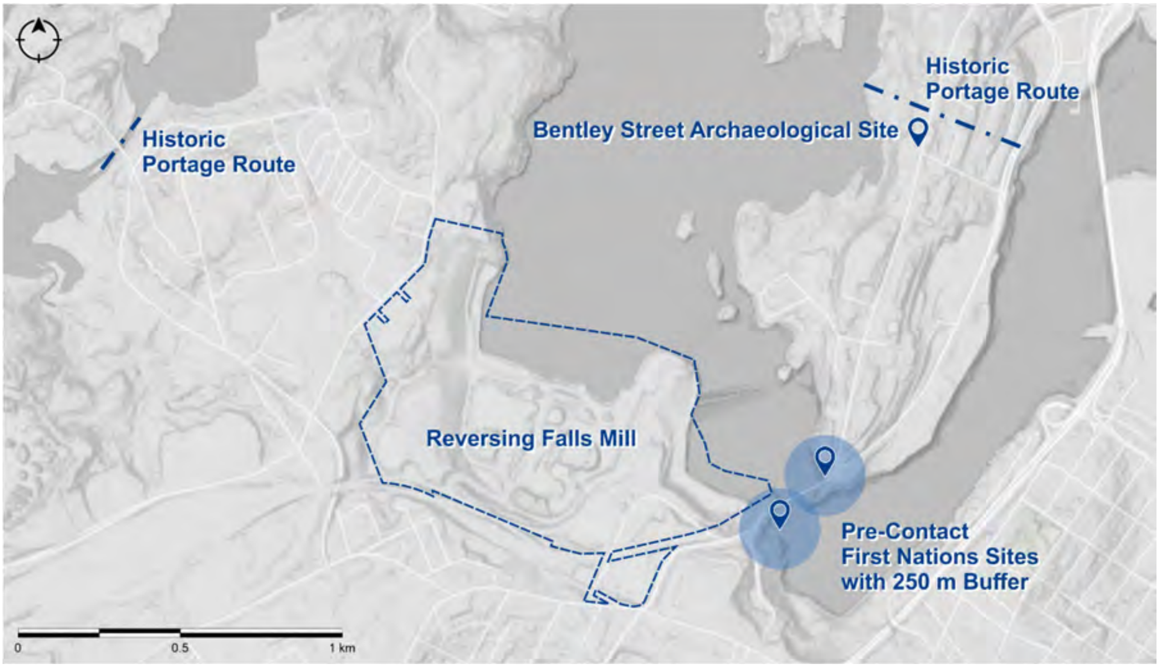


Figure 70. Summary of known archaeological sites in the vicinity of the Reversing Falls Mill Project site in Saint John, New Brunswick. Source: New Brunswick Department of Tourism, Heritage, and Culture.

3.3.5 *Traditional Uses by First Nations*

The history of First Nations is not widely known in New Brunswick. The oldest site, just off the Marysville Bypass outside of Fredericton, confirms that First Nations lived on the land at least 12 000 years ago following the glacial retreat. The three Nations that lived and survived off the lands are the Wolastoqiyik / Wəlastəkewiyik / Maliseet, the Mi'kmaq / Mi'kmaw, and the Peskotomuhkati / Passamaquoddy. Although they chose to settle in places near the plants and animals they depended upon for food, medicines, ceremony, and sacred spiritual objects, they migrated through the entirety of the lands in New Brunswick.

The Mill site is located adjacent to Reversing Falls (Gtchi-quaabeet-a-wi-cup-ahegan / great beaver's dam). *Pawling* [2017], notes that birchbark canoes, the traditional transportation of First Nations, could only run the Reversing Falls four times during a 24 hour period, probably for only 15 minute to 20 minute intervals during slack tide. If the tide was not optimal for traversing the falls, a short portage provided alternative access to the Bay of Fundy. A 1604 chart drawn by Samuel de Champlain of Saint John shows a portage route on the opposite side of the falls from the location of the existing Mill (Figure 71; extending from Marble Cove up and over the Douglas Avenue ridge to the Saint John Harbour). It is likely that was the route used by First Nations to navigate the falls (*i.e.*, near the New Brunswick Museum along Douglas Avenue and the Bentley Street Archaeological Site along Chesley Drive shown in Figure 70) [*Raymond*, 1905].

Reversing Falls and adjacent lands are an important Wolastoqey cultural feature and sacred story land and waterscape. According to Wolastoqey stories recorded over century ago, the Reversing Falls passageway as well as Split Rock and other localized features within the passageway were reshaped long ago by Klouskap, the Wolastoqi cultural hero.

As such, the passageway and adjacent lands are an important Wolastoqi cultural land and waterscape that hold spiritual, cultural, and historic significance. In the 17th century, a French writer revealed that Wolastoqiyik left ceremonial offerings of furs upon a wooden feature that sometimes surfaced within a pool located below the Reversing Falls rapids when they paddled through it. Wolastoqiyik considered that wooden feature to be Manitou (spirit). The editor of a republished version of the 17th century source placed that feature on the west side of the river, just above Union Point. In the 19th century, Wolastoqi paddlers continued leaving offerings in the Reversing Falls passageway near Klouskap's Face, another cultural landscape feature that is located on the opposite side of the Wolastoq from the Mill site.

The 1604 chart also depicts an historic Wolastoqey settlement located below the Mill site on the northeast shore of the upper Saint John Harbour. Today, on the opposite side of the Wolastoq from the Mill site northeast of Marble Cove is a Saint John neighbourhood known as Indiantown. The neighbourhood received its name because it was an important place of trade between Wolastoqiyik and the British in the late 18th and early 19th centuries.

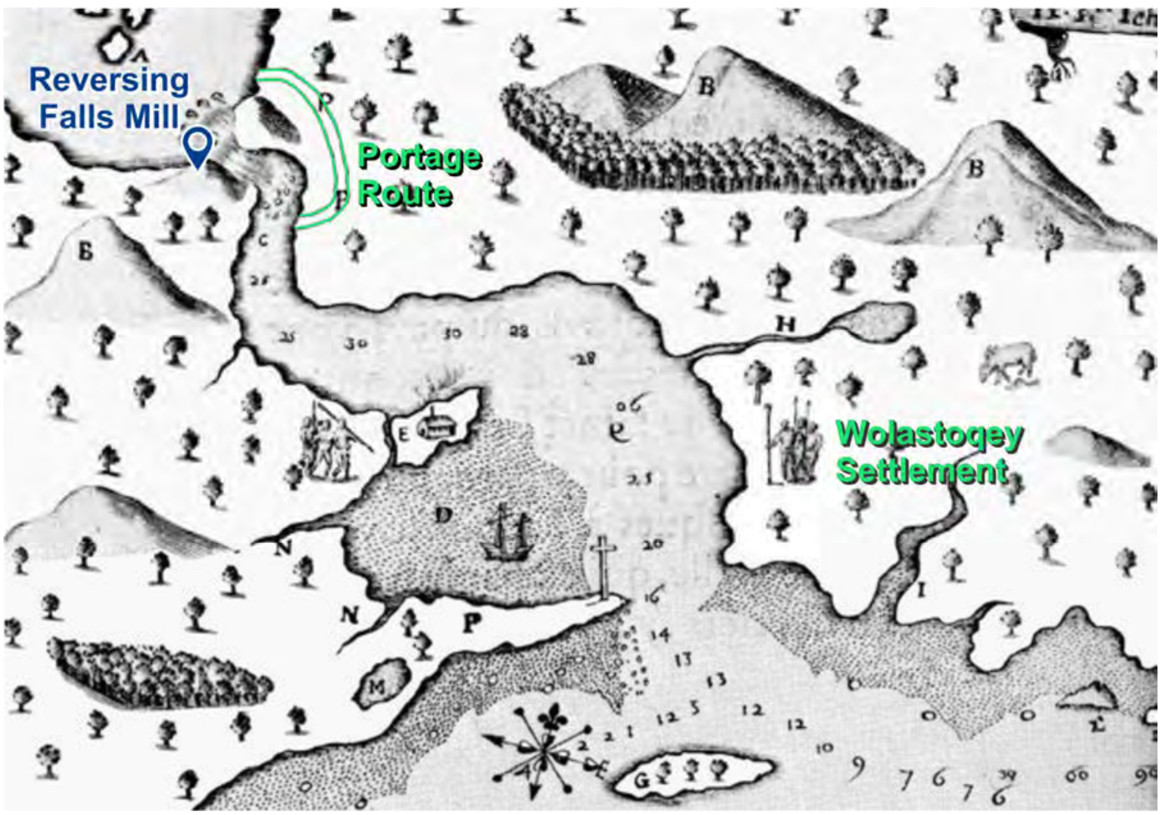


Figure 71. A copy of Samuel de Champlain's 1604 chart of the Saint John Harbour. From *Raymond* [1905].

Today, there are 15 recognized First Nations communities in New Brunswick (Figure 72); six Wolastoqiyik and nine Mi'kmaq. The Peskotomuhkati, which were only recognized as still existing in New Brunswick, have begun a process of seeking recognition for a community near St. Stephen as depicted in Figure 72 [*PNS*, 2022]. There are lands near the Mill site that have been used by First Nations for millennia. The Brothers Island Indian Reserve (*i.e.*, Indian Island, Goat Island, and Burnt Island) is located approximately 5 km to the North of the Mill in the Kenepekachiachk / Kennebecasis River (*i.e.*, little, long bay place; Figure 73). In the past, this reserve was home to a Wolastoqey settlement and Wolastoqiyik who lived there fished, traded, hunted marine mammals, and cultivated crops. There is no longer a permanent Wolastoqey community on those lands; however, Wolastoqiyik continue to occupy and use the reserve for traditional purposes.

All lands of New Brunswick are subject to the Treaties of Peace and Friendship that the First Nations signed with the British Crown in 1726 and renewed in specific agreements thereafter. The Treaties of Peace and Friendship established rules for an ongoing relationship of peace, friendship, and mutual respect between nations for two very different modes of life and land-use. First Nations assert Aboriginal and treaty rights through those Treaties of Peace and Friendship, which are protected under Section 35 of the Constitution Act, 1982 [**U.K., 1982, c 11**].

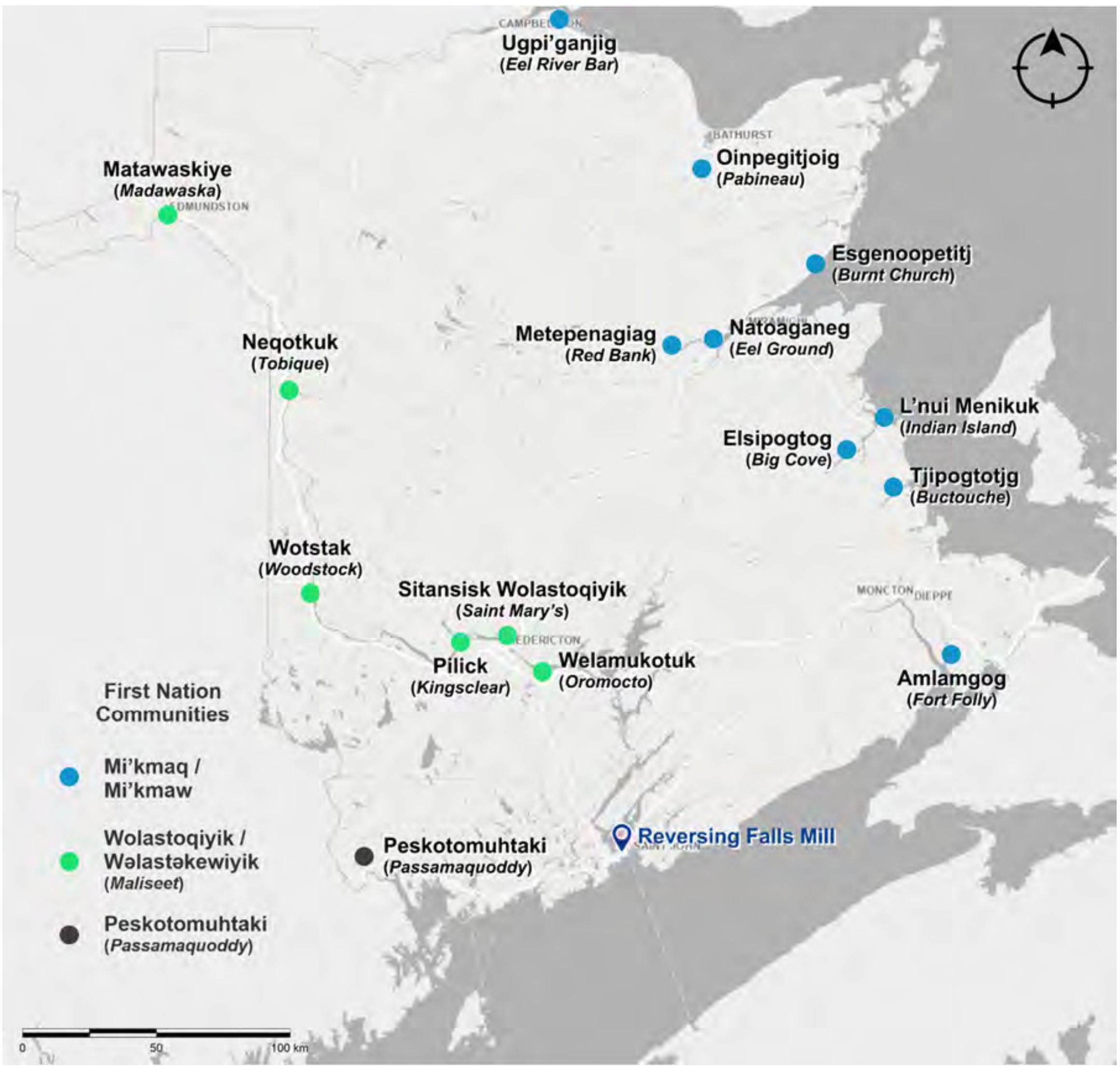


Figure 72. New Brunswick's First Nations communities.

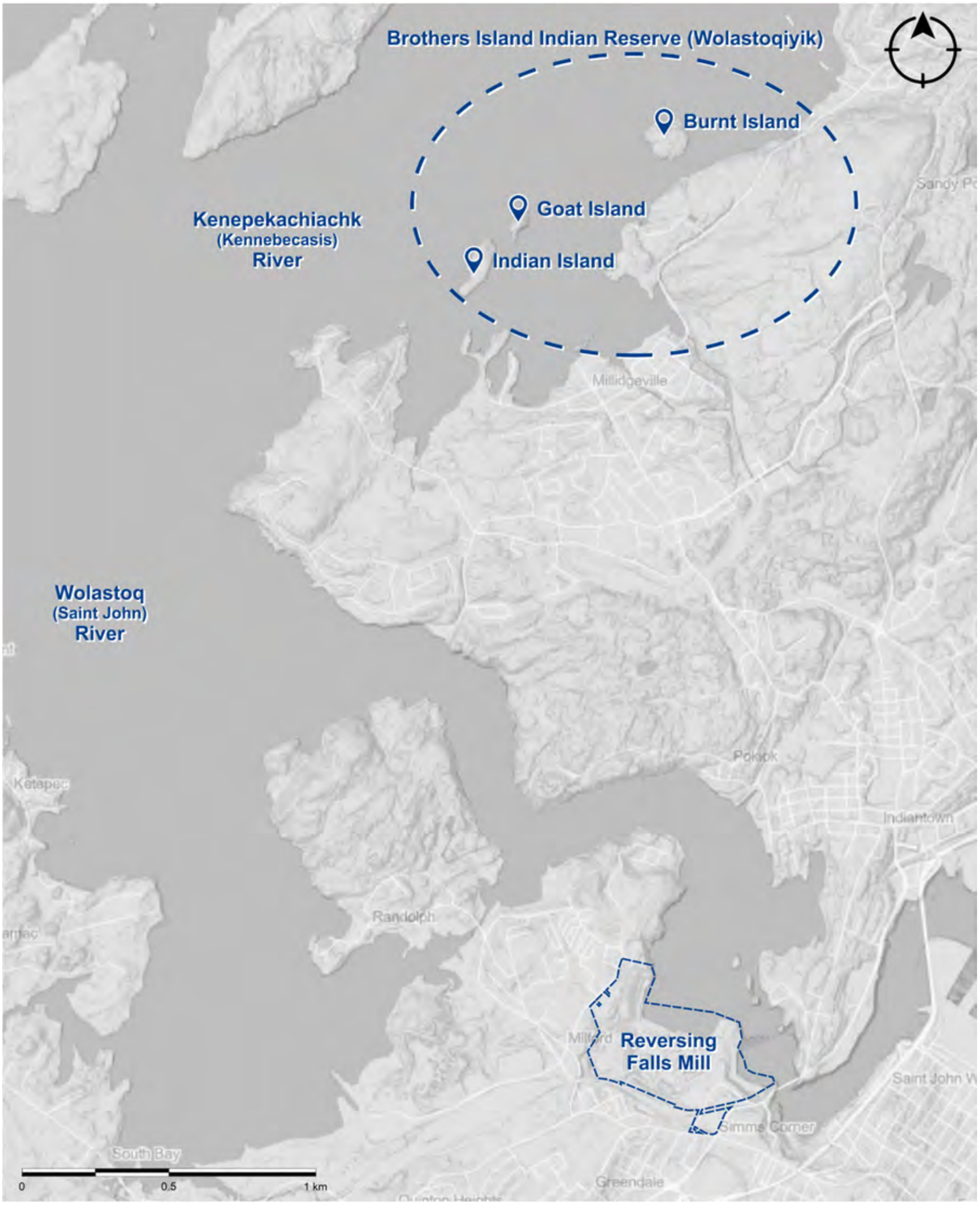


Figure 73. Aerial photograph showing the location of Goat Island, Indian Island, and Burnt Island, which together form the Brothers Island Indian Reserve, in relation to the Reversing Falls Mill in Saint John, New Brunswick.

3.3.6 Historical Land-Use

The point of land the Mill sits atop was known historically as Union Point, which is located within Lancaster Parish of Saint John County. Since the mid- to late-1800s, the site has been home to heavy industrial activities related to pulp and paper making. The Provincial Archives of New Brunswick does note that in 1866, Union Point had 55 families. It is inferred that those families were present for the operation of the local mill. The settlement of Union Point Road, located nearby, had six resident families at that time. Information on Union Point is scant; however, what information could be compiled from historical references is provided below and summarized in Table 24. What is clear is that Union Point has been the site of industrial activity for > 175 years. Previous mills have burned down while others endured financial hardships. At 70 years+, IPP has been present at the site the longest.

Table 24. Historical timeline of the use of the Union Point lands, now known as the Reversing Falls Mill in Saint John, New Brunswick.

Year	Description
Cunnabells Sawmill	
1836 / 1837	➢ St. John Mills and Canal Company constructed and operated the Cunnabells Sawmill at Cunnabelle Point (Union Point)
1850	➢ Colonel John E. Goddard (1811-1870) purchased the Cunnabells sawmill and operated it with his son Charles W. (1844-?)
Andre Cushing and Company Mill	
1852	➢ Brothers Theophilus (1802-1881) and Andre Cushing (1820-1891) purchased the Cunnabells sawmill and renamed it the Andre Cushing and Company Mill, a steam sawmill with four grates for manufacturing pine lumber for US markets
1855	➢ Fire destroyed the sawmill ➢ The sawmill was rebuilt ➢ Started manufacturing sugar box shooks and cheaper qualities of lumber for the West India market
1857	➢ Theophilus's son George Byron Cushing (1831-1888) became a partner in the firm
1861	➢ Theophilus retired and transferred his interest in the firm to his son George
1869	➢ Fire destroyed the sawmill ➢ The sawmill was rebuilt
10 April 1895	➢ Fire destroyed the sawmill that employed about 250
Andre Cushing and Company Mill and Cushing Sulphite Fibre Company	
1896	➢ The sawmill was rebuilt and the Cushing Sulphite Fibre Company was co-located at the site to process waste from the mill ➢ Together, the two companies employed approximately 550 people
Saint John Pulp & Paper Company	
Circa 1900s	➢ Saint John Pulp & Paper Company, with operations at Mispec Point, purchased the mills at Union Point
Partington Pulp & Paper	
1911	➢ English Industrialist Edward Partington (1836-1925), the first Baron of Doverdale, purchased the Saint John Pulp & Paper Company and rebranded it as the Partington Pulp & Paper
1913	➢ Machinery (two small digesters, a pulp drying machine, screens, *etc.*) was moved from the pulp and paper operations at Mispec Point to the Union Point mill
Nashwaak Pulp and Paper Company	
1916	➢ Bryant Paper Company and the Oxford Paper Company purchased the Edward Partington Pulp and Paper Company and operated as the Nashwaak Pulp and Paper Company

Year	Description
	➢ Daily sulphite production capacity was 120 tons
1930	➢ The Nashwaak Pulp and Paper Company was shuttered
Port Royal Pulp & Paper Co. Ltd.	
1932	➢ Brothers Edward Lacroix (1889-1963) and Charles Lacroix of Quebec purchased the shuttered Mill
1933	➢ The Mill reopened under the name Port Royal Pulp & Paper Co. Ltd.
Saint John Sulphite Ltd.	
1946	➢ K.C. Irving (1899-1992) purchased Port Royal Pulp & Paper Co. Ltd. when it fell into financial troubles and initially operated as Saint John Sulphite Ltd.
Irving Pulp & Paper, Limited	
1951	➢ Saint John Sulphite Ltd. renamed to Irving Pulp & Paper, Limited (IPP) ➢ IPP has continuously operated the Reversing Falls Mill since 1946 ➢ Present production is 1 000 Air Dry Metric Tonnes per day of pulp and employees number ~ 350

Since its purchase by IPP, the Mill has undergone many upgrades and expansions to remain globally competitive. A 1953 aerial photograph of the site shows the existence of some residences on the swath of land between the railroad tracks and the Mill where the Tissue Plant currently exists (Figure 74). The Mill underwent expansion following the purchase by IPP. Land was acquired for the expansion, which included residential lots.

Aerial photographs of the Mill since being taken over and operated by IPP are shown in Figure 74 through Figure 80. The photographs show progressive expansion of the Mill site, primarily through development of previous residential and vacant lands towards the railway tracks.

Figure 74. Aerial photograph, circa 1953, of the Reversing Falls Mill in Saint John, New Brunswick.

Figure 75. Aerial photograph, circa 1960, of the Reversing Falls Mill in Saint John, New Brunswick.

Figure 76. Aerial photograph, circa 1976, of the Reversing Falls Mill in Saint John, New Brunswick.

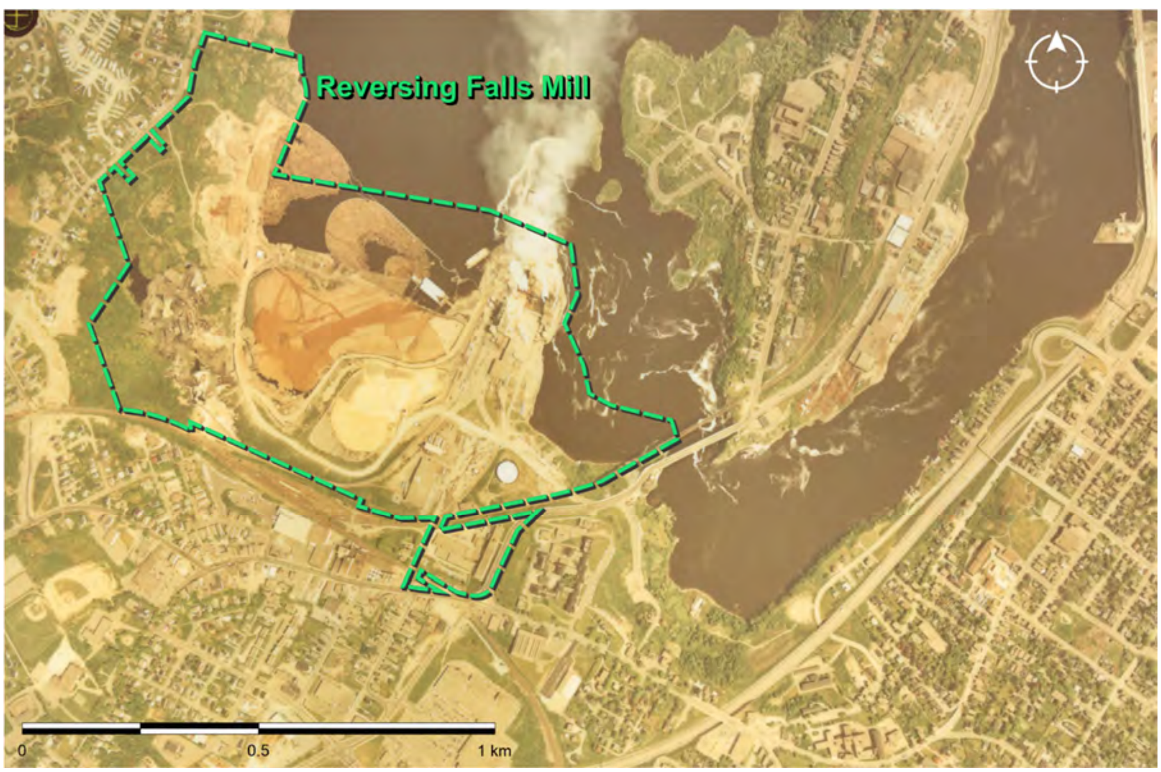


Figure 77. Aerial photograph, circa 1984, of the Reversing Falls Mill in Saint John, New Brunswick.

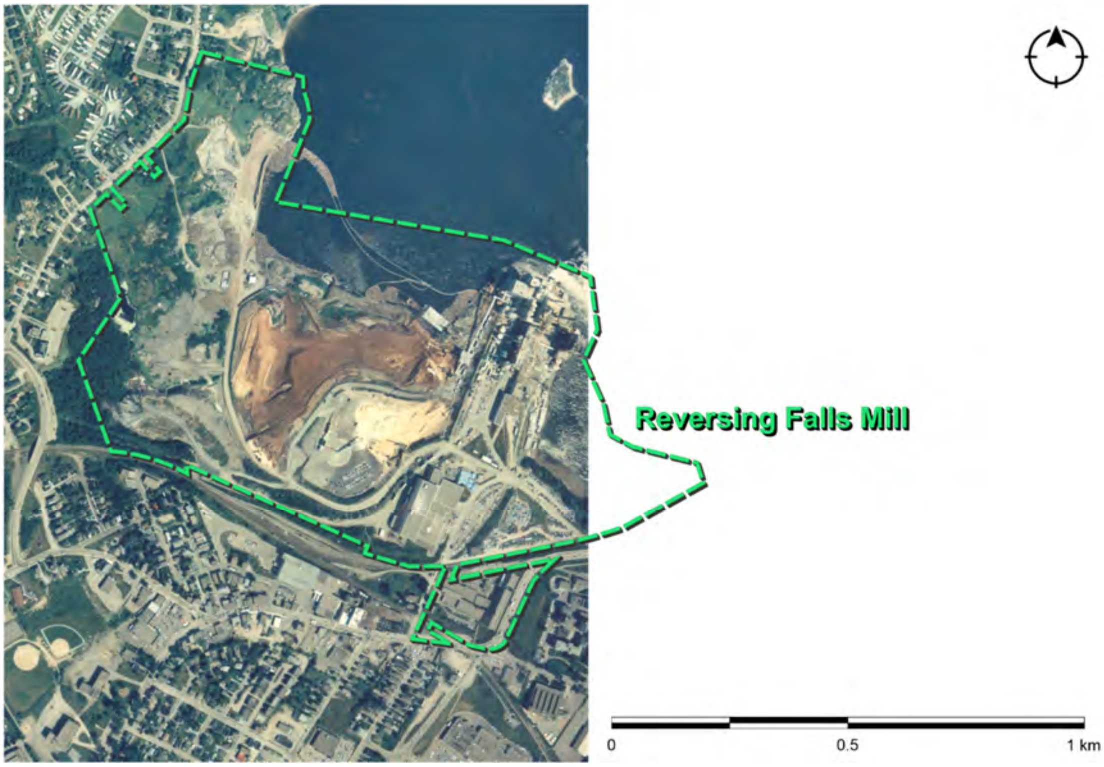


Figure 78. Aerial photograph, circa 1994, of the Reversing Falls Mill in Saint John, New Brunswick.

Figure 79. Aerial photograph, circa 2004, of the Reversing Falls Mill in Saint John, New Brunswick.

Figure 80. Aerial photograph, circa 2021, of the Reversing Falls Mill in Saint John, New Brunswick.

3.3.7 Health and Safety

Started in 1849, the Saint John Police Force (SJPF) is one of the Canada's oldest police departments. The SJPF has about 140 sworn and 50 civilian members [*EY*, 2020]. Services the SJPF provides are: victim services and service planning; crime prevention; emergency response (*e.g.*, 911, emergency tactical services, canine, *etc.*); law enforcement (*e.g.*, patrol, criminal investigations, traffic, integrated intelligence, *etc.*); and public order (*e.g.*, by-law enforcement).

Typically, the SJPF handles 55 000 calls annually of which between 3 500 and 4 000 are offences (*i.e.*, violent crimes and property crimes combined). The SJPF is headquartered at One Peel Plaza in the heart of Saint John but does operate some community police offices in priority neighbourhoods of the city.

The Saint John Fire Department (SJFD) has been operating in the city since 1786. The SJFD focuses on reducing the loss of life, personal injury, property damage, and impact on the environment caused by fire, accident, medical emergency, and hazardous materials release. Some of the many services the ~ 165 member SJFD provides include: fire rescue and suppression; technical rescue; hazardous materials emergency response; fire prevention; fire investigation; and medical first response [*EY*, 2020].

Existing in Canada's oldest incorporated city that is the most industrialized in eastern Canada, the SJFD strategically focuses on developing their response to support high risk industrial operations, including refining, processing, manufacturing, and energy related industries. The SJFD responds to around 5 000 calls annually of which about 60 % are medical calls [*EY*, 2020]. Saint John's fire service is operated from six stations scattered throughout the city.

Saint John has an Emergency Management Organization (EMO), which is dedicated to emergency preparedness, mitigation, response, and recovery for both natural and anthropogenic disasters. The goal of the EMO is to minimize the impact of emergencies on residents, property, and environment. Major emergencies the EMO prepares for include: floods; wind storms; power outages; severe storms; storm surges; wild fires; disease outbreaks; and hazardous materials.

Ambulance New Brunswick (ANB) provides land and air ambulance services throughout New Brunswick. ANB's team comprises more than 1 000 health care professionals, including primary care paramedics, emergency medical dispatchers, and critical care flight nurses.

The Reversing Falls Mill is a heavy industrial site. Approximately 480 people are employed at the Mill for routine operations (*n.b.*, many more people are employed during regular operation and maintenance programs). As described in Section 2.8.2.8, a detailed and site-specific health and safety program is in place at the Mill.

3.3.8 Transportation Network and Links

Saint John is strategically located on a natural harbour about 100 km from the US border and within 48 hours travel to major markets in central Canada and the Atlantic seaboard. Because of its location, Saint John is a gateway for trade to the Maritimes, Atlantic markets in North and South America, and Europe. Various components of the transportation network and their links are described below.

Saint John has an intricate web of roadways. A network of provincial and municipal roads provides access to the Mill site. The Saint John Throughway (*i.e.*, NB Route 1) is a four-lane divided highway that is maintained by Transfield Dexter Gateway Services Ltd. Municipal roads, such as Bridge Road and Chesley Drive (*i.e.*, together forming NB Route 100) are two-lane asphalt roads that are maintained by the City of Saint John. Within the Mill site, there is a series of private roads, which are maintained by IPP, for accessing specific areas (*i.e.*, Mill Street, Mill Cove Road, and Woodyard Road). All the roadways described above are designed for heavy truck traffic and / or are truck routes (Figure 81).

Port Saint John, Atlantic Canada's largest port by volume, has major international port facilities at the head of Saint John Harbour near the mouth of the Saint John River (Figure 81) [*PSJ*, 2021]. The Port of Saint John is a recognized port of national significance and one Canada's marine gateways for domestic and international trade and tourism. Port Saint John's facilities are linked to major railroads and highways.

The Port has several berths capable of supporting a wide variety of vessels and there are several expansive laydown areas within the Port's landholdings. There is also a wide range of facilities to handle all types of cargo and is essential to some of New Brunswick's major industries. The Port's diversified operations cross six business sectors: liquid bulk; dry bulk; break bulk; containers; cruise; and indirect marine-related activities [*PSJ*, 2021].

In 2021, the Port processed 28.8 million metric tonnes of cargo and 86 949 twenty-foot equivalent unit containers [*PSJ*, 2021]. Liquid bulk represents the largest cargo and is typically > 95 % of the annual cargo. Cargo levels peaked in 2017, fell in 2018 and have continued to rise since. Container numbers and numbers of vessel calls increased in 2017 when DP World Saint John took over operations at the cargo terminal. Cruise ship traffic was suspended in Canadian waters by Transport Canada in 2020 due to the global COVID-19 pandemic. As a result, Port Saint John experienced no cruise visits in 2020 and 2021. In 2019, 79 cruise ships with a total of 196 032 guests called on the Port.

In partnership with the Government of Canada and the Province of New Brunswick, Port Saint John is undergoing a seven year, $200 million+ West Side Modernization Project. The project will see much needed infrastructure upgrades at the Port's west side terminal. When complete in 2023, the longer, stronger pier, a 4.9 m deeper berth, and a 40 m wider channel will ensure Port prosperity and regional growth for years to come by having the ability to accommodate the New Panamax container vessel size). Annual throughput capacity is anticipated to double as a result and proper handling capabilities will be in place to service modern shipping fleets.

The Canadian National (CN) railway, which is the sole Class 1 Railroad in Atlantic Canada, and New Brunswick Southern Railway (NBSR) both serve Saint John. The NBSR has long line connections to CN, Canadian Pacific, Pan Am, and Maine, Montreal, Atlantic into the Maritimes, Central Canada, the US East Coast, and the Midwest. Transit times for most locations are about a week or less.

The Mill is serviced with rail by NBSR, which is also a division of JDI. Direct rail connections to other Atlantic Provinces and the US northeast are made via the NBSR. There are several spur lines into the Mill site (Figure 81). One of the spur lines is dedicated to woodchip unloading from rail cars while other spurs are used for delivering pulping chemicals and other process input materials and for exporting Kraft pulp.

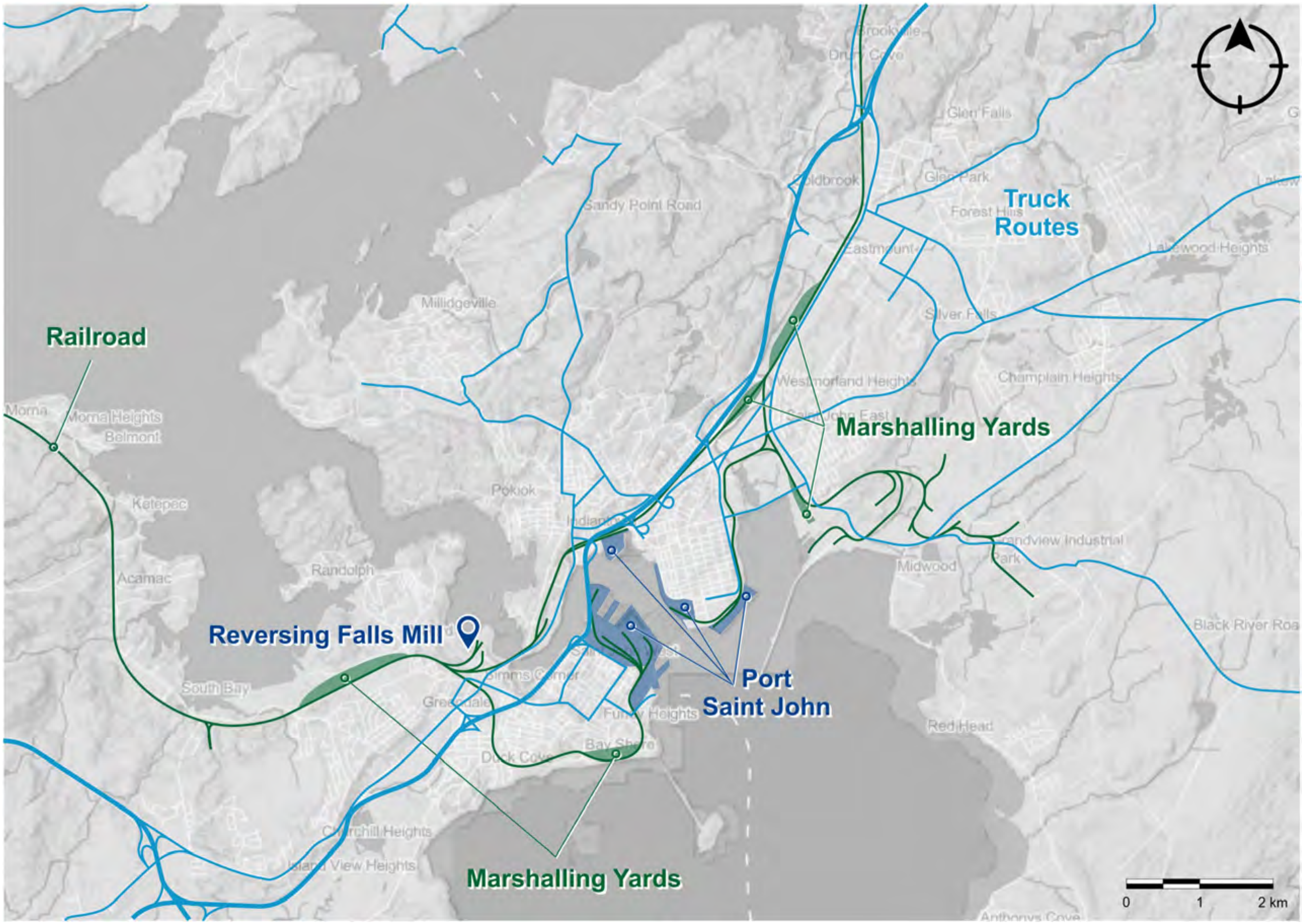


Figure 81. Map showing truck, railway, and port connections to the Reversing Falls Mill in Saint John, New Brunswick.

The Saint John Airport, YSJ, is in east Saint John about 15 km northeast of the City's center. The airport has two asphalt runways; runway 05 / 23 is 2 195 m long and runway 14 / 32 is 1 554 m long.

Air travel was significantly affected at YSJ because of the global COVID-19 pandemic and the industry is still recovering. Depending on the time of year, YSJ is serviced by up to four airlines: Air Canada; Sunwing; Flair; and Atlantic Charters. In 2019, YSJ underwent significant upgrades such that the airport now has one of the most modern and safe airfields in all of Canada. In 2019, the passenger count through YSJ was about 281 000. Medevac flights, cargo, and private carriers also use the airport daily. Although not a major cargo handling facility, Air Canada Cargo does process, store, and ship cargo at YSJ.

3.3.9 Municipal Services and Infrastructure

The City of Saint John provides many municipal services, including water and sanitary sewer, police and fire, transit, recreation, and many others. The core municipal services provided by the City of Saint John are described in more detail below.

Saint John Water (SJW), a department of the City of Saint John, is responsible for the delivery of water and sewer services within the city. SJW provides quality potable water and industrial water to all connected users within the city. Potable water conforms to the Water Quality Regulation [**82-126**] of the New Brunswick *Clean Environment Act* [**R.S.N.B. 1973, c. C-6**] and the Potable Water Regulation [**93-203**] of the New Brunswick *Clean Water Act* [**S.N.B. 1989, c. C-6.1**]. In Saint John, potable water receives treatment; coarse screening, chemical treatment and filtration, disinfection, and fluoridation. Industrial water is water that has not been treated.

The City of Saint John has an extensive water network with over 510 km of distribution and transmission water pipes [*EY*, 2020]. Potable water is primarily sourced from the Loch Lomond surface water system in the east and the Southbay groundwater system in the west (*n.b.*, there is also a small wellfield in Red Head for residents of the Harbourview Subdivision). Industrial water is sourced from Spruce Lake in the west and Loch Lomond in the east.

Wastewater is collected from residential, commercial, and industrial clients within the city and transported to treatment plants through an extensive network of sewer lines and pumping stations. SJW operates seven wastewater treatment facilities, 38 wastewater pumping stations, and 510 km of sanitary and storm sewers in the city. Through the implementation of *Harbour Cleanup*, the City of Saint John has treated all of the sanitary waste collected within the city since 2006 before discharge to a receiving water body, such as the Bay of Fundy.

Potable water, industrial water (*i.e.*, process water), and fire water at the Mill are all supplied by the City of Saint John. Sanitary waste generated at the Mill is sent to the municipal collection system.

The City of Saint John has a residential solid waste management program only. Garbage, compost, and recyclables are collected and transported by truck to the Crane Mountain Landfill operated by the Fundy Region Solid Waste Commission. Multi-unit residences (*i.e.*, five or more units), commercial properties, and industry are responsible for their own solid waste management, which is generally contracted through one of several waste management haulers (*e.g.*, GFL Saint John, Fero Waste & Recycling, *etc.*). The Mill has contracts in place whereby solid waste is transported to the Crane Mountain Landfill and compostable materials that are not burned in the biomass boiler are sent to facilities such as Envirem Organics Inc.

The Saint John Transit Commission (SJTC) was established in 1979 to provide scheduled transit service throughout the City. The SJTC also has scheduled service to some outlining communities through the COMmunity EXpress (COMEX) service. As the largest public transit system in New Brunswick, the SJTC has a ridership of about 2.1 million passengers annually. On average, ridership is 50 % higher for the SJTC when compared to other Canadian cities with a population between 50 000 and 150 000.

3.3.10 Aesthetics

As Canada's first incorporated city, Saint John has a rich collection of historic buildings. It is a city that has largely built out, not up; in 2021, the population across the 316 km^2 City was only 69 895 [*StatsCan*, 2022a]. Only a few tall office buildings (*e.g.*, Bell, Brunswick House, City Hall, Hilton Saint John, Irving Oil Home Office, 300 Union, *etc.*) and churches (*e.g.*, St. John's Anglican Stone Church, Trinity Church, St. Andrew and St. David, Cathedral of the Immaculate Conception at Saint John, *etc.*) dominate Uptown Saint John's skyline (Figure 82). Saint John's east side and west side skylines are dominated by long-lived industries that are major regional employers. To the east are industries such as Bayside Power, the Saint John Refinery, and Irving Paper while to the west are industries such as Moosehead Breweries and the Mill.

Figure 82. Panoramic photographs showing the skyline of east Saint John, Uptown Saint John, and west Saint John, New Brunswick.

3.3.11 Recreation and Tourism

The Mill site is a private and secure facility. It is not part of any International, National, Provincial, or Municipal Park. It does not comprise a migratory bird sanctuary, ecological reserve, wildlife management area, wildlife refuge, or game sanctuary. The site is not protected environmentally in any manner (*i.e.*, protected watershed, wellfield protection zone, and / or protected natural area). This was confirmed through information reviewed within the ACCDC databases and mapping available from the NBDNRED, the NBDELG, and the City of Saint John.

Hundreds of thousands of people are drawn to the region each year for the rich urban architecture, the region's natural beauty, and the unique maritime culture. The cruise ship business began in 1989 when a ship was forced into port during a hurricane. Since then, more than three million passengers have called on Saint John. There are many attractions that tourists are encouraged to visit as shown in Figure 83. According to *Envision Saint John: The Regional Growth Agency*, the top attractions within the heart of Saint John are the Reversing Falls / Rapids and the Saint John City Market. In addition to visiting Reversing Falls to view the natural beauty, people also kayak and fish for striped bass.

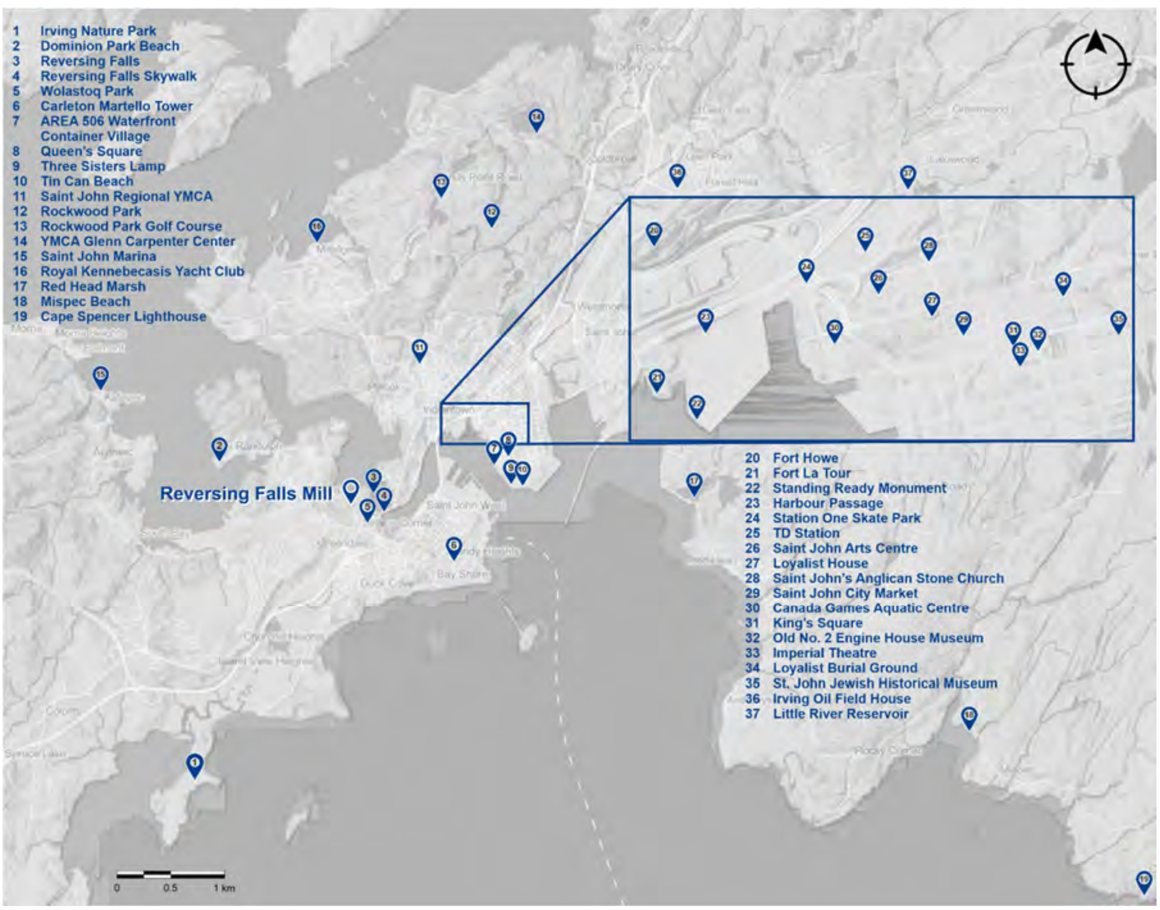


Figure 83. Several tourist attractions are in the vicinity of the Reversing Falls Mill in Saint John, New Brunswick.

Saint John has several national historic sites that lure tourists. Those sites, which are all protected under the *Historic Sites and Monuments Act* [**R.S.C., 1985, c. H-4**], include:

- Fort La Tour;
- Fort Howe;
- Carleton Martello Tower;
- Loyalist House;
- Saint John City Market; and
- St. John Anglican Stone Church.

Fort La Tour (Figure 83) was erected in 1631 by Charles de Saint-Etienne de La Tour, the Governor of Acadia on ground traditionally used by First Nations. Fort La Tour, built on a grassy knoll at the entrance to the Saint John River, was one of the earliest French fur trading centres with the region's First Nations. In 1645 during his absence, La Tour's wife, Francoise-Marie Jacquelin was unsuccessful at defending the Fort against Charles de Menou d'Aulany who captured the fort in the name of the king. Fort La Tour was declared a national historic site in 1923.

Built in 1777, Fort Howe (Figure 83) guarded settlers at the mouth of the Saint John River from American privateers and attacks by Americans during the Revolutionary War and the War of 1812. Much of the original fort, comprising a blockhouse and barracks high above the river's mouth, was removed by 1870. In 1966, the Fort Howe site was designated a national historic site for its significance in the protection of early residents of the Saint John area.

Carleton Martello Tower (Figure 83) is one of the nine surviving Martello Towers in Canada. It was built by the British government between 1812 and 1815 during the War of 1812 to protect Saint John from the risk of American invasion. The fortification represents the type of coastal defence that was used by the British during the Napoleonic period. The Carleton Martello Tower was designated a national historic site in 1930 because of its history during the War of 1812, its used during the Second World War, and its military architecture.

Loyalist House (Figure 83) was constructed sometime before 1820 by merchant David Merritt. The building was maintained with minimal changes by five generations of the Merritt family who lived there until 1959. It represents a fine example of the Federal style architecture reminiscent of New England homes built by prosperous United Empire Loyalists and their descendants. Loyalist House was designated a national historic site in 1958.

The Saint John City Market (Figure 83), the oldest continuously operated farmer's market in Canada, was constructed between 1874 and 1876. It survived the Great Fire of 1877 that razed much of Uptown Saint John. Although the Market has undergone many renovations over the years, it continues to function as a public farmer's market to this day. In 1986, the market was designated as a national historic site because of its hall interior that represents a ship's inverted keel, its Second Empire façade on Winter Street, and its two side elevations on North and South Market Street.

The St. John Anglican Stone Church (Figure 83) was constructed between 1823 to 1826 to accommodate members of the British garrison and the increasing number of Anglicans living in the fast-growing Port City. The church was built from stones that were brought from England as ballast on returning cargo ships. It was designated a national historic site in 1987 and has gained significance as Canada's earliest and best example of a Gothic Revival church built during the Romantic period.

4.0 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION

4.1 ENVIRONMENTAL IMPACT ASSESSMENT PURPOSE

The concept of Environmental Impact Assessment was first developed in the United States because of the *National Environmental Policy Act* of 1969 (*NEPA*) [*Wood*, 1995], which was enacted on 1 January 1970. Today, *NEPA* is considered the environmental *Magna Carta* [*CEQ*, 2021]. Several celebrated cases in the United States, such as the 1950s proposed Tocks Island Dam across the Delaware River and the halted Cross-Florida Barge Canal in the 1960s [*ELI*, 2010], clarified the significance of the *NEPA* and focused international attention on EIAs. The United Nations Conference on the Human Environment held in Stockholm from 5 to 16 June 1972, also known as the *1972 Stockholm Conference*, introduced a framework for environmental action [*UNEP*, 1973].

EIA was introduced in Canada with the passing of a federal cabinet directive in 1973 for the Environmental Assessment Review Process (EARP) [*Wood*, 1995]. In 1975, New Brunswick became the first Atlantic province to adopt the formal Cabinet EARP policy [*NBDELG*, 2018]. That policy covered all major development proposals that the Government and / or its various agencies have significant financial involvement. During the late 1970s and early to mid-1980s, the New Brunswick government reviewed, amended, and revised their EIA statutory framework.

On 13 July 1997, the Environmental Impact Assessment Regulation [**87-83**] was enacted under New Brunswick's *Clean Environment Act* [**R.S.N.B. 1973, c. C-6**], which is administered by the NBDELG. Under [**87-83**], any individual, private firm, or government agency that proposes a project listed under "Schedule A" that may impact the environment must formally register the project for EIA review with the NBDELG. The proponent is responsible for generating and subsequently submitting an EIA registration document that satisfies the requirements of the *NBDELG* [2018] guide to EIAs.

The EIA process is used as a planning tool under which the environmental impact potentially resulting from a proposed project is identified and assessed. EIA is an anticipatory and participatory process that involves identifying measures that can be taken to avoid negative environmental impacts or reduce them to acceptable levels well in advance of their occurrence. EIAs need to be of sufficient length and breadth to ensure that the underlying decision about whether a project can move forward, and that decision can be adequately evaluated by regulatory authorities, stakeholders, and the public.

In New Brunswick, the EIA process is considered a proactive and preventative approach to environmental management and protection. The NBDELG realizes that the proponent has likely only completed preliminary project design at the time of EIA review. Detailed design can occur following EIA approval and so long as any modifications made yield the same or reduced potential environmental impacts, they are acceptable. Any modifications that have the potential to yield additional environmental impacts may require additional review and approval.

Although not unique, New Brunswick has its own distinctive EIA process. Under that process, there are two types of EIA review: a Determination Review; and a Comprehensive Review. All Projects registered under the EIA Regulation are required to undergo a Determination Review. Some projects require a Comprehensive Review largely due to significant public interest or large-scale potential environmental impacts. Less than 0.1 % of previously registered projects with the NBDELG have triggered a Comprehensive Review. It is presumed that this Project will be evaluated under a Determination Review. The stepwise systematic review process of the Determination Review is shown in Figure 84.

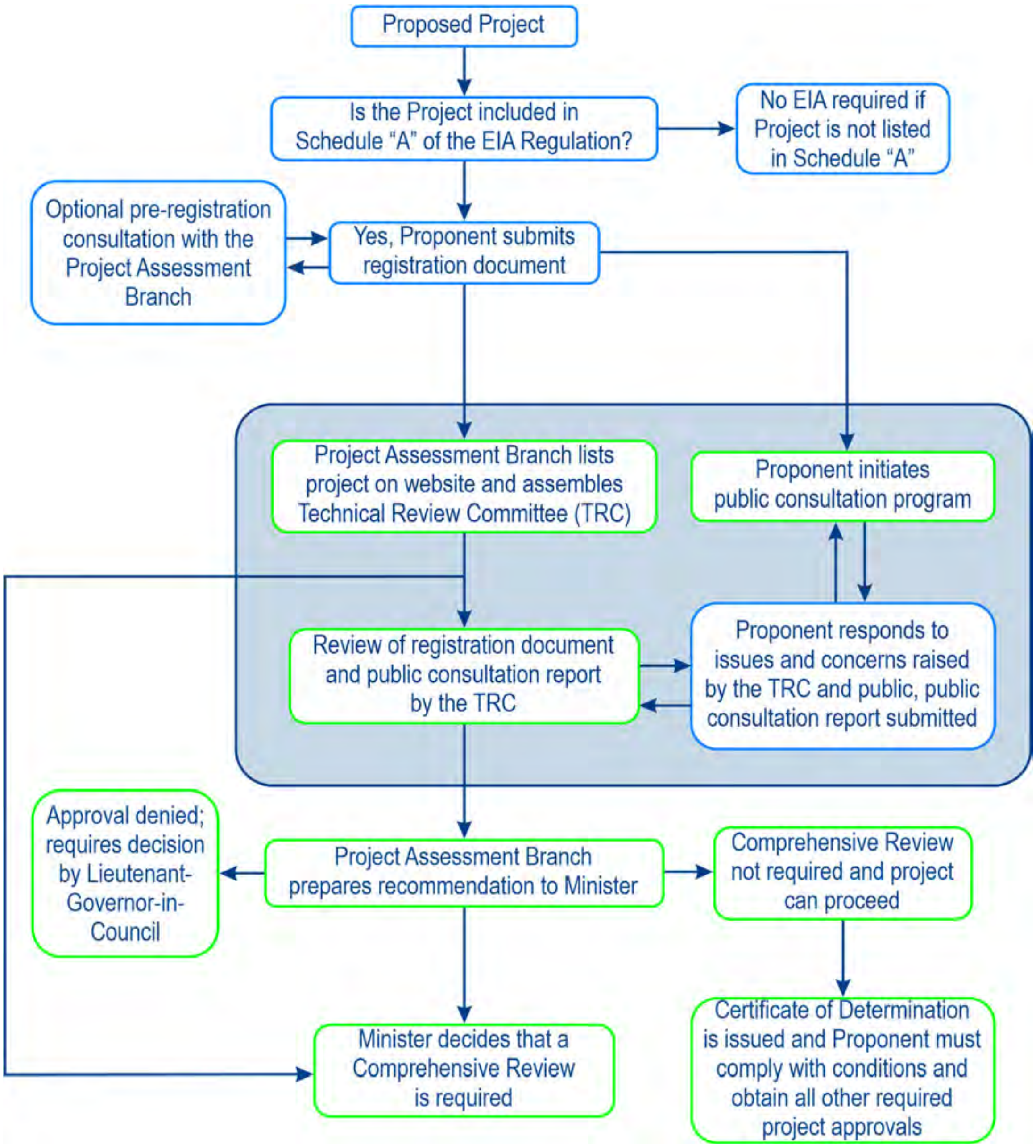


Figure 84. The New Brunswick Department of the Environment and Local Government’s Environmental Impact Assessment (EIA) stepwise determination review process highlighting the public consultation component of the process (*i.e.*, the blue box). Source *NBDELG* [2018].

4.1.1 Guiding Principles

The guiding principles of EIA good practice are presented in Table 25. Within this EIA, the principles are considered together while recognizing their varying interrelationships.

Table 25. The guiding principles of environmental impact assessment. After *Sadler* [1996] and *IAIA & IEMA* [1999].

Principle	Application
Purposive	Achieves the goal of informing decision makers and ensures an appropriate level of environmental protection and human health
Focused	Concentrates on the significant environmental impacts and accounts for issues that matter
Adaptive	Adjusts to the realities, issues, and circumstances of the project under review
Participative	Provides appropriate opportunities to inform and involve rightsholders, stakeholders, and the public while accepting their input and addressing their issues and concerns
Transparent	Is clear, easily understood, and in an open process with early notification procedures, access to documentation, and a public record of decisions taken and reasons for them
Rigorous	Applies best practicable methodologies to address the impacts and issues being assessed
Practical	Identifies measures for impact mitigation that work and can be implemented
Credible	Is carried out with professionalism, rigor, fairness, objectivity, impartiality, and balance
Efficient	Imposes minimum cost burden on proponents consistent with meeting process requirements and objectives

4.2 ENVIRONMENTAL IMPACT AVOIDANCE

Sustainable development is an evolving concept that first gained traction with the release of the *Brundtland* [1987] report. In that, sustainable development was defined as development that meets the needs of today's generation without compromising those of future generations. Much of EIA today is concerned with preventing, mitigating, and offsetting significant adverse effects to accommodate the needs of the environment for subsequent generations.

Reducing the burden of environmental impacts is necessary if development is to become sustainable. Therefore, a preference hierarchy (Figure 85) is typically applied to environmental impacts. Although not always possible, impact avoidance is the preferred choice for project development. Avoidance can sometimes be achieved by choosing an alternate project, selecting an alternative project design, implementing environmentally sustainable technologies, or picking an alternate development site.

Mitigation must occur when avoidance is not possible and is the reduction of adverse effects of development at all project stages to the smallest degree possible and must always be undertaken when impacts are present. Proposed mitigation, which includes preventing pollution, minimizing physical disturbances, good-housekeeping, creative land management, technological fixes, *etc.*, must be realistic and effective, and where possible, based on best practices.

Compensation should only be considered after all other options have been duly addressed. It attempts to 'make up' for or 'offset' unavoidable impacts, which is required in some instances. For example, the *Fisheries Act* [**R.S.C., 1985, c. F-14**] requires a "no-net-loss" of fish habitat whereby altered, disturbed, or destroyed habitat must be offset by reclaiming, enhancing, or creating habitat elsewhere.

Mitigation and compensation play an important role in the EIA process. Through the planning process, measures can be developed to:

- enable better protection of environmental features and components;
- encourage the prudent use of natural resources; and
- avoid costly environmental damage.

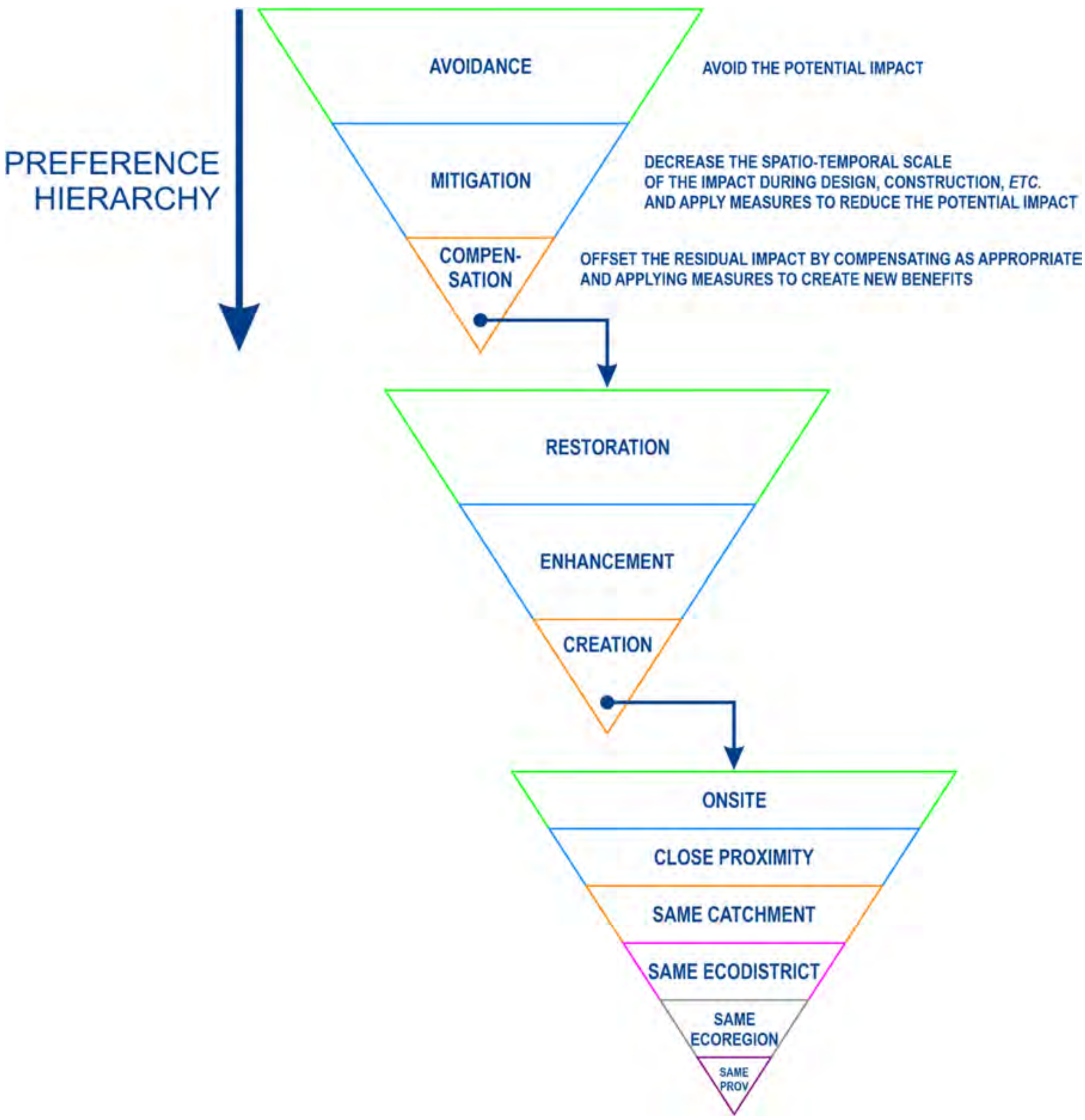


Figure 85. Preference hierarchy associated with impacts under environmental assessment review.

4.3 OVERVIEW OF VALUED ENVIRONMENTAL COMPONENT ANALYSIS

A critical component of the EIA process is identifying and assessing the impact on Valued (socially, economically, culturally and / or scientifically) Environmental Components (VECs). Impacts can be positive or negative. When negative impacts to VECs are identified, it is critical to determine what mitigation measures can be implemented to reduce that impact. In some instances, it may even be necessary to mitigate a positive impact.

Residual effects are also considered in the assessment of potential project environmental impacts. A residual effect is any measurable or demonstrable environmental impact that remains following the implementation of mitigation measures. Each Project activity, component, and associated mitigation measure is assessed on different attributes of the potential for environmental impact (*i.e.*, probability, magnitude, extent, duration, frequency, and reversibility). The potential for residual effects is described for each VEC below. In the instance where a residual effect is expected to occur, the potential impact is further assessed to determine whether any cumulative effects may arise through the interaction between the Project-specific impacts and similar effects from past, present, and / or reasonably foreseeable activities.

4.3.1 Project Interactions / Scoping

As noted in Section 2.7, there are five Project stages. Different activities are associated with each stage and not all stages interact with the environment. For this EIA, environmental interactions are strictly limited to the spatial and temporal boundaries of this Project. For example, interactions are not considered in the cooking of wood chips at the Mill as that is already a pre-existing activity; however, pile driving associated with the structural foundations to support the Project infrastructure is considered.

Decommissioning was not considered part of this impact assessment because the nature of that Project stage is not predictable. Decommissioning is not expected to occur until at least 2077, presumably when the regulatory setting could be considerably different. Therefore, decommissioning will be assessed just prior to the end of Project operation to assess the potential environmental impacts pursuant to the applicable regulatory regime.

A high-level assessment of the Project stages and potential environmental interaction is summarized in Table 26. Accordingly, only Stages II, III, and V require further assessment here as they are the only stages that have potential interactions with the environment that can be adequately identified.

Table 26. Project stages of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick. Included are the activities associated with each stage and whether there is an interaction with the environment.

Project Stage	Activities	Environmental Interaction
I – Environmental permitting, monitoring, and compliance	➢ Desktop reviews ➢ Non-intrusive field investigations ➢ Permit applications ➢ Site reviews and inspections ➢ Development and review of best management practices	No
II – Construction	➢ Erecting temporary site facilities for contractors ➢ Driving piles ➢ Excavating and hammering rock ➢ Installing foundations and services ➢ Constructing tanks, pipelines, and buildings ➢ Installing infrastructure ➢ Commissioning infrastructure ➢ Dismantling temporary site facilities for contractors	Yes
III – Operation and maintenance	➢ Evaporating water ➢ Recovering inorganics through combustion ➢ Recausticizing ➢ Generating electricity ➢ Re-stocking and storing chemicals required for the cooking materials recovery process	Yes
IV – Decommissioning	➢ Dismantling, removing, and recycling equipment and infrastructure ➢ Removing contaminated materials ➢ Grading and leveling the site ➢ Reclaiming the site	Yes, but will be defined later
V – Mishaps, errors, and / or unforeseen events	➢ Potential for spills, contaminant releases, fires, and / or explosions ➢ Operational failures	Yes

4.3.1.1 VEC Matrix

Collectively, there are three broad VEC categories that are typically reviewed through an EIA process. Based on the activities described in Section 2.0, potential interactions with the environment were identified. Fundy Engineering's Project Team, based on previous environmental impact assessment experience and professional judgment, assessed potential interactions between Stages II, III, and V (*i.e.*, those with an environmental interaction as identified in Table 26) and all the environmental components described in Section 3.0.

Through this VEC interaction matrix exercise, it was determined that there are 12 environmental components that require detailed assessment with respect to the mill modernization and green energy generation project (*i.e.*, those with a potential Project interaction as noted in Table 27). Those environmental components are identified below as VECs.

Table 27. Assessment of potential interactions of various stages of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick and the environment. Check marks indicate that there is potential for interaction and require further assessment.

Valued Environmental Component	Project Stage and Environmental Interaction		
	II: Construction	III: Operation and Maintenance	V: Mishaps, Errors and Unforeseen Events
PHYSIO-CHEMICAL ENVIRONMENT			
Climate	NA	NA	NA
Air quality	✓	✓	✓
Sound emissions	✓	✓	✓
Topography	NA	NA	NA
Hydrology	✓	✓	✓
Geology	NA	NA	NA
Hydrogeology	✓	✓	✓
BIOLOGICAL ENVIRONMENT			
Terrestrial flora and fauna	✓	✓	✓
Aquatic flora and fauna	✓	✓	✓
SOCIO-ECONOMIC ENVIRONMENT			
Labour and economy	✓	✓	✓
Archaeological and cultural resources	✓	✓	✓
Land-use	NA	NA	NA
Transportation network	✓	✓	✓
Aesthetics	✓	✓	✓
Protected areas	NA	NA	NA
Recreation and tourism	✓	✓	✓
Health and safety	✓	✓	✓

4.3.2 Impact Assessment Methodology

The impact assessment methodology used for this Project is summarized in Figure 86. Described in the sections that follow are the various steps used in assessing the Project's impact on the environment.

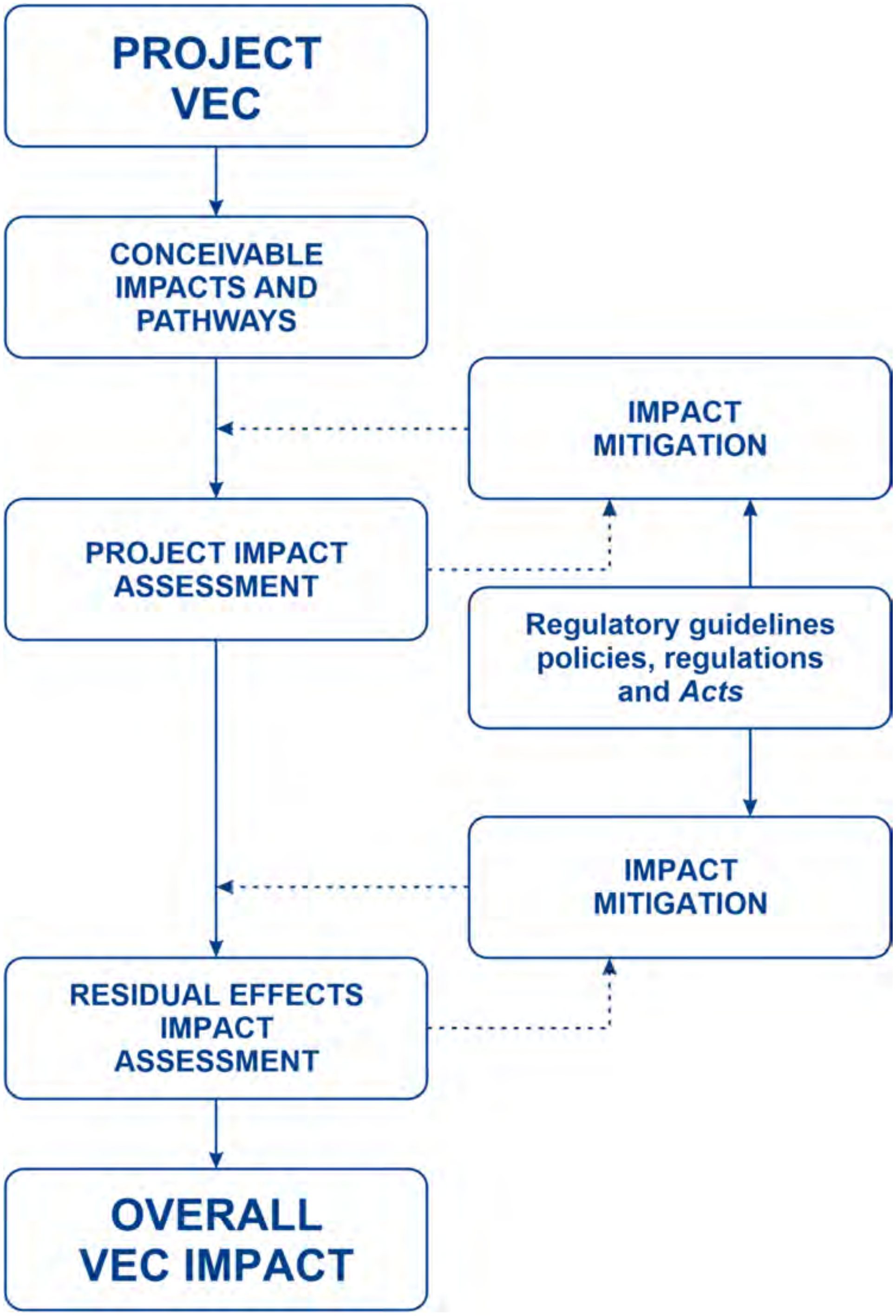


Figure 86. Visual representation of the process used in assessing the Project's impact on the environment.

4.3.2.1 Conceivable Impacts and Pathways

Conceivable impacts and pathways are identified for each VEC, for each of the Project stages, to describe:

- the Project activities that are involved;

- the type of cause-effect relationships that could possibly exist; and
- the mechanisms by which stressors could ultimately lead to effects on the VEC.

Each conceivable impact and pathway represent an area where mitigation measures could be applied to reduce or eliminate a potential effect. It is critical to identify those pathways to develop appropriate mitigation strategies.

4.3.2.2 Project Impact Assessment

EIA documents are reviewed by rightsholders, stakeholders, the public, and industry and regulatory professionals. As such, the methods used to assess the impact of a project on the environment, and vice versa, must be clear and easy to follow. They must also be robust enough to ensure that all interested parties can understand the conclusions. There are several methodologies used in the EIA process, such as the Leopold Matrix [*Leopold et al.*, 1971], the Battelle Environmental Evaluation System [*Dee et al.*, 1973], and Environmental Risk Assessment [*Wood*, 1995]. None of the methodologies are ideal for all situations [*Goyal and Deshpande*, 2001] and there is no single best set of criteria that can be used to classify all environmental impacts. Generally, there are trade-offs between the amount of effort necessary to acquire and assess the various VECs and the overall results that can be drawn from the various methodologies.

Fundy Engineering employs a visual impact significance symbol summary method for the assessment of VECs, which is analogous to a traffic light (Table 28). The traffic light assessment method has been successfully used by others, such as *Koeller et al.* [2000] and *ODPM* [2002]. Our method, which has proven valuable in many other EIAs, is a way for reviewers to examine the impacts quickly and easily without having to necessarily understand a complex environmental assessment process.

Table 28. Fundy Engineering's Valued Environment Component Assessment visual coding method, which is analogous to a traffic light.

Assessment Symbol	Description
	***Favourable or little to no impact***: criteria receiving this impact level have no significant problems associated with them; they are green lights for the Project.
	***Potential impacts that may require some degree of mitigation***: criteria receiving this impact level do not appear to have significant problems associated with them; they are yellow lights for the Project and should be approached with caution.
	***Not favorable or a major impact***: criteria receiving this impact level rating would be difficult to implement; they are red lights for the Project.
	***No change in existing impact***: criteria receiving this impact level have no additional potential impact from the Project than already currently exists.

Project impact green lights are considered those activities that may yield short-term impacts. Those impacts would be experienced for a brief period of the Project (*i.e.*, a day or week during a Project stage). For example, a green light may be applied to sound emissions if a pile driver was used for a one-week period over a year-long construction period where the only loud activity anticipated is pile driving. Green lights are also applied to activities that have a positive outcome. Creating long-term employment through the development of a recreational facility, for example, would have a positive impact that would be assigned a green light in our analysis. If the impact is not entirely positive, then mitigation measures are likely required for green lights.

Project yellow lights are those activities that extend between the short-term and long-term. Impacts considered long-term are those that may be experienced for a prolonged period, such as during the entire duration of the Project. With yellow lights, long-term impacts are not permanent (*i.e.*, they are reversible and as environmental protection methods are improved, the impact may be further reduced). An example of a yellow light would be increased erosion along a linear corridor resulting from the clearing and grubbing of a forest. The impact is reversible (*i.e.*, replanting of vegetation to return to pre-impact conditions) or can be mitigated (*i.e.*, through the implementation of best-management practices, such as silt fences and sedimentation basins). Mitigation measures are required for yellow lights.

Red lights are applied when long-term impacts are permanent. That is, they may cause irreversible change in the environment. An example would be a large and persistent oil spill to a major drinking water aquifer. After halting the spill, considerable effort may be required to remediate the contamination. During remediation, which would likely be prolonged, a new source of drinking water would be required. Red lights require that mitigation measures be developed.

When there is no anticipated change to the component because of the project, a blue light is applied. Blue lights do not require mitigation because there is no change.

4.3.2.2.1 Impact Assessment Scoring Matrices

Fundy Engineering's traffic-light assessment method of Table 28 is a summary of a much more rigorous process. An impact assessment scoring matrix was completed for each VEC to produce the traffic light summary. The matrices, which were completed via expert opinion, are provided in Appendix VIII. The detailed matrices characterize the impacts of each VEC sub-component for the three Project stages where interactions are expected (*i.e.*, Table 26 and Table 27). The impact characterization used in the impact assessment scoring matrices is summarized in Table 29.

Numerical values were used to represent the importance assigned to each impact category within the matrices; the higher the number, the more important the impact and vice versa. The impact categories, the ranks, and the assigned importance scores are summarized in Table 30. As summarized in Table 31, the sum of the importance scores was used to determine the overall score for the impact and in turn the impact significance or traffic light colour.

Table 29. Environmental impact characterization used in the assessment of the Valued Environmental Components and their sub-components.

Impact Category	Rank	Description
Direction	Positive	Improvement over baseline conditions
	Neutral	No change from baseline conditions
	Negative	Deterioration from baseline conditions
Probability	Low	Previous research, knowledge, experience, and / or traditional knowledge indicates that there is a small likelihood that the environmental component has experienced the same impact from activities of similar project types; < 25 % chance of occurring
	Moderate	Previous research, knowledge, experience, and / or traditional knowledge indicates that the environmental sub-component may have experienced the same impact from activities of similar project types; 25 % to 75 % chance of occurring
	High	Previous research, knowledge, experience, and / or traditional knowledge indicates that the environmental sub-component has experienced the same impact from activities of similar project types; > 75 % chance of occurring
Magnitude	Low	Imperceptible change from baseline conditions
	Moderate	Observable increase over baseline conditions, but not substantial
	High	Substantially above baseline conditions
Extent	Local	Confined to the Project boundaries
	Regional	Extending beyond the Project boundaries, but confined to the Saint John region
	Provincial	Extending beyond the Saint John region
Duration	Short-term	< 25 % of the time during the Project phase
	Medium-term	25 % to 75 % of the time during the Project phase
	Long-term	> 75 % of the time during the Project phase
Frequency	Temporary	Occurs for a limited period during the Project phase
	Intermittent / irregular	Occurs more than once, but does not occur all the time during the Project phase
	Permanent / continuous	Occurs throughout the entire Project phase
Reversibility	Reversible	Impacts that are not permanent and can be changed back to the original condition
	Irreversible	Impacts that are permanent and there is no chance to change back to the original condition

Table 30. Impact categories, ranks, and assigned importance scores used in the assessment of significant environmental impacts.

Importance Score	Impact Category and Rank					
	Probability	Magnitude	Extent	Duration	Frequency	Reversibility
0	Not applicable / negligible					
1	Low	Low	Local	Short-term	Temporary	Reversible
2	Moderate	Moderate	Regional	Medium-term	Intermittent / irregular	
3	High	High	National	Long-term	Permanent / continuous	Irreversible

Table 31. Assessment scores, impact significance, and symbols used in the assessment of significant environmental impacts.

Overall Score	Impact Significance	Symbol
Negative Impacts		
≤ 8	Favourable or little to no impact	
9 to 14	Potential impacts that may require some degree of mitigation	
≥ 15	Not favorable or a major impact	
Positive Impacts		
≥ 11	Favourable or little to no impact	
7 to 10	Potential impacts that may require some degree of mitigation	
≤ 6	Not favorable or a major impact	
Neutral Impacts		
No score	No potential impact predicted	

4.3.2.3 Impact Mitigation

The identification and development of mitigation measures was an iterative process undertaken during the VEC impact assessment and the residual and cumulative impact assessment. Regulatory guidelines, policies, regulations, and acts applicable to the protection of the VEC were considered in the development of the mitigation measures. Development of impact mitigation was critical to reducing the overall impact of the Project on the environment. Ranking within the impact assessment scoring matrices considered the implementation of the mitigation measures identified.

It is expected that the mitigation measures identified will become part of the Project-specific EPP. Roman numerals in curly brackets follow each of the listed mitigation measures and refer to the applicable Project stage(s).

4.3.2.4 Residual Impact Assessment

Residual impacts were considered in the assessment of potential project environmental impacts. A residual impact is one where any measurable or demonstrable environmental impact remains following the implementation of mitigation measures. Each Project activity, component, and associated mitigation measure was assessed on different attributes of the potential for environmental impact. The potential for residual effects is described for each VEC below.

4.4 POTENTIAL PROJECT IMPACTS ON THE ENVIRONMENT

4.4.1 Valued Environmental Components Assessed

The following VECs were assessed for the mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick:

- physio-chemical environment:
  - air quality;
  - sound emissions;
  - surface water quality and quantity; and
  - groundwater quality and quantity;
- biological environment:
  - terrestrial flora and fauna;
  - aquatic flora and fauna; and
- socio-economic environment:
  - labour and economy;
  - archaeological and cultural resources;
  - transportation network;
  - aesthetics;
  - recreation and tourism; and
  - health and safety.

The identified VECs were assessed with consideration given to risks associated with construction (*i.e.*, Stage II), operation and maintenance (*i.e.*, Stage III), and any mishaps, errors, and / or unforeseen events (*i.e.*, malfunctions or accidents) that may occur because of the proposed Project (*i.e.*, Stage V). The assessment of the VECs listed above is described in detail in the sections that follow.

A table within each VEC section below summarizes the impact assessment. Readers who do not wish to read the sections below in their entirety may instead find it useful to focus on the tables because they provide an overall summary of the impact assessment process for each VEC.

4.4.2 Physio-Chemical Environment

4.4.2.1 Air Quality

Canadians are fortunate to have very good air quality compared to many other industrialized nations, and this is especially true in New Brunswick. Air quality has been selected as a VEC because the atmosphere helps maintain the health and well-being of humans, wildlife, vegetation, and other biota. Emissions from the Project to the air may cause adverse environmental effects through the various transport, dispersion, deposition, and transformation processes that occur in the atmosphere. Additionally, GHG emissions are thought to be a major factor in affecting global climate and leading to climate change.

Air quality is typically characterized by the composition of the ambient air, including the presence and quantity of air contaminants in the atmosphere in comparison to applicable ambient air quality objectives, standards, or guidelines. The release of air contaminant emissions to the atmosphere from industrial stacks and vents, mobile equipment, and fugitive sources can all contribute to affect local and regional air quality, particularly in industrialized settings and urban areas. Emissions can have both localized and regional effects (*e.g.*, from odours, particulate matter, combustion gas emissions, *etc.*) as well as global effects (*i.e.*, emission of GHGs).

This assessment of air quality considers the air contaminants that are typically associated with this type of project, and are regulated provincially and, in some cases, federally. These air contaminants, released during both the construction and operation and maintenance phases, are generated from fuel combustion in industrial processes, mobile equipment, and from various process unit operations at the Mill. For this assessment, the primary potential air contaminants of concern that are associated with this Project are:

- combustion gases, including SO_2 and NO_X (*i.e.*, usually expressed as NO_2);
- TRS; and
- PM, including both TSP and $PM_{2.5}$ (*i.e.*, fine particulate matter).

In addition, releases of GHGs from the combustion of fossil fuels are considered in relation to the potential for interactions with climate change. For the GHG assessment, emissions, including CO_2, methane (CH_4), and nitrous oxide (N_2O), are collectively expressed as CO_{2eq}.

In New Brunswick, air quality is regulated pursuant to the Air Quality Regulation [**97-133**] under the New Brunswick *Clean Air Act* [**S.N.B. 1997, c. C-5.2**]. Among other requirements, the *Air Quality Regulation* specifies maximum permissible ground-level concentrations for five air contaminants, which are legally binding in New Brunswick, as presented in Table 32. The maximum permissible ground-level concentrations for TRS are represented as H_2S in Table 32.

The Canadian Ambient Air Quality Standards (CAAQS) developed by the Canadian Council of Ministers of the Environment (CCME) are health and environmental-based outdoor air quality objectives for air contaminant concentrations. The CAAQS are used as an indicator to assess the effects of air pollutants and to drive continuous improvement in air quality across Canada, but they do not have force of law on their own. The CAAQS, which became effective in 2020 [*ECCC*, 2023], are presented in Table 33.

Table 32. Maximum permissible ground-level concentration for air contaminants of concern as per the Air Quality Regulation [**97-133**] New Brunswick *Clean Air Act* [**S.N.B. 1997, c. C-5.2**].

Air Contaminant of Concern	Maximum Permissible Ground-Level Concentration (µg · m^{-3})* Averaging Period			
	1 hr	8 hr	24 hr	1 yr
Carbon monoxide (CO)	35 000	15 000		
Hydrogen sulphide (H_2S)	15		5	
Nitrogen dioxide (NO_2)	400		200	100
Sulphur dioxide (SO_2)	450†		150†	30†
Total suspended particulates (TSP)			120	70‡

NOTES:
*at 101.3 kPa and 21 °C
†maximum permissible ground-level concentration for SO_2 applicable in Saint John, Charlotte, and Kings Counties
‡geometric mean

Table 33. Canadian ambient air quality standards developed by the Canadian Council of Ministers of the Environment that became effective in 2020 [*ECCC*, 2023].

Air Contaminant of Concern	Canadian Ambient Air Quality Standards Concentration*, Averaging Period				Details
	1 hr	8 hr	24 hr (calendar day)	1 yr (calendar year)	
Nitrogen dioxide (NO_2)	113 µg · m^{-3} 60 ppb			32 µg · m^{-3} 17 ppb	➢ The three year average of the annual 98th percentile of the daily maximum 1 hr average concentrations ➢ The arithmetic average over a single calendar year of all 1 hr average concentrations
Ozone (O_3) - ground level		122 µg · m^{-3} 62 ppb			➢ The three year average of the annual ➢ 4th highest of the daily maximum ➢ 8 hr average concentrations
Fine Particulate Matter ($PM_{2.5}$)			27 µg · m^{-3}	8.8 µg · m^{-3}	➢ The three year average of the annual 98th percentile of the daily 24 hr average concentrations ➢ The three year average of the annual average of the daily 24 hr average concentrations
Sulphur dioxide (SO_2)	183 µg · m^{-3} 70 ppb			13 µg · m^{-3} 5 ppb	➢ The three year average of the annual 99th percentile of the daily maximum 1 hr average concentrations ➢ The arithmetic average over a single calendar year of all 1 hr average concentrations

NOTES:
*conversion from ppb to µg · m^{-3} is *at 101.3 kPa and 21 °C

With respect to GHG emissions and climate change, Canada is a signatory to various international agreements, conventions, and protocols. Some, including *The Paris Agreement* of the United Nations Framework Convention on Climate Change (UNFCCC), include commitments requiring action relating to climate change and GHG emissions

[*UNFCCC*, 2021]. The overarching goal of *The Paris Agreement*, which affects all Canadian provinces and territories is to limit global warming to well below 2 °C, preferably 1.5 °C, compared to pre-industrial levels.

In December 2016, the federal government released the *Pan-Canadian Framework on Clean Growth and Climate Change* [*GOC*, 2016]. The plan was developed in conjunction with the provinces and territories and in consultation with Indigenous peoples, to meet its emissions reduction targets, grow the economy, and build resilience to a changing climate. The Framework includes a pan-Canadian approach to pricing carbon pollution and measures to achieve reductions across all sectors of the economy. It aims to drive innovation and growth by increasing technology development and adoption so that Canadian businesses are competitive in the global low-carbon economy. It also includes actions to advance climate change adaptation and build resilience to climate impacts across the country.

In 2016, the Province of New Brunswick issued the *Transitioning to a Low-Carbon Economy* action plan, which represents the Province's Climate Change Action Plan [*PNB*, 2016]. In 2022, the Province issued the Climate Change Action Plan 2022-2027 [*PNB*, 2022]. The goal of both plans is to reduce emissions and build resilience by adapting to a changing climate. The initial action plan focuses on seven key areas:

- provincial government leadership;
- collaboration with First Nations;
- GHG emission reductions;
- adaptation to the impacts of climate change;
- economic opportunities;
- accountability and reporting; and
- funding for climate change.

The second action plan focuses on the following three pillars:

- government leadership and accountability;
- reducing GHG emissions; and
- preparing for climate change.

4.4.2.1.1 Conceivable Impacts and Pathways

There are several sources of air contaminant emissions associated with the construction and operation and maintenance phases of the Project. Air contaminant emissions will be both intermittent (*e.g.*, emissions from fossil fuel combustion in heavy equipment used during construction, *etc.*) and continuous (*e.g.*, stack emissions from the new recovery boiler and new lime kiln, *etc.*).

Activities and physical works that may occur during the Project and their associated potential environmental effects are summarized in Table 34. In the section that follows, the potential impacts are assessed in concert with the development of mitigation measures.

Table 34. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on air quality during various activities associated with the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Activity	Conceivable Impacts and Pathways
Construction and operational traffic	➢ An increase in personal, construction, and delivery vehicles could impact the local air quality ➢ Fugitive dust emissions from vehicle traffic on unpaved roads could lead to local air quality effects
Operation and maintenance of heavy equipment	➢ Construction equipment is a major source of combustion emissions which will potentially affect local and regional air quality ➢ Fugitive dust emissions from vehicle traffic on unpaved roads could lead to local air quality effects
Operation of new recovery boiler	➢ Combustion gas and particulate matter emissions from operating the new recovery boiler and associated electrostatic precipitators could affect local and regional air quality ➢ Burning non-condensable gases and stripper off gases in the new recovery boiler or #3 power boiler will lower total reduced sulphur emissions that would otherwise be released to the atmosphere and lead to ambient odours and impaired air quality ➢ Greenhouse gas emissions from the new recovery boiler are carbon-neutral because spent cooking liquor burned is organic / biogenic (*i.e.*, the calorific value is provided by residual biomass contained in the lignin in wood fibre, a carbon-neutral fuel).
Operation of new turbine(s) and green energy generator(s)	➢ The operation of the new turbine(s) and green energy generator(s) will provide up to 140 MW of green electricity that could otherwise be generated by fossil fuels
Operation of new recausticizing plant	➢ Combustion gas and particulate matter emissions from operating of the new lime kiln and associated electrostatic precipitator could affect local and regional air quality ➢ Greenhouse gas emissions from the combustion of natural gas in the new lime kiln could contribute to global climate change
Operation of the new emergency backup burner	➢ Burning non-condensable gases in the emergency backup burner in the extremely unlikely event that the new recovery boiler or #3 power boiler are not available will lower total reduced sulphur emissions that would otherwise be released to atmosphere and lead to ambient odours and / or impaired air quality. ➢ Burning natural gas in the new emergency backup burner will release combustion gas and greenhouse gas emissions that could affect local air quality and contribute to global climate change

Air quality was selected as a VEC because it has the potential to be affected during all aspects of the Project (*e.g.*, construction and commissioning, operation and maintenance, and mishaps, errors, and / or unforeseen events). The following potential impacts associated with air quality were assessed:

- micro-climate;
- Project-related air contaminant emissions (*i.e.*, stack, vent, vehicle, and fugitive emissions;
- ambient air quality (*i.e.*, ground-level contaminants); and
- greenhouse gas emissions.

There is always a potential for mishaps, errors, and / or unforeseen events to occur regardless of how stringent the implemented mitigation measures are. The causes for abnormal air contaminant emissions under such a scenario for the air quality VEC would be the possible off-specification operation of the new recovery boiler and / or the new lime kiln, the failure of electrostatic precipitators, and / or the operation of the emergency backup burner, among others. If such an event were to occur, it is likely that it would be of short duration (*i.e.*, minutes to hours) while the problem is resolved.

4.4.2.1.2 Potential Impacts

An air quality and GHG study for the pre- and post-Project operation of the Mill was completed. The assessment was done to determine Mill-wide emissions and to quantify any improvements in Mill-wide emissions associated with the proposed modernization. The impact of the Mill's air contaminant emissions on air quality were assessed for three operating scenarios:

- pre-Project scenario (*i.e.*, daily pulp production of 1 000 ADMT);
- post-Project peak scenario (*i.e.*, daily pulp production of 1 800 ADMT); and
- post-Project average scenario (*i.e.*, daily pulp production of 1 650 ADMT).

The post-Project peak scenario represents a conservative estimate of anticipated emissions and resulting ground-level concentrations of air contaminants over the short-term, which was used to predict the 1 hour and 24 hour ground-level concentrations. The post-Project average scenario represents the future operation of the Mill on an annual average basis (*i.e.*, because the Mill will not always operate at its peak production rate), which was used to predict the annual average ground-level concentrations. The post-Project peak scenario represents the highest daily production of the Mill and thus the highest emission rates that will be released from Mill sources. The post-Project average scenario represents the production rates average over the year because the Mill will not always operate at peak production (*i.e.*, it accounts for production variations and accounts for equipment shutdowns by only operating for 350 days annually). The selection of the two post-Project scenarios for the air quality monitoring exercise is conservative. Results of the air quality and GHG assessment report completed by *Dillon* [2024] were used to complete the assessment below. For a copy of the complete standalone report, please refer to Appendix IX.

The complete assessment of potential impacts of the potential Project on air quality is provided in Table 35. Overall, the assessment yielded four green lights, five yellow lights, and three no change lights.

The effects of construction and heavy mobile equipment activities on ambient air quality (*i.e.*, emissions of particulate matter, combustion gases, GHGs, and fugitive dusts) are expected to be temporary, very localized, and minimal considering the standard and site-specific mitigation measures identified. The magnitude of emissions resulting from the construction phase is expected to be low in comparison to emissions from other local industrial sources. Furthermore, the emissions are expected to be largely confined to the Project site save for GHG emissions, which will be indistinguishable from global GHG emissions. The appropriate mitigation measures that apply to the construction phase will be taken, when required, to control potential fugitive dust levels and combustion gases from Project-related vehicles and heavy mobile equipment. It is highly unlikely that emissions resulting from the construction phase of the Project will cause an exceedance of provincial or federal air quality standards or objectives.

While there is a substantive amount of physical infrastructure that will be built and operated as part of this Project within the boundaries of the existing Mill site, there are no features that are expected to result in changes to the micro-climate in the vicinity of the Project. The decommissioning of the Teller scrubber and stack serving the existing RB will result in the near elimination of a visible vapour plume, which may result in some improvement in visual aesthetics, but that source is not expected to affect the micro-climate. The reason the existing Teller scrubber currently produces a highly visible vapour plume is because it is a wet scrubber. The replacement technology is dry and will result in a significant reduction in the visible vapour plume.

Although the Mill-wide emission rates are expected to increase on an absolute basis for most parameters when increasing daily pulp production from 1 000 ADMT to 1 800 ADMT or 1 650 ADMT, the inclusion of BAT, installing a leading-edge RB, and implementing modern and efficient air pollution control systems, such as ESPs, the intensity and ground-level impact from those increased emissions will be minimized as discussed below.

As shown in Table 36, Mill-wide emission rates for SO_2 and TRS are expected to decrease during post-Project peak production. The reductions in the Mill-wide emission rates for those two parameters will occur because of:

1) the new efficient RB and associated ESP;
2) the elimination of combustion sources that use Bunker C heavy fuel oil (*i.e.*, the #2 PB); and
3) the capture and incineration of NCGs and SOGs in the new RB or #3 PB (*n.b.*, non-condensable gases will be incinerated using the emergency backup burner in the extremely rare event when the new RB or #3 PB are not available and the capture and incineration of those gases will also reduce odourous emissions from the Mill). This is important because it will further reduce odour events at the Mill.

Table 35. Assessment of potential impacts on air quality of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Micro-climate	⊜			⊜			⊜		
Project-related air contaminant emissions (*i.e.*, stack, vent, vehicle, and fugitive emissions)	▲	1 to 3	A to M	▲	4 to 14	N to Y	●	2, 4 to 11	A to C, Q to S, Z
Ambient air quality (*i.e.*, ground-level contaminants)	▲	1 to 3	A to M	●	4 to 14	N to Y	●	2, 4 to 11	A to C, Q to S, Z
Greenhouse gas emissions	▲	1 to 3	A to M	●	4 to 14	N to Y	▲	2, 4 to 11	A to C, Q to S, Z

PATHWAYS

1 – An increase in personal, construction, and delivery vehicles could affect local air quality.
2 – Fugitive dust emissions from vehicle traffic on unpaved Mill site roads could lead to local air quality effects.
3 – Construction equipment is a major source of combustion emissions, which could potentially affect local and regional air quality.
4 – Combustion gas and particulate matter emissions from the operation of the new recovery boiler and associated electrostatic precipitators could affect local and regional air quality.
5 – Incinerating collected non-condensable gases, dilute non-condensable gases, and stripper off-gases will reduce total reduced sulphur emissions that would otherwise be released to the atmosphere and lead to ambient odours and impaired air quality.
6 – Greenhouse gas emissions from the recovery boiler are carbon-neutral since the spent cooking liquor burned is organic / biogenic (*i.e.*, the calorific value is provided by residual biomass contained in the lignin in wood fibre, which is a carbon-neutral fuel).
7 – Operation of the new turbine(s) and green energy generator(s) will provide up to 140 MW of green electricity that could otherwise be generated by fossil fuels.
8 – Combustion gas and particulate matter emissions from operation of the new lime kiln and associated electrostatic precipitators could affect local and regional air quality.
9 – Greenhouse gas emissions from the combustion of natural gas in the new lime kiln could contribute to global climate change.
10 – Burning non-condensable gases in the emergency backup burner when the new recovery boiler or #3 power boiler are not available will reduce total reduced sulphur emissions that would otherwise be released to atmosphere and lead to ambient odours and / or impaired air quality.
11 – Burning natural gas in the new emergency backup burner will release combustion gas and greenhouse gas emissions that could affect local air quality and contribute to global climate change.
12 – Greenhouse gas emissions from the combustion of Bunker C heavy fuel oil will be reduced through the decommissioning of the #2 power boiler (*n.b.*, the equipment will be left in place).
13 – Air emissions will be reduced through the decommissioning of the existing recovery boiler and Teller scrubber (*n.b.*, the equipment will be left in place).
14 – The two existing steam turbines will be taken out of service but will remain in place.

MITIGATION

A – A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to air quality to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of Environment and Local Government for review and approval.
B – All Project equipment operators and supervisors should be briefed on the potential impacts that equipment emissions can have on the quality of the local airshed and briefing information should range from describing emissions that are released from equipment to how those emissions can be reduced.
C – Mitigation measures developed and included in the Project-specific environmental protection plan should be adhered to for adequately addressing potential impacts.
D – Construction equipment should only be operated at or below peak loading rates.
E – Heavy equipment should be turned off when not in use and / or when practical (*i.e.*, anti-idling policy).
F – The number of vehicle-kilometres travelled should be kept to a minimum (*i.e.*, there should be no unnecessary operation of equipment in and around the site).
G – Heavy equipment and vehicles should be operated using clean fuels (*i.e.*, ultra-low sulphur diesels), where available and practical.
H – Heavy equipment exhaust emission systems should meet the recommended standards.
I – Equipment should be maintained according to manufacturer recommended servicing periods.
J – Heavy equipment and vehicles should be refueled using a protocol designed to mitigate environmental risks.
K – No solid construction waste should be burned on-site (*n.b.*, this does not include wood waste normally incinerated in the bark boiler, power boiler, and recovery boiler).
L – Construction vehicles should comply with the posted / recommended speed limits and, as appropriate, reduce speed when travelling on surfaces where dust is generated (*i.e.*, gravel or dirt roadways).
M – If the application of a dust suppressant is deemed necessary on gravel roadways of the Mill site, it should be applied using suitable equipment (*e.g.*, a tanker truck equipped with spray bars and methods of controlling water flow, *etc.*).
N – The use of Bunker C heavy fuel oil will be eliminated in the new recovery boiler by only burning spent cooking liquor as the primary fuel and natural gas as the primary auxiliary fuel.
O – Operators should ensure that the new electrostatic precipitators on the new recovery boiler and lime kilns operate efficiently and are maintained on appropriate schedules to maintain decreased air emissions.
P – Improved and comprehensive emissions monitoring will be used on the new flue gas stack and new lime kiln stack.
Q – Collected non-condensable gases should always be incinerated in the new recovery boiler, #3 power boiler, or emergency backup burner, when required, to reduce total reduced sulphur emissions from the Mill that could lead to odourous emissions.
R – Collected dilute non-condensable gases, which are being collected from more locations post-Project than compared to pre-Project, should always be incinerated in the new recovery boiler or #3 power boiler to reduce odourous emissions for treatment prior to being released to the environment at all times other than: times of general maintenance on the dilute non-condensable gases collection system and / or incineration system; or other unforeseen short-term outages.
S – Collected stripper off-gases should always be incinerated in the new recovery boiler, #3 power boiler, or lime kilns to reduce total reduced sulphur emissions from the Mill that could lead to odourous emissions.
T – The auxiliary fuel used for the emergency backup burner should be natural gas.
U – The Project will eliminate the use of Bunker C heavy fuel oil within the recovery boiler and the new lime kiln.
V – Spent cooking liquor, biomass, and / or natural gas should be used for generating heat and steam whenever possible.

W **–** Up to 140 MW of green electricity could be generated using the new turbine(s) whenever possible to displace the purchase of electricity from the grid, which is a produced using a variety of methods including the incineration of fossil fuels.
X **–** Excess green electricity produced but not needed for Mill operation will be transmitted to the New Brunswick electrical grid to be sold to local markets to displace electricity that could otherwise be generated by fossil fuels.
Y – Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, will require updating based on operational requirements of the modernized equipment.
Z **–** Emergency response and contingency plans will be designed to prevent any major and / or sustained environmental damage during construction and during any errors, mishaps, and / or unforeseen events.

Table 36. Pre- and post-Project (*i.e.*, proposed mill modernization and green energy generation project) Mill-wide emission rates at the Reversing Falls Mill in Saint John, New Brunswick at peak daily production and average daily production. The lowest emission rates are bolded in green.

Air Contaminant	Mill-Wide Emission Rates ($g \cdot s^{-1}$)			
	Pre-Project Peak Daily (1 000 ADMT)		Post-Project Peak Daily (1 800 ADMT)	Post-Project Average Daily (1 650 ADMT)
	1 hr, 24 hr	Annual	Maximum	Maximum
Nitrogen dioxide (NO_2)*	38.798	**33.359**	56.834	54.986
Fine Particulate Matter ($PM_{2.5}$)	4.514	**2.977**	4.694	4.001
Sulphur dioxide (SO_2)	49.482	15.680	**14.523**	19.995
Total Reduced Sulphur (TRS)	0.398	0.398	**0.361**	0.471
Total Suspended Particulates (TSP)	9.093	**6.348**	7.967	6.824

NOTES:
*represents Nitrogen Oxides (NO_X)

From an emissions intensity perspective (*i.e.*, emissions rate per unit of pulp produced), a decrease is anticipated for every contaminant, some by up to 84 %. Overall, this represents a significant improvement in Mill emissions intensity performance, which is expected to be on par with, or better than, some of the most modern and efficient mills in the world.

To assess the impacts on ambient air quality resulting from the increase in Kraft pulp production, *Dillon* [2024] conducted dispersion modelling to predict the current and future ambient air quality conditions (*n.b.*, for a copy of the complete standalone report please refer to Appendix IX). Air contaminant emissions were modelled using the CALifornia PUFF model (CALPUFF) developed by the United States Environmental Protection Agency (USEPA). A summary the maximum predicted ground-level concentrations of contaminants for pre- and post-Project operation of the Mill compared to the applicable provincial or federal guideline / standard / objective is presented in Table 37.

As shown in Table 37, there were no exceedances of the applicable provincial or federal air quality guidelines / objectives /standards predicted through the CALPUFF modelling for pre- and post-Project operation of the Mill (*i.e.*, proposed mill modernization and green energy generation project). The results show a marked reduction in predicted ground-level concentrations for the average period of most contaminants post-Project, resulting in substantially improved ambient air quality.

Selected dispersion modelling results from CALPUFF for pre- and post-Project operation of the Mill are presented in Figure 87 through Figure 91. Review of those figures from *Dillon* [2024] also demonstrates a considerable improvement in the maximum predicted ground-level concentrations in the post-Project scenario for all five air contaminants when compared to the pre-Project scenario.

Table 37. Maximum predicted ground-level air contaminant concentrations obtained using CALPUFF for pre- and post-Project (*i.e.*, proposed mill modernization and green energy generation project) operation of the Reversing Falls Mill in Saint John, New Brunswick at peak daily production and average daily production. Reductions from the pre-Project conditions are bolded in green.

Air Contaminant and Averaging Period		Regulatory Guideline / Standard / Objective (µg · m⁻³)	Maximum Predicted Ground-Level Concentration (µg · m⁻³)			Amount of Regulatory Guideline / Standard / Objective			Concentration Change from Pre-Project		Comments
			Pre-Project	Post-Project		Pre-Project	Post-Project				
			Peak Daily (1 000 ADMT)*	Peak Daily (1 800 ADMT)†	Average Daily (1 650 ADMT)‡	Peak Daily (1 000 ADMT)*	Peak Daily (1 800 ADMT)	Average Daily (1 650 ADMT)	Peak Daily (1 800 ADMT)	Average Daily (1 650 ADMT)	
NO_2	1 hr	400§	270	**210**	**210**	67.5 %	**52.5 %**	**52.5 %**	**- 27 %**	**- 22 %**	The changes in the maximum predicted ground-level concentrations for NO_2 are primarily due to decommissioning the #2 power boiler and replacing the existing recovery boiler and the existing incinerator with the new recovery boiler and the #4 lime kiln.
	24 hr	200§	41.6	42.7	43.9	20.8 %	21.4 %	22.0 %	4 %	3 %	
	Annual	100§	2.8	3.01	3.01	2.8 %	3.0 %	3.0 %	8 %	8 %	
$PM_{2.5}$	1 hr	--	58	**32.3**	**26.6**	--	--	--	**- 54 %**	**- 44 %**	The reductions in the maximum predicted ground-level concentrations for $PM_{2.5}$ are primarily due to decommissioning the #2 power boiler and replacing the existing recovery boiler with the new recovery boiler that will have much better dispersion (*i.e.*, a larger and taller stack) and best-available emission reduction technologies.
	24 hr	2.7‖	7.9	**6.60**	**5.3**	29.4 %	**24.3 %**	**19.6 %**	**- 34 %**	**- 18 %**	
	Annual	8.8‖	0.33	0.390	**0.32**	3.8 %	**4.4 %**	**3.6 %**	**- 4 %**	17 %	
SO_2	1 hr	450¶, #, **	215.2	**135.0**	**177.7**	47.8 %	**30.0 %**	**39.5 %**	**- 17 %**	**- 37 %**	The current 1 hr / 24 hr (*i.e.*, short-term) maximum predicted ground-level concentrations were conservatively predicted using the maximum short-term #2 power boiler emissions. Decommissioning the #2 power boiler will significantly reduce the SO_2 maximum predicted ground-level concentrations, especially in the short-term. A slight increase in the short-term SO_2 maximum predicted ground-level concentration at the average daily production rate is due to burning more NCGs, SOGs, and DNCGs in the recovery boiler.
	24 hr	150¶, #	64.1	68.1	88.3	42.7 %	45.4 %	58.9 %	38 %	6 %	
	Annual	30¶, #	3.00	**2.73**	3.86	10.0 %	**9.1 %**	12.9 %	29 %	**- 9 %**	
TRS	1 hr	--	18.6	**2.30**	**18.0**	--	--	--	**- 3 %**	**- 88 %**	The reductions in the maximum predicted ground-level concentrations for TRS are because of decreased overall emissions and replacing the Teller scrubber stack of the existing recovery boiler with the new recovery boiler that will have much better dispersion (i.e., a larger and taller stack) and best-available emission technologies. A slight increase in the short-term TRS maximum predicted ground-level concentration at the average daily production rate is due to burning more NCGs, SOGs, and DNCGs in the recovery boiler.
	24 hr	14††	5.58	**0.50**	**4.4**	39.9 %	**3.3 %**	**31.4 %**	**- 21 %**	**- 92 %**	
	Annual	--	0.93	**0.05**	**0.79**	--	--	--	**- 15 %**	**- 95 %**	
TSP	1 hr	--	116	**69.0**	**58.3**	--	--	--	**- 50 %**	**- 41 %**	The reductions in the maximum predicted ground-level concentrations for TSP are primarily due to decommissioning the #2 power boiler and replacing the existing recovery boiler with the new recovery boiler that will have much better dispersion (*i.e.*, a larger and taller stack) and best-available emission reduction technologies.
	24 hr	120§	16.1	**14.0**	**11.6**	13.4 %	**11.7 %**	**9.7 %**	**- 28 %**	**- 13 %**	
	Annual	70§	0.728	0.82	**0.69**	1.0 %	1.2 %	**1.0 %**	**- 5 %**	13 %	

NOTES:
*The 1 hr and 24 hr (*i.e.*, short-term) results for the pre-Project operation scenario are from the numerical model, which uses the conservative, maximum capable short-term emissions for the #2 power boiler and the maximum annual emissions for other sources; the annual results are based on the Mill's maximum annual emissions from existing sources between 2018 and 2021
†The numerical modelling results for the post-Project peak daily production rate are based on the Mill's maximum annual emissions from existing sources between 2018 and 2012 and the maximum estimated emissions for the post-Project sources were assumed to be operating at the maximum daily production rate (*i.e.*, 1 800 ADMT)
‡The numerical modelling results for the post-Project average daily production rate are based on the Mill's maximum annual emissions from existing sources between 2018 and 2021 and the maximum estimated emissions for the post-Project sources assumed to be operating at average daily production rate (*i.e.*, 1 650 ADMT to allow for production variations and equipment shutdowns by only operating 350 days annually).
§Schedule B of the Air Quality Regulation [**97-133**] under the New Brunswick *Clean Air Act* [**S.N.B., 1997, c. C-5.2**]
‖Canadian Ambient Air Quality Standards [*ECCC*, 2023]
¶Schedule C of the Air Quality Regulation [**97-133**] under the New Brunswick *Clean Air Act* [**S.N.B., 1997, c. C-5.2**]
#Because the #2 power boiler and #3 power boiler do not operate at the same time, the maximum 1 hr SO_2 emissions from the #2 power boiler, which are higher than the 1 hr SO_2 emissions from the #3 power boiler, were based on the daily SO_2 emissions rate from the operating year that had the highest combined daily SO_2 emissions rate from the #2 power boiler and the #3 power boiler (*i.e.*, 2021); this was used for conservatively assessing the short-term SO_2 emissions
**The meteorological anomalies were eliminated for the maximum 1 hr SO_2 concentration following the ADMGO-Appendix B; more specifically, the maximum of the ninth-highest 1 hr concentration in each year among the five modelled meteorological years was compared against the criteria
††Air contaminants benchmark list for Ontario Regulation 419 / 05: Air Pollution; TRS concentration limit is for facilities that are part of the class identified by NAICS code 3221 (*i.e.*, Pulp, Paper, and Paperboard Mills)

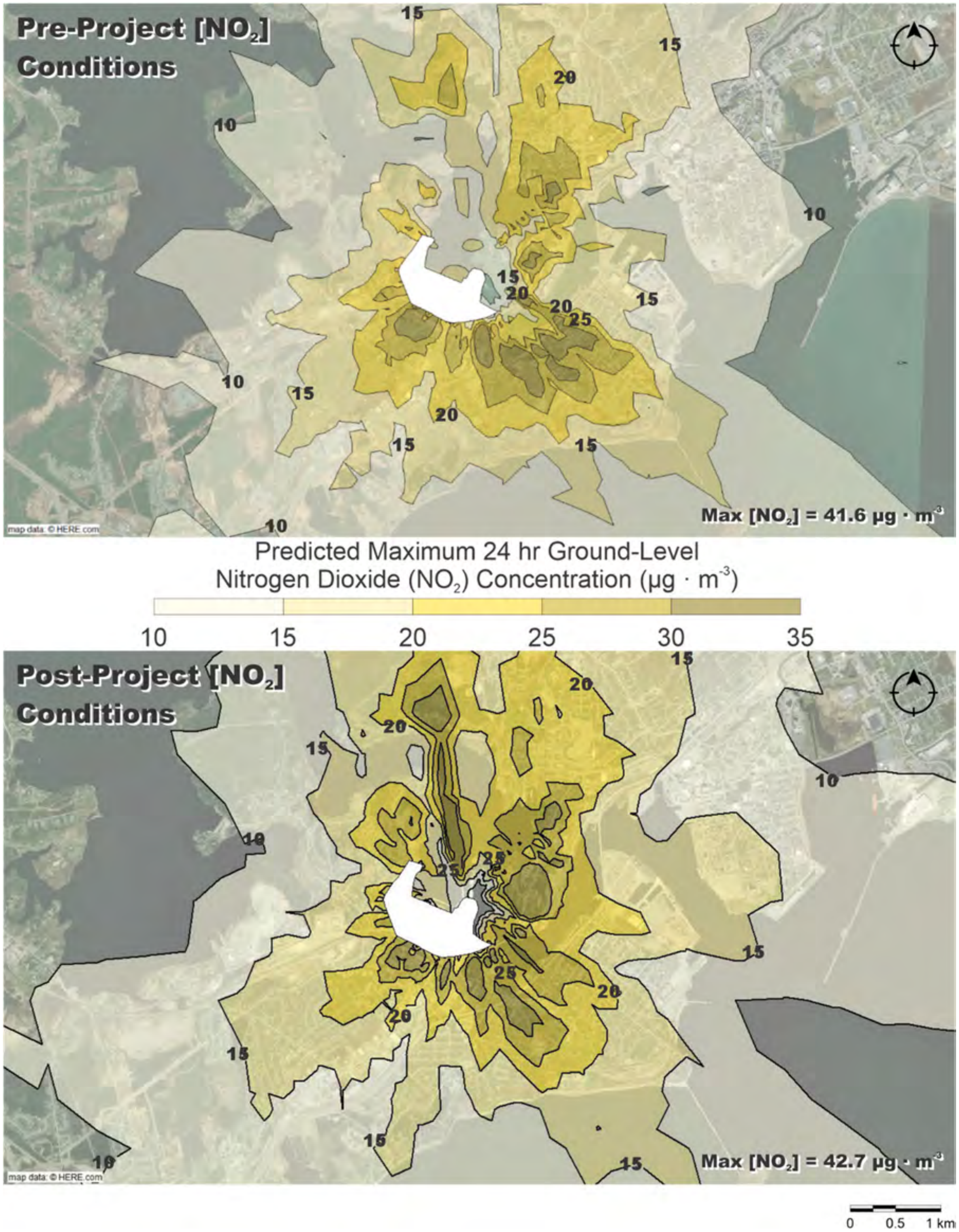


Figure 87. Maximum predicted ground-level nitrogen dioxide (NO_2) concentrations obtained using CALPUFF for pre-Project (*i.e.*, 1 000 ADMT peak daily pulp production) and post-Project (*i.e.*, proposed mill modernization and green energy generation project with 1 800 ADMT peak daily pulp production) operation of the Reversing Falls Mill in Saint John, New Brunswick.

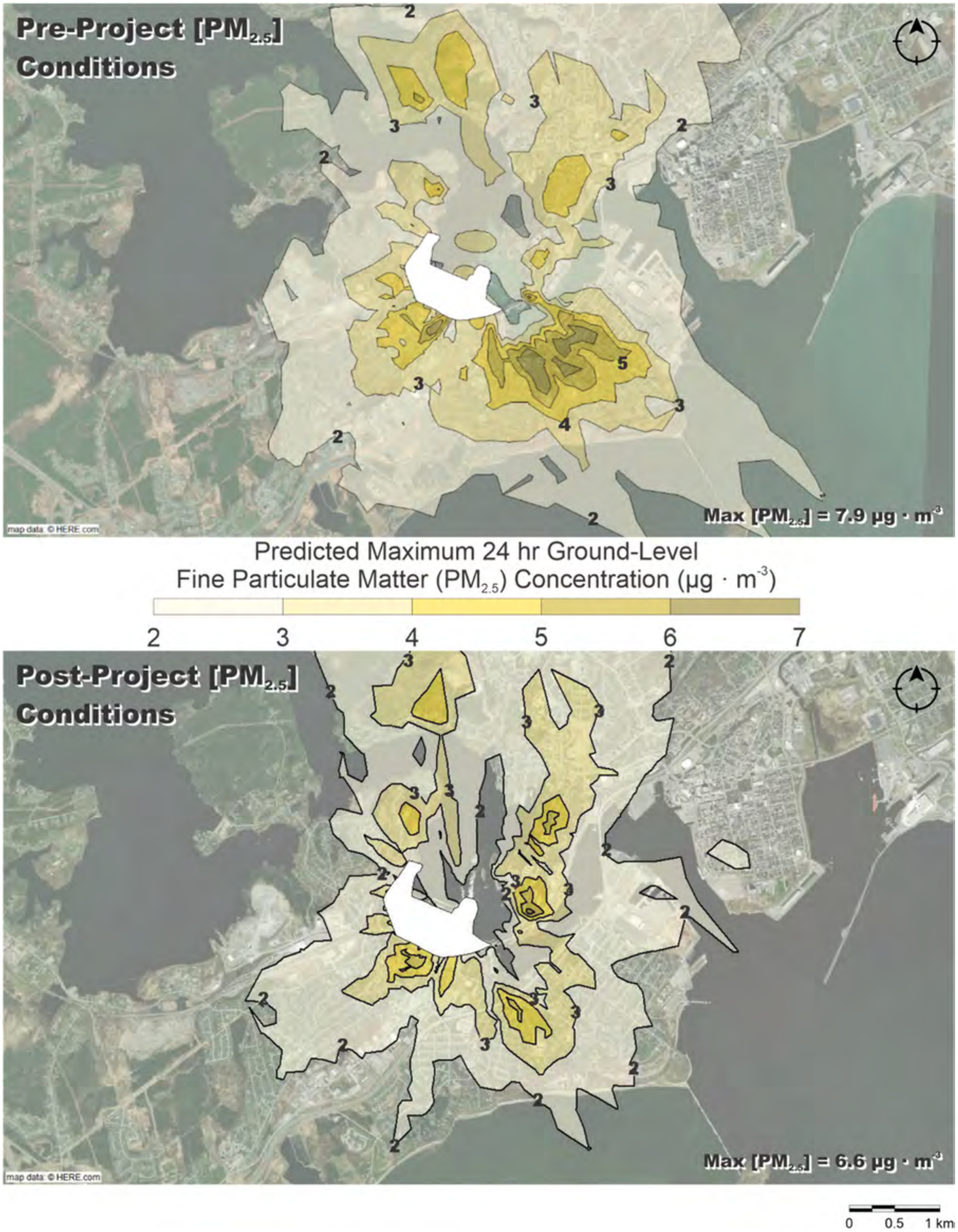


Figure 88. Maximum predicted ground-level fine particulate matter ($PM_{2.5}$) concentrations obtained using CALPUFF for pre-Project (*i.e.*, 1 000 ADMT peak daily pulp production) and post-Project (*i.e.*, proposed mill modernization and green energy generation project with 1 800 ADMT peak daily pulp production) operation of the Reversing Falls Mill in Saint John, New Brunswick.

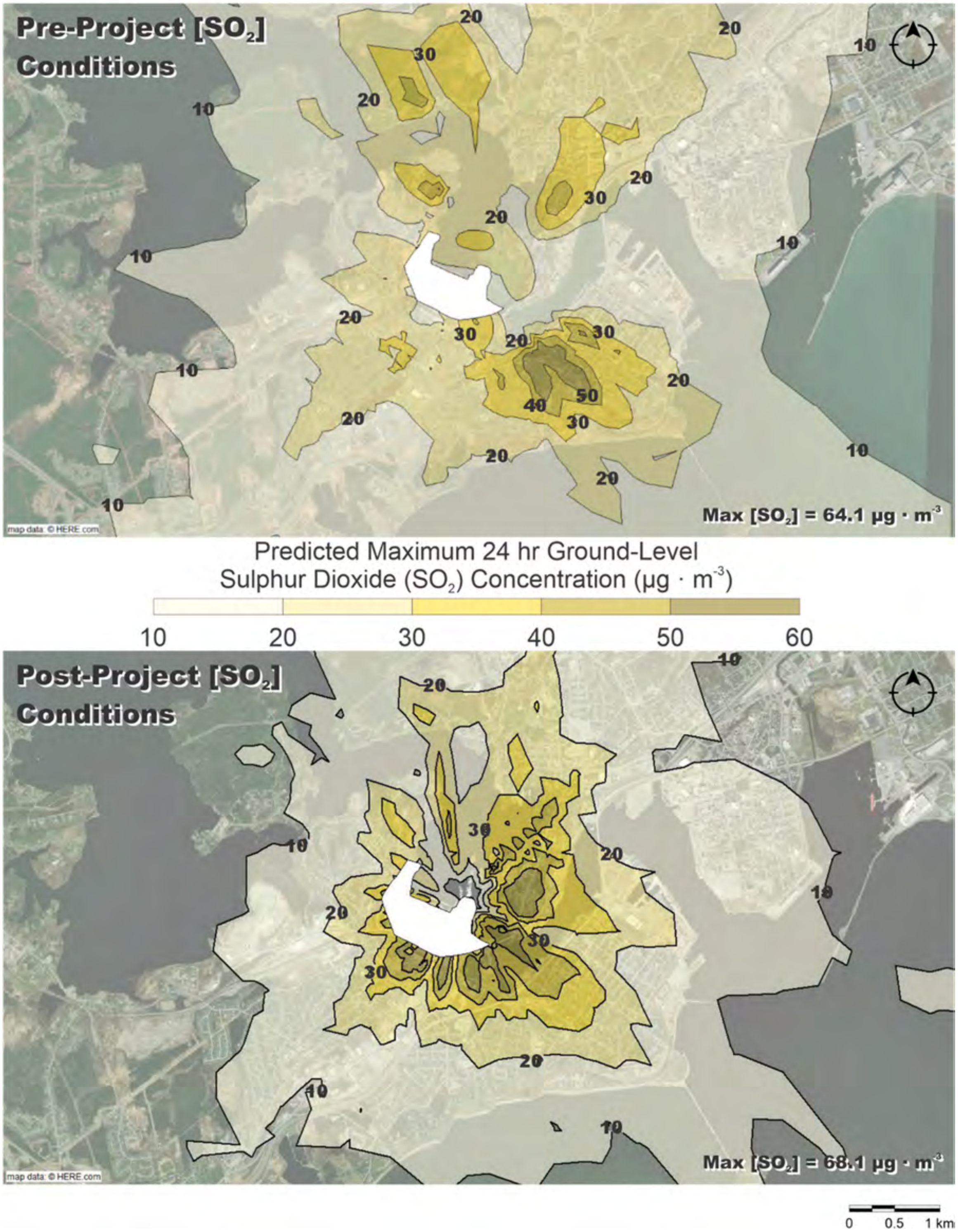


Figure 89. Maximum predicted ground-level sulphur dioxide (SO_2) concentrations obtained using CALPUFF for pre-Project (*i.e.*, 1 000 ADMT peak daily pulp production) and post-Project (*i.e.*, proposed mill modernization and green energy generation project with 1 800 ADMT peak daily pulp production) operation of the Reversing Falls Mill in Saint John, New Brunswick.

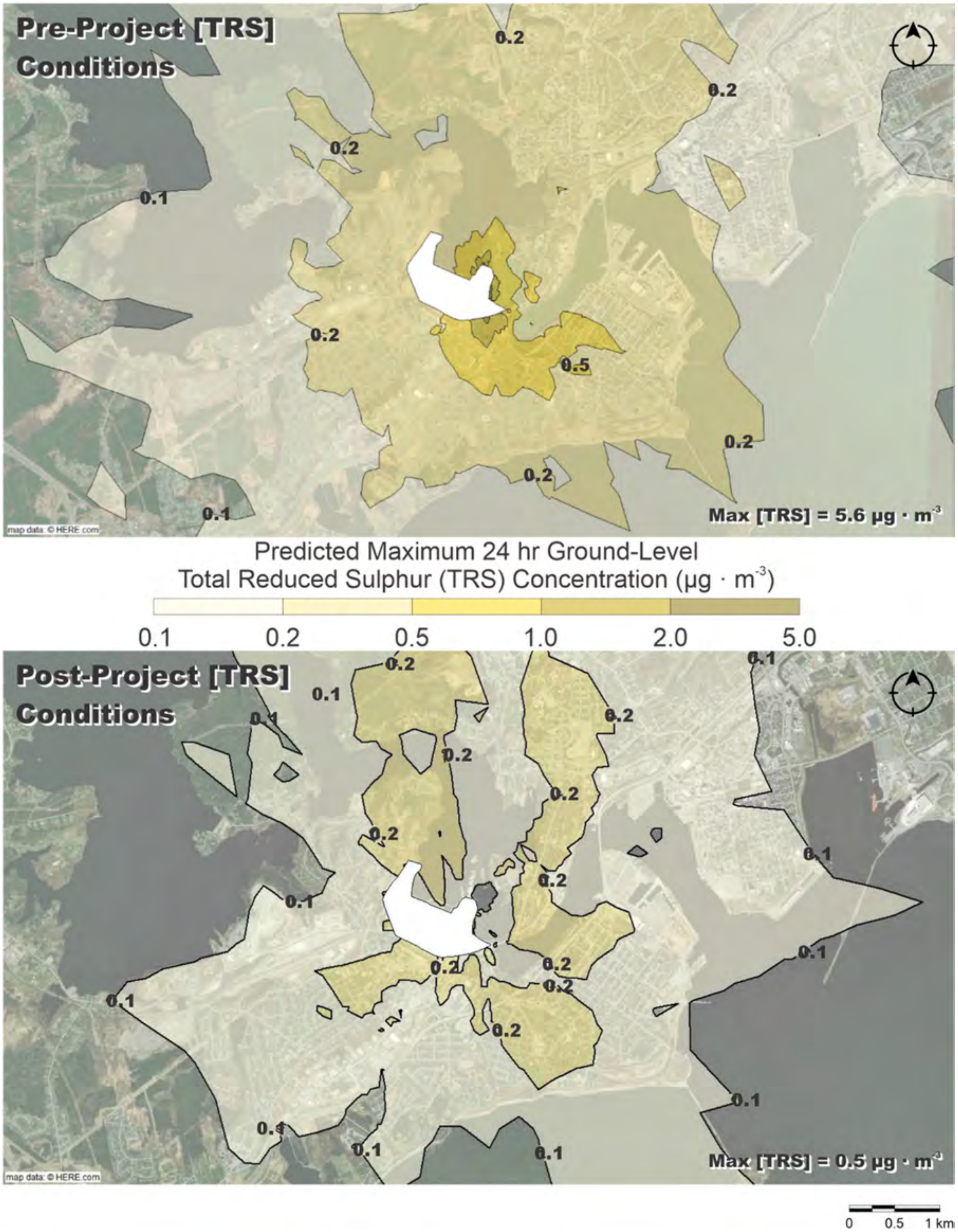


Figure 90. Maximum predicted ground-level total reduced sulphur (TRS) concentrations obtained using CALPUFF for pre-Project (*i.e.*, 1 000 ADMT peak daily pulp production) and post-Project (*i.e.*, proposed mill modernization and green energy generation project with 1 800 ADMT peak daily pulp production) operation of the Reversing Falls Mill in Saint John, New Brunswick.

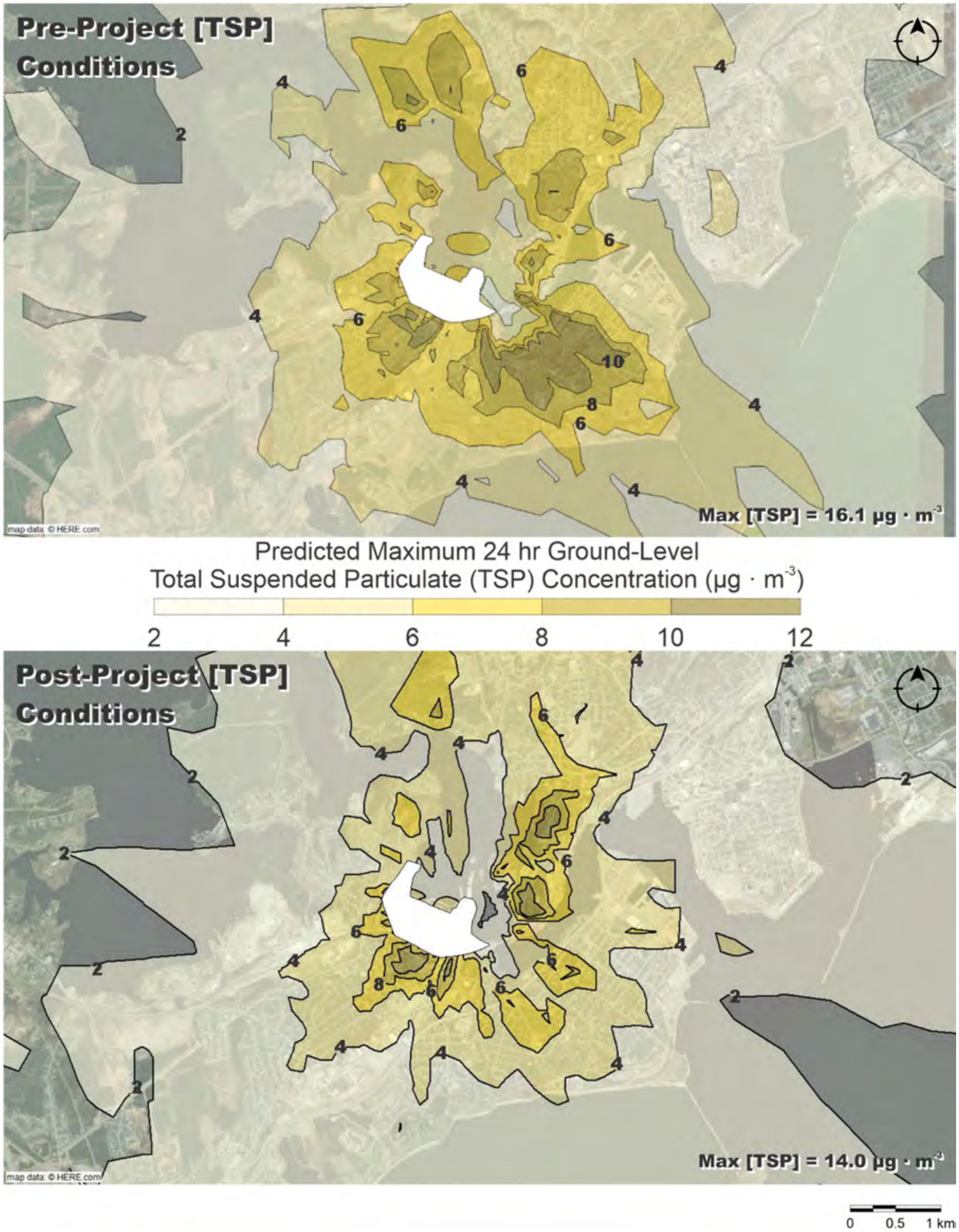


Figure 91. Maximum predicted ground-level total suspended particulates (TSP) concentrations obtained using CALPUFF for pre-Project (*i.e.*, 1 000 ADMT peak daily pulp production) and post-Project (*i.e.*, proposed mill modernization and green energy generation project with 1 800 ADMT peak daily pulp production) operation of the Reversing Falls Mill in Saint John, New Brunswick.

A summary of results of the CALPUFF dispersion modelling for pre- and post-project scenario are provided in Table 38. The results demonstrate that implementation of the Project features and mitigation measures will yield a reduction in the maximum predicted ground-level concentrations of most air contaminants assessed. Some of the modelled reductions are considerable. For example, it is anticipated that the maximum average ground-level TRS concentrations will decrease by up to 97 %. Currently, the Mill is one of the lowest TRS emitting Kraft pulp mills in the country (Figure 92). Following this Project, the Mill will have the lowest TRS emissions of any Kraft pulp mill in Canada.

Table 38. Maximum predicted ground-level air contaminant concentrations obtained using CALPUFF for pre- and post-Project (*i.e.*, proposed mill modernization and green energy generation project) operation of the Reversing Falls Mill in Saint John, New Brunswick. Note: Change values that are bolded in green represent air contaminant concentration reductions.

Air Contaminant / Averaging Period	Maximum Predicted Ground-Level Concentration (µg ·°m^{-3})			Normalized Maximum Predicted Ground-Level Concentration per 1 000 ADMT (µg ·°m^{-3})		
	Pre-Project*	Post-Project	Change	Pre-Project	Post-Project	Change
Nitrogen Dioxide (NO_2)						
1 hr	270	210	**- 22 %**	0.2700	0.1167	**- 57 %**
24 hr	41.6	42.7	3 %	0.0416	0.0237	**- 43 %**
Annual	2.8	3.01	8 %	0.0028	0.0017	**- 40 %**
Fine Particulate Matter ($PM_{2.5}$)						
1 hr	58.0	32.2	**- 54 %**	0.0580	0.0179	**- 69 %**
24 hr	7.9	6.60	**- 34 %**	0.0079	0.0036	**- 54 %**
Annual	0.33	0.39	**- 4 %**	0.0003	0.0002	**- 35 %**
Sulphur Dioxide (SO_2)						
1 hr	215.2	135.0	**- 17 %**	0.2152	0.0750	**- 65 %**
24 hr	64.1	68.1	38 %	0.0641	0.0378	**- 41 %**
Annual	3.001	2.73	29 %	0.0030	0.0015	**- 49 %**
Total Reduced Sulphur (TRS)						
1 hr	18.6	2.30	**- 3 %**	0.0186	0.0013	**- 93 %**
24 hr	5.58	0.50	**- 21 %**	0.0056	0.0003	**- 95 %**
Annual	0.93	0.05	**- 15 %**	0.0009	0.00003	**- 97 %**
Total Suspended Particulates (TSP)						
1 hr	116	69.0	**- 50 %**	0.1160	0.0383	**- 67 %**
24 hr	16.1	14.0	**- 28 %**	0.0161	0.0078	**- 52 %**
Annual	0.728	0.820	**- 5 %**	0.0007	0.0005	**- 37 %**

NOTES:
*Results are from the short-term model using conservative, maximum capable 1 hr and 24 hr emissions for the #2 power boiler and the maximum annual emissions for other sources; the annual results are based on the maximum annual emissions from 2018 to 2021

Despite the anticipated air emission reductions, there were some exceptions (Table 38). Modelling suggests that the maximum 24 hr average ground-level SO_2 concentration may increase by 38 % and the maximum annual may increase by up to 29 %. The maximum 24 hr average ground-level NO_2 concentration and the maximum annual average ground-level NO_2 concentration, respectively, may modestly increase by 6 % and 8 %. Despite those limited modelled increases, it is important to note that no exceedances of the applicable provincial or federal guideline / standard / objective are predicted.

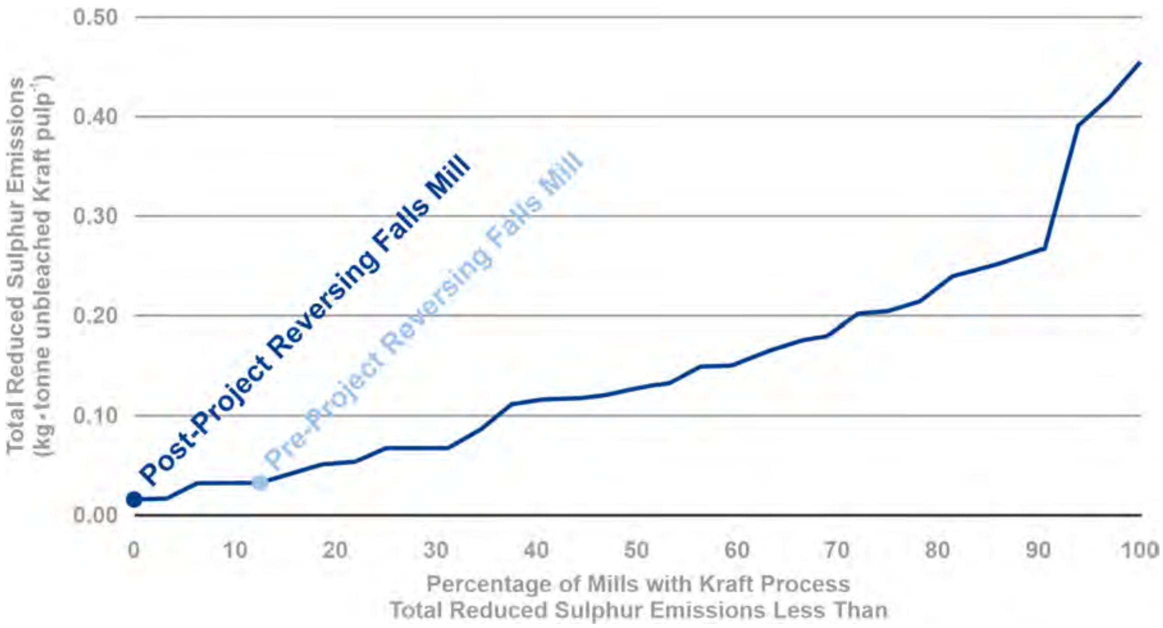


Figure 92. Total Reduced Sulphur emissions for 33 Canadian bleached Kraft pulp and dissolving bleached Kraft pulp mills in Canada showing the position of the Irving Pulp & Paper, Limited Mill pre- and post-Project. Data from the *National Council for Air and Stream Improvement, Inc.* (*NCASI*) 2023.

To better contextualize and normalize the improved ground-level concentrations of air contaminants once the Project is in operation and pulp production is increased by as much as 1.8 times, ground-level concentrations were also compared on a per unit of pulp production basis (Table 39). The modelled normalized maximum predicted ground-level concentrations show significant decreases in Table 38, ranging from 35 % to 97 % for all contaminants for all averaging periods once the Project is in operation. Therefore, even with an approximate 80 % increase in pulp production arising from the future scenario, the normalized maximum predicted ground-level concentrations of all contaminants are expected to decrease.

Englobe [2023] estimated the GHG emissions associated with Project construction (*n.b.*, for a copy of the complete standalone report please refer to Appendix X). They estimated that over the four year construction period that up to 5 637 t CO_{2eq} will be emitted. The emissions are related to the use of fossil fuels and electricity by construction equipment, such as cranes, transport trucks, and hand equipment. *Englobe* [2023] note that the estimate may vary by ± 1 691 t CO_{2eq}. The reason for that variation is because the actual emissions for each piece of equipment may be different based on such variables as site conditions, the age and level of equipment maintenance, and the amount of idling time allowed.

A summary of GHG emissions for pre- and post-Project operation of the Mill is provided in Table 40 and summarized in Figure 93. The base year for the pre-Project GHG emissions is based on the average emissions from the Mill between 2016 and 2018. The post-Project operation of the Mil is based on the daily peak pulp production rate of 1 800 ADMT.

It is anticipated that Scope 1 CO_{2eq} emissions associated with operating the Mill will increase by 18 792 tonnes annually post-Project (Table 40 and Figure 93). The Scope 1 CO_{2eq} emissions increase is largely attributed to the increased stationary fuel combustion associated with the Kraft pulp production increase.

Scope 2 CO_{2eq} emissions are predicted to decrease by almost 20 times post-Project (Table 40 and Figure 93). That marked decrease is associated with an overall reduction in fossil fuel associated with generating electricity to operate the Mill. The significant reduction in the use of fossil fuel generated electricity is because there will be a prominent increase in the combustion of biogenic fuel in the new RB. The increase in biogenic fuel (*i.e.*, biomass and spent cooking fluids) will reduce the amount of electricity purchased by the Mill from the New Brunswick electrical grid. That is because additional electricity will be generated on-site via the new green energy generator(s).

Overall, it is anticipated that there will be a 14.6 % decrease in total GHG emissions (*i.e.*, an annual decrease of 19 648 tonnes CO_{2eq}) moving from a peak daily pulp production of 1 000 ADMT to 1 800 ADMT(Table 40 and Figure 93); GHG emissions per ADMT will reduce from 0.226 t CO_{2eq} to 0.157 t CO_{2eq}. The GHG emissions decrease resulting from the Project represents 0.16 % of New Brunswick's entire 2020 GHG emissions, which was approximately 12.4 million tonnes CO_{2eq} as reported in *ECCC*, [2022b].

Table 39. Comparison of normalized predicted maximum ground-level air contaminant concentrations obtained using CALPUFF for pre-and post-Project (*i.e.*, proposed mill modernization and green energy generation project) operation of the Reversing Falls Mill in Saint John, New Brunswick at peak daily production and average daily production. Reductions from the pre-Project conditions are bolded in green.

Air Contaminant and Averaging Period		Normalized Predicted Maximum Ground-Level Concentration per 1 000 tonnes of Production ($\mu g \cdot m^{-3}$ per 1 000 tonnes per day)			Normalized Concentration Change from Pre-Project		Comments
		Pre-Project Peak Daily (1 000 ADMT)	Post-Project Peak Daily (1 800 ADMT)	Post-Project Average Daily (1 650 ADMT)	Post-Project Peak Daily (1 800 ADMT)	Post-Project Average Daily (1 650 ADMT)	
NO_2	1 hr	0.2700	**0.1167**	**0.1273**	**- 57 %**	**- 53 %**	The changes in the maximum predicted ground-level concentrations for NO_2 are primarily due to decommissioning the #2 power boiler and replacing the existing recovery boiler and the existing incinerator with the new recovery boiler and the #4 lime kiln.
	24 hr	0.0416	**0.0237**	**0.0266**	**- 43 %**	**- 36 %**	
	Annual	0.0028	**0.0017**	**0.0018**	**- 40 %**	**- 35 %**	
$PM_{2.5}$	1 hr	0.0580	**0.0179**	**0.0161**	**- 69 %**	**- 72 %**	The reductions in the maximum predicted ground-level concentrations for $PM_{2.5}$ are primarily due to decommissioning the #2 power boiler and replacing the existing recovery boiler with the new recovery boiler that will have much better dispersion (*i.e.*, a larger and taller stack) and best-available emission reduction technologies.
	24 hr	0.0079	**0.0036**	**0.0032**	**- 54 %**	**- 60 %**	
	Annual	0.0003	**0.0002**	**0.0002**	**- 35 %**	**- 42 %**	
SO_2	1 hr	0.2152	**0.0750**	**0.1077**	**- 65 %**	**- 50 %**	The current 1 hr / 24 hr (*i.e.*, short-term) maximum predicted ground-level concentrations were conservatively predicted using the maximum short-term #2 power boiler emissions. Decommissioning the #2 power boiler will significantly reduce the SO_2 maximum predicted ground-level concentrations, especially in the short-term. A slight increase in the short-term SO_2 maximum predicted ground-level concentration at the average daily production rate is due to burning more NCGs, SOGs, and DNCGs in the recovery boiler.
	24 hr	0.0641	**0.0378**	**0.0535**	**- 41 %**	**- 17 %**	
	Annual	0.0030	**0.0015**	**0.0023**	**- 49 %**	**- 22 %**	
TRS	1 hr	0.0186	**0.0013**	**0.0109**	**- 93 %**	**- 41 %**	The reductions in the maximum predicted ground-level concentrations for TRS are because of decreased overall emissions and replacing the Teller scrubber stack of the existing recovery boiler with the new recovery boiler that will have much better dispersion (*i.e.*, a larger and taller stack) and best-available emission reduction technologies. A slight increase in the short-term TRS maximum predicted ground-level concentration at the average daily production rate is due to burning more NCGs, SOGs, and DNCGs in the recovery boiler.
	24 hr	0.0056	**0.0003**	**0.0027**	**- 95 %**	**- 52 %**	
	Annual	0.0009	**0.00003**	**0.0005**	**- 97 %**	**- 49 %**	
TSP	1 hr	0.1160	**0.0383**	**0.0353**	**- 67 %**	**- 70 %**	The reductions in the maximum predicted ground-level concentrations for TSP are primarily due to decommissioning the #2 power boiler and replacing the existing recovery boiler with the new recovery boiler that will have much better dispersion (*i.e.*, a larger and taller stack) and best-available emission reduction technologies.
	24 hr	0.0161	**0.0078**	**0.0070**	**- 52 %**	**- 56 %**	
	Annual	0.0007	**0.0005**	**0.0004**	**- 37 %**	**- 42 %**	

Table 40. Comparison of greenhouse gas emissions for the pre- and post-project (*i.e.*, proposed mill modernization and green energy generation project) operation of the Reversing Falls Mill in Saint John, New Brunswick.

Emission Category	Annual GHG Emissions (tonnes CO_{2eq})		
	Pre-Project Peak Daily (1 000 ADMT)*	Post-Project Peak Daily (1 800 ADMT)	Difference
Scope 1 (*i.e.*, direct emissions)†	93 132	111 924	18 792
Scope 2 (*i.e.*, indirect emissions)	41 107	2 667	- 38 440
TOTAL	134 239	114 591	- 19 648

NOTES:
*CO_2 emissions from the combustion of biogenic fuels (*i.e.*, wood waste and spent cooking fluids) are excluded from the total site emissions
†Average of 2016 to 2018 operational emissions from the Mill

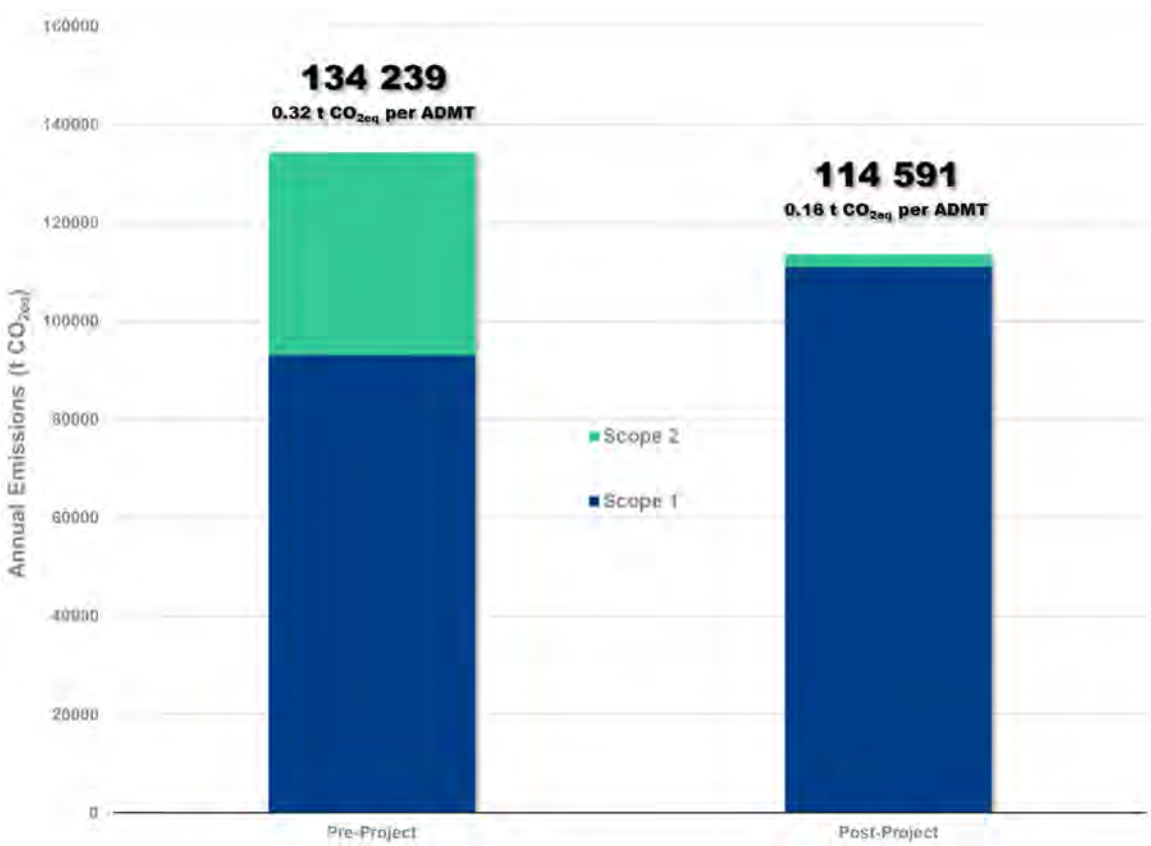


Figure 93. Comparison of Scope 1 and Scope 2 greenhouse gas emissions for the pre- and post-Project (*i.e.*, proposed mill modernization and green energy generation project) operation of the Reversing Falls Mill in Saint John, New Brunswick.

The increased use of biogenic fuels in the new RB and #3 PB will displace fossil fuel use; thus, reducing future GHG emissions from the Mill. Taking the #2 PB offline will eliminate GHG emissions related to the combustion of Bunker C heavy fuel oil. Similarly, some features of Project's new equipment, such as the auxiliary fuel systems of the new RB and new lime kiln (*i.e.*, replacing Bunker C heavy fuel oil with natural gas), will contribute to future GHG emission reductions.

The quantity of electricity purchased and sold by the Mill has a direct impact on Scope 2 GHG emissions. The new green energy generator(s) will increase the Mill's electricity production from the existing 30 MW up to 140 MW. This will substantially reduce (*i.e.*, up to 95 %) the Mill's reliance on electricity purchased from NB Power's electricity grid (*i.e.,* Scope 2 GHG emissions as shown in Figure 93). The excess green, carbon-free electricity will be available for purchase by NB Power for distribution on its grid replacing electricity that could otherwise be generated by fossil fuels. A summary of the total annual electricity purchased and sold pre- and post-Project is provided in Table 41.

Carbon intensity is the amount of CO_2 produced per unit of energy generated. It is a useful indicator of energy efficiency with respect to moving towards net-zero emissions. Producing less carbon emissions for an equivalent amount of electricity generated by using more biogenic fuels will reduce the Mill's reliance on fossil fuel combustion. A comparison of the carbon intensity for pre- and post-Project operation of the Mill is provided in Table 42.

Table 41. Comparison of annual electricity consumption for the pre- and post-Project (*i.e.*, proposed mill modernization and green energy generation project) operation of the Reversing Falls Mill in Saint John, New Brunswick.

Category	Total Electricity (MWh)		
	Pre-Project Peak Daily 1 000 ADMT)	Post-Project Peak Daily (1 800 ADMT)	Difference
Electricity purchased by Mill	141 747	9 198	- 132 549
Electricity sold by Mill	4 788	604 002	599 214

The carbon intensity notably decreases post-Project (Table 42). The comparison shows that when the Project is in operation, the Mill will emit significantly less GHGs per MWh of electricity produced (*i.e.*, an 82 % reduction). Overall, the Project is expected to result in positive environmental effects with respect to GHG emissions. The Project will enable the Mill to become nearly energy self-sufficient by producing largely carbon-free electricity and moving the Mill closer to net-zero emissions. It will also benefit New Brunswick because the Mill, a net energy producer, will have a relatively low carbon intensity when compared to the province's overall composite electricity generation carbon intensity or the combustion electricity generation carbon intensity. As a result, it is expected that GHG emissions will reduce from about 290 t $CO_{2eq} \cdot kWh^{-1}$ generated to 254 t $CO_{2eq} \cdot kWh^{-1}$ generated (Figure 94).

Table 42. Comparison of carbon intensity for the pre- and post-Project (*i.e.*, proposed mill modernization and green energy generation project) operation of the Reversing Falls Mill in Saint John, New Brunswick.

Category	Pre-Project Peak Daily 1 000 ADMT)	Post-Project Peak Daily (1 800 ADMT)	New Brunswick Composite Electricity Generation*	New Brunswick Combustion Electricity Generation†
Electricity purchased annually (MWh)	141 747‡	9 198*	--	--
Electricity sold annually (MWh)§	4 788	604 002	--	--
Carbon intensity (tonnes $CO_{2eq} \cdot MWh^{-1}$)	0.027‖	0.005‖	0.290¶	0.964¶

NOTES:
*Composite refers to an electricity generation mixture of hydro, nuclear, wind, biomass, and coal, oil, natural gas, and diesel-powered generating stations
†Combustion refers to electricity generated at coal, oil, natural gas, and diesel-powered stations
‡The pre-Project base years is based on an average of the Mill operating between 2016 to 2018
§Assumes the Mill will be 100 % reliant on its own power generation with power needing to be purchased when the turbine generator(s) is not available during maintenance (*i.e.*, 1 % of the time)
‖With biogenic CO_2 removed
¶From the National Inventory Report 1999-2021: Greenhouse Gas Sources and Sinks in Canada
https://publications.gc.ca/collections/collection_2023/eccc/En81-4-2021-3-eng.pdf

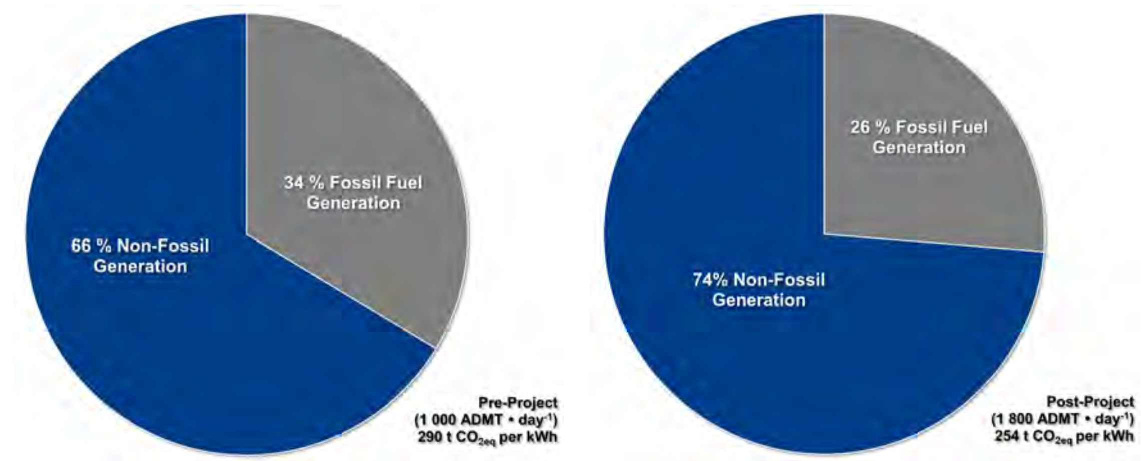


Figure 94. Potential impact to the NB Power electricity generation grid with construction and operation of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

4.4.2.1.3 Proposed Mitigation

At a minimum, the mitigation measures outlined below should be undertaken by Project personnel to ensure that potential impacts to air quality are minimized.

- A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to air quality to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of Environment and Local Government for review and approval. {Applicable to Stages II and V}

- All Project equipment operators and supervisors should be briefed on the potential impacts that equipment emissions can have on the quality of the local airshed and briefing information should range from describing emissions that are released from equipment to how those emissions can be reduced. {II and V}
- Mitigation measures developed and included in the Project-specific environmental protection plan should be adhered to for adequately addressing potential impacts. {II and V}
- Construction equipment should only be operated at or below peak loading rates. {II}
- Heavy equipment should be turned off when not in use and / or when practical (*i.e.*, anti-idling policy). {II}
- The number of vehicle-kilometres travelled should be kept to a minimum (*i.e.*, there should be no unnecessary operation of equipment in and around the site). {II}
- Heavy equipment and vehicles should be operated using clean fuels (*i.e.*, ultra-low sulphur diesels), where available and practical. {II}
- Heavy equipment exhaust emission systems should meet the recommended standards. {II}
- Equipment should be maintained according to manufacturer recommended servicing periods. {II}
- Heavy equipment and vehicles should be refueled using a protocol designed to mitigate environmental risks. {II}
- No solid construction waste should be burned on-site (*n.b.*, this does not include wood waste normally incinerated in the bark boiler, power boiler, and recovery boiler). {II}
- Construction vehicles should comply with the posted / recommended speed limits and, as appropriate, reduce speed when travelling on surfaces where dusts are generated (*i.e.*, gravel or dirt roadways). {II}
- If the application of a dust suppressant is deemed necessary on gravel roadways of the Mill site, it should be applied using suitable equipment (*e.g.*, a tanker truck equipped with spray bars and methods of controlling water flow, *etc.*). {II}
- The use of Bunker C heavy fuel oil will be eliminated in the new recovery boiler by only burning spent cooking liquor as the primary fuel and natural gas as the primary auxiliary fuel. {III}
- Operators should ensure that the new electrostatic precipitators on the new recovery boiler and lime kilns operate efficiently and are maintained on appropriate schedules to maintain decreased air emissions. {III}
- Improved and comprehensive emissions monitoring will be used on the new flue gas stack and new lime kiln stack. {III}
- Collected non-condensable gases should always be incinerated in the new recovery boiler, #3 power boiler, or emergency backup burner, when required, to reduce total reduced sulphur emissions from the Mill that could lead to odourous emissions. {III and V}
- Collected dilute non-condensable gases, which are being collected from more locations post-Project than compared to pre-Project, should always be incinerated

in the new recovery boiler or #3 power boiler to reduce odourous emissions for treatment prior to being released to the environment at all times other than: times of general maintenance on the dilute non-condensable gases collection system and / or incineration system; or other unforeseen short-term outages. {III and V}

- Collected stripper off-gases should always be incinerated in the new recovery boiler, #3 power boiler, lime kilns, or emergency backup burner to reduce total reduced sulphur emissions from the Mill that could lead to odourous emissions. {III and V}
- The auxiliary fuel used for the emergency backup burner will be natural gas. {III}
- The Project will eliminate the use of Bunker C heavy fuel oil within the recovery boiler and the new lime kiln. {III}
- Spent cooking liquor, biomass, and / or natural gas should be used for generating heat and steam whenever possible. {III}
- Up to 140 MW of green electricity could be generated using the new turbine(s) whenever possible to displace the purchase of electricity from the grid, which is a produced using a variety of methods including the incineration of fossil fuels. {III}
- Excess green electricity produced but not needed for Mill operation will be transmitted to the New Brunswick electrical grid to be sold to local markets to displace electricity that could otherwise be generated by fossil fuels. {III}
- Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, will require updating based on operational requirements of the modernized equipment. {III}
- Emergency response and contingency plans will be designed to prevent any major and / or sustained environmental damage during construction and during any errors, mishaps, and / or unforeseen events. {V}

4.4.2.1.4 Potential Post-Mitigation Residual Impacts

Through this Project, the ambient air quality in Saint John should be substantially improved and GHG emissions should be markedly reduced. Therefore, this Project is expected to result in impacts to local air quality that are positively significant or are a considerable improvement compared to current operations as summarized in Table 35. There are no residual impacts anticipated for air quality considering planned mitigation, safeguards, and the use of BAT for this Project.

4.4.2.2 Sound Emissions

Although the Mill is in a traditional heavy industrial area of west Saint John, some residential properties do exist in the area (Refer to Section 3.3.6). Sound will be emitted by most construction equipment and some Project equipment (Figure 95). Those sounds may be above ambient sound levels. If they become too high, those sound levels may be an annoyance or be a health concern to nearby residents and may cause a disturbance to local wildlife. Additionally, sound levels could be a hazard to all Project personnel if appropriate precautions are not taken. Because of this, sound was selected as a VEC.

Construction equipment and activities that produce sound waves will also generate ground vibration. Therefore, ground vibrations are assessed within the sound VEC. When vibration levels exceed the thresholds of human perception, they can become an annoyance. Construction activities, such as pile driving, the dynamic compaction of loose soils, rock breaking, and the operation of heavy construction equipment often induce ground and structure vibrations.

Loud sounds are generally associated with construction activities and industrial operations. Sounds and vibrations during construction and operation will be emitted by both mobile sources (*e.g.*, heavy equipment, pile driving, *etc.*) and stationary sources (*e.g.*, process equipment, *etc.*). The intensity and frequency of those emitted sounds will vary. Sound pressure levels, which are measured in decibels, describe intensity. Every 10 dB increase in sound pressure level corresponds to a tenfold increase in intensity, which is perceived by humans as being twice as loud [*Health Canada*, 1998]. Typically, sounds with a frequency / pitch in the range of 20 Hz to 20 000 Hz are heard by people and the maximum sensitivity to sound occurs in the 1 000 Hz to 3 000 Hz range. Therefore, sounds with very low or very high frequencies seem less disturbing to humans than those in the middle frequencies, even at equal intensities.

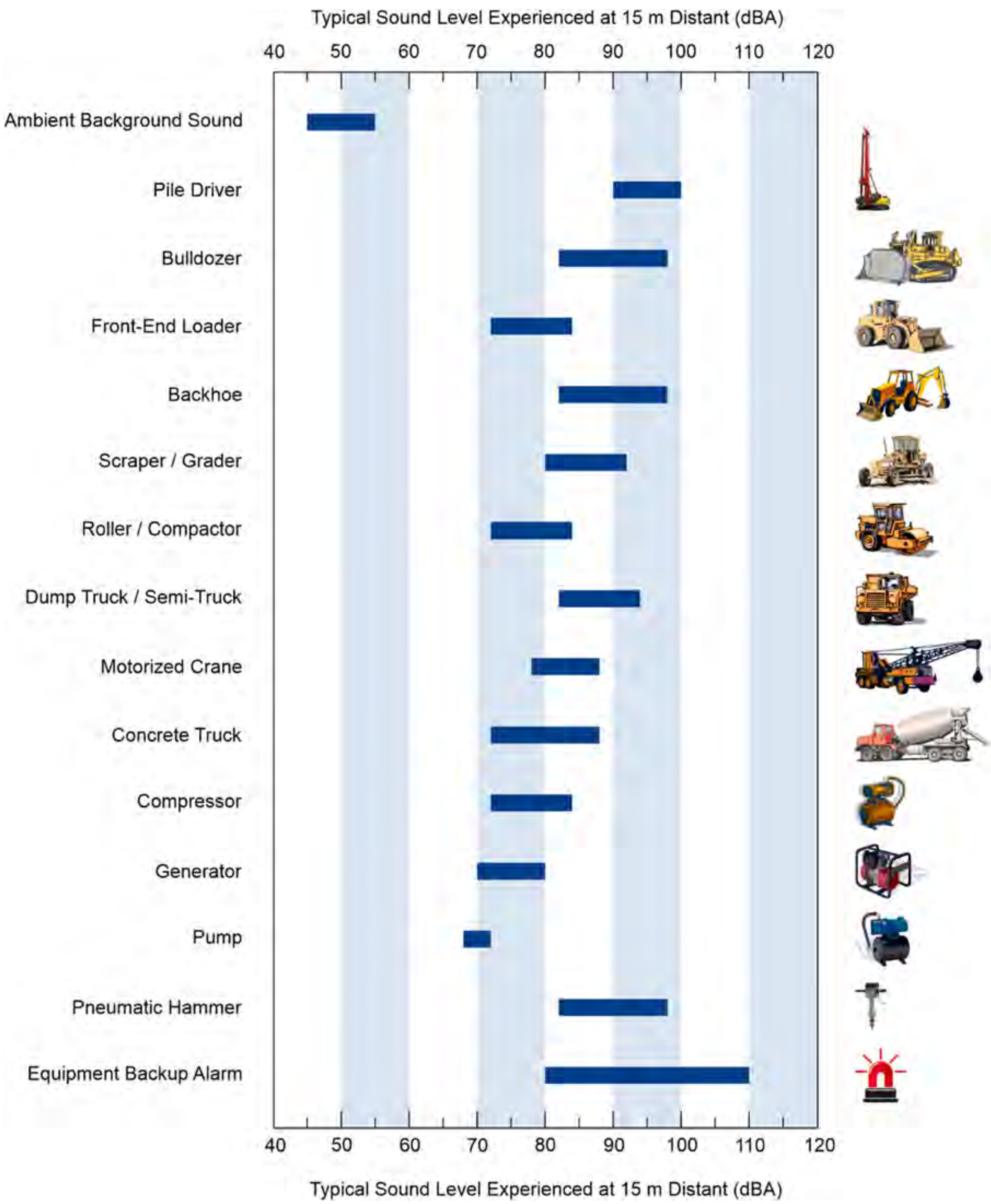


Figure 95. Typical sound levels from construction equipment experienced by a receptor at 15 m distant. After *USEPA* [1971].

4.4.2.2.1 Conceivable Impacts and Pathways

Activities and physical works that may occur during the Project that may cause sounds and vibrations are listed in Table 43. The potential impacts on the sound environment and their associated pathways are also included for reference. In the section that follows, the potential impacts are assessed in concert with the development of mitigation measures.

There is always a potential for mishaps, errors, and / or unforeseen events to occur regardless of how stringent the implemented mitigation measures are.

The following specific potential impacts were assessed for the Project:

- sound pressure levels (*i.e.*, intensity);
- sound duration;
- sound repetition; and
- ground vibration.

Table 43. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on the sound environment during various activities associated with the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Activity	Conceivable Impacts and Pathways
Construction traffic	➢ Vehicles and equipment travelling across road surfaces emit sounds, which may be heard at nearby residences ➢ Vehicles and equipment travelling across road surfaces may cause ground vibrations that could extend to nearby residences
Operation and maintenance of heavy equipment	➢ Worker exposure to loud sounds and / or continuous sounds can affect hearing temporarily and / or permanently ➢ Worker exposure to sounds can cause fatigue ➢ Worker exposure to sounds can cause annoyance and stress ➢ Sound emissions can affect the sleep quality of nearby residents (*e.g.*, affect them falling asleep, awakening them during sleep, *etc.*) ➢ Loud sounds (*e.g.*, back-up alarms) and / or continuous sounds (*e.g.*, traffic) can be an annoyance to nearby residents, which could become stressful ➢ Loud sounds may be reflected off the waters of the Saint John River and travel greater distances than they would across land
Pile driving and pneumatic rock breaking activities	➢ Worker exposure can cause fatigue ➢ High-energy impulsive sounds (*i.e.*, breaking) coupled with ground vibrations can be an annoyance to nearby residents, which can cause stress ➢ Highly impulsive sounds (*e.g.*, pile driving and pneumatic hammering) coupled with ground vibrations can be an annoyance to nearby residents, which can cause stress ➢ Vibrations may propagate outwards from the Project site

4.4.2.2.2 Potential Impacts

Table 44 is the complete assessment of potential impacts conducted for sound emissions associated with the Project. Of the 12 potential impacts, four generated yellow lights. Sound emission levels, sound duration, sound repetition, and ground vibrations during Stage II yielded yellow lights.

No new types of Kraft pulp manufacturing equipment are being installed through this Project. Instead, outdated equipment is being replaced with modern equipment fitted with BAT. Therefore, during operation of the Project, there is expected to be no negative change in operational sound emissions emitted and / or ground vibrations emanating from the Mill site. For these reasons, no change lights were applied to all potential impacts during Stage III (Table 44).

Equipment brought to the site to deal with any mishaps, errors, and / or unforeseen events may not have appropriate noise dampening measures or vibration reduction devices in place. Their operation would be expected to be of short duration and only long enough to rectify the situation. Green lights were produced for the assessment related to all potential impacts during Stage IV (Table 44).

Table 44. Assessment of potential impacts on sound emissions of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Sound pressure levels (*i.e.*, intensity)		1 to 4	A to M		7			1, 8	A, B, C, N
Sound duration		5	A to M		7			1, 8	A, B, C, N
Sound repetition		1 to 4	A to M		7			1, 8	A, B, C, N
Ground vibration		1, 6	A to M		7			1, 8	A, B, C, N

PATHWAYS

1 – The heavy equipment planned for constructing the Project may emit sound at levels less than or greater than those currently emitted during normal Mill operations and that heavy construction equipment may also cause ground vibrations.
2 – For personnel safety, back-up alarms on heavy equipment used during Project construction will emit sounds around 120 dBA. The use of those alarms will be intermittent and like the alarms on loaders, bulldozers, and other heavy equipment currently used at the Mill site for normal operations.
3 – A considerable number of steel piles (*i.e.*, about 1 500, but the exact amount will not be known until detailed design is completed) will be driven into the subsurface as part of the structural foundations for this Project. Pile driving often emits loud and repetitive sounds that can be annoying for nearby human receptors.
4 – Minimal use of pneumatic hammers may be required to break up bedrock during excavation of foundations for various Project components. Although the instantaneous impulse sounds generated by pneumatic hammers are typically < 100 dBA, the repetitive sounds emitted from their operation can be annoying to nearby human receptors.
5 – To minimize the extent of the construction period for this significant Project, work will occur 24 hours per day, seven days a week.
6 – Ground vibrations may be generated by heavy equipment travelling across the ground surface, pile driving may cause ground vibrations as the hammer forces the steel pile into the subsurface (*n.b.*, it is not anticipated that air concussions will be a significant issue during pile driving), and rock breaking with pneumatic hammers may cause ground vibrations as the hammer repeatedly hits the rock.
7 – There are no new types of equipment being installed through this Project. The equipment being installed is newer technology and sounds emanating from that equipment will be no greater than those associated with current operations.
8 – Equipment brought in to mitigate any mishaps, errors, and / or unforeseen events may not have appropriate noise dampening measures or vibration reduction devices, but their operation would be expected to be of short duration.

MITIGATION

A – A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to the sound environment to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of Environment and Local Government for review and approval.
B – All Project personnel should be briefed on the potential impacts the Project may have on sound and sound levels; this may range from explaining that regular reviews and maintenance should be done on all heavy equipment to ensure the equipment is operating as designed and is not unnecessarily contributing to loud sound emissions.
C – Mitigation measures developed and included in the Project-specific environmental protection plan should be adhered to for adequately addressing potential impacts.
D – Project personnel should ensure that all construction equipment is equipped with the appropriate manufacturer designed sound level abatement equipment (*i.e.*, mufflers and shrouds).
E – The exhaust systems of all Project equipment should be reviewed regularly to ensure that sound level abatement equipment is operating properly.
F – Construction equipment should be maintained according to the manufacturer's recommended servicing periods.
G – The idling of all heavy construction equipment should be kept to a minimum and excessive engine throttling should be avoided.
H – Where practical, the staging of heavy construction equipment should be done away from sensitive sound receptors, such as residences.
I – Loud construction activity (*e.g.*, pile driving and rock breaking, *etc.*) should be scheduled / planned to occur during normal workday / daylight hours (*i.e.*, 7 AM through 7 PM Monday through Saturday), where possible, to limit any potential annoyance to residential receptors. Loud activities should be scheduled to occur concurrently.
J – When multiple options are available and where practical and feasible, the quieter construction equipment / process should be selected.
K – Nearby residents and businesses should be notified at least one week prior to the start of pile driving activities.
L – Pile drivers should be equipped with the appropriate manufacturer designed sound emission abatement equipment to help minimize sounds emitted from pile driving activity.
M – A protocol should be used for receiving, investigating, managing, and tracking residential complaints in a timely manner regarding sound and vibrations emitted from the Project site.
N – In the event of an emergency, equipment with proper sound abatement technologies may not be readily available. What will be more important at this stage is correcting the error, mishap, and / or unforeseen event to limit all permanent environmental impact(s).

4.4.2.2.3 Proposed Mitigation

For this Project, the mitigation of environmental sounds is best achieved through sound source controls and sound receptor controls. Being in the center of the city, IPP understands how important it is to be a good neighbour with respect to sound emissions from the Mill site. The following mitigation measures will be implemented by Project personnel as source controls to minimize the potential impact of sound emissions to nearby receptors (*i.e.*, residents and the public), during Phases II and IV.

- Project personnel should ensure that all construction equipment is equipped with the appropriate manufacturer designed sound level abatement equipment (*i.e.*, mufflers and shrouds). {Applicable to Stage II}
- The exhaust systems of all Project construction equipment should be reviewed regularly to ensure that sound level abatement equipment is operating properly. {II}
- Construction equipment should be maintained according to the manufacturer's recommended servicing periods. {II}
- The idling of all heavy construction equipment should be kept to a minimum and excessive engine throttling should be avoided. {II}
- Where practical, the staging of heavy construction equipment should be done away from sensitive sound receptors, such as residences. {II}
- Loud construction activity (*e.g.*, pile driving and rock breaking, *etc.*) should be scheduled / planned to occur during normal workday / daylight hours (*i.e.*, 7 AM through 7 PM Monday through Saturday), where possible, to limit any potential annoyance to residential receptors. Loud activities should be scheduled to occur concurrently. {II}
- When multiple options are available and where practical and feasible, the quieter construction equipment / process should be selected. {II}
- Pile drivers should be equipped with the appropriate manufacturer designed sound emission abatement equipment to help minimize sounds emitted from pile driving activity. {II}

The following mitigation measures will be implemented by Project personnel as sound receptor controls.

- Nearby residents and businesses should be notified at least one week prior to the start of pile driving activities. {II}
- A protocol should be used for receiving, investigating, managing, and tracking residential complaints in a timely manner regarding sound and vibrations emitted from the Project site. {II}

The general mitigation measures provided below will also be implemented for the Project.

- A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to the sound environment to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of Environment and Local Government for review and approval. {II and V}

- All Project personnel should be briefed on the potential impacts the Project may have on sound and sound levels; this may range from explaining that regular reviews and regular maintenance should be done on all heavy equipment to ensure the equipment is operating as designed. {II and V}
- Mitigation measures developed and included in the Project-specific environmental protection plan should be adhered to for adequately addressing potential impacts. {II and V}
- In the event of an emergency, equipment with proper sound abatement technologies may not be readily available. What will be more important at this stage is correcting the error, mishap, and / or unforeseen event to limit all permanent environmental impact(s). {II and V}

4.4.2.2.4 Potential Post-Mitigation Residual Impacts

Project construction may result in some short-term sounds greater than are currently emitted from the Mill site. Those potential impacts can be mitigated as noted above. During operation, it is anticipated that there will be no change in sound emissions.

4.4.2.3 Surface Water Quality and Quantity

The Saint John River Watershed is a rich and important ecosystem biologically, socially, economically, and culturally. A perennial connection has existed between humans and the Saint John River. The river provides habitat for numerous species and is a source of water for many purposes, such as drinking water and irrigation. The river is also used for navigation, recreation, energy production, and industrial purposes.

The majority of New Brunswick's population growth has occurred adjacent to the Saint John River. As industries developed, so too did the residential population required to support them. The Mill sits on the banks of the Saint John River at the confluence with Saint John Harbour on the Bay of Fundy near the center of Saint John.

Studies in the 1960s revealed that water quality along specific stretches of the Saint John River was poor [*CRI*, 2011]. As a result of those findings, significant improvements to water quality of the river were made between 1972 and 1984 when municipalities and industries installed systems for treating effluent prior to discharge. Since then, there has been continuous water quality improvements as treatment systems are upgraded and flows are reduced.

4.4.2.3.1 Conceivable Impacts and Pathways

Project activities and physical works that may cause surface water quality and quantity impacts are listed in Table 45. The potential impacts on the surface water environment and their associated pathways are also included for reference. In the section that follows, the potential impacts are assessed in concert with the development of mitigation measures.

Because various Project activities have the potential to impact the surface water environment, it was identified as a VEC that required assessment. Based on the conceivable impacts and pathways identified in Table 45, the following specific potential impacts were assessed:

- surface water physical quality (*i.e.*, turbidity, suspended sediment, and temperature);
- surface water biological quality (*i.e.*, microbiology) and chemical quality (*i.e.*, general chemistry and trace metals);
- surface water quantity (*i.e.*, runoff volume, drainage patterns, and discharges); and
- contamination by hydrocarbons / hazardous chemicals.

Table 45. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on the surface water environment during various activities associated with the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Activity	Conceivable Impacts and Pathways
Pile driving	➢ Creation and exposure of large rock faces at the edge of excavations may be new sources of groundwater discharge (*i.e.*, seepage faces) that generate more surface water runoff that has to be managed ➢ Runoff from stockpiled shot rock and excavated rock may contain increased sediment loads that are subsequently transported to the river
Operation and maintenance of heavy equipment	➢ Ground spills of hydrocarbons during refueling operations (*i.e.*, gasoline and diesel) may be washed into the Saint John River ➢ Leaks of hydraulic fluids, oils, *etc.* during normal operations may spill on to the ground and be washed into the river
Temporary construction personnel sanitary facilities	➢ Leaks or spills on the ground during use or maintenance may cause untreated sanitary waste to be introduced to the Saint John River
Storage and handling of various hazardous chemicals	➢ Leaks or spills on the ground during the handling and storage of hazardous chemicals (*e.g.*, paint, epoxies, concrete additives, cleaners, solvents, *etc.*) may be washed into the river
Foundation construction and roadway paving	➢ Dewatering activities may cause sediment to be entrained in discharged water that could be subsequently transported to the Saint John River ➢ Foundations and asphalt roadways / parking areas are impermeable surfaces, which may change in quantity of water directed to the aquifer and increase the amount directed to the Saint John River
Dust suppression and winter roadway clearing	➢ If chemical dust suppressants are used on roadways, they may be entrained in overland flow and subsequently transported to the Saint John River ➢ If salt is used for winter roadway maintenance, it may be entrained in overland flow and subsequently transported to the river
Temporary storage of construction and hazardous waste	➢ Precipitation may encounter construction and hazardous waste that is temporarily stored onsite prior to safe disposal, which may cause water to become contaminated and subsequently be introduced to the Saint John River

4.4.2.3.2 Potential Impacts

The impact assessment for surface water quantity and quality is summarized in Table 46. As previously noted, there is no in-water work associated with the Project and there is very little work that will be occurring within 30 m of the river. The assessment yielded primarily green lights (n = 4). Two yellow lights were produced during the assessment and one no change light was generated.

Table 46. Assessment of potential impacts on surface water quantity and quality of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Surface water physical quality (*i.e.*, turbidity, suspended sediment, and temperature)	●	1, 2, 3	A to G	●	8, 9	R	●	11	A, B, C, S
Surface water biological (*i.e.*, microbiology) and chemical (*i.e.*, general chemistry and trace metals) quality	●	4, 5	A, B, C, H	●	8, 9	O, P, Q, R	●	11	A, B, C, S
Surface water quantity (*i.e.*, runoff volume, drainage patterns, and discharges)	●	6	A to F	●	8, 9	R	⊖		
Contamination by hydrocarbons / hazardous chemicals	△	7	A, B, C, I to Q	●	10	O, P, Q, R	△	11	A, B, C, O, Q, S

PATHWAYS

1 – Construction activities, especially those activities that occur in the presence of exposed soils and / or within 30 m of the Saint John River, have the potential to increase the amount of sediment entering the river, which can increase turbidity / suspended sediment concentrations.
2 – Grading and site development may alter overland flow conditions within the Project footprint (*i.e.*, timing, duration, frequency, and volume) due to changes in slope, removal of vegetation, ditching, *etc.*, and may cause water to be quickly dispersed from the site, and overland flow conditions may become "flashy".
3 – Runoff from any temporary stockpiles may contain increased sediment loads that are subsequently transported to the Saint John River.
4 – Leaks or spills on the ground during use or maintenance of construction personnel temporary sanitary facilities may cause untreated sanitary waste to be introduced to the Saint John River.
5 – Site grading and development may affect the quality of water being introduced to the Saint John River from the Project site, such as chemical element concentrations (*e.g.*, sodium, potassium, *etc.*).
6 – Foundations and asphalt roadways / parking areas are impermeable surfaces, which may alter overland flow conditions within the Project site (*i.e.*, timing, duration, frequency, and volume).
7 – Spills can occur during refueling operations, while operating and maintaining heavy equipment, or during the storage of such products. The potential impacts from a hydrocarbon / hazardous chemical spill would be dictated by the size, duration, and location of the spill. Any spills could be introduced to the Saint John River.
8 – Further developing the lands and installing impermeable surfaces, such as concrete, will reduce the amount of undeveloped space available for groundwater recharge and potentially result in increased surface water runoff that could affect the quality of the receiving waterbody, such as the Saint John River. The Project will occupy a total footprint of about 6 650 m^2; however, the entire footprint will not be new impermeable surfaces.
9 – Once the Project is operational there should be little additional impact to the surface water environment.
10 – During operation and maintenance, there will be minimal use of hydrocarbon / hazardous chemicals on the site; however, there is a potential for spills, including Kraft pulp manufacturing chemicals, and there is a possibility that the Saint John River could be impacted.
11 – If the mishap, error, and / or unforeseen event is significant, there is a potential for the damage to be severe and / or irreversible.

MITIGATION

A – A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to the surface water environment to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of Environment and Local Government for review and approval.
B – All Project personnel should be briefed on the potential impacts the Project may have on surface water quality and quantity; this could range from explaining that soil erosion may increase due to site grading and development, to possible contamination by hydrocarbons due to spills and the appropriate mitigation measures.
C – Mitigation measures developed for this Project should be followed to adequately address potential impacts on surface quantity and quality.
D – An erosion and sedimentation control plan, which may form part of the Project-specific environmental protection plan, should be developed, and implemented prior to completing any onsite works and may include the installation and management of structures, such as strawbale barriers, rock check dams, silt fences, *etc.*, to limit and control erosion and sedimentation.
E – Erosion and sediment control structures should be regularly inspected and maintained according to the Project-specific environmental protection plan to ensure they continue to protect against erosion and sedimentation.
F – A surface water drainage management plan, which may form part of the Project-specific environmental protection plan, should be developed, and implemented prior to completing any onsite works and may include the use of ditches and settling basins to control surface water flow and to reduce sediment concentrations in water prior to discharge from the site.
G – Temporary material stockpiles, if required, should not be in areas where there is a concentration of surface water runoff. Perimeter erosion control, such as silt fencing, should be erected around any temporary material stockpiles, where appropriate, to protect them from surface water runoff. The slope of temporary material stockpiles should not exceed a 2 : 1 slope.
H – During construction activities, all sanitary waste associated with those construction activities should be collected using self-contained portable washroom facilities and those wastes should be handled and disposed of by a licensed waste disposal operator. Alternatively, sanitary waste may be collected and treated via the municipal wastewater collection system from permanent and semi-permanent washroom facilities.
I – All heavy equipment used onsite should be in good repair and free of excess oil and grease, the equipment should be equipped with appropriately-sized spill response equipment (*i.e.*, spill kits), all Project personnel should be trained in the use of such equipment, and the equipment should be regularly maintained and inspected to minimize the risk of hydrocarbon-based fluid spills that may pose a threat to the Saint John River.
J – Concrete slurry waste should not be allowed to spill on to the ground and concrete equipment should only be washed up in designated areas where concrete waste can set, be broken up, and subsequently disposed of appropriately. To do this, temporary concrete washout facilities should be used or constructed that are designed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by onsite washout operations.
K – Construction debris, surplus materials, and other solid waste materials should be disposed of in an appropriate manner and waste receptacles / bins should be made available for containing construction debris and other solid waste materials for temporary storage before offsite disposal at an approved facility.
L – Construction vehicles should comply with the posted / recommended speed limits and, as appropriate, reduce speed when travelling on surfaces where dust is generated (*i.e.*, gravel or dirt roadways).
M – If the application of a dust suppressant is deemed necessary on gravel roadways of the Mill site, it should be applied using suitable equipment (*e.g.*, a

tanker truck equipped with spray bars and methods of controlling water flow, *etc.*).
N – Designated refueling locations should be identified within the Project-specific environmental protection plan (*i.e.*, > 30 m from the edge of the Saint John River) and those locations should be equipped with appropriately stocked and maintained spill response equipment (*i.e.*, spill kits). Refueling should only be done by trained and competent personnel using a means of spill containment, such as completing the operation atop an impermeable liner or using spill collection pans. Any materials used to clean-up spills, contaminated materials, and recovered spilled material that is not suitable for reuse should be stored and disposed of appropriately.
O – All potential contaminants and contaminated materials should be dealt with appropriately.
P – Regular maintenance and inspection of equipment onsite should be performed to minimize the risk of spills of oil-based fluids and / or hazardous materials that could pose a threat to the Saint John River.
Q – All spills of hazardous materials should be reported immediately to the appropriate Regulator(s).
R – Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment.
S – Emergency response / contingency plans should be designed to prevent any major and / or sustained environmental damage during any errors, mishaps, and / or unforeseen events.

4.4.2.3.3 Proposed Mitigation

The mitigation measures listed below should be employed to minimize the chance of activities related to the Project affecting surface water environs through the introduction of hydrocarbons and hazardous chemicals and contaminants.

- A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to the surface water environment to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of Environment and Local Government for review and approval. {Applicable to Stages II and V}
- All Project personnel should be briefed on the potential impacts the Project may have on surface water quality and quantity; this could range from explaining that soil erosion may increase due to site grading and development, to possible contamination by hydrocarbons due to spills and the appropriate mitigation measures. {II and V}
- Mitigation measures developed for this Project should be followed to adequately address potential impacts on surface quantity and quality. {II and V}
- An erosion and sedimentation control plan, which may form part of the Project-specific environmental protection plan, should be developed, and implemented prior to completing any onsite works and may include the installation and management of structures, such as strawbale barriers, rock check dams, silt fences, *etc.*, to limit and control erosion and sedimentation. {II}
- Erosion and sediment control structures should be regularly inspected and maintained according to the Project-specific environmental protection plan to ensure they continue to protect against erosion and sedimentation. {II}
- A surface water drainage management plan, which may form part of the Project-specific environmental protection plan, should be developed, and implemented prior to completing any onsite works and may include the use of ditches and settling basins to control surface water flow and to reduce sediment concentrations in water prior to discharge from the site. {II}
- Temporary material stockpiles, if required, should not be in areas where there is a concentration of surface water runoff. Perimeter erosion control, such as silt fencing, should be erected around any temporary material stockpiles, where appropriate, to protect them from surface water runoff. The slope of temporary material stockpiles should not exceed a 2 : 1 slope. {II}
- During construction activities, all sanitary waste associated with those construction activities should be collected using self-contained portable washroom facilities and those wastes should be handled and disposed of by a licensed waste disposal operator. Alternatively, sanitary waste may be collected and treated via the municipal wastewater collection system from permanent and semi-permanent washroom facilities. {II}
- All heavy equipment used onsite should be in good repair and free of excess oil and grease, the equipment should be equipped with appropriately-sized spill response equipment (*i.e.*, spill kits), all Project personnel should be trained in the use of such equipment, and the equipment should be regularly maintained and inspected to minimize the risk of hydrocarbon-based fluid spills that may pose a threat to the Saint John River. {II}

- Concrete slurry waste should not be allowed to spill on to the ground and concrete equipment should only be washed up in designated areas where concrete waste can set, be broken up, and subsequently disposed of appropriately. To do this, temporary concrete washout facilities should be used or constructed that are designed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by onsite washout operations. {II}
- Construction debris, surplus materials, and other solid waste materials should be disposed of in an appropriate manner and waste receptacles / bins should be made available for containing construction debris and other solid waste materials for temporary storage before offsite disposal at an approved facility. {II}
- Construction vehicles should comply with the posted / recommended speed limits and, as appropriate, reduce speed when travelling on surfaces where dust is generated (*i.e.*, gravel or dirt roadways). {II}
- If the application of a dust suppressant is deemed necessary on gravel roadways of the Mill site, it should be applied using suitable equipment (*e.g.*, a tanker truck equipped with spray bars and methods of controlling water flow, *etc.*). {II}
- Designated refueling locations should be identified within the Project-specific environmental protection plan (*i.e.*, > 30 m from the edge of the Saint John River) and those locations should be equipped with appropriately stocked and maintained spill response equipment (*i.e.*, spill kits). Refueling should only be done by trained and competent personnel using a means of spill containment, such as completing the operation atop an impermeable liner or using spill collection pans. Any materials used to clean-up spills, contaminated materials, and recovered spilled material that is not suitable for reuse should be stored and disposed of appropriately. {II}
- All potential contaminants and contaminated materials should be dealt with appropriately. {II, III, and V}
- Regular maintenance and inspection of equipment onsite should be performed to minimize the risk of spills of oil-based fluids and / or hazardous materials that could pose a threat to the Saint John River. {II and III}
- All spills of hazardous materials should be reported immediately to the appropriate Regulator(s). {II, III, and V}
- Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment. {III}
- Emergency response / contingency plans should be designed to prevent any major and / or sustained environmental damage during any errors, mishaps, and / or unforeseen events. {V}

4.4.2.3.4 Potential Post-Mitigation Residual and Cumulative Impacts

No residual and cumulative effects are likely to occur to the surface water so long as the mitigation measures provided here are followed.

4.4.2.4 Groundwater Quality and Quantity

Groundwater is a resource used for supplying potable water to a very limited number of residents in the local area. Many of the residential, commercial, institutional, and industrial properties in west Saint John are supplied municipal potable water that is obtained either from the South Bay Wellfield, which is located about 3 km distant from the Mill, or the Loch Lomond watershed in east Saint John. Although the City of Saint John's municipal water distribution system extends to most areas of Milford, there is at least one property on Kingsville Road that is not connected (*i.e.*, refer to Section 3.3.9). That property relies on an individual groundwater well to supply potable water (*i.e.*, refer to Section 3.1.7).

Groundwater discharge provides baseflow to local and regional watercourses during periods of little precipitation. Wetlands serve as areas of groundwater discharge and recharge depending on their geographical context. Together, watercourses and wetlands in communication with the groundwater environment form part of the structure and function of the natural ecosystem (*i.e.*, through the hydrological cycle and nitrogen cycle).

For the above noted reasons, groundwater was selected as a VEC requiring assessment.

4.4.2.4.1 Conceivable Impacts and Pathways

Based on Fundy Engineering's experience in the area, there is generally moderate communication between surface water and groundwater systems. Some activities that occur at the surface could impact the groundwater system in the absence of mitigation measures. Therefore, it is important to consider potential impacts and their pathways to the groundwater environment. It is important to consider aquifer sustainability in terms of water quantity and aquifer health in terms of water quality.

Activities and physical works that may occur during the Project and their potential impacts on the groundwater environment are summarized in Table 47. In the section that follows, the potential impacts are assessed in concert with the development of mitigation measures.

Regardless of how stringent the implemented mitigation measures are, there is always a potential for mishaps, errors, and / or unforeseen events to occur. The primary concern for groundwater is contamination by hydrocarbons and / or hazardous materials.

Because various Project activities have the potential to impact the groundwater environment, it was identified as a VEC that required assessment. Based on the conceivable impacts and pathways identified in Table 47, the following specific potential impacts were assessed:

- groundwater quality;
- groundwater quantity;
- hydrocarbon / hazardous chemical contamination;
- groundwater recharge areas; and
- groundwater discharge areas.

Impacts to hydrogeology may have secondary effects that induce changes in other VECs. Those secondary effects are dealt with in the assessment of the other VECs. For example, changes in groundwater discharge or recharge may affect wetlands, which are assessed under the surface water quality and quantity VEC.

Table 47. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on the groundwater environment during various activities associated with the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Activity	Conceivable Impacts and Pathways
Grading and site development	➢ Increased erosion potential whereby exposed sediments may be entrained in overland flow and subsequently transported to the aquifer (*n.b.*, this is more of a potential concern for fractured bedrock systems where entrained sediments may not be filtered out during infiltration) ➢ Altered overland flow conditions (*i.e.*, timing, duration, and frequency) due to changes in slope, ditching, *etc.* may cause water to be quickly dispersed such that it does not have an opportunity to infiltrate to the aquifer (*i.e.*, reduction in quantity of water directed to the aquifer) ➢ Runoff from stockpiled excavated material and / or rock fill may contain increased sediment loads that are subsequently transported to the aquifer
Operation and maintenance of heavy equipment	➢ Ground spills of hydrocarbons during refueling operations (*i.e.*, gasoline and diesel) may infiltrate to the aquifer ➢ Leaks of hydraulic fluids, oils, *etc.* during normal operations may spill on to the ground and infiltrate to the aquifer
Pile driving	➢ Sediment may be dislodged within rock fractures and may become entrained in groundwater if ground vibrations are excessive ➢ New fractures may be created or existing fractures may become clogged affecting the communication of the fracture network
Temporary construction personnel sanitary facilities	➢ Leaks or spills on the ground during use or maintenance may cause untreated sanitary waste to infiltrate to the aquifer
Storage and handling of various hazardous chemicals	➢ Leaks or spills on the ground during the handling and storage of hazardous chemicals (*e.g.*, paint, epoxies, concrete additives, cleaners, solvents, *etc.*) may infiltrate to the aquifer
Footing and foundation construction	➢ Dewatering activities may cause sediment to be entrained in discharged water that could be subsequently transported to the aquifer ➢ Foundations are impermeable surfaces, which may be placed in areas that were formerly groundwater recharge or discharge areas (*i.e.*, change in quantity of water directed to the aquifer)
Dust suppression and winter roadway clearing	➢ If chemical dust suppressants are used on roadways, they may be entrained in overland flow and subsequently transported to the aquifer ➢ If salt is used for winter roadway maintenance, it may be entrained in overland flow and subsequently transported to the aquifer
Temporary storage of construction and hazardous waste	➢ Precipitation may encounter construction and hazardous waste that is temporarily stored onsite prior to safe disposal, which may cause water to become contaminated and subsequently infiltrate to the aquifer
Kraft pulp manufacturing chemical fluid pipe leak	➢ During operation, leaks could be entrained in overland flow and subsequently transported to the aquifer

4.4.2.4.2 Potential Impacts

Results of the groundwater quantity and quality impact assessment are provided in Table 48. Six yellow lights were generated and are largely related to groundwater quality and potential spills of hydrocarbons and hazardous chemicals. It is realized that contamination may occur to the groundwater system and potential impacts could be long-lasting depending on the degree of the spill and the initial clean-up efforts. All other potential impacts produced either green lights (n = 3) or no change lights (n = 6).

Table 48. Assessment of potential impacts on groundwater quantity and quality of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Groundwater quality	▲	1, 2	A to G	●	6	P, Q, R, S	▲	8	A to C, H, P to R, T
Groundwater quantity	▲	1, 2	A to G	●	6	S	⊜		
Hydrocarbon / hazardous chemical contamination	▲	1, 3, 4	A, B, C, H to R	●	1, 3, 6, 7	P, Q, R, S	▲	8	A to C, H, P to R, T
Groundwater recharge areas	▲	5	A, C	⊜			⊜		
Groundwater discharge areas	⊜			⊜			⊜		

PATHWAYS

1 – Surrounding properties served by individual onsite groundwater wells for potable water are located upgradient. Therefore, no impact is anticipated. Based on our review of nearby properties, only one residence on Kingsville Road appears to obtain their potable groundwater from an onsite groundwater well while all other properties in the area appear to be connected to the municipal system. That potable groundwater well on Kingsville Road is > 1.25 km from the Project site.
2 – Energy released from pile driving activity rapidly decreases from the pile being driven and vibrations are usually insignificant after several tens of metres from the pile being driven. Therefore, no impact from pile driving activity is anticipated to potable groundwater wells > 100 m from the Project site.
3 – Spills can occur during refueling operations, while operating and maintaining heavy equipment, or during the storage of such products. The potential impacts from a hydrocarbon / hazardous chemical spill would be dictated by the size, duration, and location of the spill.
4 – At least one property in the surrounding area is served by an individual onsite groundwater well for potable water (*n.b.*, that property is > 1.25 km distant). If a hydrocarbon or hazardous chemical spill migrates to the groundwater system, the potential impacts could be long lasting because groundwater systems are complex and often difficult to remediate once contaminated.
5 – Further developing the lands and installing impermeable surfaces, such as concrete, will reduce the amount of undeveloped space available for groundwater recharge. The Project will occupy a total footprint of about 6 650 m^2.
6 – Once the Project is operational there will likely be no additional impact to the groundwater environment.
7 – During operation and maintenance, there will be minimal use of hydrocarbon / hazardous chemicals on the site; however, there is a potential for spills, including Kraft pulp manufacturing chemicals, to occur.
8 – If the mishap, error, and / or unforeseen event is significant, there is a potential for the damage to be severe and / or irreversible.

MITIGATION

A – A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to the groundwater environment to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of Environment and Local Government for review and approval.
B – All Project personnel should be briefed on the potential impacts that the Project could have on groundwater quantity and quality; this could range from impermeable surfaces reducing groundwater recharge to a hydrocarbon spill potentially contaminating groundwater and the appropriate mitigation measures.
C – Mitigation measures developed for this Project should be followed to adequately address potential impacts on groundwater quantity and quality.
D – No baseline sampling of groundwater wells is warranted as there only appears to be one groundwater well used for potable purposes and that well located on Kingsville Road is located > 1.25 km distant from the Project site. Furthermore, no rock blasting is associated with this Project.
E – An erosion and sedimentation control plan, which may form part of the Project-specific environmental protection plan, will be developed, and implemented prior to completing any onsite works and may include the installation and management of structures, such as strawbale barriers, rock check dams, silt fences, *etc.*, to limit and control erosion and sedimentation.
F – Erosion and sediment control structures should be regularly inspected and maintained according to the Project-specific environmental protection plan to ensure they continue to protect against erosion and sedimentation.
G – A surface water drainage management plan, which may form part of the Project-specific environmental protection plan, should be developed, and implemented prior to completing any onsite works and may include the use of ditches and settling basins to control surface water flow and to reduce sediment concentrations in water prior to discharge from the site.
H – All heavy equipment used onsite should be in good repair and free of excess oil and grease, the equipment should be equipped with appropriately-sized spill response equipment (*i.e.*, spill kits) and all Project personnel should be trained in the use of such equipment, and the equipment should be regularly maintained and inspected to minimize the risk of hydrocarbon-based fluid spills that may pose a threat to groundwater systems.
I – Excavations that require dewatering should be done using proper techniques, which may include the use of sediment filter bags to limit sedimentation.
J – Concrete slurry waste should not be allowed to spill on to the ground and concrete equipment should only be washed up in designated areas where concrete waste can set, be broken up, and subsequently disposed of appropriately. To do this, temporary concrete washout facilities should be used or constructed that are designed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by onsite washout operations.
K – Construction debris, surplus materials, and other solid waste materials should be disposed of in an appropriate manner and waste receptacles / bins should be made available for containing construction debris and other solid waste materials for temporary storage before offsite disposal at an approved facility.
L – Temporary material stockpiles, if required, should not be in areas where there is a concentration of surface water runoff. Perimeter erosion control, such as silt fencing, should be erected around any temporary material stockpiles, where appropriate, to protect them from surface water runoff. The slope of temporary material stockpiles should not exceed a 2 : 1 slope.
M – Construction vehicles should comply with the posted / recommended speed limits and, as appropriate, reduce speed when travelling on surfaces where dust is generated (*i.e.*, gravel or dirt roadways).
N – During construction activities, all sanitary waste associated with those construction activities should be collected using self-contained portable washroom facilities and those wastes should be handled and disposed of by a licensed waste disposal operator. Alternatively, sanitary waste may be collected and treated via the municipal wastewater collection system for permanent and semi-permanent washroom facilities.
O – Designated refueling locations should be identified within the Project-specific environmental protection plan (*e.g.*, > 30 m from the edge of a watercourse, *etc.*) and those locations should be equipped with appropriately stocked and maintained spill response equipment (*i.e.*, spill kits). Refueling should only be done by trained and competent personnel using a means of spill containment, such as completing the operation atop an impermeable liner or using spill collection pans. Any materials used to clean-up spills, contaminated materials, and recovered spilled material that is not suitable for reuse should be stored and disposed of appropriately.
P – All potential contaminants and contaminated materials should be dealt with appropriately.
Q – Regular maintenance and inspection of equipment onsite should be performed to minimize the risk of spills of oil-based fluids and / or hazardous

materials that could pose a threat to groundwater systems.
R – All spills of hazardous materials should be reported immediately to the appropriate Regulator(s).
S – Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment.
T – Emergency response / contingency plans should be designed to prevent any major and / or sustained environmental damage during any errors, mishaps, and / or unforeseen events.

4.4.2.4.3 Proposed Mitigation

The mitigation measures listed below should be employed to minimize the chance of Project activities from impacting the groundwater regime (*n.b.*, many of the mitigation measures are nearly identical to those provided for surface water protection and is because the two systems are often interconnected).

- A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to the groundwater environment to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of Environment and Local Government for review and approval. {Applicable to Stages II and V}
- All Project personnel should be briefed on the potential impacts that the Project could have on groundwater quantity and quality; this could range from impermeable surfaces reducing groundwater recharge to a hydrocarbon spill potentially contaminating groundwater and the appropriate mitigation measures. {II and V}
- Mitigation measures developed for this Project should be followed to adequately address potential impacts on groundwater quantity and quality. {II and V}
- No baseline sampling of groundwater wells is warranted as there only appears to be one groundwater well used for potable purposes and that well located on Kingsville Road is located > 1.25 km distant from the Project site. Furthermore, no rock blasting is associated with this Project. {II}
- An erosion and sedimentation control plan, which may form part of the Project-specific environmental protection plan, will be developed, and implemented prior to completing any onsite works and may include the installation and management of structures, such as strawbale barriers, rock check dams, silt fences, *etc.*, to limit and control erosion and sedimentation. {II}
- Erosion and sediment control structures should be regularly inspected and maintained according to the Project-specific environmental protection plan to ensure they continue to protect against erosion and sedimentation. {II}
- A surface water drainage management plan, which may form part of the Project-specific environmental protection plan, should be developed, and implemented prior to completing any onsite works and may include the use of ditches and settling basins to control surface water flow and to reduce sediment concentrations in water prior to discharge from the site. {II}
- All heavy equipment used onsite should be in good repair and free of excess oil and grease, the equipment should be equipped with appropriately-sized spill response equipment (*i.e.*, spill kits) and all Project personnel should be trained in the use of such equipment, and the equipment should be regularly maintained and inspected to minimize the risk of hydrocarbon-based fluid spills that may pose a threat to groundwater systems. {II and V}
- Excavations that require dewatering should be done using proper techniques, which may include the use of sediment filter bags to limit sedimentation. {II}
- Concrete slurry waste should not be allowed to spill on to the ground and concrete equipment should only be washed up in designated areas where concrete waste can set, be broken up, and subsequently disposed of appropriately. To do this,

temporary concrete washout facilities should be used or constructed that are designed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by onsite washout operations. {II}

- Construction debris, surplus materials, and other solid waste materials should be disposed of in an appropriate manner and waste receptacles / bins should be made available for containing construction debris and other solid waste materials for temporary storage before offsite disposal at an approved facility. {II}
- Temporary material stockpiles, if required, should not be in areas where there is a concentration of surface water runoff. Perimeter erosion control, such as silt fencing, should be erected around any temporary material stockpiles, where appropriate, to protect them from surface water runoff. The slope of temporary material stockpiles should not exceed a 2 : 1 slope. {II}
- Construction vehicles should comply with the posted / recommended speed limits and, as appropriate, reduce speed when travelling on surfaces where dust is generated (*i.e.*, gravel or dirt roadways). {II}
- During construction activities, all sanitary waste associated with those construction activities should be collected using self-contained portable washroom facilities and those wastes should be handled and disposed of by a licensed waste disposal operator. Alternatively, sanitary waste may be collected and treated via the municipal wastewater collection system for permanent and semi-permanent washroom facilities. {II}
- Designated refueling locations should be identified within the Project-specific environmental protection plan (*e.g.*, > 30 m from the edge of a watercourse, *etc.*) and those locations should be equipped with appropriately stocked and maintained spill response equipment (*i.e.*, spill kits). Refueling should only be done by trained and competent personnel using a means of spill containment, such as completing the operation atop an impermeable liner or using spill collection pans. Any materials used to clean-up spills, contaminated materials, and recovered spilled material that is not suitable for reuse should be stored and disposed of appropriately. {II}
- All potential contaminants and contaminated materials should be dealt with appropriately. {II, III, and V}
- Regular maintenance and inspection of equipment onsite should be performed to minimize the risk of spills of oil-based fluids and / or hazardous materials that could pose a threat to groundwater systems. {II, III, and V}
- All spills of hazardous materials should be reported immediately to the appropriate Regulator(s). {II, III, and V}
- Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment. {III}
- Emergency response / contingency plans should be designed to prevent any major and / or sustained environmental damage during any errors, mishaps, and / or unforeseen events. {V}

4.4.2.4.4 Potential Post-Mitigation Residual Impacts

If a spill migrates to the groundwater system, the potential impacts could be long lasting because groundwater environments are complex and often difficult to remediate. This is an extremely unlikely and remote possibility because of the stringent environmental protection measures used onsite under IPP's existing EMS and through the environmental protection measures that will be described in the Project-specific EPP. Spills of hydrocarbons or hazardous materials within the Project site will be remediated to the appropriate criteria selected by the Site Professional in consultation with regulatory authorities.

4.4.3 Biological Environment

4.4.3.1 Terrestrial Flora and Fauna

Human lives are maintained and enhanced by interactions between flora and fauna. To demonstrate this, three national surveys (*i.e.*, 1981, 1987, and 1991) were conducted to assess the socioeconomic importance of wildlife to Canadians. Through those surveys [*Gray et al.*, 1993], it was determined that wildlife plays an important role in the lives of about 90 % of Canadians whether it be feeding, observing, photographing, hunting, trapping, *etc.* [*Filion et al.*, 1989].

As detailed in Section 3.2.4, the Project site is nearly devoid of vegetation and there are no virgin lands involved as detailed in Section 3.3.6. It is possible that fauna living in adjacent areas may migrate through the area on occasion. The Maritime Breeding Bird Atlas identifies the Mill site as being occupied with urban cover [*Stewart et al.*, 2015].

4.4.3.1.1 Conceivable Impacts and Pathways

The potential impacts on terrestrial flora and fauna and their associated pathways during the Project are summarized in Table 49. In the section that follows, the potential impacts are assessed in concert with the development of mitigation measures.

Table 49. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on terrestrial flora and fauna during various activities associated with the proposed recovery boiler project and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Activity	Conceivable Impacts and Pathways
Pile driving	➢ Loud intermittent sounds and vibrations may spook wildlife ➢ Loud intermittent sounds and vibrations could cause stress to wildlife, particularly during feeding and breeding activities
Operation and maintenance of heavy equipment	➢ Sound emitted from heavy equipment could spook / displace wildlife ➢ Sounds emitted from heavy equipment could make the hunting process by predators more difficult (*i.e.*, prey may be more easily startled) ➢ Sounds emitted from heavy equipment could interfere with the audible communication of wildlife (*e.g.*, bird mating calls, *etc.*) ➢ Ground spills of hydrocarbons during refueling operations (*i.e.*, gasoline and diesel) may contaminate food and water sources for wildlife ➢ Leaks of hydraulic fluids, oils, *etc.* during normal operations may spill on to the ground and contaminate food and water sources for wildlife ➢ Exhaust from heavy equipment can lead to the surface contamination of vegetation (*i.e.*, via particulate matter), which can be absorbed by plants that are later consumed by wildlife

Activity	Conceivable Impacts and Pathways
	➢ Emission particulates, and specifically those containing heavy metals, can be ingested by wildlife that can then bioaccumulate and biomagnify up the food chain ➢ Emission particulates can lead to the acidification of soils and cause death or injury to vegetation ➢ Sound emitted from equipment could disturb wildlife interactions, feeding, and breeding ➢ Potential for wildlife collisions and direct mortality ➢ Tall construction equipment (*i.e.*, heavy lift cranes) could lead to collisions with birds particularly during low-visibility conditions
Temporary construction personnel sanitary facilities	➢ Leaks or spills on the ground during use or maintenance may contaminate food and water sources for wildlife
Storage and handling of various hazardous chemicals	➢ Leaks or spills on the ground during the handling and storage of hazardous chemicals (*e.g.*, hydrocarbons, paints, solvents, polymers, cooking fluids, *etc.*) may contaminate food and water sources for wildlife
Dust suppression and winter roadway clearing	➢ Dusts emitted from the Project site (*e.g.*, vehicle traffic on roadways, *etc.*) may land on vegetation and affect primary production (*i.e.*, by impacting photosynthesis, respiration, and transpiration and allowing the penetration of phytotoxic gaseous pollutants) ➢ If chemical dust suppressants are used on roadways, they may be entrained in overland flow and subsequently transported to surface water sources used by wildlife ➢ If salt is used for winter roadway maintenance, it may be entrained in overland flow and be subsequently transported to and contaminate surface water sources used by wildlife
Temporary storage of hazardous waste	➢ If construction and hazardous waste that is temporarily stored onsite prior to safe disposal is not properly secured, wildlife may get into it and be injured and / or poisoned
Temporary storage of food wastes	➢ If food scraps and garbage from Project personnel are not properly stored, they may attract wildlife, which could result in unwanted interactions between humans and wildlife
Safety lighting	➢ Light emitted from construction and operational employee safety lights may attract birds, which could lead to collisions with onsite infrastructure resulting in injury or mortality

Based on information obtained from the ACCDC, some COSEWIC and *SARA* ranked species of terrestrial flora and fauna do exist within a 5 km radial buffer surrounding the Project site (*i.e.*, refer to Section 3.2 for a description of the species, Appendix VI for the ACCDC data report, and Table 15 for a listing and Figure 54, Figure 61, Figure 62, and Figure 63 for distribution maps). The following potential impacts were evaluated with respect to terrestrial flora and fauna:

- species of concern (*i.e., SARA* and COSEWIC listed species);
- flora and habitat;
- flora associations and biodiversity;
- fauna (*i.e.*, birds, animals, and mammals) and habitat (direct and indirect);
- fauna and habitat fragmentation; and
- fauna migration patterns (*i.e.*, migratory birds), nesting, and food chains.

4.4.3.1.2 Potential Impacts

The Project site does not contain any substantial areas that are vegetated with terrestrial flora (*n.b.*, there are some very limited areas of mowed grass). Because the site is nearly devoid of vegetation, there is little to no habitat that would be desirable for terrestrial fauna. None of those species identified in the ACCDC report are known to inhabit the property and none were observed during the site visits completed. Furthermore, the probability for any of those species being impacted by the proposed Project is extremely low given the existing and long-lived land-use as a heavy industrial site (*i.e.*, refer to Section 3.3.6).

Migratory birds are afforded special protection under the *Migratory Birds Convention Act* [**S.C., 1994, c. 22**]. Several species of migratory birds are known to migrate through the Saint John region (*e.g.*, Canada geese, semipalmated sandpipers, *etc.*). The lack of vegetation and cover on the site makes it an unlikely area for nesting locations for most species. The presence and continuous movement of heavy equipment on the site (*e.g.*, transport trucks, loaders, bulldozers, *etc.*) and the lack of suitable habitat makes it largely unattractive for staging and stopover areas. Nearby nesting grounds and open waters used by migratory birds are also unlikely to be indirectly affected by the Project. Although several sightings of ACCDC ranked migratory birds have been observed within a 5 km radial buffer around the site, none of those species are known to inhabit or frequent the site (*n.b.*, they may be transient visitors).

The impact assessment for terrestrial flora and fauna is summarized in Table 50. Because of existing conditions as a heavy industrial site with a well-prepared and implemented EMS by IPP personnel, there is expected to be very little change between now and throughout the various Project stages. The impact assessment yielded no change lights for many of the potential impacts (n = 8). It generated green lights for three potential impacts. Seven yellow lights were produced and are primarily related to species of special conservation concern, which are susceptible to environmental impacts should they move / migrate through the area.

Table 50. Assessment of potential impacts on terrestrial flora and fauna of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Species of concern (*i.e., SARA* and COSWEIC listed)	△	1 to 4	A to E	△	1 to 4	U	△	1 to 4, 12	A to E, H, V
Flora and habitat	△	1, 2, 5	A, B, C	⊜			◎	1, 2, 5, 11, 12	A, B, C, H, V
Flora associations and biodiversity	⊜			⊜			⊜		
Fauna (*i.e.*, birds, animals, and mammals) and habitat (*i.e.*, direct and indirect)	△	1, 2, 3, 6, 7	A to D, F, G	⊜			◎	1, 2, 3, 6 7, 12	A to D, F, H, V
Fauna and habitat fragmentation	⊜			⊜			⊜		
Fauna migration patterns (*i.e.*, migratory birds), nesting and food chains	△	8, 9	A to T	◎	10, 11	U	△	12	A to E, H to T, V

PATHWAYS

1 – The Project site is nearly devoid of any terrestrial flora and fauna (*n.b.*, transients / vagrants / migrants can and do make their way through the site on occasion).
2 – No *Species At Risk Act* listed species (*i.e.*, provincial and federal) or Committee On the Status of Endangered Wildlife In Canada listed species were observed during the various field assessments completed at the Project site; however, Atlantic Canada Conservation Data Centre records suggest that some transient / vagrant / migrant species of special conservation concern or rare species have been observed within a 5 km radius of the site, such as the barn swallow, bur oak, and the monarch butterfly. Therefore, there is a possibility that they could be found on the site or pass through the site on occasion.
3 – Sound and light emitted from heavy equipment and / or construction / operation activity may spook / displace wildlife from the Project site and / or adjacent areas.
4 – The New Brunswick Department of Natural Resources and Energy Development lists the wood turtle, bald eagle, and peregrine falcon as location-sensitive species for the area, but the various field assessments completed at the Project site did not show their presence. Regardless, there is a possibility that those location-sensitive species could exist at the site or pass through the site on occasion.
5 – Dust emitted from the Project site (*e.g.*, vehicle traffic on Mill site roadways, *etc.*) may be deposited on vegetation and could affect primary production (*i.e.*, by impacting photosynthesis, respiration, and transpiration and allowing the penetration of phytotoxic gaseous pollutants).
6 – Tall construction equipment (*i.e.*, heavy lift cranes) could lead to collisions with birds, particularly during low-visibility conditions.
7 – Nighttime lighting can attract birds and they can become disoriented or trapped in the beams of light.
8 – Ground spills of hydrocarbons during refueling operations (*i.e.*, gasoline and diesel) may contaminate food and water sources for wildlife.
9 – If food scraps and garbage from Project personnel are not stored properly, they may attract wildlife, which could result in unwanted interactions between humans and wildlife.
10 – Once the Project is in operation, there should be little impact to natural wildlife migration, nesting, and food chains.
11 – Hydrocarbon (*e.g.*, lubricating oils, gasoline, diesel, *etc.*) and chemical leaks (*e.g.*, Kraft pulp cooking fluids, *etc.*) from the various Kraft pulp manufacturing equipment may spill on to the ground and could contaminate food and water sources for wildlife.
12 – Depending on the mishap, error, and / or unforeseen event, there is a possibility the impact could be long-lasting and could extend offsite to affect a species of special conservation concern.

MITIGATION

A – A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to terrestrial flora and fauna to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of the Environment and Local Government for review and approval.
B – All Project personnel should be briefed on the potential impacts the Project may have on terrestrial flora and fauna; this could range from potential hydrocarbon spill contaminating food supplies to improperly stored food scraps attracting wildlife and appropriate mitigation measures.
C – Mitigation measures developed and included in the Project-specific environmental protection plan should be adhered to for adequately addressing potential impacts.
D – Extremely loud, intrusive, or otherwise potentially harassing construction activities (*i.e.*, pile driving) should be managed appropriately during periods of the year when wildlife are under severe environmental and physiological stress, such as the spring breeding and nesting season for migratory birds (*i.e.*, mid-April to the end of August).
E – If a species listed under the federal *Species At Risk Act* [**S.C. 2002, c. 29**] is observed on the Project site during construction, then the sighting will be reported to Environment and Climate Change Canada's Canadian Wildlife Service branch and if a species listed under the provincial *Species At Risk Act* [**R.S.N.B. 2012, c 6**] is observed on the Project site during construction, then the sighting will be reported to the New Brunswick Department of Natural Resources and Energy Development.
F – Tall equipment, such as heavy lift cranes, should be lowered when no longer required to avoid collisions with birds.
G – Nighttime lighting should be limited to that necessary for worker safety, the lighting should be focused on the work area, and the lighting should be down shielded or full-cut-off lighting (*i.e.*, no light is emitted above 90 °).
H – Heavy equipment should arrive at the Project site in a clean condition free of invasive species and noxious weeds.
I – Project personnel should report all unusual wildlife encounters to their Project supervisor.
J – Project personnel should properly dispose of food scraps and garbage in the appropriate onsite receptacles provided by the contractor or proponent.
K – Food scraps, garbage, and other waste stored onsite should be stowed in an appropriate manner and be transported offsite to an appropriate disposal facility (*e.g.*, Crane Mountain Landfill, *etc.*) on a regular basis.
L – Prior to working on the Project site, Project personnel should be advised not to feed or harass nuisance wildlife (*e.g.*, raccoons, pigeons, sea gulls, rodents, *etc.*).
M – Heavy equipment should comply with the posted / recommended speed limits and, as appropriate, yield the right-of-way to wildlife.
N – No attempt should be made to chase, catch, divert, follow, or otherwise harass any wildlife by vehicle or on foot.
O – If injured or deceased wildlife are encountered, then personnel with the New Brunswick Department of Natural Resources and Energy Development and the Canadian Wildlife Service should be contacted to determine the appropriate course of action for dealing with injured or deceased wildlife.

P – If deceased animals are encountered, they should be removed and disposed of as soon as possible in consultation with representatives with the New Brunswick Department of Natural Resources and Energy Development and the Canadian Wildlife Service.
Q – No Project personnel should affect wildlife populations by either hunting or trapping and firearms should be strictly prohibited on the Project site.
R – If an active nest, den, *etc.* is encountered, then a no-disturbance buffer zone should be established around the area (*n.b.*, flagging tape should not be used to mark the feature as it increases the chance of predation) until a qualified biologist determines if the buffer zone shall remain, if the size should be increased, or if the buffer zone can be eliminated (*i.e.*, the animal has abandoned the feature). Representatives with the New Brunswick Department of Natural Resources and Energy Development and the Canadian Wildlife Service should also be contacted to determine the appropriate buffer size.
S – No Project personnel should deposit or permit to be deposited oil, oil wastes, or any other substance harmful to wildlife in any waters or any area frequented by wildlife.
T – An oil spill prevention and response plan should be developed as part of the Project-specific environmental protection plan and include information on mitigation measures to deter migratory birds from encountering polluting substances, mitigation measures to be undertaken if migratory birds and / or sensitive habitat becomes contaminated, and the type and extent of monitoring that would be conducted in relation to various spill events.
U – Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment.
V – Emergency response and contingency plans should be designed to prevent any sustained environmental damage during any mishaps, errors, and / or unforeseen events.

4.4.3.1.3 Proposed Mitigation

The mitigation measures listed below should be employed to minimize the probability of activities related to the Project affecting terrestrial flora and fauna.

- A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to terrestrial flora and fauna to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of the Environment and Local Government for review and approval. {Applicable to Stages II and V}
- All Project personnel should be briefed on the potential impacts the Project may have on terrestrial flora and fauna; this could range from potential hydrocarbon spill contaminating food supplies to improperly stored food scraps attracting wildlife and appropriate mitigation measures. {II and V}
- Mitigation measures developed and included in the Project-specific environmental protection plan should be adhered to for adequately addressing potential impacts. {II and V}
- Extremely loud, intrusive, or otherwise potentially harassing construction activities (*i.e.*, pile driving) should be managed appropriately during periods of the year when wildlife are under severe environmental and physiological stress, such as the spring breeding and nesting season for migratory birds (*i.e.*, mid-April to the end of August). {II and V}
- If a species listed under the federal *Species At Risk Act* [**S.C. 2002, c. 29**] is observed on the Project site during construction, then the sighting will be reported to Environment and Climate Change Canada's Canadian Wildlife Service branch and if a species listed under the provincial *Species At Risk Act* [**R.S.N.B. 2012, c 6**] is observed on the Project site during construction, then the sighting will be reported to the New Brunswick Department of Natural Resources and Energy Development. {II and V}
- Tall equipment, such as heavy lift cranes, should be lowered when no longer required to avoid collisions with birds. {II and V}
- Nighttime lighting should be limited to that necessary for worker safety, the lighting should be focused on the work area, and the lighting should be down shielded or full-cut-off lighting (*i.e.*, no light is emitted above 90 °). {II}
- Heavy equipment should arrive at the Project site in a clean condition free of invasive species and noxious weeds. {II and V}
- Project personnel should report all unusual wildlife encounters to their Project supervisor. {II and V}
- Project personnel should properly dispose of food scraps and garbage in the appropriate onsite receptacles provided by the contractor or proponent. {II and V}
- Food scraps, garbage, and other waste stored onsite should be stowed in an appropriate manner and be transported offsite to an appropriate disposal facility (*e.g.*, Crane Mountain Landfill, *etc.*) on a regular basis. {II and V}
- Prior to working on the Project site, Project personnel should be advised not to feed or harass nuisance wildlife (*e.g.*, raccoons, pigeons, sea gulls, rodents, *etc.*). {II and V}
- Heavy equipment should comply with the posted / recommended speed limits and,

as appropriate, yield the right-of-way to wildlife. {II and V}

- No attempt should be made to chase, catch, divert, follow, or otherwise harass any wildlife by vehicle or on foot. {II and V}
- If injured or deceased wildlife are encountered, then personnel with the New Brunswick Department of Natural Resources and Energy Development and the Canadian Wildlife Service should be contacted to determine the appropriate course of action for dealing with injured or deceased wildlife. {II and V}
- If deceased animals are encountered, they should be removed and disposed of as soon as possible in consultation with representatives with the New Brunswick Department of Natural Resources and Energy Development and the Canadian Wildlife Service. {II and V}
- No Project personnel should affect wildlife populations by either hunting or trapping and firearms should be strictly prohibited on the Project site. {II and V}
- If an active nest, den, *etc.* is encountered, then a no-disturbance buffer zone should be established around the area (*n.b.*, flagging tape should not be used to mark the feature as it increases the chance of predation) until a qualified biologist determines if the buffer zone shall remain, if the size should be increased, or if the buffer zone can be eliminated (*i.e.*, the animal has abandoned the feature). Representatives with the New Brunswick Department of Natural Resources and Energy Development and the Canadian Wildlife Service should also be contacted to determine the appropriate buffer size. {II and V}
- No Project personnel should deposit or permit to be deposited oil, oil wastes, or any other substance harmful to wildlife in any waters or any area frequented by wildlife. {II and V}
- An oil spill prevention and response plan should be developed as part of the Project-specific environmental protection plan and include information on mitigation measures to deter migratory birds from encountering polluting substances, mitigation measures to be undertaken if migratory birds and / or sensitive habitat becomes contaminated, and the type and extent of monitoring that would be conducted in relation to various spill events. {II and V}
- Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment. {III}
- Emergency response and contingency plans should be designed to prevent any sustained environmental damage during any mishaps, errors, and / or unforeseen events. {V}

4.4.3.1.4 Potential Post-Mitigation Residual Impacts

No residual effects are expected for terrestrial flora and fauna over the duration of the Project assuming the above mitigation measures are implemented.

4.4.3.2 Aquatic Flora and Fauna

The Mill is located adjacent to Reversing Falls on the Saint John River and there is a long history of connection between the Mill and the River. As noted in Section 3.3.6, a Mill has existed at the site since at least 1836.

The Saint John River supports many communities ecologically and socially along its route from headwaters to mouth. It provides habitat for numerous species and is a source of water for many purposes, such as hydroelectricity, potable water, process water, and irrigation water and a is sink for many sources, such as agricultural and urban runoff, and treated municipal and industrial effluents. It is also used for many transportation and recreational purposes throughout the year. The river has been and will continue to be affected by anthropogenic activities.

4.4.3.2.1 Conceivable Impacts and Pathways

There will be no in-water work associated with this Project, but there will be some work within 30 m of the Saint John River. The potential impacts on aquatic flora and fauna and their associated pathways during the Project are summarized in Table 51. In the section that follows, the potential impacts are assessed in concert with the development of mitigation measures.

Table 51. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on aquatic flora and fauna during various activities associated with the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Activity	Conceivable Impacts and Pathways
Grading and site development	➢ Increased erosion potential and exposed sediments may be entrained in overland flow and transported to watercourses, wetlands, and / or the Bay of Fundy where entrained sediments (*i.e.*, elevated levels of total suspended sediments) may affect the water quality ➢ Excessive amounts of sediment introduced to surface water systems can affect light penetration and could affect growth of aquatic vegetation ➢ Excessive amounts of sediment introduced to surface water systems can smother and displace aquatic fauna (*e.g.*, benthic invertebrates) ➢ Altered overland flow conditions (*i.e.*, timing, duration, frequency, and volume) due to changes in slope, ditching, *etc.* may cause water to be quickly dispersed from the site; conditions may become "flashy" ➢ Amount of water directed to the subsurface may be reduced, which could cause changes to baseflow in watercourses ➢ Loss of vegetation may affect soil stability, which may lead to increased erosion potential ➢ Runoff from stockpiled spoils may contain increased sediment loads that are subsequently transported to surface water systems ➢ Sediment and other deleterious substances can affect the olfactory navigation used by some fish species during migration
Pile driving	➢ Shock waves and vibrations could have lethal (*i.e.*, damage to the swim bladder of fishes or rupture of internal organs) or sub-lethal (*e.g.*, behavioural) effects on aquatic fauna (*i.e.*, avoidance of preferred habitat, changes to migration, reduced feeding, and / or reduced schooling that could increase predation) ➢ Sound can affect reptiles and amphibians by forcing them from their habitat or causing undue stress ➢ Surface materials may be loosened, which may lead to increased erosion potential
Operation and maintenance of heavy equipment	➢ Vibrations from heavy equipment could have lethal (*i.e.*, damage to the swim bladder or rupture of internal organs) or sub-lethal (*e.g.*, behavioural) effects on fish ➢ Use of mobile industrial equipment may lead to the re-suspension and entrainment

Activity	Conceivable Impacts and Pathways
	of sediments in watercourses and / or wetlands ➢ Ground spills of hydrocarbons during refueling operations (*i.e.*, gasoline and diesel) may allow hydrocarbons to be introduced to surface water systems and cause contamination with lethal or sub-lethal results ➢ Leaks of hydraulic fluids, oils, *etc.* during normal operations may spill on to the ground and be introduced to surface water systems and cause contamination with lethal or sub-lethal results ➢ Exhaust from heavy equipment can lead to the surface contamination of aquatic vegetation (*i.e.*, via particulate matter), which can be absorbed and either cause damage or death ➢ Emission particulates, and specifically those containing heavy metals, can be ingested by fauna that can bioaccumulate and biomagnify up the food chain (*e.g.*, mercury is a particular heavy metal that is often a problem in aquatic ecosystems)
Temporary construction personnel sanitary facilities	➢ Leaks or spills on the ground during use or maintenance may cause untreated sanitary waste to be introduced to surface water systems and results can be lethal or sub-lethal to aquatic flora and fauna
Storage and handling of various hazardous chemicals	➢ Leaks or spills on the ground during the handling and storage of hazardous chemicals (*e.g.*, paint, epoxies, concrete additives, cleaners, solvents, *etc.*) may cause surface water and / or groundwater contamination with lethal or sub-lethal results on aquatic flora and fauna
Footing and foundation construction	➢ Dewatering activities may cause sediment to be entrained in discharged water that could be subsequently transported to surface waters and / or groundwater ➢ Foundations are impermeable surfaces, which may be placed in areas that were formerly groundwater recharge or discharge areas (*i.e.*, change in quantity of water directed to the groundwater system)
Dust suppression and winter roadway clearing	➢ Dusts emitted from the Project site (*e.g.*, vehicle traffic on roadways, wind erosion of aggregate stockpiles, *etc.*) may land on aquatic vegetation and affect primary production (*i.e.*, by impacting photosynthesis, respiration, and transpiration and allowing the penetration of phytotoxic gaseous pollutants) ➢ Excessive amounts of dust introduced to surface water systems can affect light penetration and could affect growth of aquatic vegetation ➢ If chemical dust suppressants are used on roadways, they may be entrained in overland flow and subsequently transported to and contaminate surface waters and / or groundwater ➢ If salt is used for winter roadway maintenance, it may be entrained in overland flow and subsequently transported to and contaminate surface waters and / or groundwater
Temporary storage of construction and hazardous waste	➢ Precipitation may encounter construction and hazardous waste that is temporarily stored onsite prior to safe disposal, which may cause water to become contaminated and subsequently infiltrate to the aquifer
Kraft pulp manufacturing chemical fluid pipe leak	➢ During operation, leaks could be entrained in overland flow and subsequently transported to and contaminate surface waters and / or groundwater

The Project site is adjacent to the Saint John River. The flora and fauna occupying the waters in the vicinity of the Project site may be negatively impacted by the Project in two primary ways: 1) via the release of contaminants, such as hydrocarbons from refueling activities and heavy equipment breakdown / malfunction; and 2) the release of sediments during surface water runoff. Therefore, there is potential for the Project to have a negative impact on the aquatic flora and fauna contained within the Saint John River, which the ACCDC identifies as containing some aquatic fauna that are protected under the p*SARA* or the COSEWIC (*e.g.*, the American eel and striped bass; refer to Appendix VI for the ACCDC report).

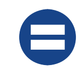
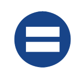
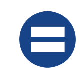
Based on the conceivable impacts and pathways identified in Table 51, the following specific potential impacts were assessed for aquatic flora and fauna:

- species of concern (*i.e., SARA* and COSEWIC listed);
- flora and habitat;
- flora associations and biodiversity;
- fauna (*e.g.*, fishes, mammals, *etc.*) and habitat (*i.e.*, direct and indirect);
- fauna habitat fragmentation; and
- fauna migration patterns (*i.e.*, anadromous fishes) / food chains.

4.4.3.2.2 Potential Impacts

The impact assessment for aquatic flora and fauna is summarized in Table 52. There is not likely to be any significant change between now, through Project construction, and when the Project is in operation and being maintained. Therefore, the impact assessment yielded primarily no change lights (n = 9) and green lights (n = 6). It produced three yellow lights, which are associated with potential unforeseen mishaps, errors, and / or unforeseen events.

Table 52. Assessment of potential impacts on aquatic flora and fauna of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Species of concern (*i.e., SARA* and COSWEIC listed)		1 to 4	A to I		5, 6	J		7	A to C, G to I, K to M
Flora and habitat		2 to 4	A to I		5, 6	J		7	A to C, G to I, K to M
Flora associations and biodiversity									
Fauna (*e.g.*, fish, mammals, *etc.*) and habitat (*i.e.*, direct and indirect)		2 to 4	A to I		5, 6	J		7	A to C, G to I, K to M
Fauna and habitat fragmentation									
Fauna migration patterns (*i.e.*, anadromous fishes) and food chains									

PATHWAYS

1 – No *Species At Risk Act* listed species (*i.e.*, provincial and federal) or Committee On the Status of Endangered Wildlife In Canada listed species exist on the Project site; however, Atlantic Canada Conservation Data Centre records suggest that some species have been observed in the waters of the adjacent Saint John River and connected waterways (*e.g.*, harbour porpoise, American eel, *etc.*).
2 – Increased erosion potential due to grading and site development may be allow sediment to become entrained in overland flow and transported to the Saint John River via engineered surface water runoff collection systems (*i.e.*, ditches, trenches, and ponds) where entrained sediments (*i.e.*, elevated levels of total suspended sediments) may affect the water quality.
3 – Ground spills of hydrocarbons during refueling operations (*i.e.*, gasoline and diesel) may allow hydrocarbons to be introduced to surface water systems and cause contamination with lethal or sub-lethal results to aquatic flora and / or fauna.
4 – Shock waves and vibrations from pile driving activities could have lethal (*i.e.*, damage to the swim bladder of fishes or rupture of internal organs) or sub-lethal (*i.e.*, behavioural) effects on aquatic fauna (*i.e.*, avoidance of preferred habitat, changes to migration, reduced feeding, and / or reduced schooling that could increase predation).
5 – The long-term operation and maintenance of the Project is expected to have little to no impact on any aquatic flora and fauna.
6 – Hydrocarbon (*e.g.*, lubricating oils, gasoline, diesel, *etc.*) and chemical leaks (*e.g.*, Kraft pulp cooking fluids, *etc.*) from the various Kraft pulp manufacturing equipment may spill on to the ground, be introduced to surface water systems, and cause contamination with lethal or sub-lethal results to aquatic flora and / or fauna.
7 – If there is a mishap, error, and / or unforeseen event it may have an impact on aquatic flora and fauna.

MITIGATION

A – A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to aquatic flora and fauna to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of the Environment and Local Government for review and approval.
B – All Project personnel should be briefed on the potential impacts the Project may have on aquatic flora and fauna; this could range from potential hydrocarbon spill contaminating surface water systems pile driving activities causing vibrations and shock waves that could affect behaviour of aquatic fauna and appropriate mitigation measures.
C – Mitigation measures developed and included in the Project-specific environmental protection plan should be adhered to for adequately addressing potential impacts.
D – An erosion and sedimentation control plan, which may form part of the Project-specific environmental protection plan, should be developed, and implemented prior to completing any onsite works and may include the installation and management of structures, such as strawbale barriers, rock check dams, silt fences, *etc.*, to limit and control erosion and sedimentation.
E – Erosion and sediment control structures should be regularly inspected and maintained according to the Project-specific environmental protection plan to ensure they continue to protect against erosion and sedimentation.
F – A surface water drainage management plan, which may form part of the Project-specific environmental protection plan, should be developed, and implemented prior to completing any onsite works and may include the use of ditches and settling basins to control surface water flow and to reduce sediment concentrations in water prior to discharge from the site.
G – Designated refueling locations should be identified within the Project-specific environmental protection plan (*i.e.*, > 30 m from the edge of the Saint John River) and those locations should be equipped with appropriately stocked and maintained spill response equipment (*i.e.*, spill kits). Refueling should only be done by trained and competent personnel using a means of spill containment, such as completing the operation atop an impermeable liner or using spill collection pans. Any materials used to clean-up spills, contaminated materials, and recovered spilled material that is not suitable for reuse should be stored and disposed of appropriately.
H – All potential contaminants and contaminated materials should be dealt with appropriately.
I – Regular maintenance and inspection of equipment onsite should be performed to minimize the risk of spills of oil-based fluids and / or hazardous materials that could pose a threat to the Saint John River.
J – All spills of hazardous materials should be reported immediately to the appropriate Regulator(s).
K – Heavy equipment working within or in 30 m of watercourses and / or wetlands should use eco-friendly biodegradable and non-toxic hydraulic fluids as opposed to petroleum-based hydraulic fluids, where practical and feasible.
L – Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment.
M – Emergency response and contingency plans should be designed to prevent any sustained environmental damage during any errors, mishaps, and / or unforeseen events.

4.4.3.2.3 Proposed Mitigation

The environmental protection measures provided below should be implemented by all Project personnel to minimize the potential impact on aquatic flora and fauna.

- A Project-specific environmental protection plan will be developed to provide best-management practices that all Project personnel should follow to limit the potential for impacts to aquatic flora and fauna to occur. When complete, the Project-specific environmental protection plan will be submitted to the New Brunswick Department of the Environment and Local Government for review and approval. {Applicable to Stages II and V}
- All Project personnel should be briefed on the potential impacts the Project may have on aquatic flora and fauna; this could range from potential hydrocarbon spill contaminating surface water systems pile driving activities causing vibrations and shock waves that could affect behaviour of aquatic fauna and appropriate mitigation measures. {II and V}
- Mitigation measures developed and included in the Project-specific environmental protection plan should be adhered to for adequately addressing potential impacts. {II and V}
- An erosion and sedimentation control plan, which may form part of the Project-specific environmental protection plan, should be developed, and implemented prior to completing any onsite works and may include the installation and management of structures, such as strawbale barriers, rock check dams, silt fences, *etc.*, to limit and control erosion and sedimentation. {II}
- Erosion and sediment control structures should be regularly inspected and maintained according to the Project-specific environmental protection plan to ensure they continue to protect against erosion and sedimentation. {II}
- A surface water drainage management plan, which may form part of the Project-specific environmental protection plan, should be developed, and implemented prior to completing any onsite works and may include the use of ditches and settling basins to control surface water flow and to reduce sediment concentrations in water prior to discharge from the site. {II}
- Designated refueling locations should be identified within the Project-specific environmental protection plan (*i.e.*, > 30 m from the edge of the Saint John River) and those locations should be equipped with appropriately stocked and maintained spill response equipment (*i.e.*, spill kits). Refueling should only be done by trained and competent personnel using a means of spill containment, such as completing the operation atop an impermeable liner or using spill collection pans. Any materials used to clean-up spills, contaminated materials, and recovered spilled material that is not suitable for reuse should be stored and disposed of appropriately. {II and V}
- All potential contaminants and contaminated materials should be dealt with appropriately. {II and V}
- Regular maintenance and inspection of equipment onsite should be performed to minimize the risk of spills of oil-based fluids and / or hazardous materials that could pose a threat to the Saint John River. {II and V}
- All spills of hazardous materials should be reported immediately to the appropriate Regulator(s). {II and V}

- Heavy equipment working within or in 30 m of watercourses and / or wetlands should use eco-friendly biodegradable and non-toxic hydraulic fluids as opposed to petroleum-based hydraulic fluids, where practical and feasible. {II and V}
- Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment. {III}
- Emergency response and contingency plans should be designed to prevent any sustained environmental damage during any errors, mishaps, and / or unforeseen events. {V}

4.4.3.2.4 Potential Post-Mitigation Residual and Cumulative Impacts

No residual and cumulative effects are likely to occur to aquatic flora and fauna over the duration of the three Project stages assessed assuming the above mitigation measures are implemented.

4.4.4 Socio-Economic Environment

4.4.4.1 Labour and Economy

Labour and the economy play a distinct role in the EIA process. As described in Section 2.8.2.5, this Project has the potential substantially and positively to affect the local, regional, and provincial labour market and economy. Therefore, labour and the economy were selected as a VEC because environmental impacts will likely occur through economic linkages.

4.4.4.1.1 Conceivable Impacts and Pathways

Impacts on labour and the economy will occur throughout all three stages of the Project assessed but will be most pronounced during construction. Table 53 links conceivable positive and negative impacts and pathways to labour and the economy for the various Project stages.

Based on the conceivable impacts and pathways identified in Table 53, the following specific potential impacts were assessed:

- employment / workforce retention;
- skills demand and training;
- direct and induced local, regional, and provincial spending;
- livelihood; and
- GDP contribution and tax inducements.

Table 53. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on labour and the economy during various stages associated with the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Project Stage	Conceivable Impacts and Pathways
Project construction	➢ Skilled labour (*e.g.*, surveyors, engineers, carpenters, heavy equipment operators, electricians, pipefitters, boilermakers, *etc.*) will be required to build the Project and some of those wages will be used to purchase goods and services ➢ Demand for local goods (*i.e.*, construction materials) and services (*e.g.*, construction equipment, construction materials, restaurant and hospitality, *etc.*) will increase due to those workers required to build the Project ➢ Demand for skilled labour during peak construction periods may be too much for the local labour market to bear, which could put upward pressure on wages
Project operation and maintenance	➢ Additional jobs will be created for importing woodchips and cooking chemicals and exporting Kraft pulp and the wages and salaries generated will be spent locally, regionally, and provincially ➢ Federal and provincial taxes will be paid during the operational lifespan of the Project ➢ Annual property taxes will be paid to the municipality (*i.e.*, Saint John) ➢ Goods and services will be required to operate and maintain the Project, such as woodchips and cooking chemicals ➢ Periodic maintenance shutdowns will require skilled labour
Project errors, mishaps, and / or unforeseen events	➢ Errors, mishaps, and / or unforeseen events could result in a short-term or long-term stoppage in work ➢ Depending on the error, mishap, and / or unforeseen event, employment may be generated (*e.g.*, cleanup of a spill, *etc.*) ➢ Depending on the error, mishap, and / or unforeseen event, there may be a need for new or upgraded infrastructure

4.4.4.1.2 Potential Impacts

Results of the economic impact assessment report completed by *Jupia* [2023] were used to complete the VEC impact assessment. For a copy of the complete standalone report please refer to Appendix III.

Table 54 presents the anticipated impact of the proposed Project on the labour market and the economy. It is believed that the Project will yield almost entirely positive and significant impacts to local and regional communities, and the province. Therefore, the assessment largely produced green lights for most potential impacts (n = 14). It produced one yellow light associated with direct and induced local, regional, and provincial spending in the event of a mishap, error, and / or unforeseen event (*n.b.*, Figure 96 provides a pictorial representation of direct, indirect, and induced spending).

Table 54. Assessment of potential impacts on labour and the economy of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Employment / workforce retention	●	1, 2, 3	A	●	13, 14, 15		●	23	E
Skills demand and training	●	4, 5, 6	B, C	●	16	B	●	23	E
Direct and induced local, regional, and provincial spending	●	7, 8, 9	A, D	●	17, 18		▲	23, 24	E
Livelihood	●	10	D	●	13, 14, 15		●	23	E
GDP contribution and tax inducements	●	11, 12	A, D	●	19, 20, 21, 22		●	23	E

PATHWAYS

1 – There will be a significant increase in employment for the local, regional, and provincial construction labour market. It is estimated that 1 780 years of employment will be generated during the four-year construction period (*i.e.*, 1 465 years of construction trades and supervision and 315 years of engineering and other professional services). A project of this magnitude, duration, and complexity has the capacity to retain skilled labour and draw skilled labour to the region. This Project will provide significant opportunity for skilled tradespeople, such as ironworkers, millwrights, carpenters, boilermakers, pipefitters, masons, and labourers to be employed in New Brunswick as opposed to having to work remotely in places like northern Alberta where large-scale industrial projects have occurred over the past several decades.
2 – The COVID-19 global pandemic impacted local, regional, provincial, national, and international economies. In Canada, unemployment rates at the height of the pandemic were high in transportation, service, and manufacturing industries primarily because of social-distancing requirements. As the provincial and national response moves from a pandemic phase to an endemic phase, there is a need to fill job vacancies created by older workers withdrawing from the workforce, income support programs in response to the pandemic, and a mismatch of jobs available and the willingness of people to fill them.
3 – Data indicates that there is room to grow employment in the local labour market (*i.e.*, unemployment rates in Saint John and New Brunswick circa June 2023 were around 6 % and 6.2 %, respectively).
4 – Many of the Project construction jobs require skilled labour, such as surveyors, engineers, ironworkers, millwrights, carpenters, boilermakers, pipefitters, masons, labourers, heavy equipment operators, electricians, *etc.*
5 – Planning for this significant modernization project began several years ago. During that time, IPP representatives have been working with post-secondary education institutions and trade unions to ensure that there will be workers available when construction begins, and that availability will continue throughout the entire construction period.
6 – Should other large-scale industrial projects be announced for the region, demand for skilled labour during peak construction periods may be too much for the local labour market to bear, which could put upward pressure on wages.
7 – The Project has an anticipated overall capital expenditure of $1.1 billion (2023 dollars), which will result in considerable direct and indirect spending in the local, regional, and provincial economy for many goods and services.
8 – It is estimated that about $427.2 million and $112.1 million, respectively, will be spent directly and indirectly on labour during the four-year construction period.
9 – Household spending over the four-year construction period was modelled by Jupia Consultants Inc. to increase by $408.8 million, which should benefit many small and large businesses throughout New Brunswick: food purchased from stores, $45.5 million; food purchased from restaurants, $18.8 million; housing / shelter, $93.2 million; communications, $16.9 million; pet expenses, $5.8 million; household furnishings and equipment, $16.4 million; clothing and accessories, $18.1 million; gas and other fuels, $22.9 million; vehicle maintenance and repair, $4.5 million; other transportation, $64.3 million; personal care, $4.0 million; hair grooming, $2.5 million, other health / personal care, $21.8 million; recreational vehicles and operation, $13.7 million; other recreation services, $17.6 million; insurance, $32.3 million; and charitable donations, $11 million.
10 – The Project will provide significant opportunity for skilled tradespeople, such as ironworkers, millwrights, carpenters, boilermakers, pipefitters, masons, and labourers to be employed in New Brunswick as opposed to having to work remotely in places like northern Alberta where large-scale industrial projects have occurred over the past several decades. This Project will have a significant positive effect on careers in the skilled trades.
11 – This will be the most significant investment in the Canadian Forest Products Industry since 1993 when the new Kraft pulp mill opened in Grande Prairie, Alberta.
12 – Provincial GDP contribution and provincial and municipal tax inducements were modelled by Jupia Consultants Inc. over the four-year construction period to be about $710.7 million and $171.5 million, respectively.
13 – Although no change in the compliment of employees is required to operate and maintain the Mill daily, there will be an increase in employment related to the import / export of materials to / from the Mill. The 80 % Kraft pulp production increase will require more woodchips and cooking chemicals to be delivered to the Mill and more Kraft pulp to be exported, which will require the need for more truck drivers and rail operators.
14 – Mill shutdowns will likely require additional skilled labour to maintain the modernized and specialized Kraft pulp manufacturing equipment installed as part of this Project.
15 – Jupia Consultants Inc. estimate a 42 % increase or 623 full-time equivalent positions in total employment related to the annual supply chain changes induced by the 80 % increase in Kraft production at the Mill. That will result in a total annual employment income increase of about $44.5 million.
16 – Production operators, project engineers, power engineers, lab technicians, *etc.* will require routine training to ensure their skills are maintained.
17 – The 80 % Kraft pulp production increase will result in considerable direct and indirect spending in the local, regional, and provincial economy for many goods and services throughout the anticipated 50 year lifespan of the Project.
18 – Jupia Consultants Inc. estimate that total annual household spending will increase by 38 % or about $33.7 million (2022 dollars) because of this Project.
19 – The forest products cluster is already a top source of economic activity for New Brunswick and is a significant contributor to provincial GDP. The 80 % increase in Kraft pulp production will result in significant contributions to provincial GDP.
20 – It is estimated by Jupia Consultants Inc. that operating the Project will increase the annual contribution of the Mill's production to provincial GDP by about 35 % or $80.1 million. This will induce an annual tax revenue increase of about 31 % or $16.6 million.
21 – Through additional biomass combustion, this Project will generate about 70 MW of excess green energy available for NB Power to purchase.
22 – Development of this Project will be an important source of renewable, green energy that will help New Brunswick meet its commitment to decarbonizing the electrical grid within the 2030s and becoming a net zero carbon emitter by 2050. The 70 MW of green energy is enough to power up to 24 400 Canadian homes annually. Selling the green energy to NB Power will increase their electricity purchased from third-party suppliers by up to 14 %.
23 – Errors, mishaps, and / or unforeseen events could result in a short-term or a long-term stoppage in work and / or a reduction in spending.
24 – Depending on the error, mishap, and / or unforeseen event, third-party employment may be generated (*e.g.*, cleanup of a spill, *etc.*).

MITIGATION

A – Hiring from the local, regional, and provincial workforce should be a priority for contractors to the maximum extent possible before going outside the province, subject to skills, availability, costs, and quality.
B – Local, regional, and provincial post-secondary education institutions should continue to be consulted over the long-term to ensure they continue to offer necessary training for skilled trades and professionals.
C – Local and regional construction associations and labour unions may have to coordinate the quantity of available workers with the contractors should other large-scale industrial projects be announced for the region.
D – The proponent should develop employment and procurement programs that promote opportunities for local workers and local businesses, where practical and feasible.
E – Mitigation measures developed for this Project should be adhered to for adequately addressing any potential impacts to minimize the amount of lost work time.

The $1.1 billion Project capital expenditure will be spread out over a four-year period where the bulk of the construction and trades activity will occur at the Mill during 2026 and 2027. The overall cost for labour is expected to be $50.5 million in 2024, rising to $172.9 million in 2026, and totaling $427.2 million over the four-year period (Table 55). Adding estimated additional indirect and induced labour income brings the total cost for labour over the four-year period to $539.3 million. Project construction is expected to generate $171.5 million in tax revenue for provincial and local governments across the province. It is also anticipated that household spending will increase by $408.8 million over the four-year construction period.

Figure 96. Pictorial representation of direct, indirect, and induced spending from *Jupia* [2023]

Table 55. Costs, taxes, and spending in millions of dollars with respect to the mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick as modelled by *Jupia* [2023].

Component	2024	2025	2026	2027	TOTAL
Project Labour Costs	$50.5	$78.4	$172.9	$125.4	**$427.2**
Total Labour Costs (*i.e.*, indirect and induced)	$63.8	$98.9	$218.3	$158.3	**$539.3**
Contribution to Provincial GDP	$84.0	$130.4	$287.7	$208.7	**$710.7**
Induced Provincial and Local Government Taxes	$20.3	$31.5	$69.4	$50.4	**$171.5**
Induced Household Spending	$48.3	$75.0	$165.5	$120	**$408.8**

The $408.8 million of induced household spending during Project construction (*i.e.*, Table 55) will primarily be converted into purchases of goods and services, which will benefit small-, medium-, and large-scale businesses throughout New Brunswick. A summary of those purchases during the four-year construction period is provided in Table 56.

Boosting overall production at the Mill by 80 % will result in significant increases in supply chain activity, including the delivery of woodchips and additional cooking chemicals and the export of Kraft pulp as summarized in Section 2.8.3. That production increase is expected to increase the Mill's contribution to New Brunswick's GDP by up to 35 % or by $80.1 million. The generation of green energy will also be a significant Project benefit. It will be an important source of renewable green energy that will help New Brunswick meet its commitment to green the electricity grid by some time in the mid-2030s and to become a net zero economy by 2050. The 70 MW of excess green energy generated and available for purchase by NB Power will be enough to annually power up to 24 000 Canadian homes.

As noted by *Jupia* [2023] in their economic impact assessment, this Project will help ensure the forest products sector continues to be a major driver of economic activity in

New Brunswick for decades to come. This is especially important considering the forest products cluster generates more economic activity than any other industrial cluster in the province and substantially contributes to New Brunswick's GDP.

If a catastrophic even occurred with the Project, then there is the potential that regular employment could be reduced until such time that the situation is rectified; however, such a situation would likely result in increased employment to third-part contractors required to remedy the situation. That is the reason why green lights were applied to most of the impacts during that Project stage (Table 54).

Although there will be no change in the compliment of employees operating the Mill, there will be an increase in employment associated with imports, exports, and ancillary activities. The approximately 42 % increase in total employment, or 623 full-time equivalent positions, will yield a 38 % increase in employment income. Induced tax revenues are expected to increase by 31 % or by $9.8 million within the province and household spending is expected to rise by 38 % from $89.5 million to $123.2 million.

Table 56. Estimated four-year household spending in the province induced during construction of the mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick as modelled by *Jupia* [2023].

Household Spending Category	Estimated Four-Year Construction Period Induced Household Spending
Food purchased from stores	$45 518 000
Food purchased from restaurants	$18 797 000
Housing / shelter	$93 154 000
Communications (*i.e.*, telephone and internet)	$16 911 000
Pet expenses (*e.g.*, veterinarians, food supplies, *etc.*)	$5 808 000
Household furnishings and equipment	$16 438 000
Clothing and accessories	$18 054 000
Gas and other fuels (*i.e.*, all vehicles and tools)	$22 897 000
Maintenance and repairs of vehicles	$4 479 000
Other transportation	$64 306 000
Personal care services	$3 493 000
Hair grooming services	$2 471 000
Other health and personal care services	$21 813 000
Recreational vehicles and associated services	$11 697 000
Operation of recreational vehicles	$2 049 000
Other recreation services	$17 638 000
Insurance (*i.e.*, homeowner and tenant, vehicle, and health and life insurance)	$32 269 000
Monetary gifts, support payments, and charitable contributions	$10 964 000
Other services	$54 000
TOTAL	**$408 810 000**

The generation of green energy will also be a significant Project benefit. It will be an important source of renewable green energy that will help New Brunswick meet its commitment to green the electricity grid by some time in the mid-2030s and to become a net zero economy by 2050. The 70 MW of excess green energy generated and available for purchase by NB Power will be enough to annually power up to 24 400 Canadian homes.

As noted by *Jupia* [2023] in their economic impact assessment, this Project will help ensure the forest products sector continues to be a major driver of economic activity in New Brunswick for decades to come. This is especially important considering the forest products cluster generates more economic activity than any other industrial cluster in the province and substantially contributes to New Brunswick's GDP.

If a catastrophic event occurred with the Project, then there is the potential that regular employment could be reduced until such time that the situation is rectified; however, such a situation would likely result in increased employment to third-party contractors required to remedy the situation. That is the reason why green lights were applied to most of impacts during that Project stage (Table 54).

Table 57. Estimated annual economic impact increase in the Saint John, New Brunswick Reversing Falls Mill following the mill modernization and green energy generation project as modelled by *Jupia* [2023].

Component	Pre-Project (2022 Actual)	Post-Project (2028 and Beyond)*	Change	
				%
Contribution to Provincial GDP (millions)	$229.8	$309.9	$80.1	+ 35
Total Employment (Full-Time Equivalent†)	1 482	2 105	623	+ 42
Total Employment Income (millions)‡	$118.1	$162.6	$44.5	+ 38
All Induced Tax Revenue (millions)	$53.3	$69.9	$16.6	+ 31
Provincial / Local Induced Tax Revenue (millions)	$31.4	$41.2	$9.8	+ 31
Household Spending (millions)	$89.5	$123.2	$33.7	+ 38

NOTES:
*Expressed as 2022 dollars
†Where full-time equivalent equals 2 000 hours
‡Total income does not rise as much as total employment because the average income in the direct jobs is considerably higher than the indirect and induced jobs

4.4.4.1.3 Proposed Mitigation

This Project is extremely positive for the labour market and the economy. Locally, the unemployment rate remains above 6 % (*i.e.*, refer to Figure 68) as the economy recovers from the effects of the COVID-19 global pandemic. There are no negative impacts anticipated save for potential impacts to employment, skills training, and livelihood in the case of a mishap, error, and / or unforeseen event; however, those negative impacts would be short-term and easily mitigated. No additional mitigation measures, other than those highlighted in Table 54 are required.

- Hiring from the local, regional, and provincial workforce should be a priority for contractors to the maximum extent possible before going outside the province, subject to skills, availability, costs, and quality. {Applicable to Stage II}

- Local, regional, and provincial post-secondary education institutions should continue to be consulted over the long-term to ensure they continue to offer necessary training for skilled trades and professionals. {II and III}
- Local and regional construction associations and labour unions may have to coordinate the quantity of available workers with the contractors should other large-scale industrial projects be announced for the region. {II}
- The proponent should develop employment and procurement programs that promote opportunities for local workers and local businesses, where practical and feasible. {II}
- Mitigation measures developed for this Project should be adhered to for adequately addressing any potential impacts to minimize the amount of lost work time. {V}

4.4.4.1.4 Potential Post-Mitigation Residual Impacts

There will be positive residual impacts (*i.e.*, skills development and income generation) that do not require mitigation. No negative residual effects are likely to be incurred within the labour market and the economy during the three Project stages assessed.

4.4.4.2 Archaeological and Cultural Resources

First Nations have occupied lands throughout New Brunswick for time immemorial. As noted in Section 3.3.4, if the tide was not optimal for traversing Reversing Falls, First Nations would portage around the Falls. Samuel de Champlain's 1604 map showed a portage route located on the opposite side of the River from the Mill site (*i.e.*, Figure 71). When representatives with the New Brunswick Museum were considering an expansion at their Douglas Avenue location in Saint John, archaeologists found evidence of an ~ 4 400-year-old campsite along that portage route [*CBC*, 2016].

There are no known archaeological and cultural resources on the Mill site; however, it is possible that a portage route may have existed on the Mill side of the Saint John River. Additionally, it is plausible that First Nations camped on the lands surrounding Reversing Falls if the tides were not optimal for navigating the falls or if they were staying in the area for a period.

All the lands where the Project will be located have been previously impacted by Mill operations; however, there could still be undiscovered archaeological and cultural resources located there. Therefore, archaeological and cultural resources were selected as VEC.

4.4.4.2.1 Conceivable Impacts and Pathways

Ground disturbance exercises have the potential to reveal previously undiscovered archaeological and cultural resources. Activities and physical works that may occur during the Project stages along with the conceivable impacts and pathways are summarized in Table 58. In the section that follows, the potential impacts were assessed in concert with the development of mitigation measures.

Based on the conceivable impacts and pathways identified in Table 58, the following specific potential impacts were assessed for archaeological and cultural resources:

- damage / destruction of archaeological sites and landmarks;
- damage / destruction of cultural sites and landmarks;
- conflict with ancestral remains; and
- conflict with cultural domains.

Table 58. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on archaeological and cultural resources during various activities associated with the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Activity	Conceivable Impacts and Pathways
Grading and site development	➢ Ground disturbing exercises can damage or destroy archaeological and cultural resources ➢ Vandalism of archaeological and cultural resources either by personnel and / or the public
Operation and maintenance of heavy equipment	➢ Vibrations from heavy equipment could cause damage to archaeological or cultural resources ➢ Ground spills of hydrocarbons during refueling operations (*i.e.*, gasoline and diesel) may allow hydrocarbons to infiltrate the ground and impact buried resources ➢ Leaks of hydraulic fluids, oils, *etc.* during normal operations may spill on to the ground and infiltrate the subsurface where they may impact buried resources
Rock breaking and excavating with pneumatic hammers	➢ Fracturing of rock can increase oxygen ingress into undisturbed layers, which could cause increased decay or corrosion of buried resources ➢ Shock waves and vibrations could cause damage to buried resources
Pile driving	➢ Fracturing of rock can increase oxygen ingress into undisturbed layers, which could cause increased decay or corrosion of buried resources ➢ Shock waves and vibrations could cause damage to buried resources
Temporary construction personnel sanitary facilities	➢ Leaks or spills on the ground during use or maintenance may cause untreated sanitary waste to be introduced to the subsurface, which could affect buried resources
Storage and handling of various hazardous chemicals	➢ Leaks or spills on the ground during the handling and storage of hazardous chemicals (*e.g.*, hydrocarbons, paints, solvents, polymers, acids, *etc.*) may be introduced to the subsurface, which could affect buried resources
Footing and foundation construction	➢ Dewatering activities may cause sediment layers to dry out, which could stimulate biodegradation of preserved resources
Dust suppression and winter roadway clearing	➢ If chemical dust suppressants are used on roadways, they may be entrained in surface waters and / or groundwater and come in to contact with buried resources ➢ If salt is used for winter roadway maintenance, it may be entrained in surface waters and / or groundwater and come in to contact with buried resources
Temporary storage of construction and hazardous waste	➢ Precipitation may encounter construction and hazardous waste that is temporarily stored onsite prior to safe disposal, which may cause water to become contaminated and subsequently transported to and contaminate water that may come in to contact with archaeological or cultural resources
Kraft pulp manufacturing chemical fluid pipe leak	➢ During operation, leaks could enter surface waters and / or groundwater and come in to contact with buried resources

4.4.4.2.2 Potential Impacts

Table 59 provides a summary of the impact assessment for archaeological and cultural features. The assessment generated mostly yellow lights (n = 8) while the remainder were green lights (n = 4).

Table 59. Assessment of potential impacts on archaeological and cultural features of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Damage / destruction of archaeological sites and landmarks		1 to 10	A to E		1, 4, 9, 11, 12	H		1, 4, 7, 9, 12	A to C, I
Damage / destruction of cultural sites and landmarks		1 to 10	A to E		1, 4, 9, 11, 12	H		1, 4, 7, 9, 12	A to C, I
Conflict with ancestral remains		1 to 10	A to G		1, 4, 9, 11, 12	H		1, 4, 7, 9, 12	A to C, F, G, I
Conflict with cultural domains		1 to 10	A to G		1, 4, 9, 11, 12	H		1, 4, 7, 9, 12	A to C, F, G, I

PATHWAYS

1 – There are no known archaeological and / or cultural resources within the Project footprint; however, accidental disruption / destruction of unknown buried resources is possible should an unknown resource be encountered.
2 – Ground disturbing exercises during site development could damage or destroy if unknown buried archaeological and / or cultural resources exist within the Project footprint.
3 – Vandalism of any discovered buried archaeological and / or cultural resources could occur after site preparation has begun.
4 – Vibrations from heavy equipment could cause damage to buried archaeological and / or cultural resources.
5 – Fracturing of rock using pneumatic hammers and / or driving piles could cause an increase oxygen ingress into undisturbed subsurface layers, which could cause increased decay or corrosion of buried resources.
6 – Shock waves and vibrations could cause damage to buried archaeological and / or cultural resources.
7 – Ground spills of hydrocarbons during refueling operations (*i.e.*, gasoline and diesel) may allow hydrocarbons to infiltrate the ground and impact buried archaeological and / or cultural resources.
8 – Dewatering activities during footing and foundation construction could cause sediment layers to dry out, which could stimulate biodegradation of preserved buried archaeological and / or cultural resources.
9 – Hydrocarbon (*e.g.*, lubricating oils, gasoline, diesel, *etc.*) and chemical leaks (*e.g.*, cooking chemicals, *etc.*) from the various Kraft pulp manufacturing equipment could spill on to the ground and could contaminate surface waters and / or groundwater that eventually interact with buried archaeological and / or cultural resources.
10 – Dust suppressants for controlling roadway dusts could interact with buried archaeological and / or cultural resources and result in damage.
11 – Salt for winter roadway maintenance could interact with buried archaeological and / or cultural resources and result in damage.
12 – Leaks or spills from the Kraft pulp manufacturing equipment could interact with buried archaeological and / or cultural resources and result in damage.

MITIGATION

A – An archaeological resources protection plan, which may form part of the Project-specific environmental protection plan, should be developed and implemented prior to completing any onsite Project works.
B – IPP will engage the Wolastoqey Nation in New Brunswick to train contractors and employees on their *Accidental Discovery of Archaeological Resources Protocol*.
C – Any archaeological and / or cultural resource discovered should be reported immediately to the appropriate Regulator(s) as per the New Brunswick *Heritage Conservation Act* [**S.N.B. 2010, c. H-4.05**].
D – The Wolastoqey Nation in New Brunswick should be contacted immediately at 506.459.6341 if any archaeological and / or cultural resource is discovered as outlined in their *Accidental Discovery of Archaeological Resources Protocol*.
E – If any discovered archaeological and / or cultural resources require removal to facilitate Project development, then excavation, recording, and reporting should occur for those features as per the New Brunswick *Heritage Conservation Act* [**S.N.B. 2010, c. H-4.05**].
F – Should any human remains be discovered; the Saint John Police Force will be contacted to determine if the remains are an archaeological and / or cultural resource whereupon they will contact the appropriate authorities to have a licensed Resource Archaeologist examine the remains.
G – All spills of hazardous materials should be reported immediately to the appropriate Regulator(s).
H – Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment.
I – Emergency response and contingency plans should be designed to prevent any sustained damage to archaeological and / or cultural resources during any errors, mishaps, and / or unforeseen events.

There are no known archaeological and / or cultural resources within the Project footprint and nothing has been noted during previous excavation work at the site. Therefore, the probability of an encounter is considered extremely low. Should accidental disruption / destruction of an unknown resource occur, the magnitude of that impact is considered moderate (*e.g.*, the resource could be damaged, be removed from its contextual setting, *etc.*) and the impact would likely be irreversible.

Potential impacts are considered most probable during the construction stage when ground disturbance activities are taking place. Potential impacts are also possible should any errors, mishaps, and / or unforeseen events occur. While the Project is in operation, potential impacts are considered negligible because ground disturbance exercises will not be occurring.

4.4.4.2.3 Proposed Mitigation

The mitigation measures listed below will be followed to minimize the potential impact on archaeological and cultural resources during Project works.

- An archaeological resources protection plan, which may form part of the Project-specific environmental protection plan, should be developed and implemented prior to completing any onsite Project works. {Applicable to Stage II and V}
- IPP will engage the Wolastoqey Nation in New Brunswick to train contractors and employees on their *Accidental Discovery of Archaeological Resources Protocol*. {II and V}
- Any archaeological and / or cultural resource discovered should be reported immediately to the appropriate Regulator(s) as per the New Brunswick *Heritage Conservation Act* [**S.N.B. 2010, c. H-4.05**]. {II and V}
- The Wolastoqey Nation in New Brunswick should be contacted immediately at 506.459.6341 if any archaeological and / or cultural resource is discovered as outlined in their *Accidental Discovery of Archaeological Resources Protocol*. {II}
- If any discovered archaeological and / or cultural resources require removal to facilitate Project development, then excavation, recording, and reporting should occur for those features as per the New Brunswick *Heritage Conservation Act* [**S.N.B. 2010, c. H-4.05**]. {II}
- Should any human remains be discovered, the Saint John Police Force will be contacted to determine if the remains are an archaeological and / or cultural resource whereupon they will contact the appropriate authorities to have a licensed Resource Archaeologist examine the remains. {II and V}
- All spills of hazardous materials should be reported immediately to the appropriate Regulator(s). {II and V}
- Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment. {III}
- Emergency response and contingency plans should be designed to prevent any sustained damage to archaeological and / or cultural resources during any errors, mishaps, and / or unforeseen events. {V}

4.4.4.2.4 Potential Post-Mitigation Residual Impacts

By implementing the mitigation measures and standards prescribed by regulatory authorities, residual impacts on archaeological and cultural features because of the Project are expected to be negligible.

4.4.4.3 Transportation Network

Saint John's transportation network is fundamental to public living and / or moving throughout the city. Herein, transportation network refers to roadways only and does not include other networks, such as railways, seaways, and skyways because they are not expected to be impacted either at all or to the degree of the public roadway system. A variety of motorized vehicles of different sizes and configurations use the road network, including automobiles, buses, motorcycles, and trucks. Vehicles sharing the roads are used for private, commercial passenger, and freight transportation activities. The roadways are also used as active transportation routes (*e.g.*, bicycles, walkers, runners, *etc.*).

4.4.4.3.1 Conceivable Impacts and Pathways

Activities and physical works that may occur throughout the Project that could potentially impact the transportation network are summarized in Table 60 along with their associated impact pathways. In the section that follows, the potential impacts are assessed in concert with the development of mitigation measures.

Table 60. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on the transportation network during various activities associated with the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Activity	Conceivable Impacts and Pathways
Transporting materials and equipment (*e.g.*, building supplies, polymers, nutrients, *etc.*) to and from the site (*i.e.*, via tractor trailers, vans, pick-up trucks, and other delivery vehicles)	➢ Increase in traffic volumes along local road networks ➢ Increase in travel times along local road networks (*e.g.*, due to traffic, *etc.*) ➢ Traffic delays or disruptions to accommodate wide loads (*i.e.*, due to use of escorts or loads that are too wide for single lane transportation) ➢ Damage to road surfaces and associated infrastructure (*e.g.*, bridges, *etc.*) due to wide and / or heavy loads ➢ Conflicts with active transportation routes (*e.g.*, bikes on roadways, use of roadway shoulders as walking routes, *etc.*) ➢ Increase in traffic accidents
Transporting contractors and employees to and from the site	➢ Increase in traffic volumes along local road networks ➢ Change in traffic volumes and patterns along local road networks (*i.e.*, rush hour traffic times may shift and / or be extended) ➢ Increase in travel times along local road networks (*i.e.*, due to traffic) ➢ Damage to road surfaces and associated infrastructure (*e.g.*, bridges, *etc.*) due to traffic volumes and load weights ➢ Conflicts with active transportation routes (*e.g.*, bikes on roadways, use of roadway shoulders as walking routes, *etc.*) ➢ Increase in traffic accidents

Through this Project, the local transportation network will see a moderate increase in heavy equipment traffic (*e.g.*, the delivery of construction equipment and Project infrastructure, *etc.*). Additionally, during peak construction, dozens of workers are expected to be at the Mill site working specifically on the Project (*i.e.*, refer to Section 2.8.2.5). The potential impacts that were assessed with respect to the local transportation network were:

- traffic hazards;
- damage to infrastructure; and
- conflict with existing traffic.

4.4.4.3.2 Potential Impacts

Results of the traffic impact study completed by *Englobe* [2024] were used to complete the assessment below. For a copy of the complete standalone report please refer to Appendix XI.

To provide a baseline analysis and for modelling future traffic scenarios, traffic volumes were collected in the field by Englobe staff in October 2022 using Miovision cameras. The baseline analysis was done to provide AM and PM peak hour turning movement counts at 14 intersections near the Reversing Falls Mill as shown in Figure 97. Using data collected for another project, Englobe adjusted the traffic data collected in October 2022 to account for the ongoing Harbour Bridge rehabilitation work on the network (*i.e.*, the adjustment propagated a reduction in volumes throughout the network based on the existing traffic patterns).

The baseline data collection indicates that the overall road network in the vicinity of the Mill currently operates at a good Level OF Service (LOS) as summarized in Table 61. Three intersections were noted for having long delays or capacity limits for the baseline period:

- Fairville Boulevard at Bleury Street / Catherwood Street:
    - three existing movements operate at an LOS D (*i.e.*, satisfactory, but congestion becomes noticeable, and vehicles must sometimes wait through more than one red light);
- Catherwood Street and Ready Street:
    - the southbound shared movement operates at an LOS F (*i.e.*, extended delays for most drivers as the arrival flow rates exceed the intersection capacity) during PM peak traffic; and
- Dever Road / Church Avenue at Green Head Road:
    - the southbound shared movement operates at an LOS D during both peak traffic periods.

The proposed Project will add a significant volume of traffic during construction (*i.e.*, short- to medium-term). Only a few truck trips will be added (*i.e.*, 11 additional trucks per hour) to the network during operation (*i.e.*, long-term), which will not markedly impact the traffic network.

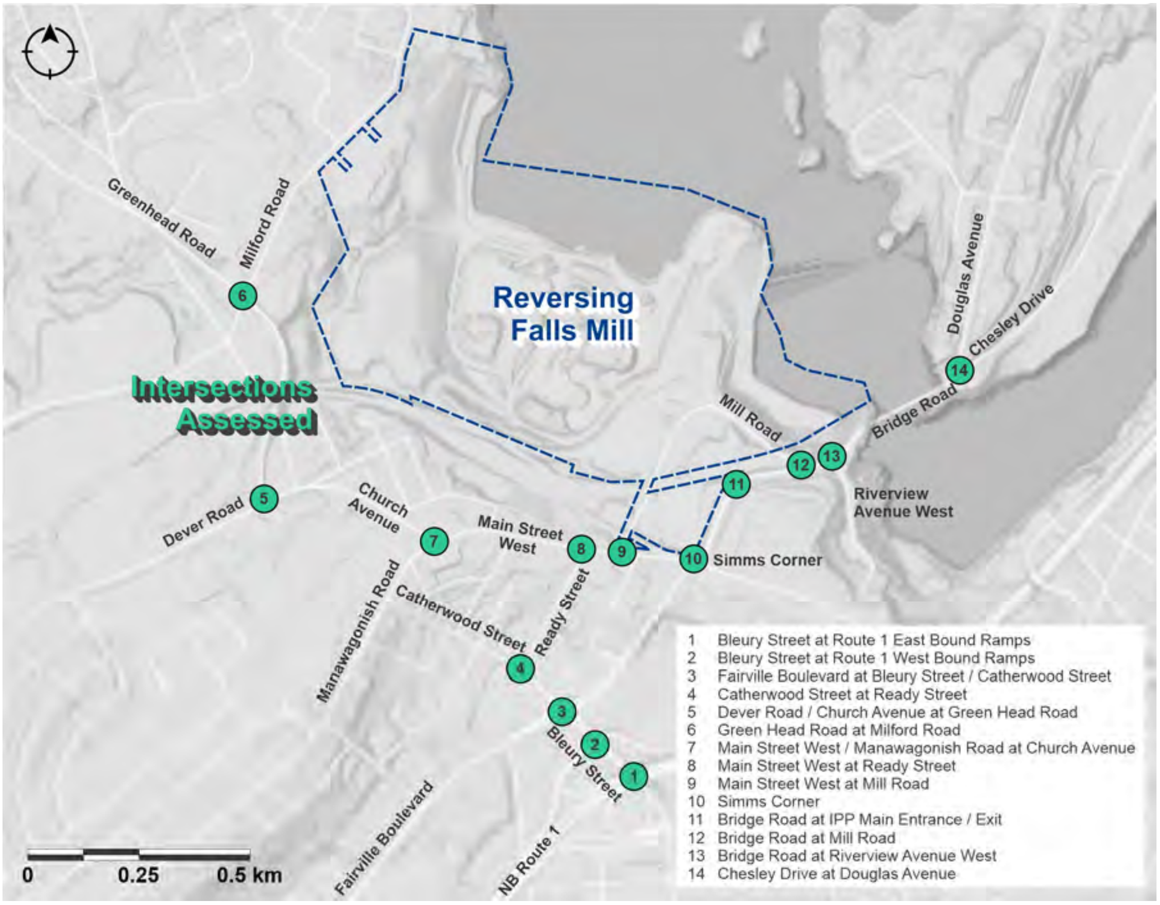


Figure 97. Intersections where traffic volumes were collected by Englobe staff in October 2022 to provide AM and PM peak hour turning movement counts near the Reversing Falls Mill in Saint John, New Brunswick.

Up to 832 workers will be onsite during peak construction (*i.e.*, 661 dayshift and 171 night shift as shown in Figure 35. Table 62 summarizes the anticipated arrival and departure times for the various shifts during peak construction. Based on that summary, the most relevant hours to analyze for traffic impacts were 7 AM to 8 AM and 5 PM to 6 PM. Although the 6:30 AM to 7:30 AM hour is predicted to have a higher volume of construction traffic entering the site, it is further removed from the peak hour of the road network. Therefore, it is predicted that it will not have as considerable a strain on the network as the 7 AM to 8 AM hour.

Table 61. Level of service movements for intersections near the Reversing Falls Mill in Saint John, New Brunswick based on AM and PM peak hour traffic volume data collected by Englobe staff in October 2022. Yellow shaded cells with bold entries indicate intersections where the level of service is satisfactory, but congestion is noticeable while red shaded cells with bold entries indicate intersections with an unacceptable level of service. For additional details please see *Englobe*, 2024.

Intersection Details			Overall Level of Service*	Individual Movement Level of Service (LOS)											
				Eastbound			Westbound			Northbound			Southbound		
Main Street @ Minor Street	Traffic Control	Peak Period		L	T	R	L	T	R	L	T	R	L	T	R
Simms Corner	STOP	AM	A	A	A	Shared	--	C	A	--	B	Shared	A	--	A
		PM	B	A	A	Shared	--	C	A	--	B	Shared	B	--	A
Bleury Street @ Route 1 East Bound Ramps	(traffic signal)	AM	A	--	A	A	A	A	--	B	--	A	--	--	--
		PM	A	--	A	A	A	A	--	B	--	A	--	--	--
Fairville Boulevard @ Bleury Street / Catherwood Street	(traffic signal)	AM	B	C	C	Shared	B	B	A	B	B	Shared	B	B	Shared
		PM	C	B	**D**	Shared	**D**	C	A	C	C	Shared	**D**	C	Shared
Main Street West / Manawagonish Road @ Church Avenue	(traffic signal)	AM	B	B	B	--	--	C	A	--	--	--	C	--	A
		PM	B	A	A	--	--	C	A	--	--	--	C	--	A
Bleury Street @ Route 1 West Bound Ramps	STOP	AM	A	--	Free Flow	Free Flow	A	Free Flow	Shared	--	--	B	--	--	B
		PM	A	--	Free Flow	Free Flow	A	Free Flow	Shared	--	--	B	--	--	**D**
Catherwood Street @ Ready Street	STOP	AM	A	Shared	A	Shared	Shared	A	Free Flow	C	C	Shared	Shared	**D**	Shared
		PM	A	Shared	A	Shared	Shared	A	Free Flow	C	C	Shared	Shared	**F**	Shared
Green Head Road @ Milford Road	STOP	AM	A	Shared	A	Shared	Shared	A	Shared	Shared	B	Shared	Shared	C	Shared
		PM	A	Shared	A	Shared	Shared	A	Shared	Shared	A	Shared	Shared	C	Shared
Dever Road / Church Avenue @ Green Head Road	STOP	AM	B	Shared	A	--	--	Free Flow	Shared	--	--	--	**D**	--	Shared
		PM	A	Shared	A	--	--	Free Fow	Shared	--	--	--	**D**	--	Shared
Main Street West @ Ready Street	STOP	AM	A	--	Free Flow	Shared	Shared	A	--	C	--	Shared	--	--	--
		PM	A	--	Free Flow	Shared	Shared	A	--	C	--	Shared	--	--	--
Main Street West @ Mill Road	STOP	AM	A	Shared	A	--	--	Free Flow	Shared	--	--	--	C	--	Shared
		PM	A	Shared	A	--	--	Free Flow	Shared	--	--	--	**D**	--	Shared
Bridge Road @ IPP Main Entrance / Exit	STOP	AM	A	A	Free Flow	--	--	Free Flow	Free Flow	--	--	--	**D**	--	B
		PM	A	A	Free Flow	--	--	Free Flow	Free Flow	--	--	--	C	--	B
Bridge Road @ Mill Road	STOP	AM	A	Shared	Free Flow	--	--	Shared	Shared	--	--	--	Shared	--	Shared
		PM	A	Shared	Free Flow	--	--	Shared	Shared	--	--	--	Shared	--	Shared
Bridge Road @ Riverview Avenue West	STOP	AM	A	--	Free Flow	Free Flow	B	Free Flow	--	C	--	Shared	--	--	--
		PM	A	--	Free Flow	Free Flow	A	Free Flow	--	B	--	Shared	--	--	--
Chesley Drive @ Douglas Avenue	STOP	AM	A	Shared	A	--	--	Free Flow	Free Flow	--	--	--	B	--	Shared
		PM	A	Shared	A	--	--	Free Flow	Free Flow	--	--	--	C	--	Shared

NOTES:
*Level Of Service (LOS) categories are provided below
LOS A = Excellent – very low delay; most vehicles do not stop
LOS B = Very Good – higher delay; more vehicles stop
LOS C = Good – higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping
LOS D = Satisfactory – congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop
LOS E = Delay – vehicles must often wait through more than one red light
LOS F = Extended Delay – this level is considered by most drivers to be unacceptable; occurs when arrival flow rates exceed the capacity of the intersection

Table 62. Anticipated arrival and departure times during peak construction in February 2027 of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Time	Dayshift				Nightshift	Totals
	4 × 10 Group 1	4 × 10 Group 2	5 × 8 Group 1	5 × 8 Group 2		
AM Hours						
5:00 - 5:30					163 Exit	163 Exit
5:30 - 6:00						
6:00 - 6:30						
6:30 - 7:00	236 Enter					236 Enter
7:00 - 7:30		236 Enter	78 Enter			392 Enter
7:30 - 8:00				78 Enter		78 Enter
PM Hours						
3:30 - 4:00			78 Exit			78 Exit
4:00 - 4:30				78 Exit		78 Exit
4:30 - 5:00						
5:00 - 5:30	236 Exit					236 Exit
5:30 - 6:00		236 Exit				236 Exit
6:00 - 6:30						
6:30 - 7:00					163 Enter	163 Enter

The LOS analysis during construction is summarized in Table 63 (*n.b.*, this LOS analysis was done for peak construction traffic). It is predicted that the road network will still operate well during the construction period even with the added traffic during the AM peak period. Some of the intersections may become congested during the PM peak traffic period. The predicted delays are largely associated with the access points leaving the Mill (*i.e.*, Main Street West at Mill Street and Bridge Road at IPP Main Entrance / Exit) and at key chokepoints in the existing road network (*i.e.*, Dever Road at Green Head Road and Catherwood Street at Ready Street) that under baseline conditions already exhibit long delays and limited access capacity. The westbound through movement at Simms Corner is predicted to operate at an LOS F during the PM peak construction period. The D, E, and F levels of service noted in Table 63 will likely only be experienced during the peak construction period and not the entire four year construction period.

Once construction is complete and the Project is in operation, the road network is predicted to work quite well during the AM and PM periods as indicated by the LOS summary provided in Table 64. The added traffic associated with future operation of the Mill will be so low that the road network will essentially operate the same as to today. In the future, the same three intersections identified for the baseline analysis are predicted to have long delays or capacity limits:

- Fairville Boulevard at Bleury Street / Catherwood Street:
  - several movements during PM peak traffic are predicted to approach capacity;
- Catherwood Street and Ready Street:

  - the southbound shared movement is predicted to operate at an LOS F (*i.e.*, extended delay to most drivers as the arrival flow rates exceed the intersection capacity) during PM peak traffic and may approach capacity; and
- Dever Road / Church Avenue at Green Head Road:
  - the southbound shared movement is predicted to operate at an LOS E during both peak traffic periods.

The capacity issues for the three intersections noted above are largely due to general annual increases in traffic throughout the road network (*n.b.*, this was set to be a 1 % annual exponential growth rate on the 2022 traffic volumes).

Englobe [2024] did not recommend any infrastructure changes be made to support the added construction volumes associated with the Project. They did note that traffic issues, should they arise, can likely be mitigated by communicating to contractors where the available entrances and exits from the site are. Additionally, they could incentivize contractors to carpool and make use of the Milford Road / Green Head Road access location of the Mill.

To support background traffic through the area surrounding the Mill, *Englobe* [2024] notes that the single most impactful change that could be made to the road network would be reconfiguring Simms Corner into a roundabout. Doing so would dramatically improve the LOS of individual movements at that intersection. Building a roundabout would shift the flow of vehicles broadly throughout the network by converting Fairville Boulevard from a one-way road to a two-way road at the intersection. The only other notable change that could be made would be to add an additional southbound lane on Green Head Road to separate the left and right turning traffic when it sometimes becomes congested during the PM.

The predicted level of service movements for intersections near the Mill for the PM peak traffic period are summarized in Figure 98. The summary shows several changes between the baseline period and peak construction but only one change between the baseline and operational periods (*i.e.*, Simms Corner). During construction, two of the impacts are strictly associated with access to and from the Mill.

Although rail traffic will increase when the Project is in operation (*i.e.*, about 60 additional railcars as noted in Section 2.8.3, which is equivalent to about one train per week), the potential impacts on the existing road network (*i.e.*, traffic disruption or delays) were not modelled. The reason is because the movement of railcars is done by a third-party company and the times and days when railcars are moved into and out of the Mill vary greatly based on many different factors including what trains transport the railcars, where the railcars are coming from or going to, *etc.*

Based on the information presented above, the impact assessment for the local transportation network yielded seven green lights and two yellow lights (Table 65). The yellow lights are associated with construction traffic, which may result in delays or disruptions to existing traffic travelling the local road network. Once the Project is in operation, it is expected that there will be no perceptible change from existing conditions.

Table 63. Predicted level of service movements for intersections near the Reversing Falls Mill in Saint John, New Brunswick during construction of the proposed mill modernization and green energy generation project. Yellow shaded cells with bold entries indicate intersections where the level of service is acceptable, but congestion is noticeable, orange shaded cells with bold entries indicate intersections with a limit of acceptable service, while red shaded cells with bold entries indicate intersections with an unacceptable level of service. For additional details please see *Englobe*, 2024.

Intersection Details			Overall Level of Service*	Individual Movement Level of Service (LOS)											
				Eastbound			Westbound			Northbound			Southbound		
Main Street @ Minor Street	Traffic Control	Peak Period		L	T	R	L	T	R	L	T	R	L	T	R
Simms Corner	STOP	AM	A	A	A	Shared	--	C	A	--	C	Shared	A	--	A
		PM	B	A	A	Shared	--	**F**	**D**	--	B	Shared	B	--	A
Bleury Street @ Route 1 East Bound Ramps		AM	A	--	A	A	B	A	--	B	--	A	--	--	--
		PM	A	--	A	A	A	A	--	B	--	A	--	--	--
Fairville Boulevard @ Bleury Street / Catherwood Street		AM	B	C	C	Shared	B	B	A	B	B	Shared	B	B	Shared
		PM	**D**	B	**D**	Shared	**D**	C	A	C	**D**	Shared	**E**	C	Shared
Main Street West / Manawagonish Road @ Church Avenue		AM	B	B	C	--	--	C	A	--	--	--	C	--	A
		PM	B	A	A	--	--	**D**	A	--	--	--	C	--	A
Bleury Street @ Route 1 West Bound Ramps	STOP	AM	A	--	Free Flow	Free Flow	A	Free Flow	Shared	--	--	B	--	--	C
		PM	B	--	Free Flow	Free Flow	A	Free Flow	Shared	--	--	B	--	--	**E**
Catherwood Street @ Ready Street	STOP	AM	A	Shared	A	Shared	Shared	A	Free Flow	**D**	C	Shared	Shared	**D**	Shared
		PM	C	Shared	A	Shared	Shared	A	Free Flow	**D**	C	Shared	Shared	**F**	Shared
Green Head Road @ Milford Road	STOP	AM	A	Shared	A	Shared	Shared	A	Shared	Shared	B	Shared	Shared	C	Shared
		PM	A	Shared	A	Shared	Shared	A	Shared	Shared	B	Shared	Shared	**D**	Shared
Dever Road / Church Avenue @ Green Head Road	STOP	AM	C	Shared	A	--	--	Free Flow	Shared	--	--	--	**F**	--	Shared
		PM	**D**	Shared	A	--	--	Free Flow	Shared	--	--	--	**F**	--	Shared
Main Street West @ Ready Street	STOP	AM	A	--	Free Flow	Shared	Shared	A	--	**E**	--	Shared	--	--	--
		PM	A	--	Free Flow	Shared	Shared	A	--	C	--	Shared	--	--	--
Main Street West @ Mill Road	STOP	AM	A	Shared	A	--	--	Free Flow	Shared	--	--	--	**E**	--	Shared
		PM	B	Shared	A	--	--	Free Flow	Shared	--	--	--	**F**	--	Shared
Bridge Road @ IPP Main Entrance / Exit	STOP	AM	A	A	Free Flow	--	--	Free Flow	Free Flow	--	--	--	**E**	--	B
		PM	C	A	Free Flow	--	--	Free Flow	Free Flow	--	--	--	**F**	--	B
Bridge Road @ Mill Road	STOP	AM	A	Shared	Free Flow	--	--	Shared	Shared	--	--	--	Shared	--	Shared
		PM	A	Shared	Free Flow	--	--	Shared	Shared	--	--	--	Shared	--	Shared
Bridge Road @ Riverview Avenue West	STOP	AM	A	--	Free Flow	Free Flow	B	Free Flow	--	**D**	--	Shared	--	--	--
		PM	A	--	Free Flow	Free Flow	A	Free Flow	--	C	--	Shared	--	--	--
Chesley Drive @ Douglas Avenue	STOP	AM	A	Shared	A	--	--	Free Flow	Free Flow	--	--	--	C	--	Shared
		PM	A	Shared	A	--	--	Free Flow	Free Flow	--	--	--	C	--	Shared

NOTES:
*Level Of Service (LOS) categories are provided below
LOS A = Excellent – very low delay; most vehicles do not stop
LOS B = Very Good – higher delay; more vehicles stop
LOS C = Good – higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping
LOS D = Satisfactory – congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop
LOS E = Delay – vehicles must often wait through more than one red light
LOS F = Extended Delay – this level is considered by most drivers to be unacceptable; occurs when arrival flow rates exceed the capacity of the intersection

Table 64. Predicted level of service movements for intersections near the Reversing Falls Mill in Saint John, New Brunswick during operation of the proposed mill modernization and green energy generation project. Yellow shaded cells with bold entries indicate intersections where the level of service is acceptable, but congestion is noticeable, orange shaded cells with bold entries indicate intersections with a limit of acceptable service, while red shaded cells with bold entries indicate intersections with an unacceptable level of service. For additional details please see *Englobe*, 2024.

Intersection Details			Overall Level of Service*	Individual Movement Level of Service (LOS)											
				Eastbound			Westbound			Northbound			Southbound		
Main Street @ Minor Street	Traffic Control	Peak Period		L	T	R	L	T	R	L	T	R	L	T	R
Simms Corner	STOP	AM	A	A	A	Shared	--	**D**	A	--	**D**	Shared	B	--	A
		PM	A	A	A	Shared	--	**D**	A	--	B	Shared	B	--	A
Bleury Street @ Route 1 East Bound Ramps	🚦	AM	A	--	A	A	B	A	--	B	--	A	--	--	--
		PM	A	--	A	A	A	A	--	B	--	A	--	--	--
Fairville Boulevard @ Bleury Street / Catherwood Street	🚦	AM	B	C	C	Shared	B	B	A	B	B	Shared	B	B	Shared
		PM	C	B	**D**	Shared	**D**	C	A	C	**D**	Shared	**D**	C	Shared
Main Street West / Manawagonish Road @ Church Avenue	🚦	AM	B	B	B	--	--	C	A	--	--	--	C	--	A
		PM	B	A	A	--	--	C	A	--	--	--	C	--	A
Bleury Street @ Route 1 West Bound Ramps	STOP	AM	A	--	Free Flow	Free Flow	A	Free Flow	Shared	--	--	B	--	--	C
		PM	B	--	Free Flow	Free Flow	A	Free Flow	Shared	--	--	B	--	--	**E**
Catherwood Street @ Ready Street	STOP	AM	A	Shared	A	Shared	Shared	A	Free Flow	**D**	C	Shared	Shared	**D**	Shared
		PM	B	Shared	A	Shared	Shared	A	Free Flow	**D**	C	Shared	Shared	**F**	Shared
Green Head Road @ Milford Road	STOP	AM	A	Shared	A	Shared	Shared	A	Shared	Shared	B	Shared	Shared	C	Shared
		PM	A	Shared	A	Shared	Shared	A	Shared	Shared	A	Shared	Shared	C	Shared
Dever Road / Church Avenue @ Green Head Road	STOP	AM	B	Shared	A	--	--	Free Flow	Shared	--	--	--	**E**	--	Shared
		PM	B	Shared	A	--	--	Free Flow	Shared	--	--	--	**E**	--	Shared
Main Street West @ Ready Street	STOP	AM	A	--	Free Flow	Shared	Shared	A	--	C	--	Shared	--	--	--
		PM	A	--	Free Flow	Shared	Shared	A	--	C	--	Shared	--	--	--
Main Street West @ Mill Road	STOP	AM	A	Shared	A	--	--	Free Flow	Shared	--	--	--	C	--	Shared
		PM	A	Shared	A	--	--	Free Flow	Shared	--	--	--	**D**	--	Shared
Bridge Road @ IPP Main Entrance / Exit	STOP	AM	A	A	Free Flow	--	--	Free Flow	Free Flow	--	--	--	**D**	--	B
		PM	A	A	Fre Flow	--	--	Free Flow	Free Flow	--	--	--	C	--	B
Bridge Road @ Mill Road	STOP	AM	A	Shared	Free Flow	--	--	Shared	Shared	--	--	--	Shared	--	Shared
		PM	A	Shared	Free Flow	--	--	Shared	Shared	--	--	--	Shared	--	Shared
Bridge Road @ Riverview Avenue West	STOP	AM	A	--	Free Flow	Free Flow	B	Free Flow	--	C	--	Shared	--	--	--
		PM	A	--	Free Flow	Free Flow	A	Free Flow	--	B	--	Shared	--	--	--
Chesley Drive @ Douglas Avenue	STOP	AM	A	Shared	A	--	--	Free Flow	Free Flow	--	--	--	B	--	Shared
		PM	A	Shared	A	--	--	Free Flow	Free Flow	--	--	--	C	--	Shared

NOTES:
*Level Of Service (LOS) categories are provided below
LOS A = Excellent – very low delay; most vehicles do not stop
LOS B = Very Good – higher delay; more vehicles stop
LOS C = Good – higher level of congestion; number of vehicles stopping is significant, although many still pass through intersection without stopping
LOS D = Satisfactory – congestion becomes noticeable; vehicles must sometimes wait through more than one red light; many vehicles stop
LOS E = Delay – vehicles must often wait through more than one red light
LOS F = Extended Delay – this level is considered by most drivers to be unacceptable; occurs when arrival flow rates exceed the capacity of the intersection

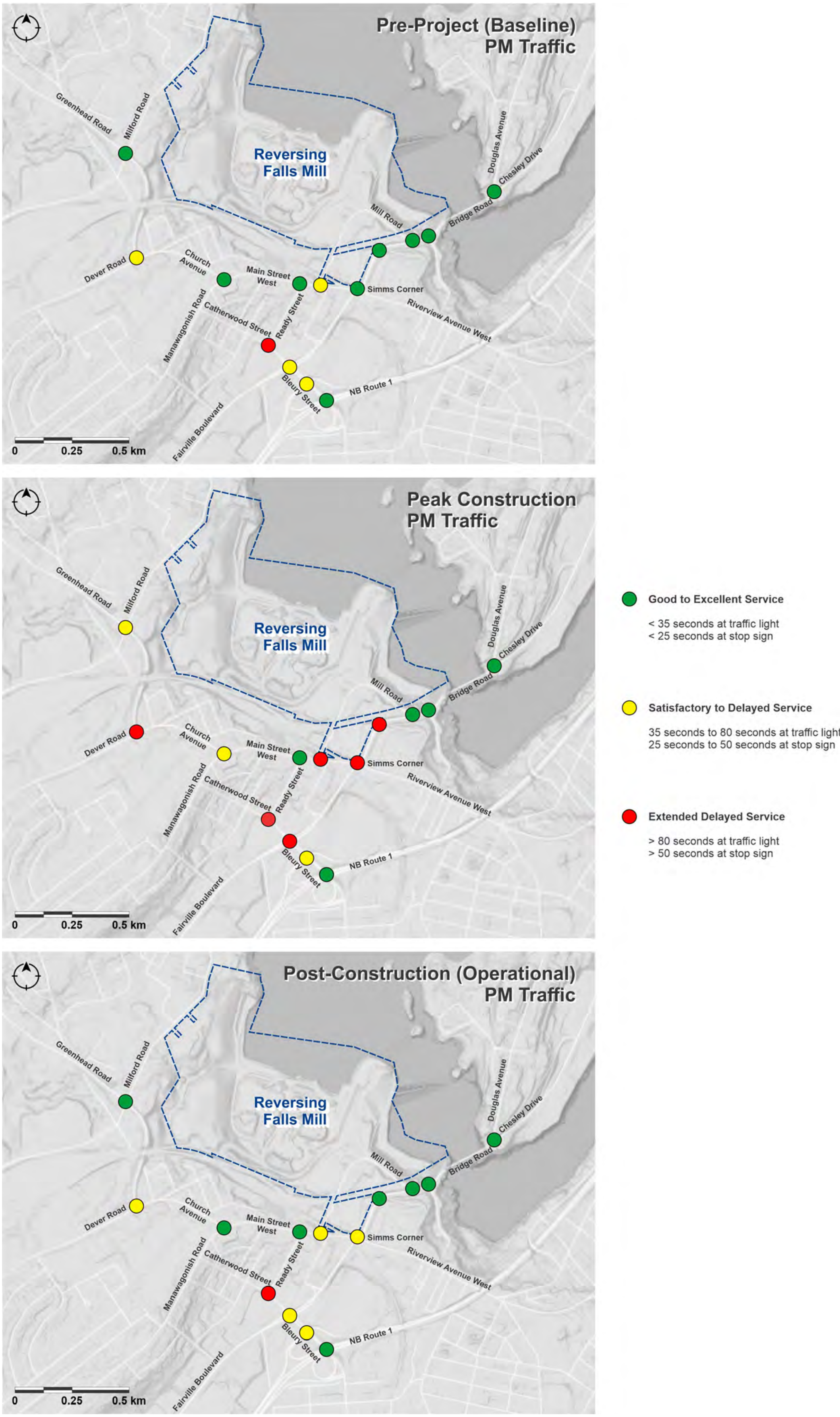


Figure 98. Predicted level of service movements for intersections near the Reversing Falls Mill in Saint John, New Brunswick pre-construction, peak construction, and post-construction of the proposed mill modernization and green energy generation project. For additional details please see *Englobe*, 2024.

Table 65. Assessment of potential impacts on the transportation network of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Traffic hazards		1, 2, 3	A to F		9, 10	C, E, F		12	A to C, E, F
Damage to infrastructure		4, 5	F, G		9, 10, 11	F, G		4, 5, 11	F, G
Conflict with existing traffic		6, 7, 8	F, H		9, 10	F		12	F

PATHWAYS

1 – There will be an increase in heavy equipment traffic along local roadways to deliver construction equipment and supplies.
2 – There will be an increase in personal vehicles entering and exiting the Mill site and it is projected that up to 832 contractor employees (*i.e.*, 661 dayshift and 171 night shift) could be onsite during peak Project construction.
3 – There may be an increase in traffic accidents surrounding the Mill site on public roads because of increased traffic associated with the Project.
4 – There may be additional damage to road surfaces (*e.g.*, potholes, rutting, cracking, *etc.*) and associated infrastructure (*e.g.*, bridges, interchanges, *etc.*) due to wide and / or heavy loads or traffic volumes.
5 – Existing infrastructure is designed to standards capable of supporting the movement of heavy equipment to and from the Project site (*e.g.*, truck routes are designed for specific load limits, turning radii, *etc.*).
6 – There may be an increase in traffic volumes along local roadways.
7 – There may be a change in traffic volumes and patterns along local roadways (*i.e.*, peak traffic times may shift and / or be extended).
8 – There may be traffic delays or disruptions to accommodate wide loads (*i.e.*, due to escorts or loads that are too wide for single lane transportation).
9 – Once construction is complete and the Project is operational, there will be an additional 80 trucks going to / from the Mill site per day to deliver additional raw materials to the site or export product from the site. It is anticipated that there will be an additional 11 truck trips during peak traffic hours when the Project is operational.
10 – No additional workers will be required to operate the Project once it is in operation.
11 – Property tax revenue increases, which may result from this Project, would increase the amount of money available to the municipal and provincial governments for maintaining and improving public infrastructure.
12 – In the event of a major mishap, error, and / or unforeseen event, there may be a temporary increase in traffic until the impacts are mitigated. It would be expected that any increase in traffic would be short-lived.

MITIGATION

A – Contractors should ensure that all Project vehicles used on local roadways are maintained according to provincial regulations with respect to licensing, insurance, and safety inspection.
B – No vehicles associated with Project work (*i.e.*, contractor personnel vehicles, construction vehicles, heavy equipment, *etc.*) should be allowed to park along local roadways; parking should only occur in safe and identified locations.
C – All Project personnel operating vehicles permitted on local roadways should obey the posted speed limits and other posted signs, such as weight restrictions.
D – Carpooling of workers should be encouraged during Project construction to reduce traffic volumes.
E – Road traffic control measures (*e.g.*, use of flaggers, escort crews, *etc.*) should be used where required when transporting over-sized loads on public roadways using trained traffic personnel in accordance with the New Brunswick Department of Transportation and Infrastructure standards and practices.
F – Any additional mitigation measures developed for this Project should be adhered to for adequately addressing any potential impacts.
G – Heavy equipment haulers and shippers should adhere to weight restrictions and load limits as designated by the New Brunswick Department of Transportation and Infrastructure.
H – To avoid traffic congestion, movement of heavy equipment and materials to and from the Mill site during Project construction may have to be scheduled outside of normal peak traffic hours (*i.e.*, 7:30 AM to 8:30 AM and 4:30 PM to 5:30 PM Monday through Friday).

4.4.4.3.3 Proposed Mitigation

In addition to the normal project management practices undertaken at the Mill during routine operations and during Mill maintenance, shutdowns, and upgrades, the measures provided below should be implemented by all Project personnel to minimize the potential impact on the local transportation network.

- Contractors should ensure that all Project vehicles used on local roadways are maintained according to provincial regulations with respect to licensing, insurance, and safety inspection. {Applicable to Stages II and V}
- No vehicles associated with Project work (*i.e.*, contractor personnel vehicles, construction vehicles, heavy equipment, *etc.*) should be allowed to park along local roadways; parking should only occur in safe and identified locations. {II and IV}
- All Project personnel operating vehicles permitted on local roadways should obey the posted speed limits and other posted signs, such as weight restrictions. {II, III, and IV}
- Carpooling of workers should be encouraged during Project construction to reduce traffic volumes. {II}
- Road traffic control measures (*e.g.*, use of flaggers, escort crews, *etc.*) should be used where required when transporting over-sized loads on public roadways using trained traffic personnel in accordance with the New Brunswick Department of Transportation and Infrastructure standards and practices. {II, III, and V}
- Any additional mitigation measures developed for this Project should be adhered to for adequately addressing any potential impacts. {II, III, and V}
- Heavy equipment haulers and shippers should adhere to weight restrictions and load limits as designated by the New Brunswick Department of Transportation and Infrastructure. {II, III, and V}
- To avoid traffic congestion, movement of heavy equipment and materials to and from the Mill site during Project construction may have to be scheduled outside of normal peak traffic hours (*i.e.*, 7 AM to 8 AM and 5 PM to 6 PM Monday through Friday). {II}

4.4.4.3.4 Potential Post-Mitigation Residual and Cumulative Impacts

No residual and cumulative effects are likely to be incurred to the local transportation network due to this Project.

4.4.4.4 Aesthetics

Saint John is known as an industrial city and its economy is heavily focused on industrial and manufacturing operations. As noted in Section 3.3.6, a Mill has existed at Reversing Falls since at least 1836. Within PlanSJ [*Urban Strategies Inc.*, 2011], industrial operations are recognized as being critical to economic growth locally and regionally. Although industrial projects and operations are critical to sustaining and growing Saint John's economy, it is necessary to ensure that industrial development is sited appropriately such that it does not negatively impact surrounding non-industrial land uses.

The Mill site is zoned Heavy Industrial, which allows for the most intense industrial operations to occur. Properties abutting the Mill site have a variety of zoning types including (Figure 99):

- ➢ neighbourhood community facility (*e.g.*, Saint Rose of Lima Church, *etc.*);
- ➢ two-unit residential (*i.e.*, properties along Milford Road);
- ➢ mid-rise residential (*e.g.*, properties along Morris Street, Collins Street, *etc.*);
- ➢ heavy industrial (*i.e.*, Moosehead Breweries); and
- ➢ parkland (*i.e.*, Wolastoq Park and Reversing Falls Park).

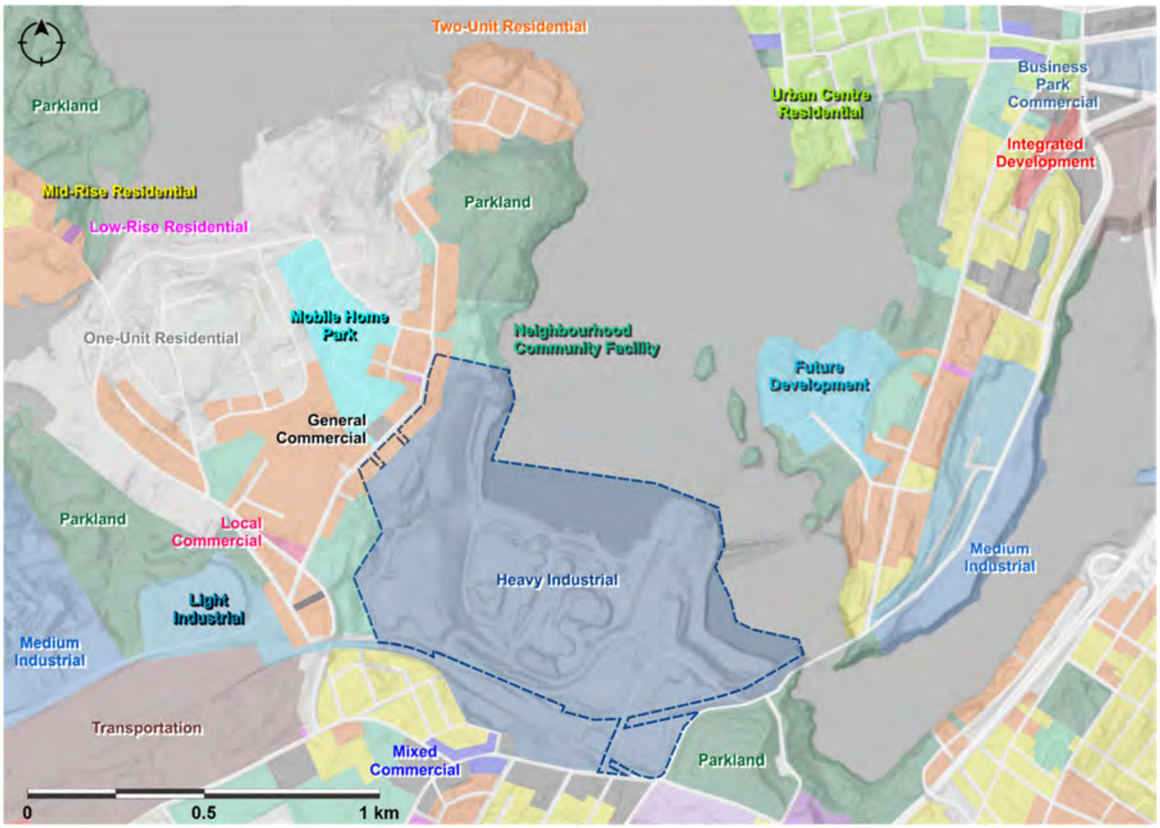


Figure 99. City of Saint John, New Brunswick zoning map in the vicinity of Reversing Falls Mill.

4.4.4.4.1 Conceivable Impacts and Pathways

Activities and physical works that may occur during the Project that may impact aesthetics are summarized in Table 66. Sound emissions are not included within the assessment of aesthetics as they were assessed as their own standalone VEC (*i.e.*, refer to Section 4.4.2.2).

Based on the conceivable impacts and pathways identified above, the following specific potential impacts were considered for aesthetics:

- ➢ visual pollution (*i.e.*, industrial infrastructure, water vapour plumes, *etc.*);
- ➢ light pollution (*i.e.*, light trespass);
- ➢ local compatibility; and
- ➢ odour.

Table 66. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on aesthetics during various activities associated with the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Activity	Conceivable Impacts and Pathways
Erection of tall structures	➢ Use of large cranes for hoisting may affect the scenic nature of the area ➢ Installation of tall structures may affect the scenic nature of the area
Operation of heavy equipment	➢ Construction equipment can emit odourous emissions
Low light conditions and nighttime operations	➢ Lights on construction equipment and used for lighting work areas may spill into neighbouring areas ➢ Light emitted from operational employee safety lights may affect use of the areas, particularly during the nighttime (*e.g.*, for star-gazing, *etc.*)
Kraft production	➢ Emission of unpleasant odours may waft into neighbouring areas ➢ Water vapour plumes generated may block views, reduce visibility, and create shadows for neighbouring residents

4.4.4.4.2 Potential Impacts

Recognizing the importance of being a good neighbour, IPP has continually improved the Mill since acquiring it in 1946. Improvements have included:

- reducing sound emissions (*e.g.*, enclosing chip conveyor belts, reducing the number of loaders working the chip pile, *etc.*);
- reducing odourous emissions (*i.e.*, TRS emissions have been reduced by 99.5 % since 1980 and SO_2 emissions have been reduced by 85 % since the early 2000s);
- reducing solid waste (*i.e.*, the Mill is only pulp and paper mill in North America that operates without an onsite landfill);
- increasing green energy production to reduce use of fossil fuels and the generation of GHGs;
- improving the look of Mill infrastructure (*i.e.*, all new buildings have the same appearance and similar finish); and
- enhancing environmental performance by installing BAT during each modernization phase.

Several three-dimensional images of what the Project will look like when completed are provided in Figure 24, Figure 28, Figure 31. Three-dimensional images of the Mill site from two of the three entrances to the Mill are shown in Figure 100 and Figure 101. All the images demonstrate that the Project will blend in with the existing infrastructure.

The impact assessment for aesthetics, which is summarized in Table 67, yielded three green lights and nine yellow lights. The yellow lights were generated during the construction period and for mishaps, errors and / or unforeseen events.

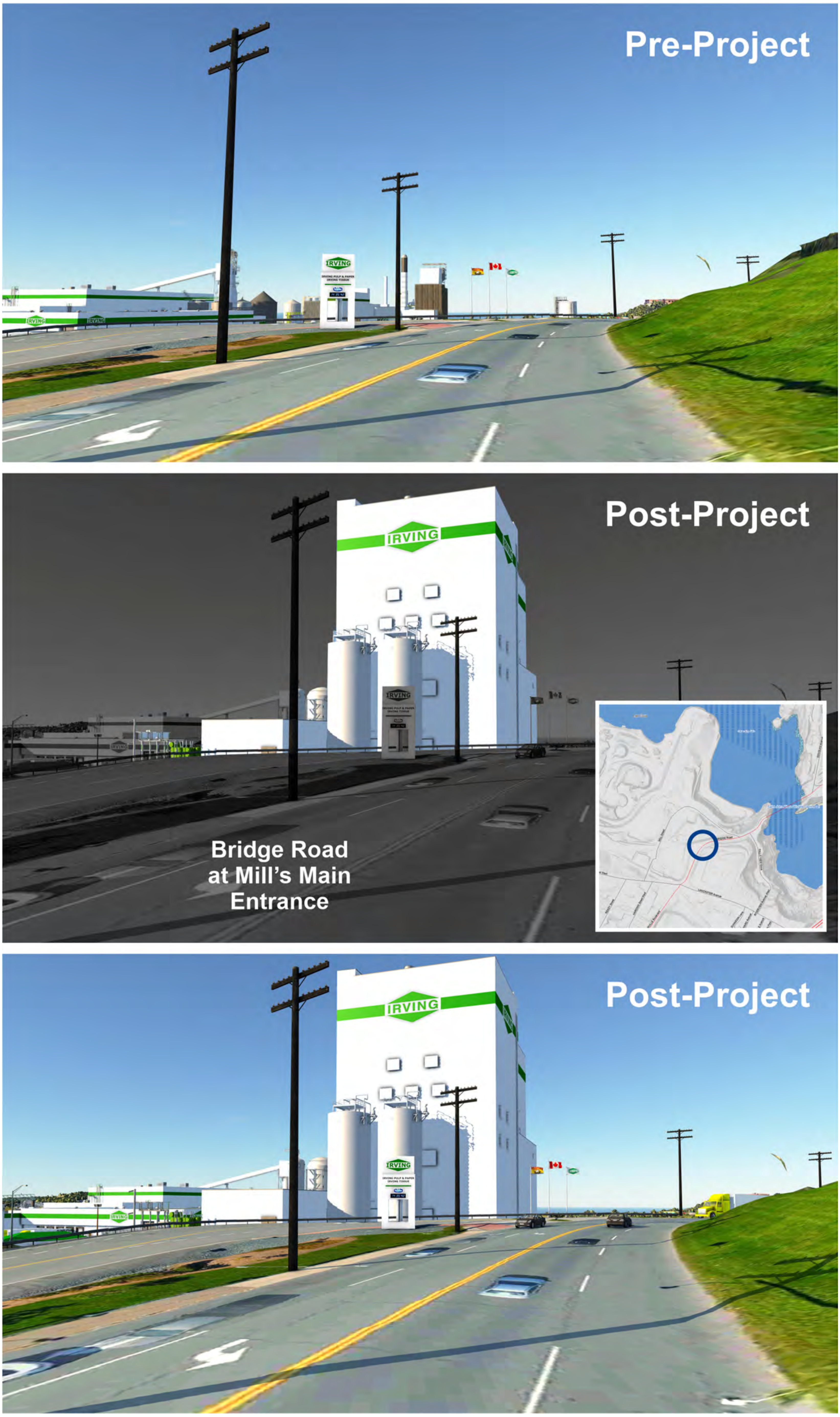


Figure 100. Modelled images showing the view of the Mill from the Main Entrance on Bridge Street before and after construction of mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Figure 101. Modelled images showing the view of the Mill from Bridge Street at Mill Street before and after construction of mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Table 67. Assessment of potential impacts on aesthetics of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Visual pollution (*i.e.*, infrastructure and water vapour plumes)	△	1, 2, 3	A	●	8, 9, 10, 11	H	△	16	N
Light pollution (*i.e.*, light trespass)	△	4	B, C	●	12	I	△	16	N
Local compatibility	△	5, 6	D, E	△	6, 13	J	△	16	N
Odour	△	7	F, G, L	●	14, 15	K, L, M	△	16	N

PATHWAYS

1 – Tall heavy lift cranes (*i.e.*, up to 125 m tall) and tower cranes may be visible for several kilometers.
2 – Heavy equipment will be working in an area of the Mill that experiences regular activity including the use of tall cranes.
3 – The area of the Mill where the work will be occurring is a geographically low area adjacent to Reversing Falls.
4 – Temporary construction lighting used during low-light and nighttime conditions may spill beyond the work areas and into adjacent commercial, residential, and recreational areas.
5 – Construction activities at the site will conform with other routine and regular developments undertaken at the Mill, such as Main Mill Shutdowns that occur every 18 months, and the previous Mill modernization phases.
6 – Heavy industrial activity, including construction projects, has occurred at this site for at least 185 years. Areas of the City have built up around the Mill and residents living in adjacent residential neighbourhoods would be accustomed to this type of activity.
7 – Any odours generated through Project construction (*e.g.*, exhausts, *etc.*) should dissipate before reaching nearby commercial and residential receptors.
8 – The new flue gas stack will employ dry versus wet emissions scrubbing technology that should produce a very limited visible water vapour plume.
9 – Depending on meteorological conditions (*e.g.*, temperature, wind direction and speed, humidity, *etc.*), water vapour plumes from the new flue gas stack may be visible, but they should be considerably less visible than the water vapour plumes emitted from the current stack.
10 – The site topography and existing tall infrastructure should conceal new low-rise Project infrastructure.
11 – The new flue gas stack will be slightly taller than the existing stacks at the Mill, which may make it visible at greater distances.
12 – Permanent Project lighting will be similar in quantity to the existing, but the lighting will be a newer technology that should limit potential offsite impacts such as light trespass.
13 – No new processes are being added to the Mill, instead best-available technology is being installed to replace aging technology.
14 – Odour reduction during operation was a criterion used for selecting the new best-available technology. The new technology installed will reduce total reduced sulphur and sulphur dioxide that are linked to odourous emissions from the Mill.
15 – There will be some additional heavy equipment onsite required to complete Main Mill Shutdowns that occur every 18 months.
16 – In the event of a major mishap, error, and / or unforeseen event, there may be short-lived impacts to aesthetics (*e.g.*, the erection of several tall cranes, the use of additional temporary lighting, the release of an unpleasant odour, *etc.*).

MITIGATION

A – Tall heavy lift cranes (*i.e.*, those used for erecting the flue gas stack) should be lowered when no longer required, where practical and feasible.
B – Construction will occur around the clock for most of the construction phase of the Project and lighting required for personnel safety during low-light conditions and evening hours should be confined to areas actively being worked, be down shielded, and extinguished when not in use.
C – Work will be performed in such a way that adverse impacts of construction lighting are controlled or mitigated to avoid unnecessary and obtrusive light on adjoining commercial, residential, and / or recreational areas.
D – Construction activity should be confined to the Mill site where heavy industrial activity is a routine occurrence.
E – Project designers should select materials that are architecturally appropriate to conform with other structures on the Mill site.
F – Heavy equipment and vehicles should be turned off when not in use and / or when practical to limit the amount of exhaust and associated nuisance odours that have the potential to migrate offsite.
G – Heavy equipment exhaust emission systems should meet the recommended standards.
H – The visual water vapour plume emitted from the new recovery boiler stack should be virtually eliminated when compared to the existing recovery boiler stack.
I – Permanent Project lighting will be limited to that necessary for Project personnel to perform their work safely and the lighting should be designed to minimize light trespass, which may include tilting or aiming luminaires away from neighbouring spaces, using light-emitting diode lights that provide targeted lighting levels, and controlling lights to turn off or dim when not necessary for employee safety.
J – As a good neighbour, IPP should maintain infrastructure in a similar fashion to other existing structures on the Mill site.
K – Operators should ensure that new equipment operates efficiently and is maintained on appropriate schedules to maintain decreased air emissions.
L – A protocol should continue to be used for receiving, investigating, managing, and tracking residential complaints in a timely manner regarding odour complaints.
M – Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment.
N – Mitigation measures developed for this Project should be adhered to for adequately addressing any potential impacts.

4.4.4.4.3 Proposed Mitigation

The mitigation measures provided below should be undertaken by all Project personnel to ensure that the potential impacts to aesthetics are minimized.

- Tall heavy lift cranes (*i.e.*, those used for erecting the flue gas stack) should be lowered when no longer required, where practical and feasible. {Applicable to Stage II}
- Construction will occur around the clock for most of the construction phase of the Project and lighting required for personnel safety during low-light conditions and evening hours should be confined to areas actively being worked, be down shielded, and extinguished when not in use. {II}
- Work will be performed in such a way that adverse impacts of construction lighting are controlled or mitigated to avoid unnecessary and obtrusive light on adjoining commercial, residential, and / or recreational areas. {II}
- Construction activity should be confined to the Mill site where heavy industrial activity is a routine occurrence. {II}
- Project designers should select materials that are architecturally appropriate to conform with other structures on the Mill site. {II}
- Heavy equipment and vehicles should be turned off when not in use and / or when practical to limit the amount of exhaust and associated nuisance odours that have the potential to migrate offsite. {II}
- Heavy equipment exhaust emission systems should meet the recommended standards. {II}
- Operators should ensure the flue gas stack operates efficiently and is maintained on appropriate schedules to limit the size and scale of the visual water vapour plume emitted. {III}
- Permanent Project lighting will be limited to that necessary for Project personnel to perform their work safely and the lighting should be designed to minimize light trespass, which may include tilting or aiming luminaires away from neighbouring spaces, using light-emitting diode lights that provide targeted lighting levels, and controlling lights to turn off or dim when not necessary for employee safety. {III}
- As a good neighbour, IPP should maintain infrastructure in a similar fashion to other existing structures on the Mill site. {III}
- The visual water vapour plume emitted from the new recovery boiler stack should be virtually eliminated when compared to the existing recovery boiler stack. {III}
- A protocol should continue to be used for receiving, investigating, managing, and tracking residential complaints in a timely manner regarding odour complaints. {II and III}
- Portions of the Mill's Environmental Management System, which is registered to the ISO 14001 environmental standard, may require updating based on operational requirements of the modernized equipment. {III}
- Mitigation measures developed for this Project should be adhered to for adequately addressing any potential impacts. {V}

4.4.4.4.4 Potential Post-Mitigation Residual Impacts

No residual and cumulative effects are likely to occur to local aesthetics over the duration of Project for the three stages assessed assuming the above mitigation measures are implemented.

4.4.4.5 Recreation and Tourism

4.4.4.5.1 Conceivable Impacts and Pathways

Activities and physical works that may occur throughout the Project that could potentially impact local recreation and tourism attractions are summarized in Table 68 along with their associated impact pathways. In the section that follows, the potential impacts are assessed in concert with the development of mitigation measures.

Table 68. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on local recreation and tourism attractions during various activities associated with the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Activity	Conceivable Impacts and Pathways
General construction	➢ Increase in local employment rate may translate to increased spending on local extra-curricular activities like recreation and tourism
Operation of heavy equipment	➢ Solitude of natural spaces may be affected by construction sound emissions
Pile driving activities	➢ Highly impulsive sounds (*e.g.*, pile driving, *etc.*) coupled with ground vibrations may be an annoyance and may affect the peacefulness of recreation and tourism spaces
Erection of tall structures	➢ Use of large cranes for hoisting and erection of permanent tall structures may affect the scenic nature of the area
Safety lighting	➢ Light emitted from operational employee safety lights may affect use of the areas, particularly during the nighttime (*e.g.*, for stargazing, *etc.*)

Because there are many tourist attractions within 5 km of the Project site (*i.e.*, refer to Figure 83) that are visited by locals and visitors to the region, the following potential impacts to local recreation and tourism attractions were assessed:

- ➢ site visitation and access;
- ➢ visitor numbers;
- ➢ economy and revenue generation; and
- ➢ scenic character.

4.4.4.5.2 Potential Impacts

Table 69 summarizes the potential impacts the Project may have on local recreation and tourism. The impact assessment yielded two no change lights and three green lights. Seven yellow lights were also generated (Table 69) and are particularly associated with mishaps, errors, and / or unforeseen events. Two yellow lights were also given to two potential impacts during construction. It was considered that some local recreation and tourism operators may choose to limit their business during Project construction activities for reasons such as increased traffic and congestion, increased loud sounds, *etc*. Also, some loud sounds and ground vibrations associated with construction equipment may cause some people to limit or delay visitation to tourism and recreation sites near the Project site.

Table 69. Assessment of potential impacts on local recreation and tourism attractions of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Site visitation / access	⊜	1		⊜	1		△	11	G
Visitor numbers	△	2	A, B	◉	9		△	11	G
Economy and revenue generation	◉	3, 4		◉	3		△	11	G
Scenic character	△	5 to 8	C, D, E, F	△	10		△	11	G

PATHWAYS

1 – The Reversing Falls Mill site is a private industrial site and there is no public access; there will be no impact to accessing sites not owned by the proponent because of the Project.
2 – Local recreation and tourism operators may choose to limit their business during Project construction activities for reasons such as increased traffic and congestion, increased loud sounds, *etc.*
3 – Increasing local and regional employment may translate to increased spending on extra-curricular activities like local recreation and tourism.
4 – Bringing in workers from areas outside the region to work on the Project during construction may increase the visitation of local recreation and tourism attractions.
5 – Operation of heavy equipment can emit loud sounds (*e.g.*, general operation, back up alarms, *etc.*), which can be an annoyance to users of nearby recreation and tourist attractions.
6 – Additional tall structures at the Mill during construction (*i.e.*, cranes) may affect the scenic nature of the area, but people are still going to visit the top local attractions such as the renowned Reversing Falls at Fallsview Park on the opposite side of the Saint John River from the Mill.
7 – Highly impulsive sounds (*e.g.*, pile driving, *etc.*) coupled with ground vibrations may be an annoyance and may affect the peacefulness of nearby recreation and tourism spaces.
8 – Additional light emitted during construction may increase light levels during the nighttime, which could affect low-light activities such as stargazing.
9 – Once Project construction is complete, the Reversing Falls Mill will operate as it currently does, although there should be some additional environmental improvements, such as reduced odours and a reduced visible water vapour plume that may enhance the draw to local recreation and tourism sites.
10 – Once Project construction is complete, the new buildings and infrastructure will blend into the existing industrial landscape.
11 – Depending on the type / degree of event, there may be a possibility that access to one of the immediately adjacent tourist sites (*e.g.*, Fallsview Park, Wolastoq Park, *etc.*) could be restricted for a short period of time, which could reduce the number of visitors.

MITIGATION

A – Mitigation measures developed for impacts on air quality, sound, and the transportation network should be adhered to during Project construction to limit potential impacts on recreation and tourism.
B – Nearby businesses, including recreation and tourism operators, should be notified at least one week prior to the start of pile driving activities.
C – Use of mobile, tall, heavy lift cranes during construction should be scheduled, where feasible and practical, to complete the necessary hoisting activities within a coordinated window to limit their erection period.
D – Construction work that has the potential to emit highly impulsive sounds (*e.g.*, pile driving, *etc.*) should be coordinated to be completed concurrently, where practical.
E – Lighting should be designed to minimize the amount of light that leaves the facility; down facing and shielded lighting should be employed to the maximum extent practicable.
F – Project designers should select materials that are architecturally appropriate to conform with other structures on the Mill site.
G – Emergency response and contingency plans should be designed to prevent any major and / or sustained environmental damage.

4.4.4.5.3 Proposed Mitigation

It is challenging to develop mitigation measures related to tourist attractions that are not located on the Mill site because they are not under the proponent's control. Emergency response and contingency plans should be designed to prevent any major and / or sustained environmental damage on the Mill site to preserve what attracts people local tourism and recreation sites.

The mitigation measures provided below should be undertaken by all Project personnel to ensure that the potential risks to local recreation and tourism attractions are minimized.

- Mitigation measures developed for impacts on air quality, sound, and the transportation network should be adhered to during Project construction to limit potential impacts on recreation and tourism. {Applicable to Stage II}
- Nearby businesses, including recreation and tourism operators, should be notified at least one week prior to the start of pile driving activities. {II}
- Use of mobile, tall, heavy lift cranes during construction should be scheduled, where feasible and practical, to complete the necessary hoisting activities within a coordinated window to limit their erection period. {II}
- Construction work that has the potential to emit highly impulsive sounds (*e.g.*, pile driving, *etc.*) should be coordinated to be completed concurrently, where practical. {II}
- Lighting should be designed to minimize the amount of light that leaves the facility; down facing and shielded lighting should be employed to the maximum extent practicable. {II}
- Project designers should select materials that are architecturally appropriate to conform with other structures on the Mill site. {II}
- Emergency response and contingency plans should be designed to prevent any major and / or sustained environmental damage. {V}

4.4.4.5.4 Potential Post-Mitigation Residual Impacts

Considering the mitigation measures presented, no residual impacts were identified for the three Project stages assessed.

4.4.4.6 Health and Safety

The proposed Project has the potential to affect the health and safety of Project personnel, as well as the public and visitors. As noted in Table 27, there is a potential for interaction during the three Project stages assessed. Construction, operation, and maintenance work on the Project equipment can present several unique and special hazards to personnel. In addition to the hazards associated with the various trades during construction and maintenance work, there are other hazards associated with Project operation, including contact with:

- hazardous process chemicals;
- high temperature piping systems;
- high pressure piping systems;

- loud sounds; and
- pinch points and moving equipment.

For the above reasons, health and safety was selected as a VEC.

4.4.4.6.1 Conceivable Impacts and Pathways

Activities and physical works that may occur during the Project and could impact health and safety are summarized in Table 70. Sound emissions are not included within the assessment of aesthetics as they were assessed as their own standalone VEC (*i.e.*, refer to Section 4.4.2.2).

Table 70. The type of cause-effect relationships that are possible and the mechanisms by which stressors could ultimately lead to impacts on health and safety during various stages associated with the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Activity	Conceivable Impacts and Pathways
Construction and operation contractor and employee traffic	➢ Increase in traffic volumes along local road networks may increase traffic accidents ➢ Conflicts with active transportation routes (*e.g.*, bikes on roadways, use of roadway shoulders as walking routes, *etc.*) ➢ Increase in traffic accidents
Transporting materials and equipment to and from the site	➢ Increase in traffic volumes along local road networks may restrict traffic ➢ Traffic delays or disruptions to accommodate wide loads (*i.e.*, due to use of escorts or loads that are too wide for single lane transportation) may hamper roadway use ➢ Conflicts with active transportation routes (*e.g.*, bikes on roadways, use of roadway shoulders as walking routes, *etc.*) ➢ Increase in traffic accidents
General construction and operation	➢ Workers will be involved in activities that will include the potential exposure to dust, loud sounds, and hazardous chemicals (*n.b.*, as solids, liquids, and gases) ➢ Workers will be exposed to conventional construction hazards related to such activities as hoisting, rigging, working around heavy equipment, confined spaces, welding, cutting, *etc.* ➢ Local residents may be exposed to loud sounds and ground vibrations from heavy construction equipment ➢ Local residents may be exposed to dust generated during site preparation activities and general construction traffic ➢ Light emitted from the Project may affect use of nearby areas, particularly during the nighttime (*e.g.*, for star-gazing, *etc.*)
Operators handling process chemicals and their byproducts	➢ Depending on the chemical(s) and material(s) involved, exposure may lead to skin, eye, nose, and / or throat irritation, burns, and inhalation or absorption of potentially dangerous toxins ➢ Working around high-pressure and high temperature piping may lead to burns and flying debris ➢ Operators may be required to enter confined spaces that may expose them to hazardous chemicals and their byproducts
Working around operational equipment	➢ Pinch points may lead to injury ➢ Exposure to electric shock or electrocution ➢ Accidental exposure to hazardous chemicals (*n.b.*, as solids, liquids, and gases) ➢ If molten smelt contacts water, there is a possibility a pressure burst of high temperature smelt could result

Almost all workplace incidents resulting in bodily harm or death are attributed to mishaps, errors, and / or unforeseen events. Despite the rigorous mitigation measures implemented to prevent such incidents from happening, impacts may still result.

The following specific potential impacts pertaining to health and safety were assessed for the Project:

- occupational and personal hazards;
- airshed contamination;
- water contamination;
- solid waste and sanitary waste generation; and
- traffic hazards.

4.4.4.6.2 Potential Impacts

The impact assessment for health and safety is summarized in Table 71. Maintaining a safe work site is of paramount importance to IPP as described in Section 2.8.2.8. Therefore, green lights (n = 11) were generated for most potential impacts on the basis that the hazards associated with health and safety are well defined and understood and can be mitigated through IPP's rigorous health and safety protocols. Some potential impacts that may be present during construction, operation, or may occur because of mishaps, errors, and / or unforeseen events yielded yellow lights (n = 4).

Worker activities during operation will be governed by the Mill's comprehensive Health and Safety Plan, which will outline a thorough set of operating procedures for the Project equipment. Many of the activities currently undertaken at the Mill that have operational and safety plans associated with them will not change but may be updated to reflect modern technologies that may be incorporated into the new equipment. Additional operation and safety plans will be created for any new activities associated with operation of Project equipment.

Significant efforts have been made in recent years to improve the safety of operators working around RBs, MEEs, and recausticizing equipment at pulp mills. Several high-risk manual tasks have been eliminated. The advent of robotics has led to automation of tasks, such as cleaning spent cooking fluid sprayers, molten smelt spouts, ports for combustion air, and smelt shatter jets of the RB. These improvements create a safer employee work environment.

Table 71. Assessment of potential impacts on health and safety of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Potential Impact	Stage II: Construction			Stage III: Operation and Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation	Degree of Impact	Pathways	Mitigation
Occupational and personal hazards	▲	1 to 4	A to I	●	1 to 4, 11	Q, R, S, T	●	1 to 4, 14	A to I, V, W
Airshed contamination	▲	5	A, B, C, J	●	12	Q, U	●	12, 14	A to D, J, W
Water contamination	●	6	F, G, K	●	6	Q	●	6, 14	F, G, K, W
Solid waste and sanitary waste generation	●	7, 8	A, B, C, L, M	●	7, 8	Q	●	7, 8, 14	A, B, C, W
Traffic hazards	▲	9, 10	A, B, C, N, O, P	▲	9, 13	O, Q	●	9, 14	A to D, N, O, P, W

PATHWAYS

1 – The implementation of health and safety protocols is a fundamental component to the safe and secure regular operation of the Mill, during Mill maintenance upgrades and shutdowns, and during construction projects. If a health and safety protocol does not currently exist for a specific task, it is expected that one will be developed to protect the health and safety of Project personnel.
2 – Workers may be involved in activities that will include the potential exposure to dust, loud sounds, and potentially hazardous chemicals (*e.g.*, hydrocarbons, paints, solvents, polymers, acids, *etc.*) and working within excavations, at heights, in confined spaces, around high-pressure equipment, around high temperature equipment, around high voltage equipment, *etc.*
3 – Accidents could cause personal injury (*e.g.*, if back up alarms are not used, if inattentiveness occurs during operation, *etc.*) and infrastructure damage.
4 – Members of the public could be harmed if adequate precautions are not taken to keep them from accessing the Project site during construction, keeping them away from hazards during operations (*e.g.*, operation of heavy equipment, *etc.*), and protecting them from potentially dangerous situations (*e.g.*, transportation and delivery of oversized equipment and hazardous materials, *etc.*).
5 – As noted in the Air Quality Valued Environmental Component Impact Assessment table, there is expected to be a moderate, though localized, impact on air quality during Project construction primarily because of the increased operation of heavy equipment emitting pollutants to the local airshed.
6 – Spills or accidental releases of hazardous chemicals (*e.g.*, hydrocarbons, paints, solvents, polymers, acids, *etc.*) could cause contamination of surface water and groundwater.
7 – Solid wastes will be generated during many construction, operation, and maintenance activities. Those materials will require safe disposal or else they could lead to health issues or environmental concerns.
8 – Sanitary wastes from temporary washroom facilities will most likely be collected within a storage tank and transported offsite for safe disposal. Spills or an accidental release of sanitary waste could cause contamination of surface water and groundwater and improper handling of sanitary wastes could lead to health issues.
9 – As noted in the Transportation Network Valued Environmental Component Impact Assessment table, there is expected to be an increase in potential traffic hazards throughout all Project stages.
10 – Tall, mobile, heavy lift cranes (*i.e.*, up to 125 m tall), tower cranes, and tall infrastructure may present hazards to very low-flying aircraft.
11 – There will still be risks during operation and maintenance, but they will be considerably lower than construction. Some of the more high-risk occupational safety activities, such as the cleaning of the smelt ports on the recovery boiler, will be done using robots.
12 – As noted in the Air Quality Valued Environmental Component Impact Assessment table, there is expected to be an overall improvement in air quality during Project operations because new best-available technology will be installed to replace aging technology.
13 – An overall up to 1.8 times increase in Kraft pulp production will result in increased imports to the Mill (*e.g.*, wood chips, processing chemicals, *etc.*) and exports from the Mill (*i.e.*, Kraft pulp).
14 – All mishaps, errors, and / or unforeseen events by their nature pose potential impacts to health and safety of Project personnel and, depending on the nature of the incident, could pose a risk to public health and safety.

MITIGATION

A – All Project personnel should make occupational health and safety and public health and safety a primary objective in all their activities related to the Project.
B – All Project personnel should be instructed on what personal protective equipment is required to be worn, what safeguards should be in place, what measures should be taken to protect other workers and the public, and how rules and regulations with respect to the environment, roadways, and equipment should be strictly adhered to, with no exceptions.
C – All Project personnel should be adequately trained to do their job so that they conform to the occupational health and safety standards.
D – The Proponent should ensure that occupational health and safety standards are part of the Project working environment and contractors should ensure that Project personnel under their control have appropriate personal protective equipment available to wear for the tasks they are performing and that they don that safety equipment (*n.b.*, the proponent performs routine audits on the proper and consistent use of personnel protective equipment).
E – All hazardous materials (*e.g.*, hydrocarbons, paints, solvents, polymers, acids, *etc.*) should be labelled appropriately and stored and used as per the manufacturer's recommendations.
F – Project personnel working with hazardous chemicals should be trained appropriately for their safe use, handling, and storage, they should be provided with the appropriate personal protective equipment for their safe use, handling, and storage, and they should have ready access to the current Safety Data Sheet information.
G – All specialized work (*e.g.*, working in high voltage areas, at heights, within excavations, and in confined spaces, operating heavy equipment, refueling heavy equipment, *etc.*) should only be completed by trained, competent, and / or certified / licensed professionals.
H – Project personnel working at heights, within confined spaces, high-pressure environments, high temperature environments, and high-voltage areas should be trained appropriately for working under those conditions / in those environments and should be provided with the appropriate personal protective equipment to don.
I – Project personnel should immediately report any serious accident that results in an injury, no matter how minor, lost time, or property damage and those reports should be submitted promptly by the contractor, when applicable, to the appropriate regulatory authority.
J – Mitigation measures noted in the assessment of the Air Quality Valued Environmental Component should be implemented and followed.
K – Mitigation measures noted in the assessment of the Surface Water Quantity and Quality Valued Environmental Component and the Groundwater Quantity and Quality Environmental Component should be implemented and followed.
L – Approved construction debris and operation and maintenance waste should be sent to an appropriate facility for safe disposal. Collected fibre and solids should be sent to the onsite biomass boiler or to an approved compost facility.
M – Sanitary wastes generated during Project construction and operation and maintenance activities should be handled appropriately. Sanitary waste should be collected and disposed of using a licensed waste disposal operator.
N – Mitigation measures noted in the assessment of the Transportation Network Valued Environmental Component should be implemented and followed.
O – Vehicle routes and pedestrian routes on the Project site should be clearly mapped and movements should be closely monitored and controlled to

prevent accidents.
P – Tall heavy lift cranes, tower cranes, and infrastructure should be equipped with aircraft warning lights where deemed necessary and regulatory authorities, when appropriate, should be contacted regarding safety protocols to prevent a collision by very low-flying aircraft.
Q – Portions of the Mill's Health and Safety Manual may have to be updated.
R – Automatic operations, such that operators can monitor and operate processes from the safety and security of an isolated control room, should be preferred when practical and feasible.
S – Periodic inspection and maintenance programs should be undertaken to prevent and identify health and safety concerns, leaks, equipment failure, *etc.*
T – As per IPP policy, process equipment should be completely shut off and appropriately locked out, where required, before performing any maintenance, cleaning, or repair operations.
U – Operators should ensure that new equipment operates efficiently and is maintained on appropriate schedules to maintain expected air emissions.
V – Proper engineering controls, such as pressure relief valves, negative pressures and ventilation systems, gas monitors, and alarms, should be installed to mitigate against accidents, errors and / or unforeseen events.
W – Emergency response and contingency plans should be designed to prevent a foreseeable major and / or sustained environmental damage or health and safety concern.

4.4.4.6.3 Proposed Mitigation

To mitigate any potential impact associated with health and safety, all Project personnel should be briefed on health and safety issues prior to implementing their tasks associated with the Project (*e.g.*, during a site safety orientation session, toolbox meeting, tail gate meetings, *etc.*). They should be instructed on what Personal Protective Equipment (PPE) they must wear, what guards are to be in place, what measures are to be undertaken to protect themselves, their coworkers, and the public, and how rules and regulations with respect to roadways and equipment must always be followed. In addition to this, safety areas such as first aid stations, fire extinguisher storage areas, eye wash stations, muster stations, and spill clean-up stations should be erected in various strategic locations around the Project site. Project personnel should be briefed on the general use, capabilities, and limitations of the mitigation measures.

Various safety procedures and protocols should be put in place, not only to protect those working on the site, but also used to protect the public and visitors from any harm. The mitigation measures provided below should be undertaken by all Project personnel to ensure that the potential risks to Project personnel and public health and safety are minimized.

- All Project personnel should make occupational health and safety and public health and safety a primary objective in all their activities related to the Project. {Applicable to Stages II and V}
- All Project personnel should be instructed on what personal protective equipment is required to be worn, what safeguards should be in place, what measures should be taken to protect other workers and the public, and how rules and regulations with respect to the environment, roadways, and equipment should be strictly adhered to, with no exceptions. {II and V}
- All Project personnel should be adequately trained to do their job so that they conform to the occupational health and safety standards. {II and V}
- The Proponent should ensure that occupational health and safety standards are part of the Project working environment and contractors should ensure that Project personnel under their control have appropriate personal protective equipment available to wear for the tasks they are performing and that they don that safety equipment (*n.b.*, the proponent performs routine audits on the proper and consistent use of personal protective equipment). {II and V}
- All hazardous materials (*e.g.*, hydrocarbons, paints, solvents, polymers, acids, *etc.*) should be labelled appropriately and stored and used as per the manufacturer's recommendations. {II and V}
- Project personnel working with hazardous chemicals should be trained appropriately for their safe use, handling, and storage, they should be provided with the appropriate personal protective equipment for their safe use, handling, and storage, and they should have ready access to the current Safety Data Sheet information. {II and V}
- All specialized work (*e.g.*, working in high voltage areas, at heights, within excavations, and in confined spaces, operating heavy equipment, refueling heavy equipment, *etc.*) should only be completed by trained, competent, and / or certified / licensed professionals. {II and V}
- Project personnel working at heights, within confined spaces, high-pressure

environments, high temperature environments, and high-voltage areas should be trained appropriately for working under those conditions / in those environments and should be provided with the appropriate personal protective equipment to don. {II and V}

- Project personnel should immediately report any serious accident that results in an injury, no matter how minor, lost time, or property damage and those reports should be submitted promptly by the contractor, when applicable, to the appropriate regulatory authority. {II and V}
- Mitigation measures noted in the assessment of the Air Quality Valued Environmental Component should be implemented and followed. {II and V}
- Mitigation measures noted in the assessment of the Surface Water Quantity and Quality Valued Environmental Component and the Groundwater Quantity and Quality Environmental Component should be implemented and followed. {II and V}
- Approved construction debris and operation and maintenance waste should be sent to an appropriate facility for safe disposal. Collected fibre and solids should be sent to the onsite biomass boiler or to an approved compost facility. {II}
- Sanitary wastes generated during Project construction and operation and maintenance activities should be handled appropriately. Sanitary waste should be collected and disposed of using a licensed waste disposal operator. {II}
- Mitigation measures noted in the assessment of the Transportation Network Valued Environmental Component should be implemented and followed. {II and V}
- Vehicle routes and pedestrian routes on the Project site should be clearly mapped and movements should be closely monitored and controlled to prevent accidents. {II and V}
- Tall heavy lift cranes, tower cranes, and infrastructure should be equipped with aircraft warning lights where deemed necessary and regulatory authorities, when appropriate, should be contacted regarding safety protocols to prevent a collision by very low-flying aircraft. {II and V}
- Portions of the Mill's Health and Safety Manual may have to be updated. {III}
- Automatic operations, such that operators can monitor and operate processes from the safety and security of an isolated control room, should be preferred when practical and feasible. {III}
- Periodic inspection and maintenance programs should be undertaken to prevent and identify health and safety concerns, leaks, equipment failure, *etc.* {III}
- As per IPP policy, process equipment should be completely shut off and appropriately locked out, where required, before performing any maintenance, cleaning, or repair operations. {III}
- Operators should ensure that new equipment operates efficiently and is maintained on appropriate schedules to maintain expected air emissions. {III}
- Proper engineering controls, such as pressure relief valves, negative pressures and ventilation systems, gas monitors, and alarms, should be installed to mitigate against accidents, errors and / or unforeseen events. {V}
- Emergency response and contingency plans should be designed to prevent a foreseeable major and / or sustained environmental damage or health and safety concern. {V}

4.4.4.6.4 Potential Post-Mitigation Residual Impacts

No residual effects are anticipated, with respect to health and safety, during the Project stages assessed, if the above mitigation measures are implemented.

4.4.5 Summary of Potential Environmental Impacts

IPP is committed to environmental excellence and continually explores innovative ways to reduce their environmental footprint. The Mill produces high quality products in an environmentally sustainable and socially responsible manner by operating under stringent environmental policies. Employees are committed to:

- continually seeking to understand operational impacts on the air, water, soil, forest ecosystem, and local communities;
- actively working to continuously improve our environmental performance;
- meeting or exceeding relevant environmental legislation and regulations;
- meeting the requirements of organizations and associations to which we belong;
- educating other employees and contractors about environmental concerns, their environmental responsibilities, and corporate policies and best practices;
- encouraging other employees and contractors be environmental advocates; and
- cooperating with efforts to raise public awareness about environmental issues.

As described above, 12 VECs were assessed for potential impacts to the environment by the proposed Project. An overall VEC impact assessment summary is provided in Table 72. The results indicate that in many instances, there are no changes anticipated because of this Project.

All told, 162 specific possible impacts were assessed (Table 72). Of those, 20 % (n = 33) yielded no change lights, 36 % (n = 58) were given yellow lights, and 44 % (n = 71) were assigned green lights. No red lights were assigned to any of the potential impacts (*i.e.*, not favourable or major impacts). The ultimate Project impact assessment produced a green light (*i.e.*, based on the summation of all possible impacts for the 12 VECs). The proposed Project is expected to have little to no impact on the environment considering the comprehensive mitigation measures developed. Therefore, the Project should proceed as detailed within this EIA document.

It is worth noting that most of the yellow lights were applied to potential impacts during Stage II and / or Stage V (Table 72). **There are very few operational impacts associated with this Project.**

Table 72. Summary of the potential impacts of the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick on selected valued environmental components.

VEC	Number of Lights For Stage II / III / V				Overall VEC Impact Assessment*
	Green	Yellow	Red	No Change (Blue)	
PHYSIO-CHEMICAL ENVIRONMENT					
Air quality	0 / 2 / 2	3 / 1 / 1	0 / 0 / 0	1 / 1 / 1	
Sound emissions	0 / 0 / 4	4 / 0 / 0	0 / 0 / 0	0 / 4 / 0	
Surface water quality and quantity	3 / 4 / 2	1 / 0 / 1	0 / 0 / 0	0 / 0 / 1	
Groundwater quality and quantity	0 / 3 / 0	4 / 0 / 2	0 / 0 / 0	1 / 2 / 3	
BIOLOGICAL ENVIRONMENT					
Terrestrial flora and fauna	0 / 1 / 2	4 / 1 / 2	0 / 0 / 0	2 / 4 / 2	
Aquatic flora and fauna	3 / 3 / 0	0 / 0 / 3	0 / 0 / 0	3 / 3 / 3	
SOCIO-ECONOMIC ENVIRONMENT					
Labour and economy	5 / 5 / 4	0 / 0 / 1	0 / 0 / 0	0 / 0 / 0	
Transportation network	1 / 3 / 3	2 / 0 / 0	0 / 0 / 0	0 / 0 / 0	
Archaeological & cultural resources	0 / 4 / 0	4 / 0 / 4	0 / 0 / 0	0 / 0 / 0	
Aesthetics	0 / 3 / 0	4 / 1 / 4	0 / 0 / 0	0 / 0 / 0	
Recreation and tourism	1 / 2 / 0	2 / 1 / 4	0 / 0 / 0	1 / 1 / 0	
Health and safety	2 / 4 / 5	3 / 1 / 0	0 / 0 / 0	0 / 0 / 0	
TOTALS	71	58	0	33	

NOTES: *No change lights are excluded from the determination of the overall VEC impact; the coloured light that was generated the most in the impact assessments determines the ultimate VEC impact

4.5 Potential Environment Impacts on the Project

As part of the NBDELG's EIA process, the environment's impact on a project should also be assessed (*e.g.*, seasonal flooding and extreme events, such as maximum precipitation, wind, and climate change scenarios, which may be pertinent to long-term facilities). No government agency provides specific guidance on how to properly assess the impacts of the environment on a project, but instead it is left up to the proponent to determine. Several impacts of the environment on the proposed Project are considered here including: temperature; precipitation; wind; wet and dry acid deposition; seismic events; and sea level rise. One theme of interest in assessing the impact of the environment on a project is climate change.

4.5.1 Notes on Climate Change

The international scientific community generally agrees that climate change is occurring and that the impacts are currently being felt globally [*Warren and Lulham*, 2021]. Since the 1950s, observations have been made with regards to the warming of the atmosphere, the warming of the ocean, the decrease in the amounts and duration of snow and ice cover, the increase in sea level, and the increased concentrations of GHGs present in the atmosphere. Changes observed in recent years are unprecedented when compared with historical data over similar timeframes in the past [*IPCC*, 2021]. For example, the period between 1983 and 2012 in the northern hemisphere was likely the warmest 20 year period of the last 1 400 years [*IPCC*, 2013], and the global surface temperature has increased faster since 1970 than in any other 50 year period or the last 2 000 years [*IPCC*, 2021]. As the phenomena of climate change continues, the effects are predicted to increase at an accelerating rate.

The Intergovernmental Panel on Climate Change (IPCC), through climate modeling scenarios, estimates that mean global surface temperatures are likely to increase 1.0 °C to 5.7 °C during the twenty-first century [*IPCC*, 2021], depending on the GHG emission scenario used. Warming is anticipated to be most prominent over land and at high northern latitudes. This means that in Canada, because it is a high latitude country, is expected to have more pronounced warming [*Bruce et al.*, 2000]. Although temperatures are predicted to increase over time, seasonal variations are still expected. According to the *IPCC* [2013], recent climate warming has already shown to have influenced terrestrial biological systems such as the timing of spring events (*e.g.*, bird migration and egg laying, leaf unfolding, northern shifts in the habitable ranges of various flora and fauna, *etc.*).

The rate of sea level rise since 1900 has been larger than over any preceding century during the previous three millennia. Sea levels increased by 0.15 m to 0.25 m between 1901 and 2018 and a 0.26 m to 0.82 m increase in global mean sea level is predicted by the year 2100 [*IPCC*, 2013 and 2021]. Rising sea levels and the increased rate in change can be attributed to thermal expansion resulting from an increase in ocean temperatures and a loss of ice mass from glaciers and ice sheets. Water levels along the southeastern coast of New Brunswick could increase by 50 cm to 70 cm by the end of this century [*Parkes et al.*, 2006].

Changes to climate will not be homogenous, but instead will vary regionally. In Atlantic Canada, inland areas may be subject to drier summers where increased evaporation of water may exceed increased precipitation. Coastal regions may be subjected to frequent flooding caused by a rising sea coupled with an anticipated increase of high intensity weather systems [*Vasseur and Catto*, 2008]. *Zweirs and Kharn* [1998] speculate that the most acute effects under a changing climate may be the increased intensity and frequency of extreme events, and in particular precipitation events.

Bruce et al. [2000] predict climate changes for Atlantic Canada if a doubled CO_2 atmosphere is attained by 2050. Under a doubled CO_2 atmosphere, summer temperatures are likely to be 4 °C warmer than current, while winter temperatures may increase by about 6 °C. In the past 30 years, the mean average annual temperature in New Brunswick has increased by 1.1 °C [*NBDELG*, 2022]. *Vasseur and Catto*, [2008] estimate that by 2050 temperatures in Atlantic Canada will increase by 2 °C to 4 °C during the summer and 1.5 °C to 6 °C during the winter. For Saint John in 2080, the maximum and minimum temperatures are expected to increase by 3.9 °C to 4.2 °C and 3.8 °C to 4.2 °C, respectively [*Lines et al.*, 2006] while the average is expected to increase by 3.5 °C [*ACAPSJ*, 2020].

Precipitation amounts under a doubled CO_2 atmosphere may increase by 20 % in the winter, and although unpredictable, summer precipitation amounts are also expected to increase. Studies by *Lewis* [1997] show that precipitation in Atlantic Canada between 1948 and 1995 increased by about 10 %. Predictions by *Lines et al.*, [2006] suggest that by 2080, precipitation for Saint John could increase by as much as 12 % in the winter and 35 % in the summer. Extreme precipitation events are expected, according to *Zweirs and*

Kharn [1998], to increase and may result in decreasing return periods by half (*i.e.*, a 100 year event will become a 50 year event under a doubled CO_2 environment).

The following guidance was offered by the *Canadian Environmental Assessment Agency* [2003] for assessing climate change:

> *The objective [of the guidance document] is to help practitioners assess, reduce, and manage the adverse impacts that climate change may have on projects and ensure that these impacts will not pose a risk to the public or the environment. The consideration of climate change impacts on a project is a component of the standard EA practice of considering possible changes to a project caused by the environment. The consideration of climate change impacts in EA should reflect regional variations in climate and environment, and jurisdictional practices.*

Design engineers and architects generally follow specific guidelines with respect to design criteria. Those design criteria consider the environmental effects of climate change and the potential cumulative effects on built structures (*e.g.*, increased streamflow through a culvert, increased snow loads on a roof, *etc.*). Engineers will account for impacts of climate change on the proposed Project in their design. Mitigation of potential effects of the environment on the proposed Project are also inherent in the planning (*i.e.*, the EIA document), construction (*i.e.*, environmental protection / management plans), and planned operation of the Project (*i.e.*, capture and handling of surface water runoff).

The information contained in this section of the document provides information on how the environment may affect the Project. A considerable adverse effect of the environment on the proposed Project is considered one that would result in:

- a long-term interruption in schedule (*i.e.*, a construction season) or in service (*i.e.*, several days);
- damage to infrastructure that is not economically feasible to repair (*i.e.*, > 150 % of the total original cost); and / or
- causes a considerable negative effect on an established VEC for the Project as per the criteria established for that VEC.

Many planning, design, and construction strategies are available to minimize the potential effects of the environment on the Project so that risk of serious damage to infrastructure, human health, or interruption of service can be reduced to acceptable levels. The National Codes of Canada, which will be strictly adhered to for this Project, identify many codes and standards that address environmental considerations during all aspects of a project.

The scope of the assessment of the environment on the Project is limited by spatial and temporal boundaries. Analysis is done only for inside the Project boundaries and all seasons were analyzed. Consideration was given to construction, operation, maintenance, and errors, mishaps, and / or unforeseen events.

4.5.1.1 Recent Commitments to Mitigating Climate Change

The federal and provincial governments across Canada have committed to fighting climate change by reducing GHG emissions. The most recent commitments made by regulators are summarized below.

4.5.1.1.1 Paris Agreement

In December 2015, leaders from around the world, including Canada, met for the twenty first Conference Of the Parties (COP21) summit in Paris, France. At the conference, 196 parties signed the now historic *Paris Agreement* as a global act to fight climate change. The goal of the *Paris Agreement* is to limit global warming to 2 °C and preferably to 1.5 °C compared to pre-industrial levels and to commit to reaching climate neutrality by 2050 [*UNFCCC*, 2021]. Since COP21, world leaders have been getting pressure to place more emphasis on climate policy and adaptation to reach the agreed upon targets by mid-century because current projections are that Earth will warm 3 °C by 2100 based on existing GHG emission rates [*OAGC*, 2021].

Despite Canada's commitments, strategies, and action plans, GHG emissions in the country continue to rise (*i.e.*, refer to Figure 42). Canada's emissions target for 2020 was 607 Mt, but according to the 2021 National Inventory Report, Canada emitted 730 Mt of CO_{2eq}. As such, Canada has established a new target by committing to reduce carbon emissions by 2030 to between 406 Mt and 443 Mt [*OAGC*, 2021].

4.5.1.1.2 The Glasgow Climate Pact

The twenty sixth Conference Of the Parties (COP26) took place between 31 October and 13 November 2021 in Glasgow, Scotland. This conference was acknowledged as the most important since the *Paris Agreement*. At COP26, world leaders and participants acknowledged that more work is required to achieve the GHG emission reduction targets proposed in 2015 for reducing the impacts of climate change.

Prior to COP26, Canada worked with key partners to create several key climate change commitments, including [*GOC*, 2021]:

- developing a strengthened climate plan in December 2020 to allow Canada to meet its previous GHG emission reduction targets;
- committing to a GHG emission reduction target between 40 % and 45 % from 2005 levels by 2030;
- placing the GHG emission reduction target in law, as well as Canada's commitment to achieve net zero emissions by 2050 through the *Canadian Net-Zero Emissions Accountability Act* [**S.C. 2021, c. 22**]; and
- doubling its international climate finance commitments for developing countries.

The *Glasgow Climate Pact* was formulated to emphasize areas that need improvement for the *Paris Agreement* to succeed [*GOC*, 2021]. Some key aspects of the *Glasgow Climate Pact* are provided below.

- The temperature impacts of climate change will now be closer to 1.5 °C rather than the previously predicted 2.0 °C.
- Countries will present stronger national action plans by 2022 instead of 2025 to achieve GHG emission reductions of 45 % by 2050.
- Leaders agreed to the "phase-down of coal power and the phase-out of inefficient fossil subsidies".

- Countries reached agreements on the remaining issues of the *Paris Agreement*, including addressing carbon markets that will allow countries struggling to meet their emission targets to purchase emission reductions from countries that have already met or exceeded their goals.

4.5.2 Notes on Extreme Weather

The frequency and severity of extreme weather is on the rise globally (Figure 102) and it appears to be a product of climate change [*Carey*, 2012]. The number of extraordinarily severe floods, storms, and other weather-related events that have occurred during the past few decades seems to suggest that extreme weather events are becoming more common [*Francis and Hengeveld*, 1998]. Severe weather in 2021 caused $2.1 billion in insured damage across Canada. Over the past few decades in Atlantic Canada, the most-costly extreme weather events have been hurricanes [*ICLR*, 2012] with Hurricane / Post-Tropical Storm Fiona in September 2022 being the most-costly weather event (*i.e.*, > $660 million in insured damage) to ever hit Atlantic Canada [*CBC*, 2022].

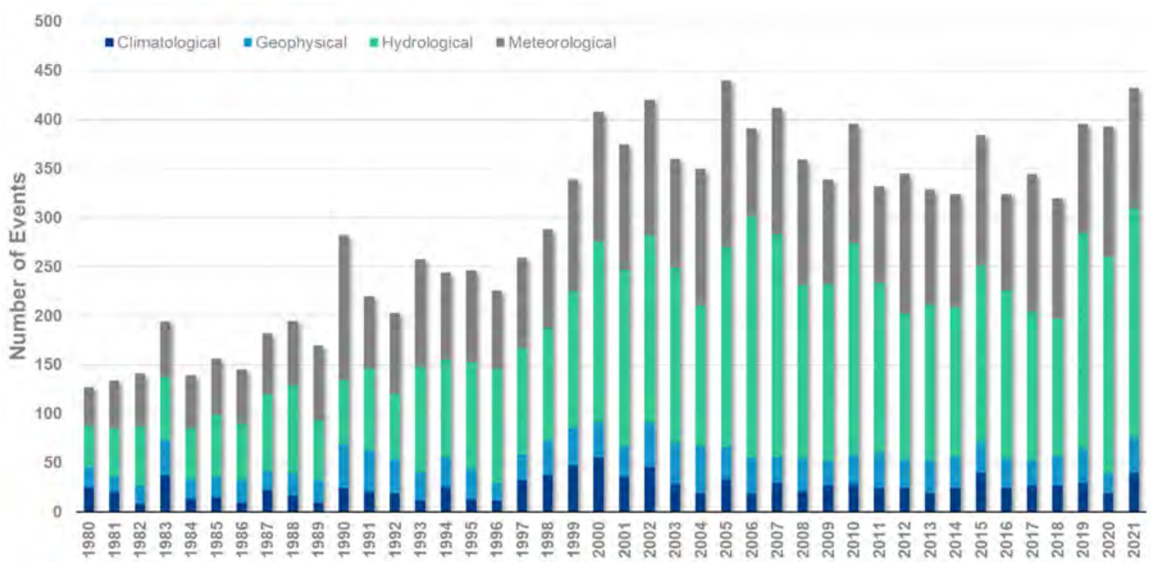


Figure 102. Natural disasters between 1980 and 2021 compiled from various sources, including UN agencies, non-governmental organizations, insurance companies, research institutes, and press agencies [*EM-DAT*, 2022].

Public Safety Canada (PSC) maintains the Canadian Disaster Database (CDD). The CDD contains detailed disaster information for 86 natural disasters that have occurred in New Brunswick between 1900 and 2019. About 45 % of those natural disasters have occurred in the past 25 years. The events are broken down as shown in Figure 103. The most-costly event on record for New Brunswick was the 1998 Ice Storm (*n.b.*, the event extended across Ontario, Quebec, and Atlantic Canada and was Canada's second highest insurance payout event for a natural disaster).

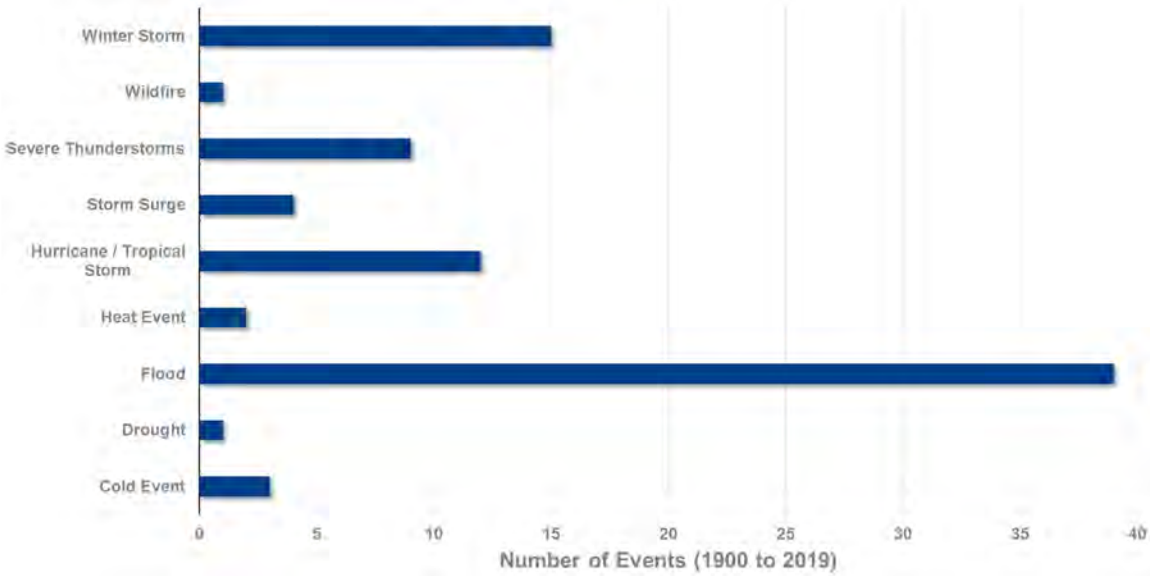


Figure 103. Characterization of the 86 natural disasters for New Brunswick between 1900 and 2019 as recorded in the Canadian Disaster Database [*PSC*, 2019].

Extreme weather events that are the most typical for the Saint John region are hurricanes, post-tropical storms, and ice storms. The Greater Saint John Area can expect power outages, flooding, and isolation will occur due to the strong winds and heavy precipitation associated with hurricanes and post-tropical storms. In combination with poor visibility, low temperatures and high winds, the presence of ice can be extremely hazardous for residents such as fallen trees, broken power lines, and poor road conditions.

4.5.3 Temperature

Increased temperatures from a changing climate could increase the frequency and intensity of thunderstorms. Those thunderstorms could be coupled with more intense precipitation and / or hail. Electrical power outages are often experienced during severe thunderstorms.

In Atlantic Canada, increased precipitation in the winter, coupled with expected elevated temperatures, may result in the increased frequency of rain on snow events resulting in larger volumes of precipitation being discharged as runoff and a smaller percentage of precipitation infiltrating the surface and recharging groundwater systems [*Vasseur and Catto*, 2008]. This phenomenon also increases the risk of flooding due to the reduced lag time associated with runoff entering watercourses versus groundwater infiltrating watercourses after precipitation events. Contamination of flood waters may pose further damage to the environment, should they encounter sewage, domestic or industrial waste, or agricultural pesticides and fertilizers [*Vasseur and Catto*, 2008].

Based on information in *Roy and Huard* [2016], Greater Saint John will likely have hotter summers and shorter, warmer winters within the next few decades. Projected changes in temperature for three-time horizons under two different Representative Concentration Pathways (RCPs) are summarized in Table 73. RCP refers to the total radiative forcing. For example, RCP 4.5 is a scenario under which GHGs will heat Earth at a rate of 4.5 W · m^{-2}.

Table 73. Temperature projections under climate change scenarios for Greater Saint John, New Brunswick. Data from *Roy and Huard* [2016].

	Climate Normals (1981-2010)	Time Horizon					
		2020		2050		2080	
		RCP4.5	RCP8.5	RCP4.5	RCP8.5	RCP4.5	RCP8.5
Average Annual Temperature (°C)	5.25	6.40	6.49	7.44	8.30	8.02	10.38
Average Summer Temperature (°C)*	15.79	16.95	17.04	17.99	18.80	18.52	20.92
Average Winter Temperature (°C)†	- 6.14	- 4.75	- 4.70	- 3.63	- 2.65	- 2.92	- 0.43
Annual Number of Days > 25 °C	18	29.15	30.33	40.91	50.92	47.42	77.60
Annual Number of Days > 35 °C	0	0.01	0.01	0.12	0.26	0.22	1.91
Annual Number of Freeze-Thaw Days‡	106.00	108.42	108.54	110.09	111.07	110.82	112.71

NOTES:
*Temperatures during June, July, and August
†Temperatures during December, January, and February
‡The average number of days when the daily maximum temperature is > 0 °C and the daily minimum temperature is < 0 °C

Greater Saint John will likely experience an increase in average annual temperatures, earlier snowmelts, and more mid-winter thaws and breakups. Those events can all result in significant damage to infrastructure especially when combined with intense rainfall. Temperatures under a changing climate present several concerns to the Project, which are listed in Table 74. Measures are also presented to mitigate the identified concerns.

Table 74. Potential concerns and mitigation measures of increased temperature under a changing climate on the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Event	Concern	Mitigation
Extreme heat or cold events		
	Unsafe work conditions	➢ Work should be halted when extreme temperatures cause unsafe working conditions ➢ Disruption of Project activities and delays during construction may be avoided by scheduling tasks that require optimal weather conditions to occur when weather conditions are favourable
Electrical storms		
	Loss of electrical power	➢ All permanent Project electrical equipment should be equipped with back-up power to maintain operations throughout a power outage ➢ All permanent Project electrical equipment should be properly grounded
Rain on snow events		
	Localized flooding	➢ As much as practicable, the Proponent should develop softscapes in order to absorb these events ➢ A surface water management program should be part of the overall landscape design for the Project site

Event	Concern	Mitigation
		➢ Throughout the Project development, appropriately engineered drainage measures, as part of the erosion and sedimentation control plan, should be implemented ➢ Structures that could be impacted by flooding should be located well above (*i.e.*, > 1 m) the predicted high-high water mark of the Saint John River ➢ Permanent drainage infrastructure should be designed considering the largest possible storm event (*i.e.*, 1 in 100 year 24 hour event)
	Loss of electrical power	➢ All permanent Project electrical equipment should be equipped with back-up power to maintain operations throughout a power outage
Changing thermal regimes		
	Operation of temperature moderating equipment	➢ Design engineers should account for the variation in the minimum, average, and maximum annual air and water temperatures when specifying the equipment for temperature moderation

4.5.4 Precipitation

Occasionally, tropical storms and hurricanes pass through the region bringing with them extreme precipitation (*n.b.*, the Atlantic hurricane season extends annually from 1 June to 30 November). Heavy bursts of rain and hail during thunderstorms are typically short-lived and occur on an infrequent basis in the Greater Saint John region. Heavy snowfalls are common in New Brunswick, but they do not typically cause any considerable impacts. As noted above, climate change is expected to increase the amount of annual precipitation in the Greater Saint John region and the area will experience a higher frequency in extreme precipitation events (*i.e.*, ≥ 50 mm over 24 hours).

Roy and Huard [2016], predict that precipitation levels will increase annually as well as during the summer and winter (Table 75). Furthermore, there will be an increase in the number of days with precipitation. The number of days with snow will decline due to a predicted increase in temperature (*i.e.*, more precipitation will fall in the form of rain in the future).

One impact being realized locally because of increased winter precipitation is an increase in flooding during the spring freshet. In 2018, the lower Saint John River basin experienced unprecedented flooding (*i.e.*, refer to Section 3.1.5). Those conditions were almost repeated in 2019. During the unprecedented flooding of May 2018, some portions of the Mill site were flooded. In spring 2020, IPP began a project to permanently raise the elevation of the riverbanks surrounding the low-lying areas of the Mill to protect against future flooding.

Table 75. Precipitation projections under climate change scenarios for Greater Saint John, New Brunswick. Data from *Roy and Huard* [2016].

	Climate Normals (1981-2010)	Time Horizon					
		2020		2050		2080	
		RCP4.5	RCP8.5	RCP4.5	RCP8.5	RCP4.5	RCP8.5
Average Annual Precipitation (mm)	1 293.42	1 342.96	1 346.58	1 380.98	1 395.60	1 400.77	1 445.27
Average Summer Precipitation (mm)*	272.31	278.41	283.31	285.49	286.36	294.86	291.75
Average Winter Precipitation (°C)†	342.87	367.83	368.38	375.48	392.21	384.80	413.50
Average Annual Days with Rain	158.00	154.77	154.95	155.48	155.80	155.68	155.74
Average Annual Days with Snow	52.75	47.82	47.46	44.57	41.12	41.35	31.76

NOTES:
*Precipitation during June, July, and August
†Precipitation during December, January, and February

Design engineers will use appropriate codes and standards for planning the Project, which has an estimated operational lifespan of 50 years. Best design practices dictate that those professionals consider a changing climate. Because potential impacts are being planned for in the design, considerable impacts are not expected to occur. As an assessment tool, potential precipitation events that could have an impact on the Project are listed in Table 76. Also listed are potential concerns and mitigation measures.

Table 76. Potential concerns and mitigation measures of increased precipitation under a changing climate on the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Event	Concern	Mitigation
Extreme (> 50 mm) precipitation events		
	Unsafe work conditions	➢ Work should be halted when extreme precipitation causes unsafe working conditions ➢ Disruption of Project activities and delays during construction may be avoided by scheduling tasks that require optimal weather conditions to occur when weather conditions are favourable
	Unsafe travel conditions	➢ Workers, the public, and visitors should use their own discretion
	Localized flooding	➢ As much as practicable, the Proponent should develop softscapes in order to absorb these events ➢ A surface water management program, which includes an erosion and sedimentation control plan during construction, should be part of the overall landscape design for the Project site ➢ Throughout the Project development, appropriately engineered drainage measures, as part of the erosion and sedimentation control plan, should be implemented ➢ Structures that could be impacted by flooding should be located well above (*i.e.*, > 1 m) ground-level and / or the predicted high-high water mark of the Saint John River

Event	Concern	Mitigation
		➢ Permanent drainage infrastructure should be designed considering the largest possible storm event (*i.e.*, 1 in 100 year 24 hour event)
	Increased overland flow	➢ As much as practicable, the Proponent should develop green spaces in order to absorb these events ➢ Landscaping could help limit overland flow
	Increased insurance costs	➢ Flooding mitigation should be implemented to minimize risk of damage and associated insurance claims
	Loss of electrical power	➢ All permanent Project electrical equipment should be equipped with back-up power to maintain operations throughout a power outage
High frequency and high intensity precipitation events		
	Increased erosion	➢ Appropriately engineered landscaped areas should offset increased erosion posed by these events ➢ Erosion and sedimentation control structures should be installed during construction to limit potential impacts
	Localized flooding	➢ As much as practicable, the Proponent should develop softscapes in order to absorb these events ➢ A surface water management program should be part of the overall landscape design for the Project site ➢ Throughout the Project development, appropriately engineered drainage measures, as part of the erosion and sedimentation control plan, should be implemented ➢ Structures that could be impacted by flooding should be located well above (*i.e.*, > 1 m) the predicted high-high water mark of the Saint John River ➢ Permanent drainage infrastructure should be designed considering the largest possible storm event (*i.e.*, 1 in 100 year 24 hour event)
	Increased overland flow	➢ As much as practicable, the Proponent should develop green spaces in order to absorb these events ➢ Landscaping could help limit overland flow
	Loss of electrical power	➢ All permanent Project electrical equipment should be equipped with back-up power to maintain operations throughout a power outage
Heavy snowfalls		
	Unsafe work conditions	➢ Work should be halted when extreme precipitation causes unsafe working conditions ➢ Disruption of Project activities and delays during construction may be avoided by scheduling tasks that require optimal weather conditions to occur when weather conditions are favourable
	Unsafe travel conditions	➢ Workers, residents, and visitors should use their own discretion
	Increased stress and strain on structures through snow loads	➢ Engineers and architects should account for snow loads in the design of the structures to accommodate increased potential snow loads under a changing climate throughout the Project's lifespan ➢ Materials specified for the Project should comply with the appropriate standards and codes (*n.b.*, the National Building Code of Canada provides for factors of safety to account for

Event	Concern	Mitigation
		possible extreme weather, including allowances for future increased frequency and / or severity of precipitation events that could arise from climate change)
	Localized flooding during spring melt	➢ As much as practicable, the Proponent should develop softscapes in order to absorb these events ➢ A surface water management program should be part of the overall landscape design for the Project site ➢ Throughout the Project development, appropriately engineered drainage measures, as part of the erosion and sedimentation control plan, should be implemented ➢ Structures that could be impacted by flooding should be located well above (*i.e.*, > 1 m) the predicted high-high water mark of the Saint John River
	Loss of electrical power	➢ All permanent Project electrical equipment should be equipped with back-up power to maintain operations throughout a power outage
Increased fog		
	Unsafe work conditions	➢ Work should be halted when extreme precipitation causes unsafe working conditions ➢ Disruption of Project activities and delays during construction may be avoided by scheduling tasks that require optimal weather conditions to occur when weather conditions are favourable
	Unsafe travel conditions	➢ Workers, the public, and visitors should use their own discretion

4.5.5 Winds

Winds are weaker at the ground surface compared to higher up in the atmosphere because of increased resistance afforded by vegetation and structures [*Henry and Heinke*, 1996; *Lutgens and Tarbuck*, 2001]. No predictions that the authors are aware of have been made with respect to wind directions and speeds under a changing climate for Atlantic Canada; however, it is likely that winds could increase / decrease in speed because of changing temperature patterns. For example, there has been an increase in the number of named storms (*i.e.*, those storms that develop sustained wind speeds > 63 km · hr^{-1}) in the Atlantic region since 1850. Figure 104 shows the data for the past 50 years.

On 23 September 2022, Hurricane Fiona hit the Atlantic provinces. It was the worst storm on record to hit Nova Scotia and caused severe damage in Prince Edward Island and Newfoundland. New Brunswick felt the impact of Fiona as a post-tropical storm. As previously noted, Hurricane / Post-Tropical Storm Fiona is the most-costly weather event to ever hit Atlantic Canada. With a minimum pressure of 932.6 mb, it was the deepest low-pressure system ever recorded in Canada [*TWN*, 2022]. Winds, rain, storm surges, and damage varied across Atlantic Canada. Peak wind gusts of 179 km · hr^{-1} were measured in Arisaig, Nova Scotia, 192 mm of rain was recorded in Osborne Head, Nova Scotia, and the Port aux Basques station recorded its highest water level ever of 2.75 m.

Table 77 lists of some concerns related to increased wind speeds that could pose an impact to this Project along with mitigation measures.

Table 77. Potential concerns and mitigation measures of increased wind speeds under a changing climate on the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Concern	Mitigation
Unsafe work conditions	➢ Work should be halted when extreme precipitation causes unsafe working conditions ➢ Disruption of Project activities and delays during construction may be avoided by scheduling tasks that require optimal weather conditions to occur when weather conditions are favourable
Increased wind erosion	➢ During construction, stockpiles should be covered with tarps ➢ Easily erodible permanent surfaces should be landscaped or hardscaped
Increased stress and strain on structures	➢ Materials specified for the Project should comply with the appropriate standards and codes (*n.b.*, the National Building Code of Canada provides for factors of safety to account for possible extreme weather, including allowances for future increased frequency and / or severity of precipitation events that could arise from climate change) ➢ Buildings and structures should be designed to withstand wind extremes throughout the Project's lifespan ➢ Structural engineers should account for increased wind stress and strain in their design to accommodate potential increased winds under a changing climate

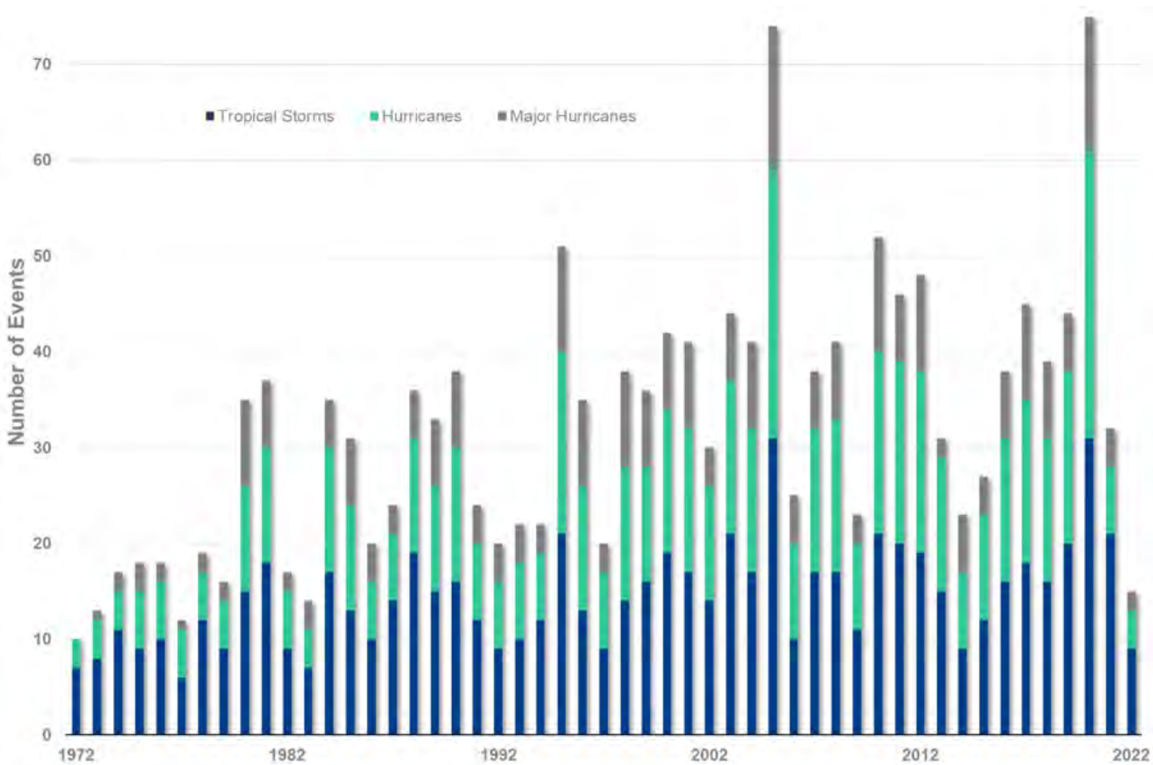


Figure 104. Number of named storms experienced annually within the Atlantic region between 1972 and October 2022.

4.5.6 Wet and Dry Acid Deposition

An estimated 21 % to 75 % of Atlantic Canada's landmass receives an amount of acid deposition that exceeds critical loads where adverse environmental effects are evident [*MSC*, 2004]. Fossil fuel combustion in power generating plants, smelting operations, petroleum refining, and motor vehicles produce large quantities of sulfur and nitrogen oxides (*i.e.*, SO_X and NO_X) that are emitted to the atmosphere [*Sawyer et al.*, 1994; *Craig et al.*, 1996]. Those oxides (*i.e.*, acid gases) are often emitted through tall stacks that introduce the pollutants to areas of the atmosphere where there are stronger and more persistent winds [*Lutgens and Tarbuck*, 2001]. The use of tall stacks helps reduce local pollution, but through the process of long-range transport it can aggravate downwind regional pollution problems [*Langmuir*, 1997].

Once in the atmosphere, those acid gas emissions can be scavenged by water droplets and fall to the Earth's surface as acid precipitation (*i.e.*, having a pH < 5.0 and in the form of dew, drizzle, fog, sleet, snow, and rain) in the form of sulfuric and nitric acid [*Murphy and Nance*, 1998]. Dry deposition (*i.e.*, particulates, gases, and aerosols) can also occur and once on the ground surface those deposits can be entrained by water to form acids [*Henry and Heinke*, 1996].

Wet and dry deposition of acids can be problematic in New Brunswick. That is because fallout from the heavy industrialized areas of Michigan, Indiana, Ohio, western Pennsylvania, and southern Ontario and Quebec generally occurs in the region [*IJC*, 2020]. Those emissions can wreak havoc on the region's environment. Because the deposition is sourced from far away, there is little that can be done locally to curb the potential impacts. Instead, design and mitigation measures must be developed to account for the potential impacts.

In October 1998, federal, provincial, and territorial Energy and Environment Ministers signed *The Canada-Wide Acid Rain Strategy for Post 2000* [*CCME*, 2013]. Part of that strategy called for reducing domestic acidifying emissions in New Brunswick. In that vein, emissions caps and stack emissions limits were introduced for existing facilities. Air emissions from new major sources became regulated through the issuance of ATOs under the New Brunswick *Clean Air Act* [**S.N.B. 1997, c C-5.2**]. A facility's ATO stipulates emissions limits and conditions under which reporting is required. Similar programs to New Brunswick's have been applied to emissions in other Atlantic provinces. Overall, the implementation of those programs has yielded a reduction in emissions (Figure 105) and the subsequent decline in the production of sulfuric and nitric acid formation from those pollutants. Although the reductions have levelled out, progress can still be made.

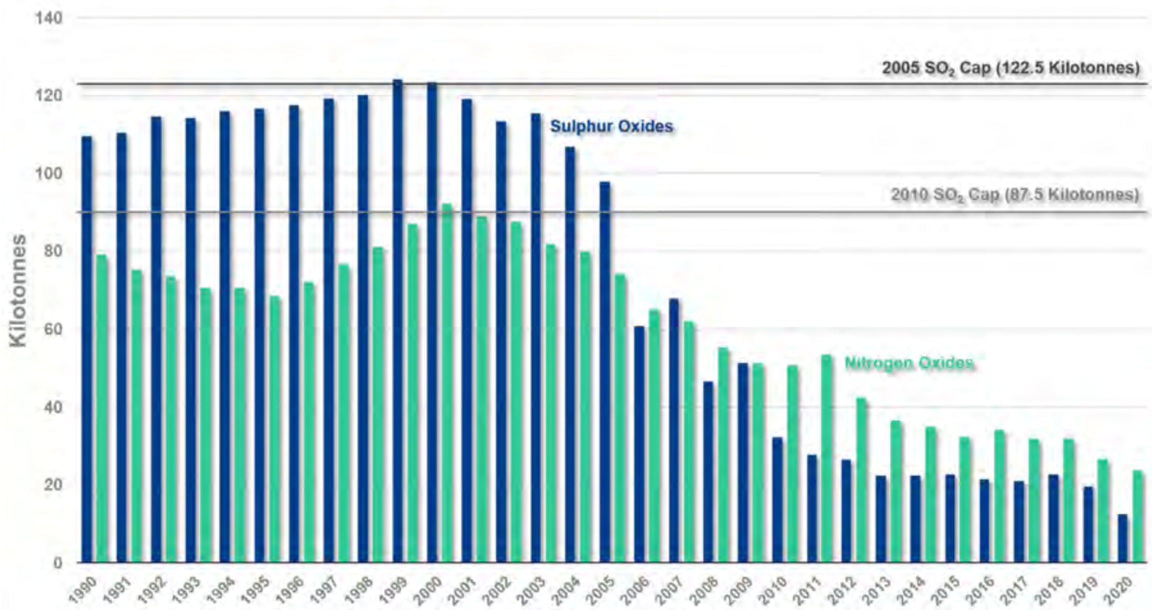


Figure 105. Historical sulphur oxide and nitrous oxide emissions for New Brunswick as reported by the *ECCC* [2022d].

It is possible that wet and dry acid deposition will have an impact on the proposed Project. Although it is likely that some structures will be affected, the damage is expected to be minimal or occur in a manner that is not mechanically or operationally destructive to the structure during its expected lifetime. Climate change could have a negative impact on the amount of acid precipitation contacting the Project. For example, predicted increases in precipitation could yield more wet acid deposition leading to increased destruction of the facilities.

The following is a list of some concerns related to wet and dry acid deposition that could pose an impact to this Project:

- etching and dissolving of concrete;
- enhanced steel corrosion;
- etching on glass windows; and
- increased insurance costs.

Below is the mitigation offered for all concerns listed above for wet and dry acid deposition.

- Design professionals should use sound engineering practices to provide mitigation and ensure that those concerns associated with wet and dry acid deposition are addressed.
- Design professionals should specify materials that are better able to withstand the corrosive effects of wet and dry acid deposition.
- Materials specified for the Project should comply with the applicable standards and codes (*n.b.*, the National Building Code of Canada provides for factors of safety to account for possible extreme weather that could arise from climate change).

4.5.7 Seismic Activity

New Brunswick lies within the northeastern corner of the Northern Appalachians seismic zone (NAP; Figure 106). According to the *Geological Survey of Canada* [2021], approximately 330 earthquakes greater than magnitude (M) 2.5 occurred within the NAP between 1764 and 2001 (*n.b.*, pre-1960s, the M was estimated based on newspaper articles and historical documents while Earthquakes Canada's seismograph network has been used to detect earthquakes post-1960 whose M > 2.5). On average, approximately three events whose M > 5 (*i.e.*, those earthquakes that are potentially damaging to structures) occur each decade.

Burke [1984] noted that the epicentres of recent earthquakes in the NAP coincide with larger historical earthquakes; those regions that were lively in the past remain active today. The New Brunswick earthquake records show a clustering of earthquake epicentres in three sub-zones: Passamaquoddy Bay (PB); Central Highlands (CH); and MOncton (MO) [*Burke*, 2004]. *Halchuk et al.* [2004] calculated the maximum likelihood probability estimates for the three subzones with respect to the entire NAN. Activity rates were higher by a factor of two for the CH, higher by a factor of two to three for PB, and lower by a factor of 0.5 for MO (*n.b.*, MO was identified by *Burke* [1984] as a sub-zone because an earthquake with an M > 5 was recorded there). The intraplate earthquakes in those three sub-zones are thought to be a result of either old fault line reactivation, the concentration of stress at pluton boundaries, or glaciostatic movements.

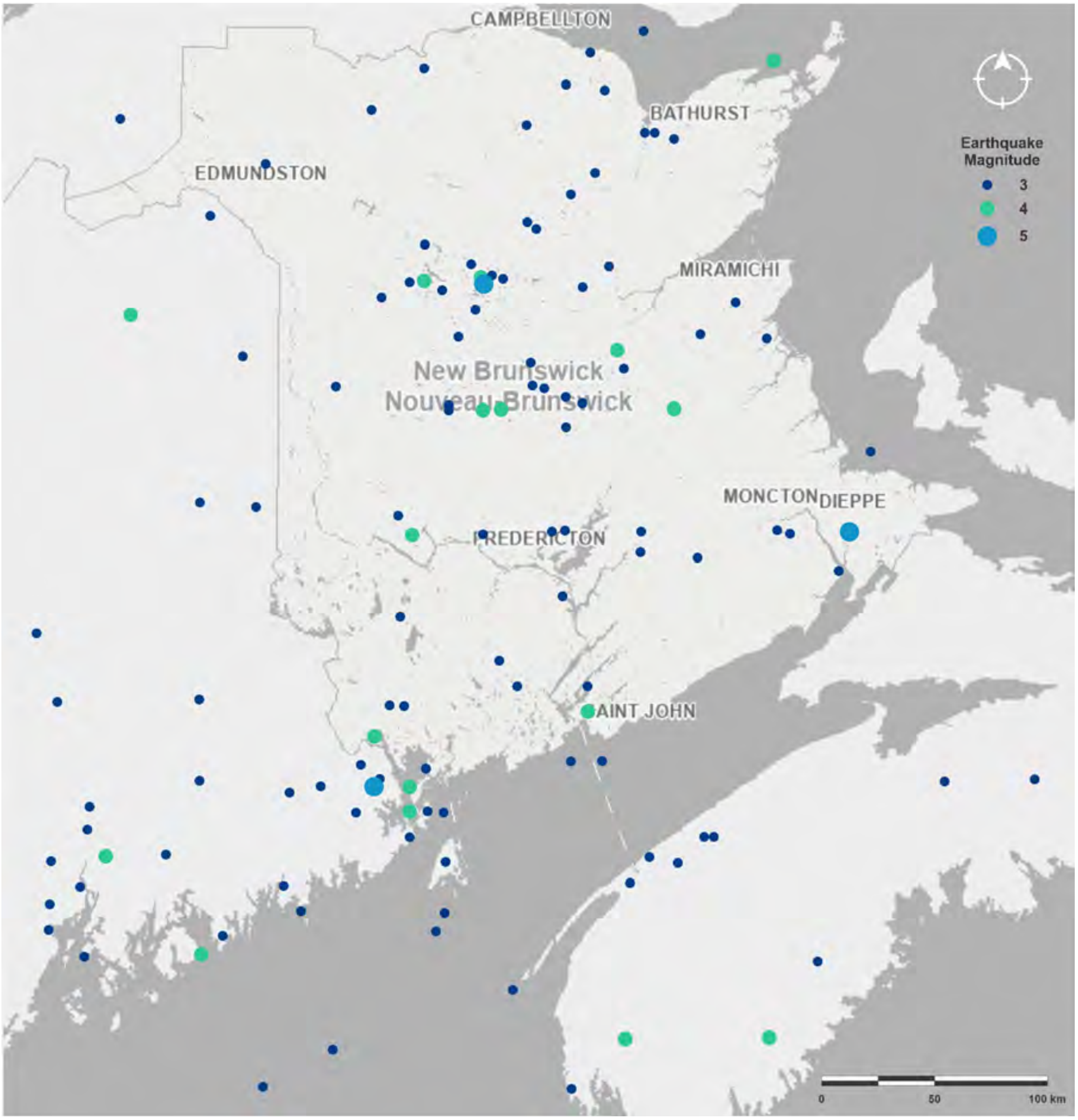


Figure 106. Map showing the Northern Appalachian Seismic Zone (NAP). Data from *GSC* [2021].

Significant Canadian earthquakes for the period 1600 to 2017 were catalogued by *Lamontagne et al.* [2018]. Of the 172 significant events, seven occurred within the NAP (Table 78). The largest historically reported event for the NAP struck the PB sub-zone on 21 March 1904. Foreshocks and aftershocks accompanied that earthquake, which reportedly caused minor building damage (*e.g.*, throwing of chimneys) and was felt throughout the Maritimes [*Burke*, 2013]. The 9 January 1982 Miramichi earthquake, which produced two sizeable aftershocks (*i.e.*, an M 5.1 and an M 5.4, respectively, 3.5 hours and 2.5 days after the mainshock), was the most recent significant event and was also the most comprehensively studied in the NAP [*Broster and Burke*, 2011].

Table 78. Significant earthquakes recorded in New Brunswick between 1600 and 2017 as reported by *Lamontagne et al.* [2018].

Date	Sub-Zone*	Latitude (° N)	Longitude (° W)	Magnitude	Magnitude Type†
22 May 1817	PB	45.0	67.2	4.8	m_N
8 February 1855	MO	46.0	64.5	5.2	m_N
22 October 1869	CH	46.5	66.5	5.7	M_f (IV)
21 March 1904	PB	45.0	67.2	5.9	M_f (IV)
22 July 1922	CH	46.5	66.6	4.9	M_{FA}
30 September 1937	CH	47.4	66.3	4.8	M_{FA}
9 January 1982	CH	47.0	66.6	5.8	m_N

NOTES:
*PB = Passamaquoddy Bay, MO = MOncton, and CH = Caledonia Highlands
†m_N = Nuttli or body wave magnitude, M_{FA} = felt area magnitude, and M_f (IV) = magnitude based on the Modified Mercalli Intensity IV area

Seismic threat studies for the NAP place most of New Brunswick in the moderate hazard range [*Burke*, 1984 and *Broster and Burke*, 2011]. When significant earthquakes strike, they can cause minor damage to buildings and infrastructure, and have some effects on natural features (*e.g.*, floods from embankment failure, alteration to flow of rivers and springs, mass movements, tsunami along coasts, seiches in lakes, ground disturbance, *etc.*).

The Greater Saint John region is not considered to be within a defined active seismic zone. Statistics indicate that all the recent earthquakes in the region have resulted in little significant damage (*i.e.*, no considerable damage to structures). There is no evidence in the region to support any surface displacement in recent geologic times. It is likely that recent earthquakes in the region were a result of deep geological activity rather than shallow surface fault systems. Potential for disturbance and seismic activity within the region is considered low.

Standards dictate that all structures be designed and built to withstand earthquakes in the area (*i.e.*, based on the probability of specific magnitude earthquakes within a specific return period). Those criteria ensure the integrity of the structure based on the level of earthquake risk in the area. If a minor earthquake were to occur in the area, construction and / or operation of the Project could be moderately affected. It is unlikely that a minor earthquake would cause extensive damage to Project structures. In the event of an extreme earthquake, the Project could receive damage such that it would not be economically feasible to repair; however, this is highly unlikely. An earthquake in between minor and extreme could cause moderate damage to Project structures, but it is likely that they could be repaired.

The Geological Survey of Canada regularly updates seismic hazard maps for Canada. The most recent edition of those maps was produced for the 2015 National Building Code Canada (NBCC; Figure 107). To determine the 2015 NBCC seismic hazard values at The Reversing Falls Mill site, Natural Resources Canada's seismic hazard calculator was used (http://www.seismescanada.rncan.gc.ca/hazard-alea/interpolat/index_2015-en.php). The ground motion probabilities are summarized in Table 79.

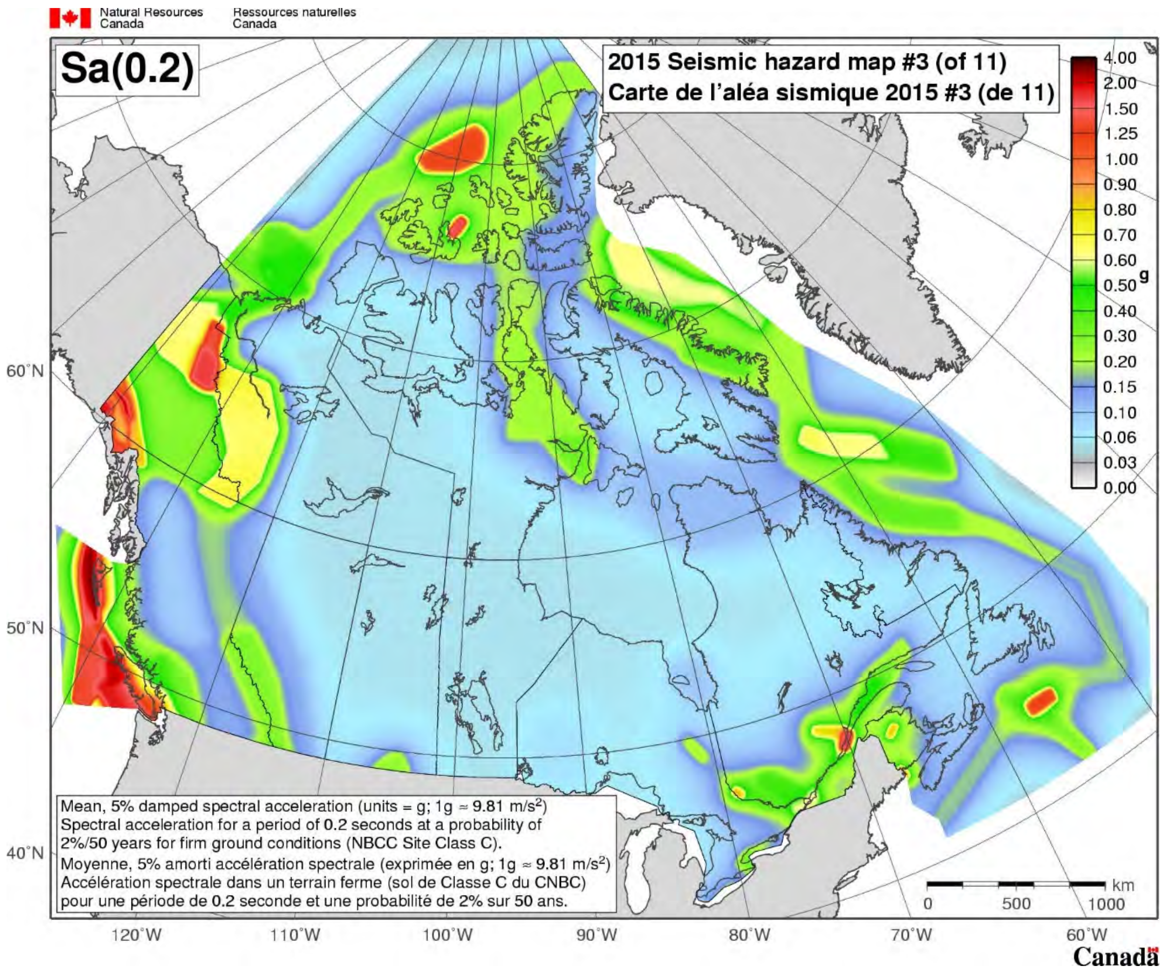


Figure 107. Spectral acceleration for a period of 0.2 s at a probability of 2 % · 50 yr^{-1} for firm ground conditions (*i.e.*, NBCC soil class C) from *NRC* [2021b].

Below is the mitigation offered for seismic activity.

- All structures should be designed and built to withstand earthquakes in the greater Saint John region based on the probability of specific magnitude earthquakes within a specific return period (*n.b.*, the National Building Code of Canada provides for sufficient factors of safety to account for seismic activity in Canada).

Table 79. 2015 National Building Code interpolated ground motions calculated for the Reversing Falls Mill site in Saint John, New Brunswick using Natural Resources Canada's seismic hazard calculator.

Probability of exceedance per annum	0.010	0.0021	0.001	0.000404
Probability of exceedance in 50 years	40 %	10 %	5 %	2 %
Sa (0.2 s)	0.031 g	0.088 g	0.134 g	0.209 g
Sa (0.5 s)	0.021 g	0.055 g	0.082 g	0.125 g
Sa (1.0 s)	0.012 g	0.032 g	0.046 g	0.070 g
Sa (2.0 s)	0.005 g	0.016 g	0.023 g	0.035 g
Sa (5.0 s)	0.001 g	0.004 g	0.006 g	0.009 g
Sa (10.0 s)	0.001 g	0.002 g	0.002 g	0.004
Peak Ground Acceleration	0.017 g	0.052 g	0.082 g	0.131 g
Peak Ground Velocity	0.014 g	0.042 g	0.065 g	0.103 g

NOTES:
Spectral and peak hazard values are determined for firm ground (*NBCC* 2015 soil class C – with an average shear wave velocity of 450 m · s^{-1}). The values were interpolated from a 10 km spacing grid of points. More than 95 % of the interpolated values yielded by the seismic hazard calculator are within 2 % of the calculated values.

4.5.8 Sea Level Rise

Sea-level rise can produce significant impacts on coastal zones, particularly for low-lying parts of Atlantic Canada. Those include storm impacts on the coast (*i.e.*, waves, surges, and flooding), sediment movement and erosion hazard, impacts on ecological systems (*e.g.*, coastal wetlands, fisheries, *etc.*), and damage to private and / or commercial property and public infrastructure [*Henton et al.*, 2006]. Throughout the course of this century, relative sea level is expected to rise in the Bay of Fundy because of global sea level rise and regional post-glacial rebound.

The IPCC Special Report on Emission Scenarios (SRES) A1B scenario estimates that global sea level is rising at about 4 mm · yr^{-1} and that by 2090-2099 relative global sea levels will rise 0.21 m to 0.48 m above 1980-1990 levels [*Bindoff et al.*, 2007]. Like historical observations, future sea level change will not be geographically uniform. Regional sea level change may vary within about ± 0.15 m of the mean global projection. Thermal expansion of the oceans is projected to produce more than half of the average sea level rise, but land ice will lose mass increasingly rapidly as the century progresses. An important uncertainty relates to whether discharge of ice from the ice sheets will continue to increase because of accelerated ice flow, which has been observed in recent years [*Bindoff et al.*, 2007].

While most of Canada's landmass is currently experiencing uplift associated with post-glacial rebound, Atlantic Canada is experiencing subsidence. This is primarily due to unloading of the continental landmass (*i.e.*, collapse of the peripheral bulge, Figure 108) following the deglaciation of the Laurentide Ice Sheet coupled with the effects of rising post-glacial sea level loading on the continental shelf. Figure 108 shows the annual rates of post-glacial uplift and subsidence across Canada. The subsidence rates in Atlantic Canada are not particularly large, typically on the order of - 1 mm · yr^{-1} to - 2 mm · yr^{-1}; however, the rates are in the opposite direction of sea level rise. Consequently, relative sea-level rise, with respect to land, is regionally more rapid in Atlantic Canada than many other areas [*Henton et al.*, 2006].

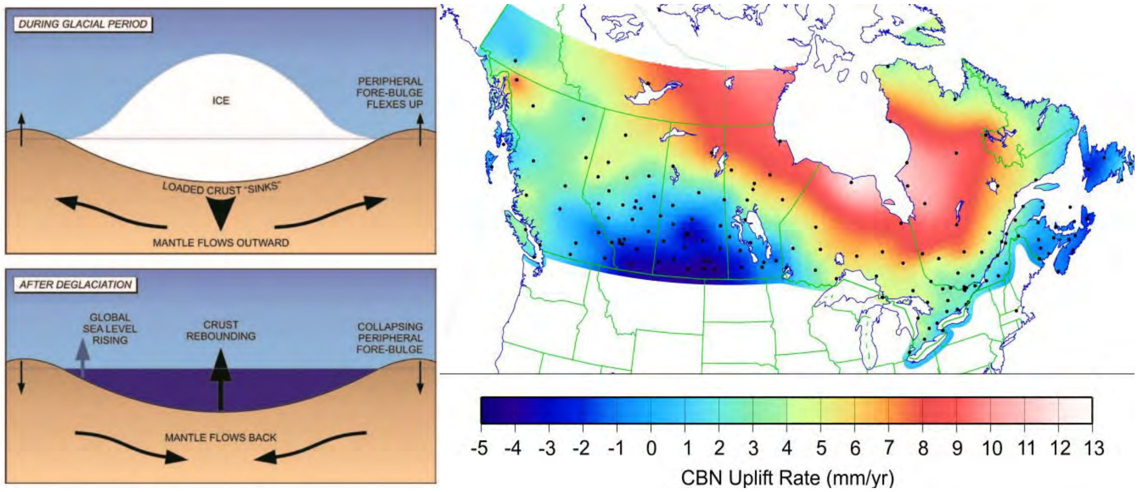


Figure 108. Schematics showing the generalized process of post-glacial rebound and a map showing uplift and subsidence of land masses across Canada due to post-glacial rebound [*Environment Canada*, 2006]. Dots on the map represent Canadian Base Network (CBN) sites.

An *Environment Canada* [2006] study of sea level rise along New Brunswick's Northumberland Strait coastline anticipates that by 2100, global sea level rise and regional post-glacial subsidence will generate a relative sea level rise of between 19 cm and 91 cm. New Brunswick's Bay of Fundy coastline is experiencing similar post-glacial subsidence, but the effects of relative sea level rise along those two coasts may greatly differ. Northumberland Strait's low-lying shorelines are comprised of erodible material, which makes them much more susceptible to storm damage and erosion when compared to the rocky coastline of the Bay of Fundy. Recent climate change modeling by the Environment and Sustainable Development Research Centre (ESDRC) predicts that the relative sea level rise for Saint John is expected to increase by 85 cm ± 33 cm by 2100 [*ESDRC*, 2010]. Those data for Saint John were further refined by *Daigle* [2020]. Total predicted changes are as follows:

- 0.17 m ± 0.07 m between 2010 and 2030;
- 0.31 m ± 0.14 m between 2010 and 2050;
- 0.86 m ± 0.38 m between 2010 and 2100; and
- 1.51 m + 0.38 m between 2010 and 2100 with 0.65 m increase related to potential rise due to the melting of the Antarctic Ice Sheet.

Tides are of special significance within the Bay of Fundy. A funneling effect of the Bay as it narrows generates the world's highest tides. Tide predictions are available online through the *DFO* [2021a] and have been tracked in Saint John since 1896. Regular tides range between highs of 5.5 m to lows of 0.4 m. The highest tide recorded in Saint John since 1896 was 9.2 m [*DFO*, 2021b]. On 21 January 1943, the lowest mean water level of 3.725 m above chart datum was recorded for Saint John. Conversely, on 4 January 1997, the highest mean water level of 5.361 m above chart datum was recorded.

The Project site is at Reversing Falls where the Saint John River meets the Bay of Fundy. As noted previously (*i.e.*, refer to Section 3.1.5), the site is currently being built up with a protective berm at an elevation of 6.8 m above chart datum to mitigate any impacts associated with sea level rise.

The New Brunswick Flood Hazard Map Viewer within the GeoNB web-based application provides flood hazard mapping for the province that includes current flood conditions and projected flood conditions by the year 2100. The present day 1 in 20 year return period flood event and 1 in 100 year return period flood event are shown in Figure 109 and Figure 110, respectively. The flood levels in 2100, with climate change, for a 1 in 20 year return period event (Figure 111) and a 1 in 100 year return period event are also shown (Figure 112). The "bathtub" approach used by the model does not account for areas whose elevation falls below the selected water level where ridges or other features protect them from inundation at that level. It also does not account for coastal defenses, such as levees, like those currently being constructed at the site.

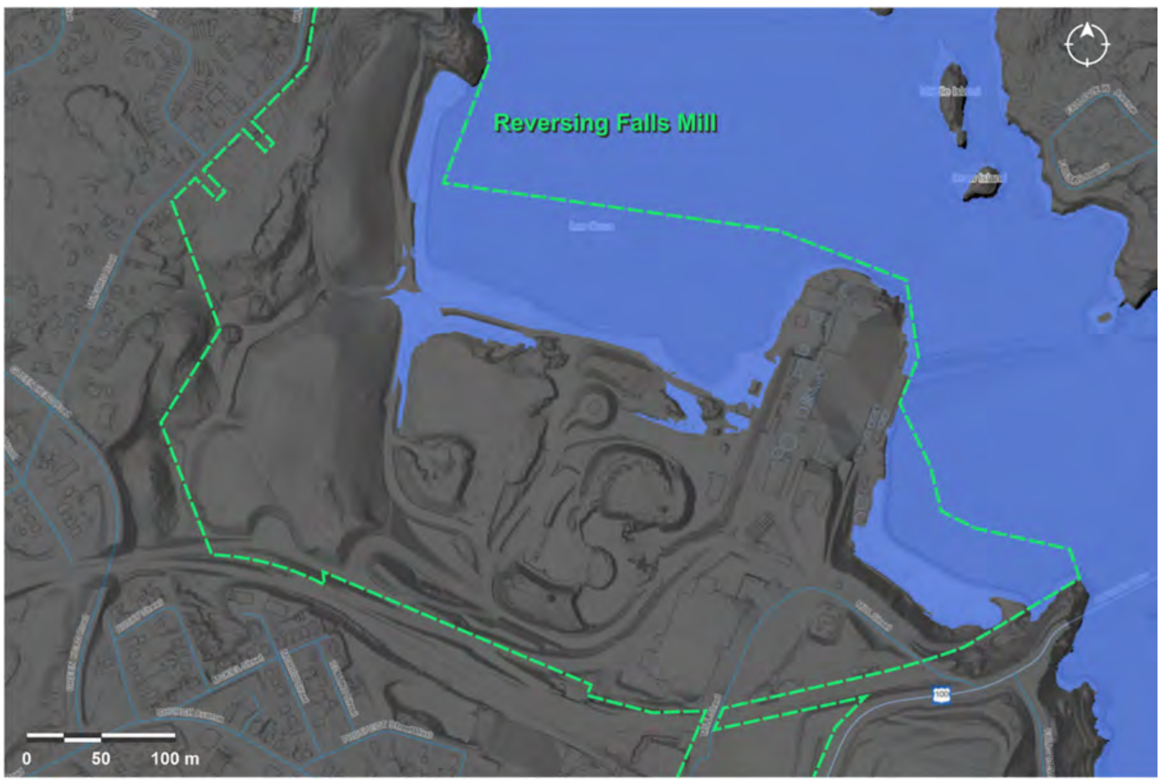


Figure 109. Land in vicinity of the Reversing Falls Mill in Saint John, New Brunswick that currently floods during a 1 in 20 year flood event.

Figure 110. Land in vicinity of the Reversing Falls Mill in Saint John, New Brunswick that currently floods during a 1 in 100 year flood event.

Figure 111. Land in vicinity of the Reversing Falls Mill in Saint John, New Brunswick that is projected to flood in 2100 with climate change during a 1 in 20 year flood event.

Figure 112. Land in vicinity of the Reversing Falls Mill in Saint John, New Brunswick that is projected to flood in 2100 with climate change during a 1 in 100 year flood event.

Table 80 lists of some concerns associated with sea level rise that could pose an impact to this Project along with mitigation measures.

Table 80. Potential concerns of sea level rise along with mitigation measures under a changing climate on the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Concern	Mitigation
Unsafe work conditions	➢ Work should be halted when extreme precipitation causes unsafe working conditions ➢ Disruption of Project activities and delays during construction may be avoided by scheduling tasks that require optimal weather conditions to occur when weather conditions are favourable
Increased erosion	➢ A surface water management plan, which includes an erosion and sedimentation control plan during construction, should be developed for the Project site ➢ Erosion and sedimentation control structures should be installed during construction to limit potential impacts
Localized flooding	➢ Structures that could be impacted by flooding, should be located well above ground-level ➢ Protective flood berms as the stie may have to be raised to protect against future sea level rise combined with annual flooding events
Increased insurance costs	➢ Structures that could be impacted by flooding, should be located well above ground-level

Concern	Mitigation
Increased stress and strain on structures (*e.g.*, wind and wave action)	➢ Structural engineers should account for increased wind stress and strain in their design to accommodate potential increased winds under a changing climate ➢ Protective flood berms as the site may have to be raised to protect against future sea level rise combined with annual flooding events

4.5.9 Summary

The Proponent will ensure that the Project is being designed in accordance to strict standards and codes, such as the NBCC. That code tends to consistently overestimate and account for possible forces of the environment and incorporates several factors of safety to ensure that a project is designed to be safe and reliable throughout its lifetime. Through application of those criteria and implementation of the mitigation measures noted, the Project should withstand all impacts of the environment on it, even under a changing climate. Detailed mitigation strategies for potential impacts of the environment on the Project should be further discussed in the Project-specific EPP. In particular, the Project-specific EPP should ensure that there is:

- no long-term interruption in construction activities;
- no long-term interruption in scheduling of the Project;
- no long-term interruption in operation of the Project;
- no damage to infrastructure such that public health and safety are put at risk; and
- no change to infrastructure that would not be economically feasible to repair.

Compliance with design and building codes and standards are expected to account for the effects of climate change, weather extremes, seismicity, and sea level rise through built-in factors of safety to prevent undue damage to infrastructure from such events. Further, no substantial damage to project infrastructure are anticipated because of natural environmental conditions due to the design and type of activities proposed. Therefore, the effects of the environment are not expected to adversely affect the project in a manner that cannot be planned for or accommodated through design and other mitigation and adaptive management strategies. As a result, the effects of the environment on the Project are not expected to be significant.

4.6 PROJECT-SPECIFIC ENVIRONMENTAL PROTECTION PLAN

A Project-specific EPP will be developed. The EPP will be an important component to the overall Project because it will dictate the importance of Best-Management Practices (BMPs) that shall be undertaken by all those associated with the Project to ensure environmental protection. The EPP will provide a practical means for conveying BMPs to IPP personnel for ensuring the implementation of the outlined standards and regulations throughout the entire Project. It will be a dynamic document to be used by Project personnel in the field and at the corporate level for ensuring commitments made in the EIA are implemented and monitored.

More specifically, the purpose of the EPP will be to:

- outline IPP's commitments to minimize potential Project environmental impacts, including commitments made during the regulatory review process of the EIA;
- comply with conditions and requirements of an "EIA Approval", if and when issued;
- comply with the conditions of any authorization(s), license(s), and / or permit(s) issued to complete the Project;
- provide a reference document for IPP and all contractor personnel to use when planning and / or conducting specific Project activities; and
- provide a summary of environmental issues and protection measures to be implemented during the Project.

The EPP will be developed in accordance with applicable federal and provincial environmental protection legislation and regulations. IPP will continue to take a proactive approach toward creating a safe and secure work environment and maintain a system to manage environmental effects of the Project. They will identify health, safety, environmental, and security issues as part of the execution planning and manage the environmental effects of the Project and work in ways that are environmentally, economically, and socially justified and legally compliant. Specific health, environmental, safety, and security issues will be addressed in the execution plans and procedures for the Project.

5.0 FIRST NATIONS ENGAGEMENT AND PUBLIC CONSULTATION

The NBDELG has a process for undertaking First Nations engagement and public consultation with respect to EIAs. This section describes the work that has been and will be done to engage First Nations and consult the public and stakeholders in the EIA process. It identifies the meetings that have been held and who was consulted.

For the Project EIA review to be inclusive and transparent, First Nations engagement and public consultation must be incorporated. IPP's First Nations engagement and public consultation plan is designed to inform and engage all the rights-holders and all stakeholder groups about the Project to encourage participation and gather feedback. The overall goal of the process is to ensure that those potentially affected by the Project are aware of it, can obtain additional information, and have the option to identify impacts to Rights, and express any issues and concerns they may have. The process involves gathering input, identifying potential issues, and ensuring understanding of the Project among all parties.

The information collected during the First Nations engagement and public consultation process is considered by the Minister during the EIA decision-making process. In support of that, the Proponent must prepare a report for the NBDELG. That report will document the public consultation process and outline the issues that were brought forward, those issues that were corrected, and those issues that were not resolved. In addition, that report will document the engagement with First Nations, and outline any impacts to Rights that were identified, how those identified impacts were avoided, minimized, or mitigated, or if those impacts were not resolved. In addition to impacts to Rights, the report will also identify any other issues of concern to First Nations, issues that were addressed, and issues that were not resolved.

On-going First Nations engagement and public and stakeholder consultation will occur throughout the regulatory review process to collect feedback and enhance the Project's development.

5.1 PARTIES INCLUDED

5.1.1 First Nations

The Project site is located within the traditional territory of the Wolastoqiyik and Mi'gmaq Nations. Section 35 of the *Constitution Act, 1982* [**U.K., 1982, c 11**] "recognizes and affirms" the "existing" Aboriginal and treaty rights in Canada and the duty to consult. Aboriginal rights derive from the long-standing use and occupancy of the land prior to the arrival of settlers. Those Aboriginal rights protect the activities, practice, or traditions that are integral to the distinct cultures of Aboriginal peoples. The treaty rights protect and enforce agreements between the Crown and Aboriginal peoples. Section 35 also provides protection of Aboriginal title, which protects the use of land for traditional purposes. In New Brunswick, First Nations are rightsholders and they require consultation by the Crown when the Duty to Consult is triggered.

It is best practice for proponents to engage with First Nations communities in New Brunswick. Although the provincial government has the Duty to Consult with First Nations communities during the EIA review process, it is a recognized best practice for a proponent like IPP to engage early and often with First Nations. The goal of early engagement is to identify issues and impacts to Rights early and to address issues and impacts in the design stage of a project (*i.e.*, by avoiding, minimizing, or mitigating impacts). Appropriate and meaningful engagement promotes transparency, collaboration, and builds long-term relationships.

The Wolastoqey Nation in New Brunswick (WWNB) provides technical advice to Wolastoqey communities and offers support to ensure that the constitutional Duty to Consult is being met and that Aboriginal and Treaty rights are recognized and implemented. The First Nations communities WWNB represents are:

- Welamakotuk (Oromocto);
- Sitansisk (Saint Mary's);
- Pilick (Kingsclear);
- Wolastokuk / Woolastoogiw (Woodstock);
- Neqotkuk (Tobique); and
- Kapskuksisok (Madawaska).

The Mi'gmawe'l Tplu'taqnn Inc. (MTI) holds the mandate of consultation and accommodation and rights implementation for its Mi'kmaq member communities. The First Nations communities represented by MTI are:

- Amlamgog (Fort Folly);
- Esgenoôpetitj (Burnt Church);
- L'nui Menikuk (Indian Island);
- Metepenagiag (Red Bank);
- Natoaganeg (Eel Ground);
- Tjipõgtõtjg (Bouctouche);
- Ugpi'ganjig (Eel River Bar); and
- Oinpegitjoig L'Noeigati (Pabineau).

The Mi'kmaq First Nation Elsipogtog is a member community of MTI, but not represented by MTI for the purposes of consultation. Instead, that First Nation consults directly with the government. Similarly, the Peskotomuhkati First Nation consults directly with government.

Best practices for engagement with First Nations includes:

- learning about the First Nations communities affected and their Aboriginal culture;
- mutual respect;
- early engagement;
- being open and transparent;
- listening with an open mind; and
- adapting where possible to avoid impacts to Aboriginal rights.

Each of the Chiefs of the above communities were sent correspondence as part of the engagement process. Table 81 lists those individuals who will be sent formal notification of the Project registration document (*i.e.*, in the form of an information letter).

Table 81. Chiefs and Consultation Directors of New Brunswick's First Nations who will be sent information regarding the mill modernization and green energy generation project proposed for the Reversing Falls Mill in Saint John, New Brunswick.

First Nation Group / Community	Chief	Consultation Coordinator(s)	Address
Mi'gmawe'l Tplu'taqnn, Inc. (MTI) Members*			
Amlamgog (Fort Folly)	Rebecca Knockwood		38 Bernard Trail, PO Box 1007, Dorchester, NB, E4K 3V5
Esgenoôpetitj (Burnt Church)	Alvery Paul		620 Bayview Drive, Burnt Church, NB, E9G 2A8
L'nui Menikuk (Indian Island)	Kenneth Barlow		61 Island Drive, Indian Island, NB, E4W 1S9
Metepenagiag (Red Bank)	William (Bill) Ward		PO Box 293, Metepenagiag Mi'kmaq Nation, NB, E9E 2P2
Natoaganeg (Eel Ground)	George Ginnish		47 Church Road, Eel Ground, NB, E1V 4E6
Tjipõgtõtjg (Bouctouche)	Brenton LeBlanc		9 Reserve Road, Bouctouche Reserve, NB, E4S 4G2
Ugpi'ganjig (Eel River Bar)	Sacha LaBillois		11 Main Street, Unit 201, Eel River Bar, NB, E8C 1A1
Oinpegitjoig L-Noeigati (Pabineau)	Joseph Terence (Terry) Richardson		1290 Pabineau Falls Road, Pabineau First Nation, NB, E2A 7M3
Independent Mi'gmaq†			
Elsipogtog (Big Cove)	Arren Sock		Kopit Lodge, 33 Riverside Drive, Elsipogtog, NB, E4W 2Y6
Wolastoqey Nation in New Brunswick (WNNB) Members‡			
Welamakotuk (Oromocto)	Shelley Sabattis	Fred Sabattis, Robert Paul	PO Box 417, Oromocto, NB, E2V 2J2
Sitansisk (Saint Mary's)	Allan Polchies Jr.	Tim Plant	150 Cliff Street, Fredericton, NB, E3A 0A1
Pilick (Kingsclear)	Gabriel Atwin	Richard Francis	77 French Village Road, Kingsclear First Nation, NB, E3E 1K3
Wotstak (Woodstock)	Timothy (Tim) Paul	Amanda McIntosh	3 Wulastook Court, Woodstock First Nation, NB, E8C 1A1
Neqotkuk (Tobique)	Ross Perley	Jamie Gorman	13094 Route 105, Tobique, NB, E7H 3Y4
Matawaskiye (Madawaska)	Patricia Bernard	Russ Letica, Shawn Francis	1771 Principale Rue, Madawaska First Nation, NB, E7C 1W9
Peskotomuhkati Nation at Skutik§			
Peskotomuhkati	Hugh M. Akagi		93 Milltown Boulevard, Suite 201, St. Stephen, NB, E3L 1G0

NOTES:
*When corresponding with MTI member Chiefs, carbon copy Dean Vicaire (Executive Director of MTI), Derek Simon (Legal Counsel at MTI), and Jennifer Coleman (Intergovernmental Affairs at MTI) at 40 Micmac Road, Eel Ground, NB, E1V 4B1
†When corresponding with Chief Arren Sock, carbon copy Kopit Lodge and Alex Levi (Communications Engagement Coordinator)
‡When corresponding with WNNB member Chiefs, carbon copy Darrah Beaver (Consultation Director at WNNB), Gillian Paul Legal and Governance Advisor), and Gordon Grey (EIA Coordinator)
§When corresponding with Chief Hugh Akagi, carbon copy, Cynthia Howland (Executive Assistant to Chief Akagi) John Ames (Director of Operations)

5.1.2 Nearby Residents and Stakeholders

Fundy Engineering and IPP will reach out to nearby residents and stakeholders. Stakeholders including Non-Government Organizations (NGOs) (*i.e.*, The Chamber, Envision SJ, Uptown Saint John, and the Saint John Construction Association), and community groups (*i.e.*, ACAP Saint John, Conservation Council of New Brunswick, and Saint John Citizens' Coalition for Clean Air). Stakeholders are generally direct conduits to the community. Relayed Project information will include:

- who is involved;
- what is the purpose of the proposed Project;
- where the proposed Project will occur;
- when the proposed Project will occur;
- why the proposed Project is being considered; and
- how the proposed Project will be undertaken.

5.1.3 Regulatory Agencies

The NBDELG, through the EIA regulation [**87-83**] of the *Clean Environment Act* [**R.S.N.B. 1973, c. C-6**] and approval of the Mill's existing ATOs (*i.e.*, Appendix IV), has regulatory jurisdiction over this Project. The provincial government has a constitutional Duty to Consult [*NBAAS*, 2011] and where required, accommodate Aboriginal Peoples, whenever a decision or activity could adversely impact Aboriginal or Treaty rights. The provincial government must also ensure First Nations are given a meaningful opportunity to provide input on the Project.

5.2 PRE-REGISTRATION ENGAGEMENT AND CONSULTATION

5.2.1 First Nations

Proponents are encouraged to engage with First Nations early in the development of a project. The engagement steps that should occur throughout the life of a project, include:

- early and meaningful engagement (*i.e.*, pre-EIA application);
- standard engagement (*i.e.*, EIA application submitted and under review);
- engagement and accommodation (*i.e.*, EIA application submitted and under review);
- follow-up engagement (*i.e.*, approved EIA applications).

Conducting engagement in this manner ensures that there is an opportunity to identify impacts to Rights and provide IPP the opportunity to develop plans that avoid, minimize, or mitigate impacts to Rights at the earliest possible opportunity in the engineering and design process. Identifying and addressing impacts early should ensure improved impact resolution, reduce costs, and avoid delays.

In recent years and while working on other projects, IPP has invested in efforts to build relationships with First Nations communities in New Brunswick. This has included cultural awareness training (*i.e.*, via participation in the "Blanket Exercise" by IPP senior leadership and engineering staff), presentations regarding Mill operations, site tours, and a commitment to sharing regulatory documents with interested communities prior to submission to the Regulator(s). With respect to this Project, IPP began engaging with First Nations in November 2022 through the issuance of letters. In early 2023, IPP gave presentations that provided a recent history of upgrades and modernization work at IPP, the current Mill operation, and draft forward-looking plans for the mill modernization and green energy generation project at IPP.

The proponent has undertaken several forms of engagement with the First Nations communities on this Project as summarized in Table 82. Appendix XII provides additional information on the First Nations engagement that has been completed to date.

Table 82. Summary of pre-registration engagement activities between IPP and First Nations groups regarding the mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Date	Activity	Summary
20 November 2022	Offer of participation in early engagement	➢ IPP sent a letter to the Chiefs of all 16 First Nations communities in New Brunswick and their organizations describing the mill modernization and green energy generation project at a high level
12 January 2023	Pre-registration engagement session was held with WNNB representatives	➢ An overview of the mill modernization and green energy generation project was presented ➢ Attendees were given a tour of the existing Mill, the Lee Cove flood mitigation project, and the environmental treatment facility construction site
30 January 2023	Pre-registration engagement session with New Brunswick Aboriginal Peoples Council (NBAPC) representatives	➢ An overview of the mill modernization and green energy generation project was presented
6 February 2023	Pre-registration engagement session with Mi'qmawe'l Tplu'taqnn, Inc. (MTI) representatives	➢ An overview presentation was provided of the IPP mill history and operations, the mill modernization and green energy generation project, and the wood supply ➢ MTI representatives noted that they would like a follow-up meeting so that their director of forestry can attend and that they would also like to have a presentation on JDI's forestry operations
21 February 2023	Follow-up pre-registration engagement session with MTI representatives	➢ This follow-up meeting focused on the wood supply for the mill modernization and green energy generation project ➢ Representatives of MTI indicated that they would welcome lower emissions from the Mill, they see benefits from reducing the amount of waste fibre left behind in the woods, and they see opportunities for their members to be employed
4 April 2023	Follow-up pre-registration engagement session with representatives of the NBAPC	➢ A tour of Mill operations and the environmental treatment facility construction site was also provided. An overview of the mill modernization and green energy generation project was presented ➢ Attendees were also given a tour of the existing Mill, the Lee Cove flood mitigation project, and the environmental treatment facility construction site

Date	Activity	Summary
6 April 2023	Follow-up pre-registration engagement session with representatives of MTI	➢ An overview of the mill modernization and green energy generation project was presented ➢ Attendees were also given a tour of the existing Mill, the Lee Cove flood mitigation project, and the environmental treatment facility construction site
18 April 2023	Follow-up pre-registration engagement session with representatives of WNNB	➢ A presentation was provided on the wood supply requested during the 12 January 2023 meeting

NOTES:
*The NBAPC is the voice for approximately 28 260 Status and Non-Status Aboriginal People who reside in New Brunswick. Their members, who are widely dispersed throughout the province, are people of Aboriginal Ancestry. The organization endeavours to improve the social and economic standards of Off-Reserve Aboriginal People. The NBAPC is affiliate with the national organization, The Congress of Aboriginal People of Canada.

5.2.2 *New Brunswick Department of Aboriginal Affairs*

The provincial government is responsible for the overall consultation process and must ensure that consultation and accommodation are appropriate for the circumstances prior to determining whether a project can proceed. The government, through the New Brunswick Department of Aboriginal Affairs, is responsible for overseeing and ensuring the adequacy of the Proponent's engagement efforts as well as assessing any proposed mitigation strategies and accommodation measures developed in response to concerns raised by First Nations.

5.2.2.1 7 November 2022

On 7 November 2022, a pre-registration consultation meeting was held between representatives of the NBDAA and IPP (Table 83). An overview of the previous modernization projects at the Mill was given. The mill modernization and green energy generation project was also presented. The meeting occurred within the Project trailers at the Mill site from 10:30 AM to 1:30 PM.

Table 83. Attendees of the pre-registration consultation meeting held on 7 November 2022 regarding the mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Name	Affiliation
Kim Newman	NBDAA, Assistant Deputy Minister
Michelle Daigle	NBDAA, Director of Consultation Branch
Stephen Gray	NBDAA, Consultation Advisor
Andrew Foster	Regional Development Corporation, Director of Development
Andrew Willet	JD Irving, Director of Aboriginal Relations
Renee Morais	JD Irving, Director of Environment
Cory Gallant	IPP, Operational Integration Manager
Mark Fitzpatrick	IPP, Phase IV Program Manager

5.2.3 New Brunswick Department of the Environment and Local Government

Prior to registering a project, the NBDELG recommends discussing it with Project Assessment Branch representatives to:

- obtain advice and guidance on the submission of the EIA registration document and the review process;
- obtain information with respect to the possible timing and duration of the review for the EIA document; and
- provide the NBDELG personnel with advance notice of the anticipated timing for preparation and submission of the EIA document.

5.2.3.1 27 April 2023

On 27 April 2023, a pre-registration consultation meeting was held between representatives of the NBDELG and IPP (Table 84) from 10AM to 1:30PM. The meeting was held at the Mill and included a presentation on the overall Phase IV modernization work. Following the presentation, a tour was provided of the completed Phase II and Phase III projects and the environmental treatment facility currently under construction.

Table 84. Attendees of the pre-registration consultation videoconference held on 27 April 2023 regarding the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Name	Affiliation
Shawn Hamilton	NBDELG, EIA Specialist
Sheryl Johnstone	NBDELG, Permitting Engineer
Cathy Dubee	NBDELG, Region 4 Inspector
Chris Clark	JD Irving, Director of Pulp & Paper
Renee Morais	JD Irving, Director of Environment
Cory Gallant	IPP, Director of Operational Integration
Mark Fitzpatrick	IPP, Phase IV Program Manager
Helen Tanfara	IPP, Environmental Coordinator
Matt Alexander	Fundy Engineering, Environmental Scientist

5.2.3.2 15 May 2023

On 15 May 2023, a pre-registration consultation meeting was held between representatives of the NBDELG's proposed TRC and IPP (Table 85). The meeting was a hybrid format with some meeting in-person at the NBDELG's head office in Fredericton and others joining virtually. An overview of the Project was presented so members of the TRC would have a basic understanding of the Project before reviewing the EIA registration document.

Table 85. Attendees of the pre-registration consultation videoconference held on 15 May 2023 regarding the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Name	Affiliation
Shawn Hamilton	NBDELG, EIA Specialist
Sheryl Johnstone	NBDELG, Permitting Engineer
Gerard Souma	NBDELG, Healthy Environments Branch Engineer
Mark Glynn	NBDELG, Permitting South Section Manager
Timothy Leblanc	NBDELG, Authorizations and Compliance Division Director
Kelli-Nicolle Croucher	NBDELG, Water Sciences Section Specialist
Catherine Lambert	NBDELG, Surface Water Management Technician
Aaron Brown	NBDELG, Mitigation Section Analyst
Courtney Stadler	NBDELG, Surface Water Management Biologist
Joe McIntosh	NBDNRED, Resource Tenure Section Administrator
Colette Lemieux	NBDNRED, Planning Section Analyst
Tom Howard	NBDNRED, Petroleum Resource Development Section Manager
Wayne Osborne	NBDNRED, Resource Tenure Section Specialist
Shaylyn Wallace	NBDNRED, Species at Risk Biologist
Karen Connor	NBDAA, Consultation Branch Manager
Rhonda Morrow	NBDAA, Consultation Branch Consultation Advisor
Shaun Crowley	NBDJPS
Anne Hamilton	NBTHC, Review and Regulations Section Manager
Karen Lalonde	IAAC, Environmental Assessment Officer
Angeline Leblanc	DFO, Aquatic Sciences Biologist
Chris Clark	JD Irving, Director of Pulp & Paper
Renee Morais	JD Irving, Director of Environment
Mark Fitzpatrick	IPP, Phase IV Program Manager
Andrew Willet	JD Irving, Director of Aboriginal Relations
Cory Gallant	IPP, Director of Operational Integration
Fenwick Jeffrey	IPP, Project Manager
Rick Wasson	IPP, Technical Operations Manager
Heather Munn	IPP, Project Engineer
Helen Tanfara	IPP, Environmental Coordinator
Howard Constable	IPP, Project Manager
Kennedy Coleman Eustace	IPP, Project Manager
Jason Smith	IPP, Project Engineer
Matt Alexander	Fundy Engineering, Environmental Scientist
Crystal Caines	Fundy Engineering, Project Manager

NOTES:
IAAC = Impact Assessment Agency of Canada

5.2.3.3 21 February 2024

On 21 February 2024, an additional pre-registration consultation meeting was held between representatives of the NBDELG's proposed TRC and IPP (Table 86). The meeting was a hybrid format with some meeting in-person at the NBDELG's head office in Fredericton and others joining virtually. An overview of the updated Project was presented so members of the TRC would have a basic understanding of the Project before reviewing the EIA registration document.

Table 86. Attendees of the pre-registration consultation videoconference held on 21 February 2024 regarding the proposed mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Name	Affiliation
Shawn Hamilton	NBDELG, EIA Specialist
Courtney Johnson	NBDELG, EIA Specialist
Crystale Harty	NBDELG, EIA Director
Sheryl Johnstone	NBDELG, Permitting Engineer
Gerard Souma	NBDELG, Healthy Environments Branch Engineer
Marcelle Thibodeau-Hennigar	NBDELG, Planner
Matthew Trueman	NBDELG, Engineer
Aaron Brown	NBDELG, Mitigation Analyst
Catherine Lambert	NBDELG, Surface Water Management Technician
Aaron Brown	NBDELG, Mitigation Section Analyst
Danielle Leger	NBDELG, Adaptation Section Director
Mariah Belyea	NBDELG, Wetland Biologist
Natalie Deseta	NBDELG, Water Science Section Coordinator
Mark Leger	NBDELG, Engineer
Joe McIntosh	NBDNRED, Resource Tenure Section Administrator
Stephen Gray	NBDIA, Consultation Advisor
Kimberly Bittermann	NBDIA, Consultation Advisor
Shaun Crowley	NBDJPS, Regional Director
Anne Hamilton	NBTHC, Review and Regulations Section Manager
Jodi Buckingham	NBDTI, Environmental Coordinator
Johanne Leblanc	Intergovernmental Affairs, Director of Communications
Stephen Zwicker	ECCC, Environmental Assessment Coordinator
Angeline Leblanc	DFO, Aquatic Sciences Biologist
Abbie Martyn	DFO, Biologist
Nathan Cormier	DFO, Biologist
Chris Clark	JD Irving, Director of Pulp & Paper
Renee Morais	JD Irving, Director of Environment
Mark Fitzpatrick	IPP, Phase IV Program Manager
Andrew Willet	JD Irving, Director of Aboriginal Relations
Nicole Ross	JD Irving, Environmental Engineer
Fenwick Jeffrey	IPP, Project Manager
Heather Munn	IPP, Project Engineer
Helen Tanfara	IPP, Environmental Coordinator
Howard Constable	IPP, Project Manager
Matt Alexander	Fundy Engineering, Environmental Scientist

5.2.4 Meetings with other Regulatory Authorities

5.2.4.1 5 December 2022

On 5 December 2022, a meeting was held with representatives of the NBDTI (Table 87) to identify potential roadway infrastructure projects over the next five years within the vicinity of the Mill that fall under their jurisdiction. NBDTI representatives indicated that the Harbour Bridge Rehabilitation Project will continue until at least the end of 2026. Restoration work on the Reversing Falls Bridge will likely occur in 2027. During the meeting, which was held virtually, it was recommended that representatives with the City of Saint John and Gateway Operations Ltd. be contacted regarding potential projects in the vicinity of the Mill related to City roadway infrastructure and Route 1 infrastructure, respectively.

Table 87. Attendees of the meeting held on 5 December 2022 regarding potential New Brunswick Department of Transportation and Infrastructure roadway infrastructure projects over the next five years within the vicinity of the Reversing Falls Mill in Saint John, New Brunswick.

Name	Affiliation
Susan Mayo	NBDTI, Senior Structural Engineer
Holly Moffitt	NBDTI, Engineer
James Connors	NBDTI
Michael Rosehart	NBDTI, Assistant to District Engineer
Hassan Mteri	NBDTI, Senior Resident Engineer
Renee Morais	JD Irving, Director of Environment
Jill Demerchant	Englobe, Traffic Engineer
Ryan Esligar	Englobe, Transportation Engineer
Crystal Caines	Fundy Engineering, Project Manager
Matt Alexander	Fundy Engineering, Environmental Scientist

5.2.4.2 7 December 2022

A meeting was held on 7 December 2022 with representatives of the City of Saint John (Table 88) to identify potential roadway infrastructure projects over the next five years within the vicinity of the Mill. CSJ representatives indicated that Simms Corner is a concern, and they envision upgrades to traffic routing in that area following upgrades on the Reversing Falls Bridge by NBDTI in 2027. There are only two options of crossing the Saint John River in Saint John and when service on one of them is reduced, service on the other tends to increase in response. Therefore, it was recommended that any projects occurring at the Mill over the next few years consider traffic impacts associated with possible lane closures on the Harbour Bridge.

Table 88. Attendees of the meeting held on 5 December 2022 regarding potential New Brunswick Department of Transportation and Infrastructure roadway infrastructure projects over the next five years within the vicinity of the Reversing Falls Mill in Saint John, New Brunswick.

Name	Affiliation
Tim O'Reilly	City of Saint John, Director of Public Works
Michael Hugenholtz	City of Saint John, Commissioner of Public Works
Mark Reade	City of Saint John, Senior Planner
Lisa Caissie	City of Saint John, Director of External Relations
Chris MacDonald	JD Irving, Vice President Government Relations
Renee Morais	JD Irving, Director of Environment
Jill Demerchant	Englobe, Traffic Engineer
Crystal Caines	Fundy Engineering, Project Manager
Matt Alexander	Fundy Engineering, Environmental Scientist

5.3 REGISTRATION ENGAGEMENT AND CONSULTATION

It is the Proponent's responsibility to demonstrate that the potentially affected rightsholders, public, and stakeholders are given the opportunity to actively participate in the EIA review process. Fundy Engineering has developed an organized information dissemination program, whereby relevant, sufficient, and credible information is presented to First Nations and the public.

The First Nations engagement and public consultation plan for this Project was developed in accordance with the process described in A Guide for Proponents Engaging with Aboriginal Peoples in New Brunswick [*NBDAA*, 2019] and Appendix C of *A Guide to Environmental Impact Assessment in New Brunswick* [*NBDELG*, 2018]. The stepwise process proposed for the public consultation plan for this EIA is described in detail below. Our process satisfies the component of the NBDELG EIA Determination Review Summary highlighted in the blue box of Figure 84.

The public will be informed of this Project and the EIA registration document will be made available for review. Questions, comments, and concerns regarding the document will be collected and addressed as part of this process (*i.e.*, there is a two-way flow of information between the proponent and the public with opportunities for the public to express their views).

5.3.1 Step 1: Direct Communication with Elected Officials and Service Groups

Formal notification of the Project registration document (*i.e.*, in the form of an information letter) will be sent to elected officials, local service groups and community groups, environmental groups, and other key stakeholder groups. Direct communication will enable those individuals and groups (*i.e.*, Table 89) to become more familiar with the Project, ask questions, and / or raise all issues / concerns.

Table 89. Elected officials, service groups, environmental groups, and stakeholders who will be sent information regarding the mill modernization and green energy generation project at the Reversing Falls Mill in Saint John, New Brunswick.

Name	Association	Address
Honourable Glen Savoie	Minster of Environment and Local Government	Marysville Place, PO Box 6000, Fredericton, NB, E3B 5H1
Honourable Mike Holland	Minister of Natural Resources and Energy Development	Hugh John Flemming Forestry Centre, PO Box 6000, Fredericton, NB, E3B 5H1
Dorothy Shephard	Saint John Lancaster MLA	HSBC Place, PO Box 6000, Fredericton, NB, E3B 5H1
Wayne Long	Saint John-Rothesay MP	1 Market Square, Suite N306, Saint John, NB, E2L 4Z6
Donna Reardon	Saint John Mayor	15 Market Square, Saint John, NB, E2L 4L1
John MacKenzie	Saint John Deputy Mayor	15 Market Square, Saint John, NB, E2L 4L1
Brent McGovern	Saint John Chief Administrative Officer	15 Market Square, Saint John, NB, E2L 4L1
Lisa Caissie	Saint John, External Relations	15 Market Square, Saint John, NB, E2L 4L1
Joanna Killen	Saint John Councillor	15 Market Square, Saint John, NB, E2L 4L1
Greg Norton	Saint John Councillor	15 Market Square, Saint John, NB, E2L 4L1
Roxanne Mackinnon	Executive Director ACAP Saint John	139 Prince Edward Street, Suite 323, Saint John, NB, E2L 3S3
Gordon Dalzell	Saint John Citizens' Coalition for Clean Air	32 Dorothea Drive, Saint John, NB, E2J 3J1
Blaine Harris	Executive Director Saint John Lancaster Business Assoc.	23 Main Street West, Saint John, NB, E2M 3M9
Tracy Bell	The Chamber Executive Director	78 Prince William Street, Saint John, NB, E2L 2B3
Nancy Tissington	Uptown Saint John Executive Director	17-180 Canterbury Street, Saint John, NB, E2L 2C3
Andrew Beckett	Envision Saint John Chief Executive Officer	1 Germain Steet, Saint John, NB, E2L 4V1
Phil Ouellette	Fundy Regional Service Commission Chief Executive Officer	PO Box 3032, Grand Bay-Westfield, NB, E5K 4V3
Daniel Houghton	President, Construction Association of New Brunswick – Saint John Chapter	263 Germain Street, Saint John, NB, E2L 2G7
Stephanie Philips	Interim Co-Executive Director, Conservation Council of New Brunswick	180 St. John Street, Fredericton, NB, E3B 4A9
Rob Nichol	Chief, Saint John Fire Department	45 Leinster Street, Saint John, NB, E2L 1H9
Andrew Oland	President and Chief Executive Officer, Moosehead Breweries Limited	89 Main Street West, Saint John, NB, E2M 3H2
Patrick Oland	Chief Financial Officer, Moosehead Breweries Limited	89 Main Street West, Saint John, NB, E2M 3H2
Jean-Marc Ringuette	President, New Brunswick's Building Trades Unions	26 Kiwanis Court, Saint John, NB, E2K 4L2

5.3.2 Step 2: Direct Written Communication with Nearby Residents

A limited mail out comprising a project information sheet will be sent to nearby residents and businesses. Residents and businesses of the following streets will receive information regarding the Project (Figure 113):

- Milford Road from Greenhead Road to the Milford Memorial Community Centre;
- Kingsville Road to Violet Street;
- Hawtrey Street;
- Williams Street;
- Tulip Street from Kingsville Road to Violet Street;
- Hernani Court;
- Dalila Court;
- Greenhead Road from Dever Road to Dalila Court;
- Gifford Road;
- Busby Street;
- Connors Street;
- Morris Street;
- McKiel Street;
- Church Avenue;
- St. Rose Court;
- Collins Street;
- Prospect Street West;
- Winslow Street West;
- Main Street West;
- Manawagonish Road from Main Street West to Catherwood Street;
- Catherwood Street;
- Orange Street West;
- George Street;
- Charles Street West;
- Greystone Terrace;
- Ready Street;
- Harding Street West;
- Fairville Boulevard between Bleury Street and Simms Corner;
- Riverview Avenue West;
- Dunedin Lane;
- Tipperary Court;
- Edward Avenue;
- Earle Avenue;
- Lewin Park;
- Lewin Close;
- Lancaster Avenue between Simms Corner and Duke Street West;

- Prince Street;
- Bridgeview Court;
- Rockingstone Drive;
- Brian Lane;
- Demonts Street;
- Carleton Place;
- Algonquin Place;
- Champlain Street between Prince Street and Duke Street West;
- Riverview Drive;
- Olive Street;
- Carleton Kirk Place;
- Watson Street between Prince Street and Duke Street West;
- Ludlow Street between Prince Street and Duke Street West;
- King Street West;
- Market Place between NB Route 1 and Duke Street West;
- Duke Street West;
- Douglas Avenue to Civic 150;
- Gregory Place;
- Fallsview Avenue;
- Brunswick Place;
- Bentley Street;
- King George Court;
- Alexandra Street;
- Willow Street;
- Clipper Passage;
- Chesley Drive to Navy Way.

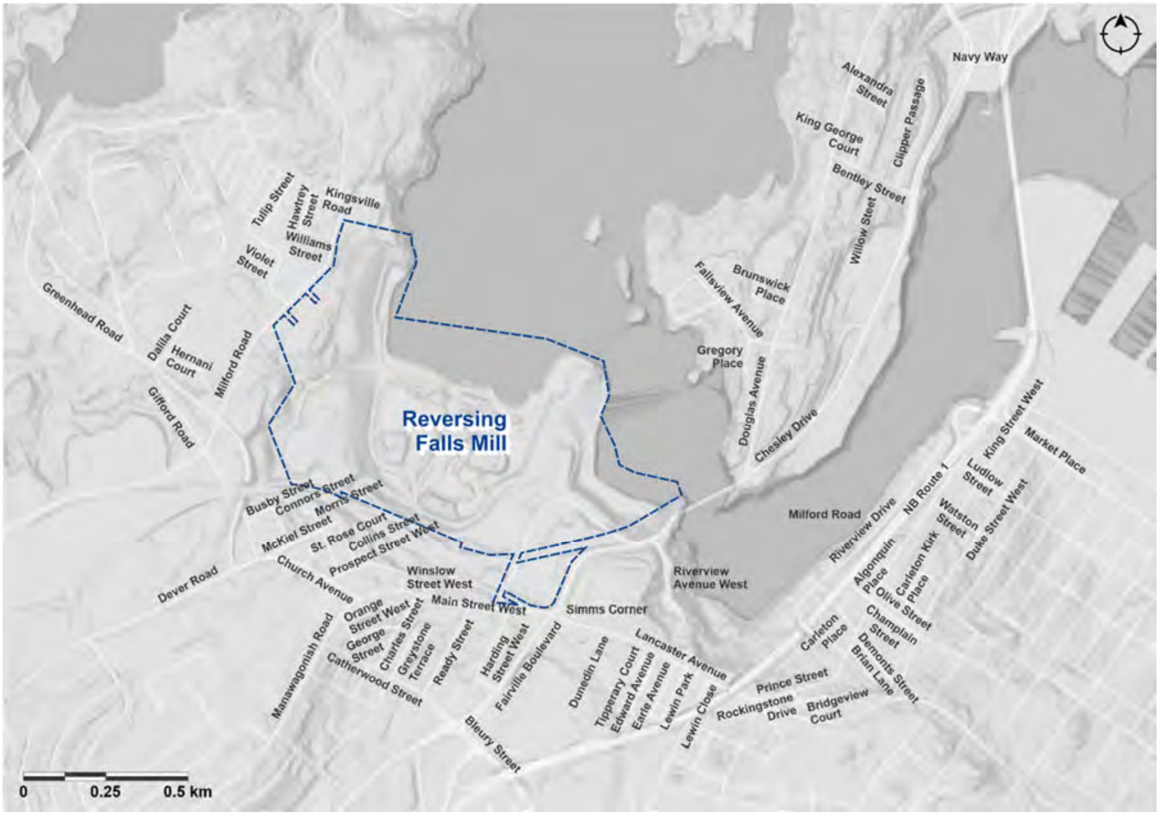


Figure 113. Residential properties in the vicinity of the proposed Project at the Reversing Falls Mill in Saint John, New Brunswick that will receive notification of the Project.

5.3.3 Step 3: Notifications on the NBDELG Website and at the Head Office

The NBDELG shall place notice of the EIA registration on its website (*i.e.*, http://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment/registrations.html) and shall have the EIA document available for public review at the Project Assessment Branch head office located on the second floor of 20 McGloin Street in Fredericton, New Brunswick. To satisfy this requirement, IPP will provide an electronic version of the registration document (*i.e.*, as a PDF document) and two hard copies to the NBDELG.

5.3.4 Step 4: Documentation Availability with Stakeholder and NBDELG Offices

Copies of the Project registration document, and any subsequent submissions made in response to issues raised by the Technical Review Committee (TRC), will be made available at the local NBDELG office. A copy of the EIA document along with any subsequent revision(s) will be placed at the Saint John NBDELG regional office at 110 Charlotte Street where it will be made available to the public.

5.3.5 Step 5: Public Notice Announcement

As required, a public notice will be placed in at least one local newspaper that has general circulation in Saint John County and / or at least one provincial daily newspaper (*i.e.*, *Telegraph Journal*). The standard notice for an EIA registration document, which will be used for publicly announcing the proposed Project is presented in Figure 114.

NOTICE

Registration of Undertaking
Environmental Impact Assessment Regulation
Clean Environment Act, Opportunity for Public Comment

On 21 May 2024, Irving Pulp & Paper, Limited submitted for registration the following activity with the Department of Environment and Local Government in accordance with Section 5(1) and Schedule "A" of the Environmental Impact Assessment Regulation: "Environmental Impact Assessment: Mill Modernization and Green Energy Generation Project".

The Irving Pulp & Paper Mill is located at Reversing Falls in Saint John, New Brunswick. Continuous investments have been made and continue to be made in the Mill to maintain it as New Brunswick's Forest Products Cluster anchor. Previous modernization phases at the Mill have prepared it for increasing daily production capacity to maintain thousands of jobs in the industry and create many more. This Project is a critical upgrade that is fundamental to the long-term economic and environmental performance of the Mill. The existing multiple-effects evaporators, recovery boiler, and steam turbines and electricity generators will be replaced with modern best-available technology. The new steam turbine(s) and electricity generator(s) will produce up to 140 MW of green energy of which about half will be available for NB Power purchase to help decarbonize the provincial electricity grid. The Mill's recausticizing plant will also be expanded through this Project. This is a generational investment in Greater Saint John's economy and the New Brunswick Forest Products Industry and green economy.

A public open house will be held on a date yet to be determined at a location near the Reversing Falls Mill.

The Proponent's registration document can be examined at:

Fundy Engineering
27 Wellington Row
Saint John, NB

Saint John Free Public Library
Market Square
Saint John, NB

and at:

NBDELG Regional Office
110 Charlotte Street
Saint John, NB

NBDELG Head Office
20 McGloin Street, 2^{nd} floor
Fredericton, NB

Any comments should be submitted directly to the Proponent at:

Irving Pulp & Paper
% Fundy Engineering
27 Wellington Row
Saint John, N.B., E2L 3H4

matt.alexander@fundyeng.com

Receipt of comments is requested on or before 12 July 2024. Additional information about the proposal and the public involvement process is available at:

http://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment/registrations.html

Notice placed by: Irving Pulp & Paper, Limited

Figure 114. Example of the public notice announcement that will be placed by the Proponent in at least one local newspaper and / or at least one provincial daily newspaper.

5.3.6 Step 6: Local Area Availability of the Registered Document

Copies of the Project registration document, and any subsequent submissions made in response to issues raised by the TRC, will be made available in at least two locations local to the Project. Locations proposed for viewing the document locally include the Saint John Free Public Library (*i.e.*, Market Square) and Fundy Engineering's Saint John office (*i.e.*, 27 Wellington Row). A copy of the Project registration document and any subsequent information will be made available to any First Nation, member of the public, and / or any stakeholder, upon request.

5.3.7 Step 7: Open House and / or Public Meeting

There is no requirement, under a Determination Review, to host an open house and / or public meeting; however, as a good environmental steward and neighbour, IPP intends to host an open house. The open house will involve the use of visual aids, staffed with Project personnel who will be able to answer questions and document issues and concerns. Tentatively, the open house will be conducted near the Reversing Falls Mill at a date and location yet to be determined. Details of the open house, including a list of attendees, questions asked, *etc.* will be included in the First Nations engagement and public consultation report submitted to the NBDELG.

5.3.8 Step 8: Documentation of Public Consultation Activities

The Minister of Environment and Climate Change (*i.e.*, the Honourable Glen Savoie Crossman) will only provide an EIA determination once sufficient information has been received. This includes documentation of First Nations engagement and public and stakeholder consultations. Within 60 days of registering the proposed Project, a report documenting the above engagement and consultation process will be submitted to the NBDELG. In addition, this report will be made available for public review. The report will:

- detail First Nations engagement including a detailed communication log;
- describe the public consultation activities including copies of newspaper notices, and letters distributed;
- identify the key public and private stakeholders that were directly contacted during the public consultation process;
- include copies of any and all correspondence received from and sent to stakeholders and the general public;
- describe any issues or concerns received during the public consultation program, which includes the names and affiliations of the person(s) providing the comments;
- indicate how those issues and concerns were, or will be, considered and / or addressed; and
- describe any proposed future public consultation with respect to the Project.

IPP will adhere to the report requirements listed above. Given the Registration date of 21 May 2024 and the deadline of 12 July 2024 for public comments, the report documenting the First Nations engagement and public and stakeholder consultation process will be released prior to 9 August 2024.

6.0 PROJECT APPROVALS

Based on our understanding of the proposed Project, several approvals are required. The sections below outline the federal, provincial, and municipal approvals that are applicable to the Project to be built and operated. Figure 115 summarizes the permitting roadmap for this Project.

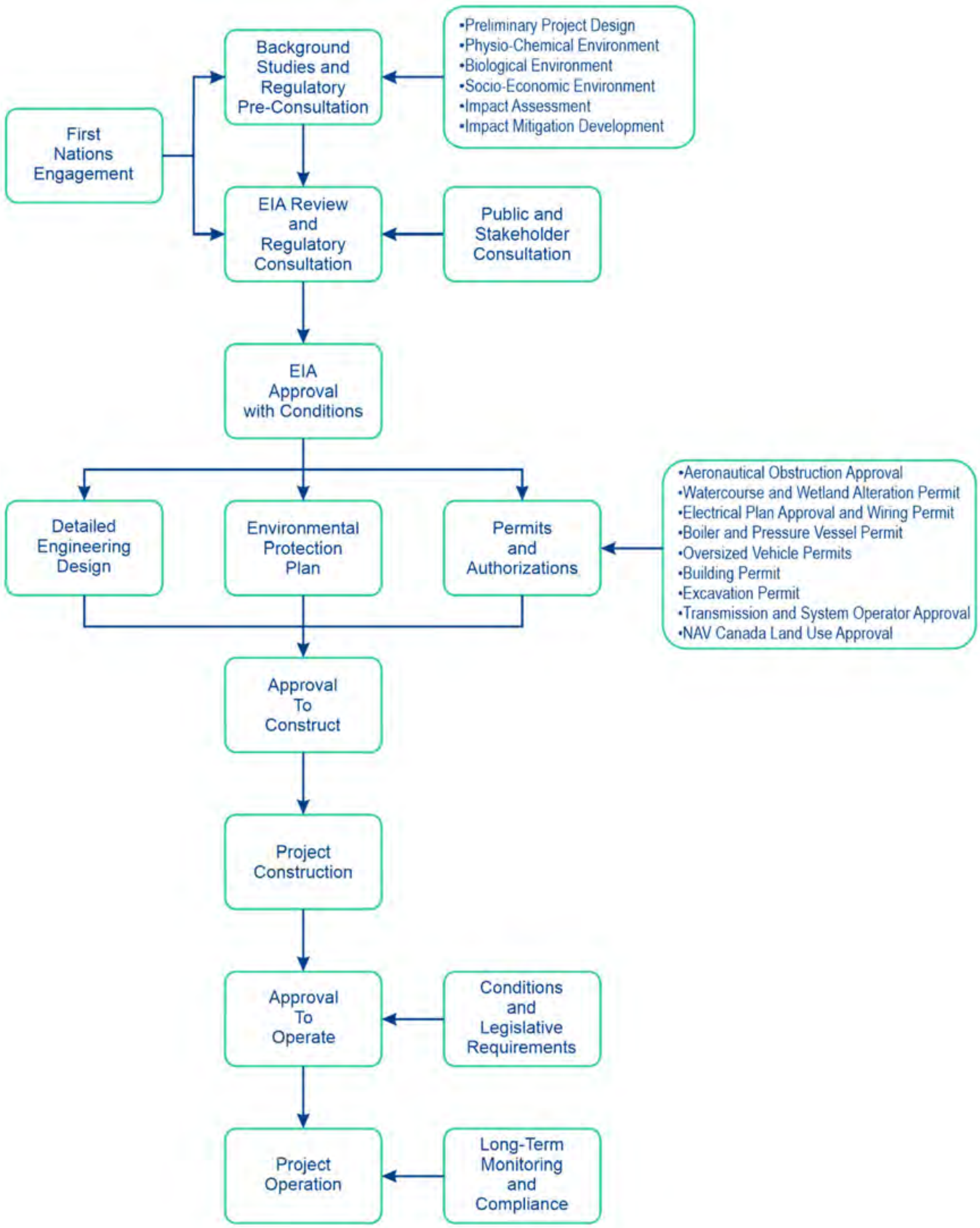


Figure 115. Permitting roadmap for the mill modernization and green energy generation project proposed for the Reversing Falls Mill in Saint John, New Brunswick.

6.1 FEDERAL APPROVALS

6.1.1 Impact Assessment Approval

The *Impact Assessment Act* [**S.C. 2019, c. 28, s. 1**], which was enacted on 28 August 2019, modernized and replaced the *Canadian Environmental Assessment Act, 2012* [**S.C. 2012, c. 19, s. 52**] (*CEAA, 2012*). Modernization of the federal impact assessment process involved improving how major projects are assessed and approved. Under the *CEAA, 2012*, decisions were based on whether a project was likely to cause significant adverse environmental effects whereas decisions under the *Impact Assessment Act* (*IAA*) are based on whether the potential adverse effects in areas of federal jurisdiction are in the public interest.

Like *CEAA, 2012*, the *IAA* designates projects by type and thresholds prescribed by regulation. Some new project types have been added while the scope of others has been expanded under the *IAA*. Unlike *CEAA, 2012*, the *IAA* includes a planning phase that assists Agency staff in determining whether to carry out an assessment, whether to coordinate with other jurisdictions or agencies, and what the scope of the assessment will be.

A copy of the *Impact Assessment Act* can be found at:

<https://laws-lois.justice.gc.ca/PDF/I-2.75.pdf>; and

a copy of the Physical Activities Regulations can be found at:

<https://laws-lois.justice.gc.ca/PDF/SOR-2019-285.pdf>.

Contact information for the Agency's Atlantic Office is as follows:

Impact Assessment Agency of Canada
Atlantic Office
200-1801 Hollis Street
Halifax, Nova Scotia
B3J 3N4

902.426.0564
902.426.6550
https://www.canada.ca/en/impact-assessment-agency.html
iaac.information.aeic@canada.ca

The Canadian *Impact Assessment Act* and the Physical Activities Regulations [**SOR/2019-285**] were reviewed in detail for applicability to this Project along with the potential environmental effects. Based on that review, it is believed that this Project is not subject to the *IAA*.

The TRC established by the NBDELG to review this EIA document will include representation from municipal, provincial, and regulatory authorities. It is likely that the TRC will include representation from the Impact Assessment Agency of Canada.

At the outset, the Project team determined that a comprehensive assessment of the Project's environmental effects would be required to fulfill the regulatory review process and to provide for the high-level of analysis that is conducive to sound decision-making. Review of this document will demonstrate that a high-level of due diligence was applied to the assessment of environmental effects and the identification of robust mitigation measures.

The rigorous review process completed by the province during review of this Project should satisfy the federal review process. Below is a summary of why the *IAA* is considered not applicable to this Project.

6.1.1.1 Fish and Fish Habitat

With respect to this Project, there are no emissions to water that could potentially impact fish and / or fish habitat. Any changes associated with effluent from the Mill, including those associated with increased production capacity, were previously reviewed, and approved through the EIA completed for the environmental treatment facility and water use reduction project [*Fundy Engineering*, 2022]. That Project received Provincial EIA approval on 19 July 2022.

6.1.1.2 Migratory Birds

There are no greenfield lands associated with this Project. All new infrastructure will be constructed within the heavily industrialized boundaries of the existing Mill. The area is not known to be a flyway for migratory birds.

6.1.1.3 Species At Risk

No *Species At Risk* have been identified within the boundaries of the Mill property.

6.1.1.4 Federal Lands and Lands Outside Canada

There are no lands under federal jurisdiction or lands outside of Canada associated with this Project. The Project is entirely located on privately owned lands within Canada.

6.1.1.5 First Nations

Generally, New Brunswick's shorelines yield a high potential for archaeological and cultural resources as watercourses were used by First Nations as transportation routes. There are no known archaeological or cultural resources located on the Mill site. The entirety of the Project area has previously been excavated, graded, and built up to facilitate existing and previous Mill development. It is expected that any archaeological and or cultural resources at the site would have been previously impacted.

First Nations continue to pursue traditional activities throughout New Brunswick that are an element of practice, custom, and tradition integral to their culture. An Indigenous Knowledge study was not competed for the Project; however, discussions with and engagement of interested First Nations communities and organizations have been undertaken by the Proponent regarding this Project and will continue throughout permitting, construction, and operation.

6.1.2 Aeronautical Obstruction Marking and Lighting Approval

As per Section Standard 621 – Obstruction Marking and Lighting under Part VI – General Operating and Flight Rules of the Canadian Aviation Regulations [**SOR/96-433**] under the *Aeronautics Act* [**R.S.C., 1985, c. A-2**], obstructions taller than 60 m above ground level require marking and lighting. According to the standards, a CL-865 medium intensity white configuration lighting system is required for those obstructions.

A copy of the *Aeronautics Act* can be found at:

<http://laws-lois.justice.gc.ca/PDF/A-2.pdf>;

a copy of the Canadian Aviation Regulations can be found at:

<http://laws-lois.justice.gc.ca/PDF/SOR-96-433.pdf>;

Standard 621 can be found at:

<https://tc.canada.ca/en/corporate-services/acts-regulations/list-regulations/canadian-aviation-regulations-sor-96-433/standards/standard-621-obstruction-marking-lighting-canadian-aviation-regulations-cars>; and

a copy of the manual for land-use practices in the vicinity of aerodromes can be found at:

<https://tc.canada.ca/sites/default/files/migrated/tp1247e.pdf>.

To assess the need and application of marking and lighting for the new RB flue gas stack, which may pose a hazard to aviation, and to determine conformance with the *Aeronautics Act*, an Aeronautical Assessment Form for Obstacle Evaluation must be completed. A copy of the form can be obtained at:

<http://wwwapps.tc.gc.ca/Corp-Serv-Gen/5/forms-formulaires/download/26-0427_BO_PX>

Contact for Transport Canada's Regional Civil Aviation office is as follows:

Transport Canada – Regional Headquarters
95 Foundry Street
Moncton, NB
E1C 5H7

800.305.2059
855.726.7495
https://www.tc.gc.ca/eng/atlantic/menu.htm#ca_moncton
tc.aviationserviceatl-serviceaviationatl.tc@tc.gc.ca

For this Project, an Aeronautical Form for Obstacle Evaluation will have to be completed and submitted to TC for review and approval before the new RB flue gas stack can be constructed. Given the height of the new RB flue gas stack is ≤ 105 m, a D1 lighting system will likely be required.

6.2 PROVINCIAL APPROVALS

6.2.1 Environmental Impact Assessment Approval

As per Schedule A, item b) (*i.e.*, all electric power generating facilities with a production rating of three megawatts or more) and item k) (*i.e.*, all facilities for the commercial processing or treatment of timber resources…) of the Environmental Impact Assessment Regulation [**87-83**] of the New Brunswick *Clean Environment Act* [**R.S.N.B. 1973, c. C-6**], the Project triggers EIA review. As previously noted, the purpose of an EIA is to identify and evaluate the potential impacts that the proposed Project will have on the environment. The EIA also identifies and presents measures to mitigate those potential environmental impacts. The one-time fee for registering this Project for EIA review is $5 500.

A copy of the New Brunswick *Clean Environment Act* can be found at:

<http://laws.gnb.ca/en/ShowPdf/cs/C-6.pdf>;

a copy of the EIA Regulation can be found at:

<http://laws.gnb.ca/en/ShowPdf/cr/87-83.pdf>;

a copy of the EIA preparation guide can be found at:

<https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/EIA-EIE/GuideEnvironmentalImpactAssessment.pdf>;

a copy of the EIA fee guide can be found at:

<https://www.pxw1.snb.ca/snb9000/product.aspx?productid=A001P809000>; and

a copy of the Timber Processing Project Sector Guidelines can be found at:

<https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/EIA-EIE/SectorGuidelines/TimberProcessing.pdf>.

Contact information for the NBDELG's Environmental Assessment Section of the Sustainable Development and Impact Evaluation Branch is as follows:

NBDELG
Environmental Assessment
Sustainable Development and Impact Evaluation
PO Box 6000
Fredericton, NB
E3B 5H1

✆ 506.444.5382
🖷 506.453.2627
🖰 www.gnb.ca/environment
✉ eia-eie@gnb.ca

6.2.2 Environmental Protection Plan

Because an EIA is triggered, a Project-specific EPP will need to be developed for this Project. The EPP will be an important component to the overall Project because it will dictate the importance of BMPs that shall be undertaken by all those associated with the Project to ensure environmental protection. The EPP will provide a practical means for conveying BMPs to IPP for ensuring the implementation of the outlined standards and regulations throughout the entire Project. It will be a dynamic document to be used by Project personnel in the field and at the corporate level for ensuring BMPs are implemented and monitored.

More specifically, the purpose of the EPP will be to:

- outline IPP's commitments to minimize potential Project environmental impacts;
- comply with the conditions of any authorization(s), license(s), and / or permit(s) issued to construct, commission, operate, and maintain the Project;
- provide a reference document for IPP and all contractor personnel to use when planning and / or conducting specific Project activities; and
- provide a summary of environmental issues and protection measures to be implemented during the Project.

The EPP should be developed in accordance with applicable federal and provincial environmental protection legislation and regulations. IPP should take a proactive approach toward creating a safe and secure work environment and maintain a system to manage environmental effects of the Project. In doing so, they should identify health, safety, environmental, and security issues as part of the execution planning and manage the environmental effects of the Project and work in ways that are environmentally, economically, and socially justified and legally compliant. Specific health, environmental, safety, and security issues should be addressed in the execution plans and procedures for the Project.

Development of an EPP document is often a requirement for many of the approvals required because it demonstrates impact mitigation. A Project-specific EPP will be developed during detailed engineering design. When complete, the EPP will be submitted to the NBDELG for review. EPPs have been developed for other EIA approved work at the Mill, such as the chip digester that was completed in 2016, the new pulp dryer that was completed in 2022, and the environmental treatment facility that is currently under construction.

Some of the datasheets that will most likely be included in the Project-specific EPP are:

- archaeological discovery;
- concrete wash water management;
- environmental incidents reporting guidelines;
- hazardous materials management;
- pile driving sound emissions;
- rock check dams;
- sanitary waste management;
- sediment filter bag;

- sediment traps;
- silt fences;
- solid waste management;
- spill prevention and control;
- spills or leaks emergency response procedures;
- stockpile management;
- storm drain inlet protection;
- straw bale barriers;
- terrestrial flora and fauna protection;
- vehicle and equipment cleaning;
- vehicle and equipment fueling; and
- vehicle and equipment maintenance.

Details regarding the management of surface water runoff / drainage will also be included within the EPP document.

6.2.3 Watercourse and Wetland Alteration Permit

New Brunswick's watercourses and wetlands are afforded protection under the Watercourse And Wetland Alteration (WAWA) Regulation [**90-80**] of the New Brunswick *Clean Water Act* [**S.N.B. 1989, c. C-6.1**]. Any proposed alterations within watercourses and / or wetlands, or within their 30 m regulated buffer, require permitting through the NBDELG's WAWA program. There will be instances when work will be required within 30 m of the Saint John River (*i.e.*, installing effluent piping, installing the recausticizing plant. That work can only be done through authorization under a WAWA permit.

A copy of the New Brunswick *Clean Water Act* can be found at:

<http://laws.gnb.ca/en/ShowPdf/cs/C-6.1.pdf>;

a copy of the WAWA Regulation can be found at:

<http://laws.gnb.ca/en/ShowPdf/cr/90-80.pdf>;

the WAWA application portal can be found at:

<https://www.elgegl.gnb.ca/WAWAG/en/Home/Site>; and

a copy of the WAWA technical guidelines can be found at:

<https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Water-Eau/WatercourseWetlandAlterationTechnicalGuidelines.pdf>.

Contact information for the NBDELG WAWA program is as follows:

NBDELG
Surface Water Protection
Sustainable Development and Impact Evaluation
Marysville Place
PO Box 6000
Fredericton, NB
E3B 5H1

✆ 506.457.4850
🖷 506.453.6862
🖱 http://www2.gnb.ca/content/gnb/en/departments/elg/environment.html
✉ elg/egl-info@gnb.ca

6.2.4 Shore Area Quarry Permit

A Shore Area Quarry Permit is required to undertake excavation within a designated shore area as per the General Regulation **[93-92]** under the New Brunswick *Quarriable Substances Act* **[S.N.B. 1991, c. Q-1.1]**.

A copy of the *Quarriable Substances Act* can be found at:

<https://laws.gnb.ca/en/pdf/cs/Q-1.1.pdf>;

a copy of the General Regulation can be found at:

<https://laws.gnb.ca/en/pdf/cr/93-92%20.pdf>; and

a copy of the quarry permit application can be found at:

<https://www.pxw1.snb.ca/snb7001/b/1000/CSS-FOL-SNB-60-0029B.pdf>.

Contact information for the Resource Tenure Branch of the NBDERD is as follows:

NBDERD
Resource Tenure Branch
Hugh John Flemming Forestry Centre
PO Box 6000
Fredericton, NB
E3B 5H1

✆ 506.453.3826
🖷 506.453.3671
🖱 http://www2.gnb.ca/content/gnb/en/departments/erd/energy/content/minerals.html
✉ geoscience@gnb.ca

6.2.5 Approval To Construct

The Water Quality Regulation [**82-126**] of the New Brunswick *Clean Environment Act* [**R.S.N.B. 1973, c. C-6**] requires owners and / or operators of a facility that releases a contaminant to the water environment to apply for the construction of the source. Construction of the Project 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 on the approval issued for that source.

A copy of the *Clean Environment Act* can be found at:

<http://laws.gnb.ca/en/ShowPdf/cs/C-6.pdf>;

a copy of the Water Quality Regulation can be found at:

<http://laws.gnb.ca/en/ShowPdf/cr/82-126.pdf>;

Contact information for the Authorizations and Compliance Division of the NBDELG is as follows:

NBDELG
Authorizations and Compliance
Permitting South
Marysville Place
PO Box 6000
Fredericton, NB
E3B 5H1

506.453.7945
506.453.2390
http://www2.gnb.ca/content/gnb/en/departments/elg/environment.html
elg/egl-info@gnb.ca

6.2.6 Approval To Operate

6.2.6.1 Air Quality

As per the Air Quality Regulation [**97-133**] of the New Brunswick *Clean Environment Act* [**R.S.N.B. 1973, c. C-6**], the Reversing Falls Mill operates under a Class 1A ATO. The most recent ATO (*i.e.*, I-11603) was issued to IPP for operation of the Reversing Falls Mill on 1 June 2022 and is valid through 32 May 2027 (*i.e.*, refer to Appendix IV). That ATO will have to be modified to include operation of the new equipment associated with Phase IV of the Mill's modernization. Links to the Act and Regulation and contact information for the NBDELG Authorizations and Compliance Division are included in Section 6.2.4.

6.2.7 Vehicle Dimensions and Mass and Special Permit Fees

The sizing of vehicles and their loadings on roadways in the province is controlled under the Vehicle Dimensions and Mass Regulation [**2001-67**] of the *Motor Vehicle Act* [**R.S.N.B. 1973, c. M-17**]. All trucks used for the Project must always adhere to the legal load weights limits, including spring weight restrictions. If a truck exceeds dimensions and / or mass for a roadway, then there is a requirement to obtain permission under the Special Permit Fees Regulation [**89-65**] of the *Act*. It is likely that vehicles exceeding weight or dimension limits on a public roadway will be required for delivering large Project components so a permit may be required.

A copy of the *Motor Vehicle Act* can be found at:

<http://laws.gnb.ca/en/ShowPdf/cs/M-17.pdf>;

a copy of the Vehicle Dimensions and Mass Regulation can be found at:

<http://laws.gnb.ca/en/ShowPdf/cr/2001-67.pdf>;

a copy of the Special Permit Fees Regulation can be found at:

<http://laws.gnb.ca/en/ShowPdf/cr/89-65.pdf>; and

an application for a Special Permit can be found at:

<https://www.pxw1.snb.ca/snb9000/product.aspx?ProductID=A001PTI023a>.

Contact information for the New Brunswick Department of Transportation and Infrastructure (NBDTI) Saint John district office is as follows:

NBDTI
Saint John District Office
50 Crown Street, Suite 105
Saint John, NB
E2L 2X6

✆ 506.643.7463
🖷 506.643.7464
🖰 https://www2.gnb.ca/content/gnb/en/departments/dti/district_offices.html
✉ transportation.web@gnb.ca

6.2.8 Electrical Plan Approval and Wiring Permit

As per the General Regulation [**84-165**] and the Lightning Protection System Regulation [**82-215**] of the New Brunswick *Electrical Installation and Inspection Act* [**R.S.N.B. 2011, c. 144**], a plan review is required for electrical installations more than 600 amps at 120 / 240 volts, 400 amps at 120 / 208 volts, 400 amps at 347 / 600 volts and for any installation having a voltage more than 600 volts. Plan approval must be completed before a wiring permit can be issued. The plan review and wiring permit are obtained from the New Brunswick Department of Justice and Public Safety (NBDJPS). Review of the preliminary design drawings for the Project indicates that there will be electrical installations that trigger an electrical plan approval and wiring permit from the province.

A copy of the *Electrical Installation and Inspection Act* can be found at:

<http://laws.gnb.ca/en/showpdf/cs/2011-c.144.pdf>;

a copy of the Lightning Protection System Regulation can be found at:

<http://laws.gnb.ca/en/showpdf/cr/82-215.pdf>; and

a copy of the General Regulation can be found at:

<http://laws.gnb.ca/en/showpdf/cr/84-165.pdf>.

Contact information for the regional office for technical inspection services is as follows:

NBDJPS
Regional Office - Saint John
Technical Inspection Services
8 Castle Street
PO Box 5001
Saint John, NB
E2L 4Y9

✆ 506.658.2510
🖷 506.658.2767
🖰 http://www2.gnb.ca/content/gnb/en/departments/public_safety.html
✉ DPS-MSP.information@gnb.ca

6.2.9 Boiler and Pressure Vessel Permit

According to the Boiler and Pressure Vessel Standards [**84-177**] and the Boiler and Pressure Vessel Code [**84-174**] of the New Brunswick *Boiler and Pressure Vessel Act* [**R.S.N.B. 2011, c. 122**] a permit is required to install or modify boilers, pressure vessels, or pressure piping systems. The permit is required to ensure manufacture meets acceptable standards of quality. Inspections must also be conducted on all new or modified boilers, pressure vessels, and pressure piping systems.

A copy of the *Boiler and Pressure Vessel Act* can be found at:

<https://laws.gnb.ca/en/showpdf/cs/2011-c.122.pdf>;

a copy of the Boiler and Pressure Vessel Code can be found at:

<https://laws.gnb.ca/fr/showpdf/cr/84-174.pdf>; and

a copy of the Standards Regulation can be found at:

<https://laws.gnb.ca/en/ShowPdf/cr/84-177.pdf>.

Contact information for the regional office for technical inspection services is as follows:

NBDJPS
Regional Office - Saint John
Technical Inspection Services
8 Castle Street
PO Box 5001
Saint John, NB
E2L 4Y9

☎ 506.658.2510
🖷 506.658.2767
🖱 http://www2.gnb.ca/content/gnb/en/departments/public_safety.html
✉ DPS-MSP.information@gnb.ca

6.3 MUNICIPAL APPROVALS

6.3.1 Building Permit

Pursuant to Part 4, Division B of the New Brunswick *Community Planning Act* [**S.N.B. 2017, c.19**], a building permit must be obtained prior to the construction, relocation, demolition, and / or altering of any structures on land within a municipality. Building Permits in Saint John are administered through the *City of Saint John One-Stop Development Shop*.

A copy of the New Brunswick *Community Planning Act* can be found at:

<http://laws.gnb.ca/en/ShowPdf/cs/2017-c.19.pdf>; and

an application for a building permit can be found at:

<https://saintjohn.ca/sites/default/files/2020-12/6%20New%20Construction%20Part%209%20Submission%20Package.pdf>.

Contact information for the *City of Saint John One-Stop Development Shop* is as follows:

Growth & Community Development Services
One Stop Development Shop
10th Floor, City Hall
15 Market Square
PO Box 1971
Saint John, NB
E2L 4L1

☎ 506.658.2911
🖱 https://saintjohn.ca/en/city-hall/city-corporation/rates-and-finances/one-stop-development-shop
✉ onestop@saintjohn.ca

A building permit will be required to build any structures (*e.g.*, buildings, boilers, *etc.*) associated with the Project within Saint John's municipal boundaries.

6.3.2 Excavation Permit

As per the New Brunswick *Community Planning Act* [**S.N.B. 2017, c.19**] and the Zoning By-Law of the City of Saint John [**C.P. 111**], an excavation permit is required to excavate land within the municipality. The permit is administered through the *City of Saint John One-Stop Development Shop*.

A copy of the New Brunswick *Community Planning Act* can be found at:

<http://laws.gnb.ca/en/ShowPdf/cs/2017-c.19.pdf>;

a copy of the City of Saint John Zoning By-Law can be found at:

<https://saintjohn.ca/sites/default/files/2021-02/Zoning%20By-Law.pdf>; and

a City of Saint John Excavation Permit application form can be found at:

<https://saintjohn.ca/sites/default/files/2020-12/6%20New%20Construction%20Part%209%20Submission%20Package.pdf>.

Contact information for the *City of Saint John One-Stop Development Shop* is provided in Section 6.3.1.

Excavations may be required for structural foundations and require the Proponent to obtain an excavation permit from the City of Saint John; however, consultations with City representatives will have to be done to confirm this.

6.4 OTHER APPROVALS

6.4.1 New Brunswick Electric Power Corporation

The 69 kV electric transmission line to the Mill is owned by the New Brunswick Power Corporation (a.k.a. NB Power). Under the Electricity from Renewable Resources Regulation [**2015-60**] of the New Brunswick *Electricity Act* [**S.N.B. 2013, c.7**], there are provisions for NB Power to purchase renewable energy from large-scale (*i.e.*, > 3 MW) industrial projects. Using more electricity generated from renewable resources has an overall positive impact on emissions and other environmental concerns.

NB Power's Large Industrial Renewable Energy Purchase Program allows the utility to purchase electricity from renewable sources, such as biomass and river hydro, from large industrial customers who have renewable electricity facilities located in New Brunswick. Purchase of electricity from those renewable sources allows NB Power to supply in-province electricity sales with renewable energy and reduces their GHG emissions associated with fossil fuel electricity generation. Revenue from the renewable energy sales assists a participating facility with reducing their net electricity costs by matching the Canadian average electricity costs thus increasing the facilities' competitiveness in the global market.

A copy of the New Brunswick *Electricity Act* can be found at:

<https://laws.gnb.ca/en/ShowPdf/cs/2013-c.7.pdf>;

A copy of the Electricity from Renewable Resources Regulation can be found at:

<https://laws.gnb.ca/en/ShowPdf/cr/2015-60.pdf>; and

More information on the Large Industrial Renewable Energy Purchase Program can be found at:

<https://www2.gnb.ca/content/gnb/en/departments/erd/energy/content/industrial.html>.

Contact information for NB Power is as follows:

NB Power
515 King Street
PO Box 2000
Fredericton, New Brunswick
E3B 4X1

✆ 506.458.4444
🖱 <http://www.nbpower.com>

6.4.1.1 Transmission and System Operator Approval

For IPP to connect the turbine driven generator(s) to NB Power's transmission grid, they will need approval from the Transmission and System Operator (TSO). Initially, a connection assessment process is undertaken by the TSO to ensure an electrical generator(s) will not cause issues with the grid or other transmission customers.

The connection assessment process may involve one to three steps: 1) a feasibility review; 2) a system and impact study; and 3) a facilities study. The feasibility review is an informal process designed to determine if there are any issues with the proposal. An application fee of $5 000 is required for the TSO to undertake the feasibility review. If required, a system and impact study to assess what effect the proposal will have on the transmission system and its customers, mitigation measures that may be required, and determine the need for additions or upgrades to the transmission grid. A facilities study is triggered when there are additions or upgrades required to the transmission grid. The facilities study identifies the costs associated with the upgrades necessary to the transmission system for connecting the proposal.

A copy of New Brunswick Power Corporations New Brunswick Power Transmission Corporation Facility Connection Guide can be found at:

<https://tso.nbpower.com/Public/en/docs-EN/Facility%20Connection%20Guide%20(EN).pdf>

Contact information for NB Power is as follows:

NB Power
515 King Street
PO Box 2000
Fredericton, New Brunswick
E3B 4X1

✆ 506.458.4444
🖱 <http://www.nbpower.com>

6.4.2 NAV Canada

NAV Canada assesses all land use proposals near airports and air navigation structures before construction begins to ensure that air safety and efficiency are not compromised. The Mill is located within the regulated airspace around the Saint John Airport (Figure 116). The Land Use Office of NAV Canada must be consulted to determine aviation-specific safeguards related to line-of-site obstructions, such as the new flue gas stack of the RB or even the crane that will be required to erect that structure.

Figure 116. General aeronautical chart showing the regulated airspace around the Saint John Airport in Saint John, New Brunswick. Map obtained from Skyvector.com.

The General Submission Form for NAV Canada can be found at:

<https://www.navcanada.ca/en/f-ldu-100-land-use-proposal-submission-form---general21december2021.docx>; and

And the Crane Submission Form can be found at:

<https://www.navcanada.ca/en/f-ldu-111-land-use-proposal-submission-form---cranes27june2022.docx>.

Contact information for NAV Canada is as follows:

NAV Canada
PO Box 3411 Station 'D'
Ottawa, Ontario
K1P 5L6

- 800.876.4693
- 877.663.6656
- <http://www.navcanada.ca>
- service@navcanada.ca

7.0 FUNDING

The capital expenditure for this Project is estimated at $1 1 billion (*i.e.*, 2023 dollars). The following is the general capital expenditure breakdown for the Project:

- new multi-effect evaporators: $175 million;
- new recovery boiler: $559 million;
- new turbine(s) and green energy generator(s): $244 million; and
- recausticizing plant expansion: $125 million.

As has been the case for the previous Mill Modernization Phases, this Project will be solely funded by Irving Pulp & Paper, Limited. No municipal, provincial, and / or federal monies will be used to design, construct, and / or operate this Project.

8.0 SIGNATURES

This Project Environmental Impact Assessment was prepared in accordance with the Environmental Impact Assessment Regulation [**87-83**] under the New Brunswick *Clean Environment Act* [**R.S.N.B. 1973, c. C-6**] and on the advice of and in consultation with the various Regulators. Fundy Engineering & Consulting Ltd. prepared the document on behalf of Irving Pulp & Paper, Limited. The Proponent has reviewed the document and understands the information contained within.

Respectfully submitted,

Proponent Signature:

Ms. Renée Morais, *P.Eng.*
Director of Environment
J.D. Irving Limited

Environmental Consultant Signature:

Dr. Matt Alexander, *P.Geo., FGC, EP*
Environmental Scientist
Fundy Engineering & Consulting Ltd.

21 May 2024

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10.0 GLOSSARY

aerodrome: an airport or airfield regardless of whether they involve air cargo, passengers, or neither, and regardless of whether they are for public or private use.

Air Dry Metric Tonnes (ADMT): refers to any pulp and paper sample that has its moisture content in equilibrium with the surrounding atmospheric conditions. Conventionally, air-dry pulps are assumed to contain 10 % moisture.

ambient: the surrounding area or environment.

anadromous: fish that hatch and rear in freshwater, migrate to the ocean to grow and mature, and then migrate back to freshwater to spawn and reproduce.

anthropogenic: caused by human activity.

Approval To Construct (ATC): Part I of the Air Quality Regulation [**97-133**] (*i.e.*, Sections 3 through 12) of the New Brunswick *Clean Air Act* and the Water Quality Regulation [**82-126**] of the New Brunswick *Clean Environment Act* [**R.S.N.B. 1973, c. C-6**] requires owners and / or operators of a facility that releases a contaminant to the environment to apply for and obtain approval for the construction of the source.

Approval To Operate (ATO): Part I of the Air Quality Regulation [**97-133**] (*i.e.*, Sections 3 through 12) of the New Brunswick *Clean Air Act* and the Water Quality Regulation [**82-126**] of the New Brunswick *Clean Environment Act* [**R.S.N.B. 1973, c. C-6**] requires owners and / or operators of a facility that releases a contaminant to the environment to apply for and obtain approval for the operation of the source.

aquifer: a saturated permeable geologic unit that can transmit significant quantities of water under ordinary hydraulic conditions.

archaeological and cultural features: all evidence of human occupation that comes out of the ground or underwater or on the ground, including shell middens, fishing stations, large First Nation villages, sugar-bush camps, shipbuilding yards, trading posts, shipwrecks, cemeteries, military forts, and a variety of other locations where humans, both long ago and more recently.

artifact: any ancient object that has been formed or altered by the human hand. There are thousands of types of artifacts in New Brunswick that can vary from 10 000 year old First Nation spear points to 17th century iron door hinges.

avian: a bird.

avoidance: the measures taken by a proponent to prevent impacts of a project on the environment.

baseline: background or pre-activity data that can be used for comparison when conducting further analyses.

bedrock: solid rock encountered below the soil or any other unconsolidated cover that occurs on the Earth's surface.

benthic: of, or relating to, the bottom or floor of a water body.

Best Management Practices (BMPs): techniques used to guide design and construction of an Undertaking to minimize adverse environmental impacts.

bioaccumulation: the buildup of a toxic substance within an organism over time.

bioassay: an analytical method used to determine the concentration or potency of a substance by its effect on living animals or plants or on living cells or tissues.

Biochemical Oxygen Demand (BOD; BOD_5): a standard measure of wastewater strength that quantifies the amount of oxygen consumed in a stated period of time and at a specific temperature, usually 5 days at 20 °C.

biogenic carbon dioxide: carbon that is absorbed, stored, and emitted by organic matter like soil, trees, plants, and grasses as a natural consequence of its lifecycle (*e.g.*, photosynthesis, burning, natural rotting of wood, decomposition of food scraps, *etc.*). Biogenic CO_2 emissions are considered carbon-neutral since a proportional amount of GHGs will be consumed by new organic matter that is released.

biological environment: considers the flora and fauna components of the environment and their interaction.

biomagnification: the increasing accumulation of a toxic substance in increasingly higher trophic levels.

biomass: waste material from plants that can be used in various industrial processes, such as energy production.

brackish: water that is slightly salty as it is a mixture of river water and sweater in estuaries.

brownfield: abandoned or underused industrial and commercial sites that may be or perceived to be contaminated and / or need extensive redevelopment.

bylaw: a law made by municipal government.

carbon dioxide (CO_2): an atmospheric gas, composed of carbon and oxygen, that is a major component of the carbon cycle and the predominant gas contributing to the greenhouse effect and is therefore known as a contributor to climate change. It is produced through natural processes, but is also released through anthropogenic activities, such as the combustion of fossil fuels to produce electricity.

carbon dioxide equivalent (CO_{2eq}): is used to compare the emissions from various greenhouse gases based on their global-warming potential by converting amounts of other gases to the equivalent amount of carbon dioxide with the same global-warming potential.

carbon intensity: a measure of the amount of carbon dioxide produced per unit of energy generated.

causticizing: process of converting recovered inorganics from the Kraft pulping burnt spent cooking fluids to regenerated cooking fluids; recycling of spent cooking fluids.

Chart Datum: Chart Datum is a plane of vertical reference to which all charted depths and drying heights are related; it is chosen to show the least depth of water found in any place under “normal” meteorological conditions; it is a plane so low that the water level seldom falls below it; it varies from place to place with the range of tide.

circa (ca): refers to an approximate date when the actual date is unknown.

***Clean Water Act*:** a provincial *Act* administered by the New Brunswick Department of the Environment, which deals with protecting the overall water environment for all New Brunswicker’s to enjoy.

***Clean Environment Act*:** a provincial *Act* administered by the New Brunswick Department of the Environment, which deals with protecting the overall environment for all New Brunswicker’s to enjoy.

climate: a description of aggregate weather conditions or the sum of all statistical weather information that is used to describe a place or region.

combustion emissions: air pollutants released solely because of burning material.

Committee On the Status of Endangered Wildlife In Canada (COSEWIC): a committee of experts that assesses and designated which wild species are in some danger of disappearing from Canada.

contamination: the presence of a substance of concern, or a condition, in concentrations above appropriate pre-established criteria in soil, sediment, surface water, groundwater, air, and / or structures.

contingency plan: a set of pre-determined actions to be taken in the event of an accident, malfunction, or unplanned event.

cooking fluids: the chemicals mixed with water during the pulp dissolving process, such as sodium sulphide and sodium hydroxide.

Crown land: territorial area belonging to the monarch who personifies the Crown. In Canada, it is considered public land and is apart from the monarchy’s private estate.

cultural resources: archaeological and historic resources that are eligible for or listed by the government including buildings, sites, districts, structures, or objects having historical, architectural, archaeological cultural, or scientific importance.

cumulative impact: the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions.

dBA: a sound level in decibels, measured with a sound level meter having metering characteristics and frequency weighting specified in American National Standard Specifications for sound level meters (ANSI S1.4-1971). It is common to refer to numerical units of an A-weighted sound level as "dBA". It is a frequency dependent correction that is applied to a measured or calculated sound of moderate intensity to mimic the varying sensitivity of the ear to sound for different frequencies.

deaerator: a device that removes oxygen and other dissolved gases (i.e., corrosives) from feed water to a boiler.

decibel (dB): the universal logarithmic unit of sound measurement used to quantify magnitudes of sound and vibration that is commonly measured using a metre that registers sound pressure and displays the level on a scale.

decommissioning stage: the stage of a project during which the proponent permanently ceases commercial production and commences removal from service of any components of the project, and that continues until the site is restored.

deleterious substance: a substance that is harmful or dangerous.

detailed engineering: the process of and result from refining and expanding the preliminary design of a system or component to the extent that the design is sufficiently complete to be implemented.

digester: a cylindrical pressure vessel used to treat wood chips with chemicals under elevated pressure and temperature to produce pulp for papermaking. Digesters can be stationary or revolving, horizontal or upright, cylindrical or spherical.

Dilute Non-Combustible Gases (DNCGs): traces of gases that will not ignite or burn.

do nothing alternative: assessing the impacts if the Undertaking is not to proceed (*a.k.a.*, the null alternative).

dregs: undissolved materials in the recovered cooking materials that consist of carbon and foreign materials that are primarily insoluble metal carbonates, sulphates, sulphides, hydroxides, and silicates.

earthquake: is the sudden release of stored elastic energy caused by the sudden fracture and movement of rocks along a fault; some of the energy released is in the form of seismic waves that cause the ground to shake.

ecosystem: a functional unit consisting of all the living organisms (*i.e.*, plants, animals, and microbes) in a given area, and all the non-living physical and chemical factors of their environment that are linked together through nutrient cycling and energy flow.

electrostatic precipitator: equipment used to clean flue and process gases by removing 99.5 % to 99.8 % of dust particles emitted by recovery boilers, lime kilns, and power boilers (*i.e.*, bark-fired boilers).

emission: a form of pollution discharged into a receiving body from smokestacks, pipes, vents, surface areas of commercial or industrial facilities, from motor vehicles, locomotives, aircrafts, *etc.*

endangered: a species that is facing imminent extirpation.

environmental impact: the difference in the condition of an environmental component under project-induced change versus what that condition might be in the absence of project-induced change.

Environmental Impact Assessment (EIA): a study undertaken to assess the effect on a specified environment of the introduction of any new factor that may upset the current ecological balance and includes the social and physical environment of the surrounding area.

Environmental Protection Plan (EPP): a description of what will be done to minimize the environmental effects pre-, during, and post-construction of the Undertaking. The plan also includes mitigation measures.

Environmentally Significant Area (ESA): spaces that are provided special protection because they represent a habitat that is integral to the overall ecological health of the region.

erosion: the wearing away of land surface by wind or water, which naturally occurs from weather or runoff but can be intensified by land-clearing practices related to farming, residential or industrial development, road building, timber cutting, *etc.*

Erosion and Sedimentation Control Plan: a site-specific document that identifies potential sources of stormwater pollution, describes practices to reduce pollutants in stormwater discharges from the site, and identifies procedures that personnel can use to mitigate stormwater pollution.

***Escherichia coli (E. coli)*:** coliform bacteria of fecal origin that are harmful to human health and are therefore used as an indicator organism in water analysis to indicate contamination of an intestinal origin.

evaporation: the process whereby water changes from the liquid to vapour state.

evaporators: used to concentrate spent cooking fluids to make it suitable for burning in the recovery boiler.

extinct: the death of the last individual of a species; the species ceases to exist on Earth.

extirpated: local extinction; ceases to exist within a defined geographical area, though it still exists elsewhere.

extreme weather: is weather that lies outside a locale's normal range of weather intensity (*e.g.*, hurricanes, tornadoes, ice storms, *etc.*); it is infrequent or rare and has the potential to be very destructive.

fauna: the collective animal life occurring in an area or time period, especially the naturally occurring indigenous animal life.

***Fisheries Act*:** a federal *Act* administered by the Department of Fisheries and Oceans with respect to fish and fisheries in Canadian Waters.

Fisheries Authorization: New Brunswick's fish-bearing streams are afforded protection under Section 35(2) of the *Fisheries Act* [**R.S.C., 1985, c. F-14**], which is administered through the Federal Department of Fisheries and Oceans. Whenever there is a chance that fish and fish habitat will be altered, disrupted, or destroyed by an Undertaking, an authorization is required.

floodplain: the part of the ground surface inundated with water on a recurring basis, usually associated with the one percent recurrence interval (100-year) flow.

flora: the collective plant life occurring in an area or time period, especially the naturally occurring indigenous plant life.

fly ash: is a combustion product comprised of particulates that are driven out of the recovery boiler with the flue / combustion gases.

fossil carbon dioxide: carbon that has not been absorbed by living matter, but has accrued over thousands or millions of years as a result of extreme atmospheric pressures (*e.g.*, oil, coal, gas, *etc.*).

fossil fuels: a naturally occurring fuel, such as coal or gas, that formed in the geological past as a result of organic material being buried.

Freehold land: land that is free from hold of any entity besides the owner. The owner enjoys free ownership for perpetuity and can use the land for any purposes and they do not require consent from the state for sale.

fugitive emissions: pollutants released to the atmosphere but not through stacks, vents, pipes, or any other confined air stream.

Fundy Coast Ecoregion: the southern area of New Brunswick along the Bay of Fundy that is characterized by a distinctive climate, reflected in recurring patterns of vegetation on comparable landforms and soils that are different from the six other New Brunswick Ecoregions.

geology: the science that studies Earth by looking at its composition and the processes past and present that shaped it, both on the surface and within.

glacial: pertaining to an interval of geologic time that was marked by an equatorward advance of ice during an ice age.

Global-warming potential: a relative measure of how much heat a greenhouse gas traps in the atmosphere; it compares the amount of heat trapped by a certain mass of the gas in question to the amount of heat trapped by a similar mass of carbon dioxide.

green energy: a type of energy that is generated from renewable technologies, such as solar energy, wind power, geothermal energy, biomass, and hydroelectric power. The sources are naturally replenished.

greenhouse gas: a gas (*e.g.*, carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorcarbons, sulphur hexafluoride, nitrogen trifluoride, *etc.*) that contributes to the greenhouse effect by absorbing radiation.

GreenHouse Gas Reporting Program (GHGRP): a Canada-wide single reporting system that tracks direct emissions from industrial, government, commercial, and other facilities that meet or exceed the reporting threshold for 26 greenhouse gases and gas species that are subject to mandatory reporting.

greenfield: a previously undeveloped open space, such as agricultural fields or forests, that has not been used for commercial or industrial activities and is presumed to be free of contamination.

grit: large insoluble particles and impurities contained within the lime slurry (*i.e.*, typically unreacted lime).

ground truth: the process of verifying the correctness of remote sensing information by use of ancillary information, such as field studies.

groundwater: subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

guideline: a recommended, non-mandatory, optional practice that is not legislated (*i.e.*, does not have the force of law), but is a statement of desired, good, or best practice. They are often departmental documents that are used to interpret legislation and / or regulation.

habitat fragmentation: a process whereby large tracts of the natural landscape are gradually developed and subdivided until only patches of the original habitat remain and those remaining patches are often too small and too far apart to support the survival and reproductive needs for many wildlife species during various stages of their lifecycle or in different times of the year.

hazardous materials: a solid, liquid, or gaseous material that, upon exposure, constitutes an identifiable risk to human health or the natural environment. Hazardous material criteria are established with regard to appropriate regulatory requirements.

heavy metals: dense metallic elements (those with a specific gravity of 5.0 or greater), such as cadmium, mercury, and lead, that cannot be metabolized by the body and, if accumulated, can cause toxic effects by interfering with various physiological functions.

hibernaculum: an over-wintering area used to hibernate and survive the winter; bats typically seek out caves to hibernate.

hog fuel: any type of wood byproduct or waste, other than chips, shavings, bark, or sawdust, that can be burned for fuel.

hydrocarbons: a broad family of organic compounds that are comprised predominantly of carbon and hydrogen in various combinations; crude oil, natural gas, petroleum products, *etc*. are all various forms of hydrocarbons.

hydrogeology: the scientific study of groundwater geology and the geological environments that control the occurrence, movement, production, and characteristics of groundwater.

hydrology: an earth science that encompasses the occurrence, distribution, movement, and properties of water.

impermeable: not allowing water to pass through.

Important Bird Area (IBA): an area recognized as being globally important for the conservation of bird populations. There are about 10 000 sites globally.

impregnation bin: a vessel used to hold wood chips while they absorb cooking chemicals.

infiltration: the movement of water from the land surface to the subsurface.

knot: small lumps of twisted fibres in pulp.

Kraft: the German and Swedish word for “strong” and used in reference to sulphate pulp because of its relative strength.

Kraft pulp (sulphate pulp): pulp produced by a process where the active cooking agent is a mixture of sodium hydroxide and sodium sulfate. This is the predominant chemical pulping process used globally because of the strength of the paper it produces.

land parcel: an area of land for which rights or ownership can be purchased.

land use: the way that land is developed and used in terms of the kinds of activities allowed (*e.g.*, agriculture, residences, industries, *etc.*).

lignin: one of the three main constituents of wood, along with cellulose and hemicellulose. Lignin acts as the cementing agent in wood, binding the cellulose fibers together; it is largely responsible for the strength and rigidity of plants.

lime kiln: an important component of a Kraft mill's chemical recovery system. Lime sludge (calcium carbonate) is burnt in the lime kiln to produce lime.

long-term impacts: those that are experienced for a prolonged period, such as during the entire duration (*i.e.*, operation) of the Undertaking.

machine dry tonnes: refer to Air Dry Metric Tonnes.

Magnitude (M): is a measure of the amount of energy released during an earthquake; all magnitude scales are calibrated to the original scale defined by Richter.

mainshock: is the largest earthquake in a cluster of earthquakes; mainshocks are sometimes preceded by foreshocks and generally followed by aftershocks.

may: the term used to express an option or that which is permissible within the limits of the requirement.

microbiology: the science and study of microorganisms (too small for the naked eye to detect), including protozoans, algae, fungi, bacteria, and viruses, and how they affect humans.

micro-climate: an area influenced by natural or human-made features that alter the climatic conditions from the general regional climate.

migratory birds: land birds that migrate very long distances to breed or escape temperatures outside their normal optimum temperature range.

mill: a factory or complex of factories that is designed or used to produce pulp and paper products.

mitigation: the measures taken by a proponent to reduce adverse impacts of a project on the environment.

morainal sediments: glacial drift materials deposited mainly by direct glacial action and possessing initial constructional form independent of the material beneath it.

Moving Bed Biofilm Reactor (MBBR): is a biological wastewater treatment process that uses engineered polyethylene carriers (media) to create a large protected surface on which biofilm can attach. The media is mixed in the reactor, and the large surface area provides more treatment capacity in a smaller volume compared to conventional treatment methods.

***n*:** see sample size.

National Pollutant Release Inventory (NPRI): a legislated and publicly-accessible Canada-wide database that tracks information about onsite releases, offsite transfers for recycling and disposal, and pollution prevention implemented by industrial, government, commercial, and other facilities.

nitrogen oxides (NO_X): a generic term for the most relevant oxides of nitrogen responsible for air pollution, such as nitric oxide and nitrogen dioxide. These gases contribute to the formation of smog and acid rain, as well as affecting tropospheric ozone.

noise: unwanted sound.

Non-Combustible Gases (NCGs): those gases that will not ignite or burn.

***no-net-loss*:** for this EIA it refers to wetlands and acknowledges that wetland alterations will occur, some naturally and some through necessary and beneficial (socially and economically) human activities, but that those losses must be avoided, minimized, and compensated for.

Northern Bleached Hardwood Kraft (NBHK): pulp that is made primarily from maple, birch, beech, and ash to provide sheen and quality in the production of printing and writing papers as well as tissue.

Northern Bleached Softwood Kraft (NBSK): the paper industry's benchmark grade of pulp that is produced mainly in Canada and the Nordic countries.

null alternative: assessing the impacts if the Undertaking is not to proceed (a.k.a. the do nothing alternative).

odour abatement: methods, practices, equipment, and technologies designed for the purpose of eliminating the emission and emanation of noxious odours.

olfactory: pertaining to the sense of smell.

operation and maintenance stage: the stage of the project during which the commercial production takes place, including periods during which commercial production may temporarily cease, and that continues until the start of decommissioning.

outcrop: exposed stratum or body of ore at the surface of the Earth.

oxygen delignification: processing the structure of lignin content in unbleached pulp so that it can be dissolved in the paper production process before bleaching.

Parcel / Property IDentification (PID) number: a unique number given to a land parcel for tracking information, such as deed holders, size, environmental issues, *etc.*

Parcel Information: Service New Brunswick (SNB) maintains a network of registries across the province where legal plans and documents related to the ownership of real property can be registered and made available for public scrutiny. The records in the Registries provide land ownership information dating back to the issuance of the original crown grants. Instruments registered or filed in the registry include deeds, mortgages, wills, subdivision plans, *etc*.

Particulate Matter (PM): a complex mix of extremely small solid and liquid matter suspended in air.

Particulate Matter$_{10}$ (PM$_{10}$): referred to as inhalable coarse particles > 2.5 micrometres in diameter but < 10 micrometres in diameter, such as those found near roadways and dusty industries.

a complex mix of extremely small solid and liquid matter suspended in air.

Particulate Matter$_{2.5}$ (PM$_{2.5}$): referred to as fine particles < 2.5 micrometres in diameter emitted from sources such as forest fires, power plants, industries, and automobiles.

permanent impacts: those that cause irreversible change to the environment.

Personal Protective Equipment (PPE): safety clothing, helmets, goggles, earplugs, steel-toe boots, or other garments or equipment designed to protect the wearer from body injury or infection.

petroleum hydrocarbons: a family of naturally occurring liquid organic compounds,

pH: a measure of the acidity or alkalinity of a solution; a measure of the hydrogen ion concentration on a scale of 0 to 14 where a value of 7 is neutral, values below 7 indicate an increasing level of acidity, and values above 7 indicate an increasing level of alkalinity.

physiochemical environment: considers the chemical and physical components of the environment and their interaction.

physiographic region: an area having a pattern of relief features or landforms that differ significantly from that of adjacent areas.

policy: a governing principle, which is not resolved on the basis of facts and logic only, that embraces general goals and mandates or constrains actions.

precipitation: any kind of water that falls from the sky (*i.e.*, snow, rain, freezing rain, sleet, hail, virga, *etc.*) as part of the weather at a specified place within a specified period of time.

posted speed: the speed that is established for a roadway and that motorists can legally travel.

potable: safe for human consumption, such that it can be used in the preparation of food and beverages or for the cleaning of utensils and dishes used in the preparation of food and beverages.

potable groundwater well: a hole bored, drilled, or otherwise constructed in the ground to tap an aquifer for obtaining a source of drinking water.

pulp digester: see digester.

pulp dryer: steam heated cylinders on the papermaking machine over which the wet paper passes and is dried.

receptor: a sensitive component of the ecosystem that reacts to or is influenced by environmental stressors.

recausticizing: see causticizing.

recovery boiler: a unit in Kraft pulping mills where the spent cooking fluids are burnt, after concentrating it in an evaporation process. The spent cooking fluids burnt in recovery boilers are used to recover inorganic chemicals and to produce energy.

Regulation: a form of law, which defines the application and enforcement of legislation. They are made under the authority of an Act.

Regulator / Regulatory Authority: the agency / department that oversees and applies the Act and regulations governing the environment; for this EIA the Regulator includes the City of Saint John, the New Brunswick Department of the Environment, the New Brunswick Department of Natural Resources, the Department of Fisheries and Oceans, and Environment Canada.

regulatory limit: the maximum concentration of a contaminant that can be within a specific sample without a cause for concern.

residual impact: the impact that remains after mitigation measures have been applied to reduce the activity's impact.

reverse osmosis filtration: a method of separating water from dissolved salts by passing feedwater through a semipermeable membrane at a pressure greater than the osmotic pressure caused by the dissolved salts.

runoff: the flow of water that occurs when excess stormwater, meltwater, or other sources flows over the Earth's surface.

Saint John Census Metropolitan Area: an area used for collecting census data, which is comprised of the city of Saint John, the suburbs of Rothesay, Quispamsis, Grand Bay-Westfield, and rural areas of Hampton and St. Martins.

Saint John Station A: the weather station at the Saint John airport where various weather parameters are monitored and recorded for determining the climate of the area.

salmonids: members of the fish family Salmonidae, which includes salmon, trout, and chars.

sample size (*n*): the number of samples in the data set.

sanitary waste: liquid or solid waste originating solely from humans and human activities, such as wastes collected from toilets, showers, wash basins, sinks used for cleaning domestic areas, sinks used for food preparation, clothes washing operations, and sinks or washing machines where food and beverage serving dishes, glasses, and utensils are cleaned, but does not include hazardous or radioactive materials.

screening: the separation of undesired materials, such as knots, shives, bark pieces, etc. into fractings according to their size and form.

sedimentation: the process of depositing soil particles, clay, sands, or other sediments that were picked up by wind or flowing water.

sedimentation basin: a depression that floodwater or stormwater is directed to in order to remove suspended matter by settling; flow into the basin causes a reduction in velocity, which allows suspended matter to settle.

seismic zone: an area of the Earth's crust in which movements, sometimes associated with volcanism, occur.

seismicity: the occurrence of earthquakes in space and time.

shives: tiny bundles of undercooked fibres in stock that have not been separated completely during pulping.

short-term impacts: those that are only experienced for a brief period or during a portion of the Undertaking (*i.e.*, during the pre-construction, construction, or commissioning).

should: the term used to express a recommendation or that which is advised but not required.

silt fence: a temporary barrier fence constructed of wood or steel supports and either natural (*e.g.*, burlap) or synthetic fabric stretched across areas of non-concentrated flow during construction activities to trap and retain onsite sediment runoff due to precipitation.

site: a subset or combination of properties, as defined by the scope of work.

site leveling: the process of modifying the topography along the Undertaking footprint to accommodate it.

sample size (*n*): the number of samples in the data set.

slaking: the process of combining quicklime with water to produce calcium hydroxide.

smelt: the inorganics collected at the bottom of the recovery boiler furnace that largely comprises sodium sulphide and sodium carbonate.

solid waste: non-liquid or gaseous waste that can be accepted for disposal in a landfill or incinerator and includes food waste, paper and cardboard, yard waste, metals, plastics, *etc.*, but does not typically include industrial waste, medical waste, or hazardous waste.

sound: a combination of pressure waves of different frequencies and amplitudes travelling through a medium, such as air or water.

sound frequency: the number of cycles per second that a sound save oscillates, which is usually expressed in Hertz (Hz).

sound intensity: the flow of sound energy through a unit area in a unit time, which is normally expressed in decibels (dB).

spatial: of or relating to space.

special concern: a species that may become threatened or endangered because of a combination of biological characteristics and identified threats.

***Species At Risk Act (SARA)*:** a federal *Act* administered by Environment Canada with the goal of protecting Canada's wildlife.

Stripper Off-Gases (SOGs): total reduced sulfur gases, partially dissolved in the continuous cooking digester and multiple effect evaporators, stripped from off-gas condensates using a countercurrent flow of air or steam multi-stage columns.

sulphur oxides (SO_X): a generic term for the most relevant oxides of sulphur responsible for air pollution, such as sulphur dioxide, sulphur trioxide, *etc.* These gases, especially sulphur dioxide, are emitted by the burning of fossil fuels contribute to the formation of smog and acid rain, as well as affecting tropospheric ozone.

surface water: all water that flows in watercourses and wetlands or is held in reservoirs above the Earth's surface.

surficial sediments: unconsolidated alluvial (*i.e.*, formed by running water), residual, or glacial deposits overlying bedrock or occurring on or near the surface of the earth.

sustainable: systems that focus on lasting longer and have less impact on the environment, particularly in relation to major global concerns, such as oil depletion and climate change. Sustainable products can be used indefinitely without the possibility of depletion, thus complementing ecological systems and ensuring intergenerational equity.

Technical Review Committee (TRC): with respect to an EIA review, the TRC is a group of professionals that are brought together to advise the regulator on matters related to their area of expertise.

temporal: of or relating to time.

terrestrial: relating to or inhabiting the land (*e.g.*, terrestrial plants live on the land as opposed to in the water).

The Paris Agreement: an agreement within the United Nations Framework Convention on Climate Change dealing with greenhouse gas emissions mitigation, adaptation, and finance, starting in the year 2020.

threatened: a species that is likely to become endangered if nothing is done to the factors leading to its extirpation or extinction.

till: unsorted and unstratified drift consisting of a heterogeneous (*i.e.*, non-uniform) mixture of clay, sand, gravel, and boulders that is deposited by and underneath a glacier.

topography: the physical features of a geographical area including relative elevations and the position of natural and anthropogenic features.

total coliforms: a family of rod-shaped mostly harmless bacteria that reside in the intestines of humans and other warm-blooded animals, which are shed in fecal material; their presence in potable water suggests that the water has received contamination of an intestinal origin.

total emissions: the sum total mass of each gas or gas species multiplied by their respective global warming potential.

Total Suspended Solids (TSS): a measure of the amount of particles that are dispersed in a liquid due to turbulent mixing, which can create turbid and cloudy conditions; includes a wide variety of materials, such as silt, organics, industrial wastes, and sewage.

trace metals: a group of metal elements, present in very low concentrations, that were analyzed within all the potable water samples collected for this baseline study and comprising 31 species.

Transitioning to a Low-Carbon Economy: a bold vision developed for New Brunswick to intensify efforts to combat climate change.

turbidity: a qualitative measurement of water clarity resulting from suspended matter that scatters or otherwise interferes with the passage of light through the water.

Universal Transverse Mercator (UTM) coordinate system: a mapping grid developed by the National Imagery and Mapping Agency (USA). The globe is divided into numbered zones, and within each zone northing and easting values are used to locate any point on the Earth's surface.

Valued Environmental Component (VEC): components of the human and physical environment that are considered important and therefore require evaluation through an environmental impact assessment.

varmint: small nuisance animals, such as raccoons, foxes, and coyotes.

Volatile Organic Compounds (VOCs): compounds, such as gasoline, that contain carbon and readily evaporate into the air; they contribute to the formation of smog and may be toxic.

wastewater: liquid or waterborne wastes polluted or fouled from household, commercial, or industrial applications along with any surface water, stormwater, or groundwater infiltration.

watershed: an area of land that drains to a single outlet and is separated from other watersheds by a divide.

Watercourse and Wetland Alteration (WAWA) permit: in New Brunswick, watercourses and wetlands are afforded protection under the *Clean Water Act* (Regulation 90-80) with respect to a temporary or permanent change made at, near, or to a watercourse or wetland or to the water flow in a watercourse or wetland. The permits are administered by the New Brunswick Department of the Environment.

watercourse: the full width and length, including the bed, banks, sides and shoreline, or any part of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch, or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not.

weather: the state of the atmosphere at any given time.

wellfield: an area containing one or more potable groundwater wells that is used to provide water.

wetland: land that either periodically or permanently, has a water table at, near, or above the land's surface or that is saturated with water and sustains aquatic processes as indicated by the presence of hydric soils, hydrophytic vegetation, and biological activities adapted to wet conditions.

11.0 REPORT DISCLAIMERS AND DISCLOSURES

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The information presented in an Environmental Impact Assessment is based upon work undertaken according to sound scientific and engineering / geoscience practices by trained professional and technical / scientific staff under a set scope of work and budget. The scope of services was defined by the New Brunswick Department of the Environment and Local Government's guidelines to Environmental Impact Assessment in New Brunswick [*NBDELG*, 2018][7] and the *NBDELG* [2014][8] Sector Guidelines for Timber Processing Projects. The budget was defined by Fundy Engineering based on the scope of work. Should future investigations provide information that supplements or differs from the information presented in this report, Fundy Engineering requests to be notified and permitted to reassess the results and interpretations provided herein.

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[7] https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/EIA-EIE/GuideEnvironmentalImpactAssessment.pdf
[8] https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/EIA-EIE/SectorGuidelines/TimberProcessing.pdf

PLEASE NOTE:

The Appendices have not been included with this document in order to save paper and the environment. If the reader wishes to view any of the appendices, please contact the consultant, Matt Alexander at 506.674.9422 or matt.alexander@fundyeng.com

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