Effluent Treatment Upgrade

Environmental Impact Assessment

J.D. Irving, Limited

LAKE UTOPIA PAPER MILL

UTOPIA, NEW BRUNSWICK

2 September 2016

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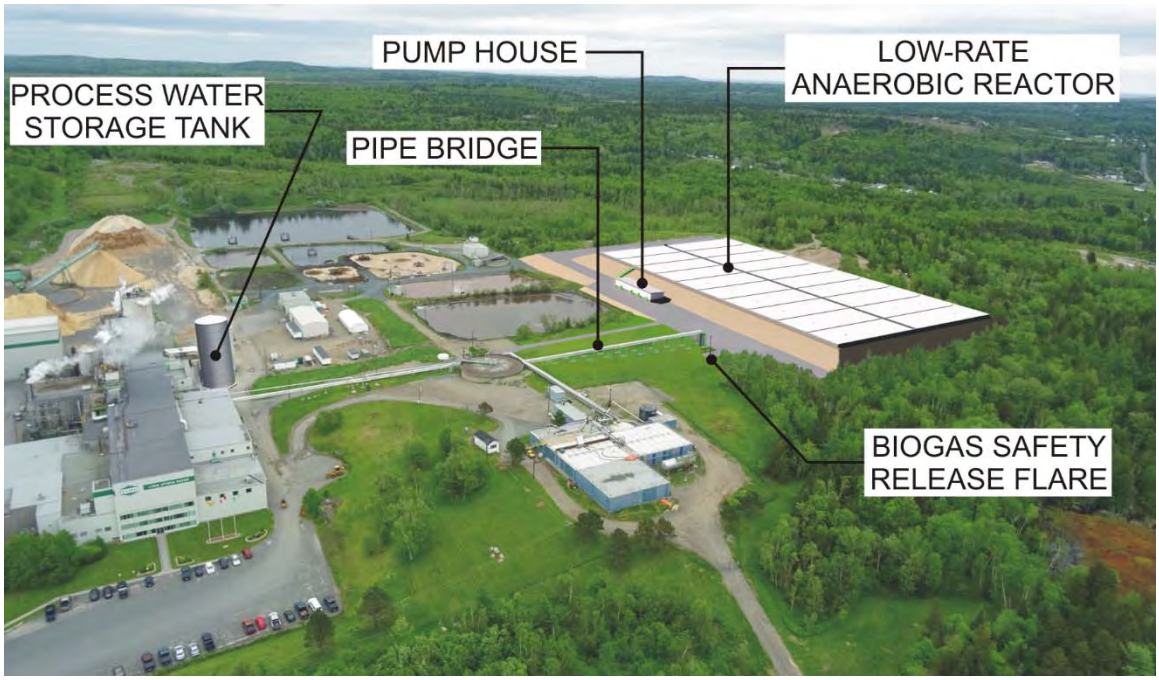
PROFESSIONAL SEAL:

EXECUTIVE SUMMARY

Lake Utopia Paper (LUP) has operated a high-quality corrugated medium mill in Utopia, New Brunswick since 1972. To remain current and maintain efficient and environmentally-sound processes, the Mill routinely undergoes modernization. As part of an on-going long-term multi-phase upgrade program to maintain the Mill's global competitiveness, LUP is proposing to install new best-available technology to replace part of the existing effluent treatment process. The current high-rate up-flow anaerobic sludge blanket digesters and associated equipment will be replaced. This Environmental Impact Assessment (EIA) details the *Effluent Treatment Upgrade* project planned for the Mill. The Project comprises installing and operating:

- a 2 300 m^3 process water storage tank;
- a 180 m long pipe bridge;
- a 150 000 m^3 low-rate anaerobic digester;
- a 280 m^2 pump house; and
- a biogas safety release flare.



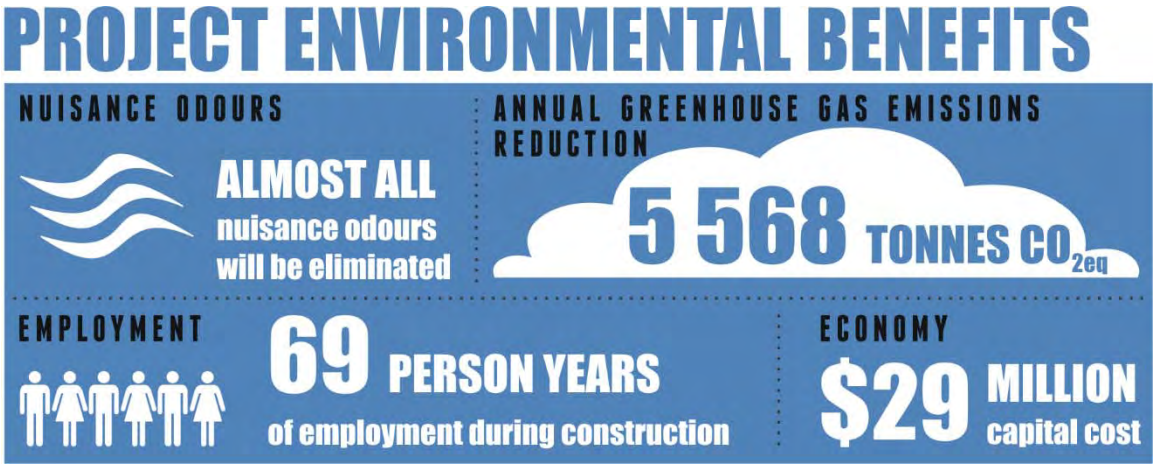
The effluent treatment upgrade project will be constructed and operated within the existing boundaries of the Mill property in Utopia, New Brunswick. That Mill has supported heavy industry in the area for about 45 years and has been one of the region's larger economic generators.

Currently, the Mill employs a full-time skilled labour force of about 140. Many more are employed at the Mill during routine maintenance, upgrades, and shutdowns. Approximately 510 Air Dry Metric Tonnes of corrugated medium are produced daily at the Mill using a variety of physical and chemical processes. Annually, J.D. Irving, Limited's forest products companies, which the LUP Mill is a part of, has total purchases of over $970 million in goods and services and has total employment wages of $714 million. The

LUP Mill contributes significantly to the communities and economy of southwestern, New Brunswick.

As per the Environmental Impact Assessment Regulation **[87-83]** of the New Brunswick *Clean Environment Act*, the renewal Project requires EIA review. An 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 are also presented to mitigate any identified potential environmental impacts. The New Brunswick Department of the Environment and Local Government (NBDELG) oversees the EIA process.

For LUP to remain successful in the global corrugated medium market, it is essential that they update the effluent treatment process. This Project offers several socio-economic and environmental benefits, including those shown in the infographic below.

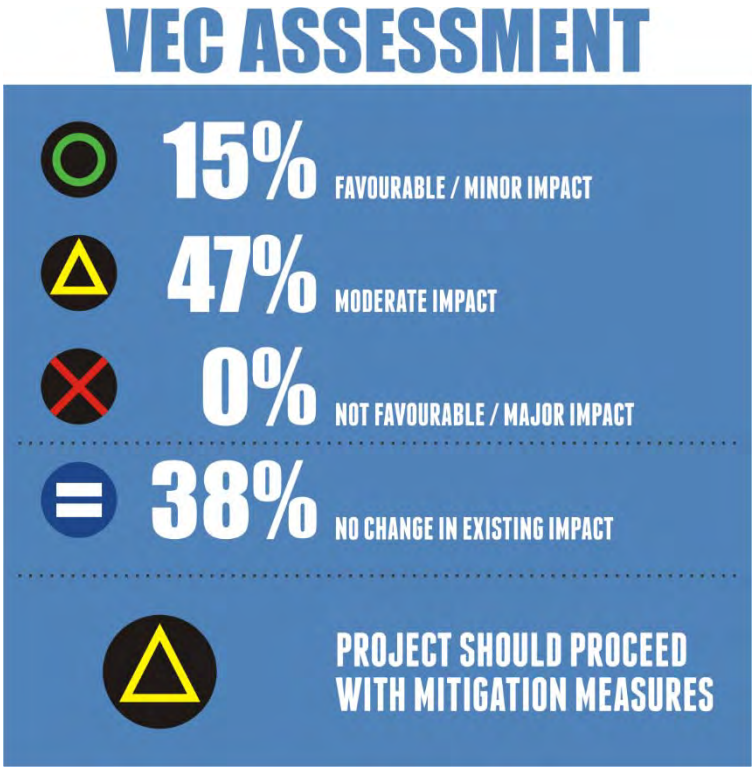


This EIA document provides a detailed Project description and a narrative on the baseline environment. Components of the existing environment that are described include the physio-chemical environment, the biological environment, and the socio-economic environment. The baseline environmental data was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

- physio-chemical environment:
  - air quality;
  - sound emissions;
  - surface water quantity and quality; and
  - groundwater quantity and quality;
- biological environment:
  - terrestrial flora and fauna;
  - aquatic flora and fauna; and
- socio-economic environment:
  - labour and economy;
  - land-use;

- transportation network;
- aesthetics;
- recreation and tourism; and
- health and safety.

Within this EIA document, a visual impact assessment process analogous to a traffic light was used for characterizing potential environmental impacts. All told, 156 specific possible impacts were assessed. In many instances, there are no changes anticipated as a result of the Project (n = 60 potential impacts); however, to determine an overall VEC impact assessment, only those interactions with potential impacts (n = 96) were considered. Based on that process, the EIA review yielded a yellow light. There are very few operational impacts associated with this Project; the majority of the yellow lights applied during the EIA review are for potential impacts during construction and / or mishaps, errors, and unforeseen events (*i.e.*, 53 % of yellow lights). Therefore, the Project should proceed as detailed within this EIA document.



A Project-specific Environmental Protection Plan (EPP) will be developed to mitigate any identified potential impacts. The EPP will dictate the importance of best-management practices that will be undertaken by all those associated with the Project to ensure environmental protection. 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.

The EIA process is an open and transparent process. There is a public consultation process that ensures those 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 registration, and are able to express any and / or all concerns they may have. This EIA

document is available for public comment until 7 October 2016. Although there is no requirement to host a public meeting, LUP held a public open house at the Magaguadavic Centre in St. George on 16 August 2016. Story boards were on display and attendees had the opportunity to discuss the Project with IPP staff. Attendees were informed that they are able to submit written questions for inclusion in a Public Consultation report.

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

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ACRONYMS

ADMT:	Air Dry Metric Tonnes
ACCDC:	Atlantic Canada Conservation Data Centre
AMSL:	Above Mean Sea Level
AOAS:	Approval Of A Source
ATC:	Approval To Construct
ATO:	Approval To Operate
ATV:	All-Terrain Vehicle
BOD:	Biochemical Oxygen Demand
BMPs:	Best-Management Practices
%:	Care Of
CO:	Carbon monoxide
CO_{2eq}:	Carbon dioxide equivalents
COSEWIC:	Committee On Status of Endangered Wildlife in Canada
cm:	centimetre
DAF:	Dissolved Air Flotation
dBA:	A-weighted deciBels (*i.e.*, relative loudness)
DDT:	Dichloro-Diphenyl-Trichloroethane
e.g.:	(*exempli gratia*) for example
EIA:	Environmental Impact Assessment
EMS:	Environmental Management System
EP:	Environmental Professional
EPP:	Environmental Protection Plan
ERP&ECP:	Emergency Response Plan & Environmental Contingency Plan

ESA:	Environmentally Significant Area
etc.:	(*et cetera*) and so forth
FOG:	Fats Oil and Grease
f*SARA*:	federal *Species At Risk Act*
GHG:	GreenHouse Gases
GHGRP:	GreenHouse Gas Reporting Program
GIS:	Geographical Information System
H_2S:	Hydrogen Sulphide
ha:	hectare
HDPE:	High-Density PolyEthylene
hp:	horsepower
hr:	hour
i.e.:	(*id est*) namely / that is
Inc.:	Incorporated
ISO:	International Standards Organization
JDI:	J.D. Irving, Limited
JOHSC:	Joint Occupational Health and Safety Committee
kg:	kilogram
km:	kilometer
km^2:	kilometers squared
kt:	kilotonne
kW:	kiloWatt
L:	Litre
LFL:	Lower Flammable Limit
LSD:	Local Service District
Ltd.:	Limited
LUP:	Lake Utopia Paper
m:	metres
m^2:	square metres
m^3:	cubic metres
mg:	milligrams
min:	minute
MLA:	Member of the Legislative Assembly

mm:	millimetre
MP:	Member of Parliament
Mt:	Megatonnes
mya:	million years ago
n:	statistical value that refers to the number of observations
N:	North
n.b.:	(*nota bene*) note well / take note
NB:	New Brunswick
NBDELG:	New Brunswick Department of Environment and Local Government
NBDOT:	New Brunswick Department of Transportation
NBDTHC:	New Brunswick Department of Tourism Heritage and Culture
NBFPI:	New Brunswick Forest Products Industry
NFPA:	National Fire Protection Association
Nm^3:	Normal cubic metres (*i.e.*, volumetric flow at normal temperature and pressure)
No.:	Number
NO_X:	Nitrogen Oxides
NPRI:	National Pollutant Release Inventory
NSCC:	Neutral Sulphite Semi-Chemical
O_3:	Ozone
OHSA:	*Occupational Health and Safety Act*
OWLS:	Online Well Log System
P.Eng.:	Professional Engineer
P.Geo.:	Professional Geoscientist
PDF:	Portable Document Format
PID:	Property IDentifier
$PM_{2.5}$:	Particulate Matter less than 2.5 microns
PO:	Post Office
ppb:	parts per billion
PPE:	Personal Protective Equipment
ppm:	parts per million
p*SARA*:	provincial *Species At Risk Act*
Q.C.:	Queen's Counsel
SARA:	*Species At Risk Act*

sCOD:	soluble Chemical Oxygen Demand
StatsCan:	Statistics Canada
SO_2:	Sulfur Dioxide
t:	tonnes
TRC:	Technical Review Committee
TSS:	Total Suspended Solids
UASB:	Up-flow Anaerobic Sludge Blanket
VEC:	Valued Environmental Component
VOCs:	Volatile Organic Compounds
yr:	year
W:	West
WANS:	Waste ANaerobic Sludge
[C]:	Concentration
° C:	degrees Celsius
%:	percent
µ:	microns
>:	greater than
<:	less than
~:	approximately
°:	Degrees
‘:	Minutes
“:	Seconds
±:	plus / minus

1.0 PROPONENT

1.1 PROPONENT NAME

The proponent for this Project is Lake Utopia Paper (LUP), a division of J.D. Irving, Limited (JDI).

1.2 PROPONENT ADDRESS

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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. 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 on the land parcels identified in the New Brunswick Geomatics Information Centre database as Property IDentification (PID) numbers 15017072 and 15079221, which are both owned by JDI. These two properties are part of the Lake Utopia Paper Mill in Utopia, New Brunswick (Figure 1). Detailed PID information is included in Appendix I.

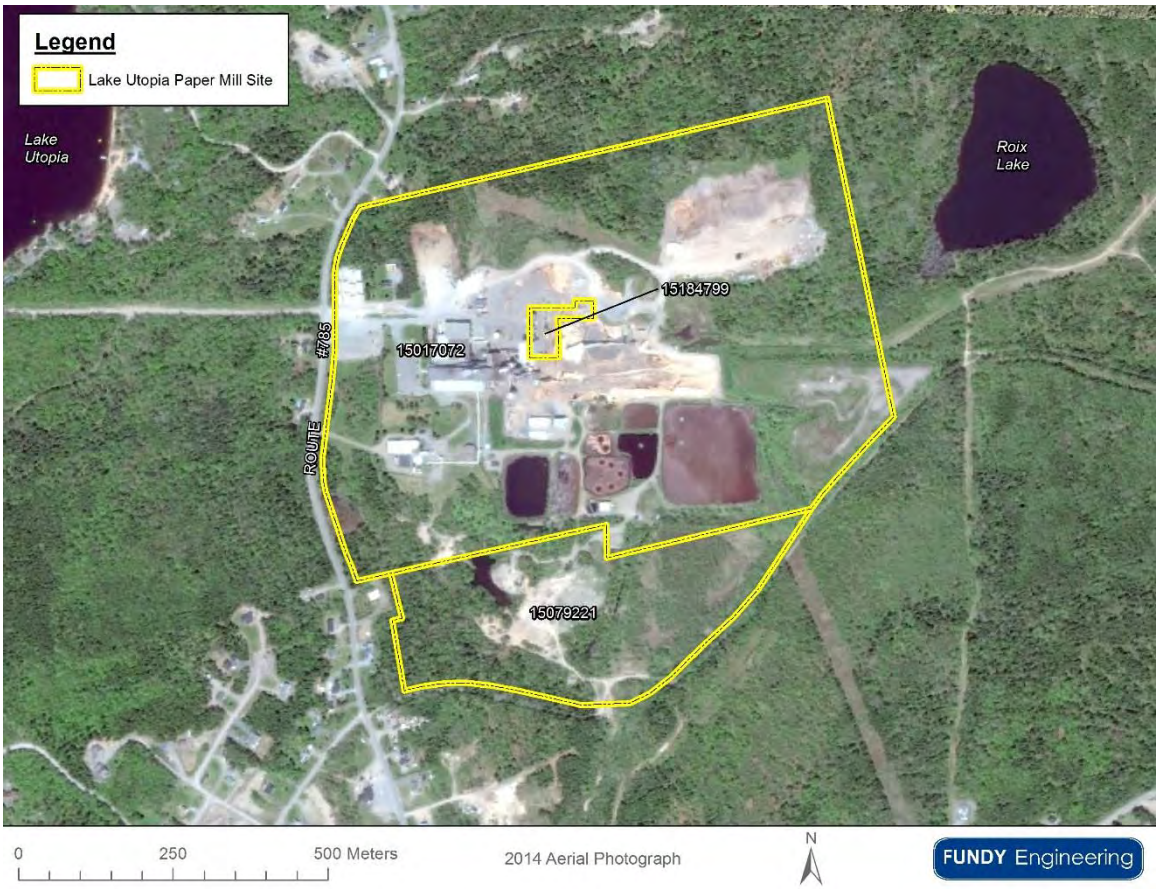


Figure 1. Aerial photograph, circa 2014, showing the Lake Utopia Paper Mill in Utopia, New Brunswick.

In the PID information, the LUP Mill is identified as being Industrial Land (*i.e.*, for heavy industrial use; Figure 2; see Appendix I). The area where the Project will be undertaken is shown in Figure 3.

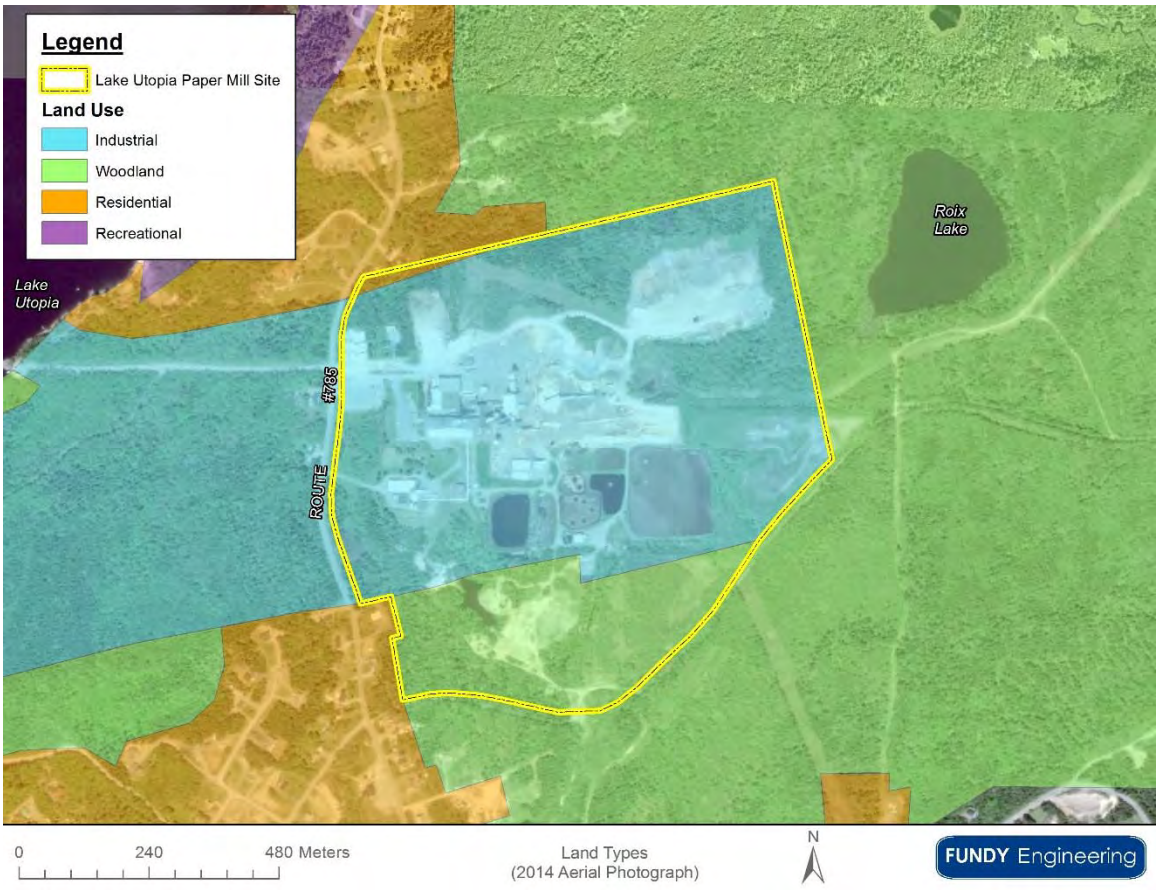


Figure 2. Aerial photograph, circa 2014, showing the land zoning in the vicinity of the Lake Utopia Paper Mill in Utopia, New Brunswick.

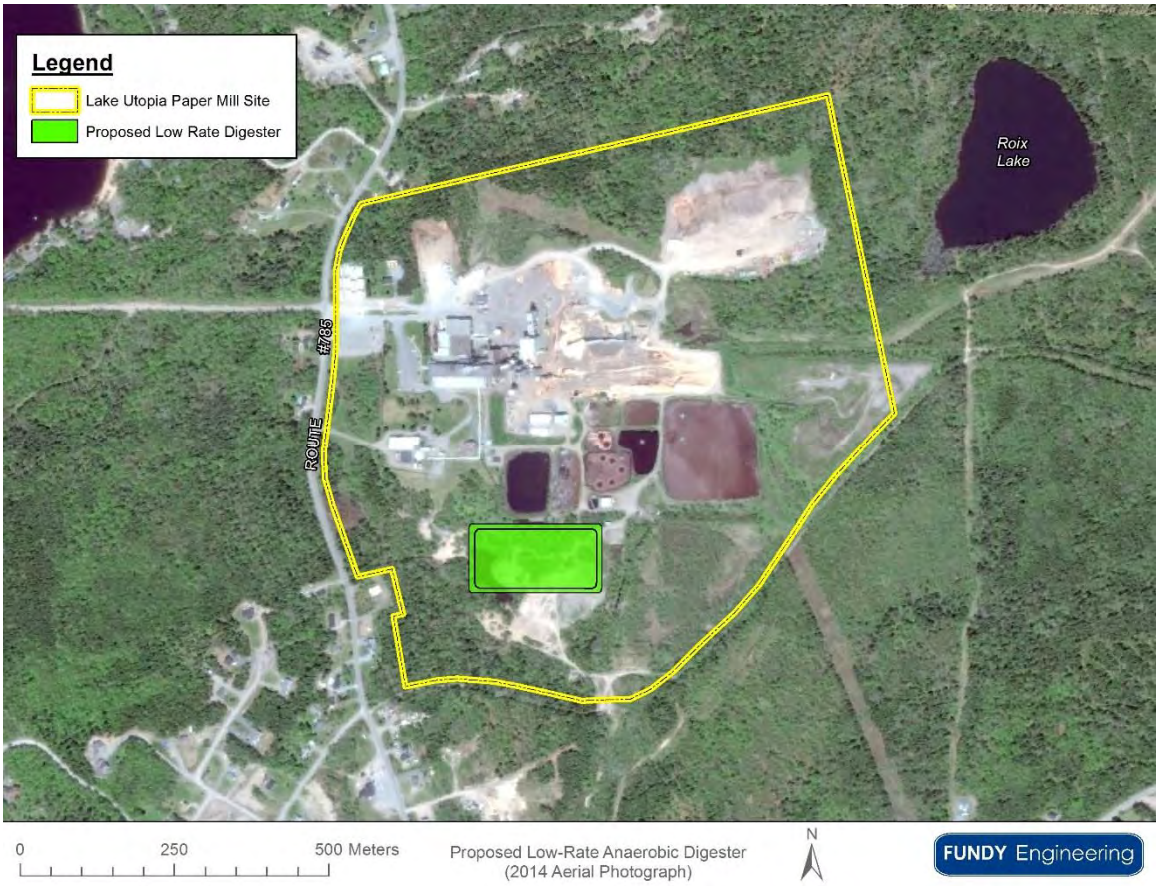


Figure 3. Aerial photograph, circa 2014, showing the area where the effluent treatment upgrade project will take place at the Lake Utopia Paper Mill in Utopia, New Brunswick.

2.0 PROJECT DESCRIPTION

2.1 PROJECT NAME

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

EFFLUENT TREATMENT UPGRADE

2.2 PROJECT OVERVIEW

LUP has operated a high-quality corrugated medium mill (*i.e.*, the Mill) in Utopia, New Brunswick (Figure 4) since 1972. For about two years prior to that, the Mill was operated by the Province under the name Fundy Forest Products (*n.b.*, the Mill became operational in April 1971). The Mill, which is located 6.5 km east of the Town of St. Stephen (partly in Pennfield Parish and partly in Saint George Parish), has undergone substantial upgrades over the past five years to become the world class corrugated medium producing facility that it is today. Presently, the Mill produces approximately 510 Air Dry Metric Tonnes (ADMT) per day of corrugated medium in two grades (*i.e.*, a high-performance pulp and a recycled pulp) using a variety of physical and chemical processes. The corrugating medium is a key component of box packaging for a broad range of industries, including food and beverage, consumer goods, industrial, agriculture, and electronics.

Figure 4. The Lake Utopia Paper Mill located in Utopia, New Brunswick.

The corrugated medium produced at the LUP Mill comprises approximately 65 % virgin hardwood fibre and 35 % recycled content (*i.e.*, recycled cardboard). The virgin pulp is produced using the Neutral Sulphite Semi-Chemical (NSCC) pulping process, which consists of the following operations:

- hardwood preparation (*i.e.*, debarking and chipping) and storage (*i.e.*, on-site chip piles);

- cooking liquor preparation and storage;
- pulping process;
- mechanical refiners; and
- pulp storage.

The recycle pulping process consists of the following operations:

- agitating the cardboard with water to create a slurry;
- passing the slurry through several mechanical screens to remove contaminants; and
- pulp storage.

The two fibres are blended together and passed through additional screens and mechanical cleaners before being delivered to the paper machine. Liquid effluent from the pulp and paper process is treated on-site in a liquid effluent treatment plant (Figure 5) that comprises a primary gravity clarifier, high-rate Up-flow Anaerobic Sludge Blanket (UASB) digesters, an activated sludge system, and a secondary gravity clarifier. There is a Dissolved Air Floatation (DAF) clarifier installed as a backup system to the secondary gravity clarifier.

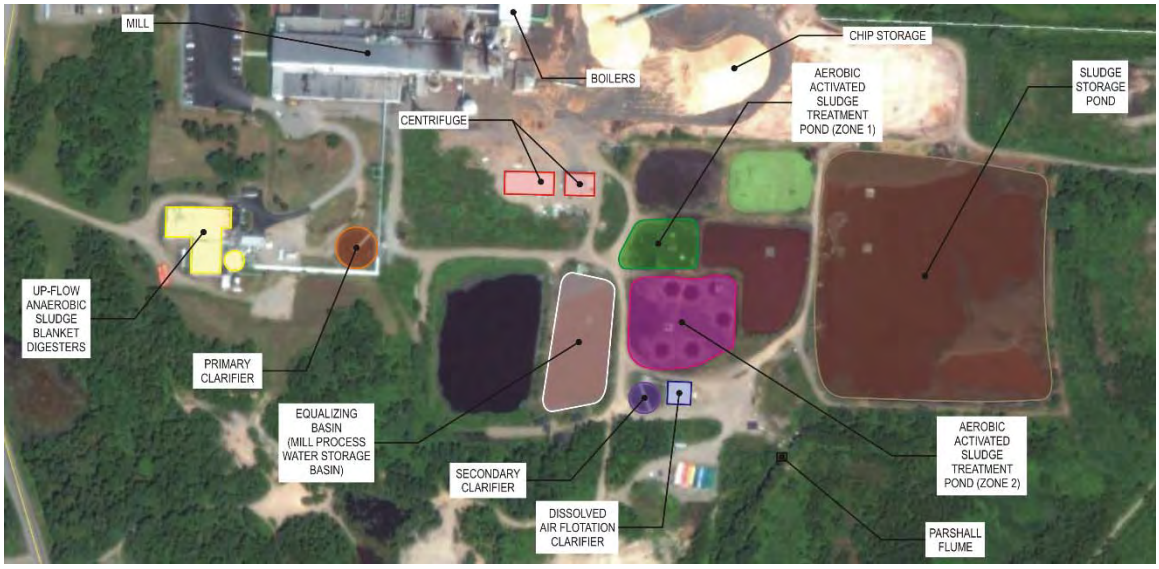


Figure 5. Existing components of the effluent treatment system at the Lake Utopia Paper Mill located in Utopia, New Brunswick.

The existing on-site anaerobic digesters (Figure 5), which were installed in 1985, were designed for a soluble Chemical Oxygen Demand (sCOD) loading rate of 60 tonnes per day. Today, production at the Mill yields sCOD loading rates almost double the existing plant's design capacity. This has resulted in inconsistent Mill production rates.

Historically, high and variable sCOD concentrations in the Mill's effluent have been treated by reducing machine production rates while producing high-content virgin pulp fibre grades. Production rates were lowered in order to ensure effluent discharge characteristics remain in compliance with the Mill's Approval to Operate (ATO) issued by the New Brunswick Department of Environment and Local Government (NBDELG). The

current system design has also resulted in undesirable odours being emitted, which negatively affects the surrounding community.

To allow LUP to maintain consistent machine production without limitations resulting from effluent treatability, the Mill is proposing to upgrade the effluent treatment system. This will be done by installing a new simple, easy-to-operate low-rate anaerobic digester. That digester will be a maintenance replacement for the current anaerobic effluent treatment plant. The new low-rate anaerobic digester will be adequately sized to meet current and future effluent treatment and operating approval requirements and will yield a uniform final effluent quality. The new treatment system will be resilient to variations in influent characteristics, such as organic loading, influent solids concentrations, pH, temperature, alkalinity, *etc.* This will allow LUP to maintain consistent machine production without limitations that currently result from effluent treatability.

Briefly, the Project comprises installing and operating a process water storage tank and a low-rate anaerobic effluent treatment digester and associated pumping equipment. An insulated geomembrane liner system will entirely cover the ~ 150 000 m^3 digester (*i.e.*, 102 m × 204 m × 8.5 m liquid depth).

Once installed and in operation, the digester is expected to:

- provide a consistent effluent flow through the treatment system;
- provide a consistent effluent quality that continuously meets discharge requirements;
- generate recoverable green energy (*i.e.*, heat and power) that can be used to supplement fuel demand at the Mill);
- produce a waste sludge suitable for land application as a nutrient-rich fertilizer; and
- reduce undesirable odours produced through the treatment of process effluent.

To remain current and maintain efficient and environmentally-sound processes, the Mill routinely undergoes modernization. As part of an on-going long-term multi-phase upgrade program to maintain the Mill's global competitiveness, LUP is proposing to install new best-available technology to replace the existing high-rate UASB digesters and associated equipment (*i.e.*, the Project). **It is important to note that this Project replaces an existing system at the Mill and all new equipment will be fully integrated into the Mill's existing advanced control systems and operations.**

Pulp and paper production is the most capital-intensive manufacturing industry in North America. Because of this, long time horizons of between 25 and 50 years are typical when undertaking large capital projects. As with many capital-intensive industries, economies of scale apply, giving lower specific investment costs for larger equipment.

The effluent treatment upgrade project offers environmental benefits, which are highlighted and summarized in Table 1. Most notable will be the reduction of odour from the existing treatment process.

Table 1. Expected benefits and consequences of the proposed effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick.

Parameter	Anticipated Change	Results From
NET PROJECT BENEFITS		
Energy consumption	66 % reduction	The low-rate anaerobic digester will have total installed power of 145 kW and require 70 kW of continuous running power compared to 600 kW and 275 kW, respectively, for the existing UASB system
Steam use	4 540 kg · hr^{-1} decrease*	Replacing the open-air equalization ponds with the process water storage tank
Green House Gas (GHG) emissions	5 568 tonnes CO_{2eq} · yr^{-1} reduction	Due to a reduction in indirect GHG emissions from electricity consumption from NB Power, a reduction in GHG emissions related to steam generation, and a reduction in natural gas used due to additional off-set by biogas
Energy from biogas generation at the Mill	30 % increase	Increase in biogas quantity generated and higher methane content will offset purchases of natural gas for energy
Odour emissions	Considerable reduction	Replacing the existing UASB system with a new gastight system and by installing a new process water storage tank that will reduce the use of outdoor storage ponds
More consistent effluent	Continuously meet regulatory discharge requirements for BOD, TSS, and toxicity	Installing the process water storage tank and the low-rate anaerobic digester will provide a stable flow through the treatment process that has a much higher treatment capacity than the existing UASB system
Effluent treatment by-products (*i.e.*, biogas and compostable solid residuals)	Higher quality	More consistent and improved effluent treatment
LUP's competitive position	Improvement	Increased effluent treatment capacity, which allows for additional paper grades to be produced
Local purchases	$29 million with 90 % being spent directly in NB	Capital expenditure on the Project
Construction jobs	69 person years	Project construction (137 500 person hours)
PROJECT CONSEQUENCES		
GHG emissions	4 707 tonnes CO_{2eq}†	Emissions from construction equipment and worker's vehicles

NOTES:
*During the winter months (*i.e.*, December, January, February, March, and April)
†These emissions are short-term (*i.e.*, 15 months) and will be offset after about 10 months of the low-rate anaerobic digester being in operation

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 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*, the Project triggers EIA review. This EIA was prepared by Fundy Engineering & Consulting Ltd. (Fundy Engineering) on behalf of LUP (℅ Mr. David Muir). The EIA identifies any potential environmental impacts this Project may pose and presents measures to mitigate those potential environmental impacts. This EIA meets the requirements of the *NBDELG* [2012] guide to EIAs and the *NBDELG* [2004] Sector Guidelines for Timber Processing Projects.

2.4 PROJECT PURPOSE / RATIONALE / NEED

The New Brunswick Forest Products Industry (NBFPI) is an integral component of the Province's natural resource-based economy. More than 7 million hectares of forested lands are managed throughout the Province. In 2010, forestry accounted for 5.1 % of the Province's Gross Domestic Product. Throughout the Province the NBFPI is a direct employer to about 11 600, who in 2010 earned more than $1 billion in wages and salaries.

Southwestern New Brunswick is the heart of the NBFPI; about one out of every 25 people in Saint John and one out of every five people in St. George is employed by the forest-related industry, respectively. One of the largest NBFPI employers in Charlotte County is the LUP Mill, which has a labour force of approximately 140 and indirectly employs about 160 people. Those workers provide a crucial link in the use of the Province's wood resource by processing sawmill by-products (*i.e.*, wood chips). Annually, the JDI's forest products companies (*i.e.*, Pulp and Paper Mills, tissue mills, sawmills, and woodlands operations) of which the LUP Mill is part of, has total purchases of over $970 million in goods and services and has total employment wages (*i.e.*, direct and indirect) of $714 million. The LUP Mill contributes significantly to the communities and economy of southwestern New Brunswick.

The global market for supplying corrugated medium is extremely competitive. For LUP to remain successful in that competitive market, it is essential that they continuously upgrade major equipment with more efficient and higher quality producing technologies. This Project is one such required upgrade that is part of a long-term asset renewal program for ensuring the Mill remains economically viable.

The Project will allow more high-performance grade corrugated medium to be produced. That product has a higher economic value than the recycled grade corrugated medium that is also produced at LUP. This will be a considerable advantage to supplying product to customers. The Project will also allow the effluent treatment system to process higher BOD concentrations that are sometimes associated with the production of pulp at LUP. This treatment will be significant to improving effluent quality from the Mill.

Overall, this Project will maintain a livelihood for many New Brunswickers by ensuring that the Mill, which is a key asset of New Brunswick's forest products industry, remains efficient to contribute to effective productivity, product quality, and profitability. The 15 month

construction stage of the Project will provide a considerable volume of jobs (*i.e.*, 69 person years of work) to the southwestern New Brunswick region.

2.5 PROJECT LOCATION

Operationally, it is necessary to site the process water storage tank and low-rate anaerobic digester in close proximity to other existing effluent treatment processes at the Mill. The storage tank and digester will be constructed on the Mill property in locations that are most appropriate for integration into the Mill's existing effluent treatment process.

The permanent Project infrastructure will be constructed and operated adjacent to the Mill's existing effluent treatment processes (Figure 6) and entirely within the boundaries of the current Mill (*i.e.*, PIDs 15017072 and 15079221; refer to Figure 1) with central coordinates for the digester of 45°09'14.64"N and 66°46'12.88"W.

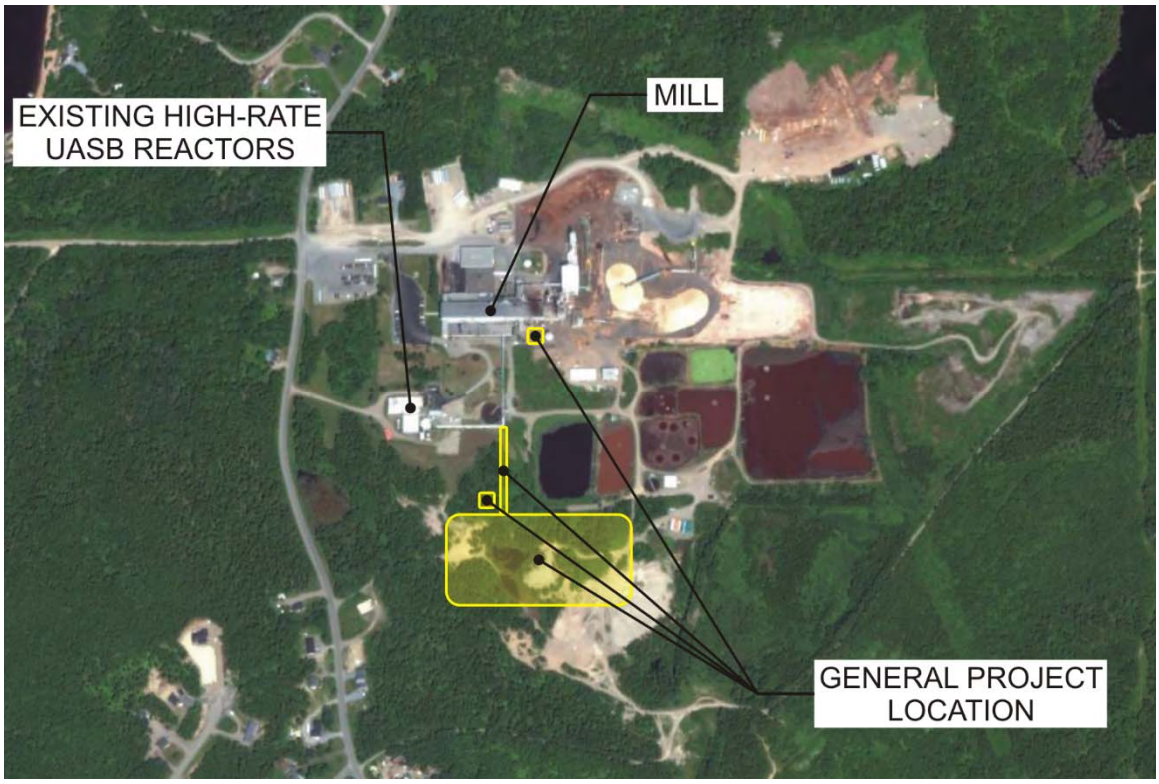


Figure 6. Aerial photograph showing the Lake Utopia Paper Mill in Utopia, New Brunswick and the general location of the effluent treatment upgrade project.

The new process water storage tank and low-rate anaerobic digester will be located in different locations on the Mill site compared to where the existing high-rate UASB digesters are located. There are several beneficial reasons for relocating to a new area at the Mill. First, construction in the new locations will allow the Mill to operate uninterrupted during the entire construction stage and once the process water storage tank and low-rate anaerobic digester are in operation, the existing high-rate UASB digesters can be shut down. Second, a larger footprint is needed for the low-rate anaerobic digester than is available in the location of the existing high-rate UASB digesters. Lastly, locating in the areas proposed will allow the Project to be concealed

from view by surrounding landowners because it takes advantage of existing grades and tree growth.

2.5.1 Project Alternatives

2.5.1.1 Null Alternative

The null alternative (*i.e.*, the do-nothing approach) was considered in order to provide a baseline against which 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. Not completing this Project will result in the continued effluent treatability issues at the LUP Mill and limit consistent machine production. Because of this, the null alternative is not a feasible option and was not considered further.

2.5.1.2 Treatment Technology

Different treatment technologies were reviewed for the digester. High-rate and low-rate anaerobic digesters were considered for treating effluent at the LUP Mill. A high-level comparison of the two technologies is provided in Table 2.

Table 2. High-level comparison between a high-rate anaerobic digester and a low-rate anaerobic digester for treating process effluent at the Lake Utopia Paper Mill in Utopia, New Brunswick.

Parameter	Comments	Digester Type*	
		High-Rate	Low-Rate
sCOD removal efficiency	The removal efficiency for the high-rate digester (60 % to 65 %) is slightly lower than that for the low-rate digester (65 % to 70 %)		✓
System stability and robustness	The low-rate digester is able to handle toxicity shocks (*i.e.*, there are no toxicity limits)		✓
Sludge handling and disposal	The high-rate digester produces considerably more sludge that has to be handled and disposed of in an environmentally-sensitive manner		✓
Dredging	The low-rate digester produces a much lower volume of return activated sludge, which requires dredging		✓
Digester footprint	The low-rate digester requires a substantially larger footprint	✓	
Operational complexity	There are far fewer moving parts within the low-rate digester, which makes its operation more simplistic		✓
Odour	The low-rate digester is an enclosed system that will capture H_2S emissions and considerably reduce the associated nuisance odours		✓
Capital costs	The capital cost for the low-rate digester is considerably lower than that for the high-rate digester		✓

NOTES:
*check marks indicate which process is better in the comparison

The low-rate anaerobic digester was selected for this Project because it yields two key benefits over the high-rate anaerobic digester:

1) it is capable of absorbing toxicity shocks caused by sCOD spikes that occur during Mill upset events; and
2) it will considerably reduce hydrogen sulphide (H_2S) emissions and the associated nuisance odour issues.

2.5.1.3 Site Location / Orientation

Six different locations / orientations were assessed for siting the low-rate anaerobic digester (Figure 7). JDI owns the land for all of the sites assessed. Table 3 presents a high-level assessment of the different locations / orientations. Based on the assessment, Option 1B was identified as the most suitable site for the low-rate anaerobic digester.

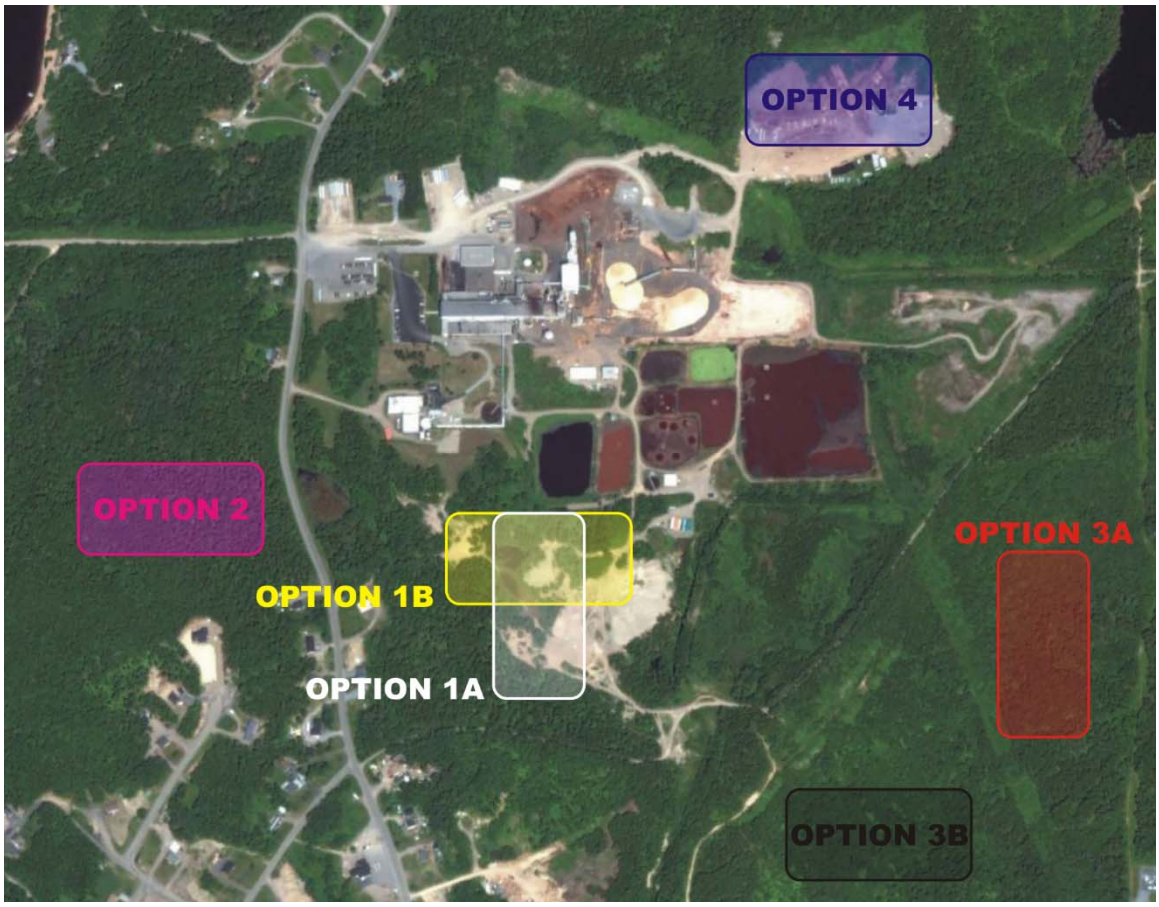


Figure 7. Aerial photograph showing the six different locations / orientations that were considered for siting the low-rate anaerobic digester at the Lake Utopia Paper Mill in Utopia, New Brunswick.

Table 3. High-level ranking of the six options assessed for siting the low-rate anaerobic digester at the Lake Utopia Paper Mill in Utopia, New Brunswick.

Parameter	Option and Ranking*					
	1A	1B	2	3A	3B	4
Distance to Mill	1	1	2	4	4	3
Proximity to neighbours / visibility	6	4	5	2	3	1
Land preparation required	2	2	3	3	3	1
Capital cost	2	1	3	5	5	4
OVERALL RANKING	3	1	4	5	6	2

NOTES:
*The lower the number, the higher the ranking and vice versa

2.6 PROJECT DETAILS

The main components of the Project (Figure 8) include installing and operating:

- a 2 300 m^3 process water storage tank;
- a 180 m long pipe bridge;
- a 150 000 m^3 low-rate anaerobic digester;
- a 280 m^2 pump house; and
- a biogas safety release flare.

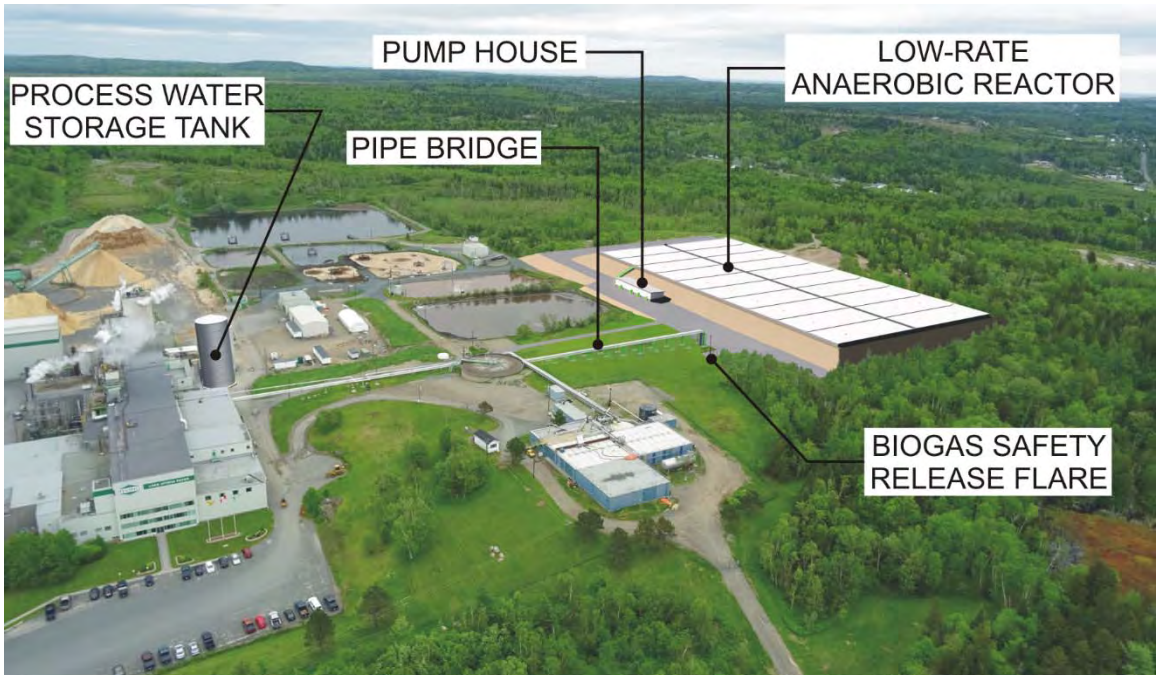


Figure 8. Three-dimensional model looking southeast towards the process water storage tank, low-rate anaerobic digester, and associated components proposed for the Lake Utopia Paper Mill in Utopia, New Brunswick.

All new equipment will be fully integrated within the Mill's existing advanced process control systems and operations. Each of the aforementioned Project components is described in the sections that follow. Schematics showing the existing and new process flow are shown in Figure 9 and Figure 10, respectively.

The typical influent and effluent characteristics to the low-rate anaerobic digester are summarized in Table 4. A 75 % sCOD reduction rate is anticipated using this treatment process.

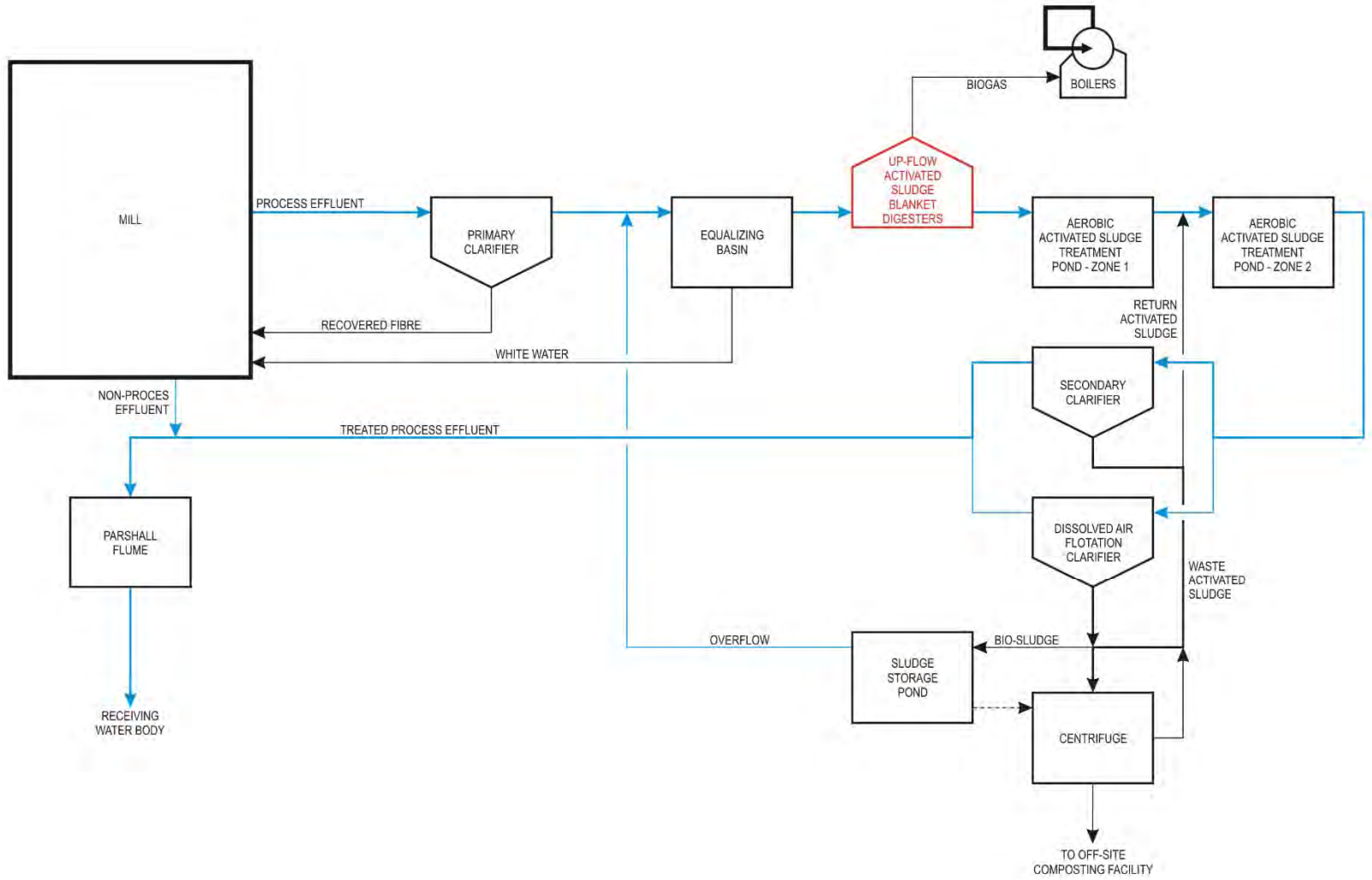


Figure 9. Schematic showing the existing process water effluent treatment system at the Lake Utopia Paper Mill in Utopia, New Brunswick. The up-flow activated sludge blanket digesters that will be replaced are outlined in red.

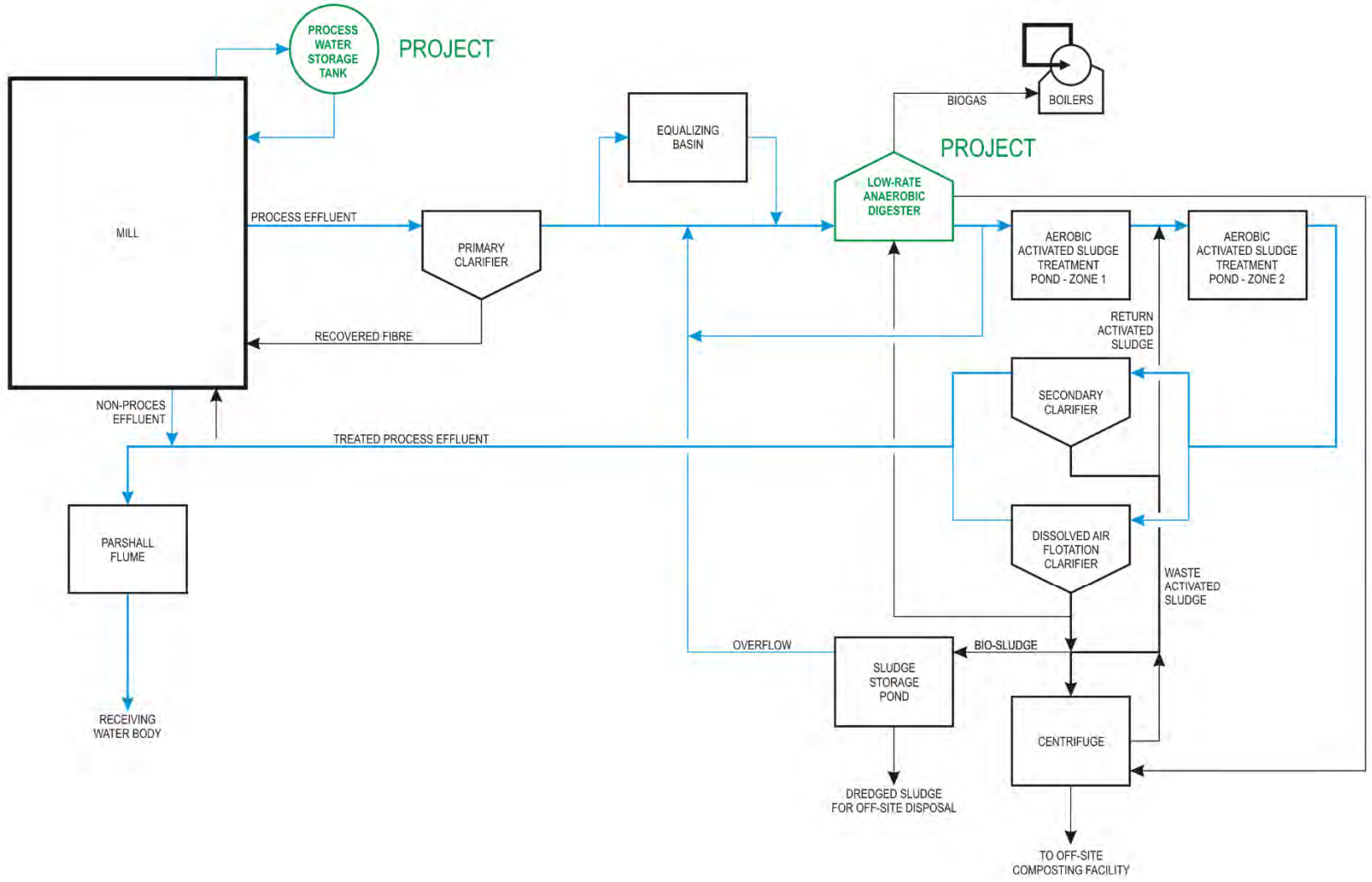


Figure 10. Schematic showing the proposed process water effluent treatment system at the Lake Utopia Paper Mill in Utopia, New Brunswick. The process water tank and low-rate anaerobic digester that will be installed are outlined in green.

Table 4. Influent and effluent characteristics of the low-rate anaerobic digester planned for the Lake Utopia Paper Mill in Utopia, New Brunswick.

Parameter	Influent*	Effluent*
Flow ($m^3 \cdot day^{-1}$)	5 400	5 400
Soluble chemical oxygen demand ($mg \cdot L^{-1}$)	36 000	9 000
Soluble chemical oxygen demand loading rate ($kg \cdot day^{-1}$)	194 500	64 185†
Total suspended solids ($mg \cdot L^{-1}$)	800‡	800
pH	5.0 to 6.0	7.0 to 8.0
Temperature (° C)	32 to 38	30 to 38

NOTES:
*These are average parameters
†This is the minimum expected to be achieved
‡Total suspended solids are expected to be 1 000 $mg \cdot L^{-1}$ to 1 500 $mg \cdot L^{-1}$ (with peaks of 2 000 $mg \cdot L^{-1}$ for up to 28 days) with 70 % digestable TSS for the first one to two years of operation (*i.e.*, during seeding of the digester)

2.6.1 Process Water Storage Tank

Water removed during the paper forming process and collected at the Mill will be sent to the process water storage tank instead of to an open lagoon, which is currently done. The 2 300 m^3 process water storage tank (Figure 11) will offer downstream benefits in the effluent treatment process. Predominantly, it will provide a consistent flow of effluent from one treatment component to the next so that the components are able to operate within their optimal design parameters. This will yield the best sCOD and BOD conversion and generate sludge and biogas with consistent characteristics.

Figure 11. Three-dimensional model looking east towards the process water storage tank proposed for the Lake Utopia Paper Mill in Utopia, New Brunswick.

Adding the process water storage tank will limit the use of the existing equalizing basin (*n.b.,* the equalizing basin may continue to be used during upset conditions), thus eliminating undesirable H_2S odour associated with the open-air basins. Eliminating use of the equalization pond in the winter months will yield steam savings at the Mill of about 4 540 kg · hr^{-1}.

2.6.2 Pipe Bridge

A 180 m long pipe bridge will be constructed to support piping and wiring that connects the new low-rate anaerobic digester to the existing effluent treatment process. The pipe bridge will be supported by several steel bents founded on spread concrete footings. In addition to cabling, the pipe bridge will support a process water influent pipe and process water effluent pipe, which will both be 30.5 cm in diameter.

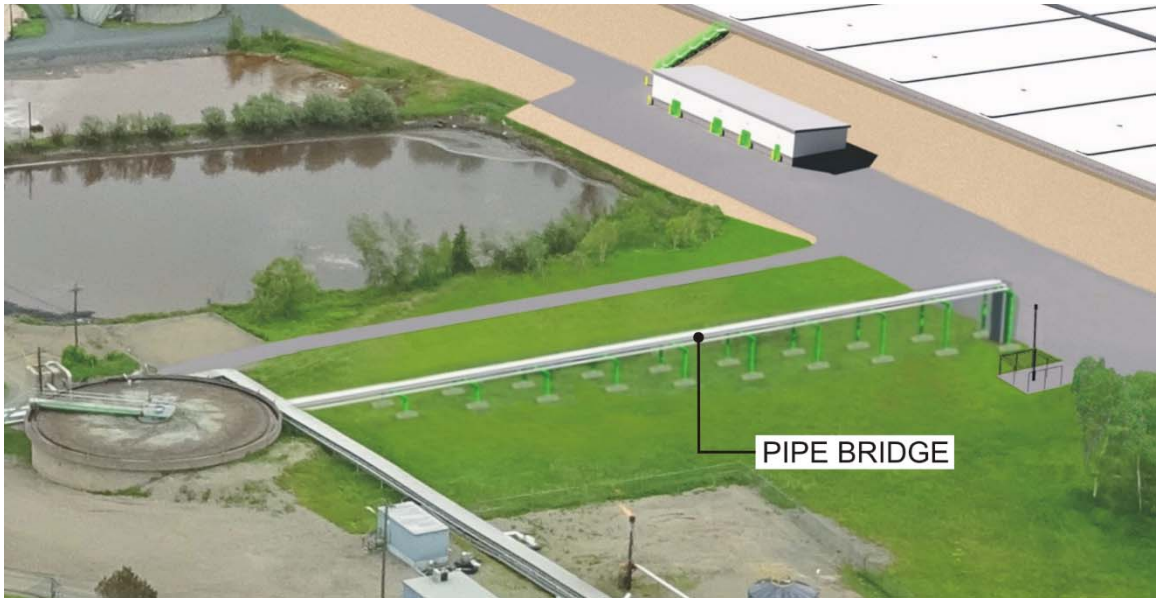


Figure 12. Three-dimensional model looking east towards the pipe bridge proposed for the Lake Utopia Paper Mill in Utopia, New Brunswick.

2.6.3 Low-Rate Anaerobic Digester

The 150 000 m^3 digester will be a low-rate anaerobic, up-flow sludge blanket process. Wastewater will enter the digester at a rate of about 5 400 $m^3 \cdot day^{-1}$ through a piping network located below the sludge bed (Figure 13). The up-flow distribution will ensure optimum substrate-to-biomass contact. As the wastewater passes upward through the sludge blanket, micro-organisms in the sludge will digest the majority of the organic material present in the wastewater. During digestion, the concentration of sCOD, Fats, Oils, and Grease (FOG) will be reduced.

This Project will provide stable concentrations of TSS (*i.e.*, ~ 800 mg · L^{-1}) to the digester, which is not currently the case (*i.e.*, TSS concentrations range from 400 mg · L^{-1} to 1 400 mg · L^{-1} depending on operations). The low-rate anaerobic digester will also have the capability of reducing concentrations of Fats, Oils, and Grease (FOG) should there be an accidental lubricant spill, *etc.* (*i.e.*, the treatment process would not be upset by the introduction of FOG).

The digester will be an in-ground earthen basin with concrete perimeter walls and a fine-grained sand floor (*i.e.*, 102 m × 204 m). The perimeter walls will be fitted with a geomembrane liner capable of accommodating an 8.5 m liquid depth. A floating, insulated, geomembrane cover system will be sealed to the perimeter walls. The geomembrane cover will be ~ 2.5 cm thick comprising a hard insulation material sandwiched between two layers of 5 mm thick high-density polyethylene. A groundwater collection system will be installed below the digester for capturing and removing groundwater. Although it is extremely unlikely that the geomembrane liner will be compromised, this system will also be there to collect any potential effluent leakage from the digester.

Biogas will be generated through the anaerobic digestion process. This methane-rich biogas will be collected within the gas-tight geomembrane lined digester. The liner will also provide odour and temperature control. The collected biogas will be utilized to supplement fuel demand at the Mill.

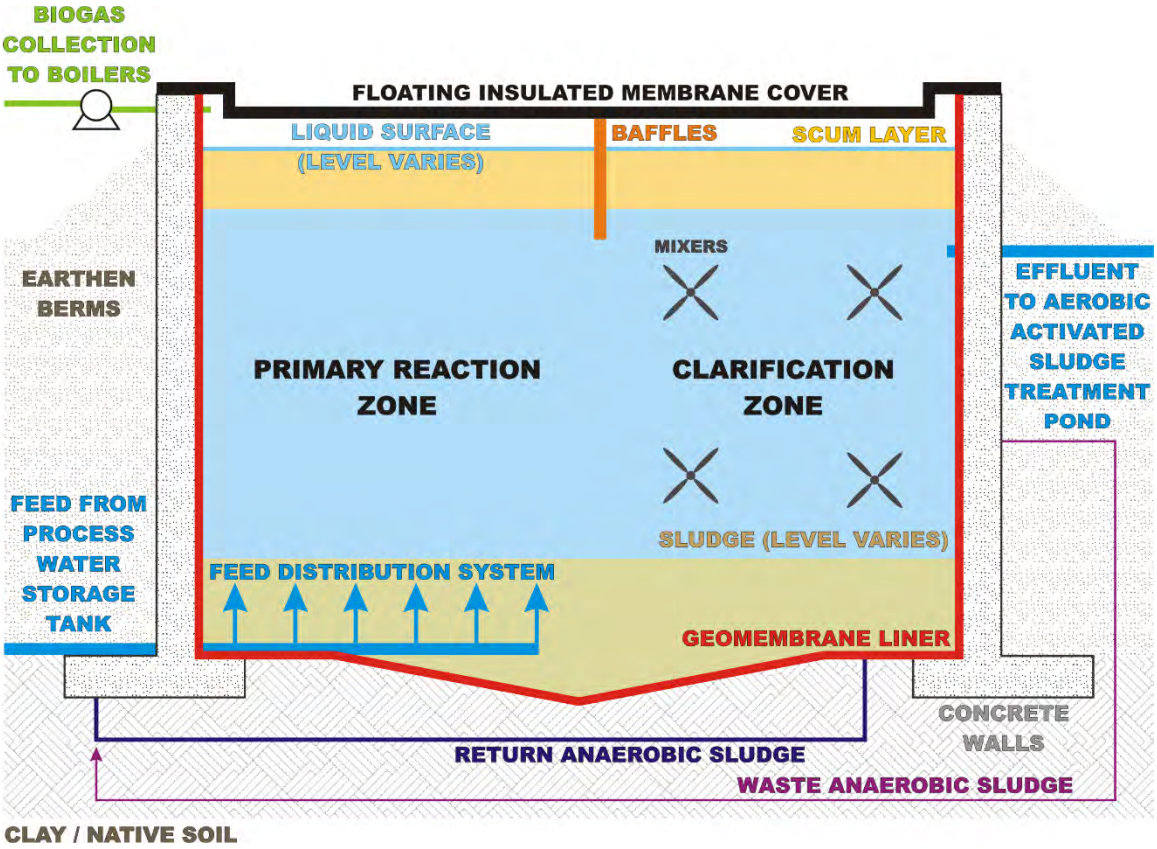


Figure 13. Schematic showing the low-rate anaerobic digester proposed for the Lake Utopia Paper Mill in Utopia, New Brunswick.

The Waste ANaerobic Sludge (WANS) is stable once digested. As a result, it can be dewatered and / or directly transported off-site for disposal and / or land application as a solid fertilizer. Because of the digester's sludge storage capacity, sludge wasting can be reduced from what is currently done today. It is expected that the waste sludge will be de-watered on-site, as it is today, using a centrifuge. The de-watered sludge will then be trucked to one of Envirem Organics Inc.'s permitted compost facilities (*i.e.*, in Clarendon or Miramichi).

About 20 800 $Nm^3 \cdot day^{-1}$ of biogas (*i.e.*, at 0 °C and 1 bar) will be generated. That biogas will have a composition of approximately 60 % to 70 % methane, 30 % to 40 % carbon dioxide, and 2.7 % hydrogen sulfide. That flow rate corresponds to an energy content of 540 $GJ \cdot day^{-1}$, which will be utilized to replace / supplement the fuel demand at the Mill's boiler plant. The amount of biogas generated and captured for use in the Mill's boiler plant is anticipated to increase by about 30 % over the existing UASB digesters. The energy that will be derived from the low-rate anaerobic digester represents about 13 % of LUP's current steam demand, up from ~ 10 % achieved from biogas over the last four years.

There are very few moving parts in the digester, which means there is a low-probability of failure once in operation. The digester will be designed to consistently produce an anaerobic effluent with sCOD and TSS concentrations of 9 000 $mg \cdot L^{-1}$ and 800 $mg \cdot L^{-1}$ or less, respectively (Table 4). Compared to the existing high-rate UASB digesters, the Project offers several environmental, process, and economic benefits as listed in Table 5.

Table 5. Benefits of the proposed low-rate anaerobic digester compared to the existing high-rate UASB digesters at the Lake Utopia Paper Mill in Utopia, New Brunswick.

Category	Benefits
Environmental	• Designed to continuously meet discharge requirements • Produces a consistent quality of effluent • Waste sludge is suitable for land application as a high-nutrient fertilizer
Process	• More stable during peak loads and flows • Pre-digester solids and fats, oil, and grease removal is not required • Operates under a wider temperature range • Has the ability to store waste sludge • Reduces the emission of fugitive odours • Requires less operator interaction
Economic	• Reduces the need to add treatment chemicals • Less energy-intensive

Macro-nutrients (*i.e.*, nitrogen and phosphorous) and a small volume of chemicals will be added to the system to support healthy biological growth to assist with the anaerobic digestion of LUP's wastewater. The additives are summarized in Table 6. Material Safety Data Sheets (MSDS) are provided in Appendix II.

Table 6. Macro-nutrients and chemicals that will be added to the low-rate anaerobic digester at the Lake Utopia Paper Mill in Utopia, New Brunswick.

Product	Use	Hazard Rating*		
		Health	Flammability	Reactivity
Ammonium polyphosphate liquid, 10-34-0	Fertilizer	0	0	0
Anhydrous ammonia	Fertilizer	3	1	0
Anhydrous ferric chloride	Laboratory use	3	0	2
Hydrex 6913	Nutrient for anaerobic treatment	3	0	0

NOTES:
*0 = little to no hazard; 1 = slight hazard; 2 = moderate hazard; 3 = serious hazard

Use of the additives in Table 6 will depend on the efficiency of the microbe performance once the system is operating. Dosage rates will vary with performance and are likely to change through the various start up phases until operational stability of the system is achieved.

2.6.4 Pump House

Pumping equipment for the digester will be housed in a 30.5 m × 9.1 m aluminum-clad building (Figure 9). The following components will be housed in the pump house:

- a sealed sump;
- a 15 horsepower (hp; *i.e.*, 250 $m^3 \cdot hr^{-1}$) supernatant recycle pump;
- a 15 hp (*i.e.*, 250 $m^3 \cdot hr^{-1}$) return anaerobic sludge pump;
- a 1.5 hp (*i.e.*, 10 $m^3 \cdot hr^{-1}$) waste anaerobic sludge pump; and
- a 1.5 hp groundwater drainage collection pump.

Figure 14. Three-dimensional model showing the pump house of the low-rate anaerobic digester proposed for the Lake Utopia Paper Mill in Utopia, New Brunswick.

The sealed sump will capture drips, condensate, *etc.* from within the pump house. The liquid collected within the sump will be piped to the digester for treatment.

The additives described in Section 2.6.3 will be stored in the pump house and added to the system from within the pump house building. There will be a small chemical storage area within the pump house building that will house totes or small tanks and metering pumping systems. Containment will be designed to be 110 % in order to include enough volume to contain all of the chemicals stored within the pump house. In case of a leak, the contents will be recovered within a floor trench system fitted with a pumping system that will discharge to the low-rate anaerobic digester.

2.6.5 Biogas Safety Release Flare

Under normal operating conditions, biogas from the low-rate anaerobic digester will be collected and sent to the on-site steam plant (*i.e.*, boilers). The biogas will be distributed to the steam plant using three 75 hp blowers (*i.e.*, two operating and one in stand-by mode). Moisture separated from the biogas will be returned to the digester via the pump house sump.

In the unlikely event of an upset event, the biogas safety release flare will safely burn or release biogas from the effluent treatment system. The safety release flare associated with the existing high-rate UASB digesters is not suitable for reuse with this Project. Therefore, a new standard candlestick flare will be constructed.

Although detailed design has yet to be completed, a new open low-level flare will be installed that is capable of handling 18 600 $Nm^3 \cdot hr^{-1}$ of biogas. Normally, the flare is not expected to be used. It is being installed in the unlikely event of an upset. A propane pilot burner will be installed for the system to continuously remain in stand-by mode in the event of an upset. The unlikely event that would trigger burning of biogas with the flare is the failure of all three boilers (*n.b.*, all three boilers at the LUP Mill have the flexibility of burning biogas). The unlikely event that would trigger a release of unburned biogas through the flare would be a Mill-wide power outage > 4 hrs (*i.e.*, the electric blowers would not be operational during a power outage and the release would be required to relieve pressure within the digester). Estimated sulphur dioxide (SO_2) flows during flare operation would be 180 $kg \cdot hr^{-1}$.

The height of the flare stack (*i.e.*, 5.5 m) will be such that it is not visible from the roadway (*i.e.*, NB Route 785) and / or most nearby residences. The flare tip, and / or flare in the unlikely event of operation, may be visible from the residence at 557 on NB Route 785 due to the elevation of the home.

2.6.6 Ancillary Equipment

2.6.6.1 Power

Power for the Mill is purchased through NB Power. It is supplied via an NB Power transmission line that is connected to the Mill. Existing power distribution to the Mill is suitable for supplying the new effluent treatment process.

The existing UASB process requires approximately 449 kiloWatts (kW) of total power (*i.e.*, 600 hp) and 206 kW of continuous power (*i.e.*, 275 hp). The energy consumption required for the low-rate anaerobic digester is expected to be about 34 % of the continuous running electrical load of the existing UASB system. Installed horsepower for this Project is approximately 194 and continuous running horsepower will be 94.

2.6.6.2 Lighting

For employee safety, new exterior lighting will be installed on the exterior of the pump house and along the perimeter of the digester. The light fixtures will be installed every 9 m to 12 m along the exterior approximately 4.6 m above grade. The lights will be

switched such that they can be turned off when not required. Generally, the lights will only be turned on at night during maintenance activities.

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. Luminaries will also be selected to minimize glare and up-lighting, which can affect avians.

2.6.6.3 Fire Prevention

New fire prevention equipment will be constructed in accordance with the National Fire Code and the National Fire Protection Association (NFPA) requirements (*i.e.*, NFPA 820). A portable fire extinguisher will be installed in each room of the pump house. The biogas compressor room will have several additional features to provide the necessary level of fire protection, including:

- a 1 hr fire separation to the adjoining areas;
- explosion venting panels;
- natural draft ventilation by installing continuous ridge ventilation and louvers at the floor level;
- a combustible gas detector installed to alarm at the 10 % Lower Flammable Limit (LFL) and to shutdown the biogas compressors at the 25 % LFL; and
- electrical equipment suitable for Class 1 Division 2 locations.

A fire hydrant will be installed within 15 m of the compressor building.

2.6.7 Design Standards

The Project will be designed, constructed, operated, maintained, and abandoned using accepted standards and methods that are in accordance to 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 of the requirements governing New Brunswick jurisdictional codes. In particular, all work performed will conform to the most recent codes of the organizations listed in Table 7. 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 7.

Table 7. Jurisdictional organizations and contractor's codes of reference for the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick.

Acronym	Description	Project Applicable Component(s)
PROJECT JURISDICTIONAL ORGANIZATIONS		
ANSI	American National Standards Institute	
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
AGMA	American Gear Manufacturers' Association	Speed reducers
ANSI	American National Standards Institute	Piping and electrical equipment
API	American Petroleum Institute	Tanks
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, 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
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	
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 STAGES

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

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

LUP is committed to environmental excellence. The Mill operates under an Environmental Management System (EMS), which is registered to the ISO 14001 standard. As part of the EMS, and in order to meet Provincial and Federal Regulations, LUP has established, implemented, and maintains an operational Emergency Response Plan and Environmental Contingency Plan (ERP&ECP) at the Mill. LUP's 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 LUP's 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. JDI 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 on-site construction works related to the Project.

Standard operating procedures, basic care procedures and contingency procedures will be developed for the effluent treatment upgrade. Those procedures will be incorporated into LUP's existing EMS. On a go-forward basis, LUP will ensure all designated Mill employees (*i.e.*, operators) are properly trained and comply with, and follow those new procedures included in the EMS.

2.7.1.1 Existing Approvals

The Mill currently has ATOs as per the Air Quality Regulation **[97-133]** of the New Brunswick *Clean Air Act* (*i.e.*, ATO I-8900 and Amendment No. 1) and Water Quality Regulation **[82-126]** of the New Brunswick *Clean Environment Act* (*i.e.*, ATO I-8828). Copies of those ATOs are included in Appendix III. 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.

2.7.2 Stage II - Project Construction

The Project will be confined to the boundaries of the existing Mill site. Project construction will only occur after receiving approval from the NBDELG and any other applicable regulatory authorities. None of those works will occur without first implementing the measures outlined in the Project-specific EPP document. Erosion and sedimentation control are particularly important during this Project Stage and will be in place prior to commencement.

The various aspects of Project construction are described in the sections that follow. Although not an exhaustive list, the heavy equipment that may be used during Project construction is summarized in Table 8. An approximate quantity summary of the main Project construction materials is provided in Table 9.

Table 8. Typical list of heavy equipment anticipated for use during construction of the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick.

Equipment Use / Type	Typical Task
DIGESTER BERM CONSTRUCTION	
Bulldozer	Moving materials
Tracked excavator	Moving materials and may be equipped with a pneumatic hammer to break up rock
Dump truck	Moving materials
DIGESTER CONCRETE WORK	
Forklift / loader	Moving formwork about the site and unloading and handling materials
Concrete truck	Hauling concrete to the site
Concrete pumper truck	Moving concrete about the site
Concrete pumps and vibratory equipment	Placing and compacting concrete
DIGESTER BACKFILLING	
Bulldozer	Moving materials
Tracked excavator	Moving materials and may be equipped with a pneumatic hammer to break up rock
Dump truck	Moving materials
DIGESTER PUMP HOUSE AND PIPE BRIDGE INSTALLATION	
Hydraulic boom truck (10 tonne (t) to 40 t)	Movement and placement of building materials and pumps
Forklift / loader	Movement of pre-cast members about the site, materials unloading, and materials handling
Welding truck	Base-stations for welding equipment
Self-propelled elevating work platforms	Safely positioning personnel in above-ground areas
Hydraulic crane (500 t)	Lifting pipe bridge components into place
DIGESTER INTERNALS, COVER, AND BIOGAS SAFETY RELEASE FLARE INSTALLATION	
Hydraulic boom truck (10 t to 40 t)	Movement and placement of building materials
Forklift / loader	Movement of pre-cast members about the site, materials unloading, and materials handling
Welding truck	Base-stations for welding equipment
Self-propelled elevating work platforms	Safely positioning personnel in above-ground areas
Truck crane (40 t to 90 t)	Movement and placement of liner
PROCESS WATER STORAGE TANK STRUCTURAL FOUNDATION	
Crawler crane (27 t to 440 t) equipped with fixed or hanging lead configuration	Driving H-piles
Carry deck (8 t to 22 t)	Movement of heavy equipment about the site
Welding truck	Base-stations for welding equipment
Forklift / loader	Movement of pre-cast members about the site, materials unloading, 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 concrete
PROCESS WATER STORAGE TANK ERECTION	
Truck crane (40 t to 90 t)	Movement and placement of steel panels
Welding truck	Base-stations for welding equipment
Forklift / loader	Movement of steel panels
Self-propelled elevating work platforms	Safely positioning personnel in above-ground areas

Equipment Use / Type	Typical Task
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
Semi-trailer truck and float	Floating equipment to and from the site
Semi-trailer truck and tilt bed trailer	Moving containers and equipment about the site
Pick-up support truck or van	Transporting equipment and personnel

Table 9. Summary of the main construction materials proposed for the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick.

Component	Approximate Quantity
Concrete (cast in place)	1 350 m^3
Granular A crushed rock (31.5 mm minus) aggregate base course	4 700 m^3
Granular B crushed rock (75 mm minus) aggregate base course	16 250 m^3
NBDOT Type B (75 mm) base course	130 m^3
Chain link fence	1 045 m
Process piping – 300 mm diameter High-Density PolyEthylene (HDPE)	290 m
Storm sewer piping – 600 mm diameter reinforced concrete	50 m

2.7.2.1 Temporary Infrastructure and Supporting Facilities

Prior to Project construction, several contractor trailers will be brought on to the Mill site. Those trailers will serve as construction offices throughout Project development. Temporary services will be connected to those facilities. Locations proposed for contractor trailers are shown in Figure 15. A security fence will be erected at the perimeter of process water storage tank site and the low-rate anaerobic digester site. The one around the low-rate anaerobic digester construction site will safeguard All-Terrain Vehicle (ATV) riders using the adjacent former pit by eliminating access.

There is a surface parking lot at the entrance of the Mill property outside of the secure perimeter. As shown in Figure 15, LUP will designate a portion of that parking lot area for this Project (*i.e.*, the southwestern corner). Additional parking will also be provided in three areas within the secure area of the Mill; one near where the process water storage tank will be constructed and two near where the low-rate anaerobic digester will be constructed. Contractors bringing their own vehicle to the site will be required to park their vehicle in one of those designated parking lots.

Materials being delivered to the Project site and workers going to and from the Project site will be required to enter one of two security monitored access points (Figure 15). Laydown required for large construction materials will be confined to the Project areas of the Mill site. Those areas may also be used for storage of general construction materials.

Temporary washroom facilities may be brought on-site 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.

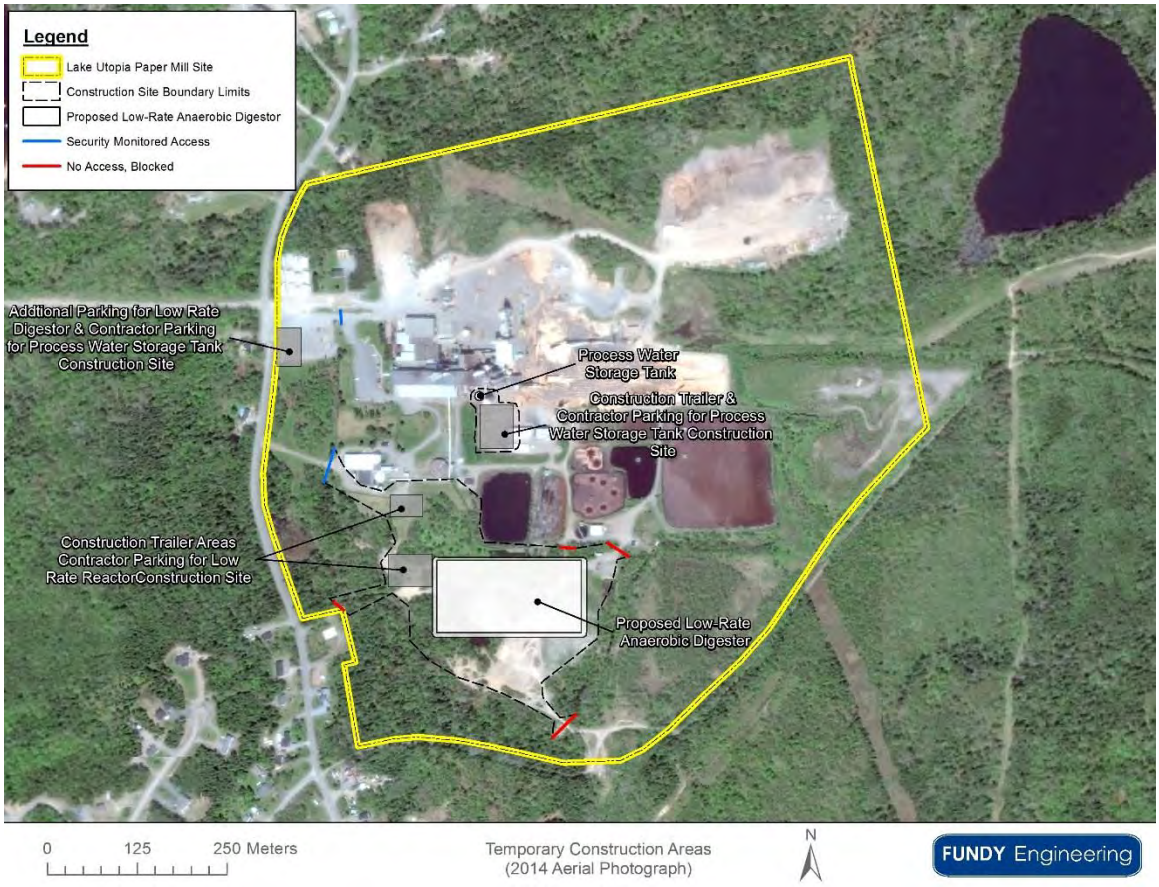


Figure 15. Aerial photograph of the Lake Utopia Paper Mill in Utopia, New Brunswick showing the locations proposed for contractor project trailers, project parking areas, material laydown areas, and construction entrances for construction of effluent treatment upgrade project.

2.7.2.2 Clearing, Grubbing, and Levelling

In summer 2016, LUP undertook a site improvement project at the Mill site. Additional information on that work can be found in Appendix IV.

Standing timber within a 4 hectare (ha) harvest block on PID 15079221 was harvested as part of that work. Some of the harvested timber was sent to JDI's Sussex Sawmill and some was sent to JDI's Reversing Falls Pulp Mill for processing. The remaining material was either stockpiled for burning within the Mill's bark boiler or for composting.

No flora removal occurred within 30 m of the existing stream located east of the harvest block. That stream carries the Mill's effluent to the L'Etang Estuary. The harvest block was grubbed following clearing and involved the removal of stumps, roots, rocks, and organic matter from the ground surface. The grubbings were either redeployed on-site or burned in the Mill's bark boiler.

Parts of the harvest block had been informally used by local contractors as a source of gravel. Clearing and grubbing of the block provided LUP and opportunity to level the area and repurpose it to support on-going Mill operations (*i.e.*, material lay-down area, contractor trailer placement, and parking).

Cuts and fills were controlled such that the material was handled for optimal usage. Any and all suitable material was stripped and salvaged. There was a net positive cut / fill whereby no fill was imported. Cut and fill quantities, respectively, were 62 500 m^3 and 61 450 m^3. The 1 050 m^3 of extra excavated material was redeployed to other areas on the LUP site.

2.7.2.3 Digester Berm Construction

Compacted earthen berms will be constructed at the perimeter of the low-rate digester using on-site materials. The base elevation for the digester will be 48.8 m. The berms will have side slopes (*i.e.*, horizontal to vertical) of 2.5 : 1 in order to provide good support for the digester, erosion protection, and vehicle traffic.

2.7.2.4 Digester Concrete Work

It is estimated that 1 200 m^3 of concrete will be required to construct the footings and the walls for the low-rate anaerobic digester and pump house. The concrete walls will be built atop a concrete spread footing foundation (Figure 16). Rebar will be used to reinforce the concrete walls.

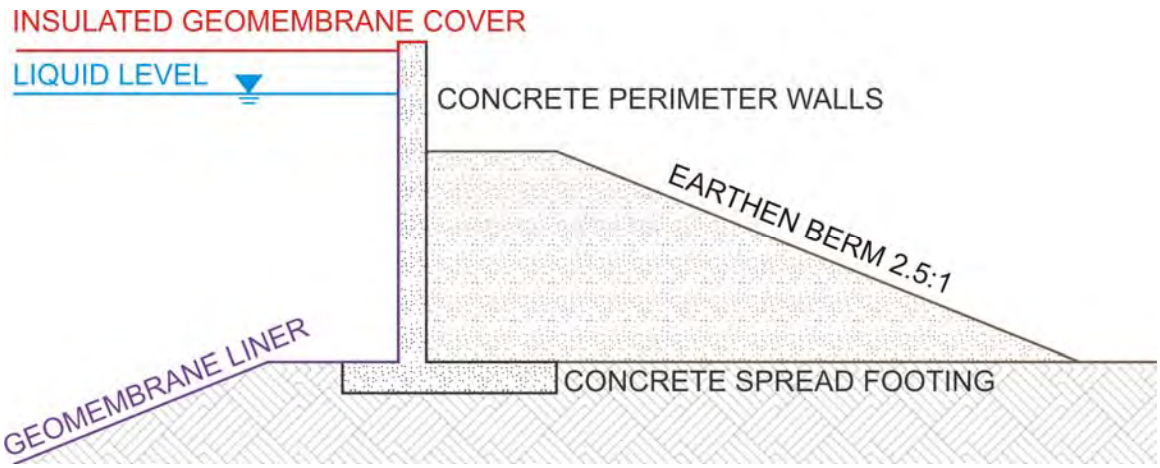


Figure 16. Cross-section showing the general layout for the concrete spread footings, concrete perimeter walls, and earthen berms for the low-rate anaerobic digester proposed for the Lake Utopia Paper Mill in Utopia, New Brunswick.

2.7.2.5 Digester Backfilling

A groundwater collection system will be installed and collection points will also be installed within the area below the digester during this stage of Project construction (Figure 17). The digester bottom will be as level as possible at all points. A 100 mm layer of sand will be placed atop an engineered clean fill placed atop the native materials in order to provide a uniform smooth surface. A 100 mm diameter perforated pipe will be installed within trenches filled with drainage stone.

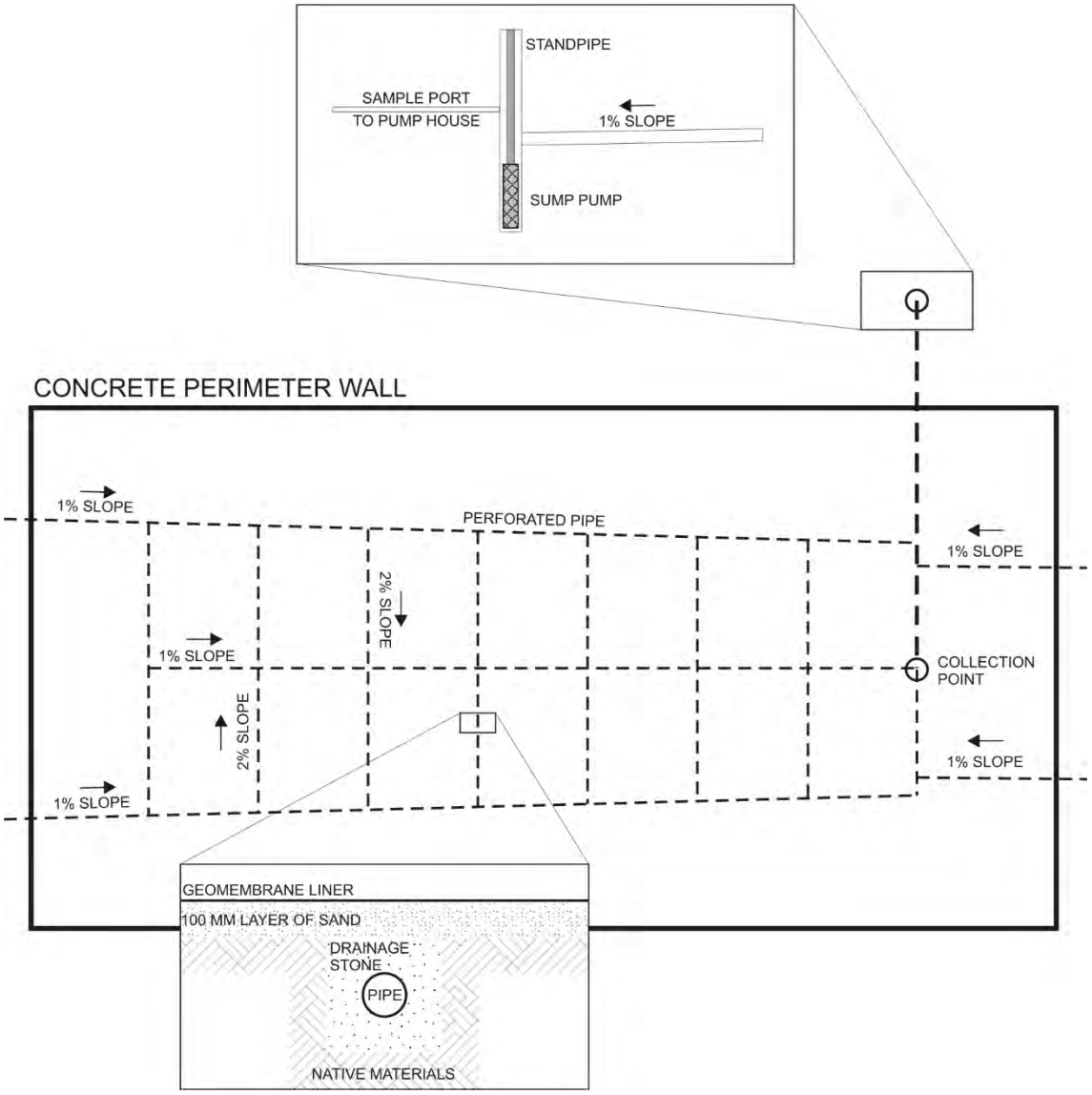


Figure 17. Plan-view and cross-sections showing the general layout of the groundwater collection system that will be installed below the low-rate anaerobic digester proposed for the Lake Utopia Paper Mill in Utopia, New Brunswick.

Groundwater collected below the low-rate anaerobic digester will flow to a collection point where it will then flow to a standpipe that is equipped with a 1.5 hp sump pump (Figure 17). A sampling port will extend from the standpipe into the pump house where operators will be able to sample the water. Routine sampling of the water will allow operators to identify if the geomembrane liner has been potentially compromised (*e.g.*, through changes in pH, conductivity, *etc.*).

The sump pump will be triggered by a water level control. Water pumped from the collection system will be directed to the low-rate anaerobic reactor for treatment. The standpipe will also be equipped with monitors that trigger an alarm when there is flow and / or when there are changes in pH, conductivity, *etc.* (*n.b.*, initially, baseline levels will have to be established for groundwater conditions and then the triggers will be established).

2.7.2.6 Digester Pump House and Pipe Bridge Installation

The 280 m^2 pump house will be of steel frame construction founded on an at-grade concrete slab (*n.b.*, the quantity of concrete required for the slab is included in the volume noted in Section 2.7.2.4). It is estimated that there will be 30 supports required for the pipe bridge and that about 40 m^3 of concrete will be require for founding those supports.

2.7.2.7 Digester Internals, Cover, and Biogas Safety Release Flare Installation

The geomembrane liner system will be installed along the walls and floor of the digester. Internal piping for distributing and mixing the effluent will be installed within the digester. Following that, the floating insulated geomembrane cover system will be fitted on top and sealed to the geomembrane liner system.

2.7.2.8 Process Water Storage Tank Structural Foundation

The process water storage tank will be supported on steel H piles driven to bedrock. The total number of piles for the Project is estimated to be between 30 and 40 laid out in a honeycomb grid. The H piles will be driven into the ground using a crane equipped with a fixed or hanging lead configuration pile driver. It is likely that the hydraulic hammer will be used; however, a diesel hammer may also be used depending on hydraulic hammer availability. The steel piles will be connected at grade using cast in place concrete pile caps. It is estimated that 110 m^3 of concrete will be required for construction the pile caps and pad for the process water storage tank.

2.7.2.9 Process Water Storage Tank Erection

The process water storage tank will be constructed from stainless steel plates fabricated off-site. The tank will be erected on-site using a crane. The shell plates will be welded and tested as the tank assembly progresses. Once the tank is shell high (*i.e.*, all of the shell plates are in place) and internal welding and cleaning is complete, the tank roof will be installed.

2.7.2.10 Mill Tie-In

Once all of the construction is complete, the new components of the effluent treatment system will be tied-in to the existing treatment system. Tying-in the new equipment will be done while the Mill and effluent treatment system are maintained in an operational state.

2.7.2.11 Work Hours

Project construction is anticipated to occur over 15 months. During that period, on-site construction activities will be continuous. Loud work (*i.e.*, breaking of rock with a pneumatic hammer and pile driving) that has the potential to disturb neighbours 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. **Minimal pile driving (*i.e.*, 30 to 40 piles) is anticipated for the structural foundation of the process water storage tank.**

A reduced construction crew may be used when working on Saturdays, Sundays, and evenings. Tie-in work (*i.e.*, connecting the new digester to the Mill), which requires Mill shutdowns, will be completed 24 hours · day^{-1}, seven days a week in order to limit shutdown duration.

2.7.2.12 Labour

It is estimated that approximately 69 person years of work will be generated through Project construction. A breakdown of the labour required to complete the Project construction is provided in Table 10.

Table 10. Estimated labour required to complete the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick.

Trade	Example	Hours*
Civil	Carpenters, masons, labourers, iron workers, *etc.*	50 000
Mechanical	Millwrights and boiler makers	12 500
Piping	Pipefitters	20 000
Electrical	Electricians	12 500
Instrumentation	Instrumentation technicians	2 500
Scaffolding	Carpenters and labourers	2 500
Management	Supervisors and support staff	2 500
Services	Testing, surveying, *etc.*	18 500
Engineering	Detailed design	16 500
	TOTAL	137 500 (69 person years)†

NOTES:
*One person year equals ~ 2 000 hrs
†Not included in this total are the various company and external management, engineering, and staff responsibilities

2.7.2.13 Site Access

Access to the Mill for routine deliveries and shipping (*e.g.*, chemicals, wood chips, corrugated medium, *etc.*) by road will not be affected by Project construction. Operational and maintenance personnel for regular Mill processes will continue to access the site via the main gatehouse Project construction equipment and personnel will enter and exit either through the main gatehouse or one other access point located near the existing UASB building (Figure 15).

2.7.2.14 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 off-site traffic during Project construction.

During Project construction (*i.e.*, a 15 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.

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.

2.7.2.15 Safety

Employee and contractor safety is a vital part of the culture at LUP. One of LUP'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* (*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.

2.7.2.16 Commissioning

All commissioning activities will follow a detailed schedule, which has not yet been established (*n.b.*, it is estimated that commissioning will take about three months). Process experts from the digester vendor will be on-site to assist with the overall commissioning stage. No additional temporary infrastructure (*e.g.*, construction trailers, washroom facilities, parking, *etc.*) will be required for the commissioning process.

After the process water storage tank is completed, it will be hydro-tested to ensure that there are no leaks in the tank and connected piping. After the hydro-test is completed and the tank is shown to be leak free, it will be ready for use.

Once the new digester is constructed and all field instrumentation, drives, mechanical checkouts, and interlocks are verified, the new digester will be brought online. Once operating crews have been trained and are comfortable with operating the new digester and all issues, if any, have been corrected, the existing digesters will be shutdown. Only

after the new low-rate anaerobic digester is fully operational will the existing UASB digesters be fully shutdown.

During construction and commissioning, there will be no interference in treating process effluent from the Mill. Once the new low-rate anaerobic digester is fully operational, the existing high-rate UASB digesters will be redundant. Although the older digesters will be shutdown, they will remain in place until such time in the future that it is determined that their footprints are needed for other upgrades or operations (*n.b.*, the existing digesters are located in a completely separate part of the Mill property than that proposed for the new digester).

Inventory held in the UASB system will be drained to the existing activated sludge treatment process. The two bio-sludge storage tanks that contain anaerobic microbes for the UASB system will be flushed into trucks. The trucks will discharge the microbes to the new pump house where they will be introduced to the new low-rate anaerobic digester. Sludge remaining in the piping, floor drains, etc. will be captured and reintroduced either into the existing activated sludge treatment process or the new digester.

If and when it is determined that the space the existing UASB digesters occupy is required, the NBDELG and other applicable regulators, if there are any, will be contacted to identify any permitting processes required to move forward with equipment removal and any associated demolition.

2.7.3 Stage III - Project Operation and Maintenance

Once commissioned and approved, the low-rate anaerobic digester will operate continuously. Similar to other Mill operations, these processes will operate 24 hours per day, 7 days a week, and 365 days per year. The only exception to this will be during planned maintenance shutdowns. There will be no change in the current compliment of employees at the Mill as a result of this Project. Existing personnel will operate the low-rate anaerobic digester.

Planned shutdowns of the Mill will occur approximately every 18 months. During these planned shutdowns, extensive inspections and overhauls, as required, preventative maintenance tasks, and equipment cleaning will be completed to help ensure the effluent treatment system is operating at optimal conditions.

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.

2.7.4 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.

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

With any Project, there is always the possibility of a mishap, errors, and / or unforeseen events. These 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 LUP Environmental Spill Response Plan will be used throughout the life of the Project. Under that plan, all spills are reported, immediately contained, and cleaned up as soon as they occur. Where required, EPP procedures will be developed specifically for this Project and may include contingency measures in the event that mishap, errors, and / or unforeseen events occur.

2.8 PROJECT SCHEDULE

Construction activities are expected to begin immediately following the granting of a successful EIA determination and issuance of all applicable construction permits. The Project Team is aiming for a construction start date in November 2016. Assuming a construction start of November 2016, the majority of Project construction activities at the Mill will be completed on or around the end of October 2017 as shown in Figure 18. Depending on business conditions, the schedule presented could be shifted out by up to 12 months.

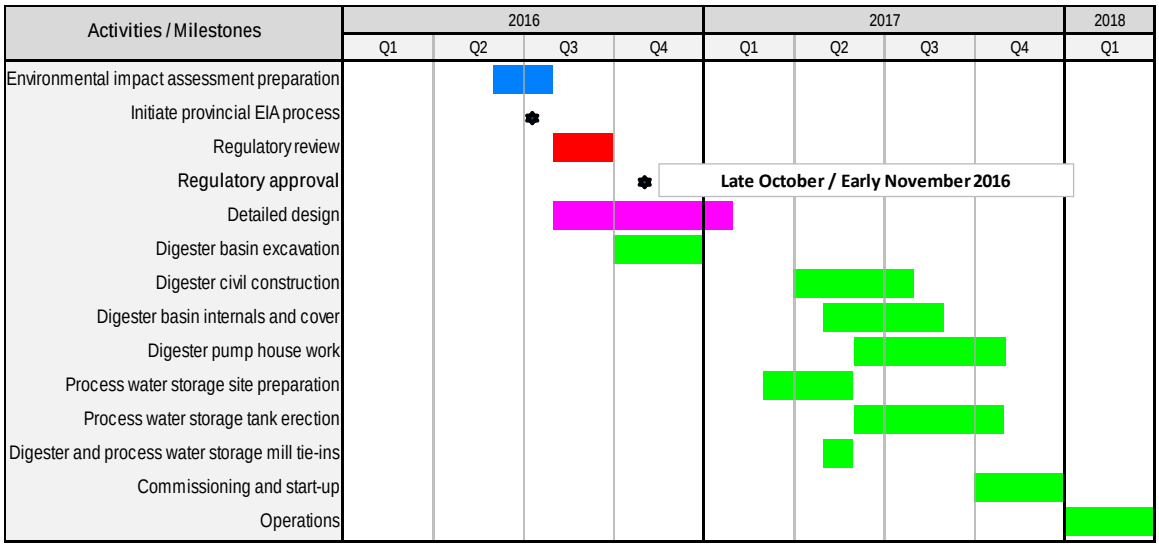


Figure 18. High-level project Gantt chart for the construction of the effluent treatment upgrade project proposed for the Lake Utopia Paper Mill in Utopia, New Brunswick.

3.0 DESCRIPTION OF THE EXISTING / BASELINE ENVIRONMENT

This section describes the existing environment, pre-Project, at and in the vicinity of the Lake Utopia Paper Mill. The information contained in this section is considered to be 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 Region 10 Service Commission Southwest New Brunswick, which includes the rural, suburban, and urban centres around the Lake Utopia Paper Mill. Those areas include, but are not limited to the three towns (*i.e.*, Saint Andrews, St. George, and St. Stephen), four villages (*i.e.*, McAdam, Blacks Harbour, Grand Manan, and Harvey), and 20 local service districts (*e.g.*, Lepreau, Saint George, Pennfield, *etc.*). 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 Utopia).

3.1 PHYSIO-CHEMICAL ENVIRONMENT

3.1.1 Climate

Utopia 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 1981 and 2010 are available for the meteorological station in Pennfield (*n.b.*, this is the most recent 'climate normal' period). That station is located at latitude 45°06'00.0"N, latitude 66°44'00.0"W, and at an elevation of 22.90 m. During that period, the mean annual temperature was 5.2°C ± 3.40 °C (Figure 19) with a monthly daily minimum of - 7.1 °C ± 2.30 °C in January to a monthly daily maximum of 15.6 °C ± 0.9 °C in July [*Environment Canada*, 2016a]. The extreme minimum mean daily temperature of - 36.5 °C was measured on 18 January 1982. In contrast, the extreme maximum mean daily temperature of 37.2 °C was measured on 22 May 1977.

Precipitation (*i.e.*, rain, drizzle, freezing drizzle, hail, snow, *etc.*) is generally well distributed throughout all months and the majority (> 86 %) falls in the form of rain. Mean annual precipitation between 1981 and 2010 (Figure 19) was 1 430 mm with a mean monthly low of 98 mm in August to a mean monthly high of 140 mm in November [*Environment Canada*, 2016a]. The most extreme daily rainfall of 111.0 mm was measured on 15 August 1981. The greatest snowfall of 38.0 cm was recorded on 16 January 2000. Snow depth, during the seven months with snowfall, averages 60 cm and almost 190 days each year experience some form of precipitation.

During the winter months, the prevailing winds are northwesterly and westerly (*i.e.*, they blow from the northwest or west) [*Wicklund and Langmaid*, 1953]. Southwesterly and westerly winds prevail during the summer months.

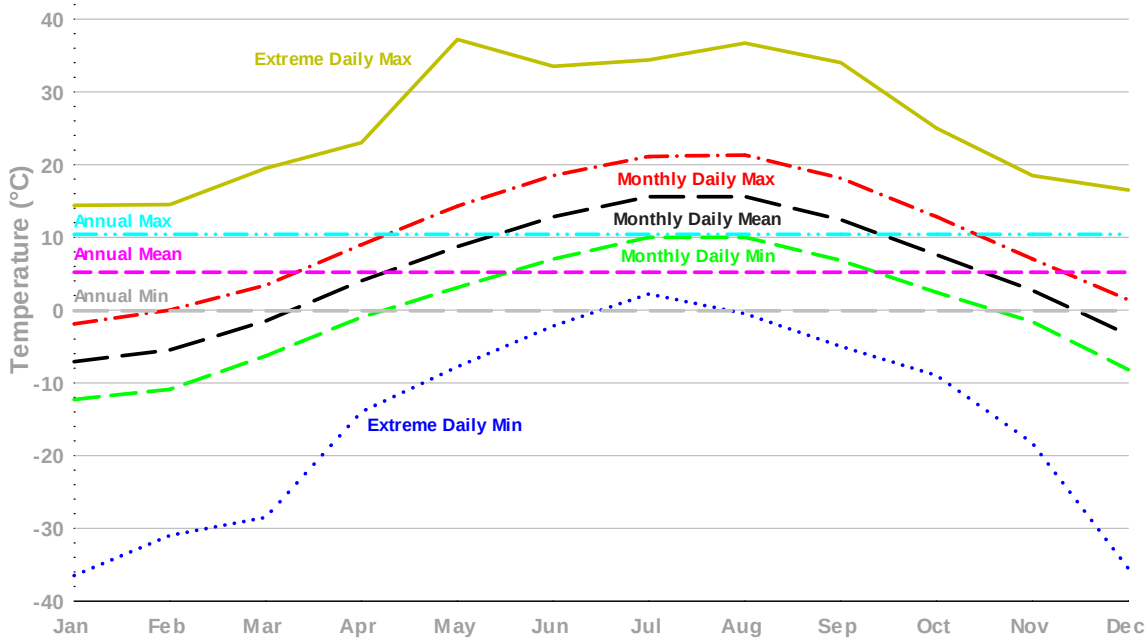


Figure 19. Compilation of mean daily temperatures measured at the Pennfield meteorological station between 1981 and 2010.

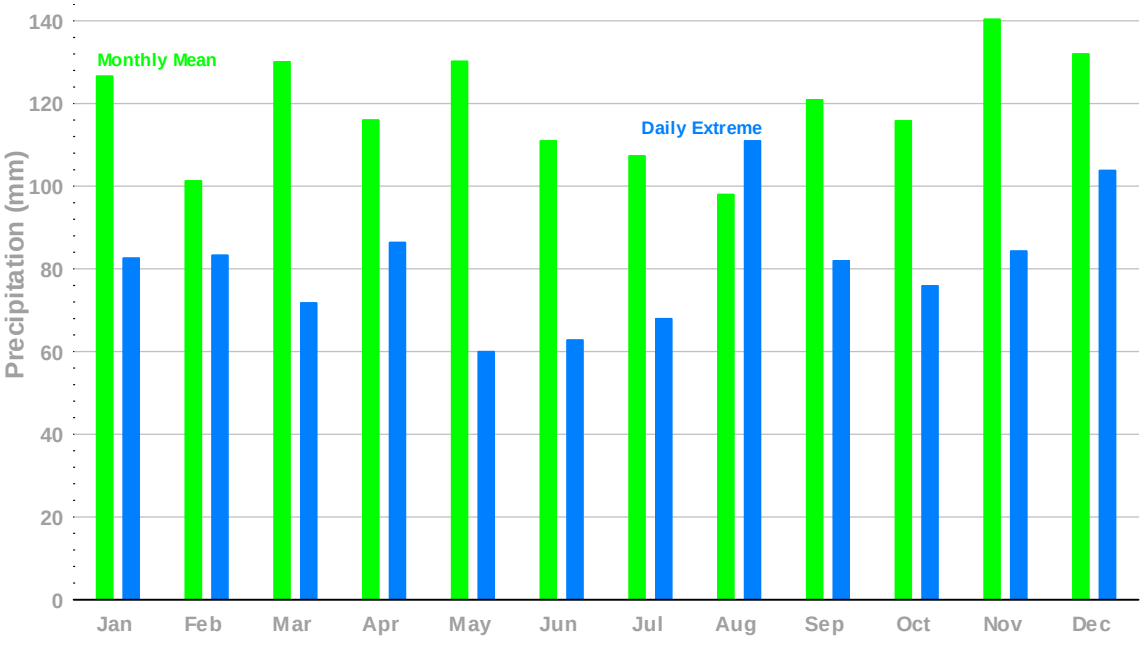


Figure 20. Compilation of mean daily precipitation measured at the Pennfield meteorological station between 1981 and 2010.

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 11 summarizes the air quality objectives as per the New

Brunswick *Clean Air Act*. 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 11. New Brunswick ambient air quality objectives as per the New Brunswick *Clean Air Act*.

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
Sulphur Dioxide (SO_2)*	ppb	339 (169.5)		113 (56.5)	23 (11.5)
Total Suspended Particulates (TSS)	$\mu g \cdot m^{-3}$			120	70
Ozone (O_3)†	ppb	82		25	15

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

3.1.2.2 Monitoring

There are 16 provincially operated air quality monitoring stations in New Brunswick [*NBDELG*, 2015]. The nearest provincially operated air quality monitoring stations to the Mill are located in Saint Andrews and at Point Lepreau. Ozone and fine particulate matter ($PM_{2.5}$) are monitored in Saint Andrews and O_3, Volatile Organic Compounds (VOCs) and meteorology are monitored at Point Lepreau. During 2012 and 2013, Ozone levels in St. Andrews and at Point Lepreau were well below the one-hour air quality objective. Fine particulate matter concentrations measured at Saint Andrews averaged about 10 $\mu g \cdot m^{-3}$ and were always below 30 $\mu g \cdot m^{-3}$.

In addition to the provincially operated stations, there are 27 industry operated air quality monitoring stations [*NBDELG*, 2015]. LUP operates an air quality monitoring station for SO_2 at the Mill. Sulfur dioxide concentrations as measured at the Mill between 1 January 2011 and 31 July 2016 are shown in Figure 21. One-hour average SO_2 concentrations consistently remained below the air quality objective during the period shown. The average concentration for the period was 3.5 ppb ± 4.82 ppb (n = 42 965). The maximum SO_2 concentration of 144 ppb was measured on 16 February 2012 at 11 AM.

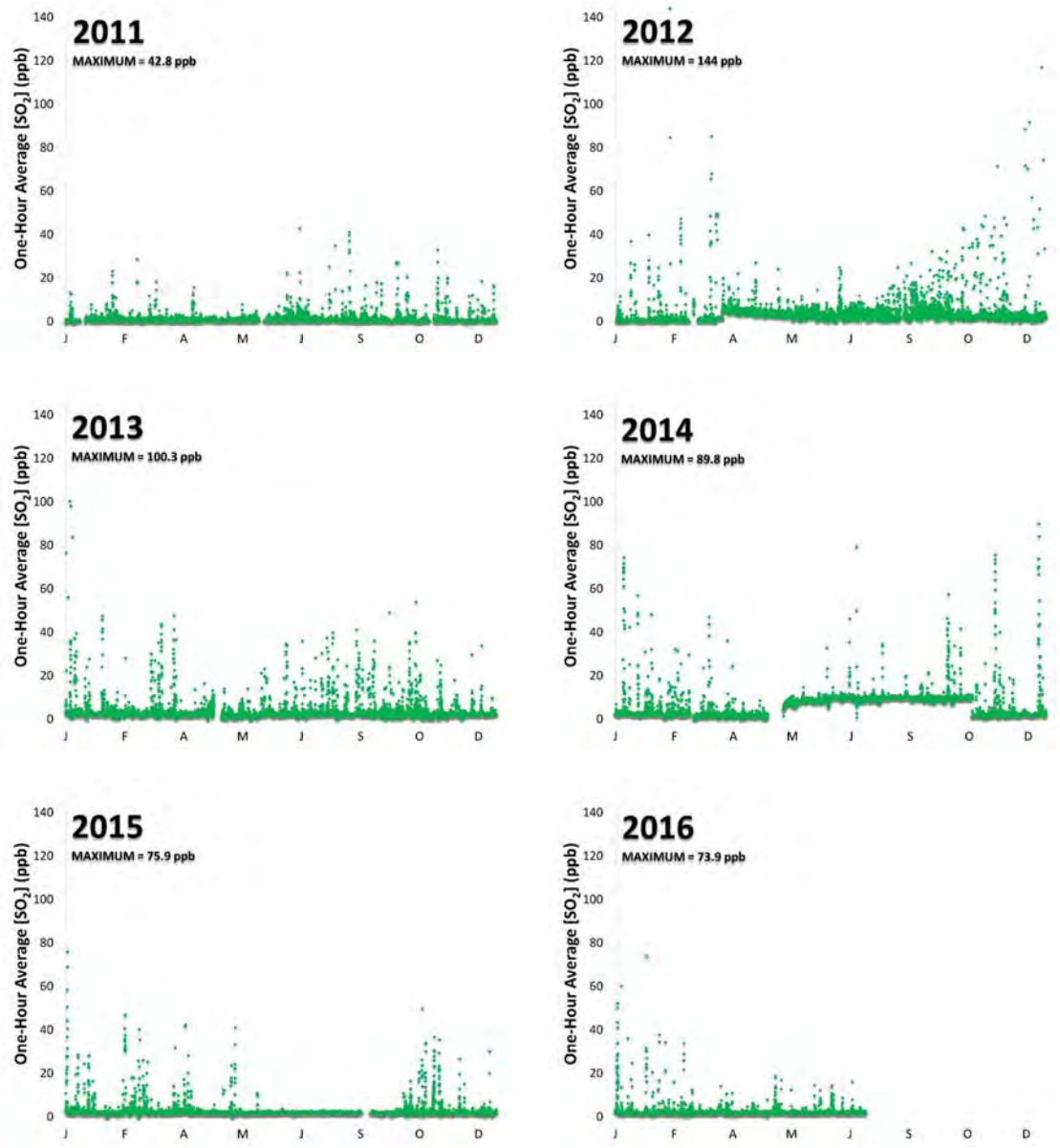


Figure 21. One-hour average Sulphur dioxide concentrations as measured at the industry-operated Lake Utopia Paper Mill air quality monitoring station in Utopia, New Brunswick from 1 January 2011 to 31 July 2016. From *NBDELG* [2014].

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*, to annually report their emissions to the National Pollutant Release Inventory (NPRI) administered by Environment Canada. The NPRI is Canada's legislated, publically accessible inventory of pollutant releases (*i.e.*, to air, water, and land), disposals, and transfers for recycling.

In the region, there are four facilities (Figure 22) that are required, based on meeting thresholds, to report their air emissions. The most recent data available (*i.e.*, 2014 emissions data) for facilities in the region are summarized in Table 12.

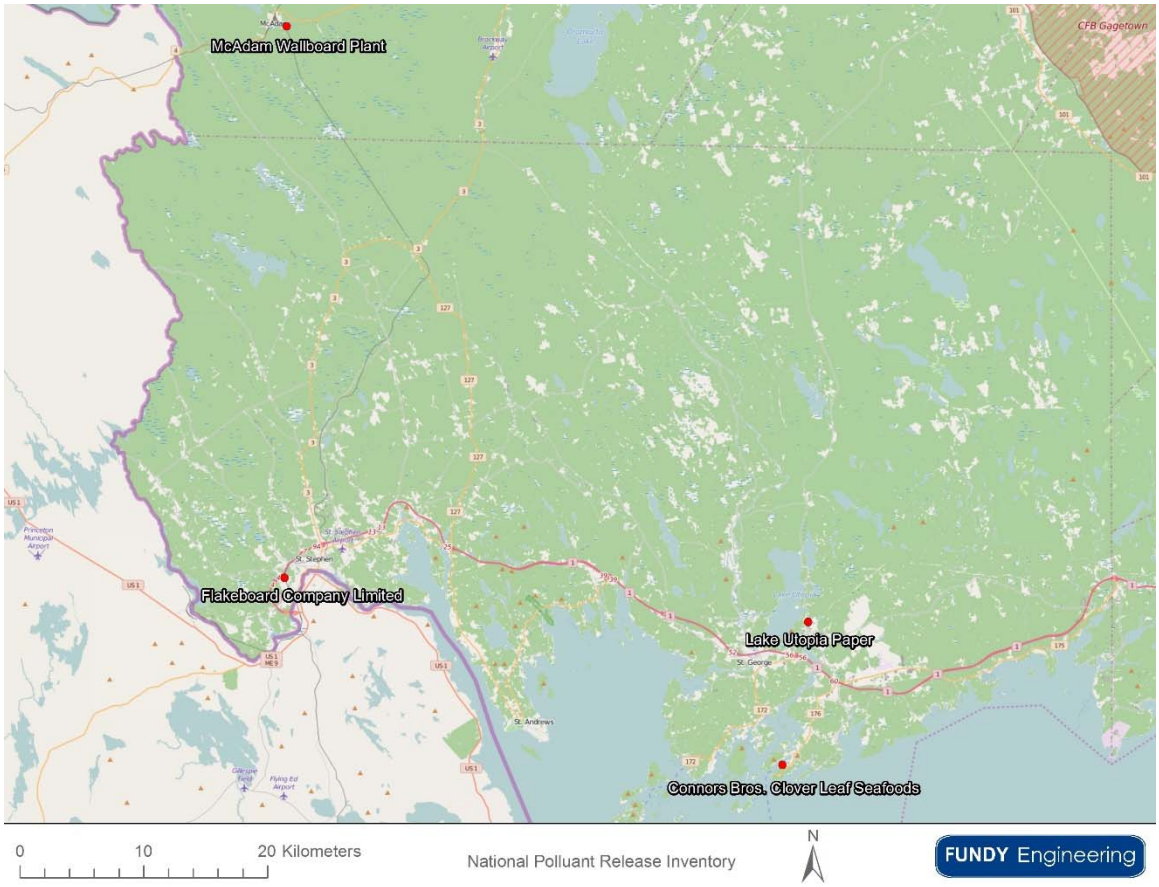


Figure 22. Facilities in the region that are required to annually report emissions to Environment Canada's National Pollutant Release Inventory tracking database.

Table 12. Air emissions data, circa 2014, for facilities in the region that reported to Environment Canada's National Pollutant Release Inventory tracking database.

Reporting Facility	NPRI ID	Air Emissions ($t \cdot yr^{-1}$)*						
		CO	NO_2	PM	PM_{10}	$PM_{2.5}$	SO_2	VOC
Lake Utopia Paper	1572	132.63	169.32	12	9.84	9.07	177.93	45.48
Flakeboard Company Limited	4842	**541.86**	**372.03**	**156.49**	**73.8**	**35.75**	**19.92**	**237.41**
McAdam Wallboard Plant	5095	33.895	43.442	11.74	9.827	6.989	54.657	
Connors Bros. Clover Leaf Seafoods	6007				2.04	1.33	58.945	

NOTES:
*Maximum values for each emission type are bolded

3.1.2.4 Greenhouse Gas Reporting

GreenHouse Gas (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. Greenhouse gas emissions summaries are available between 2005 and 2012 for all provinces and territories, Canada, and the World. 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) [*Environment Canada*, 2014d]. The data are summarized in Table 13.

Table 13. Provincial and territorial, national, and global greenhouse gas emissions data for 2005 to 2012. Data from *Environment Canada* [2014d].

Region	Kilotonnes of Carbon Dioxide Equivalent Units (kt CO_{2eq})								Change*
	2005	2006	2007	2008	2009	2010	2011	2012	
AB	232 000	242 000	244 000	238 000	233 000	241 000	244 000	249 000	107 %
BC	62 300	61 000	62 600	62 900	59 800	59 700	60 100	60 100	96 %
MB	20 900	20 700	21 300	21 700	20 300	20 200	19 700	21 100	101 %
NB	20 100	19 800	19 800	18 600	18 300	18 300	18 500	16 400	82 %
NL	9 860	9 400	10 700	9 910	9 680	9 280	9 310	8 740	89 %
NS	23 100	20 900	23 300	20 800	20 200	19 900	20 600	19 000	82 %
NT	1 630	1 830	2 130	1 890	1 220	1 340	1 410	1 460	90 %
NU	344	417	540	549	433	422	229	210	61 %
ON	207 000	196 000	200 000	192 000	168 000	175 000	171 000	167 000	81 %
PE	2 150	2 120	2 070	1 990	1 980	2 020	2 070	1 940	90 %
QC	85 600	84 800	86 200	84 600	83 600	79 200	80 600	78 300	91 %
SK	71 100	69 400	71 500	73 600	73 100	73 100	72 700	74 800	105 %
YK	457	507	406	394	345	341	383	370	81 %
Canada	736 000	728 000	749 000	731 000	689 000	699 000	701 000	699 000	95 %
NB†	2.73 %	2.72 %	2.64 %	2.54 %	2.66 %	2.62 %	2.64 %	2.35 %	
World	38 696 545	39 728 428	40 851 919	41 221 150	40 956 547	42 669 718	43 816 734		113 %
Canada‡	1.90 %	1.83 %	1.83 %	1.77 %	1.68 %	1.64 %	1.60 %		

NOTES:
*Percentage change between 2005 emissions and 2012 emissions
†New Brunswick's emissions contribution to Canada's emissions
‡Canada's emissions contribution to the World's emissions

Since 2005, there has been an upward trend in GHG emissions globally (Table 13 and Figure 23). This is largely due to the increase in emissions from developing countries. Comparatively, Canada emissions have exhibited a general downward trend and is due in large part to increased awareness and the implementation of newer technologies to reduce GHG emission. All provinces, with the exception of Alberta, Manitoba, and Saskatchewan, large fossil fuel extracting provinces, have shown a decrease in GHG

emissions. Between 2005 and 2012, New Brunswick's GHG emissions decreased by about 18 % while Canada's overall emissions have decreased by about 5 %.

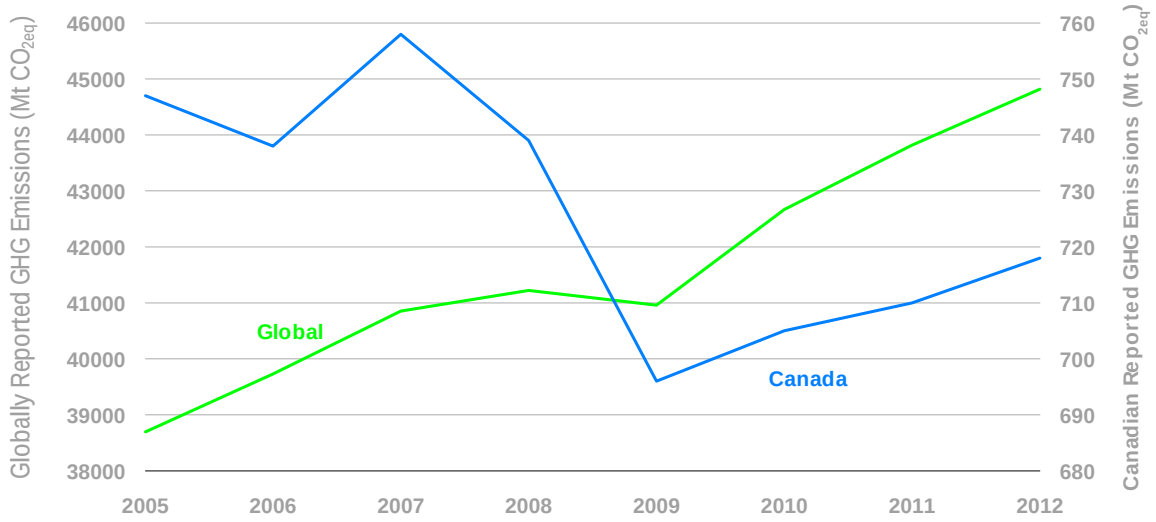


Figure 23. Annually reported greenhouse gas emissions, in Megatonnes (Mt) of carbon dioxide equivalent units (CO_{2eq}), for the world and Canada.

In order 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 50 000 tonnes or more of GHGs in carbon dioxide equivalent units (CO_{2eq}) per year from stationary combustion, industrial processes, venting, flaring, fugitives, and on-site transportation, waste, and wastewater sources are required to report. Facilities falling below the threshold are not obligated to report, but they may voluntarily do so.

Since 2004, 18 facilities in New Brunswick have reported to the GHGRP. During that time, greenhouse gas emissions from industrial site reporting has decreased by 43 % from about 13 million tonnes · yr^{-1} CO_{2eq} to about 7.5 million tonnes · $year^{-1}$ CO_{2eq}. Reductions have resulted from the implementation of improved technology and the phasing out of coal-fired power generating stations (*i.e.*, Grand Lake Generating Station and Dalhousie Generating Station) [*Environment Canada*, 2014c].

For the three years between 2011 and 2013, the same dozen facilities in New Brunswick reported to the GHGRP and the total CO_{2eq} emissions are plotted in Figure 24. The three largest contributors to total carbon dioxide equivalent emissions, which represent > 80 % of the reported emissions, are Bayside Power, the Belledune Generating Station, and the Irving Oil Refinery.

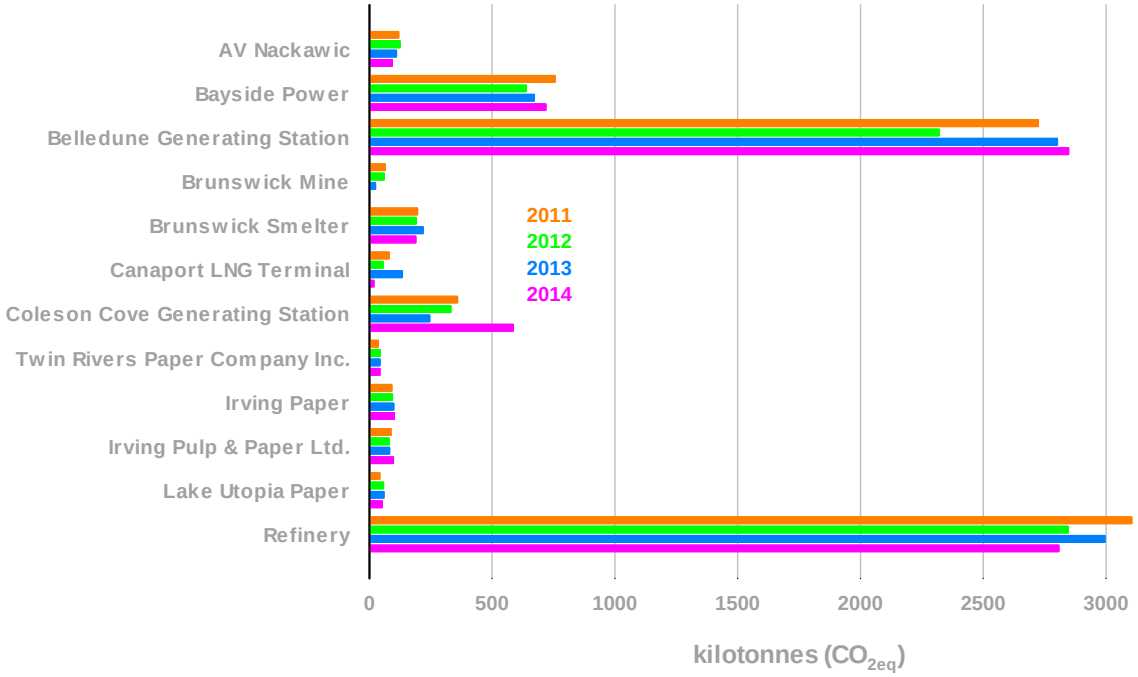


Figure 24. Reported total carbon dioxide equivalents (CO_{2eq}), in kilotonnes, for New Brunswick facilities that reported to the Greenhouse Gas Emissions Reporting Program between 2011 and 2014.

3.1.3 Sound Levels

The Pennfield LSD has pockets of light and heavy industrialized areas (*e.g.*, the LUP Mill, futureNETS, Northern Harvest, Breviro Caviar, *etc.*). Residential development in the area is sparse and interspersed amongst timberland and agricultural lands (*i.e.*, primarily for growing blueberries). There is a small cluster of cottages along Woodbury Cove located about 1 km to the southwest. Ambient sound levels in the area are considered typical of a rural setting.

3.1.4 Topography

Utopia is located within the Highland Foothills of New Brunswick [*Pronk and Allard*, 2003], which is an area of moderate relief. More specifically, Utopia falls within the Musquash Lowlands [*Allard*, 2007a], which is adjacent to the Bay of Fundy. Local relief seldom exceeds 90 m Above Mean Sea Level (AMSL). The landscape was significantly modified by glacial and meltwater processes whereby sand and gravel deposits in the form of eskers, kames, melt-water channels, and drumlinized and fluted landforms are common. St. George was the terminus of the large glacial meltwater deltas. The Pennfield-Utopia Delta Complex is located to the southeast [*Allard*, 2007]. Portions of the area were inundated by marine incursion following deglaciation. The area is characterized by abundant glacial melt-water channels, wide modern flood plains, peat bogs, and wetlands filled with sand, gravel, and organic deposits.

Figure 25. Aerial photograph, circa 2014, showing the general topography at the Lake Utopia Paper Mill in Utopia, New Brunswick.

The Mill exists in a topographically flat area adjacent to Lake Utopia. Elevations on the Mill site range from about 35 m at the southwest corner to 55 m at the northeast corner (Figure 25). The Project site exists at ground elevations around 45 m.

The Mill site is bordered to the south, west, and north by residential development and forested lands to the east.

3.1.5 Hydrology

As noted by *Allard* [2007a], drainage patterns in Pennfield are deranged, which is a result of the intense glacial activity and post-glacial submergence and emergence. The landscape is moderately to well-drained; however, poor drainage exists where broad depressions are scoured directly into bedrock.

As shown in Figure 26, the LUP Mill is located in close proximity to Lake Utopia (*i.e.*, ~ 600 m). An intake line within Lake Utopia at the end of Pumphouse Road supplies process water to the Mill. Although the Mill's process water is obtained from Lake Utopia, the treated effluent is discharged to an unnamed tributary of the L'Etang Estuary, which belongs to an adjacent but completely separate watershed (*n.b.*, Lake Utopia drains through the Magaguadavic River.

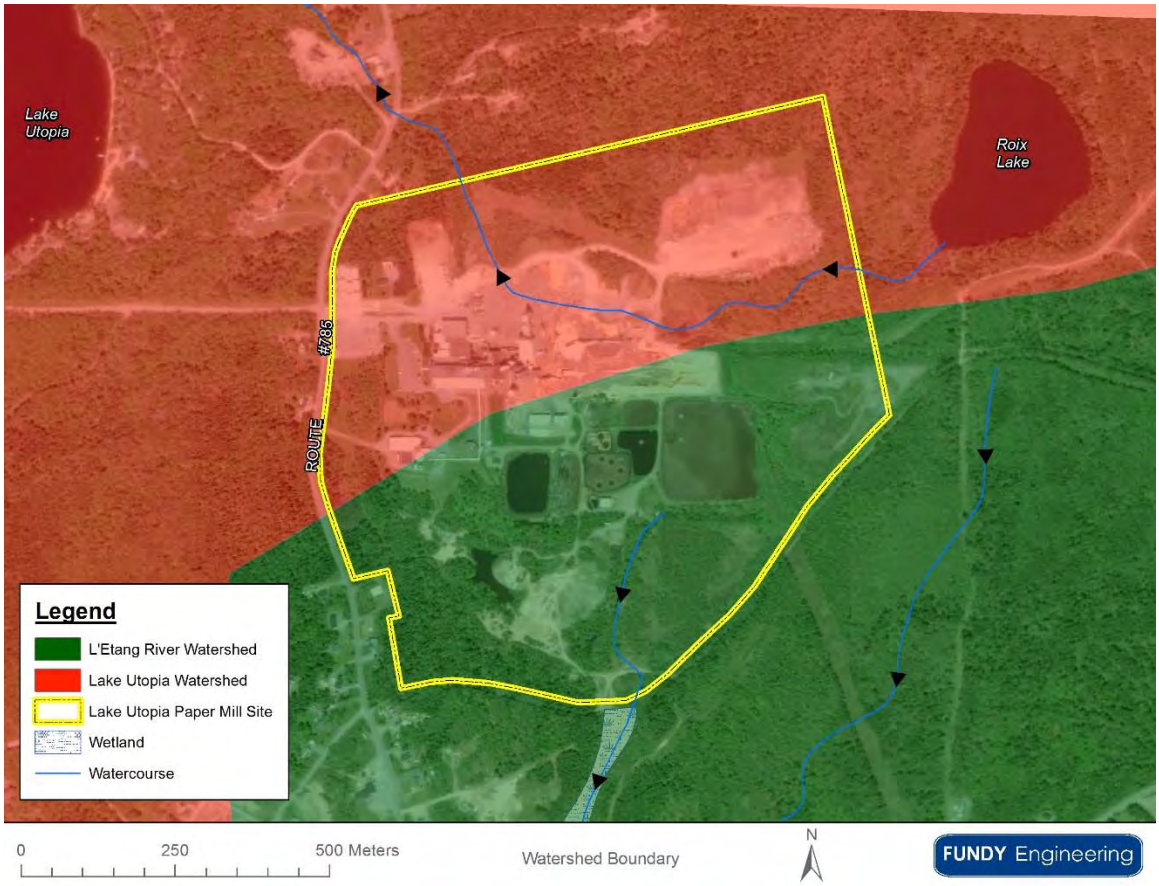


Figure 26. Aerial photograph, circa 2014, showing mapped watercourses and wetlands in the vicinity of the Lake Utopia Paper Mill in Utopia, New Brunswick.

The Mill site straddles the divide between the Lake Utopia watershed and the L'Etang River watershed (Figure 26). Review of the watercourse and wetland mapping from the NBDELG's GeoNB online Geographical Information System (GIS) tool shows that there are no mapped streams or wetlands within the Project footprint; however, aerial photos suggest the presence of a small waterbody. Ground-truthing by Fundy Engineering in June 2016 verified the presence of a small pond approximately 0.24 ha in size (Figure 27).

Figure 27. Photograph taken on 15 June 2016 showing the small unmapped pond within the footprint proposed for constructing a low-rate anaerobic digester at the Lake Utopia Paper Mill in Utopia, New Brunswick.

The pond appeared to be created artificially during the excavation of sands and gravels on the site. Discussions with LUP personnel revealed anecdotal evidence that the sands and gravels were excavated from the area during construction of the Mill in the 1970s. The pond, which has no inlet or outlet, does not support any fish or fish habitat and it has very little hydrophytic vegetation present.

A wetland biologist and an inspector with the NBDELG accompanied LUP and Fundy Engineering personnel during a site visit to the pond on 15 June 2016. NBDELG personnel concurred with Fundy Engineering's findings. As a result, a Watercourse and Wetland Alteration Permit was not required for infilling during the site improvement work during the summer of 2016.

3.1.6 Geology

3.1.6.1 Bedrock

The Lake Utopia Mill lies within the Musquash Lowlands of the St. Croix Highland physiographic region of New Brunswick [*Rampton et al.*, 1984]. Bedrock geology of the immediate area is primarily comprised of highly indurated siliceous sedimentary rocks [*Fyffe and Richard*, 2007] Late Ordovician (*i.e.*, 460 mya to 450 mya) to Late Silurian (*i.e.*, 435 mya to 420 mya) in age [*McLeod et al.*, 2005]. The shale, siltstone, sandstone, and conglomerate lithological units of the area belong to the Eastport and Letete Formations of the Mascarene Group. Additional information on bedrock geology of the area is provided in Table 14 and shown in Figure 28.

Table 14. Descriptions of the bedrock geology in the vicinity of the Lake Utopia Paper Mill in Utopia, New Brunswick.

Code	Age	Group	Formation	Description
SEP_{mc}	Late Ordovician to Late Silurian	Mascarene	Eastport	Red and grey, lithic quartzose and feldspathic sandstone, siltstone, and minor conglomerate
SL_{fc}	Late Ordovician to Late Silurian	Mascarene	Letete	Grey to black shale, siltstone, feldspathic wacke and quartz wacke with abundant felsic volcanic rocks and minor mafic rocks
SL_{ft}	Late Ordovician to Late Silurian	Mascarene	Letete	Grey to pink, felsic, lithic, and crystal tuff and felsite with pink to red and grey felsic ash-flow tuff, banded flows, lithic tuff, breccia, and volcanogenic conglomerate

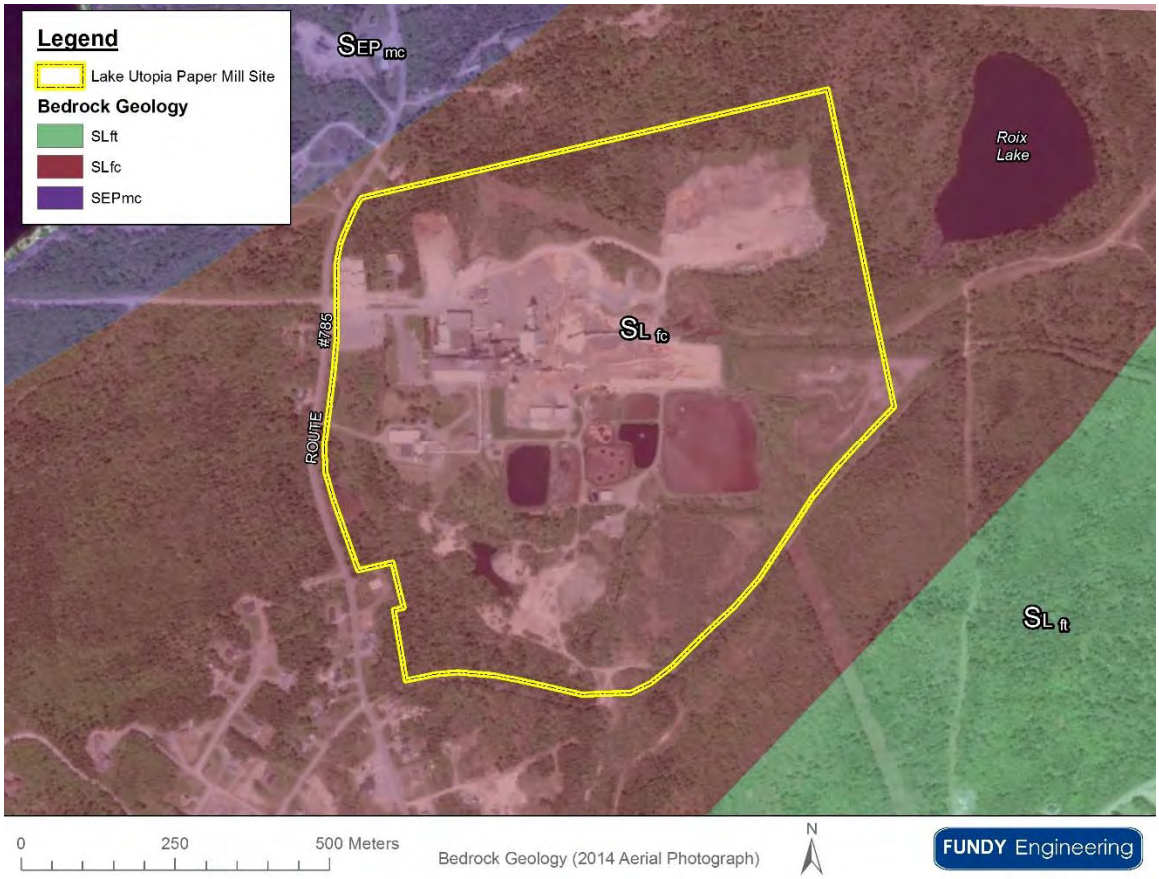


Figure 28. Bedrock geology map overlaying an aerial photograph, circa 2014, in the vicinity of the Lake Utopia Paper Mill in Utopia, New Brunswick. See text for bedrock geology descriptions.

3.1.6.2 Surficial

Surficial geology of the local area is described in Table 15 and shown in Figure 29. The Utopia area is generally overlain by Late Wisconsinan and / or early Holocene sediments [*Rampton*, 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 15. Descriptions of the surficial geology in the vicinity of the Lake Utopia Paper Mill in Utopia, New Brunswick.

Code	Age	Description
aMm3	Late Wisconsinan	Hummocky, ribbed, and rolling ablation moraines generally > 1.5 m thick comprised of loamy ablation till, some lodgment till, minor silt, sand, gravel, and boulders; the till is mainly stony with more than 35 % of the clasts pebble-sized or larger
aMv3	Late Wisconsinan	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
Wb	Late Wisconsinan and / or Early Holocene	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

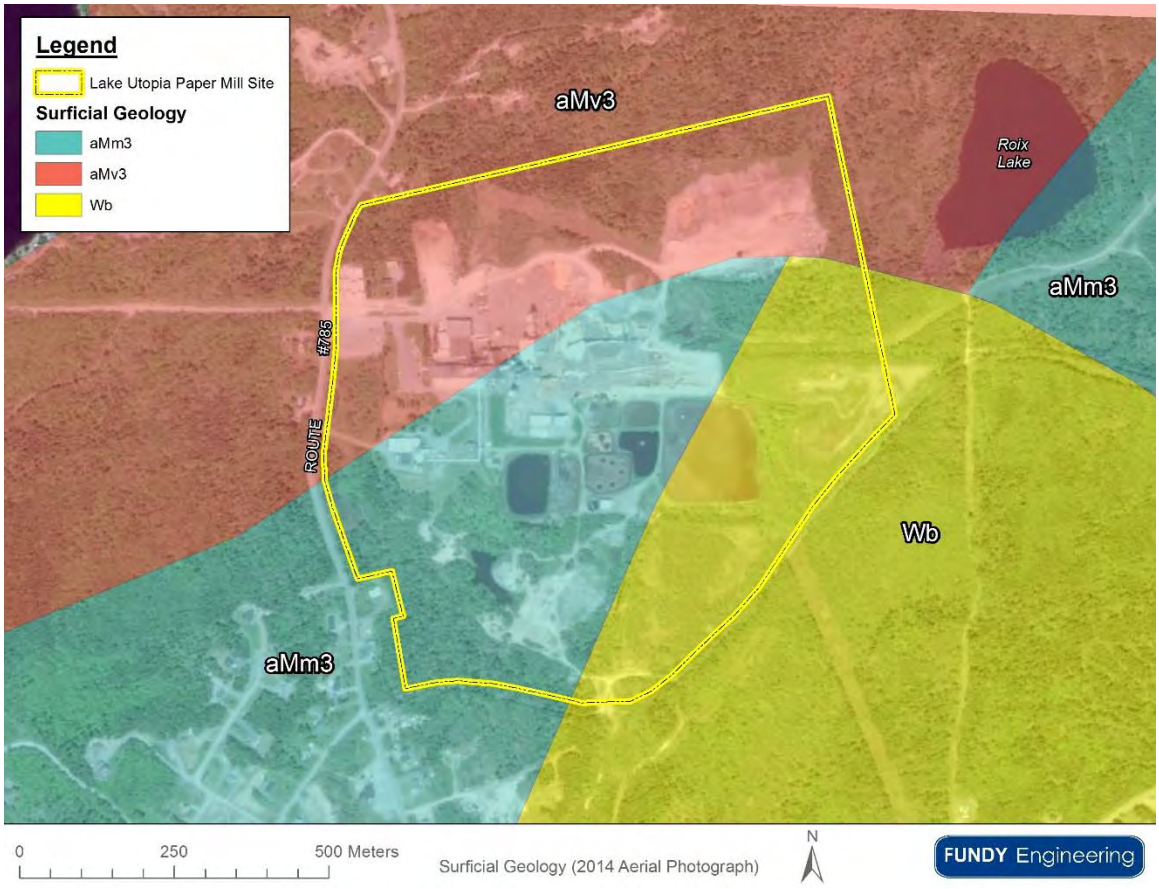


Figure 29. Surficial geology map overlaying an aerial photograph, circa 2014, in the vicinity of the Lake Utopia Paper Mill in Utopia, New Brunswick. See text for surficial geology descriptions.

3.1.7 Hydrogeology

3.1.7.1 Use

Approximately 64 % of New Brunswick's population is reliant on groundwater for supplying domestic freshwater [*Natural Resources Canada*, 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 [*Natural Resources Canada*, 2005]. In Utopia, aquifers are typically able to supply a flow rate < 24 L · min^{-1} (Figure 30); however, localized groundwater availability can only be determined through on-site investigations.

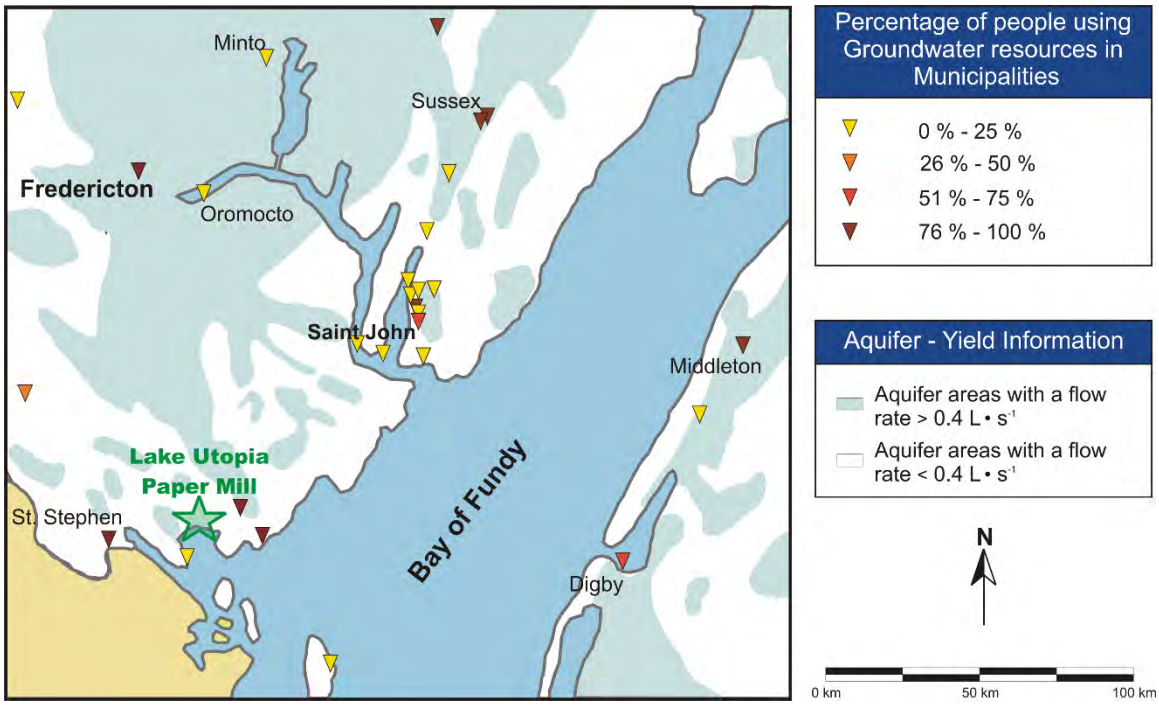


Figure 30. Groundwater availability map for southwestern, New Brunswick and the surrounding area.

Residential, commercial, and industrial properties in Utopia and surrounding areas are mostly reliant on groundwater for supplying potable water and / or process water (*n.b.*, LUP has an intake line from Lake Utopia for obtaining process water). There are several potential large groundwater users in the area (Figure 31). For example, there are two aquaculture net washing facilities (*i.e.*, Northern Harvest and futureNETS), four aquaculture operations (*i.e.*, Breviro Caviar, Brunswick Aquaculture, Seeley Trout Farm, and Kelly Cove Salmon Ltd.), several commercial operations (*e.g.*, Comeaus, *etc.*), and agricultural / horticultural operations (*e.g.*, Misty Blue Farms, *etc.*). Nearby Pennfield is also a well-known blueberry growing area. It is not known if local growers use groundwater during the growing season to irrigate their fields. Although there are many pits and quarries in the area, there does not appear to be any impacts to surrounding water supplies as a result of those operations.

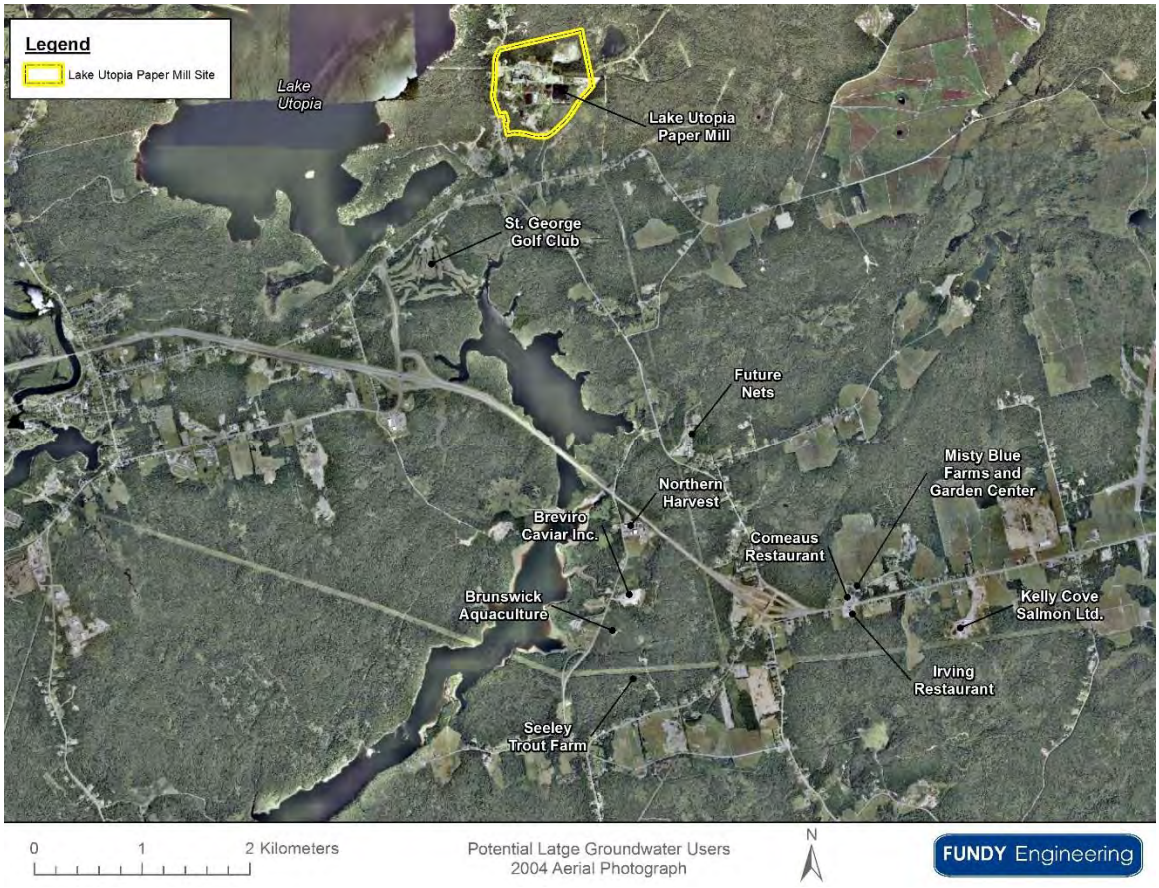


Figure 31. Potential large groundwater users in the vicinity of Lake Utopia Paper Mill in Utopia, New Brunswick.

3.1.7.2 Quantity

A potable groundwater well records search returned 34 well logs from the NBDELG's Online Well Log System (OWLS) for a 1 km radius around PID 15079221 (Figure 32). Refer to Appendix V for a copy of the OWLS records search. Those data were used for characterizing the local groundwater quantity.

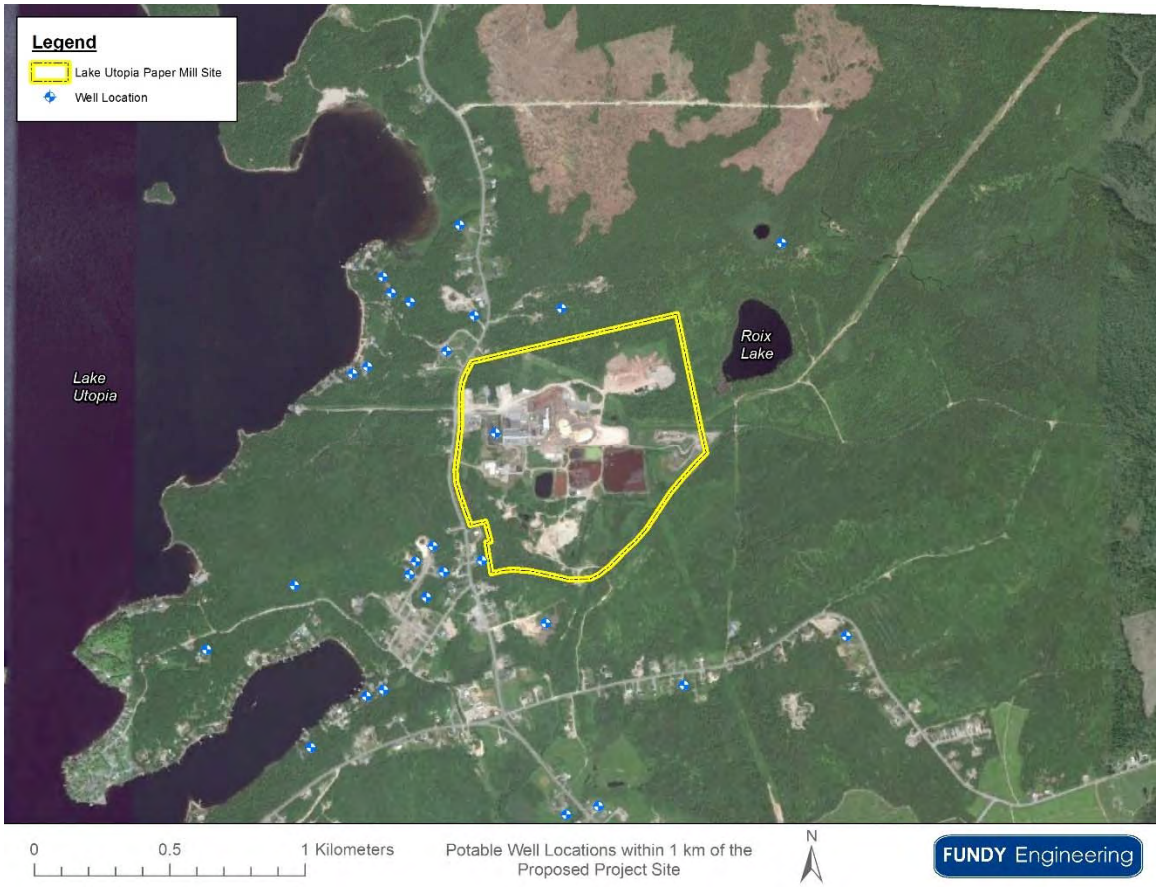


Figure 32. Aerial photograph showing groundwater wells on file with the NBDELG within a 1 km radius around PID 15079221, which is part of the Lake Utopia Paper Mill in Utopia, New Brunswick. The well logs and water quality records were obtained for characterizing local groundwater quantity and quality.

Based on the records, the average well depth is 60.4 m ± 36.05 m (n = 33; Figure 33). Depths range from as shallow as 18.0 m to as deep as 158.5 m. Casing length for this group of wells ranges from 6.1 m to 29.0 m and averages 11.8 m ± 6.94 m (n = 32). According to the well logs, where data are available, bedrock is found at a depth of 8.2 m ± 6.71 m (n = 18). The shallowest depth that bedrock was encountered is 1.2 m and the greatest depth is 21.3 m. The average safe yield for the 31 wells with available data, as estimated by the well driller(s), is 36.8 L · min^{-1} ± 31.81 L · min^{-1}. The safe yield is estimated to be a low as 0.9 L · min^{-1} and as great as 136.5 L · min^{-1} from individual wells. Static water levels are generally 9.5 m ± 10.27 m below the top of casing and typically range from 1.5 m to 53.3 m (n = 26).

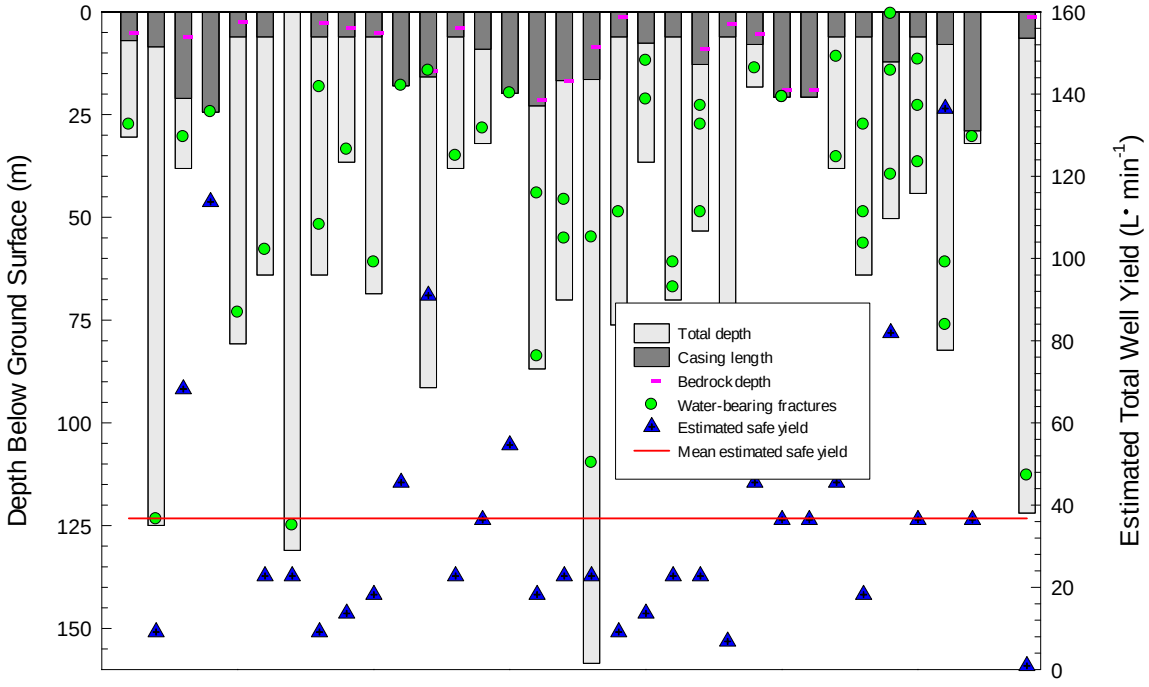


Figure 33. Compilation of the 34 potable groundwater well records within a 1 km radius of PID 15079221 in Utopia, New Brunswick.

3.1.7.3 Quality

Fundy Engineering reviewed water chemistry records (*i.e.*, microbiology, general chemistry, and trace metals) available for potable water wells within a 1 km radius of PID 15079221. A total of 20 water quality records were obtained from the NBDELG groundwater well database for microbiology, general chemistry, and trace metals. Those data were subsequently compared to the CDWQGs. A summary of the exceedances with respect to the CDWQGs is provided in Table 16.

Table 16. Summary of exceedances, with respect to the CDWQG, for water quality records available within a 1 km radius of PID 15079221 in Utopia, New Brunswick (n = 48). Yellow shaded entries indicate that the values **do not** pose a health concern, while red shaded cells indicate that the values **may** pose a health concern.

	Parameter	*n*
Microbiological Exceedances	Total Coliforms	**4**
General Chemistry Exceedances	Iron	**3**
	Manganese	**1**
	Turbidity	**7**
Trace Metal Exceedances	Arsenic	**2**
	Uranium	**1**

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 17. Those terrestrial and aquatic species identified under the federal *Species At Risk Act* (f*SARA*) and by the Committee On Status of Endangered Wildlife In Canada (COSEWIC) as being at risk in New Brunswick are listed. Listing of a species in Table 17 does not indicate that it is either present or absent at the Project site. Presence and absence information is provided 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 17. 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 Lake Utopia Paper Mill in Utopia, New Brunswick.

Common Name	Scientific Name	f*SARA* Status	COSEWIC Status
Vascular Plants, Mosses, and Lichens			
Boreal felt lichen	*Eridoerma pedicellatum*	Endangered	Endangered
Vole ears lichen	*Erioderma mollissimum*	Endangered	Endangered
Prototype quillwort	*Isoetes prototypus*	Special concern	Special concern
Butternut	*Juglans cinerea*	Endangered	Endangered
Beach pinweed	*Lechea maritime*	Special concern	Special concern
Furbish's lousewort	*Pedicularis furishiae*	Endangered	Endangered
Anticosti aster	*Symphyotrichum anticostense*	Threatened	Threatened
Gulf of St. Lawrence aster	*Symphyotrichum laurentianum*	Threatened	Threatened
Bathurst aster	*Symphyotrichum subulatum*	Special concern	Special concern
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
Wood turtle	*Glyptemys insculpta*	Threatened	Threatened
Birds			
Short-eared owl	*Asio flammeus*	Special concern	Special concern
Barrow's goldeneye	*Bucephala islandica*	Special concern	Special concern
Red knot *rufa* subspecies	*Calidris canutus rufa*	Endangered	Endangered
Eastern whip-poor-will	*Caprimulgus vociferus*	Threatened	Threatened
Canada warbler	*Cardellina*	Threatened	Threatened
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	Threatened

Common Name	Scientific Name	f*SARA* Status	COSEWIC Status
Olive-sided flycatcher	*Contopus cooperi*	Threatened	Threatened
Yellow rail	*Coturnicops noveboracensis*	Special concern	Special concern
Rusty blackbird	*Euphagus carolinus*	Special concern	Special concern
Peregrine falcon	*Falco peregrinus anatum / tundrius*	Special concern	Special concern
Harlequin duck	*Histrionicus histrionicus*	Special concern	Special concern
Least bittern	*Ixobrychus exilis*	Threatened	Threatened
Eskimo curlew	*Numenius borealis*	Endangered	Endangered
Roseate tern	*Sterna dougallii*	Endangered	Endangered
Arthropods			
Cobblestone tiger beetle	*Cicindela marginipennis*	Endangered	Endangered
Maritime ringlet	*Coenonympha nipisiquit*	Endangered	Endangered
Monarch butterfly	*Danaus plexippus*	Special concern	Special concern
Pygmy snaketail	*Ophiogomphus howei*	Special concern	Special concern
Fishes			
Shortnose sturgeon	*Acipenser brevirostrum*	Special concern	Special concern
Rainbow smelt (Lake Utopia)	*Osmerus mordax*	Threatened	Threatened
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, five species listed under the f*SARA* and by the COSEWIC have been observed (Figure 34).

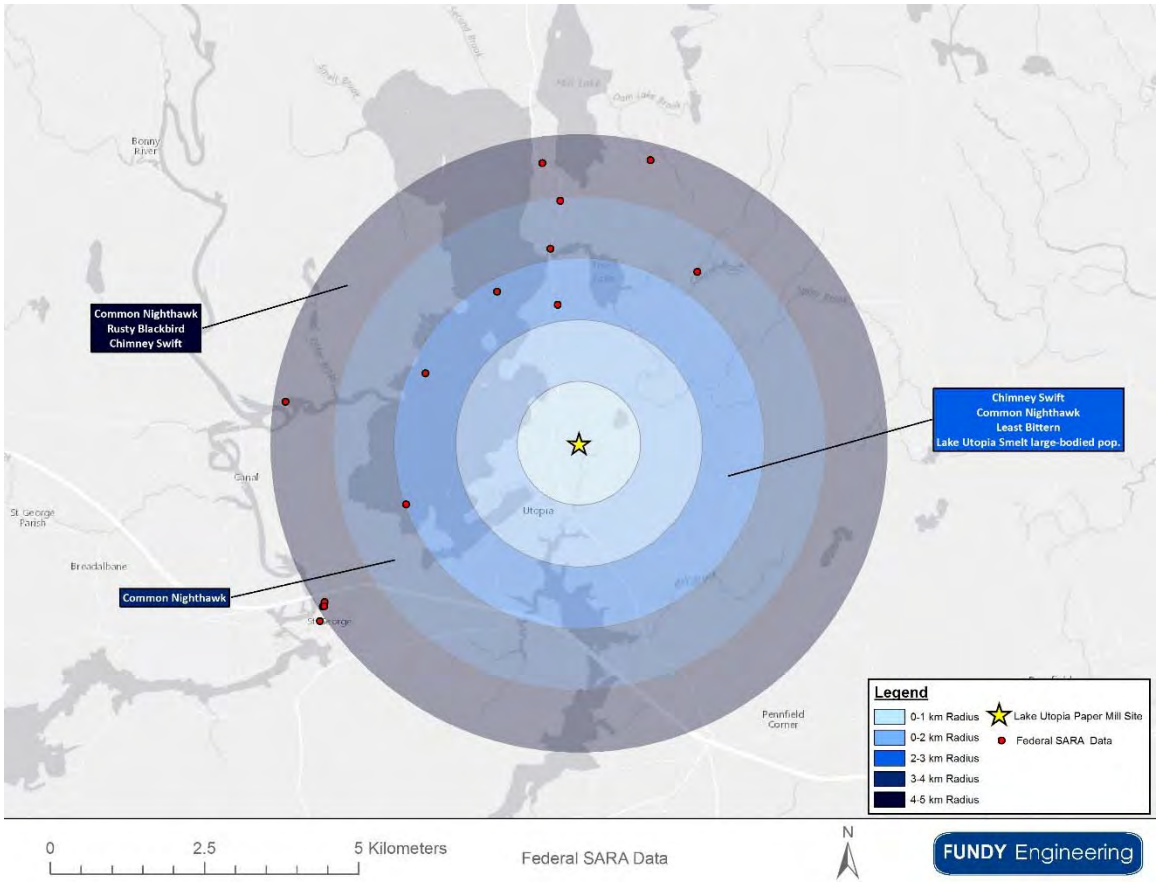


Figure 34. Map showing the recorded observations of species listed under the f*SARA* and by the COSWEIC within a 5 km radius of the Lake Utopia Paper Mill in Utopia, New Brunswick. Data obtained from the ACCDC.

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*, 2016] and COSWEIC [*COSEWIC*, 2016] websites.

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 35). They build nests of twigs stuck together with salvia, 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 population of chimney swifts 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 17).

Figure 35. 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 rusty blackbird (Figure 35) is a thrush-sized passerine with narrow and pointed wings, and a slightly rounded tail that is almost as long as the wings. *Euphagus carolinus* has pale yellow eyes and a slightly curved black bill. They nest in the forest and favour the shores of wet areas, such as slow-moving streams, peat bogs, 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. As a result, they are listed as a species of special concern under the f*SARA* and by the COSEWIC (Table 17).

The common nighthawk (Figure 35), a medium-sized bird with long, narrow, pointed wings and a slightly notched long tail, is ranked as a threatened species under the f*SARA* and by the COSEWIC (Table 17). 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 river banks. 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).

The least bittern is a small member of the heron and bittern family (Figure 35). It is ranked as a threatened species under the f*SARA* and by the COSEWIC (Table 17). The Canadian population is estimated at 1 000 pair. This species nests in freshwater marshes where dense tall aquatic vegetation (*i.e.*, cattails) is interspersed with clumps of woody vegetation and open water. In New Brunswick, nesting occurs in the extreme south and they are more common in marshes that exceed 5 ha.

The Lake Utopia dwarf smelt (Figure 35; Table 17) is a streamlined and laterally compressed smelt. Historically it was only found in Lake Utopia of Charlotte County, New

Brunswick; however, it was introduced to and became established in Meech Lake, Quebec. The naturally restricted small range and presumed low abundance are the reasons for its threatened status under the f*SARA* and by the COSEWIC (Table 17). In early to mid-May 1991, < 200 individuals were observed in the two slow-flowing tributaries of Lake Utopia that are used for spawning. Those two tributaries, which are 1 m to 2 m wide, are located at the northwest end of the Lake and neither connects with any other water body.

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 18. Those terrestrial and aquatic species identified under the provincial *Species At Risk Act* (f*SARA*) as being at risk in New Brunswick are listed. Listing of a species in Table 18 does not indicate that it is either present or absent at the Project site. Presence and absence information is provided below. The order of risk level under the p*SARA* is as follows: special concern; threatened; endangered; and extirpated.

Table 18. Terrestrial and aquatic flora and fauna listed as being at risk in New Brunswick under the p*SARA* that could potentially be affected by the proposed Project at the Lake Utopia Paper Mill in Utopia, New Brunswick.

Common Name	Scientific Name	p*SARA* Status
Vascular Plants, Mosses, and Lichens		
Blue felt lichen	*Degelia plumbea*	Species of 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*	Species of special concern
Southern twayblade	*Listera australis*	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
Bathurst aster Bathurst population	*Symphyotrichum subulatum*	Endangered
Molluscs		
Dwarf wedgemussel	*Alasmidonta heterodon*	Extirpated
Brook floater	*Alasmidonta varicosa*	Species of special concern
Yellow lampmussel	*Lampsilis cariosa*	Species of special concern
Reptiles		
Loggerhead sea turtle	*Caretta caretta*	Endangered
Snapping turtle	*Chelydra serpentina*	Species of 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*	Species of special concern
Barrow's goldeneye Eastern population	*Bucephala islandica*	Species of 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*	Threatened
Eastern wood-pewee	*Contopus virens*	Species of special concern
Yellow rail	*Coturnicops noveboracensis*	Species of special concern
Bobolink	*Dolichonyx oryzivorus*	Threatened
Rusty blackbird	*Euphagus carolinus*	Species of 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*	Species of special concern
Roseate tern	*Sterna dougallii*	Endangered
Eastern meadowlark	*Sturnella magna*	Threatened
Canada warbler	*Wilsonia canadensis*	Threatened
Arthropods		
Cobblestone tiger beetle	*Cicindela marginipennis*	Endangered
Maritime ringlet	*Coenonympha nipisiquit*	Endangered
Monarch	*Danaus plexippus*	Species of special concern
Skillet clubtail	*Gomphus ventricosus*	Endangered
Pygmy snaketail	*Omphiogomphus howei*	Species of special concern
Fishes		
Shortnose sturgeon	*Acipenser brevirostrum*	Species of special concern
Atlantic sturgeon Maritimes populations	*Acipenser oxyrinchus*	Threatened
Thorny skate	*Amblyraja radiata*	Species of special concern
Atlantic wolffish	*Anarhichas lupus*	Species of special concern
American eel	*Anguilla rostrata*	Threatened
Cusk	*Brosme brosme*	Endangered
White shark Atlantic population	*Carcharodon carcharias*	Endangered
Atlantic cod Laurentian south population	*Gadus morhua*	Endangered

Common Name	Scientific Name	p*SARA* Status
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*	Species of special concern
Smooth skate Laurentian-Scotian population	*Malacoraja senta*	Species of special concern
Striped bass Bay of Fundy population	*Morone saxitilis*	Endangered
Striped bass southern Gulf of St. Lawrence population	*Morone saxitilis*	Species of 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*	Species of 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*	Species of special concern
Acadian redfish Atlantic population	*Sebastes fasciatus*	Threatened
Spiny dogfish Atlantic population	*Squalus acanthias*	Species of special concern
Atlantic bluefin tuna	*Thunnus thynnus*	Endangered
Mammals		
Blue whale - Atlantic population	*Balaenoptera musculus*	Endangered
Fin whale Atlantic population	*Balaenoptera physalus*	Species of special concern
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*	Species of special concern
Woodland caribou	*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, 10 species listed under the p*SARA* have been observed (Figure 38).

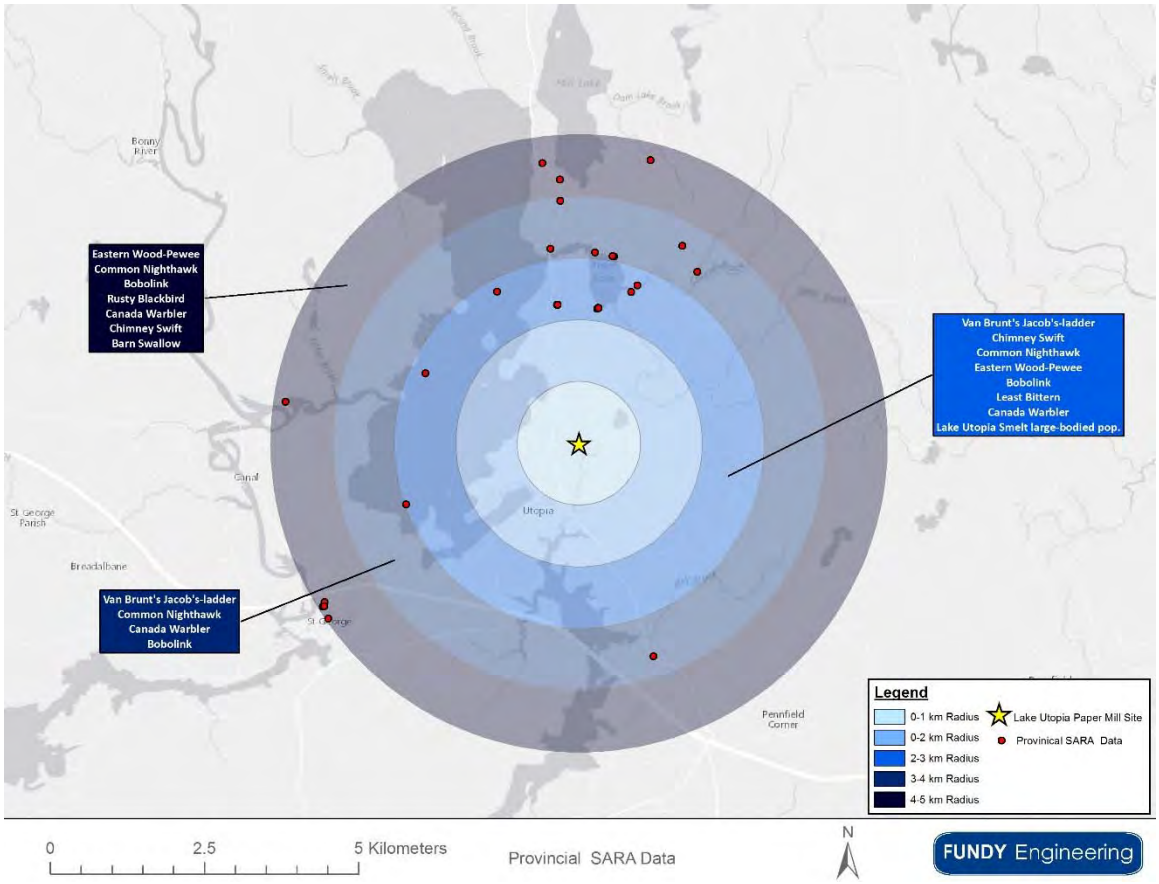


Figure 36. Map showing the recorded observations of species listed under the p*SARA* within a 5 km radius of the Lake Utopia Paper Mill in Utopia, New Brunswick. Data obtained from the ACCDC.

3.2.2.1 Snapshots of Provincial Species at Risk Locally Present

Those 11 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 37. Descriptions of those species are also provided if not previously described in Section 3.2.1.1. One of the species previously described, the peregrine falcon, is listed provincially as being endangered while federally it is only listed as being of special concern. All other listings are the same as above. Detailed information provided below on the protected species was obtained from the species profiles on the f*SARA* [*SARA*, 2016], COSWEIC [*COSEWIC*, 2016], and regulatory agency websites.

The bobolink (Figure 37) is a small bird that averages 18 cm long, has a wingspan of about 29 cm, and weighs approximately 40 g. Male bobolinks have a distinctive plumage during the breeding season, which includes a black and white rump and a black and yellow nape. Their winter plumage, yellow and brown, is similar to that of the female. Bobolinks feed mainly on insects during the summer and switch to grains during migration periods. 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. Under the p*SARA*, the bobolink is listed as being a threatened species (Table 18).

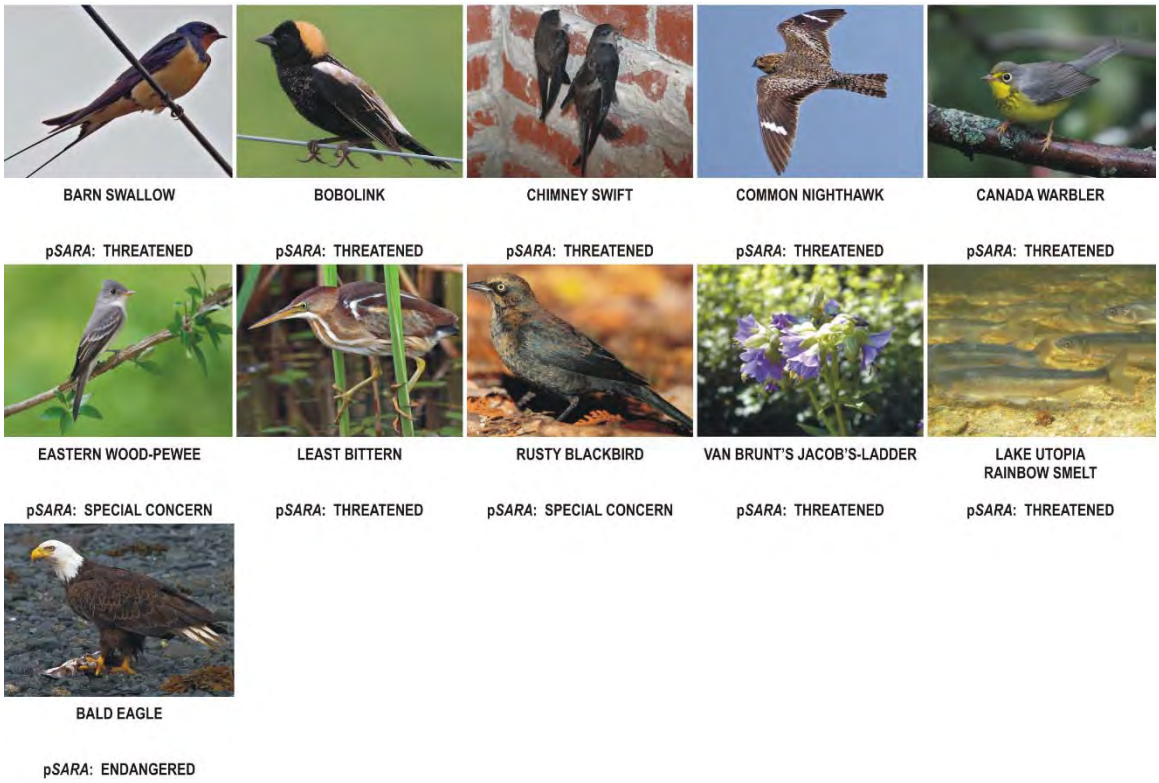


Figure 37. Photographs of species listed under the p*SARA* that have been observed within a 5 km radius of the Lake Utopia Paper Mill in Utopia, New Brunswick.

The barn swallow (Figure 37) is the most widespread swallow species in the world. The population of over 190 million individuals globally is considered stable [*BirdLife*, 2014]. Because there have been considerable declines in the presence for the past several decades, the barn swallow is species is listed as threatened under the p*SARA* (Table 18). 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 feeds on insects caught while in flight.

The Canada warbler is a small (12 cm to 15 cm), brightly coloured songbird (Figure 37). Their numbers have plummeted in the majority of their nesting areas. Although most abundant in wet, mixed deciduous-coniferous forest with a well-developed shrub layer, it is found in a variety of forest types. It also prefers riparian shrub forests on slopes and in ravines and in old-growth forests with canopy openings and a high density of shrubs, as well as in regenerating forest stands. Because their habitat is being lost and degraded, their numbers continue to be vulnerable to decline and hence the reasoning for their threatened ranking under the p*SARA* (Table 18).

Rediscovered in Charlotte County in 2005, Van Brunt's Jacob's-Ladder is a delicate flowering plant that grows up to 1 m tall and produces showy purple, bell-like flowers (Figure 37) during spring and early summer. It is ranked under p*SARA* as being threatened (Table 18) because it is only known to exist in a few locations in New Brunswick and Quebec. It is typically found growing in cedar swamps and near the edges of streams

or lakes, often amongst alders. Recreational activities and logging are the biggest threats to this species.

The eastern wood-pewee is a small forest flycatcher that grows to about 15 cm long (Figure 37). It was once thought to be a single species of the olive-sided flycatcher, but was later identified as a separate species. Adults are generally greyish-olive on their upper parts and pale on the under parts with pale bars on their wings. Males and females are similar in appearance. They have a distinctive, clear, three-part song, usually heard as "pee-ah-wee". It is generally found in the mid-canopy layer of forest clearings and at the edges of deciduous and mixed forests. Its habitat is threatened through various land-use activities, which is why it is listed as a species of special concern under the p*SARA* (Table 18).

The bald eagle (Figure 37) 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 the number of bald eagles has drastically increased over the past few decades to the point where they are no longer a species listed under the f*SARA*, they are still listed as being endangered under the p*SARA* (Table 18).

3.2.3 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. The full list of the flora (n = 22 unique species) and fauna (n = 20 unique species) within 5 km of the site is provided in Table 18 and the ACCDC report can be found in Appendix VI. Interpretation of the ACCDC S-rank system is provided in Table 20.

A visual representation of the 22 observed flora species is provided in Figure 38. Similarly, a visual representation of the 20 observed fauna species is provided in Figure 39 through Figure 41.

Table 19. List of provincially ranked flora and fauna identified by the ACCDC as being observed within 5 km of the Lake Utopia Paper Mill in Utopia, New Brunswick.

Common Name	Scientific Name	S-rank	NB GS Rank
Flora			
Canada serviceberry	*Amelanchier canadensis*	S3	Secure
Michaux's sedge	*Carex michauxiana*	S3	Secure
Spotted coralroot	*Corallorhiza maculate*	S3S4	Sensitive
Toothed flatsedge	*Cyperus dentatus*	S3	Secure
Small waterwort	*Elatine minima*	S3	Secure
American shoreweed	*Littorella uniflora*	S3	Secure
Lobelia cardinalis	*Cardinal flower*	S3	Secure
Whorled water milfoil	*Myriophyllum verticillatum*	S3	Secure
Ditch stonecrop	*Penthorum sedoides*	S3	Secure
Large purple fringed orchid	*Platanthera grandiflora*	S3	Sensitive

Common Name	Scientific Name	S-rank	NB GS Rank
Water smartweed	*Polygonum amphibium var. emersum*	S2	Sensitive
Oakes' pondweed	*Potamogeton oakesianus*	S3S4	Secure
Marsh mermaidweed	*Proserpinaca palustris var. crebra*	S2?	Sensitive
Brown beakrush	*Rhynchospora fusca*	S3	Secure
Swamp rose	*Rosa palustris*	S3	Secure
Bog willow	*Salix pedicellaris*	S3	Secure
Water awlwort	*Subularia aquatic var. americana*	S3	Secure
Eastern skunk cabbage	*Symplocarpus foetidus*	S2	Sensitive
Clinton's clubrush	*Trichophorum clintonii*	S3	Secure
Northern arrow-wood	*Viburnum recognitum*	S2	Secure
New England violet	*Viola novae-angliae*	S2	Sensitive
Humped bladderwort	*Utricularia gibba*	S3S4	Secure
Fauna			
Northern shoveler	*Anas clypeata*	S2B	Secure
Long-eared owl	*Asio otus*	S2S3	Undetermined
Upland sandpiper	*Bartramia longicauda*	S1B	Sandpiper
Turkey vulture	*Cathartes aura*	S3B	Secure
Killdeer	*Charadrius vociferus*	S3B	Sensitive
Willow flycatcher	*Empidonax traillii*	S1S2B	Sensitive
Two-spotted skipper	*Euphyes bimacula*	S3	Secure
Red crossbill	*Loxia curvirostra*	S3	Secure
Indigo bunting	*Passerina cyanea*	S3B	Secure
Cliff swallow	*Petrochelidon pyrrhonota*	S3S4B	Sensitive
Scarlet tanager	*Piranga olivacea*	S3S4B	Secure
Vesper sparrow	*Pooecetes gramineus*	S2B	May be at risk
Cougar - Eastern pop	*Puma concolor pop. 1*	SU	Undetermined
Virginia rail	*Rallus limicola*	S3B	Sensitive
Bank swallow	*Riparia riparia*	S3B	Sensitive
Aphrodite fritillary	*Speyeria aphrodite*	S3	Secure
Northern rough-winged swallow	*Stelgidopteryx serripennis*	S1S2B	May be at risk
Brown thrasher	*Toxostoma rufum*	S2B	Sensitive
Solitary sandpiper	*Tringa solitaria*	S2B, S5M	Secure
Eastern kingbird	*Tyrannus tyrannus*	S3S4B	Sensitive

Table 20. 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	Definition
S1	Extremely rare: may be especially vulnerable to extirpation; typically five or fewer occurrences or very few remaining individuals.
S2	Rare: may be vulnerable to extirpation due to rarity or other factors; six to 20 occurrences or few remaining individuals.
S3	Uncommon: found only in a restricted range, even if abundant at some locations; 21 to 100 occurrences.
S4	Usually widespread, fairly common: apparently secure with many occurrences, but of longer-term concern (*e.g.*, watch list); 100 + occurrences).
S5	Abundant: widespread and secure under present conditions.
S#S#	Numeric range rank: a range between two consecutive ranks for a species / community; denotes uncertainty about the exact rarity (*e.g.*, S1S2).
SH	Historical: previously occurred in the province but may have been overlooked during the past 20 years to 70 years; presence is suspected and will likely be rediscovered.
SU	Unrankable: possibly in peril, but status is uncertain; need more information.
SX	Extinct / Extirpated: believed to be extirpated from its former range.
S?	Unranked: not yet ranked.

ACCDC S-rank	Definition
SA	Accidental: accidental or casual, infrequent and far outside usual range; includes species (usually birds or butterflies) recorded once or twice or only at very great intervals, hundreds, or even thousands of miles outside their usual range.
SE	Exotic: an exotic established in the province (*e.g.*, Purple Loosestrife or Coltsfoot); may be native in nearby regions.
SE#	Exotic numeric: an established exotic that has been assigned a rank.
SP	Potential: potentially occurs, but no occurrences have been reported.
SR	Reported: no persuasive documentation (*e.g.*, misidentified specimen).
SRF	Reported falsely: erroneously reported and the error has persisted in the literature.
SZ	Zero: not of practical conservation concern because there are no definable occurrences, although the species is native and appears regularly; an SZ rank is generally used for occasional long distance migrants.

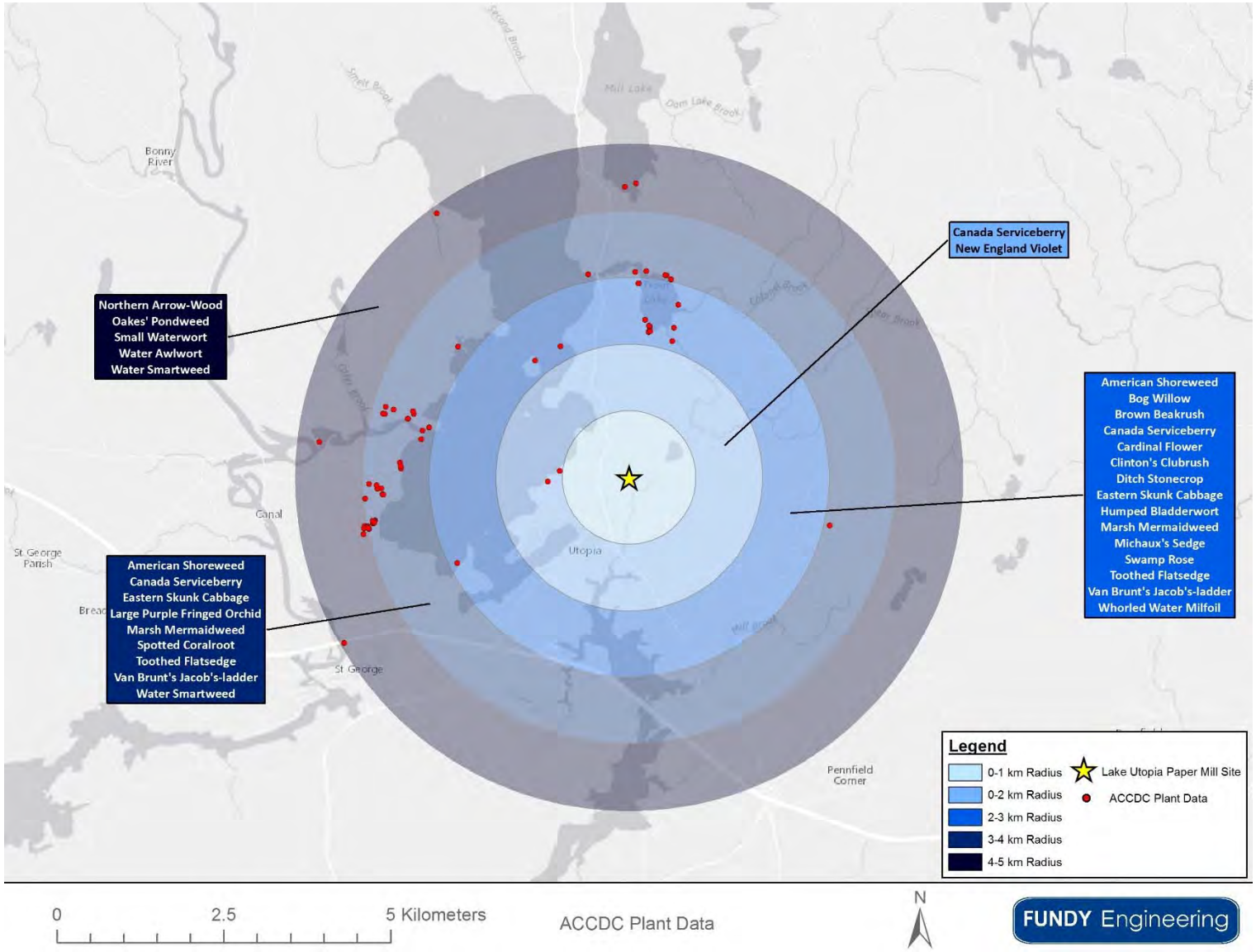


Figure 38. Map showing the observed flora species within a 5 km radius of the Lake Utopia Paper Mill in Utopia, New Brunswick. Data obtained from the ACCDC.

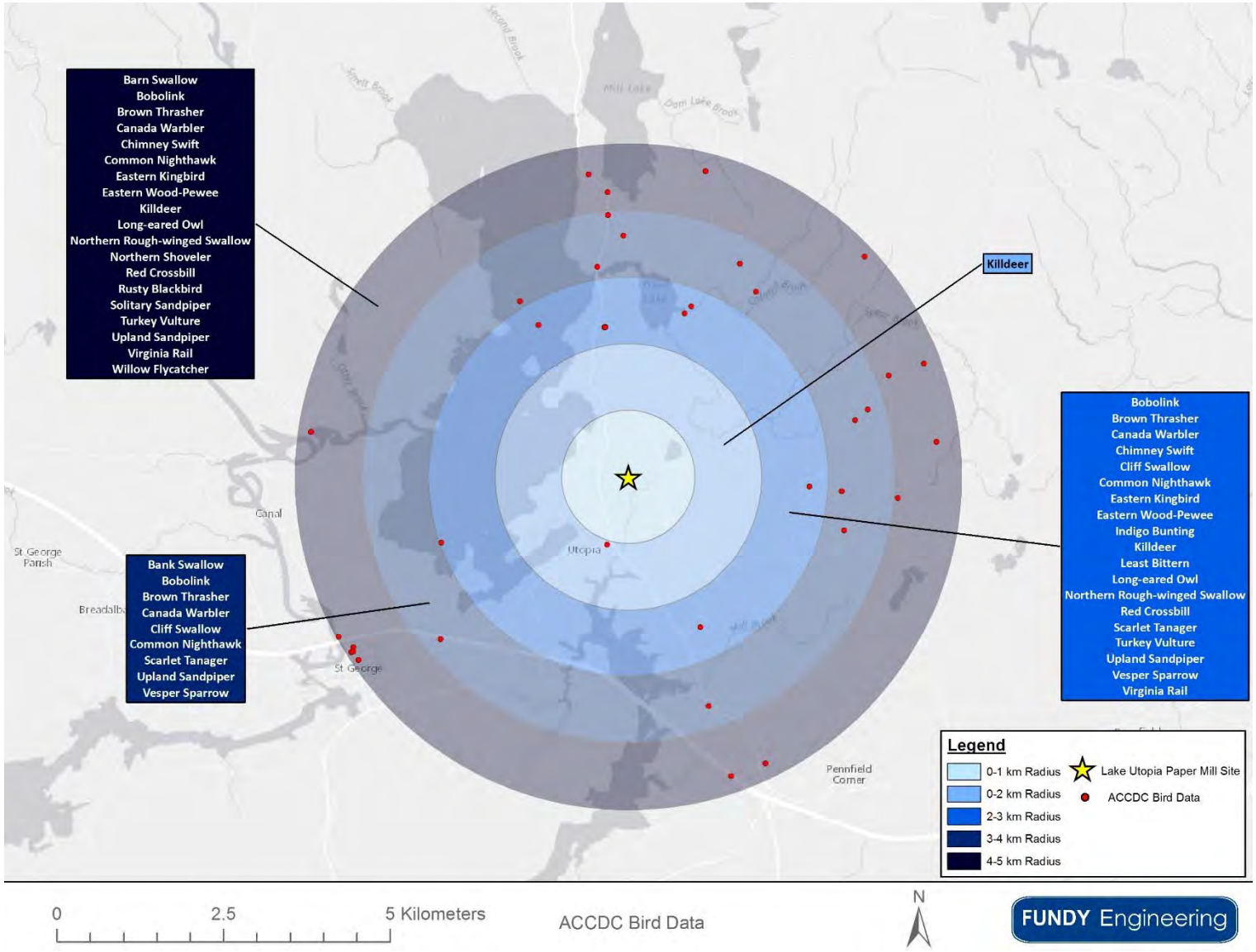


Figure 39. Map showing the observed birds within a 5 km radius of the Lake Utopia Paper Mill in Utopia, New Brunswick. Data obtained from the ACCDC.

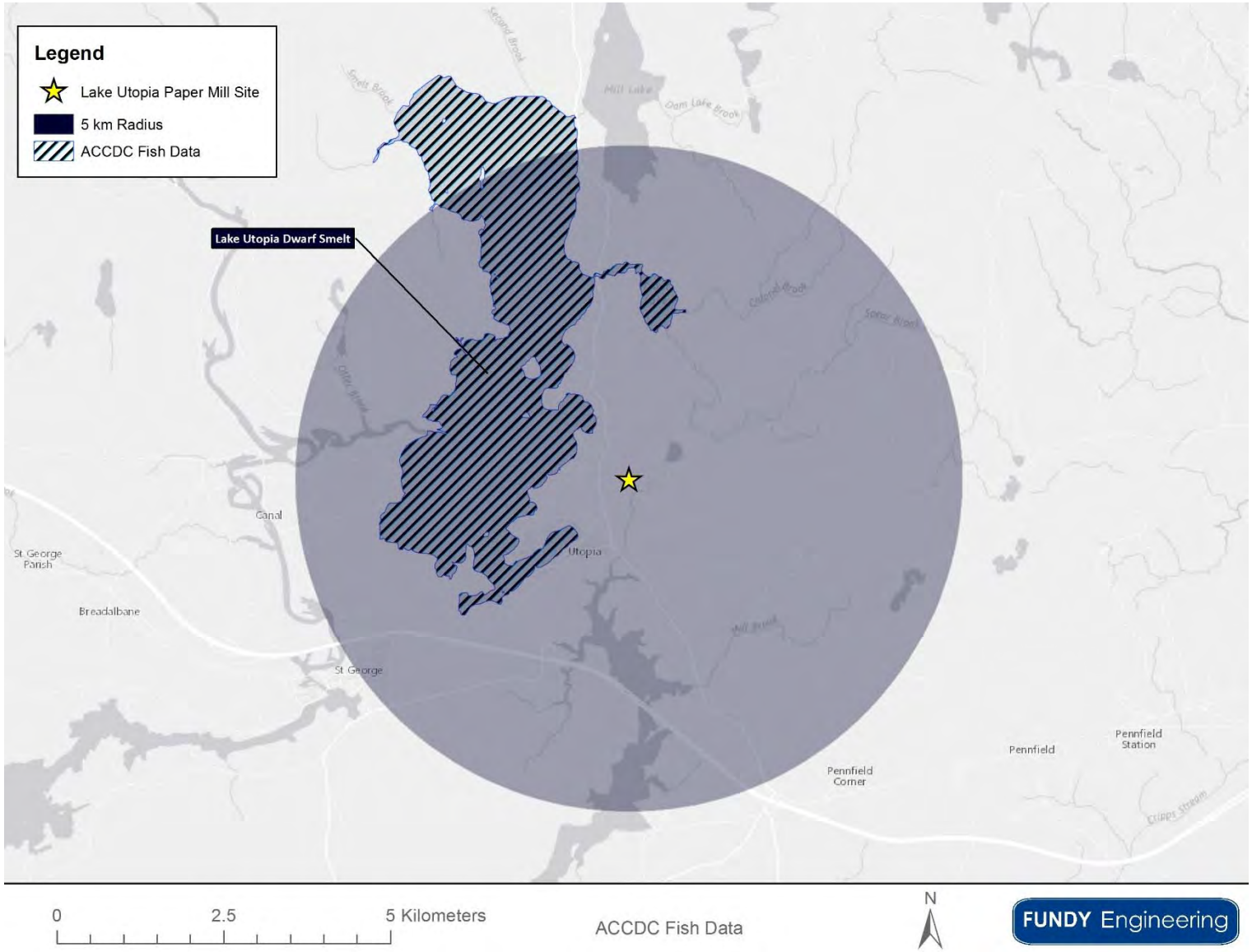


Figure 40. Map showing observed fishes within a 5 km radius of the Lake Utopia Paper Mill in Utopia, New Brunswick. Data obtained from the ACCDC.

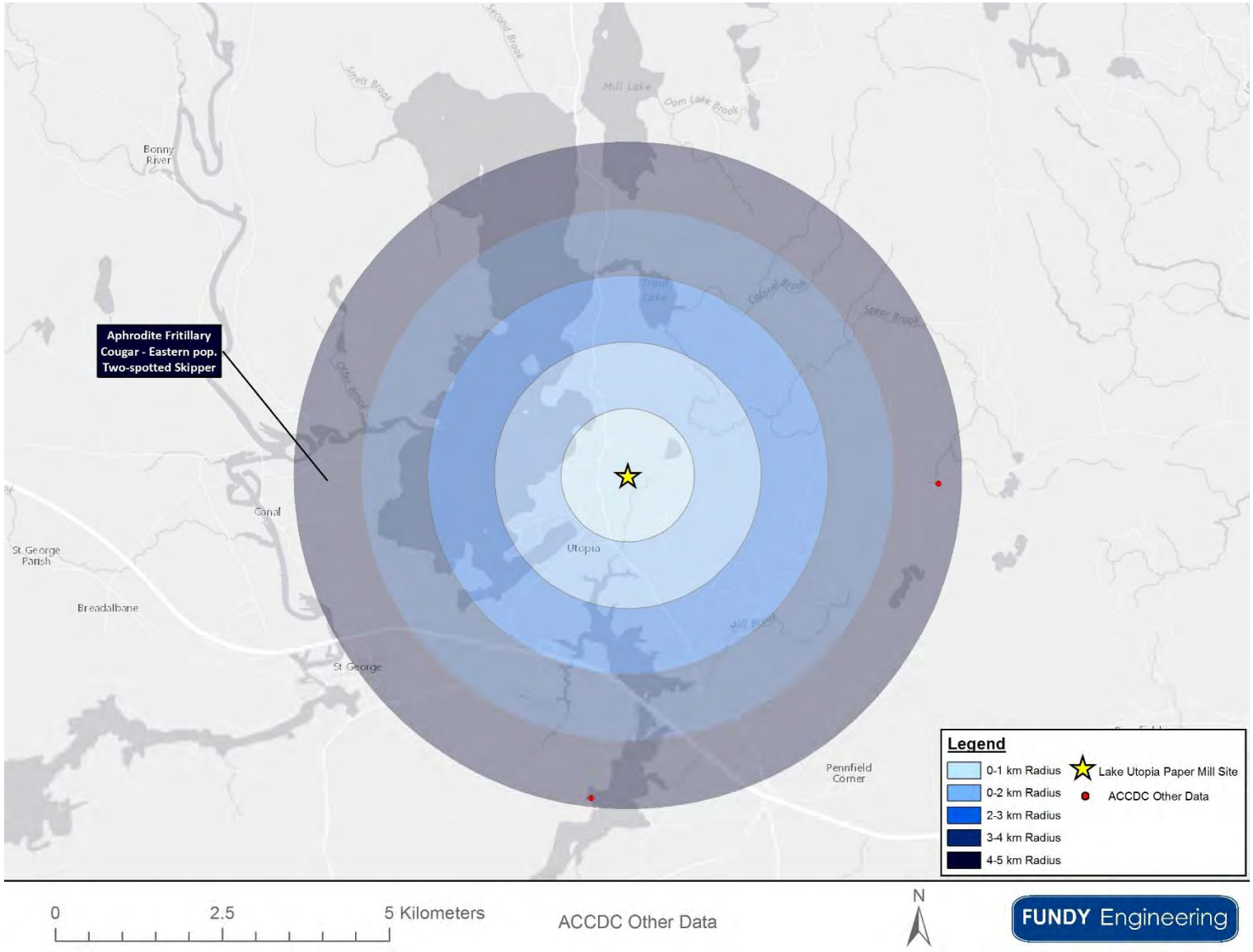


Figure 41. Map showing observed fauna other than birds within a 5 km radius of the Lake Utopia Paper Mill in Utopia, New Brunswick. Data obtained from the ACCDC.

During the site visits, no flora and fauna species of special concern were noted. It is possible that species listed above either live in adjacent areas or may migrate through the area on occasion.

3.2.4 Environmentally Significant and Managed Areas

The ACCDC query yielded two Environmentally Significant Areas (ESAs) and one managed area and within 5 km of the Lake Utopia Paper Mill (Figure 42), including:

- St. George Roadcuts ESA;
- Lake Utopia / The Canal ESA; and
- Utopia Wildlife Refuge.

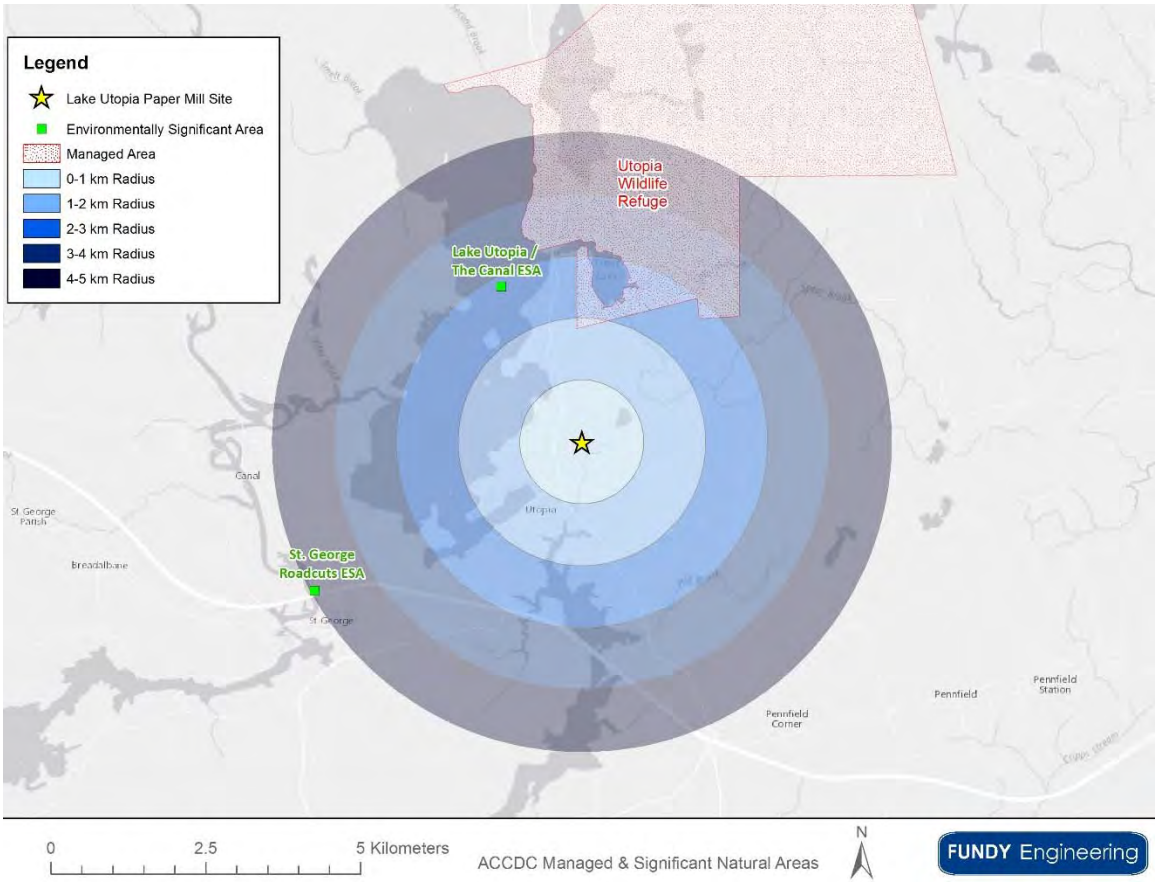


Figure 42. Map showing the environmentally significant and managed areas within a 5 km radius of the Lake Utopia Paper Mill in Utopia, New Brunswick. Data obtained from the ACCDC.

Two large roadcuts, separated by a deep valley of the Magaguadavic River, form the St. George Roadcuts ESA (Figure 42). To the east of the valley are Early Devonian, orange coloured, felsic volcanics. To the east are Early Silurian grey slates and mafic dykes. Abundant fractures in these rock cuts contain felsic volcanic rocks and minor mafic rocks.

Lake Utopia is a unique lake in New Brunswick, which is why it is designated as an ESA. Its outlet, The Canal, drains to the Magaguadavic River. This lake is likely unique in New Brunswick in having an outlet delta at The Canal, which drains the lake to the

Magaguadavic River. During periods of heavy rain, the level of the river rises higher than the lake so that the Canal reverses, becoming an inlet.

Utopia Wildlife Refuge was officially designated a conservation area on 5 June 2006. It is part of the 200 km^2 Lepreau Wildlife Management Area (*i.e.*, NB Zone 20) and is situated in the Parishes of Saint George and Pennfield. It is an area where hunting and trapping are not allowed as prescribed under the New Brunswick *Fish and Wildlife Act*.

3.3 SOCIO-ECONOMIC ENVIRONMENT

3.3.1 Demographics and Labour

Utopia is located within the southwest economic region of New Brunswick, which encompasses Charlotte, Kings, and St. John Counties (*i.e.*, 12 % of New Brunswick's land area). The region is home to about 172 764 people (2011 Census) [*NBDPETL*, 2013]. Charlotte County, of which Utopia belongs, is made up of small towns, villages, and local service districts and contains about 16 % of the region's population (Table 21). In 2011, females comprised 52 % of the population and > 95 % of the population identified English as their mother tongue.

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

County / Region	Area (km^2)	1991	1996	2001	2006	2011	1991 to 2006 % Change
St. John County	1 462	81 460	79 305	76 407	74 621	76 550	- 6
Charlotte County	3 424	26 610	27 335	27 366	26 898	26 549	- 0.2
Kings County	3 482	62 120	64 720	64 208	65 824	69 665	12
Southwest economic	8 368	170 190	171 360	167 981	167 343	172 764	1.5
New Brunswick	72 908	723 900	738 135	729 498	729 997	75 1171	3.8

Although over 40 % of the population in the southwest economic region is part of the core-working age, older cohorts have been increasing while the population of youth has been declining. The proportion of the population in the southwest economic region with no certificate, diploma, or degree (*i.e.*, 16 %) is lower than the New Brunswick average (*i.e.*, 21 %) and is the lowest of all regions.

The southwest economic region has a relatively balanced economy [*NBDPETL*, 2013]. Over one quarter of employment in the region is within the sales and service occupations (Table 22). Employment by industry is presented in Table 23 and shows that after the public sector is accounted for, the majority of individuals are employed in the services-producing sector. Some of the most significant private sector industries in the southwest economic region are trade, manufacturing, and construction.

Table 22. Employment by occupational classification for the southwest economic region of New Brunswick in 2012.

Occupational Classification	Number of Employees	Percentage of Total Employees
Sales and service	21 700	25.6
Business, finance, and administrative	15 300	18.0
Trades, transport, and equipment operators and related	14 500	17.1
Management	6 900	8.1
Health	6 700	7.9
Social science, education, government services, and religion	6 600	7.8
Natural and applied sciences and related	6 000	7.1
Processing, manufacturing, and utilities	3 400	4.0
Primary industry	2 700	3.2
Arts, culture, recreation, and sport	1 200	1.4
TOTAL	85 000	100

Table 23. Employment by industry for the southwest economic region of New Brunswick in 2012.

Industry Sector	Number of Employees	Percentage of Total Employees
Public services	22 100	26.0
All other services-producing services	20 740	24.4
Trade	12 410	14.6
Accommodation and food services	5 270	6.2
Business, building, and other support services	4 930	5.8
All other goods-producing services	5 270	6.2
Manufacturing	7 650	9.0
Construction	6 715	7.9
TOTAL	85 000	100

In 2006, the median total income for individuals in the region was $30 945, which was slightly higher than the New Brunswick average of $28 353 [*NBDPETL*, 2013]. The average family income (*i.e.*, couple families with or without children and lone-parent families) in the region was $68 231, which is also higher than the New Brunswick average of $63 913.

Some of the largest employers in the southwest economic region are [*NBDPETL*, 2013]:

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

Providing 138 direct jobs and 164 indirect jobs, the LUP Mill represents close to 20 % of the total employment in the Town of St. George [*Jupia Consultants*, 2014]. Average wage rates are more than double the provincial average for full-time, full-year workers. In 2013, LUP generated an estimated $23.9 million in direct and indirect employment income.

3.3.2 Archaeological and Cultural Features

Archaeological predictive modelling obtained from the New Brunswick Department of Tourism, Heritage, and Culture (NBDTHC) is presented in Figure 43. The information shows that two historic archaeological sites (*i.e.*, BgDq-25 and BgDq-26) are located along the shores of Roix Lake. According to personnel at the NBDTHC, those sites are most likely the remnants of historic homes.

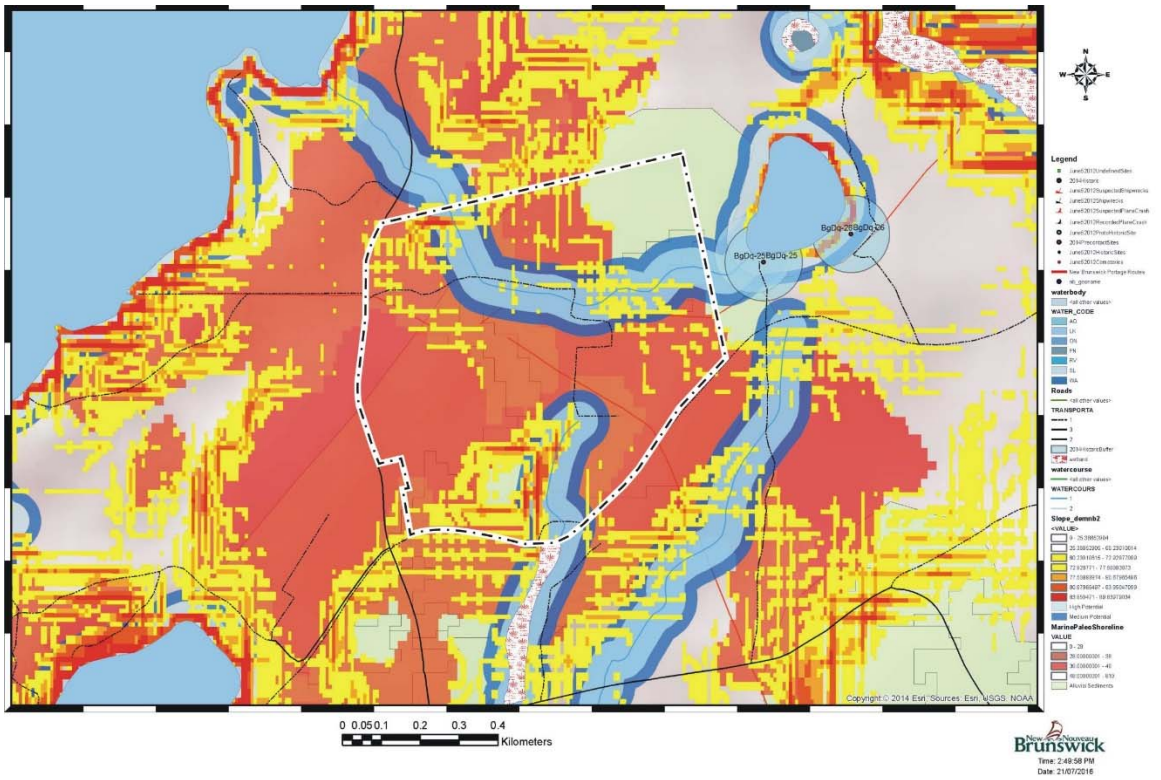


Figure 43. Archaeological predictive modelling in the vicinity of the Lake Utopia Paper Mill (*i.e.*, outlined by a dashed black line atop a white line) in Utopia, New Brunswick. Source: New Brunswick Department of Tourism, Heritage, and Culture.

Due to the historical industrial use of the Mill site, the potential for significant archaeological and / or cultural resources to be present at the Project site is considered to be 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.

3.3.3 Traditional Uses by Aboriginals and First Nations

Little is known regarding the traditional use of the Mill site by Aboriginals and First Nations. The Passamaquoddy people occupied the coastal regions along the Bay of Fundy and

the Gulf of Maine and the shores of the St. Croix River and its tributaries while the Wolastoqiyik occupied more northern and inland areas (Figure 44). Since both cultures lacked a written history, not much is known prior to the arrival of Europeans. The Passamaquoddy people were forced off their lands repeatedly by the Europeans during the sixteenth century and were eventually confined to the Indian Township Reservation in Maine. It is believed the Maliseet were pushed north towards Fredericton. According to New Brunswick census statistics, there were only 1 116 natives identified as residing in the Province in 1851 [*Webster*, 1930].

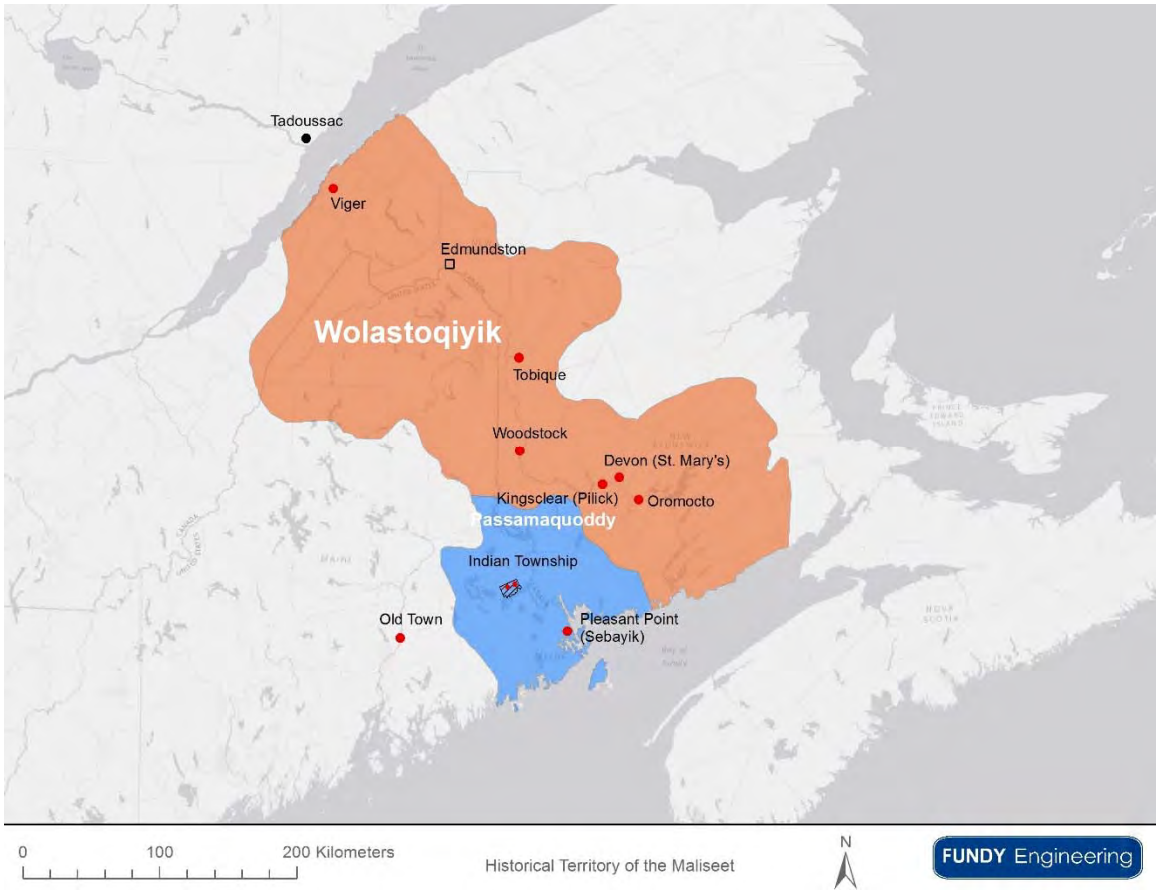


Figure 44. Historical territory of the Maliseet (*i.e.*, the Passamaquoddy people and the Wolastoqiyik) in New Brunswick, Quebec, and Maine.

It is unknown if the Maliseet used the lands the Mill occupies. The nearest designated First Nations lands are two small islands (*i.e.*, Goat Island and Indian Island) that form the Brothers Indian Reserve No. 18 and located within the Kennebecasis River approximately 55 km northeast of the Project site.

3.3.4 Historical Land-Use

As noted in Section 2.2, the Mill has existed in that location since the early 1970s. Prior to that, the site was undeveloped forested lands as shown in Figure 45. Since its purchase by JDI in 1972, the Mill has undergone many upgrades and expansions to remain globally competitive. Aerial photographs in Figure 46 through Figure 49 show changes over time.

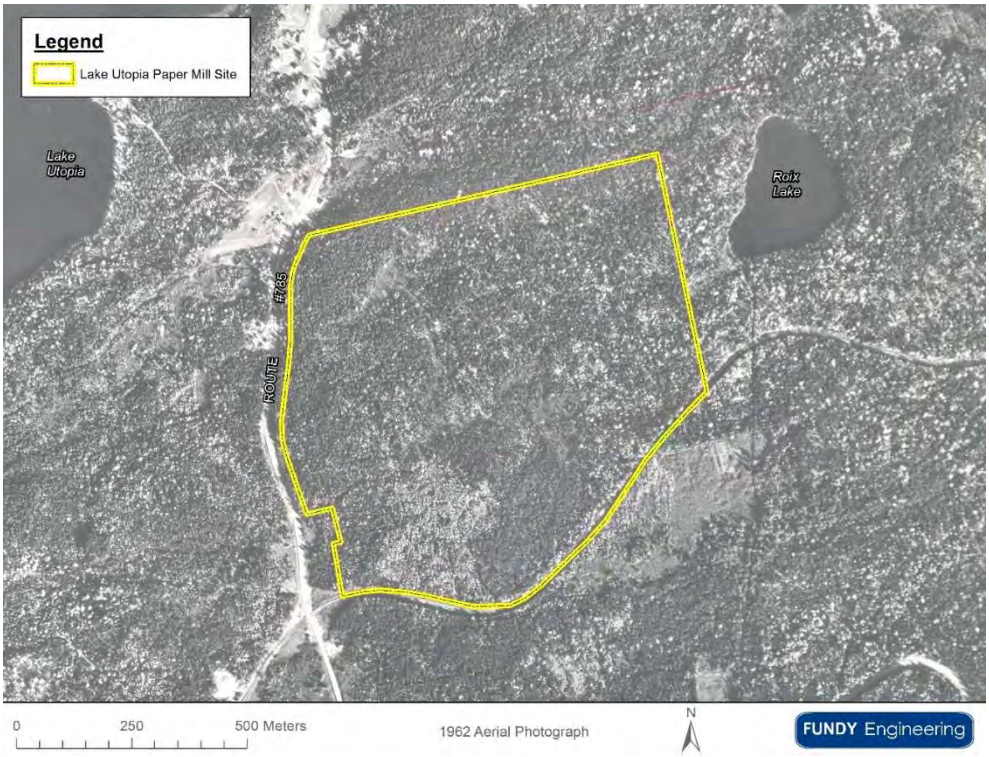


Figure 45. Aerial photograph, circa 1962, of the Lake Utopia Paper Mill site in Utopia, New Brunswick.

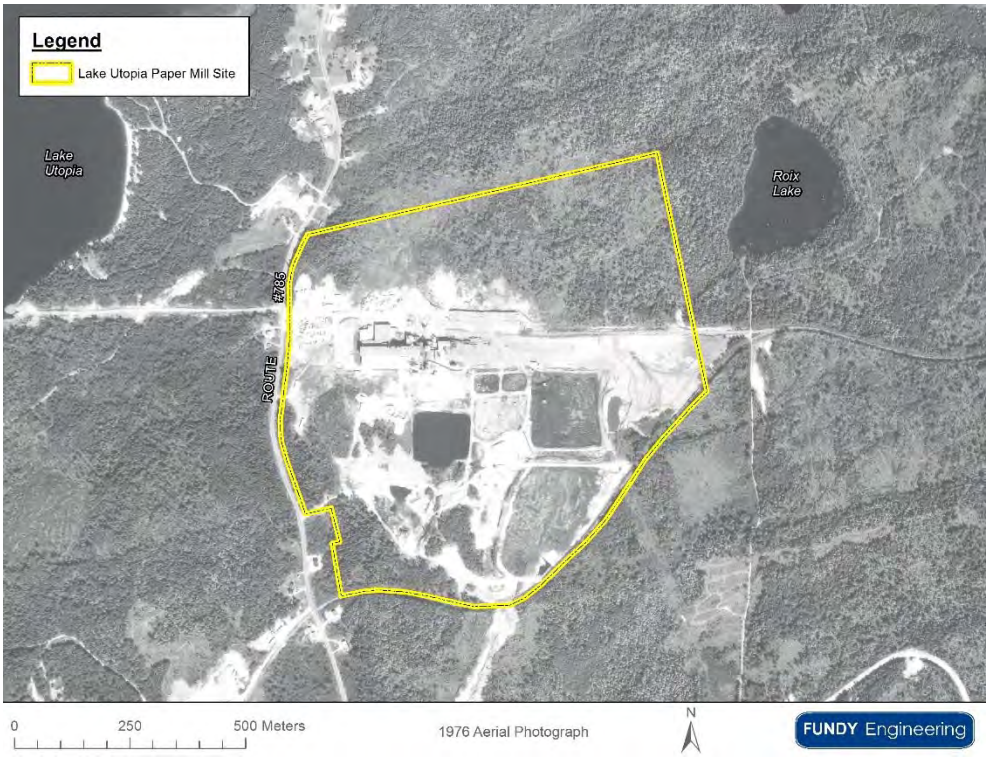


Figure 46. Aerial photograph, circa 1976, of the Lake Utopia Paper Mill in Utopia, New Brunswick.

Figure 47. Aerial photograph, circa 1984, of the Lake Utopia Paper Mill in Utopia, New Brunswick.

Figure 48. Aerial photograph, circa 1994, of the Lake Utopia Paper Mill in Utopia, New Brunswick.

Figure 49. Aerial photograph, circa 2004, of the Lake Utopia Paper Mill in Utopia, New Brunswick.

3.3.5 Health and Safety

The LUP Mill is a heavy industrial site (*i.e.*, Figure 2). Approximately 140 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 2.7.2.15, a detailed and site-specific health and safety program is in place at the Mill.

3.3.6 Transportation

The LUP Mill is located adjacent to NB Route 785 in Utopia. Connections from the four-lane divided Route 1 Gateway highway (*i.e.*, NB Route 1) are at exit 60 via NB Route 785 and at exit 56 via NB Route 780 to NB Route 785. Route 1 is maintained by Transfield Dexter Gateway Services Ltd. NB Routes 780 and 785 are two-lane asphalt roads that are maintained by the Province. Within the Mill site, there is a series of private roads, which are maintained by LUP, for accessing specific areas of the Mill site. All of the roadways described above are designed for heavy truck traffic and / or are truck routes (Figure 50).

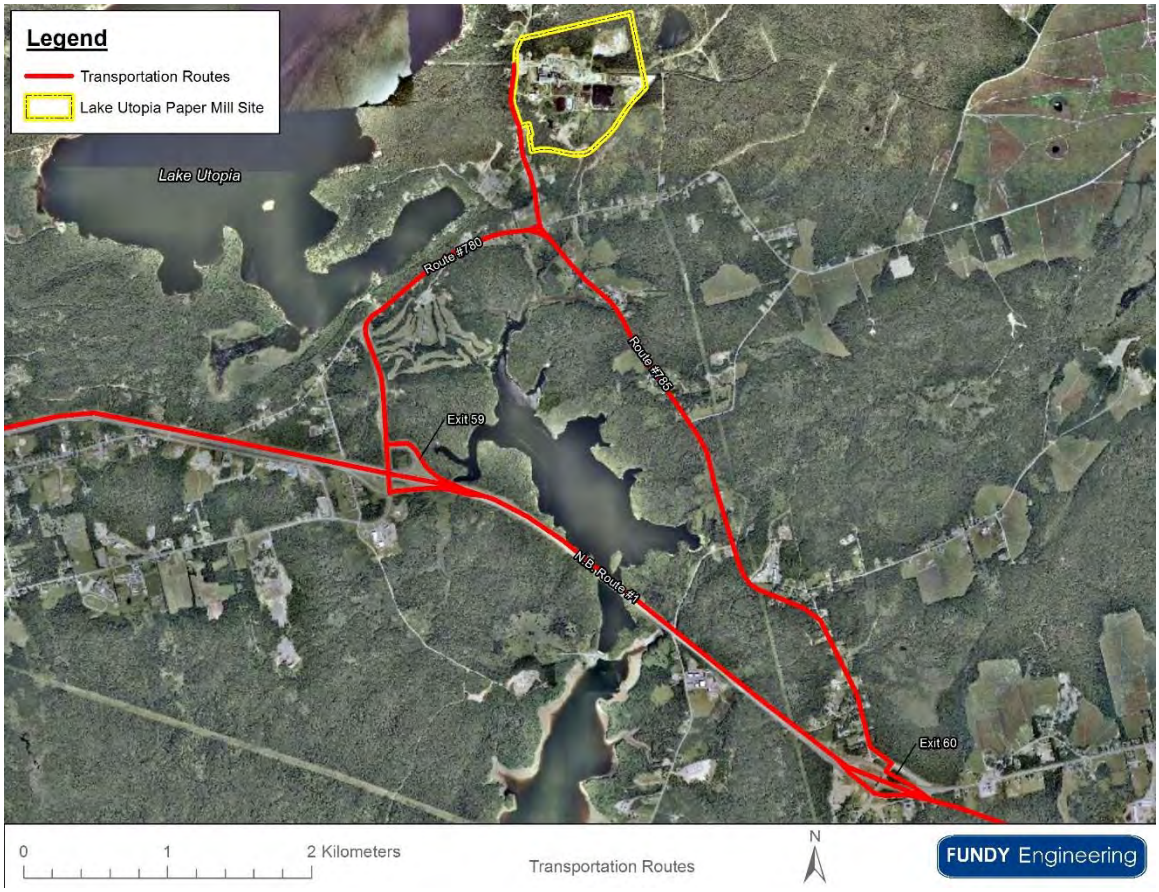


Figure 50. Map showing road connections to the Lake Utopia Paper Mill in Utopia, New Brunswick.

In 1987, tracks for the railroad connecting Saint John to St. George were lifted and the line was abandoned. Currently, the right-of-way is used as part of the NB Trail as described below in Section 3.3.9.

3.3.7 Municipal Services and Infrastructure

The LUP Mill is located within the Pennfield Local Service District, which is unserviced for water and sewer. Freshwater from Lake Utopia is used untreated as the process water and fire water at the LUP Mill. Pumps are located at the end of Pumphouse Road. Potable water for the Mill is obtained from an on-site groundwater well. Solid waste collected at the site is transported and disposed of at the Hemlock Knoll Waste Processing Facility via a private contractor.

3.3.8 Aesthetics

Lake Utopia is surrounded by a mixed Acadian forest and its shoreline is dotted with rustic camps and large summer homes. Although the LUP Mill is a heavy industrial site, it is not visually intrusive on the landscape. The area around the Mill is relatively flat and only the parking lot and buildings can be seen from the Mill's entrance along NB Route 785 (Figure 51).

Figure 51. Panoramic photograph looking southeast from NB Route 785 and showing the entrance to the Lake Utopia Paper Mill in Utopia, New Brunswick.

3.3.9 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 New Brunswick Department of Natural Resources, and the NBDELG. There are several attractions that tourists visit in the vicinity of LUP as shown in Figure 52.

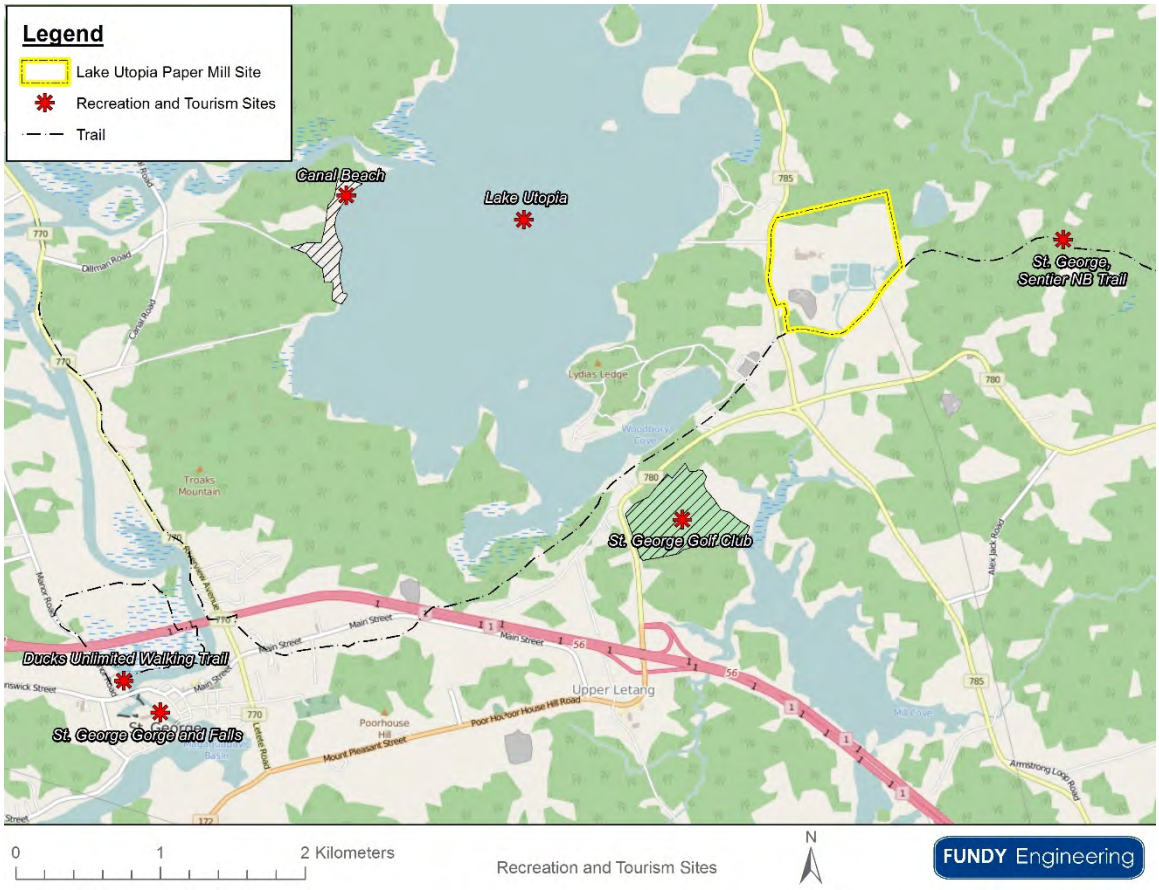


Figure 52. Several tourist attractions in the vicinity of the Lake Utopia Paper Mill in Utopia, New Brunswick.

4.0 POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION

4.1 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 transportation of corrugated medium from the Mill as that is already a pre-existing activity; however, the processing of wastewater through the new low-rate anaerobic digester 24 hours per day, 7 days a week, and 365 days per year is considered. Similarly, the operation of the bark boilers at the Mill are not considered as they are not part of this Project, but operation of the new process water storage tank is considered.

A high-level assessment of the Project stages and potential environmental interaction is summarized in Table 24. 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 identified.

Table 24. Project stages for the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick. Included are the activities associated with each stage and whether or not there is an interaction with the environment.

Stage	Activities	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	• Foundation excavation • Constructing buildings and digester • Installing infrastructure • Commissioning infrastructure	Yes
III – Operation and maintenance	• Treating process effluent	Yes
IV – Decommissioning	• Removing equipment and infrastructure • Site grading and leveling • Removing contaminated materials • Reclaiming the site	Yes, but will be defined at a later date
V – Mishaps, errors, and / or unforeseen events	• Potential for spills, contaminant releases, fires, and / or explosions	Yes

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 24) and all of the environmental components described in Section 3.0. Through that exercise, it was determined that there are 12 environmental components that require detailed assessment with respect to the effluent treatment upgrade project at the LUP Mill (*i.e.*, those with a potential Project interaction). Those environmental components are identified below as Valued (socially, economically, culturally and / or scientifically) Environmental Components (VECs).

Table 25. Assessment of potential interactions of various stages for the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick and the environment. Check marks indicate that there is potential for interaction and requires further assessment.

Environmental Component	Stage and Environmental Interaction		
	II: Construction	III: Operation & Maintenance	V: Mishaps, Errors & 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 & fauna	✓	✓	✓
Aquatic flora & fauna	✓	✓	✓
SOCIO-ECONOMIC ENVIRONMENT			
Demographics & labour	✓	✓	✓
Archaeological and cultural features	NA	NA	NA
Land-use	✓	✓	✓
Transportation network	✓	✓	✓
Aesthetics	✓	✓	✓
Protected areas	NA	NA	NA
Recreation and tourism	✓	✓	✓
Health and safety	✓	✓	✓

4.2 OVERVIEW OF VALUED ENVIRONMENTAL COMPONENT ANALYSIS

Fundy Engineering employs a visual method of impact level when assessing VECs through the EIA process. Our proven method (Table 26) is a way for reviewers (*i.e.*, Regulator(s), stakeholders, and the general public) to quickly and easily review the impacts without having to understand a complex environmental assessment process. In the analysis of Project impacts on the environment, there are several terms that must be considered.

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 were to be used for a one week period over a year-long construction period where the only loud activity anticipated is the driving of piles. 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 be 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 considered to be 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 of time, such as during the entire duration of the Project. With yellow lights, long-term impacts are not permanent (*i.e.*, they are reversible and with 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 considered to be 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 as a result of the project, a blue light is applied. Blue lights do not require mitigation because there is no change.

Table 26. 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.

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.*, intensity, spatiotemporal extent, 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 POTENTIAL PROJECT IMPACTS ON THE ENVIRONMENT

4.3.1 Valued Environmental Components Assessed

The following VECs were assessed for the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick:

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

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

4.3.2 Physio-Chemical Environment

4.3.2.1 Air Quality

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 (*i.e.*, temperature and precipitation) of the local area;
- emissions of CO;
- emissions of NO_X;
- emissions of SO_2;
- emissions of VOCs (*i.e.*, H_2S); and
- emissions of PM (*i.e.*, from exhausts and dusts).

4.3.2.1.1 Potential Impacts

The complete assessment of potential impacts of the Project on air quality is provided in Table 27 (*n.b.*, the table can be found several pages ahead). Overall, the assessment yielded two green lights, 10 yellow lights, and six no change lights.

It is anticipated that heavy equipment used during construction of the Project and vehicle use related to workers travelling to and from the site will produce about 4 707 tonnes of GHG emissions (*i.e.*, CO_{2eq}) during the 15 month construction period. After construction is complete, those emission will cease to exist. That is the reason why yellow lights were applied to the majority of potential impacts during Stage II of the Project. Project-related GHG emission estimates are provided in Appendix VII.

As noted in Table 1, the low-rate anaerobic digester will consume about 66 % less electrical energy than the existing UASB system. As a result, less power will be purchased from NB Power. Therefore, indirect GHG emissions related to electricity generation are expected to annually decrease by 322 tonnes CO_{2eq}.

About 30 % more energy from biogas will be achieved through more biogas being generated with a higher methane concentration than what is produced today by the UASB digesters. A small part of the increase will be from the use of a floating, gastight geomembrane cover system that will capture fugitive biogas emissions that are currently escaping from the cover seals on top of the two UASB units. Generation of more biogas will allow LUP to purchase less natural gas for generating steam energy (*i.e.*, natural gas will be offset using biogenic fuel). This increase accounts for about 3 % of the Mill's current energy produced on-site. This is expected to result in an annual GHG emission reduction of 1 673 tonnes CO_{2eq}.

Inclusion of the process water storage tank will considerably reduce the amount of steam generation during the winter months (*i.e.*, November through March) by reducing the amount required for storing effluent in open-air basins. Those steam savings (*i.e.*, approximately 4 % of the total energy produced at the LUP Mill annually) are expected to annually decrease GHG emissions by 3 573 tonnes CO_{2eq}. Therefore, once the Project is operational, GHG emissions will decrease by 5 568 tonnes CO_{2eq} annually and yield a green light in the VEC assessment.

This Project, as noted in Table 1 and assessed in Section 4.3.4.4, is also expected to yield a positive impact to air quality in the area by reducing fugitive odours. That positive impact is attributed to: 1) use of a process water storage tank versus the existing open-air basins (*i.e.*, refer to Figure 5); and 2) use of a sealed anaerobic digester to treat the process effluent versus the existing semi-sealed UASB digesters. Use of these two components will considerably reduce the emission of H_2S and its associated nuisance odour during the treatment of process effluent.

Should a mishap, error, and / or unforeseen event occur, there is a potential that impacts could be realized to air quality. Therefore, yellow lights were applied to the majority of potential impacts. Overall, the potential impacts identified for air quality related to this Project can be reduced or eliminated using the mitigation measures described below.

4.3.2.1.2 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.

- Heavy equipment should only be operated at optimum loading rates.
- Heavy equipment should be turned off when not in use and / or when practical.
- The number of vehicle kilometers traveled should be kept to a minimum (*i.e.*, there will be no unnecessary operation of equipment in and around the site).
- Heavy equipment should be operated at moderate and steady speeds.
- Heavy equipment should only be refueled using a protocol designed to mitigate any risk to the environment.
- If the application of water as a dust suppressant is deemed necessary (*n.b.*, this is the preferred method of dust suppression), it should be applied using suitable equipment (*e.g.*, a tanker truck equipped with spray bars and methods of controlling water flow).
- Air quality monitoring (*i.e.*, SO_2) should continue at the LUP Mill site and data should be analyzed to determine if SO_2 concentrations decrease by bringing the low-rate anaerobic digester online.

4.3.2.1.3 Potential Post-Mitigation Residual and Cumulative Impacts

Overall, this Project is expected to effect a positive change to local air quality as summarized in Table 1. There are no residual and / or cumulative impacts anticipated to air quality as a result of this Project.

4.3.2.2 Sound Emissions

Sound is emitted by all construction equipment. This sound is often above ambient sound levels. When they become too high, sound levels may be a nuisance to nearby residents and may cause disturbance to local wildlife. Additionally, sound levels can be a hazard to all Project personnel if appropriate precautions are not taken. Because of this, sound emissions were selected as a VEC. The following potential impacts were assessed for the Project:

- sound levels;
- sound duration;
- sound repetition; and
- ground vibration.

Sound waves generate ground vibration hence the reason for assessing the impact of the Project on ground vibrations.

4.3.2.2.1 Potential Impacts

Table 28 is the complete assessment of potential impacts conducted for sound emissions associated with the Project. A distance of about 100 m and 200 m, respectively, separates the nearest residence and nearest business (*i.e.*, both located along NB Route 785) to the Project footprint. A treed buffer of at least 50 m is located between the Project footprint

and the nearest receptors. It is believed that sound emission levels during construction will considerably dissipate over that distance. There are very few moving parts associated with the operational Project. Therefore, there should be no issues with sound emissions during Stage II of the Project.

Of the 12 potential impacts, eight were assigned yellow lights. Sound emission levels, sound repetition, and ground vibrations during Stage II and Stage V yielded yellow lights. During operation, a green light was assigned to sound emission levels because the low-rate anaerobic digester has very few moving parts and, when compared to the existing UASB digesters, emits less sound. No change lights were applied to all other potential impacts during Stage III because the site is already used for commercial / industrial operations and no change in sound emission levels is anticipated between existing and future conditions. Equipment used for the proposed Project will be similar to that already used on the site. Because it is difficult to determine what type(s) of equipment would be required during a mishap, error, and / or unforeseen event, yellow lights were applied.

4.3.2.2.2 Proposed Mitigation

The mitigation measures provided below should be implemented by Project personnel to minimize the potential impact of sound emissions to nearby receptors (*i.e.*, residents and the general public), particularly during Project construction and operation and maintenance.

- All heavy equipment should be equipped with the appropriate manufacturer designed sound emission abatement equipment (*i.e.*, mufflers).
- Shrouding on equipment should be inspected regularly to ensure that it is in good condition and limits the level of sound emitted.
- The exhaust systems of all heavy equipment should be inspected regularly to ensure that mufflers are operating properly.
- Heavy equipment should be maintained according to manufacturer recommended servicing periods.
- The idling of all heavy equipment should be kept to a minimum.
- Any loud equipment (*i.e.*, > 90 dBA at the source) should be sited as far away as possible from the nearest sensitive receptor (*i.e.*, residents).
- Loud construction activity should be scheduled / planned to occur during normal workday / daylight hours, where possible.
- Contractor(s) / subcontractor(s) should ensure that all equipment has proper functioning noise abatement equipment.

4.3.2.2.3 Potential Post-Mitigation Residual and Cumulative Impacts

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

4.3.2.3 Surface Water Quantity and Quality

The LUP Mill is located adjacent to several water features (*e.g.*, Lake Utopia, Roix Lake, and several unnamed watercourses, *etc.*; Figure 26). Some of the Project activities during

the various Project stages have the potential to impact surface water. Therefore, surface water quantity and quality was selected as a VEC. The following potential impacts were assessed for the Project:

- turbidity / suspended sediment;
- surface water quantity (*i.e.*, increased runoff);
- surface water quality (*i.e.*, general chemistry and trace metals);
- contamination by hydrocarbons / hazardous chemicals; and
- surface water drainage characteristics.

4.3.2.3.1 Potential Impacts

Yellow lights were applied to the majority of potential impacts (n = 12; Table 29). Construction activities, particularly when soils are exposed, have the potential to affect both surface water quality and quantity. Sections of the Project-specific environmental protection plan will likely provide best-management practices to either prevent or mitigate any potential impacts. Of principal note is that construction and operation of the low-rate anaerobic digester will yield a 2.1 ha impermeable surface. This will result in additional surface water runoff from the site (*i.e.*, loss of area for groundwater infiltration).

Overall, there is expected to be an improvement in the quality of effluent discharged to the receiving water body from the Mill. **The Mill's effluent will continue to comply with the limits outlined in the Water Quality ATO**. That is the reasoning for applying green lights to two potential impacts during Project operation and maintenance.

Depending on the nature of a mishap, error, and / or unforeseen event, there is a possibility that the impact to a surface water feature could be long-lasting. Therefore, yellow lights were applied to all potential impacts during Stage IV of the Project.

4.3.2.3.2 Proposed Mitigation

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

- Fuel storage and fueling / lubricating activities should only be performed in designated safe areas that are located such that minimum effects would be felt from a spill and harmful substances would in no circumstances enter surface water systems or storm water collection systems.
- Fuel storage and fueling / lubricating activities should only be performed in designated safe areas that are located > 30 m from a watercourse and / or wetland.
- All potential contaminants and contaminated materials will be stored in a contained area where they cannot become mobilized or access the ground surface (*i.e.*, be placed atop and within spill containment pads).
- Regular maintenance and inspection of equipment on site should be performed to minimize the risk of spills of oil based fluids that pose a threat to surface water systems.

- Appropriate spill response equipment (*i.e.,* spill kits) should be kept in designated areas, close to any designated fueling stations or potential contaminant storage areas. Equipment operators on site should be trained in the use of such equipment.
- All spills of hazardous materials should be reported immediately to the LUP Technical Department representative who will contact the appropriate Regulator(s).
- All solid waste generated during the Project works should be collected, properly stored, removed, and disposed of as outlined in the Mill's waste disposal guidelines.
- LUP should provide appropriate receptacles for Project personnel to dispose of personal garbage.
- The Project site should be kept clear of all solid waste and the site should be inspected daily to gather any debris and dispose of it in the appropriate receptacles.
- Sediment control measures (*e.g.*, silt fences, *etc.*) should be installed wherever necessary to minimize and / or eliminate the amount of sediment introduced to storm water systems and any watercourse.

4.3.2.3.3 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.

4.3.2.4 Groundwater Quantity and Quality

Groundwater was identified as a VEC because surface water and groundwater systems used for domestic water supplies in the area can have strong communication networks. The specific potential impacts assessed were:

- groundwater quality (*i.e.*, microbiology, general chemistry, trace metals);
- groundwater quantity;
- contamination by hydrocarbons; and
- groundwater recharge areas.

4.3.2.4.1 Potential Impacts

Results of the groundwater quantity and quality impact assessment are provided in Table 30. Six yellow lights were applied to the potential impacts and are primarily related to groundwater recharge potential 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 were assigned no change lights (n = 6).

4.3.2.4.2 Proposed Mitigation

The mitigation measures listed below should be employed to minimize the chance of Project activities from impacting the groundwater regime by eliminating the potential pathways where hydrocarbons and other pollutants may enter the system (*n.b.*, the

mitigation measures are nearly identical to those provided for surface water protection and is because the two systems are often interconnected).

- Fuel storage and fueling / lubricating activities will only be performed in designated safe areas that will be located such that minimum effects would be felt from a spill and harmful substances would in no circumstances enter groundwater systems.
- Fuel storage and fueling / lubricating activities should only be performed in designated safe areas that are located > 30 m from a watercourse and / or wetland.
- All potential contaminants and contaminated materials will be stored in a contained area where they cannot become mobilized or access the ground surface (*i.e.*, be placed atop and within spill containment pads).
- Regular maintenance and inspection of equipment on site should be performed to minimize the risk of spills of oil based fluids that pose a threat to groundwater systems.
- Appropriate spill response equipment (*i.e.,* spill kits) should be kept in designated areas, close to designated fueling stations and all personnel on site should be trained in the use of such equipment.
- All spills of hazardous materials should be reported immediately to the LUP Technical Department representative who will contact the appropriate Regulator(s).
- An action plan for dealing with a potential leak of effluent from the low-rate anaerobic digester should be developed.

4.3.2.4.3 Potential Post-Mitigation Residual and Cumulative 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 remote possibility because of the stringent environmental protection measures used on-site under LUP's existing EMS and through the environmental protection measures that will be set forth in the Project-specific EPP.

Table 27. Assessment of potential impacts of effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick on air quality.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
Micro-climate (*i.e.*, temperature and precipitation)	=			=			=		
CO emissions	△	1	A, B	○	2, 3	A, B	△	1	A, B
NO_X emissions	△	1	A, B	=			△	1	A, B
SO_2 emissions	△	1	A, B	=			△	1	A, B
VOC emissions (*i.e.*, H_2S)	△	1	A, B	○			△	1	A, B
PM emissions (*e.g.*, exhausts and dusts)	△	1	A, B	=			△	1	A, B

COMMENTS

1 – The majority of Project construction equipment will effect a change in this parameter and / or emit these pollutants to the atmosphere leading to minor short-term impacts within the local airshed (*i.e.*, during construction). It is estimated that heavy equipment used during construction and transportation of workers to and from the LUP Mill site will yield about 4 707 tonnes of GHG emissions (*i.e.*, CO_{2eq}) during the 15 month construction period.
2 – The low-rate anaerobic digester will consume about 66 % less energy than the existing UASB system, which means less power will be purchased from NB Power. It is estimated that the annual reduction in GHG emissions related to less electricity generation will be 322 tonnes CO_{2eq}. The low-rate anaerobic digester will also yield an additional 3 % savings of in the total energy produced at the Mill using natural gas, which will reduce annual GHG emissions from the LUP Mill by about 1 673 tonnes CO_{2eq}.
3 – Adding the process water storage tank to the Mill will considerably reduce the amount of steam generation during the winter months (*i.e.*, November through March) for keeping the open-aerated lagoons ice-free. Those steam savings (*i.e.*, approximately 4 % of the total energy produced at the LUP Mill annually) are expected to decrease annual GHG emissions by 3 505 tonnes CO_{2eq}.
4 – One of the primary benefits of the new low-rate anaerobic digester is the inclusion of a gas-tight geomembrane, which will considerably reduce H_2S emissions and associated nuisance odours from the effluent treatment process.

MITIGATING MEASURES

A – All Project personnel should be briefed on the potential impacts that equipment emissions can have on the quality of the local airshed. Briefing information should range from describing emissions that are released from equipment during operation to how those emissions can be reduced.
B – Mitigation measures developed for this Project should be adhered to in order to adequately address those potential issues.
C – In the event of an emergency, equipment with pollutant emission reduction 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 any and all permanent environmental impact(s).

Table 28. Assessment of potential impacts of effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick on sound emissions.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
Sound levels	△	1, 2	A, B	○	5		△	6	D
Sound duration	△	1, 2	A, B	=			△	6	D
Sound repetition	△	1, 2, 3	A, B, C	=			△	6	D
Ground vibration	△	1, 2, 4	A, B, C	=			△	6	D

COMMENTS

1 – The heavy equipment planned for constructing the Project may emit sound at levels less than currently emitted during normal LUP Mill operations. Although back-up alarms on heavy equipment emit sounds at 120 dBA, existing loaders, bulldozers, and other heavy equipment used on site have those alarms in use and are not continuous in operation.
2 – Construction of the Project is anticipated to be completed within a 15 month period and primarily during regular working daylight hours as such is expected to have minimal impact on surrounding residents.
3 – Between 30 and 40 piles will be driven into the subsurface for the process water storage tank. Pile driving emits repetitive sounds, which can be annoying for nearby human receptors.
4 – Pile driving causes ground vibration as the hammer forces the steel pile into the subsurface. The vibration can be disturbing to nearby human receptors.
5 – The low-rate anaerobic digester, compared to the existing UASB digesters, will emit less sound during operation.
6 – 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.

MITIGATING MEASURES

A – All Project personnel should be briefed on the potential impacts that heavy equipment can have on the sound levels in the area.
B – Mitigation measures developed for this Project should be adhered to in order to adequately address those potential issues.
C – Pile driving should be restricted to normal work hours (*i.e.*, 7 AM to 7 PM Monday through Saturday) to limit annoyance of repetitive sounds and vibrations for nearby human receptors.
D – 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 any and all permanent environmental impact(s).

Table 29. Assessment of potential impacts of the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick on surface water quantity and quality.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
Turbidity / suspended solids	⚠	1	A	=			⚠	9	B, D
Surface water quantity (*i.e.*, change in runoff regime)	⚠	2	B	⚠	6	A	⚠	9	B, D
Surface water quality (*i.e.*, change in general chemistry, trace metals)	⚠	3	B	○	7	C	⚠	9	B, D
Hydrocarbon / hazardous chemical contamination	⚠	4, 5	B, C	○	8	B, C	⚠	9	B, C, D
Surface water drainage characteristics	⚠	2	B	⚠	6	A	⚠	9	B, D

COMMENTS

1 – A distance of about 35 m separates the Project footprint and the nearest watercourse (*i.e.*, an unnamed watercourse that is the receiving waterbody for LUP's treated effluent).
2 – Project construction activities may impact the existing runoff regime (*e.g.*, construction of impermeable surfaces may increase the quantity of surface water directed to nearby watercourses, *etc.*).
3 – Exposure of rock and sediment during Project construction may alter the quality of surface water flowing from the Project site.
4 – There is a potential that hydrocarbons, through their storage and use on-site, could be introduced to surface water systems.
5 – There is a potential that hazardous chemicals, through their storage and use on-site, could be introduced to surface water systems.
6 – The impermeable digester footprint (*i.e.*, 2.1 ha) will result in more surface water runoff than currently occurs from the Project site.
7 – The low-rate anaerobic digester will improve the quality of the effluent entering the activated sludge treatment ponds. The improved quality of the effluent is expected to trickle through the system such that the overall effluent quality discharged to the receiving water body will be better than that currently being discharged. The Mill's effluent will continue to comply with the limits outlined in the Water Quality ATO.
8 – The low-rate anaerobic digester has the capability of reducing hydrocarbon concentrations should there be a small accidental lubricant spill, *etc*.
9 – Depending on the mishap, error, and / or unforeseen event, there is a possibility the impact could be long-lasting and could yield any one or all of the potential impacts identified.

MITIGATING MEASURES

A – An erosion and sediment control plan should be developed and implemented prior to initiating the Project in order to limit and control erosion and sedimentation.
B – All Project personnel should be briefed on the potential impacts that the Project could have on surface water quality and quantity.
C – Mitigation measures developed for this Project should be adhered to in order to adequately address those potential issues (*e.g.*, not storing hydrocarbons on-site, fueling equipment > 30 m from the edge of a watercourse, *etc.*).
D – Emergency response / contingency plans should be designed to prevent any major and / or sustained environmental damage during any errors, mishaps, and / or unforeseen events.

Table 30. Assessment of potential impacts of the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick on groundwater quantity and quality.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
Groundwater quality (*i.e.*, change in general chemistry, trace metals)	=			=			⚠	3	D, E
Groundwater quantity (*i.e.*, decreased well yields)	=			=			=		
Hydrocarbon / hazardous chemical contamination	⚠	1	A, B	⚠	1	A, B	⚠	1	A, B
Groundwater recharge areas	⚠	2	C	⚠	2	C	=		

COMMENTS

1 – 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.
2 – The low-rate anaerobic digester will yield a 2.1 ha impermeable surface, which will reduce the amount of groundwater recharge in the area.
3 – There is a potential for the low-rate anaerobic digester to leak. A groundwater collection system will be installed and include collection points within the area below the digester. The groundwater collected from this system will be monitored in order to identify if the integrity of the digester liner is compromised. Should an issue be identified, remedial measures should be immediately implemented.

MITIGATING MEASURES

A – All Project personnel should be briefed on the potential impacts that the Project could have on ground water quality.
B – Mitigation measures developed for this Project should be adhered to in order to adequately address those potential issues.
C – The new impermeable surface is does not significantly decrease the amount of area available in the area for groundwater recharge to occur.
D – Water captured within the groundwater collection system should be routinely monitored to identify if the geomembrane liner of the digester has been compromised.
E – An action plan for dealing with a potential leak of effluent from the digester should be implemented.

4.3.3 Biological Environment

4.3.3.1 Terrestrial Flora and Fauna

Based on information obtained from the ACCDC, some COSEWIC and *SARA* ranked species of terrestrial 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 18 for a listing and Figure 34, Figure 38, Figure 39, and Figure 41 for distribution maps). The following potential impacts were evaluated with respect to terrestrial flora and fauna:

- species of special conservation concern (*i.e.,* those listed under *SARA* and by the COSEWIC);
- existing vegetation and habitat;
- plant associations and biodiversity;
- wildlife species (*i.e.*, birds, animals, and mammals) and habitat (direct and indirect);
- wildlife species and habitat fragmentation; and
- natural wildlife migration patterns (*i.e.*, migratory birds) / nesting / food chains.

4.3.3.1.1 Potential Impacts

As described in Section 2.7.2.2, LUP undertook a site improvement project at the Mill site in summer 2016. An ~ 4 ha block of standing timber was harvested on PID 15079221 during that project. As a result, the lands slated for constructing the project described herein are almost completely devoid of vegetation. Because of that, there is little to no habitat that would be desirable for terrestrial fauna within the direct footprint.

Access for large land mammals will be limited or restricted because a perimeter security fence will be erected at the outset of the Project construction. None of those species identified in the ACCDC report are known to inhabit the LUP Mill properties.

Migratory birds are afforded special protection under the *Migratory Birds Convention Act. S*everal species of migratory birds are known to migrate through the region. The lack of vegetation and cover on the Project site makes it an unlikely area for nesting locations. The presence and continuous movement of heavy equipment at the LUP Mill (*e.g.*, transport trucks, loaders, bulldozers, *etc.*) makes it 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. Several sightings of ACCDC ranked migratory birds have been observed within a 5 km radial buffer around the site. As above, none of those species are known to inhabit or frequent the site, but they may be transient visitors.

The impact assessment for terrestrial flora and fauna is summarized in Table 31. Because of existing conditions, there is expected to be very little change between now and throughout the various Project stages. As a result, no change lights were applied to the majority of potential impacts (n = 12). Green lights were given to two potential impacts during Project operation and maintenance. Yellow lights were applied to four potential impacts and are related to species of special conservation concern, which are susceptible to environmental impacts.

4.3.3.1.2 Proposed Mitigation

The mitigation measures listed below should be employed to minimize the probability of activities related to the Project from affecting surrounding terrestrial flora and fauna.

- Project personnel should properly dispose of food scraps and garbage in the appropriate receptacles provided by LUP.
- Waste stored on-site should be stowed in an appropriate manner and will be transported to an appropriate disposal facility on a regular basis.
- Project personnel should be advised, prior to working on the Project site, to not feed or harass nuisance wildlife (*e.g.*, pigeons, sea gulls, rodents, *etc.*).
- No attempt should be made to chase, catch, divert, follow, or otherwise harass wildlife by vehicle or on foot.
- If injured or diseased wildlife are encountered, then the Department of Natural Resources and the Canadian Wildlife Service should be contacted to determine the appropriate course of action.
- If deceased animals are encountered, they should be removed and disposed of, as soon as possible, in consultation the Department of Natural Resources and the Canadian Wildlife Service.
- Heavy equipment and other vehicles used on the Project site should yield the right-of-way to wildlife.
- No Project personnel should affect wildlife populations by either hunting or trapping and firearms should be strictly prohibited on the Project site.
- If an active nest, den, *etc.* is encountered, it should be immediately reported to the Project manager / supervisor(s) who should ensure that a no-disturbance buffer zone is established.
- No Project personnel should deposit or permit to be deposited oil, oil wastes, or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds.

4.3.3.1.3 Potential Post-Mitigation Residual and Cumulative Impacts

No residual and cumulative effects are likely to occur to terrestrial flora and fauna over the duration of the construction and operation of the Project assuming the above mitigation measures are implemented.

4.3.3.2 Aquatic Flora and Fauna

The ACCDC identifies Lake Utopia as containing the large-bodied population of the Lake Utopia rainbow smelt, which is protected under the *SARA* or the COSEWIC (*e.g.*, refer to Appendix VI for the ACCDC report). Although the LUP Mill is adjacent to Lake Utopia, the majority of the Project site (*i.e.*, refer to Figure 26 Section 3.1.5) drains to the L'Etang Estuary not Lake Utopia. Watercourses adjacent to the Project site, and the flora and fauna occupying them, may be negatively impacted by the Project in two 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 those watercourses. The following potential impacts to aquatic flora and fauna were considered:

- species of special conservation concern (*i.e.,* those listed under *SARA* and by the COSEWIC);
- existing vegetation and habitat;
- plant associations and biodiversity;
- wildlife species (*e.g.*, fishes, mammals, *etc.*) and habitat (direct and indirect);
- wildlife species and habitat fragmentation; and
- natural wildlife migration patterns (*i.e.*, anadromous fishes) / food chains.

4.3.3.2.1 Potential Impacts

The impact assessment for aquatic flora and fauna is summarized in Table 32. There is not likely to be any change between now, through Project construction, and when the Project is in operation. Therefore, the majority of the potential impacts assessed were given no change lights (n = 15). Green lights were applied to two potential impacts and one yellow light was applied. Any identified potential impacts are easily mitigated.

4.3.3.2.2 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.

- The environmental spill response and reporting of LUP's EMS should continue to be implemented.
- Perimeter erosion and control measures, such as silt fences, should be established between the Project site and any adjacent waterbodies, where necessary, prior to any on-site construction activity.
- The unnamed watercourse adjacent to the Project site (*i.e.*, the watercourse that is the receiving water for the Mill's treated effluent) should be visually monitored within to identify any sources of sediment inflow from the site, and if any sources are identified, they should be stopped using appropriate erosion and sediment control devices, such as silt fences, *etc.*

4.3.3.2.3 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 construction and operation of the Project assuming the above mitigation measures are implemented.

Table 31. Assessment of potential impacts of the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick on terrestrial flora and fauna.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
SARA, COSWEIC and / or ACCDC listed species	△	1, 2, 3	A, B, C	○	1, 2, 3	A, B, C	△	1, 2, 3, 4	A, B, D
Existing vegetation and habitat	=			=			=		
Plant associations and biodiversity	=			=			=		
Wildlife species and habitat	=			=			=		
Wildlife species and habitat fragmentation	=			=			=		
Natural wildlife migration, nesting and food chains	△	1, 2, 3	A, B, C	○	1, 2, 3	A, B, C	△	1, 2, 3, 4	A, B, D

COMMENTS

1 – The Project footprint is devoid of any terrestrial flora and fauna (*n.b.*, non-flying transients / vagrants / migrants can make their way through the site).
2 – No terrestrial flora and fauna species of special concern are believed to exist on the Project site; however, ACCDC records suggest that some flying transient / vagrant / migrant species of special conservation concern, such as the common nighthawk or the chimney swift, or rare species do exist within a 5 km radius of the site. Therefore, there is a possibility that they could pass through the site on occasion.
3 – Some flying fauna could seek out areas of the Project site during construction and or when it is in operation. For example, the common nighthawk nests in a wide variety of areas that include open, vegetation-free areas. The recent harvest block could present an attractive nesting space for those individuals.
4 – Depending on the mishap, error, and / or unforeseen event, there is a possibility the impact could be long-lasting and could extend off-site to affect a species of special conservation concern.

MITIGATING MEASURES

A – All Project personnel should be briefed on the potential impacts that the Project could have on terrestrial flora and fauna.
B – Mitigation measures developed for this Project should be adhered to in order to adequately address those potential issues (*e.g.*, limiting Project lighting during normal bird migration season, *etc.*).
C – Eco-friendly measures should be established to discourage nesting on the low-rate anaerobic digester or process water storage tank (*e.g.*, use of a rotating mirrored prism, flash flags, *etc.*).
D – Emergency response and contingency plans should be designed to prevent any sustained environmental damage during any errors, mishaps, and / or unforeseen events.

Table 32. Assessment of potential impacts of the effluent treatment upgrade project at the Lake Utopia Mill in Utopia, New Brunswick on aquatic flora and fauna.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
SARA, COSWEIC and / or ACCDC listed species	△	1, 2	A, B	○	1, 3	A, B	△	1, 4	A, B, C
Existing vegetation and habitat	=			=			=		
Plant associations and biodiversity	=			=			=		
Aquatic species and habitat	=			=			=		
Aquatic species and habitat fragmentation	=			=			=		
Natural fish migration, spawning, and food chains	=			=			=		

COMMENTS

1 – There are no *SARA*, COSEWIC, and / or ACCDC listed species on the Project site; however, some may be present in adjacent waterbodies (*i.e.,* the Lake Utopia rainbow smelt inhabit Lake Utopia).
2 – For this Project, nothing is being constructed or operated within 30 m of any fish-bearing watercourse.
3 – The long-term operation and maintenance of the Project is expected to have little to no impact on any aquatic flora and fauna.
4 – If there is a mishap, error, and / or unforeseen event that may have the potential to impact aquatic flora and fauna, it is likely that it will be mitigated before it reaches a watercourse because of LUP's detailed EMS.

MITIGATING MEASURES

A – All Project personnel should be briefed on the potential impacts that the Project could have on aquatic flora and fauna.
B – Mitigation measures developed for this Project should be adhered to in order to adequately address those potential issues.
C – Emergency response and contingency plans should be designed to prevent any sustained environmental damage during any errors, mishaps, and / or unforeseen events.

4.3.4 Socio-Economic Environment

4.3.4.1 Labour and Economy

As described in Section 2.7.2.12, this Project has the potential to substantially and positively affect the local labour market and economy. Therefore those parameters were chosen as VECs to assess. The potential impacts, positive and negative, that were assessed with respect to labour and economy for the Project were:

- employment / workforce retention;
- skills training;
- local spending; and
- livelihood.

4.3.4.1.1 Potential Impacts

Table 33 presents the anticipated impact of the proposed Project on the local labour market and economy. It is believed that the Project will yield primarily positive and significant impacts to St. George and the surrounding communities. Almost 90 % of the total expenditure (*i.e.*, $29 million) will be New Brunswick based. Such benefits include the creation of jobs and an increase in local spending (*e.g.*, throughout local suppliers, within local retail establishments and restaurants, *etc.*). Therefore, the Project was given green lights for the majority of potential impacts (n = 6) related to the local labour market and economy.

The potential impact associated with labour and economy in the event of a mishap, error, and / or unforeseen event could not be determined with certainty. Therefore yellow lights were applied to those potential impacts (n = 4). For example, if there was a catastrophic event at the Mill, then there is the potential that regular employment at the Mill could be reduced until such time that the situation is rectified.

The same compliment of employees is expected to be used for operating the new effluent treatment system as is currently used for the existing UASB digesters. Therefore, a no change light was applied to local spending and livelihood during Project operation and maintenance.

4.3.4.1.2 Proposed Mitigation

This Project is extremely positive for the local labour market and economy because it will provide much needed construction jobs in the region. There are no negative impacts anticipated. Therefore, no additional mitigation measures, other than those highlighted in Table 33 are required.

4.3.4.1.3 Potential Post-Mitigation Residual and Cumulative Impacts

No residual and cumulative effects are likely to be incurred within the local labour market and economy due to this Project.

4.3.4.2 Land-Use

The majority of the Project footprint exists on vacant timberland. The potential impacts, positive and negative, that were assessed with respect to land-use for the Project were:

- land-use conflicts (*i.e.*, zoning); and
- land value (*i.e.*, developed and undeveloped land).

4.3.4.2.1 Potential Impacts

Table 34 presents the anticipated impact of the proposed Project on land use. It is believed that there will be no changes to land-use during construction and operation and maintenance stages of the Project. There is a potential for impacts to be realized in the event of mishap, error, and / or unforeseen event. Therefore, the Project was given four blue lights and two yellow lights.

4.3.4.2.2 Proposed Mitigation

Mitigation measures identified for other VECs should be adhered to in order to reduce the likelihood of impacts being realized.

4.3.4.2.3 Potential Post-Mitigation Residual and Cumulative Impacts

No residual and cumulative effects are likely to be incurred with respect to local land-use due to this Project.

4.3.4.3 Transportation Network

Through this Project, the local transportation network will see a moderate increase in heavy equipment traffic (*e.g.*, floating construction equipment to and from the site, importing Project infrastructure, *etc.*). Additionally, during peak construction, dozens of workers are expected to be on the Mill site working specifically on the Project. The potential impacts that were assessed with respect to the local transportation network were:

- traffic hazards;
- damage to infrastructure; and
- conflict with existing traffic.

4.3.4.3.1 Potential Impacts

The movement of heavy equipment in and out of the Mill site is a normal occurrence. Trucks regularly import wood chips and other production materials and export corrugated medium and by-products. It is common for the Mill to experience rapid and large increases in workforce. For example, during routine Mill maintenance, shutdowns, and upgrades, there are often hundreds of workers on the site. Effective project management by LUP personnel in the past has ensured that maintenance, shutdown, and upgrade traffic and employment numbers were smoothly integrated into regular operations.

The impact assessment for the local transportation network yielded two green lights, three no change lights, and four yellow lights (Table 35). No change lights were applied to

Project operation and maintenance because there are not expected to be any large increases in traffic once Project construction is complete. Although yellow lights dominated the impact assessment, they can be easily managed by implementing the mitigation measures identified below.

4.3.4.3.2 Proposed Mitigation

In addition to the normal project management practices undertaken at the Mill during routine operation 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.

- All vehicles permitted on local roadways should be maintained according to provincial regulations with respect to registration, licensing, insurance, and safety inspection.
- All Project personnel operating vehicles permitted on local roadways should obey the posted speed limits and other posted signs, such as weight restrictions.
- All vehicles permitted on the local roadways, save for personal vehicles, should be operated outside of normal peak traffic hours, if there are any traffic congestion periods.
- Road traffic control measures (*e.g.*, use of flaggers, escort vehicles, *etc.*) should be used when transporting over-sized loads on public roadways.

4.3.4.3.3 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.

4.3.4.4 Aesthetics

The Project has the potential to affect aesthetics of the area, which is why it was selected as a VEC for assessment. The following potential impacts to aesthetics were assessed:

- visual pollution;
- light pollution;
- locale consonance; and
- odour.

4.3.4.4.1 Potential Impacts

There will be a very minimal change to the skyline and surrounding area as a result of this Project. During the short Project construction period (*i.e.*, 15 months), there will be several large cranes on-site in order to conduct aerial lifting and erecting, particularly for the process water storage tank and placing the geomembrane liner. Those cranes are expected to extend above the tree line and will likely be seen from several local residential properties. For personnel safety during construction, there will be requirements to light equipment and work areas during low-light conditions and evening hours, but those periods are expected to be minimal. The construction activities are not out of the ordinary for routine work generally undertaken at the LUP Mill site. Construction equipment, of

which there will be more of at the site, will emit exhausts; however, the associated odours should dissipate before reaching nearby residential properties.

CFM Technical Services conducted a sightline survey for the proposed Project, which is presented in Appendix VIII. The results show sightlines from seven different camera angles. Based on that survey, the completed and operational Project is not expected to be seen from any of the surrounding areas assessed. As noted in Section 2.6.5, residents located at 557 NB Route 785 may be able to see the biogas safety release flare and possibly a portion of the digester. Once operational, there should be little or no visual and light pollution impacts. The lights installed on the outside of the digester and pump house building will be switched so that operators can extinguish them when not in use. Nuisance odours from the LUP Mill site should be considerably reduced as a result of this Project because the gas-tight geomembrane installed on the digester will allow the majority of H_2S to be captured and sent to the Mill's boiler system.

The impact assessment for aesthetics, which is summarized in Table 36, yielded two green lights, three no change lights, and seven yellow lights. Although yellow lights were applied to the majority of potential impacts, those impacts are expected to be short-lived and implementation of the mitigation measures identified below will help reduce the potential impact.

4.3.4.4.2 Proposed Mitigation

The mitigation measures provided below should be undertaken by all Project personnel to ensure that the potential impacts to aesthetics are minimized.

- During Project construction, lighting during low-light and night-time conditions should be oriented such that it does not shine directly towards residential areas along NB Route 785.
- Permanent Project lighting should be down-shielded and directed away from nearby receptors, such as residences.
- Heavy equipment should be turned off when not in use and / or when practical in order to limit the amount of exhaust and associated nuisance odours that has the potential to migrate off-site.
- The treed buffer that exists between the Project footprint and the nearest residential receptors along NB Route 785 should be retained.
- Operators should ensure that the switchable lights are turned off when not required for performing their duties and / or for safety reasons.

4.3.4.4.3 Potential Post-Mitigation Residual and Cumulative Impacts

No residual and cumulative effects are likely to occur to local aesthetics over the duration of Project construction and operation of the renewed Mill assuming the above mitigation measures are implemented.

4.3.4.5 Recreation and Tourism

There are several tourist attractions within 5 km of the Project site (Figure 52) that are visited by locals and visitors to the region. As a result, the following potential impacts to aesthetics were assessed:

- site visitation and access;
- visitor numbers;
- economy and revenue generation; and
- scenic character.

4.3.4.5.1 Potential Impacts

Table 37 summarizes the potential impacts the Project may have on local recreation and tourism. Seven yellow lights were applied to the Project and are particularly associated with the blocking of access to the on-site area used by ATV riders and due to potential mishaps, errors, and / or unforeseen events. The assessment also yielded four no change lights and one green light.

4.3.4.5.2 Proposed Mitigation

It is difficult to develop mitigation measures related to tourist attractions that are not located on the Mill site. Emergency response and contingency plans should be designed to prevent any major and / or sustained environmental damage on the Mill site in order to preserve what attracts people to the region.

4.3.4.5.3 Potential Post-Mitigation Residual and Cumulative Impacts

No residual and cumulative impacts were identified.

4.3.4.6 Health and Safety

The proposed effluent treatment upgrade has the potential to affect the health and safety of Project personnel, as well as the general public and visitors. For this reason, health and safety was selected as a VEC. The following potential impacts pertaining to health and safety were assessed for the Project:

- occupational and personal hazards;
- local airshed contamination;
- solid waste and sanitary waste generation; and
- traffic hazards.

4.3.4.6.1 Potential Impacts

The impact assessment for health and safety is summarized in Table 38. Maintaining a safe work site is of paramount importance to LUP as described in Section 2.7.2.15. Some potential impacts that may be present during construction, operation and maintenance, or may occur as a result of mishaps, errors, and / or unforeseen events were given yellow lights (n = 7). Green lights (n = 4) were applied to potential impacts where the hazards associated with health and safety are well defined and understood and can be mitigated through LUP's rigorous health and safety protocols. Almost all workplace incidents resulting in bodily harm or death can be attributed to mishaps, errors, and / or unforeseen events. Despite the rigorous mitigation measures implemented to prevent such incidents from happening, impacts may result. One no change light was applied to traffic during operation and maintenance because there is not expected to be any change as a result

of this Project.

4.3.4.6.2 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 the general public, and how rules and regulations with respect to roadways and equipment must be followed at all times. In addition to this, safety areas such as first aid stations, fire extinguisher storage areas, eye wash stations, and spill clean-up stations should be erected in various strategic locations around the Project site. Project personnel should be briefed on their general use, capabilities, and limitations.

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 general 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 of their activities related to the Project.
- All laws and regulations related to health and safety should be followed and all of those laws and regulations are applicable to all Project personnel, with no exceptions.
- All Project personnel should be adequately trained to do their job so that they conform to the occupational health and safety standards and public health and safety standards.
- LUP should ensure that occupational health and safety standards and general public health and safety standards are part of the Project working environment.
- All Project personnel should wear appropriate PPE for the tasks they are performing.
- LUP should ensure that Project personnel wear appropriate PPE for the tasks they are performing.
- All Project personnel should report any fatal or serious incident that results in lost time or property damage and those reports should be submitted promptly by LUP to the appropriate regulatory authorities.
- LUP should be vigilant in ensuring that non-authorized persons do not circulate in designated Project areas. They should provide appropriate means by use of barricades, fences, warning signs, temporary lighting and security guard as deemed necessary to protect the site against entry by non-authorized persons during the day and night.

4.3.4.6.3 Potential Post-Mitigation Residual and Cumulative Impacts

No residual and cumulative effects are anticipated, with respect to health and safety, over the construction and operation of the Project, if the above mitigation measures are implemented.

Table 33. Assessment of potential impacts of the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick on labour and economy.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
Employment / worker retention	○	1	A	○	5		△	7	B
Skills training	○	2		○	6		△	7	B
Local spending	○	3		=			△	7	B
Livelihood	○	4		=			△	7	B

COMMENTS

1 – There will be a significant increase in employment for the local labour market (*i.e.*, ~ 69 person years). A Project of this magnitude and complexity has the capacity to retain skilled labour.
2 – Many of the Project construction jobs require skilled labour, such as millwrights, pipefitters, and boiler makers. There will likely be skills training spin-offs (*i.e.*, increased enrollment in trades courses at local colleges and trade schools) as a result of this Project.
3 – This Project has an anticipated capital expenditure of $29 million, which will result in substantial spending in the local economy for many goods and services (*e.g.*, workers will patronize service businesses and eateries, *etc.*).
4 – Project construction may contribute to people launching a career in skilled trades.
5 – Although there will be no increase in the labour required to operate the Project, there may be an increase in the skilled labour required during maintenance operations and shutdowns due to the highly technical equipment being installed.
6 – Mill employees will require initial detailed skills training and then routine skills development in order to operate and maintain the Project equipment.
7 – In the event of a major mishap, error, and / or unforeseen event, there may be a reduction temporarily in the permanent staff until the impacts are mitigated. It would be expected that any employment reduction would be short-lived.

MITIGATING MEASURES

A – Data indicate that there is ample room to grow employment in the local labour market (*i.e.*, unemployment rate in Saint John is currently > 10 %).
B – Mitigation measures developed for this Project should be adhered to in order to adequately address any potential impacts in order to minimize the amount of lost work time.

Table 34. Assessment of potential impacts of the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick on land-use.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
Land-use conflicts	=			=			△	1	A
Land value	=			=			△	1	A

COMMENTS

1 – In the event of a major mishap, error, and / or unforeseen event, there may be impacts to land-use that could create conflicts and or affect land value (*e.g.*, contamination of lands, *etc.*).

MITIGATING MEASURES

A – Mitigation measures developed for this Project should be adhered to in order to adequately address any potential impacts.

Table 35. Assessment of potential impacts of the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick on the transportation network.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
Traffic hazards	△	1	A	=			△	4	D
Damage to infrastructure	○	2, 3	B	=			○	2	B
Conflict with existing traffic	△	1	C	=			△	4	D

COMMENTS

1 – There will be an increase in heavy equipment traffic to and from the LUP Mill during Project construction.
2 – Existing infrastructure is designed to standards capable of supporting the movement of heavy equipment to and from the LUP Mill (*e.g.*, truck routes are designed for specific load limits, turning radii, *etc.*). Shippers are required to ensure that loads do not exceed specified limits in order to protect and maintain infrastructure.
3 – Property tax increases, which may result from this Project, would increase the amount of money available to the local and provincial government for maintaining or improving public infrastructure.
4 – In the event of a major mishap, error, and / or unforeseen event, there may be an increase in traffic temporarily until the impacts are mitigated. It would be expected that any traffic increase would be short-lived.

MITIGATING MEASURES

A – Traffic control measures, such as using flagging crews, should be implemented to mitigate potential traffic hazards.
B – Heavy equipment haulers should adhere to weight restrictions and load limits.
C – To avoid traffic congestion, movement of heavy equipment to and from the LUP Mill during Project construction should 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).
D – Mitigation measures developed for this Project should be adhered to in order to adequately address any potential impacts.

Table 36. Assessment of potential impacts of the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick on aesthetics.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
Visual	▲	1	A	=	5		▲	8	F
Light pollution	▲	2	A, B	○	6	D, E	▲	8	F
Local consonance	=	3		=			▲	8	F
Odour	▲	4	C, D	○	7		▲	8	F

COMMENTS

1 – Tall cranes (*i.e.*, up to 60 m tall) may obstruct skyline views as the cranes may be visible for many kilometers.
2 – Construction lighting may spill beyond the work areas and into adjacent residential areas. Work during low-light conditions and evening hours is expected to be minimal.
3 – Construction activities at the site conform to routine operation, maintenance, and shutdown activities generally undertaken at the LUP Mill.
4 – Any odours generated through Project construction (*e.g.*, exhausts, *etc.*) will likely dissipate before reaching nearby receptors along NB Route 785. The nearest residence (*i.e.*, 557 NB Route 785) is ~ 100 m distant from the Project footprint and a treed buffer of at least 30 m will remain between the Project footprint and the residence.
5 – Once the construction cranes are gone, the process water storage tank should meld with the other tall structures at the Mill site. The biogas safety release flare and the digester will not be visible from all nearby residents save for the one located at 557 NB Route 785.
6 – Permanent Project lighting will be similar to existing; however, the lighting will be of a newer technology that limits potential offsite impacts and it will be switched so that it is only illuminated when required.
7 – One of the primary benefits of the new low-rate anaerobic digester is the inclusion of a gas-tight geomembrane, which will considerably reduce H_2S emissions and associated nuisance odours from the effluent treatment process.
8 – 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, operation of the biogas safety release flare, *etc.*).

MITIGATING MEASURES

A – Construction lighting should be confined to the areas actively being worked. Use of tall cranes should be limited to the period required.
B – Construction lighting should be oriented such that it does not shine directly towards residential areas and / or high-traffic areas.
C – Heavy equipment should be turned off when not in use and / or when practical in order to limit the amount of exhaust and associated nuisance odours that has the potential to migrate off-site.
D – The treed buffer that exists between the Project footprint and the nearest residential receptors along NB Route 785 should be retained.
E – Permanent Project lighting will be limited to that necessary for Project personnel to perform their work safely. The lighting will be down-shielded and / or oriented away from neighbouring receptors. Operators should ensure that the lights are turned off when not required for performing their duties and / or for safety reasons.
F – Mitigation measures developed for this Project should be adhered to in order to adequately address any potential impacts.

Table 37. Assessment of potential impacts of the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick on recreation and tourism.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
Site visitation / access	▲	1	A, B	▲	1	A, B	▲	4	A, C
Visitor numbers	=			=			▲	4	A, C
Economy and revenue generation	○	2		=			▲	4	A, C
Scenic character	▲	3	A	=			▲	4	A, C

COMMENTS

1 – The Project footprint has been used by ATV riders. To safeguard those ATV riders and to protect employee health and safety, security fencing will be erected around the Project site prior to initiating construction and that fencing will remain in place once the Project is operational.
2 – By increasing the local employment rate and local spending, local people may have more disposable income for spending on extra-curricular activities like recreation and tourism.
3 – Tall structures (*i.e.*, cranes) during the short construction period (*i.e.*, 15 months) may affect the scenic nature of the area, but people are still going to visit nearby attractions such as Lake Utopia and the St. George Golf Club.
4 – Depending on the type / degree of event, there may be a possibility that access to Lake Utopia and surrounding homes and cottages or the adjacent Sentier NB Trail could be restricted for a short period of time, which could reduce the number of visitors.

MITIGATING MEASURES

A – Mitigation measures should be developed for this Project to minimize any potential impacts to recreation and tourism.
B – Security fence will be erected to protect employee health and safety and to safeguard ATV riders.
C – Emergency response and contingency plans should be designed to prevent any major and / or sustained environmental damage.

Table 38. Assessment of potential impacts of the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick on health and safety.

Potential Impact	Stage II: Construction & Commissioning			Stage III: Operation & Maintenance			Stage V: Mishaps, Errors, and / or Unforeseen Events		
	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation	Degree of Impact	Comment	Mitigation
Occupational and personal hazards	◎	1	A, B, C	△	1, 6, 7	A, B, C, D, E	△	1, 10	A, F
Local airshed contamination	△	2	A, D	◎	1	A	△	1, 10	A, F
Solid waste and sanitary waste generation	◎	3	A	◎	1, 8	A	△	1, 10	A, F
Traffic hazards	△	4	A, D	=	1, 9	A	△	1, 10	A, F

COMMENTS

1 – The implementation of health and safety protocols is a fundamental component to the operation of the LUP Mill. If there is not currently a developed health and safety protocol for a specific task, it is expected that one will be developed to protect the health and safety of Project personnel.
2 – As noted in the respective VEC potential impact assessment, there is expected to be moderate impact on the local air quality during construction as a result of increased operation of heavy equipment emitting pollutants to the airshed.
3 – Sanitary and solid wastes generated during Project construction and operation and maintenance activities will be handled appropriately (*e.g.*, sanitary waste will be collected and disposed of using a licensed wastewater hauler, approved construction debris will be sent to the Hemlock Knoll Waste Management Facility, *etc.*).
4 – As noted in the respective VEC potential impact assessment, there is expected to be moderate increase in potential traffic hazards during Project construction. Traffic hazards may exist at the LUP Mill site and on roadways being used to transport equipment and materials on- and off-site.
5 – The low-rate anaerobic digester will have a floating, gas tight, geomembrane cover system installed for capturing biogas, including H_2S emissions, which should considerably reduce H_2S emissions for the LUP Mill site.
6 – There are some confined spaces associated with this Project (*i.e.*, the sealed sump within the pump house and the low-rate anaerobic digester) that may present hazardous situations to employees.
7 – There are some hazardous chemicals (*e.g.*, anyhydrous ammonia) required for the operation and maintenance of the low-rate anaerobic digester that may present health and safety hazards to employees.
8 – There will be less sludge produced through use of the low-rate anaerobic digester compared to the existing UASB system. The digested sludge is stable and can be dewatered and / or directly transported off-site for disposal and / or land applied as a liquid fertilizer.
9 – There is not expected to be any change in traffic at the LUP Mill site as a result of this Project during operation and maintenance.
10 – All mishaps, errors, and / or unforeseen events pose potential impacts to the health and safety of Project personnel.

MITIGATING MEASURES

A – All Project personnel should be briefed on the potential impacts that the Project could have on health and safety. They should be instructed on what personal protective equipment is required to be worn, what guards should be in place, what measures will be taken to protect other workers and the general public, and how rules and regulations with respect to the environment, roadways, and equipment should be strictly adhered to.
B – All hazardous materials should be labelled appropriately and stored as per the manufacturer's recommendations.
C – Project personnel working with hazardous chemicals should be trained appropriately for their safe handling and storage, they should be provided with the appropriate PPE for safe handling, and they should have access to the MSDS information.
D – Mitigation measures noted in the assessment of the respective VEC should be implemented and followed.
E – Confined spaces will only be accessed by trained personnel using approved confined space protocols.
F – Emergency response and contingency plans should be designed to prevent any major and / or sustained environmental damage.

4.3.5 Summary of Potential Environmental Impacts

LUP 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 39. The results indicate that in many instances, there are no changes anticipated as a result of this Project.

Table 39. Summary of the potential impacts for the effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, 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	
PHYSIO-CHEMICAL ENVIRONMENT					
Air quality	0 / 2 / 0	5 / 0 / 5	0 / 0 / 0	1 / 4 / 1	
Sound emissions	0 / 1 / 0	4 / 0 / 4	0 / 0 / 0	0 / 3 / 0	
Surface water quantity and quality	0 / 2 / 0	5 / 2 / 5	0 / 0 / 0	0 / 1 / 0	
Groundwater quantity and quality	0 / 0 / 0	2 /2 / 2	0 / 0 / 0	2 / 2 / 2	
BIOLOGICAL ENVIRONMENT					
Terrestrial flora and fauna	0 / 2 / 0	2 / 0 / 2	0 / 0 / 0	4 / 4 / 4	
Aquatic flora and fauna	0 / 1 / 0	1 / 0 / 1	0 / 0 / 0	5 / 5 / 5	
SOCIO-ECONOMIC ENVIRONMENT					
Labour and economy	4 / 2 / 0	0 / 0 / 4	0 / 0 / 0	0 / 2 / 0	
Land-use	0 / 0 / 0	0 / 0 / 2	0 / 0 / 0	2 / 2 / 0	
Transportation network	1 / 0 / 1	2 / 0 / 2	0 / 0 / 0	0 / 3 / 0	
Aesthetics	0 / 2 / 0	3 / 0 / 4	0 / 0 / 0	1 / 2 / 0	
Recreation and tourism	1 / 0 / 0	2 / 1 / 4	0 / 0 / 0	0 / 4 / 0	
Health and safety	2 / 2 / 0	2 / 1 / 4	0 / 0 / 0	0 / 1 / 0	
TOTALS	23	73	0	60	

NOTES: *No change lights are excluded from the determination of the overall VEC impact; the coloured light that received the greatest number of assignments in the environmental assessment determines the ultimate VEC impact

All told, 156 specific possible impacts were assessed (Table 39). Of those, 38 % (n = 60) yielded no change lights. As an ultimate overall VEC potential impact assessment (*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, especially in light of the mitigation measures developed. Therefore, the Project should proceed as detailed within this EIA document.

Although the ultimate VEC yielded a yellow light, the majority of the yellow lights were applied to potential impacts during Stage II and / or Stage V (Table 39). **There are very few operational impacts associated with this Project; as shown in Table 1, there are few Project consequences.**

4.4 PROJECT-SPECIFIC ENVIRONMENTAL PROTECTION PLAN

A Project-specific environmental protection plan 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 LUP 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 LUP'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 LUP 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. LUP 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 PUBLIC CONSULTATION PROCESS

The NBDELG has a prescriptive process for undertaking public consultation with respect to EIAs. This section describes the work that has been and will be done to involve stakeholders and the public in the EIA process. It identifies the meetings that have been held and who was consulted.

Public consultation is an important component of the Project. LUP's goal is to notify and inform the public and stakeholders about the Project. As such, the public consultation plan is designed to inform and engage all stakeholder groups about the Project in order to encourage participation and gather feedback from all interested parties, including questions and concerns about the Project. The overall goal is to ensure that those potentially affected by the Project are aware of the Project, able to obtain additional information and able to express any concerns they may have. The goal of the consultation process is to gather input, identify potential issues, and ensure understanding of the Project among stakeholder groups.

On-going stakeholder and public involvement will occur throughout the regulatory review process to collect feedback and enhance the Project's development.

5.1 PARTIES TO INCLUDE IN PUBLIC CONSULTATION PROCESS

5.1.1 Local People, NGOs, and Community Groups

Fundy Engineering and LUP will reach out to local residents and any applicable non-government organizations and community groups (*i.e.*, Eastern Charlotte Waterways Inc.). Generally, those groups are 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.

5.1.2 Regulatory Agencies

The NBDELG, through the EIA regulation of the *Clean Environment Act* and approval the Mill's existing ATOs (*i.e.*, I-8900 AQ + Amendment No. and I-8828 WQ), has regulatory jurisdiction over this effluent treatment upgrade project.

5.2 PRE-REGISTRATION CONSULTATION

5.2.1 New Brunswick Department of the Environment and Local Government

Prior to registering a project, the NBDELG recommends discussing it with representatives of the Project Assessment Branch in order 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.

On 27 May 2016, a pre-registration consultation meeting was held between representatives of the NBDELG, LUP, and JDI (Table 40). The meeting was held at the NBDELG's head office (*i.e.*, in Fredericton, New Brunswick).

Table 40. Attendees of the pre-registration consultation meeting on 27 May 2016 regarding the effluent treatment upgrade project proposed for the Lake Utopia Paper Mill in Utopia, New Brunswick.

Name	Affiliation
Shawn Hamilton	NBDELG, EIA Project Manager
Mark Glynn	NBDELG, Industrial Processes Section Manager
Tony Whalen	NBDELG, Water and Wastewater Management Engineer
Dale Chaffey	LUP Mill Manager
Cindy Milbury	LUP Technical Manager
Dan Fraser	LUP Effluent Treatment Upgrade Project Manager
Brent Libby	LUP Effluent Treatment Upgrade Project Engineer
Dave Muir	JDI, Environmental Director

5.2.2 Public Open House

A public open house was held on 16 August 2016 from 6 PM to 8 PM at the Magaguadavic Center (*i.e.*, 11 J.O. Spinney Drive in St. George). Letters advertising the meeting were hand-delivered to residents within 2 km of the LUP Mill between 12 and 14 August 2016 (Figure 53). An advertisement for the open house was printed in the Telegraph Journal on 11 August 2016 and the local weekly newspaper (*i.e.*, *Money Saver*) on 8 August 2016.

The proponent and consultant staffed the open house to discuss Project storyboards. Details of the open house, posters presented, *etc.* are included in Appendix IX and additional information (*i.e.*, responses to questions asked) will be included in the public involvement report submitted to the NBDELG.

During the two hour open house, 15 members of the public attended.

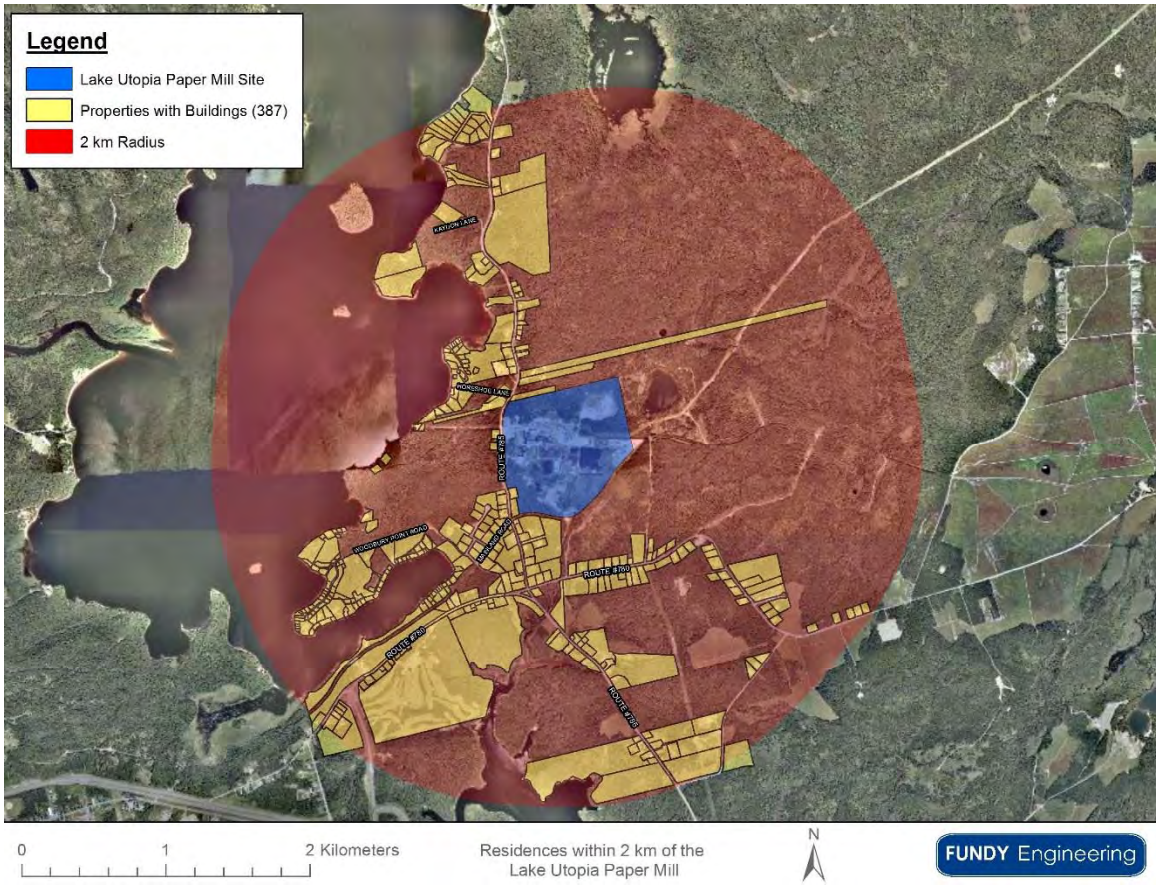


Figure 53. Neighbouring properties of the Lake Utopia Paper Mill in Utopia, New Brunswick where Project letters were hand-delivered using a courier between 12 and 14 August 2016.

5.3 PROJECT REGISTRATION PUBLIC CONSULTATION PROCESS PLAN

It is the Proponent's responsibility to demonstrate that the potentially affected public and other 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.

The public consultation plan for this Project was developed in accordance with the process described in Appendix C of *A Guide to Environmental Impact Assessment in New Brunswick* [*NBDELG*, 2012]. The step-wise 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 Figure 54.

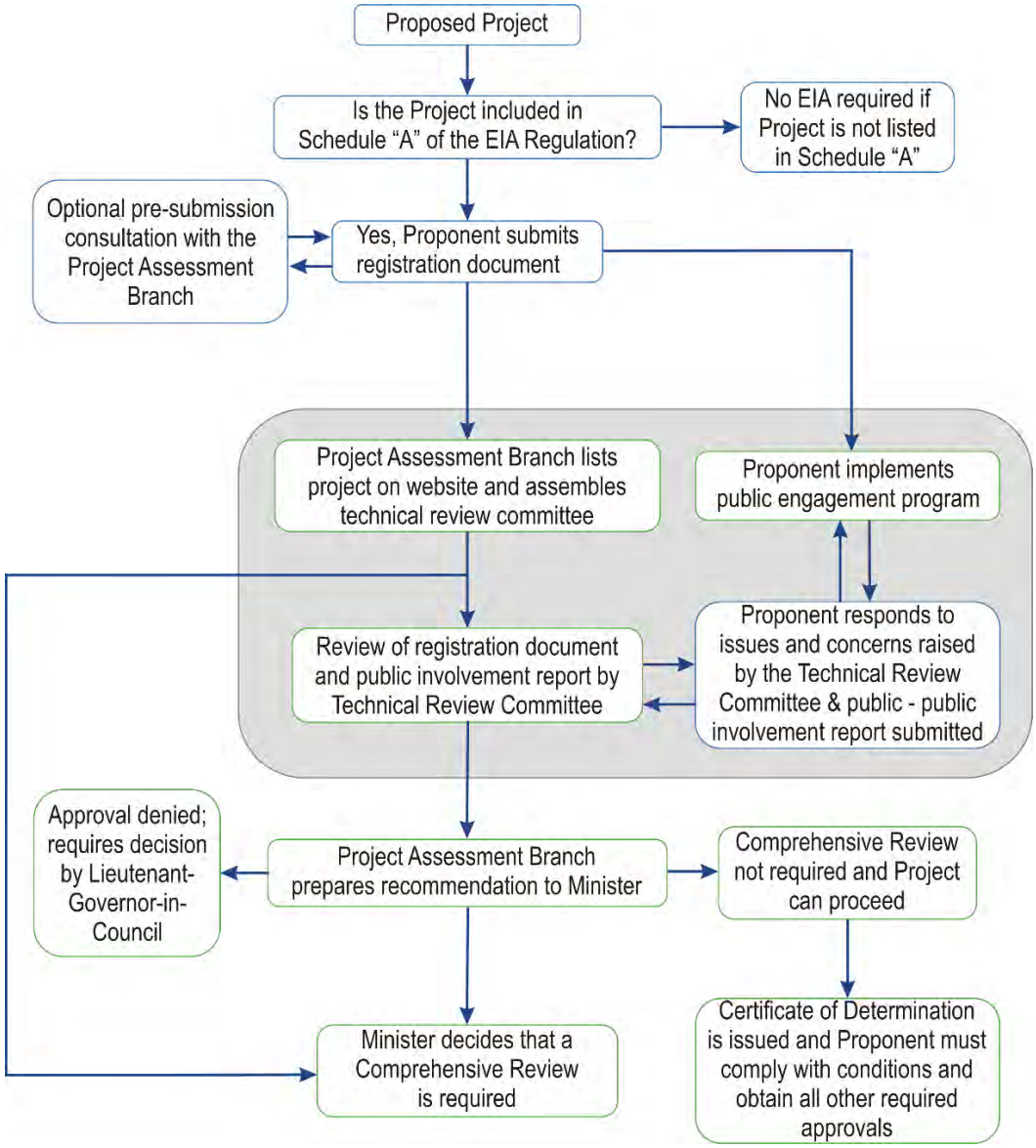


Figure 54. The NBDELG EIA Determination Review process highlighting the public consultation component of the process (*i.e.*, the grey box).

The public will be informed of this Project and the EIA registration document will be made available for review. Comments 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 (*i.e.*, Southwest New Brunswick MP, Fundy–The Isles-Saint John West MLA, Pennfield LSD Representative(s), St. George Mayor and Deputy Mayor and Town Councillors), local service groups and community groups, environmental groups (*i.e.*, Eastern Charlotte Waterways Inc., the Fundy Bay Keeper / Conservation Council of New Brunswick), and other key stakeholder groups (*i.e.*,

Sentier NB Trail). Direct communication will enable those individuals and groups to become more familiar with the Project, ask questions, and / or raise any and all concerns.

5.3.2 Step 2: Direct Written Communication with Nearby Residents

A limited mail out comprising a project information sheet will be sent to local residents and businesses (*i.e.*, those included within the 2.5 km radius shown in Figure 53).

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/dam/gnb/Departments/env/pdf/EIA-EIE/Registrations-Engegistrements/EIA.pdf) 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, LUP 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 to any interested member of the public, stakeholder group, and / or Aboriginal group. A copy of the EIA document along with any subsequent revision will be placed at the Saint John NBDELG regional office at 8 Castle Street and at the St. Stephen NBDELG district office at 41 King 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 Charlotte 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 55.

NOTICE

Registration of Undertaking
Environmental Impact Assessment Regulation
Clean Environment Act, Opportunity for Public Comment

On 2 September 2016, J.D. Irving, 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: Effluent Treatment Upgrade".

This EIA examines an effluent treatment upgrade at the Lake Utopia Paper Mill in Utopia, New Brunswick. The upgrade will include the installation of a process water storage tank and a low-rate anaerobic digester. The Project will allow the Mill to continue meeting strict environmental discharge regulations well into the future as part of its on-going modernization program in a very competitive global market place. Overall, this Project will yield positive socio-economic and environmental impacts.

A public open house was held prior to registration on 16 August 2016 in St. George. The meeting was held then in order to improve advertisement of the project and to incorporate feedback from the public into the registration document.

The Proponent's registration document can be examined at:

Lake Utopia Paper Mill 600 NB Route 785 Utopia, NB	St. George Town Office 11 Spinney Drive St. George, NB	Fundy Engineering 27 Wellington Row Saint John, NB

and at:

NBDELG District Office 41 King Street St. Stephen, NB	NBDELG Regional Office 8 Castle Street Saint John, NB	NBDELG Head Office 20 McGloin Street, 2nd floor Fredericton, NB

Any comments should be submitted directly to the Proponent at:

J.D. Irving, Limited
℅ Fundy Engineering
27 Wellington Row
Saint John, N.B., E2L 4S1

matt.alexander@fundyeng.com

Receipt of comments is requested on or before 7 October 2016. 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.html

Notice placed by: J.D. Irving, Limited

Figure 55. 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 Mill (*i.e.*, 600 NB Route 785), the Regional NBDELG Office (*i.e.*, 8 Castle Street in Saint John), the District NBDELG Office (*i.e.*, 41 King Street, St. Stephen), the St. George Town Office (*i.e.*, 11 Spinney Drive in Magaguadavic Place), 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 member of the public, stakeholder, and / or Aboriginal group 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, during the pre-registration consultation meeting, representatives with the NBDELG recommended hosting an open house. As noted in Section 5.2.2, an open house was held prior to EIA registration and involved the use of story boards staffed with Project personnel and a question and answer session.

5.3.8 Step 8: Documentation of Public Consultation Activities

The NBDELG Minister (*i.e.*, the Honourable Serge Rousselle, Q.C.) will only provide an EIA determination once sufficient information has been received. This includes documentation of public and stakeholder concerns and Proponent responses. Within 60 days of registering the proposed Project, a report documenting the above public consultation process will be submitted to the NBDELG. In addition, this report will be made available for public review. The report will:

- describe the public consultation activities including copies of newspaper notices, and letters distributed;
- identify the key public and private stakeholders including Aboriginal Groups 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.

LUP will adhere to the report requirements listed above. Given the Registration date of 2 September 2016, the deadline of 7 October 2016 for public comments, the report documenting the public consultation process will be released prior 28 October 2016.

6.0 PROJECT APPROVAL

6.1 LOCAL / MUNICIPAL APPROVAL

The Project footprint straddles the Saint George Parish, which is administered by the Town of St. George, and the Pennfield Parish, which is administered by the Pennfield Planning Area (Figure 56). The portion of the Project that exists within the St. George Parish has no restrictions (*i.e.*, planning statements or zoning regulations) and the portion of the Project that exists within the Pennfield Parish will be permitted as an expansion to an existing non-conforming use. Confirmation of this was provided by the Development Officer / Building Inspector with the Southwest New Brunswick Service Commission (*i.e.*, Mr. Don Leachman).

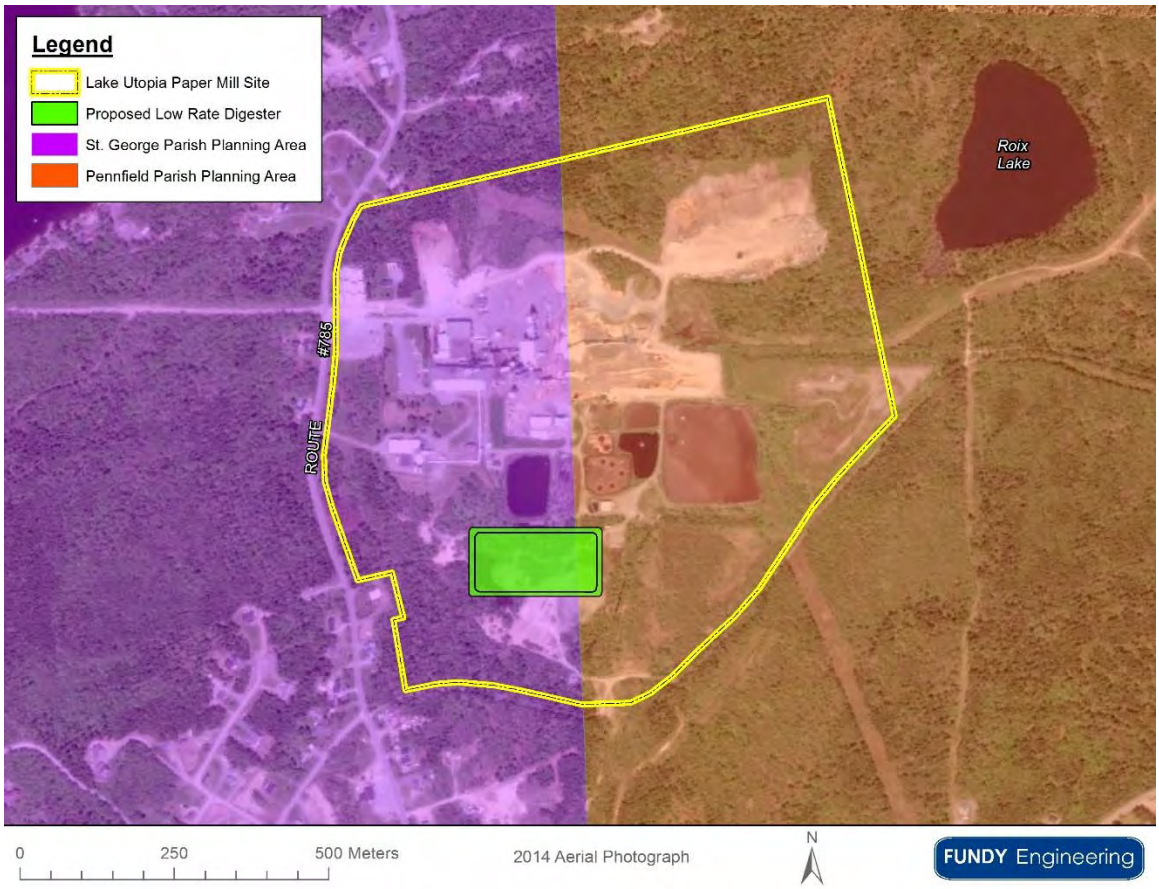


Figure 56. Aerial photograph circa 2014 showing the footprint of the proposed effluent treatment upgrade project at the Lake Utopia Paper Mill in Utopia, New Brunswick and the division between the Saint George and Pennfield Parishes.

Currently, PID 15079221 is identified as Timberland (*i.e.*, refer to Appendix I) whereas PID 15017072 is identified as Industrial Land. LUP is presently exploring how to have the Project lands entirely identified Industrial Land. The Southwest New Brunswick Service Commission has been contacted (*i.e.*, Mr. Don Leachman) to determine how this can be resolved.

6.2 PROVINCIAL APPROVAL

6.2.1 Environmental Impact Assessment Approval

As per Schedule A, 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*, this 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. This EIA must also adhere to the Sector Guidelines for Timber Processing Project.

A copy of the *Clean Environment Act* can be found at:

<http://laws.gnb.ca/en/showfulldoc/cs/C-6//20130718>;

a copy of the EIA Regulation can be found at:

<http://laws.gnb.ca/en/showfulldoc/cr/87-83//20130718>; and

a copy of the Sector Guidelines can be found at:

<http://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 Approval Of A Source

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* requires owners and / or operators of a facility that releases a contaminant to the environment to apply for and obtain approval for the construction, operation, and modification of the source. There are several source classes as shown in Table 41.

Table 41. The source, [C], is classified based on a permitted release rate of one or more of the following parameters. Source: New Brunswick *Clean Air Act*.

Class	SO_2 ($t \cdot yr^{-1}$)	PM ($t \cdot yr^{-1}$)	Gas Emissions Rate ($m^3 \cdot min^{-1}$)
1A	[C] > 1 000	[C] > 1 000	N / A
1B	250 < [C] < 1 000	250 < [C] < 1 000	[C] > 3 000
2	100 < [C] < 250	100 < [C] < 250	600 < [C] < 3 000
3	10 < [C] < 100	10 < [C] < 100	30 < [C] < 600
4	[C] < 10	[C] < 10	[C] < 30

Application for an Approval Of A Source (AOAS) is a pre-cursor to obtaining an Approval to Construct (ATC) and an ATO.

A copy of the *Clean Air Act* can be found at:

<http://laws.gnb.ca/en/ShowPdf/cs/C-5.2.pdf>; and

a copy of the Air Quality Regulation can be found at:

<http://laws.gnb.ca/en/ShowPdf/cr/97-133.pdf>.

A copy of the *Clean Environment Act* can be found at:

<http://laws.gnb.ca/en/showfulldoc/cs/C-6//20130718>;

a copy of the Water Quality Regulation can be found at:

<http://laws.gnb.ca/en/ShowPdf/cr/82-126.pdf>; and

a copy of the Used Oil Regulation can be found at:

<http://laws.gnb.ca/en/ShowPdf/cr/2002-19.pdf>.

The application form for Part I (*i.e.*, General Information) of an AOAS can be found at:

<http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/Air-Lair/RequestingApprovalOfSourceDagrementPourUneSource.pdf>.

After the NBDELG reviews the completed and submitted Part I, the applicant is advised what detailed technical information is required for Part II of the application.

6.2.3 Approval To Construct

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* 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. Construction of the facility may only commence after an ATC has been issued by the NBDELG Minister and construction must be done in accordance with the terms and conditions imposed on the approval issued for that source.

The process to apply for and obtain and ATC is described in Section 6.2.2 above.

6.2.4 Approval To Operate

6.2.4.1 Air Quality

On 13 June 2015, a Class 1B ATO, under the Air Quality Regulation **[97-133]** of the New Brunswick *Clean Air Act* was issued to LUP for operation of the Corrugated Medium Pulp and Paper Mill. That ATO is valid through 12 June 2020 (*i.e.*, refer to Appendix III). Amendment No. 1 was issued on 15 December 2015.

6.2.4.2 Water Quality

As per the Water Quality Regulation **[82-126]** of the New Brunswick *Clean Environment Act*, a Class 1B ATO was issued to LUP for operation of the Corrugated Medium Pulp and Paper Mill. That ATO was issued on 1 February 2015 and is valid through 31 January 2020 (*i.e.*, refer to Appendix III).

6.3 FEDERAL APPROVAL

There are no known permits, licenses, and / or authorizations required to be issued by any federal government department or agency for the Project to be carried out.

7.0 FUNDING

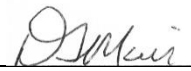
The capital cost for this Project is estimated at $29 million. The Project will be solely funded by J.D. Irving, Limited. Almost 90 % of the total expenditure will be New Brunswick based; approximately 40 % of the overall cost will be for materials purchased in New Brunswick and 50 % will be for labour. No provincial or federal monies are being used for 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* and on the advice of and in consultation with the various Regulators. Fundy Engineering & Consulting Ltd. prepared the document on behalf of J.D. Irving, Limited. The Proponent has reviewed the document and understands the information contained within. J.D. Irving, Limited commits to undertaking all environmental mitigation measures described within this Environmental Impact Assessment document and those mitigation measures.

Respectfully submitted,

Proponent Signature:



Mr. David Muir, *P.Eng.*
Director of Environmental Affairs
J.D. Irving Limited

Environmental Consultant Signature:

Dr. Matt Alexander, *P.Geo., EP*
Environmental Scientist
Fundy Engineering & Consulting Ltd.

2 September 2016

9.0 REFERENCES

Below is a list of reference documents that were used to prepare this EIA document. Any and all of these documents are available to the TRC upon request.

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10.0 GLOSSARY

Aboriginal Peoples: are the indigenous peoples recognized in the *Canadian Constitution Act*, 1982.

airshed: a geographical area that shares the same air mass due to topography, meterology, and / or climate and as a result, it behaves in a coherent way with respect to the dispersion of emissions.

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.

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.

Automated Control System (ACS): a computerized network that monitors and regulates a production process in the absence of direct human intervention.

avian: a bird.

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.

Best Management Practices (BMPs): techniques used to guide design and construction of an Undertaking to minimize adverse environmental impacts.

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.

biogas: a gaseous fuel (*e.g.*, methane) produced by the fermentation of organic matter.

broke: waste paper, either made during a sheet break or trimmings; it is gathered up and put in a re-pulper for recycling back into the process.

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 monoxide (CO): a colourless, odourless, and highly toxic gas that is a byproduct of combustion.

Chemical Oxygen Demand (COD): a measurement of biodegradable and nonbiodegradable organic matter, widely used as a means of measuring the strength of domestic and industrial wastewaters.

circa (ca): makes reference 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.

climate normal: a data period, typically 30 years in duration, used by Environment Canada to summarize or describe the average climatic conditions of a particular location.

combustion emissions: air pollutants released solely as a result 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.

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.

Distributed Control System (DCS): a dynamic computerized network designed to regulate and monitor a production process.

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 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.*

excavate: the process of making a hole in something or removing a part of something by scooping or digging it out.

First Nations: a collective group of Aboriginals that are living on a reserve.

Fisheries Act: a federal *Act* administered by the Department of Fisheries and Oceans with respect to fish and fisheries in Canadian Waters.

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.

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.

glaciomarine: deposits consisting of sediments that were transported by glacial ice and marine water.

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.

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.

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.

herptile: reptile or amphibian.

hibernaculum: an over-wintering area used to hibernate and survive the winter; bats typically seek out caves to hibernate.

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.

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.*).

lithology: a description of the physical character of a rock as determined by eye or with a low-power magnifier, and based on colour, structures, mineralogic components, and grain size.

long-term impacts: those that are experienced for a prolonged period, such as during the entire duration (*i.e.*, operation) of the Undertaking.

lubricants: a substance used to reduce the friction between surfaces or as process materials either incorporated into other materials used as processing aids in the manufacturing of other products, or as carriers for other materials.

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.

morainal sediments: glacial drift materials deposited mainly by direct glacial action and possessing initial constructional form independent of the material beneath it.

n: see sample size.

outcrop: exposed stratum or body of ore at the surface of the Earth.

outfall: the place where a sewer, drain, or stream discharges into adjacent water.

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*.

permanent impacts: those that cause irreversible change to the environment.

petroleum hydrocarbons: a family of naturally occurring liquid organic compounds,

physiographic region: an area having a pattern of relief features or landforms that differ significantly from that of adjacent areas.

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.

pre-cast: a concrete unit, structure, or member that is cast and cured in an area other than its final position or place.

primary treatment: the first stage of wastewater treatment, which typically involves the removal of floating debris and solids by screening and / or settling processes.

receptor: a sensitive component of the ecosystem that reacts to or is influenced by environmental stressors.

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.

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.

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).

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.

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.

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.

terrestrial: relating to or inhabiting the land (*e.g.*, terrestrial plants live on the land as opposed to in the water).

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 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.

varmint: small nuisance animals, such as raccoons, foxes, and coyotes.

wastewater: liquid or waterborne wastes polluted or fouled from household, commercial, or industrial applications along with any surfacewater, 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.

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.

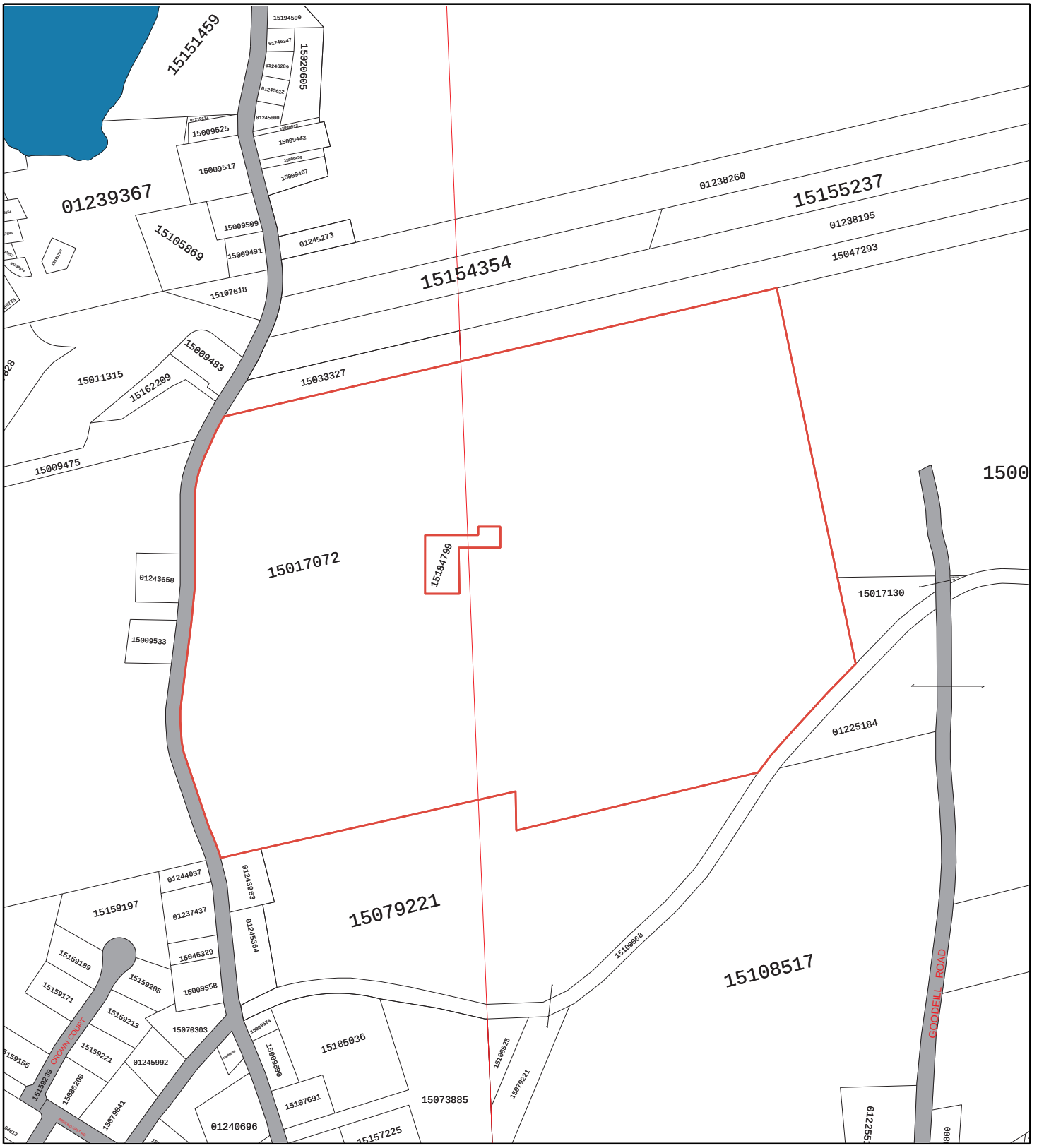
11.0 REPORT DISCLAIMERS AND DISCLOSURES

The sole purpose of this report and the associated services performed by Fundy Engineering & Consulting Ltd. is to complete an Environmental Impact Assessment document for an effluent treatment upgrade at J.D. Irving, Limited's Lake Utopia Paper Mill in Utopia, New Brunswick. 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*, 2012] and the *NBDELG* [2004] Sector Guidelines for Timber Processing Projects.

This report was prepared on behalf of and for the exclusive use of the Client. The report expresses the professional opinion of Fundy Engineering experts and is based on their technical / scientific knowledge. Fundy Engineering & Consulting Ltd. accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report or data by any third-party. Fundy Engineering makes no guarantee that the Client will be successful in the regulatory approval.

Appendix I:

Service New Brunswick Property Information



Map Scale / Échelle cartographique 1 : 7307

While this map may not be free from error or omission, care has been taken to ensure the best possible quality. This map is a graphical representation of property boundaries which approximates the size, configuration and location of properties. It is not a survey and is not intended to be used for legal descriptions or to calculate exact dimensions or area.

Même si cette carte n'est peut-être pas libre de toute erreur ou omission, toutes les précautions ont été prises pour en assurer la meilleure qualité possible. Cette carte est une représentation graphique approximative des terrains (limites, dimensions, configuration et emplacement). Elle n'a aucun caractère officiel et ne doit donc pas servir à la rédaction de la description officielle d'un terrain ni au calcul de ses dimensions exactes ou de sa superficie.

Parcel Information

PID:	15017072	**County:**	Charlotte
Status:	Active	**Active Date/Time:**	1982-01-26 00:00:00
Land Related Description:	Land	**Management Unit:**	NB0308
Area:	53.29	**Area Unit:**	Hectares
Date Last Updated:	2015-02-19 10:23:55	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2010-03-01 11:27:51
Date of Last CRO:	2010-03-25 15:29:36	**Manner of Tenure:**	Not Applicable
Land Gazette Information:	YES		

Description of Tenure:

Public Comments:

MAP / CARTE 21G02V3NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
J.D. Irving, Limited		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
3956200		512	L.S.D. of/D.S.L. de Pennfield
6048933		515	Saint George Bonny River Second Falls

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	Old Saint John	Road		Pennfield

County Parish

County	Parish
Charlotte	Pennfield
Charlotte	Saint George

Documents

Number	Registration Date	Book	Page	Code	Description
28521368	2010-03-25			6110	Discharge of Mortgage
28478908	2010-03-15			2200	Easement
28427731	2010-03-01			3800	Land Titles First Notice
28427723	2010-03-01			3720	Land Titles First Order

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
28425610	2010-02-26			3900	Land Titles First Application
28422914	2010-02-26			6100	Discharge, Release or Satisfaction
28422880	2010-02-26			6100	Discharge, Release or Satisfaction
16473002	2003-06-20			2200	Easement
14038229	2002-04-24	762	265	6100	Discharge, Release or Satisfaction
11352300	2000-09-12	732	377	2200	Easement
111453	1989-01-18	394	600	101	Deed
91560	1981-11-23	266	150	107	Discharge
91559	1981-11-23	266	149	113	Order
91558	1981-11-23	266	148	107	Discharge
91557	1981-11-23	266	146	113	Order
91556	1981-11-23	266	145	107	Discharge
70700	1973-07-26	193	337	104	Mortgage
70693	1973-01-01	193	252	101	Deed
69104	1972-01-01	187	381	120	Lien
65869	1970-10-15	177	352	114	Agreement
65574	1970-01-01	176	673	101	Deed
64728	1970-01-01	175	226	101	Deed

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
28175488		2009-12-16	9050	Subdivision & Amalgamations		Provincial Grid
28175488		2009-12-16	9050	Subdivision & Amalgamations		Provincial Grid
11988681		2001-04-25	9020	Easement or Right-of-Way		Provincial Grid
11988681		2001-04-25	9020	Easement or Right-of-Way		Provincial Grid
11352292		2000-09-12	9020	Easement or Right-of-Way	Lot	Undefined
11352292		2000-09-12	9020	Easement or Right-of-	Lot	Undefined

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
				Way		
10869148		2000-03-02	9000	Administration		Provincial Grid
10869148		2000-03-02	9000	Administration		Provincial Grid
1882		1973-07-26	9040	Retracement & Plan or Return of Survey	Parcel B	Provincial Grid
1882		1973-07-26	9040	Retracement & Plan or Return of Survey	Parcel B	Provincial Grid
1870		1973-06-28	9040	Retracement & Plan or Return of Survey		Provincial Grid
1870		1973-06-28	9040	Retracement & Plan or Return of Survey		Provincial Grid
1557		1970-08-12	9020	Easement or Right-of-Way		Provincial Grid
1557		1970-08-12	9020	Easement or Right-of-Way		Provincial Grid

Parcel Relations

Related PID	Type Of Relation	Lot Information
1243732	Parent	Parcel A
15184799	Infant	Lot 08-01

Non-Registered Instruments

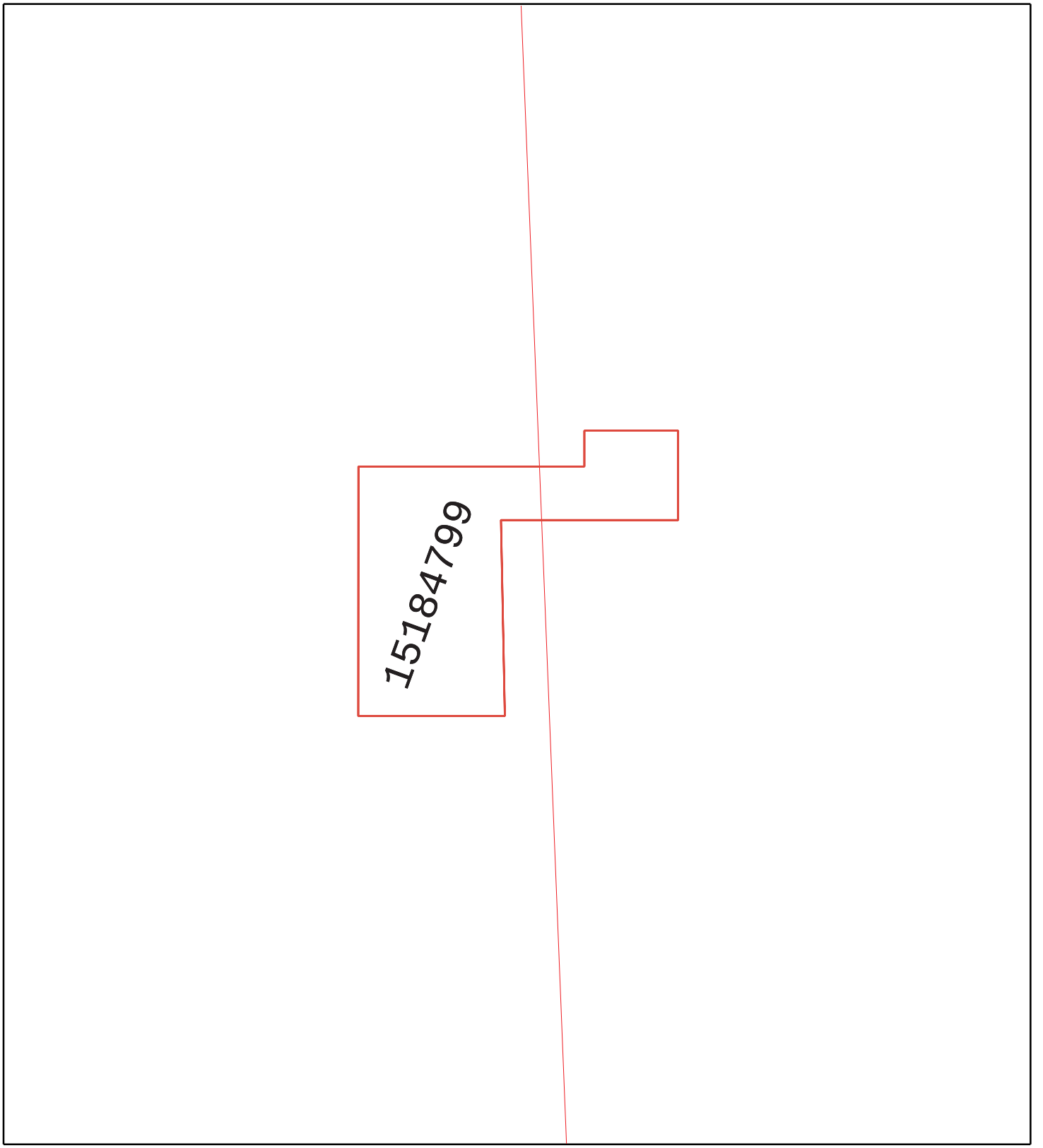
No Records Returned

PAN Information

PAN:	3956200	**Status:**	Open
Assessed Owner(s):	LAKE UTOPIA PAPER LIMITED	**Mailing Address:**	600 RTE 785 UTOPIA NB
Assessment Year:	2016	**Postal Code:**	E5C 2K4
Current Assessment:	$ 811,000	**Current Levy:**	$ 24,016.95
Location:	OLD SAINT JOHN RD	**County:**	Charlotte
Property Description:	PAPER MILL LAGOON SITE	**Tax Class:**	Fully Taxable
Property Type Code:	301	**Property Type Name:**	Industrial Land - Unimproved Unserviced
Taxing Authority Code:	512	**Neighbourhood Code:**	02
Taxing Authority Description:	L.S.D. of/D.S.L. de Pennfield	**Neighbourhood Description:**	NORTH OF HWY #1 (PTYS FR 512-01/'93)
Sequence Number:	L001C	**Sub Unit:**	0
Harmonization:	COMPLETED (PAN created due to administrative boundary or has different Tax Class from linked PAN)	**Farm Land Identifiation Program:**	No
PID:	15017130	**PID (2nd):**	15017072
More PID(s):	No		

Sale Price Information

No Records Returned



Map Scale / Échelle cartographique 1 : 1720

While this map may not be free from error or omission, care has been taken to ensure the best possible quality. This map is a graphical representation of property boundaries which approximates the size, configuration and location of properties. It is not a survey and is not intended to be used for legal descriptions or to calculate exact dimensions or area.

Même si cette carte n'est peut-être pas libre de toute erreur ou omission, toutes les précautions ont été prises pour en assurer la meilleure qualité possible. Cette carte est une représentation graphique approximative des terrains (limites, dimensions, configuration et emplacement). Elle n'a aucun caractère officiel et ne doit donc pas servir à la rédaction de la description officielle d'un terrain ni au calcul de ses dimensions exactes ou de sa superficie.

Parcel Information

PID:	15184799	**County:**	Charlotte
Status:	Active	**Active Date/Time:**	2009-12-16 16:53:36
Land Related Description:	Land	**Management Unit:**	NB0308
Area:	5064	**Area Unit:**	Square Metres
Date Last Updated:	2011-09-22 09:23:48	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2010-03-01 11:23:06
Date of Last CRO:	2010-03-25 15:29:36	**Manner of Tenure:**	Not Applicable
Land Gazette Information:	NO		

Description of Tenure:

Public Comments:

Parcel Interest Holders

Owner	Qualifier	Interest Type
J.D. Irving, Limited		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
6178885		515	Saint George Bonny River Second Falls
6178908		512	L.S.D. of/D.S.L. de Pennfield

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	785	Route		Pennfield

County Parish

County	Parish
Charlotte	Pennfield
Charlotte	Saint George

Documents

Number	Registration Date	Book	Page	Code	Description
28521368	2010-03-25			6110	Discharge of Mortgage
28478908	2010-03-15			2200	Easement
28478809	2010-03-15			5200	Debenture or Other Voluntary Charge
28427616	2010-03-01			3800	Land Titles First Notice

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
28427608	2010-03-01			3720	Land Titles First Order
28425602	2010-02-26			3900	Land Titles First Application
28422914	2010-02-26			6100	Discharge, Release or Satisfaction
28422880	2010-02-26			6100	Discharge, Release or Satisfaction
111453	1989-01-18	394	600	101	Deed
70700	1973-07-26	193	337	104	Mortgage
65869	1970-10-15	177	352	114	Agreement

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
28175488		2009-12-16	9050	Subdivision & Amalgamations	Lot 08-01	Provincial Grid
28175488		2009-12-16	9050	Subdivision & Amalgamations	Lot 08-01	Provincial Grid

Parcel Relations

Related PID	Type Of Relation	Lot Information
15017072	Parent	Lot

Non-Registered Instruments

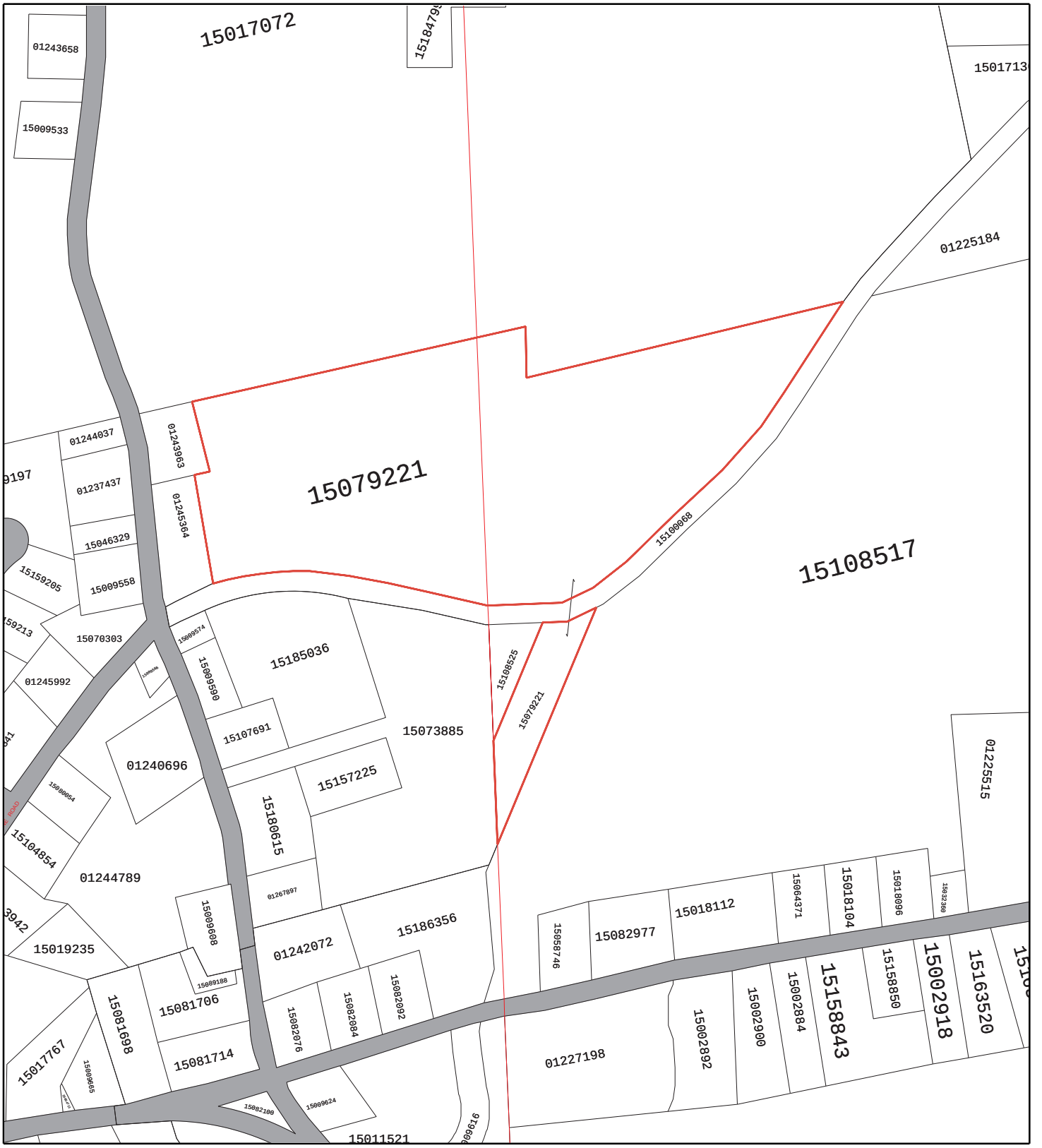
No Records Returned

PAN Information

PAN:	6178885	**Status:**	Open
Assessed Owner(s):	J D IRVING LIMITED *	**Mailing Address:**	PO BOX 5777 STN MAIN SAINT JOHN NB
Assessment Year:	2016	**Postal Code:**	E2L 4M3
Current Assessment:	$ 1,332,900	**Current Levy:**	$ 39,500.48
Location:	UTOPIA RD	**County:**	Charlotte
Property Description:	LOT 08-01/BIOMASS BOILER	**Tax Class:**	Fully Taxable
Property Type Code:	308	**Property Type Name:**	Pulp and Paper Mills
Taxing Authority Code:	515	**Neighbourhood Code:**	01
Taxing Authority Description:	Saint George Bonny River Second Falls	**Neighbourhood Description:**	ST GEORGE LSD OLD F09(PTYS.TO 515-02>'91
Sequence Number:	P015D	**Sub Unit:**	0
Harmonization:	COMPLETED (PAN created due to administrative boundary or has different Tax Class from linked PAN)	**Farm Land Identifiation Program:**	No
PID:	15184799	**PID (2nd):**	-
More PID(s):	No		

Sale Price Information

No Records Returned



Map Scale / Échelle cartographique 1 : 5576

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Parcel Information

PID:	15079221	**County:**	Charlotte
Status:	Active	**Active Date/Time:**	1992-09-14 00:00:00
Land Related Description:	Land	**Management Unit:**	NB0309
Area:	12	**Area Unit:**	Hectares
Date Last Updated:	2015-02-19 10:23:55	**Harmonization Status:**	Harmonized
Land Titles Status:	Not Land Titles	**Land Titles Date/Time:**	
Date of Last CRO:		**Manner of Tenure:**	Unknown
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP / CARTE 21G02V3NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
J D Irving Limited		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
4081367		515	Saint George Bonny River Second Falls

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	Lake	Road		Lake Utopia

County Parish

County	Parish
Charlotte	Saint George

Documents

Number	Registration Date	Book	Page	Code	Description
28525781	2010-03-26			6110	Discharge of Mortgage
111453	1989-01-18	394	600	101	Deed

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
1557		1970-08-12	9020	Easement or Right-of-Way		Provincial Grid

Parcel Relations

No Records Returned

Non-Registered Instruments

No Records Returned

PAN Information

PAN:	4081367	**Status:**	Open
Assessed Owner(s):	J D IRVING LIMITED *	**Mailing Address:**	PO BOX 5777 STN MAIN SAINT JOHN NB
Assessment Year:	2016	**Postal Code:**	E2L 4M3
Current Assessment:	$ 6,400	**Current Levy:**	$ 171.34
Location:	OLD # 1 HIGHWAY	**County:**	Charlotte
Property Description:	VACANT LAND	**Tax Class:**	Fully Taxable
Property Type Code:	701	**Property Type Name:**	Timberland
Taxing Authority Code:	515	**Neighbourhood Code:**	01
Taxing Authority Description:	Saint George Bonny River Second Falls	**Neighbourhood Description:**	ST GEORGE LSD OLD F09(PTYS.TO 515-02>'91
Sequence Number:	P005	**Sub Unit:**	0
Harmonization:	COMPLETED (One to one match of parcels)	**Farm Land Identifiation Program:**	No
PID:	15079221	**PID (2nd):**	15009616
More PID(s):	No		

Sale Price Information

No Records Returned

Appendix II:

Material Safety Data Sheets

Material Safety Data Sheet

EMERGENCY NUMBERS:

(USA) CHEMTREC : 1(800) 424-9300 (24hrs)
(CAN) CANUTEC : 1(613) 996-6666 (24hrs)
(USA) Anachemia : 1(518) 297-4444
(CAN) Anachemia : 1(514) 489-5711

WHMIS	Protective Clothing	TDG Road/Rail
WHMIS CLASS: E F D-1B		TDG CLASS: 8 PIN: UN1773 PG: III
		

Section I. Product Identification and Uses

Product name	**FERRIC CHLORIDE, ANHYDROUS**
Chemical formula	FeCl3
Synonyms	Ferric trichloride, Iron(III) chloride, AC-4472, AC-4472T, 40790, 40814
Supplier	Anachemia Canada. 255 Norman. Lachine (Montreal), Que H8R 1A3
Material uses	For laboratory use only.

CI#	Not available.
CAS#	7705-08-0
Code	AC-4472
Formula weight	162.22
Supersedes	

Section II. Ingredients

Name	CAS #	%	TLV
1) FERRIC CHLORIDE	7705-08-0	90-100	Exposure limits: ACGIH (Iron salts, soluble (as Fe)) TWA 1 mg(Fe)/m3
2) FERROUS CHLORIDE	7758-94-3	0.1-1	Exposure limits: ACGIH (Iron salts, soluble (as Fe)) TWA 1 mg(Fe)/m3

Toxicity values of the hazardous ingredients

FERRIC CHLORIDE, ANHYDROUS:
ORAL (LD50): Acute: 316 mg/kg (Rat). 200 mg/kg (Mouse).
INTRAVENOUS (LD50): Acute: 58 mg/kg (Mouse).
INTRAPERITONEAL (LD50): Acute: 440 mg/kg (Rat). 375 mg/kg (Mouse).

Section III. Physical Data

Physical state and appearance / Odor	Black-green crystalline powder.
pH (1% soln/water)	1-1.5 (20-40% aqueous solution)
Odor threshold	Not available.
Percent volatile	0% at 21°C
Freezing point	About 300°C.
Boiling point	About 316°C.
Specific gravity	2.8-2.9 (Water = 1)
Vapor density	Not available.
Vapor pressure	1 mm Hg @ 194°C
Water/oil dist. coeff.	Not available.
Evaporation rate	Not applicable.
Solubility	Soluble in cold water.

Section IV. Fire and Explosion Data

Flash point	Not applicable.
Flammable limits	Not applicable.
Auto-ignition temperature	Not available.
Fire degradation products	Oxides of iron. Hydrogen chloride gas.
Fire extinguishing procedures	Use extinguishing media appropriate to surrounding fire conditions. Self contained breathing apparatus with a full facepiece operated in a pressure demand or other positive pressure mode. Wear adequate personal protection to prevent contact with material or its combustion products.
Fire and Explosion Hazards	This product may release toxic/corrosive chlorine gas at temperatures above 200°C. Avoid direct contact of this product with water as this can cause a violent exothermic reaction. Not expected to be sensitive to static discharge. Not expected to be sensitive to mechanical impact. Emits toxic and corrosive fumes under fire conditions. Container explosion may occur under fire conditions or when heated.

Section V. Toxicological Properties

Routes of entry	Inhalation and ingestion. Eye contact. Skin contact.
Effects of Acute Exposure	Harmful by ingestion, inhalation or skin absorption. Corrosive. Acute effects may be delayed. Aqueous solutions are corrosive. May cause albuminuria and nematuria. Target organs: eyes, skin, respiratory system, liver, gastrointestinal system.
Eye	Dusts are extremely corrosive to the eyes. Brief contact causes severe eye damage and prolonged contact causes permanent eye injury which may be followed by blindness.
Skin	Dusts are extremely corrosive to the skin and rapidly cause severe chemical burns. Moisture on the skin, such as from perspiration, will accelerate tissue damage.
Inhalation	Dusts are extremely corrosive to the entire respiratory tract. Destructive to tissues of mucous membranes. May cause coughing, dyspnea, bronchopneumonia, chemical pneumonitis and pulmonary edema which can be fatal. May cause delayed lung injury.
Ingestion	Dusts or solids are extremely corrosive to the mouth and throat. Swallowing causes severe and rapid burning of the mouth, thoat, and digestive tract accompanied by severe pain, perforation of the esophagus and stomach lining, central nervous system depression (nausea, vomiting, headache, etc..), collaps and respiratory failure. May cause rapid and weak pulse, hypotension, dehydration, acidosis, liver damage. Pink urine discoloration is a strong indication of iron poisoning.

Section V. Toxicological Properties

Effects of Chronic Overexposure	Liver and kidney damage. Carcinogenic effects: Not available. Mutagenic effects: Not available. Teratogenic effects: Not available. Toxicity of the product to the reproductive system: Not available. To the best of our knowledge the chronic toxicity of this substance has not been fully investigated. Medical conditions which may be aggravated: Individuals with preexisting diseases of the skin, eye, or respiratory system may be more susceptible to the toxicity of overexposure to this product.

Section VI. First Aid Measures

Eye contact	Immediately flush eyes with copious quantities of water for at least 30 minutes holding lids apart to ensure flushing of the entire surface. Washing within 1 minute is essential to achieve maximum effectiveness. If irritation persists, repeat flushing. Seek immediate medical attention.
Skin contact	Immediately flush skin with plenty of water for at least 30 minutes while removing contaminated clothing and shoes. If irritation persists, repeat flushing. Seek immediate medical attention. Wash contaminated clothing before reusing. Do not transport victim unless the recommended flushing period is completed or flushing can be continued during transport.
Inhalation	Remove patient to fresh air. Administer approved oxygen supply if breathing is difficult. Administer artificial respiration or CPR if breathing has ceased. Get immediate medical attention.
Ingestion	DO NOT induce vomiting. If conscious, wash out mouth with water. Have conscious person drink several glasses of water to dilute. Seek immediate medical attention. Never give anything by mouth to an unconscious or convulsing person. Vomiting should only be induced under the direction of a physician or a poison control centre. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water.

Section VII. Reactivity Data

Stability	Unstable. Hygroscopic. Conditions to avoid: High temperatures, sparks, open flames and all other sources of ignition, contamination.
Hazardous decomp. products	Decomposes at temperatures above 200°C to emit chlorine fumes.
Incompatibility	Forms explosive mixtures with potassium, sodium or ethylene oxide. Allyl chloride may polymerize violently with ferric chloride. Oxidizing agents, reducing agents, acids, bases, alcohols, sodium hypochlorite, metals, sulfides, monomers (styrene, etc...).
Reaction Products	Contact with water will produce great amounts of heat and liberate toxic and corrosive hydrogen chloride gas. Do not pour water onto ferric chloride. The reaction is highly exothermic and concentrated solution could be sprayed about. Solutions are corrosive to metals. Hazardous polymerization will not occur.

Section VIII. Preventive Measures

Protective Clothing in case of spill and leak	Wear self-contained breathing apparatus, rubber boots and heavy rubber gloves.
Spill and leak	Evacuate the area. Sweep up and place in container for disposal. Avoid raising dust. Ventilate area and wash spill site after material pick up is complete. DO NOT empty into drains. DO NOT touch damaged container or spilled material. Sweep up immediately to eliminate slipping hazard.
Waste disposal	According to all applicable regulations. Harmful to aquatic life at very low concentrations. Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.
Storage and Handling	Store in a cool place away from heated areas, sparks, and flame. Store in a well ventilated area. Store away from incompatible materials. Do not add any other material to the container. Do not wash down the drain. Do not breathe dust. Do not breathe gas/fumes/vapor/spray. Keep container tightly closed and dry. Manipulate under an adequate fume hood. Avoid raising dust. Protect from moisture. Do not allow water to get inside container because of violent reaction. Empty containers may contain a hazardous residue. Handle and open container with care. Minimize dust generation and exposure - use dust mask or appropriate protection. Take off immediately all contaminated clothing. This product must be manipulated by qualified personnel. Do not get in eyes, on skin, or on clothing. Wash well after use. In accordance with good storage and handling practices. Do not allow smoking and food consumption while handling. In case of accident or if you feel unwell, seek medical advice immediately (show the label when possible.).

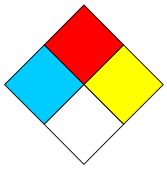
Section IX. Protective Measures

Protective clothing	Face shield and splash goggles. Impervious rubber gloves, apron, coveralls, and/or other resistant protective clothing. Sufficient to protect skin. A OSHA/MSHA jointly approved respirator is advised in the absence of proper environmental controls. If more than TLV, do not breathe vapor. Wear self-contained breathing apparatus. Do not wear contact lenses. Make eye bath and emergency shower available. Ensure that eyewash station and safety shower is proximal to the work-station location.
Engineering controls	Use in a chemical fume hood to keep airborne levels below recommended exposure limits. Do not use in unventilated spaces. Adequate ventilation and clean up must be maintained to minimize dust accumulation.

Section X. Other Information

Special Precautions or comments

Corrosive! Dangerously reactive material! Toxic! Do not breathe dust. Avoid all contact with the product. Avoid prolonged or repeated exposure. Use in a chemical fume hood. Keep water and moist air out of the container. Keep dry at all times. Corrosive effects on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Strict adherence to first aid measures following any exposure is essential. Solutions are highly corrosive. Handle and open container with care. Container should be opened only by a technically qualified person. Risk of serious damage to eyes.
RTECS NO: LJ9100000 (Ferric chloride).



NFPA

Prepared by MSDS Department/Département de F.S..

Validated 01-May-2014

River Bend Labs

Leaders in the Water Treatment Industry

SAFETY DATA SHEET

Hydrex 6913

Product	Hydrex 6913
Other means of identification	Acidic nutrient mixture, aqueous solution
Recommended use	Nutrient, anaerobic process treatment
Restrictions on use	Use only as directed. Not for use in drinking water Avoid contact with alkali and most metals

Manf. By: River Bend Labs
Chemtron Corporation
3500 Harry S. Truman Blvd.
St. Charles, MO 63301
Phone 636-940-5445 (Mon.-Fri., 8:00-5:00)
www.riverbendlab.com

Emergency Phone, 24/7
1 (800) 424-9300
CHEMTREC
For
Crown Solutions Co.
945 S. Brown School Rd
Vandalia, OH 45377 937-890-4075

Revision Date: 7/25/13

SECTION 2 -- HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

Appearance & Odor: Cloudy, purple aqueous acid, with a faint characteristic odor.
Danger. Causes severe burns and eye damage. Contains acid mixture. Liquid is corrosive or severely irritating to eyes and corrosive or severely irritating to skin after contact. In incidents involving contact with incompatible alkali materials, significant heat may be generated. In incidents involving product contact with some metals, such as aluminum and zinc, flammable hydrogen gas may be generated. Product is corrosive to most metals.

OSHA Regulatory Status: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

HEALTH EFFECTS:

Signs or Symptoms of Exposure:
Eyes: Causes severe burns and eye damage.
Skin: Causes severe burns.
Inhalation: Product mist or aerosol is irritating to mucous membranes, respiratory tract and lung tissues.

Ingestion: Ingestion may cause gastrointestinal burns or severe irritation accompanied by pain, nausea, vomiting, and symptoms of shock (rapid pulse, sweating, collapse).
Chronic Effects: No known chronic effects of overexposure. Note trace level presence of carcinogens in section 12.
Potential Environmental Effects: Significant contamination of surface water may temporarily depress pH levels below minimum requirements for aquatic organisms. Metal compounds in product – individually, less than 1% each - may cause aquatic toxicity impacts for fish or other organisms in small bodies of surface water or at the point of a spill in a larger body of water.

SECTION 3 – COMPOSITION/INGREDIENT INFORMATION

CHEMICAL INGREDIENT	C.A.S. NO.	% BY WT.
Molybdic acid	7782-91-4	1.00-5.00
Citric acid	77-92-9	1.00-5.00
Nickel chloride	7791-20-0	<1.00
Cobalt sulfate	10026-24-1	<1.00

The exact percent by weight of the ingredients in this formulation is proprietary.

SECTION 4 - FIRST AID MEASURES

EYE In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. (If easy to do, remove contact lenses, if worn.) Hold eyelids apart to ensure complete irrigation of eye/lid tissue. Get medical attention.

SKIN In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if irritation develops and persists. Wash clothing before reuse.

INHALATION Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen and get medical attention immediately.

INGESTION If swallowed, call a poison control center or physician immediately. Do NOT induce vomiting unless directed to do so by a physician. Never give anything by mouth to an unconscious person. Get medical attention immediately.

SECTION 5 - FIRE FIGHTING MEASURES

Extinguishing Media: Dry chemical, water spray, foam, carbon dioxide, or any media appropriate for the surrounding fire.
Special Fire Fighting Procedures: Approach fire from upwind direction. Cool fire exposed containers with water spray. Avoid exposure to fumes, smoke, and products of combustion or wear self contained breathing apparatus.
Unusual Fire & Explosion Hazards: Containers can rupture and release toxic vapors or decomposition products, such as oxides of sulfur, oxides of sodium, other metal oxides, or oxides of carbon, if exposed to fire conditions. In incidents involving product contact with some metals, such as aluminum and zinc, flammable hydrogen gas may be generated.

Section 6 – ACCIDENTAL RELEASE MEASURES

Action to take for spills: Wear personal protective equipment recommended in Section 8. Contain and/or absorb spill with inert material such as sand, vermiculate, or other commercially available products. Recover spill residues in DOT approved container. Prevent run-off onto land, sewers, or waterways. There is no CERCLA reportable quantity (RQ) for product ingredients present in quantities greater than 1% by weight. The Material, as shipped, is a RCRA hazardous waste, characteristic of corrosivity (D002). If product is designated waste prior to spill, the RCRA reportable quantity for a material not otherwise listed having the characteristic hazard D002 is 100 lbs. Dispose of in accordance with local, state or federal environmental regulations.

SECTION 7 HANDLING AND STORAGE

Handling: Avoid contact with eyes, skin, or clothing. Wash thoroughly after handling. Note label precautions. Open container slowly until pressure is relieved. Avoid spillage. Clean up small spills and drips promptly. Protect product from contamination. Avoid contact between this product and other chemicals, especially strong bases and metals subject to acid corrosion (See Section 10). Do not transfer to aluminum or other metal container susceptible to corrosion. Contact with such metals may generate flammable hydrogen gas. The recommended disposal for rinse waters from empty units is discharge to the treated system.

Storage: Store product in closed container in well ventilated, secure area. Protect containers against physical damage. Protect product from contamination. Avoid contact between this product and other chemicals, especially alkali materials. Also avoid contact with metals such as aluminum, zinc, and most other metals. Protect label. Empty containers retain product residues and all label hazards are still present until container is thoroughly cleaned.

SECTION 8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls

Avoid work practices that may generate aerosol or mist from product. Avoid contact with metals susceptible to corrosion reactions with acid. Metals to avoid include aluminum and zinc. Corrosion of metals may evolve flammable hydrogen gas.

Personal Protective Equipment

Eye/Face Protection: Wear safety glasses with side shields or chemical splash goggles. If splashing can occur, wear full face shield. An eye wash station and emergency shower should be readily available.

Skin: Wear industrial rubber gloves. Suitable glove materials would include PVC, neoprene, nitrile, and natural rubber. Employ apron and rubber boots when appropriate.

Respiratory Protection: Not required under typical, recommended use conditions. Avoid work practices that may generate aerosol or mist from product.

Exposure Guidelines for Product Ingredients:

Ingredient	Source & Parameter	Exposure Limit
Water soluble molybdenum compounds	ACGIH TWA TLV	0.5 mg/m3
Nickel, soluble compounds	ACGIH TWA TLV	0.1 mg/m3
Cobalt, inorganic compounds	ACGIH TWA TLV	0.02 mg/m3

NOTE: OSHA - Occupational Safety and Health Administration; ACGIH - American Conference of Governmental Industrial Hygienists; NIOSH – National Institute for Occupational Safety and Health; PEL – Permissible Exposure Limit; TWA – Time Weighted Average; TLV – Threshold Limit Value; REL – Recommended Exposure Limit; STEL – Short Term Exposure Limit; IDLH = Immediately Dangerous to Life or Health.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance (physical state, color, etc.)	Cloudy purple aqueous acid
Odor	faint characteristic odor
Odor threshold	Not known
pH	1.39
Melting point/freezing point	freeze point < 32 degrees F
Initial boiling point and boiling range	boiling point > 212 degrees F
Flash point	none
Evaporation rate	similar to water
Flammability (solid, gas)	not flammable
Upper/lower flammability or explosive limits	not applicable
Vapor pressure	not known, similar to water
Vapor density	not known, similar to water
Relative density	1.080, specific gravity
Solubility(ies)	completely miscible in water
Partition coefficient: n-octanol/water	not known
Auto-ignition temperature	not flammable
Decomposition temperature	Not known
Viscosity	similar to water

SECTION 10 - STABILITY AND REACTIVITY

Chemical Stability: Stable.
Incompatibility: Avoid contact with alkali and metals.
Hazardous Decomposition: When heated to decomposition, product may evolve oxides of sulfur, oxides of carbon, several metal oxides, chlorine or chlorine compounds. Contact with metal may evolve flammable hydrogen gas.
Hazardous Polymerization: Will not occur.
Conditions to Avoid: Avoid contact between product and alkali or metal. Avoid elevated temperature. Keep container closed

SECTION 11 – TOXICOLOGICAL INFORMATION

TOXICITY: Product toxicity has not been determined. Notable ingredient or ingredient related compound toxicity data provided below.
INGREDIENT TOXICITY:

Ingredient	**Acute Inhalation**	**Acute Oral LD50**	**Acute Dermal**

	LC50		**LD50**
Molybdic acid (data is for sodium molybdate)	rat, 2,080 mg/m3/4 hr	rat, 4,000 mg/kg	rat, >2,000 mg/kg
Nickel chloride		Rat, 105 Mg/kg	
Cobalt sulfate heptahydrate		Rat, 768 Mg/kg	

Toxicology: Toxicological data not available on formulated product. Liquid is corrosive or severely irritating to eyes and corrosive or severely irritating to skin after contact. Note health effects summary in Section 2.
Medical conditions aggravated by exposure: None known.
Carcinogen (NTP; IARC or OSHA): Product contains less than 1.0% of a nickel salt, nickel chloride. There is limited evidence in experimental animals for the carcinogenicity of nickel salts (IARC, no group designation). Product contains less than 1.0% of cobalt sulfate heptahydrate. There is clear evidence of carcinogenic activity of cobalt sulfate heptahydrate in laboratory animals (NTP, rat inhalation studies). Cobalt sulfate heptahydrate is also listed as an IARC 2B carcinogen (possibly carcinogenic to humans).
Mutagen: Product contains less than 1.0% of a nickel salt, nickel chloride. Nickel chloride is mutagenic for mammalian somatic cells.
Teratogen: Inadequate data available for evaluation.

SECTION 12 - ECOLOGICAL INFORMATION

Product has not been evaluated to determine product aquatic toxicity to fish or other aquatic organisms. Significant contamination of surface water may temporarily depress pH levels below minimum requirements for aquatic organisms. Metal compounds in product – individually, less than 1% each - may cause aquatic toxicity impacts for fish or other organisms in small bodies of surface water or at the point of a spill in a larger body of water.

SECTION 13 – DISPOSAL CONSIDERATION

Waste Disposal Methods: Product is consumed during recommended use. Flush container residues to the treated system. If product is not consumed in use, material is RCRA hazardous waste due to the corrosivity characteristic (D002).

SECTION 14 – TRANSPORT INFORMATION

Emergency Telephone Number: 800-424-9300 CHEMTREC
DOT Hazard Class: 8
DOT Shipping Name: UN 1760, corrosive liquid, n.o.s., (molybdic acid, citric acid) PG III
DOT Placard: Corrosive

SECTION 15 – REGULATIONS

Regulatory Information:

U.S. Regulations:
SARA Hazard Category:
Acute Yes **Chronic** No **Fire** No **Reactivity** No **Pressure** No
EPCRA Section 313 Toxic Chemicals: none
TSCA: All ingredients listed or exempt from listing

SECTION 16 – OTHER INFORMATION

HMIS Hazard rating:		**Scale:**
Health	3	4 – Extreme
Fire	0	3 – High
Physical Hazard	0	2 – Moderate
PPE	n or o, p*	1 – Slight
		0 – Insignificant

* PPE designation stands for splash goggles or face shield and gloves.

The information presented in this Material Safety Data Sheet is subject to additions and revisions and is not all inclusive, but represented as the best information available to date. This information was drawn from recognized sources believed to be reliable. However, Chemtron Corporation/River Bend Labs and/or the preparer of this data sheet will not be responsible for damages of any kind resulting from the use of or reliance upon such information. The product discussed is sold without warranty, expressed or implied, and upon conditions that purchasers shall perform their own verification and testing to determine its suitability for a particular purpose.

MATERIAL SAFETY DATA SHEET

ANCO CHEMICALS INC.

85 Malmo Court, ON, L6A 1R4

Tel: 905-832-2276

Anhydrous Ammonia, Met. Grade **Effective Date:** Jan. 20, 2015

1. Product Identification:

Chemical Name:	Ammonia, Anhydrous or Anhydrous Ammonia
Synonyms:	Ammonia Gas
Chemical Family:	Not applicable
Molecular Formula:	NH_3
Product Use:	Fertilizer, Refrigerant, Neutralizing Agent in Petroleum Industry etc
Manufacturer/Supplier	CF Industries

24 Hour Emergency Number CANUTEC'S #: 613-996-6666(call collect) or *666 cellular
Transport Canada Emergency Response Assistance Plan No: ERP 2-0075,
ERAP activation no: 905-832-2276

2. Hazardous Ingredients of Product

Hazardous Ingredients:	**%**	**ACGIH TLV**	**CAS. No.**
Anhydrous Ammonia	>99.995	25ppm	7664-41-7

3. PHYSICAL AND CHEMICAL PROPERTIES

Physical Form…….Gas (liquid under pressure)
Color……..Colorless gas and liquid, forms white vapour in contact with moisture.
Odour…….Strong pungent penetrating odour, ammonia.
Boiling Point……..-28.1°F
Melting Point…….-107.9°F
pH……..>13.0 (neat)
Solubility……35g/100g in water at 32°F
Specific Gravity…….0.62 (@ 60°F)

Vapour Density……..0.60 (@ 60°F)
Vaour Pressure……..93 psig (@ 60°F)
% Volatile by Volume……100%
Molecular Weight……..17.03
Density……5.14 lb. Per U.S. gallon (@ 60 °F
Critical temperature……271°F
Critical pressure……..1636 psia

4. Fire & Explosion Hazards:

Flash Point: Not applicable
Auto ignition Temperature: 651°C
Flammability Limits in Air: UEL: 25% LEL: 16%
Fire Extinguishing Media: C02, Dry Chemical, Water Spray
Fire Fighting Procedures: Stop flow of gas. Use water to keep fire from exposed containers and to cool and protect personnel effecting the shut-off. Full protective equipment, including a self-contained breathing apparatus, should be worn in a fire involving the material.

5. REACTIVITY

Stability……This is a stable material.
Hazardous Polymerization……Will not occur.
Conditions to avoid……..Excessive heat.
Decomposition: May form oxides of nitrogen. Hydrogen is released on heating above 850°F (454°C). At 1290°F or in presence of electric spark ammonia decomposes into nitrogen and hydrogen gases, which may form a flammable mixture in the air.
Incompatibilities:

a. Ammonia has potentially explosive or violent reactions with inter halogens, strong oxidizers, Nitric Acid, Fluorine, Nitrogen oxide, etc. (See note following).
b. Ammonia forms sensitive explosive mixtures with air and hydrocarbons, Ethanol, and Silver Nitrate, Chlorine, etc. (see note following)
c. Explosive products are formed by the reaction of ammonia with Silver Chloride, Silver Oxide, Bromine, Iodine, Gold, Mercury, Tellurium Halides, etc. (See note following).
d. Ammonia is incompatible or has potentially hazardous reactions with Silver, Acetaldehyde, Acrolein, Boron, Halogens, Perchlorate, Chloric Acid, Chlorine Monoxide, Chlorides, Nitrogen Tetroxide, Tin, Sulphur, etc. (See note following).

NOTE: The incompatibilities above are a partial list taken from two books by Sax & Lewis: "Dangerous Properties of Industrial Materials", 7th ed., 1989 and Hawley's "Condensed Chemical Dictionary", 11th ed. 1987, both published by Van Nostrand Reinhold Company, New York. It is recommended that if additional information is needed, refer to these and other published information.

6. TOXICOLOGICAL INFORMATION

Material is a gas and ingestion is not a likely route of exposure. Route of entry is by inhalation, irritant to eyes and skin etc.
LC50 Mouse……2115 ppm for 4 hrs.
LD50 Rat…….350 mg/kg
LC60 Goldfish/Yellow Perch……..2.0 to 2.5 ppm / 1 to 4 d
Carcingenicity Data: The ingredients of this product are not listed as carcinogens by NTP, (National Toxicology Program), not required as carcinogens by OSHA (Occupational Safety and Health Administration), and have not been evaluated by IARC (International Agency for Research on Cancer) or ACGIH (American Conference of Governmental Industrial Hygienists).
Reproductive Effects: No information is available and no adverse reproductive effects are anticipated.
Mutagenicity Data: No information is available and no adverse mutagenic effects are anticipated.
Teratogenicity Data: No information is available and no adverse teratogenic effects are anticipated.
Synergistic Materials: None known.

ECOLOGICAL INFORMATION

a. Ammonia is harmful to aquatic life in very low concentration and may be hazardous if it enters water intakes.
b. Local health and wildlife authorities, as well as operators of water intakes in the vicinity, should be notified of water releases.
c. Waterfowl toxicity: 120 ppm
d. Ammonia does not concentrate in the food chain.
e. BOD curve for ammonia begins after several days. At this time bacteria will convert it to nitrates.
f. Effect on water treatment process: Chlorination will produce chloramines which are more readily detected by taste and odour.

7. PREVENTIVE MEASURES / ACCIDENTAL RELEASE MEASURES

EXPOSURE CONTROLS, PERSONAL PROTECTION

This information is based on industrial norms, please note any limits set by the manufacturer of your brand of safety gear.
Odour Threshold: Less than 5ppm
Respiratory Protection Requirements:
<25 ppm: No protection required.
25 to 35 ppm: Protection required if the daily TWA is exceeded.

35 to 50 ppm: Protection required if exposed for more than 15 minutes.
50 to 250 ppm: Minimum of air-purifying respirator equipped with ammonia canister(s) or cartridge(s).
250 to 300 ppm: Minimum of a full face air—purifying respirator equipped with ammonia canister(s) or cartridge(s).
>300 ppm: A fresh air supply system must be used (i.e. positive pressure self contained breathing apparatus)
Skin Protection Requirements: Skin protection is required for exposure to liquid, mist, and > 1000 ppm of ammonia gas or vapours. Neoprene or rubber gauntlet-type gloves; ammonia resistant clothing (overalls, jacket, and boots) or vapour suit, as required.
Eye Protection Requirements: Use chemical (indirectly vented) goggles when there is a potential for contact with liquid or mist. A full-face shield may be worn over goggles for additional protection, but not a substitute for goggles. In areas where high concentrations (>250) of ammonia vapours may occur a SCBA may be required. (Follow the regulations of using SCBA)
Other Protective Equipment: Face shields, boots, full face ammonia mask, coat and pants should be worn, depending upon exposure. Safety shower and eyewash fountain should be provided in the ammonia handling area. In agricultural distribution, provide easily accessible shower and / or at least 100 gallons of clean water in open top container (check regulations). When transporting, provide at least 5 gallons of accessible clean water and personal protective equipment.
Engineering Controls: Adequate ventilation is required to keep ammonia concentrations below applicable standards when possible.
Note to the Physician: Pneumonitis should be anticipated after inhalation or ingestion. If severe exposure is suspected, observe for 48-72 hours for delayed pulmonary edema.
Medical Conditions Aggravated by Exposure: Chronic respiratory or skin disease.

Spill or Leak Measure: Stop leak if you can do so without any risk. Keep unnecessary people away, isolate hazardous area and deny entry. Stay upwind, out of low areas, and ventilate closed spaces before entering. Evaluate the affected area to determine whether to evacuate or shelter-in-place by taping windows and doors, shutting off outside air intake (attic fans, etc.), and placing a wet towel or cloth over the face (if needed). Self-contained breathing apparatus (SCBA) and structural firefighter's protective clothing will provide limited protection in outdoor releases for short-term exposure. Fully-encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire. Use water spray to control vapours. Mixing of water and liquid ammonia will generate heat and ammonia vapours.

CAUTION:
a. Personal protective clothing may become brittle when exposed to liquid ammonia.

b. Runoff from vapour control or dilution may cause environmental damage.

Determining spill size: Generally, a small spill is one which involves a single, small package, small cylinder, or a small (not continuing) leak from a large container.

Small Spill:

a. Flush area vapours with flooding amounts of water spray.
b. First isolate 100 feet in all directions, and then protect persons downwind 0.1 miles during daylight and 0.2 miles at night.

Large Spill:

a. Dike far ahead of liquid spill for later disposal. A
b. Large cloud of water fog can be made to stop the flow of vapours and contain the ammonia solution made out of it. Don't let this solution to go into any sewer.
c. Follow local emergency protocol for handling.
d. First isolate 300 feet in all directions, and then protect persons down wind 0.2 miles during daylight and 0.5 miles at night.

DISPOSAL INFORMATION

Reclaim as fertilizer if possible; otherwise dispose of in accordance with federal, provincial, and local environmental control regulations. Do not dispose of wastes in local sewerage system.

HANDLING AND STORAGE

Handling Procedures and Equipment: Protect cylinders from physical damage. Do not store in basement locations. Keep out of sun and away from all direct heat sources. The material will attack copper, tin, zinc, and their alloys; some forms of rubber, plastics and coatings.

Storage Requirements: Store in cool, dry, well-ventilated area away from incompatibles. Secure cylinders.

Other Precautions: Locate safety shower and eyewash station close to chemical handling area.

Regulatory Information

Controlled Products Regulations Classification: A: Compressed Gas; E: Corrosive;
OSHA Hazard Communication (29 CFR1910.1200)
WHMIS Classification: Compressed Gas and corrosive

Canadian TDG Act Shipping Description

Shipping Name:	Ammonia, Anhydrous
Shipping Class/Division:	2.3(8)
Product Identification No:	UN1005
Placard	Toxic 2.3 white or UN1005 color: white
Classification:	Toxic, corrosive and non-flammable gas

Other Regulations: Toxic gas, Placard colour white

Read the entire MSDS for the complete hazard evaluation of this product.

8. First Aid Procedures When:

Inhaled: Move victim to fresh air; give artificial respiration only if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing and no pulse. Oxygen administration may be beneficial in this situation but should *only* be administered by personnel trained in its use. Obtain medical attention immediately.

In Contact with the Skin & Mucosa: If contacted by liquid ammonia, the body area affected should be immediately flooded with water. If no safety shower is available, utilize any available water source. Water will have the effect of thawing out clothing which may be frozen to the skin. Such clothing should be removed and flooding of the skin with water continued for at least 20 minutes. Obtain medical attention promptly.

In Contact with the Eyes: If contacted by ammonia, the eyes must be flooded with copious quantities of clean water. Speed is essential. If contact lenses are worn, they must be removed; otherwise ammonia may be trapped underneath causing a severe burn. In isolated areas, water in a squeeze bottle which can be carried in the pocket is helpful for emergency irrigation purposes. An eye fountain should be used, but if not available, clean water from any source may be poured over the eyes. In any case, the eyelids MUST BE HELD OPEN and irrigation continued for at least 20 minutes. Repeat this procedure every ten minutes for an hour, each time irrigating for a period of five minutes until prompt medical attention can be obtained.

Ingested: Material is a gas and ingestion is not a likely route of exposure. If conscious give 1-2 glasses of milk or water. *Do not* induce vomiting. Obtain medical attention.

Emergency Medical Care: Pulmonary edema may be delayed. Injury may be more severe than would be indicated on early presentation.

Medical conditions that may be aggravated by exposure include asthma, bronchitis, emphysema and other lung diseases and chronic nose, sinus or throat conditions. In the event of skin or eye contact, rapid and through flushing is essential.

9. Other Information (Preparation Information)

Prepared by the Quality Department at Anco Chemicals inc. by Sat Anand
1-905-832-2276 x 233
Validation date: Jan. 20, 2015

OTHER TRANSPORTATION INFORMATION

ERAP No:…… ER 2-0075

D.O.T. Shipping Name……..Anhydrous ammonia
U S D.O.T. Hazard Class…… Non-flammable gas, class 2.2
U.N. Number…….UN1005
U S D.O.T. Placard…… Non-flammable gas 2.2, colour: green
OSHA Label required……Yes
STCC Number……49 042 10

Additional Information and Sources Used

1. RTEC-S Registry of Toxic effects of Chemical substances, On-line search, Canadian Centre for Occupational Safety & Health, US Department of Health and Human Services, Cincinnati, 1992.
2. Clayton, G.D. and Clayton, F.E., Eds., Patty's Industrial Hygiene and Toxicology, 3rd Ed., Vol II
3. Supplier's Material Safety Data Sheets.
4. Hazardous Material Spill Manual, Que. 1977.
5. NOISH, Criteria for a Recommended Standard to Ammonia.
6. "Dangerous Properties of Industrial Materials" 7th Ed. 1989
7. "Hawley's Condensed Chemical Dictionary" 11th Ed. 1987
8. "Anhydrous Ammonia Safety" LaRoche Industries 1989
9. Clear Language TDGR (effective 15th Aug. 2002)
10. Changed Canadian classification from 2.2 to 2.3

Agrium Material Safety Data Sheet

NFPA Classification	DOT / TDG Pictograms	WHMIS Classification	HMIS		PROTECTIVE CLOTHING
Health 0, Flammability 0, Reactivity 0, Specific Hazard			Health Flammability Reactivity PPE	0 0 0 a	

Section I. Chemical Product and Company Identification

PRODUCT NAME/ TRADE NAME **Ammonium Polyphosphate Liquid, 10-34-0**

SYNONYM	Rainbow Liquid 10-34-0	**MSDS NUMBER:**	**12625**
CHEMICAL NAME	Not applicable.	**REVISION NUMBER**	4.2
CHEMICAL FAMILY	Ammonium salt.	**MSDS prepared by the Environment, Health and Safety Department on:**	**August 31, 2013**
CHEMICAL FORMULA	Not applicable. A blended product.	**24 HR EMERGENCY TELEPHONE NUMBER:**	
MATERIAL USES	Agricultural industry: Fertilizer.	**Transportation: 1-800-792-8311** **Medical: 0-303-389-1653 Collect**	

MANUFACTURER

Agrium
North American Wholesale
13131 Lake Fraser Drive, S.E.
Calgary, Alberta, Canada, T2J 7E8

Agrium U.S. Inc.
Suite 1700, 4582 South Ulster St.
Denver, Colorado, U.S.A., 80237

SUPPLIER

Agrium
North American Wholesale
13131 Lake Fraser Drive, S.E.
Calgary, Alberta, Canada, T2J 7E8

Agrium U.S. Inc.
Suite 1700, 4582 South Ulster St.
Denver, Colorado, U.S.A., 80237

Section II. Hazardous Ingredients

		Exposure Limits (ACGIH)						
NAME	**CAS #**	**TLV-TWA mg/m³**	**TLV-TWA ppm**	**STEL mg/m³**	**STEL ppm**	**CEIL mg/m³**	**CEIL ppm**	**% by Weight**
No regulated components.								

ACGIH TLV notations:

---- No assigned TLV
(C) - Ceiling - the concentration not to be exceeded at any time
(I) - measured as the Inhalable fraction of the aerosol
(R) - measured as the Respirable fraction of the aerosol
(T) - measured as the Thoracic fraction of the aerosol

TOXICOLOGICAL DATA ON INGREDIENTS

Ammonium Polyphosphate Solution TFI Product Testing Program:
Acute oral LD_{50}, OECD 425 protocol: >2,000 mg/kg, rat
Acute dermal LD_{50}, OECD 402 protocol: >5,000 mg/kg, rat

Ecotoxicity:
Acute fish toxicity, 96hr LC_{50}, OECD 203 protocol, rainbow trout: >101 mg/L

Continued on Next Page

Section III. Hazards Identification.

POTENTIAL ACUTE HEALTH EFFECTS	This product may irritate eyes and skin upon prolonged or repeated contact. Over-exposure by inhalation may cause respiratory tract irritation. Ingestion of this substance may produce irritation of the gastro-intestinal tract, characterized by burning and diarrhea.
POTENTIAL CHRONIC HEALTH EFFECTS	**CARCINOGENIC EFFECTS**: NONE by ACGIH, EPA, IARC, NTP, OSHA. **MUTAGENIC EFFECTS**: NONE by ACGIH, EPA, IARC, NTP, OSHA. **TERATOGENIC EFFECTS**: NONE by ACGIH, EPA, IARC, NTP, OSHA. There is no known effect from chronic exposure to this product.

Section IV. First Aid Measures

EYE CONTACT	May cause eye irritation. Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Obtain medical attention if irritation persists.
MINOR SKIN CONTACT	May cause skin irritation. Wash contaminated skin with soap and water. Cover dry or irritated skin with a good quality skin lotion. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.
EXTENSIVE SKIN CONTACT	No additional information.
MINOR INHALATION	Repeated or prolonged inhalation of mists may lead to respiratory irritation. Loosen tight clothing around the individual's neck and waist. Allow the person to rest in a well ventilated area. Obtain medical attention if irritation persists.
SEVERE INHALATION	No additional remark.
SLIGHT INGESTION	Do not induce vomiting. Low toxicity. May cause digestive tract irritation, with accompanying nausea, vomiting and diarrhea. If spontaneous vomiting does occur, lower the head so that the vomit will not reenter the mouth and throat. If tolerated, give no more than 1 cup of milk or water for adults or 1/2 cup for children to rinse the mouth and throat, dilute the stomach contents, and minimize irritation. Obtain medical attention if irritation persists.
EXTENSIVE INGESTION	No additional information.

Section V. Fire and Explosion Data

THE PRODUCT IS	Non-flammable.
AUTO-IGNITION TEMPERATURE	Not applicable.
FLASH POINT	Not applicable.
FLAMMABILITY LIMITS	Not applicable.
PRODUCTS OF COMBUSTION	Material will not burn, but thermal decomposition may result in flammable/toxic gases being formed after material evaporated to dryness. These products are nitrogen oxides and ammonia (NO, NO_2, NH_3).
FIRE HAZARD IN THE PRESENCE OF VARIOUS SUBSTANCES	Not applicable.
EXPLOSION HAZARD IN THE PRESENCE OF VARIOUS SUBSTANCES	This product is non-explosive.
FIRE FIGHTING MEDIA AND INSTRUCTIONS	Non-flammable. Use extinguishing media suitable for surrounding materials.

Continued on Next Page

SPECIAL REMARKS ON FIRE HAZARDS	Non combustible. Flammable/toxic gases may form at elevated temperatures (>100 °C) by thermal decomposition (ammonia, phosphorus oxides, nitrogen oxides). Avoid temperatures above 100°C (212°F). On evaporation to dryness thermal decomposition may result.
SPECIAL REMARKS ON EXPLOSION HAZARDS	No additional remark.

Section VI. Accidental Release Measures

SMALL SPILL	Absorb with an inert material and place in an appropriate waste disposal container. Ensure disposal complies with local regulations.
LARGE SPILL	In the event of a spill, stop leak if possible to do so without risk. Dike and contain spilled material. Ensure that the spilled material does not enter sewers, wells, or watercourses. Product will promote algae growth which may degrade water quality and taste. Notify downstream water users. Pump up spilled material and place in suitable containers for reuse or disposal. Ensure disposal complies with local regulations.

Section VII. Handling and Storage

PRECAUTIONS	After handling, always wash hands thoroughly with soap and water. Avoid contact with skin and eyes. Keep away from food, drink and animal feed. Avoid contact with incompatable substances, particularly alkaline substances like caustic soda. Ensure previous containers and transport equipment containing strong alkali are thoroughly cleaned before adding 10-34-0 solution. Keep out of reach of children.
STORAGE	Keep in a cool, well-ventilated location.

Section VIII. Exposure Controls/Personal Protection

ENGINEERING CONTROLS	Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate mists, use ventilation to keep exposure to airborne contaminants below the exposure limit.
PERSONAL PROTECTION	The selection of personal protective equipment varies, depending upon conditions of use. Wear appropriate respiratory protection for dust/mist when ventilation is inadequate. A filtering facepiece dust mask is recommended for most applications if respiratory protection is needed. Where skin and eye contact may occur as a result of brief periodic exposures, wear long sleeved clothing, coveralls, chemical resistant gloves, and safety glasses with side shields.
PERSONAL PROTECTION IN CASE OF LARGE RELEASE	No additional information.
EXPOSURE LIMITS	Alberta TWA: 10 mg/m^3 Inhalable, 3 mg/m^3 Respirable, for Particulate Not Otherwise Regulated. Fed OSHA PEL: 15 mg/m^3 Total dust, 5 mg/m^3 Respirable fraction, for Particulates Not Otherwise Regulated. Federal, State or Provincial exposure limits may vary by jurisdiction. Consult local authorities for acceptable exposure limits in your area.

Section IX. Physical and Chemical Properties

PHYSICAL STATE AND APPEARANCE	Liquid. (Clear to slightly hazy liquid.)		
MOLECULAR WEIGHT	Not available.	**COLOR**	Clear green.
pH (10% SOLN/WATER)	7	**ODOR**	Odorless.
BOILING POINT	100 °C	**ODOR THRESHOLD**	17 PPM (Ammonia)
MELTING POINT	-18°C (-0.4°F)	**TASTE**	Acid. Saline.
CRITICAL TEMPERATURE	Not available.	**VOLATILITY**	Not available.

Continued on Next Page

SPECIFIC GRAVITY g/cc	1.4 (Water = 1)	**SOLUBILITY**	Easily soluble in cold water, hot water.
BULK DENSITY kg/m³ ; lbs/ft³	1400 kg/m³; 87.4 lbs/ft³; 11.7 lbs/gal (US).	**DISPERSION PROPERTIES**	Easily dispersed in any proportion in cold water and hot water.
VAPOR PRESSURE	Not available.	**WATER/OIL DIST. COEFF.**	Not available.
VAPOR DENSITY	Not available.		

Section X. Stability and Reactivity Data

STABILITY	The product is stable.
INSTABILITY TEMPERATURE	Not available.
CONDITIONS OF INSTABILITY	No additional remark.
INCOMPATABILITY WITH VARIOUS SUBSTANCES	Very slightly reactive with metals. Very reactive with strong alkaline substances like caustic soda, producing ammonia gas and heat with the possibility of the mixture boiling over and splashing.
CORROSIVITY	Slightly corrosive to copper, iron, and steel.
SPECIAL REMARKS ON REACTIVITY	No additional remark.
SPECIAL REMARKS ON CORROSIVITY	Incompatible with copper alloys. Corrosive to brass. Corrosive to ferrous metals and alloys. Contact your sales representative or a metallurgical specialist to ensure compatability with system equipment.

Section XI. Toxicological Information

SIGNIFICANT ROUTES OF EXPOSURE	Ingestion. Inhalation.
TOXICITY TO ANIMALS	See Section II.
SPECIAL REMARKS ON TOXICITY TO ANIMALS	Will release ammonium ions. Ammonia is a toxic hazard to fish. The product itself and its products of degradation are not harmful under normal conditions of use. May be harmful to livestock and wildlife if ingested. Clean up all spilled material, especially where bulk fertilizer loading of equipment occurs.
OTHER EFFECTS ON HUMANS	Our data base contains no additional remark on the toxicity of this product
SPECIAL REMARKS ON CHRONIC EFFECTS ON HUMANS	No additional remark.
SPECIAL REMARKS ON OTHER EFFECTS ON HUMANS	No additional remark.

Section XII. Ecological Information

ECOTOXICITY	Non-persistent. Non-cumulative when applied using normal agricultural practices. May be harmful to fish, livestock, and wildlife. Dissolved mineral salts may cause irritation of the digestive tract. Aquatic/Marine Toxicity: Will release ammonium ions. Ammonia is a toxic hazard to fish. Will release phosphate. Phosphates will result in algae growth which may increase turbidity and deplete oxygen resulting in a hazard to fish or other marine organisms. Will disperse with the current. Release to watercourses may cause effects down stream from the point of release. Avoid spills or release to watercourses. U.S. D.O.T.: This material NOT listed as a Marine pollutant.

Continued on Next Page

BOD and COD	Not available.
PRODUCTS OF DEGRADATION	Nitrogen oxides (NO,NO_2...). Phosphates. Inorganic mineral salts and oxides.
TOXICITY OF THE PRODUCTS OF DEGRADATION	The products of biodegradation are not harmful under normal conditions of slow metabolic release.
SPECIAL REMARKS ON THE PRODUCTS OF DEGRADATION	Product will promote algae growth which may degrade water quality and taste. Notify downstream water users. Will disperse in water. Reclaiming material may not be viable.

Section XIII. Disposal Considerations

WASTE DISPOSAL OR RECYCLING	Pump up spilled material and place in suitable containers for reuse or disposal. Call for information on disposal alternatives. Ensure disposal complies with local regulations.

Section XIV. Transport Information

DOT / TDG CLASSIFICATION	Not controlled under DOT (US) or TDG (Canada).
PIN and Shipping Name	Not applicable.
SPECIAL PROVISIONS FOR TRANSPORT	Not applicable.
DOT (U.S.A) (Pictograms)	

Section XV. Other Regulatory Information and Pictograms

OTHER REGULATIONS

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA): This product is on the Domestic Substances List (DSL), and acceptable for use under the provisions of CEPA.
TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.
CERCLA/SUPERFUND, 40 CFR 117,302: This product contains no Reportable Quantity (RQ) Substances.
This material contains the following chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372:

Aqueous ammonia from water dissociable ammonium ions: 14wt% (includes aqueous ammonia from water dissociable ammonium salts and other sources, 10% of which is reportable under this listing) as CAS# 68333-79-9. Refer to the specific product analysis for your product, and EPA Document 745-R-00-005 to determine your reporting requirements under this regulation.
This product is not considered as a priority pollutant as regulated under the Clean Water Act.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and is not subject to control under WHMIS (Canada), or the Hazcom Standard (US).

OTHER CLASSIFICATIONS

HCS (U.S.A.)	Not controlled under the HCS (United States).
DSCL (EEC)	Not controlled under DSCL (Europe).

National Fire Protection Association (U.S.A.)

Hazards presented under acute emergency conditions only:

TDG (Pictograms - Canada)

Continued on Next Page

DSCL (Europe) (Pictograms)

ADR (Europe) (Pictograms)

Section XVI. Other Information

REFERENCES

-Transportation of Dangerous Goods Act and Clear Language Regulations, current revision.
-Canada Gazette Part II, Vol. 122, No. 2 Registration SOR/88-64 31 December, 1987 Hazardous Products Act "Ingredient Disclosure List".
-Domestic Substances List, Canadian Environmental Protection Act.
-29 CFR Part 1910
-33 CFR Parts 151, 153, 154, 156
-40 CFR Parts 1-799
-46 CFR Part 153
-49 CFR Parts 1-199
-American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances, 2012.
-NFPA 704, National Fire Codes Online, National Fire Protection Association, current edition at time of MSDS preparation.
-Corrosion Data Survey, Sixth Edition, 1985, National Association of Corrosion Engineers
-ERG2008 Emergency Response Guidebook
-CHRIS Hazardous Chemical Data: U.S. Coast Guard, Washington, D.C.
-HSDB: Hazardous Substances Data Bank. National Library of Medicine, Bethesda, Maryland
-IRIS: Integrated Risk Information System. U.S. Environmental Protection Agency, Washington, D.C.
-NIOSH: Pocket Guide to Chemical Hazards. National Institute for Occupational Safety and Health, Cincinnati, Ohio
-OHM/TADS: Oil and Hazardous Materials Technical Assistance Data System U.S. Environmental Protection Agency, Washington, D.C.
- RTECS®: Registry of Toxic Effects of Chemical Substances National Institute for Occupational Safety and Health, Cincinnati, Ohio
-The Fertilizer Institute Product Testing Program Results, March 2003

OTHER SPECIAL CONSIDERATIONS

Three year review; Section 16 updated.

FOR FURTHER SAFETY, HEALTH, OR ENVIRONMENTAL INFORMATION ON THIS PRODUCT, CONTACT

AGRIUM
Wholesale Environment, Health and Safety
Telephone (780) 998-6906 or Fax (780) 998-6677

NOTICE TO READER

Appendix III:

Lake Utopia Paper Mill's Approvals To Operate

APPROVAL TO OPERATE

I-8900

Pursuant to paragraph 5 (3) (a) of the *Air Quality Regulation* - *Clean Air Act*, this Approval to Operate is hereby issued to:

J. D. IRVING, LIMITED
for the operation of the
Corrugated Medium Pulp and Paper Mill

Description of Source:	**Neutral Sulphite Semi-Chemical Pulp Mill and Corrugating Paper Machine**
Source Classification:	**Air Quality Regulation** **Class 1B**
Parcel Identifier:	**15017072**
Mailing Address:	**600 rte 785** **Utopia, NB E5C 2K4**
Conditions of Approval:	**See attached Schedule "A" of this Approval**
Supersedes Approval:	**I-6881**
Valid From:	**June 13, 2015**
Valid To:	**June 12, 2020**

Recommended by: _____
Environmental Management Division

Issued by: _____ June 10, 2015
for the Minister of Environment and Local Government Date

SCHEDULE "A"

A. DESCRIPTION AND LOCATION OF SOURCE

Lake Utopia Paper is a pulp and paper mill located 6.5 km east of the town of St. George, New Brunswick. The mill manufactures corrugating medium, comprised of a mixture of two fiber types. The primary component is virgin fiber produced by the neutral sulphite semi-chemical (NSSC) pulping process, using hardwood chips. The remainder is made from recycled cardboard. Using the NSSC pulping process, recycled cardboard and the corrugating paper machine the plant produces approximately 507 tonnes per day of finished corrugating medium.

There exist *potential* environmental impacts from the release of trace amounts of air contaminants from a variety of Mill Complex Emission Sources.

The operation of the Lake Utopia Paper Mill Complex at the property referenced by the Parcel Identifier 15017072 near the town of St. George, in the County of Charlotte, and the Province of New Brunswick is hereby approved under the *Air Quality Regulation - Clean Air Act*, subject to the following:

B. DEFINITIONS

1. **"Approval Holder"** means J. D. IRVING, LIMITED.

2. "**Department**" means the New Brunswick Department of Environment and Local Government.

3. **"Minister"** means the Minister of Environment and Local Government and includes any person designated to act on the Minister's behalf.

4. **"Director"** means the Director of the Impact Management Branch of the Department of Environment and Local Government and includes any person designated to act on the Director's behalf.

5. **"Inspector"** means an Inspector designated under the *Clean Air Act*, the *Clean Environment Act*, or the *Clean Water Act.*

6. **"Facility"** means the property, buildings, and equipment as identified in the Description of Source above, and all contiguous property in the title of the Approval Holder at that location.

7. **"Mill Complex Emission Sources"** means all stationary vents, stacks, storage piles, and liquid effluent treatment ponds at the Facility that release or have the potential to release air contaminants to the environment. For the purposes of this Approval the primary Mill Complex Emission Sources include: Boiler No. 1 and No. 2 Common Exhaust Stack (serving Boiler No. 1 and Boiler No. 2), Boiler No. 3 Exhaust Stack, Sulphite Digester Exhaust Stack, Paper Machine Dryer Exhaust Stacks, Absorption Tower Exhaust Stack, the Liquid Effluent Treatment Ponds, and the biomass boiler exhaust stack.

8. **"environmental emergency"** means a situation where there has been or will be a release, discharge, or deposit of a contaminant or contaminants to the atmosphere, soil, surface water, and/or groundwater environments of such a magnitude or duration that it could cause significant harm to the environment or put the health of the public at risk.

9. **“normal business hours”** means the hours when the Department's offices are open. These include the period between 8:15 a.m. and 4:30 p.m. from Monday to Friday excluding statutory holidays.

10. **"after hours"** means the hours when the Department's offices are closed. These include statutory holidays, weekends, and the hours before 8:15 a.m. and after 4:30 p.m. from Monday to Friday.

11. **"Waste Derived Fuel"** means used oil that has been tested and has been determined to have: a flashpoint of 61 degrees Celsius or higher; an arsenic concentration less than 5 parts per million; a cadmium concentration less than 2 parts per million; a chromium concentration less than 10 parts per million; a lead concentration less than 100 parts per million; a zinc concentration less than 1500 parts per million; a polychlorinated biphenyls (PCBs) concentration less than 5 parts per million; and a total organic halogens (as chlorine) concentration less than 1000 parts per million.

C. TERMS AND CONDITIONS

GENERAL

12. This Facility has been classified as a **Class 1B** Facility, pursuant to the *Air Quality Regulation 97-133* filed under the *Clean Air Act*. The Approval Holder shall pay the appropriate fee **on or before April 1 of each year.**

13. The Approval Holder shall operate the Facility in compliance with the *Air Quality Regulation 97-133* filed under the *Clean Air Act* of the Province of New Brunswick. Violation of this Approval or any condition stated herein constitutes a violation of the *Clean Air Act* of the Province of New Brunswick.

14. The issuance of this Approval does not relieve the Approval Holder from compliance with other by-laws, federal or provincial acts or regulations, or any guidelines issued pursuant to regulations.

15. An Inspector, at any reasonable time, has the authority to inspect the Facility and carry out such duties as defined in the *Clean Air Act*, the *Clean Environment Act* and/or the *Clean Water Act*.

16. **Prior to October 17, 2019**, the Approval Holder shall make application in writing for a renewal of this Approval on a form provided by the Minister.

17. In the event of Facility closure, the Approval Holder shall, in addition to any requirements under the *Environmental Impact Assessment Regulation,* prepare plans for complete site rehabilitation. The plans shall be submitted to the Department for review at least six (6) months before the planned closure date. The documentation shall include but not be limited to updated site plans as well as an engineering proposal for the site rehabilitation and closure.

18. In addition to any requirements under the *Environmental Impact Assessment Regulation*, the Approval Holder shall make application in writing for an Approval at least **two hundred and forty (240) days** prior to construction or modification of the source which could result in a significant change in the characteristics or increase the rate of discharge of any contaminant to the atmosphere. The Approval Holder shall make application on a form provided by the Minister.

19. The terms and conditions of this Approval are severable. If any term and/or condition of this Approval is held invalid, is revoked or is modified, the remainder of the Approval shall not be affected.

EMERGENCY REPORTING

20. Immediately following the discovery of an environmental emergency, a designate representing the Approval Holder shall notify the Department in the following manner:

    During normal business hours, telephone the Department's applicable Regional Office **until personal contact is made** (i.e. no voice mail messages will be accepted) and provide all information known about the environmental emergency. The telephone number for the Regional Office is provided below:

    Saint John Regional Office (506) 658-2558

    After hours, telephone the Canadian Coast Guard **until personal contact is made** and provide all information known about the environmental emergency. The telephone number for the **Canadian Coast Guard is 1-800-565-1633**.

21. Within 24 hours of the time of initial notification, a copy of a **Preliminary Emergency Report** shall be faxed, by a designate representing the Approval Holder, to the Department's applicable Regional Office *as well as* the Department's Central Office using the fax numbers provided below. The Preliminary Emergency Report shall clearly communicate all information available at the time about the environmental emergency.

    Within five (5) business days of the time of initial notification, a copy of a **Detailed Emergency Report** shall be faxed, by a designate representing the Approval Holder, to the Department's applicable Regional Office *as well as* the Department's Central Office using the fax numbers provided below. The Detailed Emergency Report shall include, as a minimum, the following: i) a description of the problem that occurred; ii) a description of the impact that occurred; iii) a description of what was done to minimize the impact; and iv) a description of what was done to prevent recurrence of the problem.

    Saint John Regional Office Fax No: (506) 658-3046
    Central Office Fax No: (506) 457-7805

LIMITS

22. The Approval Holder shall ensure that the operation of the facility does not contribute to any exceedence of the maximum ground level concentration limits provided in Schedule B of the *Air Quality Regulation - Clean Air Act*.

23. The Approval Holder shall limit the combined emission of Sulphur Dioxide (SO_2) from all sources at the Facility to a maximum of 500 tonnes for any calendar year.

24. The Approval Holder shall limit the combined emission of Particulate Matter (PM) from all sources at the Facility to a maximum of 150 tonnes for any calendar year.

25. The Approval Holder shall ensure that the emissions of Nitrogen Oxides (NOx) from all applicable Mill Emission Sources at the Facility do not exceed 300 tonnes per year for any calendar year.

26. The Approval Holder shall ensure that the Particulate Matter concentration in the exhaust gas emitted from each Boiler Exhaust Stack, including the Common Exhaust Stack that services Boiler No. 1 and No. 2, the Boiler No. 3 Exhaust Stack, and the exhaust stack for the biomass boiler, is less than 200 milligrams per cubic metre (mg/m^3) at dry standard conditions.

27. The Approval Holder shall ensure that odour, noise, and/or fugitive particulate matter emissions being emitted from the Facility do not cause adverse impacts to any off-site receptor. In the event impacts are suspected by the Department to be adversely impacting any off-site receptor, the Approval Holder will be required to develop, submit, and implement a Prevention and Control Plan in accordance with a timetable established by the Department. The plan shall be submitted in writing to the Department for review and approval prior to implementation.

FACILITY MANAGEMENT

28. **Prior to June 15, 2016**, the Approval Holder shall submit to the Department an interim Odour Control Plan. This plan shall, at a minimum, investigate new measures to reduce odours at the Facility.

29. **Prior to December 31, 2017**, the Approval Holder shall submit a final Odour Control Plan to the Department. This plan shall outline the course of action to be undertaken regarding the reduction of Odours from the Facility and a detailed implementation schedule.

30. The Approval Holder shall keep an updated Odour Evaluation and Control Plan describing steps to be taken to better understand the level of odours emitted from the facility, and actions to reduce odour emissions, as required. This plan shall include, but is not limited to, a detailed description of a process to understand the significant odour sources at the facility and their potential impacts on the surrounding areas, as well as a protocol for complaint response. It shall also include a schedule for completing the evaluation, developing action items based on its results and implementing the proposed actions. The plan shall be updated on an annual basis, with changes being made as required to ensure the plan remains current. It shall be implemented as described, once approved by the Department.

31. The Approval Holder shall ensure that the pre-acidification tank off-gas collection and distribution system to the aeration pond, used to promote further oxidation of the off-gas, is maintained and operated on a continuous basis unless otherwise specified by the Department.

32. The Approval Holder shall maintain a spare functioning off-gas blower on-site at all times (except when a change out has just occurred and the broken blower is being repaired) to ensure that hydrogen sulphide gas is continually transferred from the Anaerobic Treatment Plant to the Activated Sludge Treatment (AST) Pond, should the primary off-gas blower malfunction. Both off-gas blowers shall have a manufactures rating of at least 1850 cubic feet per minute (CFM). Continuous monitoring of off-gas blower amps will determine the need to replace the blower.

33. The Approval Holder shall ensure that all air pollution control equipment on each boiler is fully functional and operating at all times when the boiler is in operation.

34. The Approval Holder is permitted to use Waste Derived Fuel as a fuel subject to the following restrictions:

    a) the Waste Derived Fuel can be used in Boiler No.1, No.2, and No.3 at the Facility; and

    b) the Waste Derived Fuel is only permitted to be received and used as a fuel if the supplier can provide a copy of test results that demonstrates that the Waste Derived Fuel being supplied has been sampled and analysed and meets the concentration limits for each parameter listed below.

PARAMETER (UNIT)	MAXIMUM	MINIMUM
PCB (ppm)	2	
Organic Halogen, Total (ppm)	1000	
Arsenic (ppm)	5	
Cadmium (ppm)	2	
Chromium (ppm)	10	
Lead (ppm)	100	
Zinc (ppm)	1500	
Sulphur (%)	1	
Flash Point (^{o}C)		61

35. The Approval Holder is permitted to burn Flakeboard Company Limited (FCL) woodwaste in the Biomass Boiler. The FCL woodwaste must be blended with the Approval Holders existing woodwaste mixtures, which would then not contain greater than 50% of the FCL woodwaste. FCL woodwaste consists of reject medium density fiberboard material that has been tub-ground to a consistent two inch minus fiber size and has a moisture content of approximately 10% at the time of generation.

36. The Approval Holder shall submit a proposal, for review and approval by the Department, for a method to ensure the blended woodwaste mixtures do not exceed 50% FCL woodwaste.

RECORD KEEPING

37. The Approval Holder shall maintain all individual records generated from the operation of the opacity monitors, for a minimum period of two years after the date in which the individual records were generated. The Approval Holder shall make these records available to an Inspector on request.

38. The Approval Holder shall ensure that all test results for Waste Derived Fuel testing are maintained for a period not less than 2-years, and shall be made available for review by an Inspector within two weeks of receiving a written request.

TESTING AND MONITORING

39. The Approval Holder shall ensure that all source testing events undertaken by the Approval Holder, or on behalf of the Approval Holder, are completed in accordance with the requirements embodied in the Department's Guidance Document for Source Testing.

40. The Approval Holder shall ensure that each Boiler Exhaust Stack, including the Common Exhaust Stack that services Boiler No.1 and No.2, the Boiler No.3 Exhaust Stack, and the exhaust stack for the biomass boiler, are equipped with continuous emission monitors. The monitors shall be capable of providing continuous readings of the opacity levels of the exhaust gas in the stacks. The monitors shall be located, maintained, and operated in a manner and on a schedule that is acceptable to the Department. The Approval Holder shall ensure that the monitors are equipped with a hard copy or electronic recording device, and an alarm system in accordance with the Environment Canada publication EPS 1-AP-75-2, “Standard Reference Methods for Source Testing: Measurement of Opacity of Emission from Stationary Sources". The Approval Holder shall also ensure that such monitors undergo manual calibration and cleaning at least once per calendar month.

41. **By September 30 of each year**, the Approval Holder shall conduct source testing on the Common Exhaust Stack if Boiler No.1 or No.2 exceeds 700 hours of operation on No.6 Fuel Oil and on the Boiler No. 3 Exhaust Stack if Boiler No.3 consumes more than 134,000 MMBTU (approx. 3993 m^3) of No. 6 Fuel Oil, during the previous calendar year. The source testing shall determine the concentration in milligrams per cubic metre (mg/m^3) or emission rate in grams per second (g/s) of Sulphur Dioxide (SO_2), Carbon Monoxide (CO), Nitrogen Oxides (NO_x), and Particulate Matter (PM) being released the exhaust stack. The testing is to be done while the subject Boiler is firing No.6 Fuel Oil.

42. **By September 30 of each year**, the Approval Holder shall conduct source testing on the biomass boiler exhaust stack. The source testing shall determine the concentration in milligrams per cubic metre (mg/m^3) and emission rate in grams per second (g/s) of Sulphur Dioxide (SO_2), Carbon Monoxide (CO), Nitrogen Oxides (NO_x), and Particulate Matter (PM) being released the exhaust stack.

43. The Approval Holder shall ensure that where source testing for Particulate Matter is required, a Particle Size Distribution (PSD) Study is also undertaken to determine the concentration in milligrams per cubic meter and emission rate in grams per second of Total Particulate Matter, PM_{10} and $PM_{2.5}$ released to the environment from each source.

44. **Prior to September 30, 2016**, the Approval Holder shall conduct source testing on the Sulphite Digester Exhaust Stack to determine the concentration in milligrams per cubic metre (mg/m^3) or emission rate in grams per second (g/s) of Total Reduced Sulphur (TRS) Compounds and Volatile Organic Compounds (VOCs) being released under normal operating conditions.

45. The Approval Holder shall operate an Ambient Air Quality Monitoring Station for Sulphur Dioxide (SO_2) in the predominant summer downwind direction of the Mill, at a location approved by the Department. The Ambient Air Quality Monitoring Station shall be capable of providing an indication of the 1-hour and 24-hour rolling average ground level concentration of Sulphur Dioxide (SO_2) in parts per billion at the monitoring location. The monitor shall be maintained and operated in a manner and on a schedule that is acceptable to the Department.

46. **Prior to June 28, 2017**, the Approval Holder shall purchase and install new data acquisition system loggers, as approved by the Department, for the Facility operated monitoring site. The Approval Holder shall ensure that the data at these monitoring sites are available on a continuous and real-time basis to the Department.

47. **Prior to June 28, 2017**, the Approval Holder shall complete a Total Reduced Sulphur Ambient Monitoring Network Study to evaluate the effectiveness of an ambient Total Reduced Sulphur monitoring station located around the Facility. The study should be conducted in accordance with generally accepted guidance for siting air quality monitors and as a minimum include a determination of the annual wind direction profile around the mill and how the current monitoring coverage around the mill compares to the annual wind direction profile in terms of percent of time the wind direction influences the monitors. Prior to commencement of the study the Approval Holder shall submit to the Director the terms of reference for the study for review and approval.

REPORTING

48. In the event the Approval Holder violates any Term and Condition of this Approval or the *Air Quality Regulation*, the Approval Holder is to immediately report this violation, by facsimile or email, to the Department's applicable Regional Office and the Central Office in Fredericton at **(506) 457-7805.** In the event the violation may cause the health or safety of the general public to be at risk and/or significant harm to the environment could or has resulted, the Approval Holder shall follow the Emergency Reporting procedures contained in this Approval.

49. In the event the Approval Holder receives a complaint from the public regarding unfavorable environmental impacts associated with the Facility, the Approval Holder is to report this complaint by facsimile or email, to the Department's applicable Regional Office within one business day of receiving the complaint.

50. In the event of a small spill or leak of liquid materials, the Approval Holder shall act first to contain, and then to clean up the spilled or leaked material and mitigate any resulting impacts as soon as the spill or leak is detected. If the spill or leak results in an "environmental emergency" as defined in this Approval, the Approval Holder shall report the event in accordance with the Emergency Reporting section of this Approval. If the spill or leak is not an "environmental emergency", the Approval Holder shall report this event to the Department's applicable Regional Office by facsimile or email, within one business day, identifying the material spilled, the approximate amount of liquid spilled, the location of the spill and the method(s) used to clean up the liquid.

51. **Thirty (30) days prior** to any source testing events, the Approval Holder shall ensure that a Pre-Test Plan is completed in accordance with the requirements embodied in the Department's Code of Practice for Source Testing and that such Pre-Test Plan is filed with the Department for review and approval.

52. **Forty five (45) days following** any source testing events, the Approval Holder shall ensure that a Final Report is completed in accordance with the requirements embodied in the Department's Code of Practice for Source Testing and that such Final Report is filed with the Department for review.

53. **By the end of each month**, the Approval Holder shall submit to the Department in Fredericton and the Department in Saint John, a Monthly Air Quality Report for the previous month. The report can be submitted either by e-mail, fax or mail provided that the submitted copies are signed. The report shall contain the following information:

(a) copies of any reports related to the Emergency Response section of this Approval;
(b) a summary of any operating problems related to the opacity monitors;
(c) a summary of all public complaints received for the month, including the nature of each complaint, the time and date each was received, and a description of any actions taken in response;
(d) a summary of any operating problems related to the continuous emission monitors and/or ambient air quality monitors;
(e) a Fuel Consumption Inventory report for Boiler #1, #2, #3 and the Biomass Boiler. The report shall include, as a minimum, the amount of each type of fuel burned and percentage of sulphur content of each type, where applicable;
(f) an estimate of the monthly emissions of Sulphur Dioxide, Particulate Matter, Nitrogen Oxide, Carbon Monoxide and Carbon Dioxide in tonnes from Boiler #1, #2, #3 and the Biomass Boiler exhaust stacks. The estimates are to be determined using the information in the Fuel Consumption Inventory report and the most current applicable AP-42 Emission Factor equations or equivalent;
(g) a summary of the monthly waste derived fuel volume and analysis;
(h) a detailed statement from the Approval Holder indicating compliance with Condition 34 of this Approval.
(i) a table, in a format approved by the Department, showing the quality assured 1-hour and 24-hour rolling average ambient concentrations for Sulphur Dioxide (SO_2) in parts per billion measured at the Ambient Air Quality Monitoring Station and a graph showing the 1-hour and 24-hour rolling average concentrations.
(j) a table in a format approved by the Department, showing:
    i) the number of times and the number of minutes for each day when the Opacity is greater than 20% but less than 40% for more than 4 minutes per half hour;
    ii) the number of times and the number of minutes for each day when the Opacity is greater than 40% but less than 60% for more than 3 minutes per quarter hour; and
    iii) the number of times and number of minutes for each day when the Opacity is greater than 60% in the associated exhaust gas stack for the Common Exhaust Stack and the Boiler No. 3 Exhaust Stack and for Boiler No. 3 Exhaust Stack and the biomass boiler exhaust stack once the Biomass Boiler Project is completed;
(k) a table showing the number of hours that Boiler No. 1 and Boiler No. 2 were operating on No. 6 fuel oil and on natural gas for the month, and the cumulative total for the calendar year; and
(l) a table showing the amount of No. 6 fuel oil used by Boiler No. 3, for the month and the cumulative total for the calendar year (in MMBTU heat input and m^3).

54. **By February 15 of each year**, the Approval Holder shall submit to the department an annual air quality report for the previous year. The report shall be submitted electronically, and shall contain the following information:

(a) an itemized list of all fuel-fired sources;
(b) for each fuel-fired source, the amount of each type of fuel burned including used oil, and the % sulphur content of each type;
(c) a calculation of the annual emissions, in tonnes, of Sulphur Dioxide, Particulate Matter, and Nitrogen Oxides from fuel burning for each fuel-fired source;
(b) an itemized list of Sulphur Dioxide emissions from process sources at the facility in tonnes per year; and
(c) the total Sulphur Dioxide emissions in tonnes per year from the Mill Complex Emission Sources.

Prepared by: _____
Fiona Bragdon, P.Eng
Approval Engineer, Industrial Processes

AMENDMENT No. 1
Made to Approval to Operate No. I-8900 issued to:

J. D. IRVING, LIMITED
for the operation of
Corrugated Medium Pulp and Paper Mill

The Approval to Operate with identification number I-8900, issued under the *Air Quality Regulation - Clean Air Act*, **is hereby amended by:**

Adding the following under DEFINITIONS of Schedule "A"

55. **"SWIM"** means Environment Canada's Single Window Information Manager, which is a one-window secure online electronic data reporting system accessible at www.ghgreporting.gc.ca .

Adding the following under TERMS AND CONDITIONS of Schedule "A"

56. **Beginning in 2016**, the Approval Holder shall submit a greenhouse gas emissions report by June 1st of each year, for the previous calendar year, to the Department by means of the SWIM system. Reporting shall be consistent with Environment Canada's Greenhouse Gas Emissions Reporting Program (GHGRP). Reporting requirements are published annually in the Canada Gazette, Part 1 under the authority of subsection 46(1) of the *Canadian Environmental Protection Act, 1999* (CEPA 1999).

57. **Prior to November 1st, 2016**, the Approval Holder shall prepare and submit a Greenhouse Gas Management Plan to the Department in accordance with the Guidelines for Greenhouse Gas Management for Industrial Emitters in New Brunswick, July 2015, or as may be updated from time to time. The Greenhouse Gas Management Plan shall be renewed every 5 years, as a minimum.

58. **Beginning in 2017**, the Approval Holder shall prepare and submit an Annual Greenhouse Gas Progress Report to the Department by July 1st of each year, for the previous calendar year, in accordance with the Guidelines for Greenhouse Gas Management for Industrial Emitters in New Brunswick.

All other terms and conditions of the Approval to Operate No. I-8900, issued under the *Air Quality Regulation - Clean Air Act*, remain in effect.

Amendment Date: December 15, 2015

Recommended by: _____
Environment Division

Authorized by: _____
for the Minister of Environment and Local Government

APPROVAL TO OPERATE

I-8828

Pursuant to paragraph 8(1) of the *Water Quality Regulation - Clean Environment Act*, this Approval to Operate is hereby issued to:

J. D. IRVING, LIMITED
for the operation of the
Lake Utopia Paper Mill

Description of Source:	**Neutral Sulphite Semi-Chemical Pulp Mill and Corrugating Paper Machine, Wastewater Treatment Plant**
Source Classification:	**Fees for Industrial Approvals Regulation - Clean Water Act** **Class 1B**
Parcel Identifier:	**15017072**
Mailing Address:	**600 rte 785** **Utopia, NB E5C 2K4**
Conditions of Approval:	**See attached Schedule "A" of this Approval**
Supersedes Approval:	**I-6911**
Valid From:	**February 01, 2015**
Valid To:	**January 31, 2020**

Recommended by: _____
Environment Division

Issued by: _____ September 23, 2014
for the Minister of Environment and Local Government Date

SCHEDULE "A"

A. DESCRIPTION AND LOCATION OF SOURCE

J. D. Irving, Limited operates a pulp and paper mill known as Lake Utopia Paper, which is located 6.5 km east of the town of St. George, New Brunswick. The mill manufactures corrugating medium, comprised of a mixture of two fiber types. The primary component is virgin fiber produced by the neutral sulphite semi-chemical (NSSC) pulping process of hardwood chips. The remainder is made from recycled cardboard. Using the NSSC pulping process, recycled cardboard and the corrugating paper machine the plant produces approximately 507 tonnes per day of finished corrugating medium.

There exist *potential environmental impacts* to the soil, surface water and groundwater from i) the accidental spill and/or improper handling, treatment and disposal of the wastewater being generated at the Facility; and ii) the accidental spill, leakage and/or improper storage and handling of petroleum products and/or chemicals used at the Facility.

The operation of the J. D. Irving, Limited pulp mill, at the property referenced by Parcel Identifier 15017072 near the town of St. George, in the county of Charlotte, and the province of New Brunswick, is hereby approved subject to the following:

B. DEFINITIONS

1. **"Approval Holder"** means J. D. IRVING, LIMITED.

2. "**Department**" means the New Brunswick Department of Environment and Local Government.

3. **"Minister"** means the Minister of Environment and Local Government and includes any person designated to act on the Minister's behalf.

4. **"Director"** means the Director of the Impact Management Branch of the Department of Environment and Local Government and includes any person designated to act on the Director's behalf.

5. **"Inspector"** means an Inspector designated under the *Clean Air Act*, the *Clean Environment Act*, or the *Clean Water Act.*

6. **"Facility"** means the property, buildings, and equipment as identified in the Description of Source above, and all contiguous property in the title of the Approval Holder at that location.

7. **"environmental emergency"** means a situation where there has been or will be a release, discharge, or deposit of a contaminant or contaminants to the atmosphere, soil, surface water, and/or groundwater environments of such a magnitude or duration that it could cause significant harm to the environment or put the health of the public at risk.

8. **“normal business hours”** means the hours when the Department's offices are open. These include the period between 8:15 a.m. and 4:30 p.m. from Monday to Friday excluding statutory holidays.

9. **"after hours"** means the hours when the Department's offices are closed. These include statutory holidays, weekends, and the hours before 8:15 a.m. and after 4:30 p.m. from Monday to Friday.

10. **"wastewater"** means any liquid that exists or that is generated from any unit operation or ancillary equipment at the Facility and is being discharged to the environment.

11. **"Wastewater Treatment Plant"** means the unit operations and ancillary equipment used to collect, transmit, condition and treat the wastewater generated at the Lake Utopia Paper mill. These unit operations include, but are not limited to, a wastewater pumping station, primary clarifier, an equalization pond, an emergency spill pond, a two-reactor anaerobic treatment system, two non-aerated sedimentation ponds and, a secondary clarifier.

12. **"RPR"** means the reference production rate, which is the highest value of the 90th percentiles of the daily production of finished product at the mill in tonnes for any of the previous three years.

C. TERMS AND CONDITIONS

EMERGENCY REPORTING

13. Immediately following the discovery of an environmental emergency, a designate representing the Approval Holder shall notify the Department in the following manner:

    During normal business hours, telephone the Department’s applicable Regional Office **until personal contact is made** (i.e. no voice mail messages will be accepted) and provide all information known about the environmental emergency. The telephone number for the Regional Office is provided below:

    Saint John Regional Office (506) 658-2558

    After hours, telephone the Canadian Coast Guard **until personal contact is made** and provide all information known about the environmental emergency. The telephone number for the **Canadian Coast Guard is 1-800-565-1633**.

14. Within 24 hours of the time of initial notification, a copy of a **Preliminary Emergency Report** shall be faxed or emailed, by a designate representing the Approval Holder, to the Department's applicable Regional Office *as well as* the Department's Central Office using the fax numbers provided below. The Preliminary Emergency Report shall clearly communicate all information available at the time about the environmental emergency.

    Within five (5) business days of the time of initial notification, a copy of a **Detailed Emergency Report** shall be emailed or faxed, by a designate representing the Approval Holder, to the Department's applicable Regional Office *as well as* the Department's Central Office using the fax numbers provided below. The Detailed Emergency Report shall include, as a minimum, the following: i) a description of the problem that occurred; ii) a description of the impact that occurred; iii) a description of what was done to minimize the impact; and iv) a description of what was done to prevent recurrence of the problem.

Saint John Regional Office Fax No: (506) 658-3046
Central Office Fax No: (506) 457-7805

GENERAL

15. This Facility has been classified as a **Class 1B** Facility, pursuant to the *Fees for Industrial Approvals Regulation 93-201* filed under the *Clean Water Act*. The Approval Holder shall pay the appropriate fee **on or before April 1 of each year.**

16. The Approval Holder shall operate the Facility in compliance with the *Water Quality Regulation 82-126* filed under the *Clean Environment Act* of the Province of New Brunswick. Violation of this Approval or any condition stated herein constitutes a violation of the *Clean Environment Act* of the Province of New Brunswick.

17. The issuance of this Approval does not relieve the Approval Holder from compliance with other by-laws, federal or provincial acts or regulations, or any guidelines issued pursuant to regulations.

18. **Prior to October 31, 2019**, the Approval Holder shall make application in writing for a renewal of this Approval on a form provided by the Minister.

19. The Approval Holder shall notify the Minister in writing of any plans to modify the operation of the Facility that would result in a significant change in the characteristics or increased rate of discharge of any emission to the environment **at least ninety (90) days prior** to the modification.

20. In the event of Facility closure, the Approval Holder shall, in addition to any requirements under the *Environmental Impact Assessment Regulation,* prepare plans for complete site rehabilitation. The plans shall be submitted to the Department for review at least six (6) months before the planned closure date. The documentation shall include but not be limited to updated site plans as well as an engineering proposal for the site rehabilitation and closure.

21. An Inspector, at any reasonable time, has the authority to inspect the Facility and carry out such duties as defined in the *Clean Air Act*, the *Clean Environment Act* and/or the *Clean Water Act*.

22. The terms and conditions of this Approval are severable. If any term and/or condition of this Approval is held invalid, is revoked or is modified, the remainder of the Approval shall not be affected.

DISCHARGE LIMITS

23. The Approval Holder shall ensure that the pH of the wastewater being discharged from the Facility, including that from the Wastewater Treatment Plant, to the environment is within the range of 6.0 to 9.5.

24. The Approval Holder shall ensure that the Total Suspended Solids (TSS) loading of the wastewater being discharged from the Facility, including that from the Wastewater Treatment Plant, to the environment shall not exceed:

Daily Maximum:	4325 kg for any 24-hour period.
Monthly Average:	2590 kg per day.

25. The Approval Holder shall ensure that the Biochemical Oxygen Demand (BOD) loading of the wastewater being discharged from the Facility, including that from the Wastewater Treatment Plant, to the environment shall not exceed:

Daily Maximum:	2805 kg for any 24 hour period.
Monthly Average:	1680 kg per day.

26. The Approval Holder shall ensure that all wastewater being discharged from the Facility, including that discharged from the Wastewater Treatment Plant, to the environment is non-acutely lethal to rainbow trout.

FACILITY MANAGEMENT

27. The Approval Holder shall ensure that all wastewater generated as a result of the Facility operation is transported to and treated by the Wastewater Treatment Plant.

28. The Approval Holder shall ensure that only wastewater generated at the Facility is directed to and treated at the Wastewater Treatment Plant.

TESTING AND MONITORING

29. The Approval Holder shall ensure that a visual inspection of each of the following items at the Facility is conducted once per month, to check for leaks or other damage:

    i) all above-ground sections of the Wastewater Treatment Plant pipeline
    ii) all above-ground petroleum storage systems
    iii) all chemical storage systems

30. The Approval Holder shall ensure that the volumetric flowrate of the wastewater being discharged from the Wastewater Treatment Plant to the environment is metered on a continuous basis to determine the cubic metres per day being discharged.

31. The Approval Holder shall ensure that on a continual daily basis a 24-hour composite sample of the wastewater being discharged from the Wastewater Treatment Plant to the environment is collected and tested to determine the pH of the sample.

32. The Approval Holder shall ensure that on a continual daily basis a 24-hour composite sample of wastewater being discharged from the Wastewater Treatment Plant to the environment is collected. The collected samples are to be tested for TSS using the Determination of Solids Content of Pulp and Paper Effluents, Method H-1, published by the Technical Section of the Canadian Pulp and Paper Association or the Standard Methods for the Examination of Water and Wastewater.

33. The Approval Holder shall ensure that at least three times per week and on alternate days a 24-hour composite sample of the wastewater being discharged from the Wastewater Treatment Plant to the environment is collected. The collected sample are to be tested for BOD using the Determination of Biochemical Oxygen Demand, Method H-2, published by the Technical Section of the Canadian Pulp and Paper Association or the Standard Methods for the Examination of Water and Wastewater.

34. The Approval Holder shall ensure that at least once per month a grab sample of the wastewater being discharged from the Wastewater Treatment Plant to the environment is collected. The samples are to be sent to a laboratory certified to test the samples for toxicity using the Reference Method for Determining the Acute Lethality of Effluent to Rainbow Trout, EPS 1/RM/13.

35. The Approval Holder shall ensure, where possible, that a grab sample is collected of any bypass, spill, or overflow of wastewater, which is not being directed to the Wastewater Treatment Plant or which is bypassing the final wastewater monitoring station location. The samples are to be sent to a laboratory that is acceptable to the Department to test for TSS, BOD, and toxicity using the methods specified in the above conditions.

36. The Approval Holder shall remove sludge from the EQ basin, as needed, and dispose the sludge at a place acceptable to the Director.

REPORTING

37. In the event the Approval Holder receives a complaint from the public regarding unfavorable environmental impacts associated with the Facility, the Approval Holder is to report this complaint by facsimile or by email, to the Department's applicable Regional Office within one business day of receiving the complaint.

38. In the event the Approval Holder violates any Term and Condition of this Approval or the *Water Quality Regulation*, the Approval Holder is to immediately report this violation by facsimile or by email to the Department's applicable Regional Office and the Central Office in Fredericton at **(506) 457-7805.** In the event the violation may cause the health or safety of the general public to be at risk and/or significant harm to the environment could or has resulted, the Approval Holder shall follow the Emergency Reporting procedures contained in this Approval.

39. In the event of a small spill or leak of liquid materials, the Approval Holder shall act first to contain, and then to clean up the spilled or leaked material and mitigate any resulting impacts as soon as the spill or leak is detected. If the spill or leak results in an "environmental emergency" as defined in this Approval, the Approval Holder shall report the event in accordance with the Emergency Reporting section of this Approval. If the spill or leak is not an "environmental emergency", the Approval Holder shall report this event to the Department's applicable Regional Office by facsimile or by email, within one business day, identifying the material spilled, the approximate amount of liquid spilled, the location of the spill and the method(s) used to clean up the liquid.

40. **By January 31 of each year**, the Approval Holder shall ensure that the RPR value being used for that year is provided to the Department in writing.

41. **By the end of the following month**, the Approval Holder shall ensure that a Monthly Water Quality Report, for the previous month, is submitted to the Impact Management Branch in Fredericton and the Department's Saint John Regional Office. The report shall contain as a minimum:

    i) a summary of any operating and equipment problems resulting in an exceedance of the limits or violation of any condition of this Approval.
    ii) a summary of the results of the wastewater pipeline, petroleum and chemical storage systems monthly visual inspection;
    iii) a summary of all public complaints received for the month, including the nature of each complaint, the time and date each was received, and a description of any actions taken in response;
    iv) the daily total mill production of finished product in tonnes per day;

v) the monthly average daily mill production of finished product in tonnes per day;
vi) the daily volumetric flowrate of the wastewater being discharged from the Wastewater Treatment Plant and reported in cubic metres per day;
vii) the daily pH monitoring results;
viii) the daily TSS testing results reported in kilograms per day;
ix) the calculated monthly average TSS loading reported in kilograms per day;
x) the required BOD loading reported in kilograms per day;
xi) the calculated monthly average BOD loading reported in kilograms per day;
xii) the monthly rainbow trout toxicity testing results reported as lethal or non-lethal; and
xiii) sludge removal information during the month of the planned digester rebuild shutdown such as: amount of sludge removed, when the sludge was removed and where it was disposed.

Prepared by: _____
Emilie Tremblay, P.Eng.
Approval Engineer, Industrial Processes

Appendix IV:

Lake Utopia Paper Mill 2016 Site Improvement Project

IRVING **Lake Utopia Paper**

600 Route 785, Utopia, New Brunswick, Canada E5C 2K4
Tel.: (506) 755-3384 Fax: (506) 755-6303

27 July, 2016

To: Mr. David Maguire, Mr. Mark Glynn

c.c. Mr. Paul Vanderlaan, Mr. Michael Cormier

Subject: Proposed Site Improvement Project, Lake Utopia Paper

Reference: Attached aerial photo showing project area

JD Irving Woodlands Division has designated an area immediately south of the Lake Utopia Paper Mill for harvest. As the attached photo indicates, the JDI-owned block is approximately 10 acres in size. The area is currently scheduled for harvesting to begin next week.

In the past, parts of this area have been informally used by local contractors as a source of gravel. Following harvest activity, there is an opportunity for the mill to clean up the area and repurpose it to support on-going mill operations. Possible uses include material lay-down, contractor trailer placement and parking. In addition, following the harvesting work, soil disturbance may present a risk of sedimentation into a nearby existing stream located east of the proposed harvest block. This stream carries the mill's effluent to the Letang Estuary. This project will ensure that proper sediment control is in place to protect the stream during construction with more permanent measures such as berm construction being put in place once the development is complete.

The proposed work includes grubbing, leveling and shaping the area using excavators, dozers and trucks. All of the grubbed material including tree stumps and salvageable wood waste will be burned in the mill's woodwaste boiler or otherwise redeployed on site. Fortunately, the site contains high quality engineering fill that is well suited for the intended use. Therefore, minimal if any outside quarried materials will be needed to complete this project. Except for the deployment and removal of harvesting and earth-moving equipment, road traffic on Route 785 is expected to be minimal.

The nearest watercourse to the project site is the small Letang Stream approximately 42 meters from the south east boundary of the excavation. The nearest adjacent property owner and resident is approximately 67 meters from the south-west corner of the site. The soils are moist just under the surface. This will help mitigate dust concerns. Nonetheless, dust abatement measures will be taken such as use of a water truck, should this become a concern. Work hours will be limited between 8 AM and 6 PM, Monday to Friday in the interest of potential noise concerns.

We intend to begin this work Monday, August 8th, following the completion of harvest activities. It is expected to take 3 to 4 months to complete this project depending on availability of earth moving equipment and manpower. Can you please let me know if any permitting is required to carry out this work or if you have any other concerns? Thank you for your consideration.

David Muir
Environmental Director
JD Irving Limited

IRVING

Lake Utopia Paper Site Improvement Project

Proposed Harvest Plot Area

Appendix V:

Online Well Log System Search Results

New Nouveau Brunswick

Environment

Report Number 1004

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	08/30/2002

Casing Information

Casing above ground 0.30m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
1004	Steel	15.24cm	0m	7.01m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	6.10m	91 lpm	0hr	0m	0 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0L

Pump Installed
N/A

Intake Setting (BTC)
24.38m

Driller's Log

Well Log	From	End	Colour	Rock Type
1004	0m	5.18m	Brown	Clay
1004	5.18m	30.48m	Black	Slate

Overall Well Depth
30.48m

Bedrock Level
5.18m

Water Bearing Fracture Zone

Well Log	Depth	Rate
1004	27.43m	91 lpm

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number 6314

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Cable Tool	10/03/2002

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
6314	Steel	15.24cm	0m	8.53m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	9.1 lpm	0hr	0m	9.1 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
91.44m

Driller's Log

Well Log	From	End	Colour	Rock Type
6314	0m	0.91m	Brown	Till
6314	0.91m	6.10m	Red	Clay
6314	6.10m	124.97m	Black	Slate

Overall Well Depth
124.97m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
6314	123.44m	9.1 lpm

Setbacks

Well Log	Distance	Setback From
6314	16.76m	Septic Tank
6314	22.86m	Leach Field

New Nouveau Brunswick

Environment

Report Number 7208

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Cable Tool	03/26/2003

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
7208	Steel	15.24cm	0m	21.03m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	68.25 lpm	1hr	9.14m	68.25 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
25.91m

Driller's Log

Well Log	From	End	Colour	Rock Type
7208	21.03m	38.10m	Grey	Slate
7208	0m	6.10m	Red	Clay
7208	6.10m	15.24m	EMPTY VALUE	Sand
7208	15.24m	21.03m	Brown	Till

Overall Well Depth
38.10m

Bedrock Level
6.10m

Water Bearing Fracture Zone

Well Log	Depth	Rate
7208	30.48m	68.25 lpm

Setbacks

Well Log	Distance	Setback From
7208	15.24m	Septic Tank
7208	22.86m	Leach Field

New Nouveau Brunswick

Environment

Report Number 7937

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Cable Tool	08/05/2003

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
7937	Steel	15.24cm	0m	24.38m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	1.83m *(BTC - Below top of casing)*	136.5 lpm	1hr	1.83m	113.75 lpm	No	0 lpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
18.29m

Driller's Log

Well Log	From	End	Colour	Rock Type
7937	0m	9.14m	Brown	Sand
7937	9.14m	18.29m	Mix	EMPTY VALUE
7937	18.29m	24.38m	EMPTY VALUE	Gravel

Overall Well Depth
24.38m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
7937	24.38m	136.5 lpm

Setbacks

Well Log	Distance	Setback From
7937	16.76m	Septic Tank
7937	22.86m	Leach Field

New Nouveau Brunswick

Environment

Report Number 8458

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Cable Tool	08/28/2003

Casing Information

Casing above ground 0.30m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
8458	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	0 lpm	0hr	0.91m	0 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
Other

Disinfectant
N/A

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
73.15m

Driller's Log

Well Log	From	End	Colour	Rock Type
8458	0m	2.44m	Brown	Clay
8458	2.44m	80.77m	Grey	Granite

Overall Well Depth
80.77m

Bedrock Level
2.44m

Water Bearing Fracture Zone

Well Log	Depth	Rate
8458	73.15m	6.82 lpm

Setbacks

Well Log	Distance	Setback From
8458	24.38m	Septic Tank
8458	30.48m	Leach Field

New Nouveau Brunswick

Environment

Report Number 8472

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Cable Tool	11/08/2003

Casing Information

Casing above ground 0.30m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
8472	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	6.10m	22.75 lpm	0hr	7.62m	22.75 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
56.39m

Driller's Log

Well Log	From	End	Colour	Rock Type
8472	0m	2.44m	Brown	Gravel
8472	2.44m	64.01m	Grey	Slate

Overall Well Depth
64.01m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
8472	57.91m	22.75 lpm

Setbacks

Well Log	Distance	Setback From
8472	22.86m	Septic Tank
8472	24.38m	Leach Field

New Nouveau Brunswick

Environment

Report Number 8483

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	Deepened	Rotary	10/27/2003

Casing Information — Casing above ground 0m — Drive Shoe Used? Yes

There is no casing information.

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	6.10m	22.75 lpm	1hr	6.10m	22.75 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
76.20m

Driller's Log

Well Log	From	End	Colour	Rock Type
8483	115.82m	131.06m	Black	Slate
8483	0m	115.82m	Unknown Rock Colour	Unknown

Overall Well Depth
131.06m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
8483	124.97m	18.2 lpm

Setbacks

Well Log	Distance	Setback From
8483	16.76m	Septic Tank
8483	22.86m	Leach Field

New Nouveau Brunswick

Environment

Report Number 10800

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/29/2004

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
10800	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	7.62m	9.1 lpm	1hr	7.62m	9.1 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
Other

Disinfectant
Bleach (Javex)
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
45.72m

Driller's Log

Well Log	From	End	Colour	Rock Type
10800	0m	2.74m	Brown	Till
10800	2.74m	64.01m	Grey	Slate

Overall Well Depth
64.01m

Bedrock Level
2.74m

Water Bearing Fracture Zone

Well Log	Depth	Rate
10800	18.29m	4.55 lpm
10800	51.82m	4.55 lpm

Setbacks

Well Log	Distance	Setback From
10800	16.76m	Septic Tank
10800	22.86m	Leach Field

New Nouveau Brunswick

Environment

Report Number 10883

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	04/04/2005

Casing Information

Casing above ground 0.30m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
10883	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	13.65 lpm	1hr	0m	13.65 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
57.91m

Driller's Log

Well Log	From	End	Colour	Rock Type
10883	0m	3.96m	Brown	Clay and Sand
10883	3.96m	36.58m	Black	Slate

Overall Well Depth
36.58m

Bedrock Level
3.96m

Water Bearing Fracture Zone

Well Log	Depth	Rate
10883	33.53m	13.65 lpm

Setbacks

Well Log	Distance	Setback From
10883	22.86m	Septic Tank
10883	24.38m	Leach Field
10883	91.44m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 10920

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	07/25/2005

Casing Information

Casing above ground 0.30m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
10920	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	9.14m	18.2 lpm	0hr	9.14m	18.2 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
60.96m

Driller's Log

Well Log	From	End	Colour	Rock Type
10920	0m	5.18m	Brown	Clay and Sand
10920	5.18m	68.58m	Black	Slate

Overall Well Depth
68.58m

Bedrock Level
5.18m

Water Bearing Fracture Zone

Well Log	Depth	Rate
10920	60.96m	18.2 lpm

Setbacks

Well Log	Distance	Setback From
10920	18.29m	Right of any Public Way Road
10920	22.86m	Septic Tank
10920	24.38m	Leach Field

New Nouveau Brunswick

Environment

Report Number 12226

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	06/27/2005

Casing Information

Casing above ground 0.46m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
12226	Steel	15.24cm	0m	17.98m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	1.52m	45.5 lpm	0hr 30min	1.52m	45.5 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
16.76m

Driller's Log

Well Log	From	End	Colour	Rock Type
12226	0m	17.98m	Brown	Sand and Gravel

Overall Well Depth
17.98m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
12226	17.98m	45.5 lpm

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number 13643

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	08/28/2006

Casing Information

Casing above ground 0.30m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
13643	Steel	15.24cm	0m	15.85m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	91 lpm	1hr	0m	91 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Chlorine Pucks
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
18.29m

Driller's Log

Well Log	From	End	Colour	Rock Type
13643	0m	14.33m	Grey	Clay
13643	14.33m	91.44m	Black	Slate

Overall Well Depth
91.44m

Bedrock Level
14.33m

Water Bearing Fracture Zone

Well Log	Depth	Rate
13643	14.33m	1319.5 lpm

Setbacks

Well Log	Distance	Setback From
13643	21.34m	Septic Tank
13643	24.38m	Leach Field
13643	20.73m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 13644

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	08/28/2006

Casing Information

Casing above ground 0.30m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
13644	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	3.05m	22.75 lpm	1hr	3.05m	22.75 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Chlorine Pucks
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
30.48m

Driller's Log

Well Log	From	End	Colour	Rock Type
13644	0m	3.96m	Brown	Clay
13644	3.96m	38.10m	Black	Slate

Overall Well Depth
38.10m

Bedrock Level
3.96m

Water Bearing Fracture Zone

Well Log	Depth	Rate
13644	35.05m	22.75 lpm

Setbacks

Well Log	Distance	Setback From
13644	18.29m	Septic Tank
13644	22.86m	Leach Field
13644	91.44m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 13662

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	05/29/2007

Casing Information

Casing above ground 0.30m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
13662	Steel	15.24cm	0m	9.14m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	9.14m	36.4 lpm	1hr	9.14m	36.4 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
25.91m

Driller's Log

Well Log	From	End	Colour	Rock Type
13662	0m	8.53m	Brown	Gravel
13662	8.53m	32.00m	Black	Slate

Overall Well Depth
32.00m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
13662	28.35m	36.4 lpm

Setbacks

Well Log	Distance	Setback From
13662	22.86m	Septic Tank
13662	22.86m	Leach Field
13662	30.48m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 17795

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	07/05/2009

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
17795	Steel	15.24cm	0m	19.81m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	7.62m *(BTC - Below top of casing)*	54.6 lpm	1hr	7.62m	54.6 lpm	No	0 lpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
15.24m

Driller's Log

Well Log	From	End	Colour	Rock Type
17795	9.75m	14.63m	EMPTY VALUE	Gravel
17795	0m	1.22m	Brown	Till
17795	1.22m	5.18m	EMPTY VALUE	Gravel
17795	5.18m	9.75m	Grey	Hard Clay
17795	14.63m	16.15m	Grey	Clay
17795	16.15m	19.81m	EMPTY VALUE	Sand and Gravel

Overall Well Depth
19.81m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
17795	19.81m	54.6 lpm

Setbacks

Well Log	Distance	Setback From
17795	42.67m	Right of any Public Way Road
17795	19.81m	Septic Tank
17795	22.86m	Leach Field

New Nouveau Brunswick

Environment

Report Number 18633

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	05/28/2008

Casing Information

Casing above ground 0.30m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
18633	Steel	15.24cm	0m	22.86m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	6.10m	18.2 lpm	1hr	6.10m	18.2 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
76.20m

Driller's Log

Well Log	From	End	Colour	Rock Type
18633	0m	21.34m	Grey	Clay
18633	21.34m	86.87m	Black	Slate

Overall Well Depth
86.87m

Bedrock Level
21.34m

Water Bearing Fracture Zone

Well Log	Depth	Rate
18633	44.20m	4.55 lpm
18633	83.82m	13.65 lpm

Setbacks

Well Log	Distance	Setback From
18633	24.38m	Septic Tank
18633	27.43m	Leach Field
18633	22.86m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 24226

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	09/13/2011

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
24226	Steel	15.24cm	0m	16.76m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	6.10m	20.48 lpm	1hr	6.10m	22.75 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
60.96m

Driller's Log

Well Log	From	End	Colour	Rock Type
24226	0m	16.46m	Brown	Sand and Gravel
24226	16.46m	16.76m	Brown	Broken Rock
24226	16.76m	70.10m	Grey	Slate

Overall Well Depth
70.10m

Bedrock Level
16.76m

Water Bearing Fracture Zone

Well Log	Depth	Rate
24226	45.72m	13.65 lpm
24226	55.17m	6.82 lpm

Setbacks

Well Log	Distance	Setback From
24226	42.67m	Right of any Public Way Road
24226	18.29m	Septic Tank
24226	25.91m	Leach Field

New Nouveau Brunswick

Environment

Report Number 24317

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Other	New Well	Rotary	09/23/2010

Casing Information — Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
24317	Steel	15.24cm	0m	16.46m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	7.62m	22.75 lpm	1hr	7.62m	22.75 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
137.16m

Driller's Log

Well Log	From	End	Colour	Rock Type
24317	109.73m	124.97m	Brown	Slate
24317	0m	8.53m	Brown	Gravel
24317	8.53m	109.73m	Black	Slate
24317	124.97m	158.50m	Black	Slate

Overall Well Depth
158.50m

Bedrock Level
8.53m

Water Bearing Fracture Zone

Well Log	Depth	Rate
24317	54.86m	9.1 lpm
24317	109.73m	13.65 lpm

Setbacks

Well Log	Distance	Setback From
24317	91.44m	Septic Tank
24317	109.73m	Leach Field
24317	54.86m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 24326

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/10/2010

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
24326	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	5.49m	6.82 lpm	1hr	5.49m	9.1 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
60.96m

Driller's Log

Well Log	From	End	Colour	Rock Type
24326	0m	1.22m	Brown	Till
24326	1.22m	76.20m	Black	Slate

Overall Well Depth
76.20m

Bedrock Level
1.22m

Water Bearing Fracture Zone

Well Log	Depth	Rate
24326	48.77m	6.82 lpm

Setbacks

Well Log	Distance	Setback From
24326	221.89m	Right of any Public Way Road
24326	15.85m	Septic Tank
24326	23.16m	Leach Field

New Nouveau Brunswick

Environment

Report Number 24631

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	06/15/2010

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
24631	Steel	15.24cm	0m	7.62m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	5.49m	13.65 lpm	1hr	5.49m	13.65 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
27.43m

Driller's Log

Well Log	From	End	Colour	Rock Type
24631	0m	7.01m	Brown	Till and Rock
24631	7.01m	36.58m	Black	Slate

Overall Well Depth
36.58m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
24631	11.89m	9.1 lpm
24631	21.34m	4.55 lpm

Setbacks

Well Log	Distance	Setback From
24631	16.76m	Septic Tank
24631	22.86m	Leach Field
24631	25.91m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 26453

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	02/28/2011

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
26453	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	4.57m	22.75 lpm	1hr	4.57m	22.75 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
54.86m

Driller's Log

Well Log	From	End	Colour	Rock Type
26453	0m	0.91m	Brown	Till
26453	0.91m	70.10m	Black	Slate

Overall Well Depth
70.10m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
26453	60.96m	13.65 lpm
26453	67.06m	9.1 lpm

Setbacks

Well Log	Distance	Setback From
26453	54.86m	Right of any Public Way Road
26453	18.29m	Septic Tank
26453	25.91m	Leach Field

New Nouveau Brunswick

Environment

Report Number 26664

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/09/2011

Casing Information

Casing above ground 0.46m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
26664	Steel	15.24cm	0m	12.80m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	53.34m *(BTC - Below top of casing)*	22.75 lpm	0hr 30min	6.10m	22.75 lpm	No	0 lpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
N/A

Intake Setting (BTC)
48.77m

Driller's Log

Well Log	From	End	Colour	Rock Type
26664	0m	9.14m	Brown	Clay and Sand
26664	9.14m	53.34m	Dark grey	Granite

Overall Well Depth
53.34m

Bedrock Level
9.14m

Water Bearing Fracture Zone

Well Log	Depth	Rate
26664	22.86m	4.55 lpm
26664	27.43m	9.1 lpm
26664	48.77m	9.1 lpm

Setbacks

Well Log	Distance	Setback From
26664	18.29m	Septic Tank
26664	24.38m	Leach Field
26664	2.74m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 28158

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	05/30/2009

Casing Information

Casing above ground 0.38m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
28158	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	4.27m	6.82 lpm	1hr	4.27m	6.82 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Chlorine Pucks
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
76.20m

Driller's Log

Well Log	From	End	Colour	Rock Type
28158	0m	3.05m	Brown	Clay
28158	3.05m	86.87m	Black	Slate

Overall Well Depth
86.87m

Bedrock Level
3.05m

Water Bearing Fracture Zone

Well Log	Depth	Rate
28158	76.20m	6.82 lpm

Setbacks

Well Log	Distance	Setback From
28158	21.34m	Right of any Public Way Road
28158	15.24m	Septic Tank
28158	23.77m	Leach Field

New Nouveau Brunswick

Environment

Report Number 28267

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	05/12/2009

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
28267	Steel	15.24cm	0m	7.92m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	18.29m *(BTC - Below top of casing)*	45.5 lpm	0hr 30min	0.91m	45.5 lpm	No	0 lpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
N/A

Intake Setting (BTC)
0m

Driller's Log

Well Log	From	End	Colour	Rock Type
28267	0m	5.49m	Brown	Clay and Gravel
28267	5.49m	18.29m	Purple	Granite

Overall Well Depth
18.29m

Bedrock Level
5.49m

Water Bearing Fracture Zone

Well Log	Depth	Rate
28267	13.72m	45.5 lpm

Setbacks

Well Log	Distance	Setback From
28267	33.53m	Septic Tank
28267	36.58m	Leach Field
28267	45.72m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 29752

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	06/26/2014

Casing Information

Casing above ground 0.30m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
29752	Steel	15.24cm	0m	20.73m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	20.73m *(BTC - Below top of casing)*	45.5 lpm	2hrs 20min	5.49m	36.4 lpm	No	0 lpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
12.19m

Driller's Log

Well Log	From	End	Colour	Rock Type
29752	0m	8.53m	Brown	Sand and Gravel
29752	8.53m	18.90m	Grey	Clay
29752	18.90m	20.73m	Brown	Gravel

Overall Well Depth
20.73m

Bedrock Level
18.90m

Water Bearing Fracture Zone

Well Log	Depth	Rate
29752	20.73m	45.5 lpm

Setbacks

Well Log	Distance	Setback From
29752	20.12m	Septic Tank
29752	91.44m	Right of any Public Way Road
29752	26.82m	Leach Field
29752	101.19m	Center of road

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	06/26/2014

Casing Information

Casing above ground 0.30m Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
29752	Steel	15.24cm	0m	20.73m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	20.73m *(BTC - Below top of casing)*	45.5 lpm	2hrs 20min	5.49m	36.4 lpm	No	0 lpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
12.19m

Driller's Log

Well Log	From	End	Colour	Rock Type
29752	0m	8.53m	Brown	Sand and Gravel
29752	8.53m	18.90m	Grey	Clay
29752	18.90m	20.73m	Brown	Gravel

Overall Well Depth
20.73m

Bedrock Level
18.90m

Water Bearing Fracture Zone

Well Log	Depth	Rate
29752	20.73m	45.5 lpm

Setbacks

Well Log	Distance	Setback From
29752	20.12m	Septic Tank
29752	91.44m	Right of any Public Way Road
29752	26.82m	Leach Field
29752	101.19m	Center of road

New Nouveau Brunswick

Environment

Report Number 32119

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	12/18/2012

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
32119	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	5.49m *(BTC - Below top of casing)*	54.6 lpm	1hr	5.49m	45.5 lpm	No	0 lpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
30.48m

Driller's Log

Well Log	From	End	Colour	Rock Type
32119	0m	3.05m	Brown	Till
32119	3.05m	38.10m	Grey	Slate

Overall Well Depth
38.10m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
32119	10.97m	9.1 lpm
32119	35.36m	45.5 lpm

Setbacks

Well Log	Distance	Setback From
32119	54.86m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 33903

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	06/28/2012

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
33903	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	5.49m	18.2 lpm	1hr	5.49m	18.2 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
57.91m

Driller's Log

Well Log	From	End	Colour	Rock Type
33903	0m	4.88m	Brown	Till
33903	4.88m	64.01m	Black	Slate

Overall Well Depth
64.01m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
33903	27.43m	4.55 lpm
33903	48.77m	6.82 lpm
33903	56.39m	6.82 lpm

Setbacks

Well Log	Distance	Setback From
33903	16.76m	Septic Tank
33903	25.91m	Leach Field
33903	25.91m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 33946

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	06/14/2012

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
33946	Steel	15.24cm	0m	12.19m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	6.10m	91 lpm	1hr	7.62m	81.9 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)
Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
42.67m

Driller's Log

Well Log	From	End	Colour	Rock Type
33946	10.36m	12.19m	Brown	Gravel
33946	0m	2.13m	Brown	Gravel
33946	2.13m	10.36m	Brown	Clay
33946	12.19m	50.29m	Black	Slate

Overall Well Depth
50.29m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
33946	14.33m	45.5 lpm
33946	0.46m	18.2 lpm
33946	39.62m	27.3 lpm

Setbacks

Well Log	Distance	Setback From
33946	16.76m	Septic Tank
33946	24.38m	Leach Field
33946	24.38m	Right of any Public Way Road

New Nouveau Brunswick

Environment

Report Number 40027

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	06/11/2015

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
40027	Steel	15.24cm	0m	6.10m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	5.49m	36.4 lpm	1hr	5.49m	36.4 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)

Qty 0L

Pump Installed
Submersible
Intake Setting (BTC)
38.10m

Driller's Log

Well Log	From	End	Colour	Rock Type
40027	0m	3.66m	Brown	Till
40027	3.66m	44.20m	Grey	Slate

Overall Well Depth
44.20m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
40027	11.58m	13.65 lpm
40027	22.86m	9.1 lpm
40027	36.58m	13.65 lpm

Setbacks

Well Log	Distance	Setback From
40027	24.38m	Leach Field
40027	22.86m	Septic Tank

New Nouveau Brunswick

Environment

Report Number 90003407

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Non-Drinking Water, Industrial	New Well	Cable Tool	01/01/0001

Casing Information

Casing above ground 0.61m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
90003407	Steel	15.24cm	0m	7.92m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	0m	136.5 lpm	1hr	0m	136.5 lpm	No	0 lpm

(BTC - Below top of casing)

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
Bleach (Javex)
Qty 4.55L

Pump Installed
Submersible
Intake Setting (BTC)
76.20m

Driller's Log

Well Log	From	End	Colour	Rock Type
90003407	7.32m	82.30m	Grey	Granite
90003407	0m	7.32m	Brown	Till

Overall Well Depth
82.30m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
90003407	60.96m	45.5 lpm
90003407	76.20m	91 lpm

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number 90015956

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	10/24/1999

Casing Information

Casing above ground 0.30m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
90015956	Steel	15.24cm	0m	28.96m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	12.19m *(BTC - Below top of casing)*	36.4 lpm	0hr	0m	36.4 lpm	No	0 lpm

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0L

Pump Installed
Submersible

Intake Setting (BTC)
24.38m

Driller's Log

Well Log	From	End	Colour	Rock Type
90015956	0m	3.05m	Brown	Gravel
90015956	3.05m	6.10m	Brown	Clay
90015956	6.10m	28.96m	Brown	Gravel
90015956	28.96m	32.00m	Black	Slate

Overall Well Depth
32.00m

Bedrock Level
0m

Water Bearing Fracture Zone

Well Log	Depth	Rate
90015956	30.48m	36.4 lpm

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number 90022804

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well		01/01/2002

Casing Information — Casing above ground 0m — Drive Shoe Used? Yes

There is no casing information.

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
	0m	0 lpm	0hr	0m	0 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A

Qty 0L

Pump Installed
N/A

Intake Setting (BTC)
0m

Driller's Log

There is no rock layer information.

Overall Well Depth
0m

Bedrock Level
0m

Water Bearing Fracture Zone

There is no water bearing fracture zone information.

Setbacks

There is no Setback information.

New Nouveau Brunswick

Environment

Report Number 90962100

Well Driller's Report

Date printed 2016/06/23

Drilled by

Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well (NEW WELL)	Rotary (ROTARY)	08/19/1997

Casing Information

Casing above ground 0m — Drive Shoe Used? Yes

Well Log	Casing Type	Diameter	From	End	Slotted?
90962100	Steel	15.24cm	0m	6.40m	

Aquifer Test/Yield

Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
	0m	0 lpm	0hr	0m	0.91 lpm	No	0 lpm
	(BTC - Below top of casing)						

Well Grouting

There is no Grout information.

Drilling Fluids Used
None

Disinfectant
N/A
Qty 18.2L

Pump Installed
N/A
Intake Setting (BTC)
0m

Driller's Log

Well Log	From	End	Colour	Rock Type
90962100	0m	1.22m	Brown	Mud
90962100	1.22m	121.92m	Grey	Granite

Overall Well Depth
121.92m

Bedrock Level
1.22m

Water Bearing Fracture Zone

Well Log	Depth	Rate
90962100	112.78m	2.28 lpm

Setbacks

There is no Setback information.

Sample Information

ALK_T(mg/L)	Al(mg/L)	As(µg/L)	B(mg/L)	Ba(mg/L)	Br(mg/L)	COND(µSIE/cm)	Ca(mg/L)	Cd(µg/L)	Cl(mg/L)	Cr(µg/L)	Cu(µg/L)	E.coli P/A(P/A)	F(mg/L)	Fe(mg/L)	HARD(mg/L)	K(mg/L)	Mg(mg/L)	Mn(mg/L)	NO2(mg/L)	NO3(mg/L)	NOX(mg/L)	Na(mg/L)	Pb(µg/L)	SO4(mg/L)	Sb(µg/L)	Se(µg/L)	TC-P/A(P/A)	TURB(NTU)	Tl(µg/L)	U(µg/L)	Zn(µg/L)	pH(pH)	Þ =COND(µSIE/cm)	Þ =TDS(mg/L)	Þ @B(no units)	Þ @C(no units)	Þ AN(Epm)	Þ CAT(Epm)	Þ CO3(mg/L)	Þ DIFB(%)	Þ DIFC(%)	Þ HCO3(mg/L)	Þ OH(mg/L)	Þ SIN(no units)	Þ DIFTDS(%)
31.90	< 0.0250	< 1.50	< 0.01	< 0.01	< 0.10	106	13.20	< 0.50	3.64	< 10	< 10	Ab	0.1870	0.0460	39.40	0.60	1.54	0.0090	< 0.05	< 0.05	< 0.05	4.10	< 1	11.90	< 1	< 1.50	Ab	0.32	< 1	0.60	15	7.28	98.5720	54.7340	0.15	1.0720	1.0040	0.9850	0.10	0.92	3.6310	31.80	0	-1.3390	
60.10	< 0.0250	3.20	0.01	< 0.01	0.1030	347	41.30	< 0.50	59.50	< 10	14	Ab	0.2580	0.0180	124	1.61	5.03	< 0.0050	< 0.05	0.72	0.77	14.40	< 1	13.90	< 1	< 1.50	Ab	0.12	< 1	1.20	30	7.08	326.9810	175.5620	0.57	1.0910	3.2360	3.1470	0	1.39	2.97	60.10	0	-0.9880	-100
69	< 0.0250	< 1.50	0.0120	< 0.01	< 0.10	194	26.90	< 0.50	10.70	< 10	< 10	Ab	0.3310	0.0750	74.20	0.70	1.70	0.0330	< 0.05	0.37	0.42	4.98	< 1	8.60	< 1	< 1.50	Ab	0.64	< 1	0.60	6	7.30	175.8280	97.3220	1.33	1.6840	1.9060	1.7250	0	4.98	4.9140	69	0	-0.8940	
108	< 0.0250	4.20	< 0.01	< 0.01	< 0.10	257	42.80	< 0.50	6.94	< 10	< 10	Ab	1	0.0250	114	0.50	1.72	0.0070	< 0.05	0.13	0.18	6.36	1.20	12.10	1	< 1.50	Ab	* 1.13	< 1	2.10	< 5	7.97	241.8530	137.0910	0.67	1.0750	2.67	2.5710	0	1.88	3.0360	108	0	0.1720	
72.20	0.0520	4.60	0.0110	< 0.01	< 0.10	402	49.50	< 0.50	70.70	< 10	< 10	Ab	0.9020	* 0.8320	150	2.50	6.37	0.0680	< 0.05	0.17	0.22	11.70	< 1	10.50	< 1	< 1.50	Pr	* 7.30	< 1	* 21	< 5	8.08	370.1790	197.5350	0.64	1.5520	3.7250	3.6210	0.80	1.43	4.1210	71.30	0.10	0.3160	
66.80	< 0.0250	* 26	0.0250	< 0.01	< 0.10	244	18.80	< 0.50	23.90	< 10	20	Ab	0.3620	< 0.01	58.40	1.20	2.81	< 0.0050	< 0.05	0.36	0.41	20.10	< 1	12.40	< 1	< 1.50	Ab	< 0.20	< 1	3.40	< 5	7.92	210.8880	121.6340	1.74	2.64	2.3270	2.0790	0.50	5.63	7.2790	66.20	0	-0.2580	
42.10	0.0460	7.40	0.0140	< 0.01	< 0.10	129	16.10	< 0.50	4.12	< 10	< 10	Ab	0.2680	0.0350	47.60	0.90	1.83	< 0.0050	< 0.05	< 0.05	0.08	7.57	< 1	12.10	< 1	< 1.50	Pr	0.40	< 1	1.60	< 5	7.35	122.1540	68.7040	-0.65	0.8440	1.2320	1.3140	0.10	-3.20	2.7260	42	0	-1.0720	
164	< 0.0250	< 1.50	< 0.01	0.1480	< 0.10	379	66.60	< 0.50	11.70	< 10	< 10	Ab	0.4280	0.25	190	1.10	5.65	* 0.19	< 0.05	< 0.05	< 0.05	7.73	6.10	10.60	< 1	< 1.50	Ab	* 1.20	< 1	7.20	42	8.08	348.2530	203.0530	-1.93	1.5840	3.8560	4.1770	1.80	-4.0010	4.2280	162.10	0.10	0.7920	
52	< 0.0250	5.30	0.0240	< 0.01	< 0.10	276	35.80	< 0.50	45	< 10	< 10	Ab	0.5790	* 0.3530	106	1.60	4.06	0.0090	< 0.05	< 0.05	0.06	10.30	< 1	8.76	< 1	< 1.50	Pr	* 4	< 1	1.60	< 5	8.15	265.0190	138.0680	-0.71	0.72	2.5280	2.6320	0.70	-2.0110	2.03	51.20	0.10	0.1260	
27.30	< 0.0250	< 1.50	0.0160	< 0.01	< 0.10	130	16	< 0.50	9.10	< 10	50	Ab	0.1150	< 0.01	47.60	0.70	1.86	0.0070	< 0.05	3.80	3.90	6.32	1	7.42	< 1	< 1.50	Ab	< 0.20	< 1	< 0.50	< 5	7.12	116.24	75.37	0.70	1.7610	1.3390	1.25	0	3.4440	5.5880	27.30	0	-1.4890	
79.10	< 0.0250	4	< 0.01	0.0250	< 0.10	213	39.10	< 0.50	3.81	< 10	< 10	Ab	< 0.10	0.0330	103	0.50	1.28	< 0.0050	< 0.05	< 0.05	< 0.05	4.14	< 1	16.90	< 1	< 1.50	Ab	< 0.20	< 1	1.20	< 5	8.07	202.2630	113.69	-1.47	0.8860	2.0510	2.2550	0.90	-4.7250	2.5850	78.20	0.10	0.2740	
120	< 0.0250	7.40	< 0.01	0.0710	< 0.10	282	47.70	< 0.50	18.50	< 10	< 10	Ab	0.6630	* 0.7260	148	1.90	7.03	0.13	< 0.05	< 0.05	< 0.05	14.10	< 1	17.40	< 1	< 1.50	Ab	* 4	< 1	1.90	< 5	8.11	316.1730	180.5110	-2.18	-1.9190	3.3230	3.6680	1.40	-4.9350	-5.7130	118.50	0.10	0.5530	
103	< 0.0250	* 11	0.0160	0.1010	< 0.10	313	31.50	< 0.50	19.20	< 10	< 10	Ab	0.3320	0.0870	94.80	0.90	3.91	0.0210	< 0.05	0.27	0.32	27.10	2.20	20.10	< 1	2.80	Ab	0.67	< 1	15	< 5	8.31	284.6360	166.51	-0.24	1.7470	3.0680	3.1040	1.90	-0.5940	4.7460	101	0.10	0.52	
81.20	< 0.0250	3.50	< 0.01	< 0.01	< 0.10	199	30.50	< 0.50	5.59	< 10	< 10	Ab	0.2520	0.0430	90.10	1.40	3.38	0.15	< 0.05	< 0.05	0.05	5.51	< 1	10.30	< 1	< 1.50	Ab	< 0.20	< 1	< 0.50	8	7.94	186.6720	106.21	-0.53	1.0880	2.0140	2.0870	0.70	-1.7770	3.1960	80.50	0	0.0540	
58.30	< 0.0250	3.10	< 0.01	0.0220	< 0.10	181	26.10	< 0.50	11.60	< 10	< 10	Ab	0.1150	< 0.01	Z 73.60	0.80	2.04	< 0.0050	< 0.05	Z 0.56	0.56	6.20	< 1	8.13	< 1	< 1.50	Ab	< 0.20	< 1	1.10	< 5	7.61	165.14	92.6020	-0.4194	1.5463	1.7086	1.7644	0.2223	-1.6059	4.5820	58.06	0.0204	-0.4770	-99.9950
74.60	< 0.0250	8.20	< 0.01	0.0510	< 0.10	213	34.70	< 0.50	5.56	< 10	< 10	Ab	0.2310	0.1920	94.20	0.70	1.80	0.0230	< 0.05	< 0.05	< 0.05	5.24	1.10	21.40	< 1	< 1.50	Pr	* 1.10	< 1	1.40	< 5	8.11	202.4150	114.9690	-0.21	0.8730	2.1110	2.14	0.90	-0.6770	2.5480	73.60	0.10	0.2380	
22.80	< 0.0250	< 1.50	0.0110	< 0.01	< 0.10	127	12.10	< 0.50	9.80	< 10	45	Ab	< 0.10	0.1840	38	0.70	1.89	0.0280	< 0.05	2.40	2.40	8.44	2	8.54	< 1	< 1.50	Pr	* 1.40	< 1	< 0.50	51	6.82	109.0580	66.3170	-0.11	2.4070	1.1470	1.1610	0	-0.61	7.6010	22.80	0	-1.9840	
												Ab															Ab																		
135	< 0.0250	< 1.50	0.0160	0.0330	< 0.10	295	39.60	< 0.50	5.74	14	< 10	Ab	0.2140	0.0470	117	1.14	4.47	< 0.0050	< 0.05	0.06	0.11	13.30	< 1	10.40	< 1	< 1.50	Ab	0.61	< 1	6.10	10	7.87	271.6690	156.4490	0.88	1.4970	3.0940	2.9570	0	2.25	4.1170	135	0	0.1350	-100
52.90	< 0.0250	< 1	< 0.20	0.0130	< 0.10	1047	61	< 0.50	31.60	< 10	11		1.25	< 0.01	180.70	1.24	6.90	0.0980	< 0.05	0	< 0.05	218	< 1	497	< 1	< 1		0	< 1		13	8.06													
												Ab															Ab																		

Appendix VI:

Atlantic Canada Conservation Data Centre Reports

Atlantic Canada Conservation Data Centre
Centre de données sur la conservation du Canada atlantique

DATA REPORT 5564: Lake Utopia Paper, NB

Prepared 9 June 2016
by J. Churchill, Data Manager

CONTENTS OF REPORT

Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (ACCDC) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The ACCDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the ACCDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees. URL: www.ACCDC.com.

Upon request and for a fee, the ACCDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the ACCDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename	Contents
LkUtopiaPapeNB_5564ob.xls	All Rare and legally protected *Flora and Fauna* within 5 km of your study area
LkUtopiaPapeNB_5564ob100km.xls	A list of Rare and legally protected *Flora and Fauna* within 100 km of your study area
LkUtopiaPapeNB_5564ma.xls	All *Managed Areas* in your study area
LkUtopiaPapeNB_5564sa.xls	All *Significant Natural Areas* in your study area
LkUtopiaPapeNB_5564ff.xls	Rare and common *Freshwater Fish* in your study area (DFO database)

1.2 RESTRICTIONS

The ACCDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting ACCDC data, recipients assent to the following limits of use:

a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c) The ACCDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
d) ACCDC data responses are restricted to the data in our Data System at the time of the data request.
e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
f) ACCDC data responses are not to be construed as exhaustive inventories of taxa in an area.
g) The absence of a taxon cannot be inferred by its absence in an ACCDC data response.

1.3 ADDITIONAL INFORMATION

The attached file DataDictionary 2.1.pdf provides metadata for the data provided.

Please direct any additional questions about ACCDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries
Sean Blaney, Senior Scientist, Executive Director
Tel: (506) 364-2658
sblaney@mta.ca

Animals (Fauna)
John Klymko, Zoologist
Tel: (506) 364-2660
jklymko@mta.ca

Plant Communities
Sarah Robinson , Community Ecologist
Tel: (506) 364-2664
srobinson@mta.ca

Data Management, GIS
James Churchill, Data Manager
Tel: (902) 679-6146
jlchurchill@mta.ca

Billing
Jean Breau
Tel: (506) 364-2657
jrbreau@mta.ca

Questions on the biology of Federal Species at Risk can be directed to ACCDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Stewart Lusk, Natural Resources: (506) 453-7110.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Sherman Boates, NSDNR: (902) 679-6146. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NSDNR Regional Biologist:

Western: Duncan Bayne
(902) 648-3536
Duncan.Bayne@novascotia.ca

Western: Donald Sam
(902) 634-7525
Donald.Sam@novascotia.ca

Central: Shavonne Meyer
(902) 893-6353
Shavonne.Meyer@novascotia.ca

Central: Kimberly George
(902) 893-5630
Kimberly.George@novascotia.ca

Eastern: Mark Pulsifer
(902) 863-7523
Mark.Pulsifer@novascotia.ca

Eastern: Donald Anderson
(902) 295-3949
Donald.Anderson@novascotia.ca

Eastern: Terry Power
(902) 563-3370
Terrance.Power@novascotia.ca

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

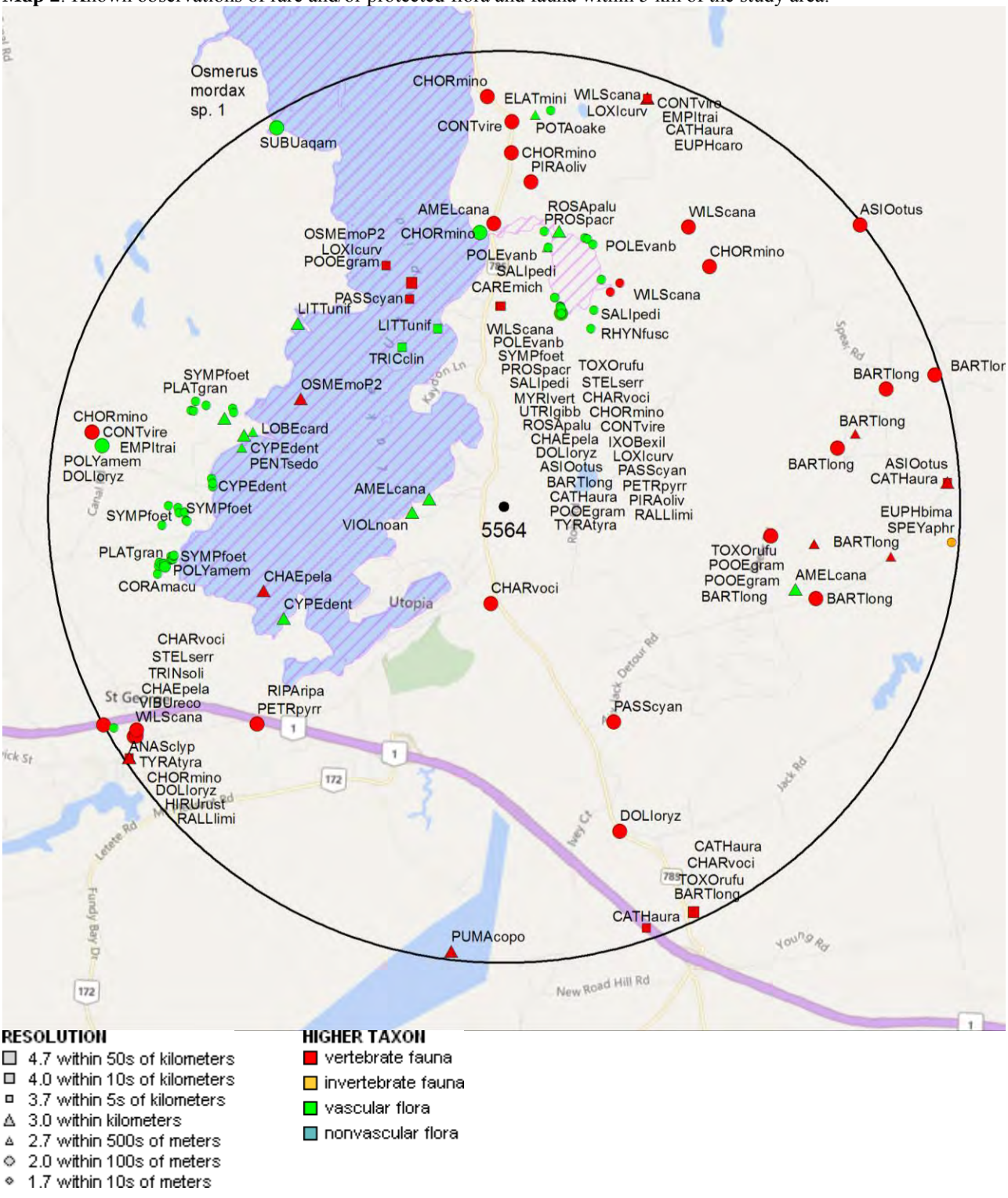
2.1 FLORA

A 5 km buffer around the study area contains 75 records of 23 vascular, no records of nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

A 5 km buffer around the study area contains 131 records of 27 vertebrate, 2 records of 2 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within 5 km of the study area.

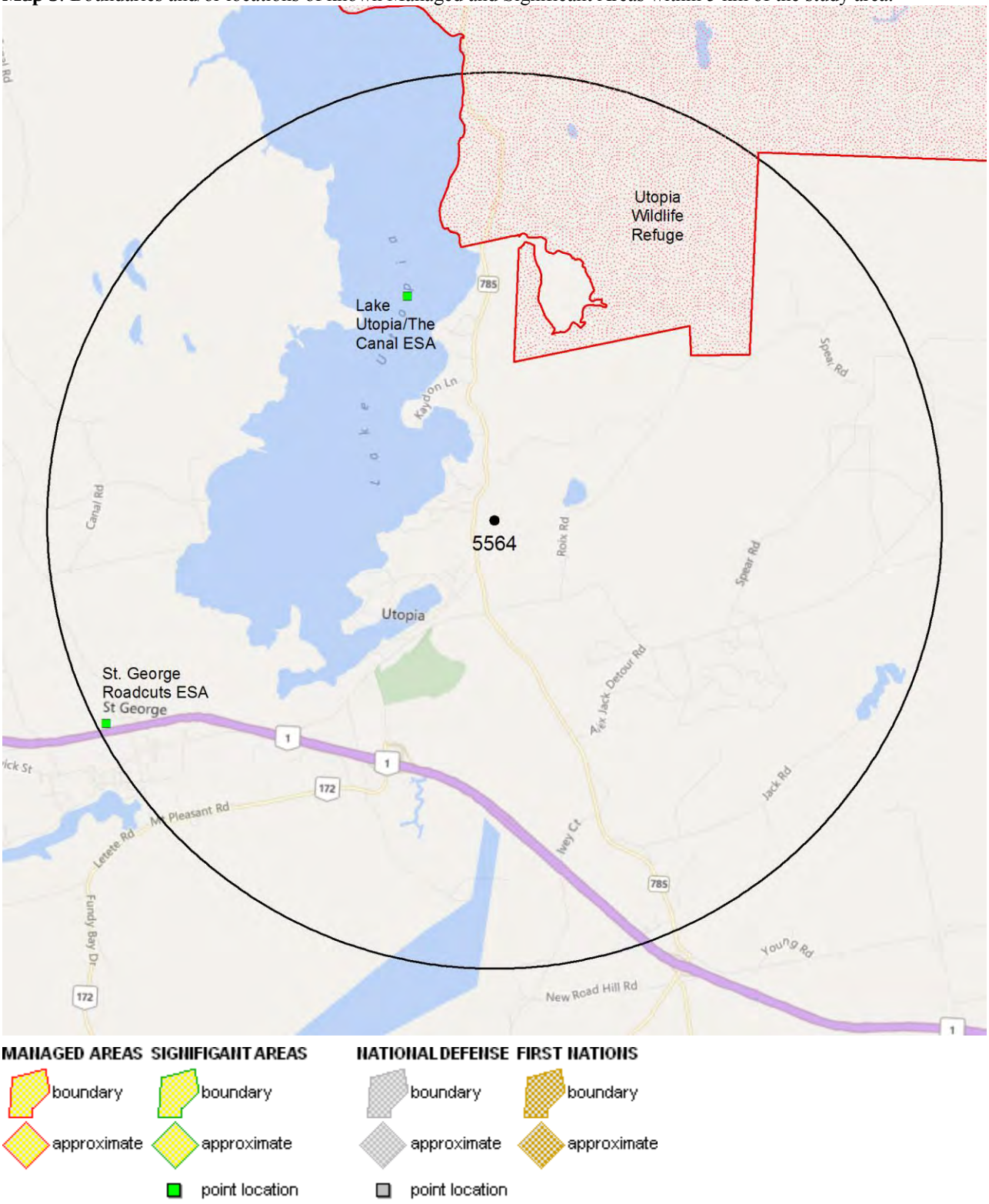


3.0 SPECIAL AREAS

3.1 MANAGED AREAS
The GIS scan identified 1 managed area in the vicinity of the study area (Map 3 and attached file: *ma*.xls)

3.2 SIGNIFICANT AREAS
The GIS scan identified 2 biologically significant sites in the vicinity of the study area (Map 3 and attached file: *sa*.xls)

Map 3: Boundaries and/or locations of known Managed and Significant Areas within 5 km of the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding "location-sensitive" species, section 4.3) within the 5 km-buffered area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	*Polemonium vanbruntiae*	Van Brunt's Jacob's-ladder	Threatened	Threatened	Threatened	S1	1 At Risk	6	2.2 ± 0.0
P	*Viburnum recognitum*	Northern Arrow-Wood				S2	4 Secure	1	4.9 ± 0.0
P	*Polygonum amphibium var. emersum*	Water Smartweed				S2	3 Sensitive	2	3.7 ± 0.0
P	*Viola novae-angliae*	New England Violet				S2	3 Sensitive	1	1.0 ± 1.0
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S2	3 Sensitive	27	2.2 ± 0.0
P	*Proserpinaca palustris var. crebra*	Marsh Mermaidweed				S2?	3 Sensitive	3	2.3 ± 0.0
P	*Subularia aquatica var. americana*	Water Awlwort				S3	4 Secure	1	4.8 ± 0.0
P	*Lobelia cardinalis*	Cardinal Flower				S3	4 Secure	1	2.9 ± 0.0
P	*Penthorum sedoides*	Ditch Stonecrop				S3	4 Secure	1	3.0 ± 0.0
P	*Elatine minima*	Small Waterwort				S3	4 Secure	1	4.4 ± 0.0
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	4 Secure	1	2.4 ± 0.0
P	*Littorella uniflora*	American Shoreweed				S3	4 Secure	2	2.1 ± 5.0
P	*Amelanchier canadensis*	Canada Serviceberry				S3	4 Secure	3	0.8 ± 1.0
P	*Rosa palustris*	Swamp Rose				S3	4 Secure	2	2.7 ± 0.0
P	*Salix pedicellaris*	Bog Willow				S3	4 Secure	4	2.3 ± 0.0
P	*Carex michauxiana*	Michaux's Sedge				S3	4 Secure	1	2.9 ± 0.0
P	*Cyperus dentatus*	Toothed Flatsedge				S3	4 Secure	4	2.7 ± 1.0
P	*Rhynchospora fusca*	Brown Beakrush				S3	4 Secure	1	2.2 ± 0.0
P	*Trichophorum clintonii*	Clinton's Clubrush				S3	4 Secure	1	2.1 ± 5.0
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	3 Sensitive	9	3.1 ± 0.0
P	*Utricularia gibba*	Humped Bladderwort				S3S4	4 Secure	1	2.4 ± 0.0
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	3 Sensitive	1	3.9 ± 0.0
P	*Potamogeton oakesianus*	Oakes' Pondweed				S3S4	4 Secure	1	4.3 ± 0.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened	Threatened	S1S2B	1 At Risk	1	2.2 ± 7.0
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B	1 At Risk	11	2.2 ± 7.0
A	*Chordeiles minor*	Common Nighthawk	Threatened	Threatened	Threatened	S3B	1 At Risk	11	2.2 ± 7.0
A	*Hirundo rustica*	Barn Swallow	Threatened		Threatened	S3B	3 Sensitive	2	4.9 ± 1.0
A	*Riparia riparia*	Bank Swallow	Threatened			S3B	3 Sensitive	1	3.6 ± 0.0
A	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3S4B	1 At Risk	9	2.2 ± 7.0
A	*Dolichonyx oryzivorus*	Bobolink	Threatened		Threatened	S3S4B	3 Sensitive	8	2.2 ± 7.0
A	*Osmerus mordax pop. 2*	Lake Utopia Smelt large-bodied pop.	Threatened		Threatened			2	2.5 ± 1.0
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B	2 May Be At Risk	1	4.7 ± 3.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern		Special Concern	S4B	4 Secure	5	2.2 ± 7.0
A	*Puma concolor pop. 1*	Cougar - Eastern pop.	Data Deficient		Endangered	SU	5 Undetermined	1	4.9 ± 1.0
A	*Bartramia longicauda*	Upland Sandpiper				S1B	3 Sensitive	15	2.2 ± 7.0
A	*Empidonax traillii*	Willow Flycatcher				S1S2B	3 Sensitive	2	4.6 ± 0.0
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B	2 May Be At Risk	3	2.2 ± 7.0
A	*Anas clypeata*	Northern Shoveler				S2B	4 Secure	1	4.9 ± 4.0
A	*Toxostoma rufum*	Brown Thrasher				S2B	3 Sensitive	3	2.2 ± 7.0
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	2 May Be At Risk	5	2.2 ± 7.0
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	4 Secure	1	4.9 ± 2.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Asio otus*	Long-eared Owl				S2S3	5 Undetermined	3	2.2 ± 7.0
A	*Loxia curvirostra*	Red Crossbill				S3	4 Secure	4	2.2 ± 7.0
A	*Cathartes aura*	Turkey Vulture				S3B	4 Secure	8	2.2 ± 7.0
A	*Rallus limicola*	Virginia Rail				S3B	3 Sensitive	8	2.2 ± 7.0
A	*Charadrius vociferus*	Killdeer				S3B	3 Sensitive	6	1.1 ± 0.0
A	*Passerina cyanea*	Indigo Bunting				S3B	4 Secure	4	2.2 ± 7.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B	3 Sensitive	10	2.2 ± 7.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S3S4B	3 Sensitive	3	2.2 ± 7.0
A	*Piranga olivacea*	Scarlet Tanager				S3S4B	4 Secure	3	2.2 ± 7.0
I	*Euphyes bimacula*	Two-spotted Skipper				S3	4 Secure	1	4.9 ± 0.0
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4 Secure	1	4.9 ± 0.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species "location sensitive". Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting a 5 km buffer of your study area are indicated below with "YES".

New Brunswick

Scientific *Name*	Common Name	SARA	Prov Legal Prot	Known within 5 km of Study Site?
Chrysemys picta picta	Eastern Painted Turtle			No
Chelydra serpentina	Snapping Turtle	Special Concern	Special Concern	No
Glyptemys insculpta	Wood Turtle	Threatened	Threatened	No
Haliaeetus leucocephalus	**Bald Eagle**		**Endangered**	**YES**
Falco peregrinus pop. 1	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Endangered	No
Cicindela marginipennis	Cobblestone Tiger Beetle	Endangered	Endangered	No
Coenonympha nipisiquit	Maritime Ringlet	Endangered	Endangered	No
Bat Hibernaculum		[Endangered][1]	[Endangered][1]	No

1 *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NB Species at Risk Act.

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the ACCDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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1 NSDNR website
1 Scott, Fred W. 1998. Updated Status Report on the Cougar (Puma Concolor couguar) [Eastern population]. Committee on the Status of Endangered Wildlife in Canada, 298 recs.
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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 20352 records of 126 vertebrate and 893 records of 57 invertebrate fauna; 5807 records of 345 vascular, 212 records of 106 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs. All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	60	39.8 ± 5.0	NB
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	14	45.8 ± 1.0	NB
A	*Perimyotis subflavus*	Eastern Pipistrelle	Endangered	Endangered	Endangered	S1	1 At Risk	2	52.1 ± 0.0	NB
A	*Eubalaena glacialis*	North Atlantic Right Whale	Endangered	Endangered	Endangered	S1		6	21.9 ± 1.0	NB
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	1 At Risk	21	18.1 ± 0.0	NB
A	*Dermochelys coriacea (Atlantic pop.)*	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	1 At Risk	4	31.7 ± 0.0	NB
A	*Morone saxatilis*	Striped Bass	Endangered			S2	2 May Be At Risk	10	27.2 ± 1.0	NB
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered	Endangered	S2	2 May Be At Risk	6	18.1 ± 0.0	NB
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S2B	1 At Risk	24	24.1 ± 0.0	NB
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered		Endangered	S3M	1 At Risk	244	23.3 ± 0.0	NB
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gasp ├ sie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	4	43.1 ± 1.0	NB
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened	Threatened	S1S2B	1 At Risk	27	2.2 ± 7.0	NB
A	*Hylocichla mustelina*	Wood Thrush	Threatened		Threatened	S1S2B	2 May Be At Risk	161	8.9 ± 7.0	NB
A	*Sturnella magna*	Eastern Meadowlark	Threatened		Threatened	S1S2B	2 May Be At Risk	26	18.2 ± 7.0	NB
A	*Caprimulgus vociferus*	Whip-Poor-Will	Threatened	Threatened	Threatened	S2B	1 At Risk	68	8.9 ± 7.0	NB
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2S3	1 At Risk	62	21.8 ± 0.0	NB
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B	1 At Risk	216	2.2 ± 7.0	NB
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Special Concern	Threatened	S2S3B	1 At Risk	21	7.8 ± 7.0	NB
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened		Threatened	S3	4 Secure	1	57.8 ± 1.0	NB
A	*Chordeiles minor*	Common Nighthawk	Threatened	Threatened	Threatened	S3B	1 At Risk	233	2.2 ± 7.0	NB
A	*Hirundo rustica*	Barn Swallow	Threatened		Threatened	S3B	3 Sensitive	1015	4.9 ± 1.0	NB
A	*Riparia riparia*	Bank Swallow	Threatened			S3B	3 Sensitive	314	3.6 ± 0.0	NB
A	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3S4B	1 At Risk	216	7.8 ± 7.0	NB
A	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3S4B	1 At Risk	628	2.2 ± 7.0	NB
A	*Dolichonyx oryzivorus*	Bobolink	Threatened		Threatened	S3S4B	3 Sensitive	531	2.2 ± 7.0	NB
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S5	4 Secure	36	19.2 ± 0.0	NB
A	*Osmerus mordax pop. 2*	Lake Utopia Smelt large-bodied pop.	Threatened		Threatened			2	2.5 ± 1.0	NB
A	*Coturnicops noveboracensis*	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B	2 May Be At Risk	3	87.7 ± 7.0	NB
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Endangered	S1B	1 At Risk	547	12.5 ± 7.0	NB
A	*Histrionicus*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S1B,S1N	1 At Risk	205	20.9 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
	histrionicus pop. 1									
A	*Acipenser brevirostrum*	Shortnose Sturgeon	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	7	51.0 ± 10.0	NB
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2N	3 Sensitive	56	13.3 ± 1.0	NB
A	*Balaenoptera physalus*	Fin Whale - Atlantic pop.	Special Concern	Special Concern	Special Concern	S2S3		5	42.6 ± 1.0	NB
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	3 Sensitive	26	15.0 ± 1.0	NB
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern	Special Concern	S3B	3 Sensitive	17	46.6 ± 7.0	NB
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B	2 May Be At Risk	110	4.7 ± 3.0	NB
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern			S3M	3 Sensitive	222	13.7 ± 0.0	NB
A	*Phocoena phocoena (NW Atlantic pop.)*	Harbour Porpoise - Northwest Atlantic pop.	Special Concern	Threatened		S4		229	7.0 ± 1.0	NB
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern		Special Concern	S4B	4 Secure	422	2.2 ± 7.0	NB
A	*Podiceps auritus*	Horned Grebe	Special Concern		Special Concern	S4M,S4N	4 Secure	269	11.4 ± 22.0	NB
A	*Cistothorus platensis*	Sedge Wren	Not At Risk			S1B	5 Undetermined	8	89.9 ± 0.0	NB
A	*Falco rusticolus*	Gyrfalcon	Not At Risk			S1N	5 Undetermined	15	40.7 ± 1.0	NB
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1S2B	2 May Be At Risk	18	56.6 ± 1.0	NB
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B	2 May Be At Risk	5	47.7 ± 1.0	NB
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	2	57.0 ± 1.0	NB
A	*Buteo lineatus*	Red-shouldered Hawk	Not At Risk	Special Concern		S2B	2 May Be At Risk	48	12.8 ± 0.0	NB
A	*Fulica americana*	American Coot	Not At Risk			S2B	3 Sensitive	4	7.8 ± 7.0	NB
A	*Chlidonias niger*	Black Tern	Not At Risk			S2B	3 Sensitive	108	54.9 ± 7.0	NB
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3		3	18.9 ± 1.0	NB
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S3	1 At Risk	7	19.9 ± 50.0	NB
A	*Desmognathus fuscus (QC/NB pop.)*	Northern Dusky Salamander - QC/NB pop.	Not At Risk			S3	3 Sensitive	80	26.0 ± 1.0	NB
A	*Megaptera novaeangliae*	Humpback Whale (NW Atlantic pop.)	Not At Risk	Special Concern		S3		4	21.9 ± 5.0	NB
A	*Haliaeetus leucocephalus*	Bald Eagle	Not At Risk		Endangered	S3B	1 At Risk	1383	2.2 ± 7.0	NB
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B	3 Sensitive	300	18.1 ± 0.0	NB
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S3M,S2N	3 Sensitive	680	10.4 ± 0.0	NB
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4		1	60.2 ± 1.0	NB
A	*Canis lupus*	Gray Wolf	Not At Risk		Extirpated	SX	0.1 Extirpated	3	46.7 ± 1.0	NB
A	*Lepomis auritus*	Redbreast Sunfish	Data Deficient	Special Concern		S3?	4 Secure	27	24.6 ± 10.0	NB
A	*Puma concolor pop. 1*	Cougar - Eastern pop.	Data Deficient		Endangered	SU	5 Undetermined	43	4.9 ± 1.0	NB
A	*Lasionycteris noctivagans*	Silver-haired Bat				S1?	5 Undetermined	1	55.1 ± 1.0	NB
A	*Bartramia longicauda*	Upland Sandpiper				S1B	3 Sensitive	47	2.2 ± 7.0	NB
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B	3 Sensitive	58	37.9 ± 1.0	NB
A	*Leucophaeus atricilla*	Laughing Gull				S1B	3 Sensitive	89	12.9 ± 0.0	NB
A	*Sterna paradisaea*	Arctic Tern				S1B	2 May Be At Risk	149	13.3 ± 1.0	NB
A	*Troglodytes aedon*	House Wren				S1B	5 Undetermined	32	11.1 ± 0.0	NB
A	*Aythya marila*	Greater Scaup				S1B,S2N	4 Secure	35	24.0 ± 2.0	NB
A	*Uria aalge*	Common Murre				S1B,S3N	4 Secure	145	16.0 ± 0.0	NB
A	*Alca torda*	Razorbill				S1B,S3N	4 Secure	181	16.0 ± 0.0	NB
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S4N	4 Secure	48	15.6 ± 0.0	NB
A	*Rissa tridactyla*	Black-legged Kittiwake				S1B,S4N	4 Secure	49	16.8 ± 0.0	NB
A	*Butorides virescens*	Green Heron				S1S2B	3 Sensitive	22	29.6 ± 7.0	NB
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B	3 Sensitive	62	5.2 ± 0.0	NB
A	*Gallinula chloropus*	Common Moorhen				S1S2B	3 Sensitive	18	5.5 ± 5.0	NB
A	*Fratercula arctica*	Atlantic Puffin				S1S2B	3 Sensitive	186	13.3 ± 1.0	NB
A	*Empidonax traillii*	Willow Flycatcher				S1S2B	3 Sensitive	75	4.6 ± 0.0	NB
A	*Progne subis*	Purple Martin				S1S2B	2 May Be At Risk	192	24.3 ± 0.0	NB
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B	2 May Be At Risk	25	2.2 ± 7.0	NB
A	*Prosopium*	Round Whitefish				S2	4 Secure	3	65.8 ± 10.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
	cylindraceum									
A	*Salmo salar*	Atlantic Salmon				S2	2 May Be At Risk	38	5.6 ± 1.0	NB
A	*Lasiurus borealis*	Eastern Red Bat				S2?	5 Undetermined	9	23.4 ± 1.0	NB
A	*Lasiurus cinereus*	Hoary Bat				S2?	5 Undetermined	11	40.3 ± 10.0	NB
A	*Oceanodroma leucorhoa*	Leach's Storm-Petrel				S2B	3 Sensitive	140	16.8 ± 0.0	NB
A	*Anas clypeata*	Northern Shoveler				S2B	4 Secure	73	4.9 ± 4.0	NB
A	*Anas strepera*	Gadwall				S2B	4 Secure	86	24.0 ± 3.0	NB
A	*Eremophila alpestris*	Horned Lark				S2B	2 May Be At Risk	25	6.1 ± 7.0	NB
A	*Cistothorus palustris*	Marsh Wren				S2B	3 Sensitive	63	35.3 ± 0.0	NB
A	*Toxostoma rufum*	Brown Thrasher				S2B	3 Sensitive	75	2.2 ± 7.0	NB
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	2 May Be At Risk	60	2.2 ± 7.0	NB
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	4 Secure	250	4.9 ± 2.0	NB
A	*Chroicocephalus ridibundus*	Black-headed Gull				S2M,S1N	3 Sensitive	42	11.8 ± 0.0	NB
A	*Somateria spectabilis*	King Eider				S2N	4 Secure	56	17.0 ± 17.0	NB
A	*Asio otus*	Long-eared Owl				S2S3	5 Undetermined	19	2.2 ± 7.0	NB
A	*Tringa semipalmata*	Willet				S2S3B	3 Sensitive	156	24.0 ± 2.0	NB
A	*Pinicola enucleator*	Pine Grosbeak				S2S3B,S4S5N	3 Sensitive	21	19.2 ± 7.0	NB
A	*Branta bernicla*	Brant				S2S3M,S2S3N	4 Secure	545	12.8 ± 10.0	NB
A	*Uria lomvia*	Thick-billed Murre				S2S3N	5 Undetermined	67	12.5 ± 0.0	NB
A	*Cepphus grylle*	Black Guillemot				S3	4 Secure	776	12.5 ± 7.0	NB
A	*Loxia curvirostra*	Red Crossbill				S3	4 Secure	93	2.2 ± 7.0	NB
A	*Coregonus clupeaformis*	Lake Whitefish				S3	4 Secure	15	31.7 ± 0.0	NB
A	*Salvelinus namaycush*	Lake Trout				S3	3 Sensitive	5	23.0 ± 0.0	NB
A	*Sorex maritimensis*	Maritime Shrew				S3	4 Secure	1	89.7 ± 1.0	NB
A	*Eptesicus fuscus*	Big Brown Bat				S3	3 Sensitive	47	11.9 ± 1.0	NB
A	*Picoides dorsalis*	American Three-toed Woodpecker				S3?	3 Sensitive	10	19.2 ± 7.0	NB
A	*Anas acuta*	Northern Pintail				S3B	3 Sensitive	47	35.4 ± 1.0	NB
A	*Anas americana*	American Wigeon				S3B	4 Secure	542	21.7 ± 7.0	NB
A	*Cathartes aura*	Turkey Vulture				S3B	4 Secure	261	2.2 ± 7.0	NB
A	*Rallus limicola*	Virginia Rail				S3B	3 Sensitive	103	2.2 ± 7.0	NB
A	*Charadrius vociferus*	Killdeer				S3B	3 Sensitive	702	1.1 ± 0.0	NB
A	*Larus delawarensis*	Ring-billed Gull				S3B	4 Secure	222	13.3 ± 1.0	NB
A	*Myiarchus crinitus*	Great Crested Flycatcher				S3B	3 Sensitive	186	7.8 ± 7.0	NB
A	*Mimus polyglottos*	Northern Mockingbird				S3B	3 Sensitive	140	6.1 ± 7.0	NB
A	*Passerina cyanea*	Indigo Bunting				S3B	4 Secure	97	2.2 ± 7.0	NB
A	*Molothrus ater*	Brown-headed Cowbird				S3B	2 May Be At Risk	219	7.8 ± 7.0	NB
A	*Mergus serrator*	Red-breasted Merganser				S3B,S4S5N	4 Secure	370	7.8 ± 7.0	NB
A	*Pluvialis dominica*	American Golden-Plover				S3M	3 Sensitive	266	24.1 ± 0.0	NB
A	*Phalaropus fulicarius*	Red Phalarope				S3M	3 Sensitive	126	13.7 ± 0.0	NB
A	*Melanitta nigra*	Black Scoter				S3M,S2S3N	3 Sensitive	797	8.7 ± 16.0	NB
A	*Calidris maritima*	Purple Sandpiper				S3M,S3N	4 Secure	267	11.9 ± 0.0	NB
A	*Bucephala albeola*	Bufflehead				S3N	3 Sensitive	1110	5.2 ± 0.0	NB
A	*Synaptomys cooperi*	Southern Bog Lemming				S3S4	4 Secure	18	57.6 ± 1.0	NB
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B	3 Sensitive	390	2.2 ± 7.0	NB
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S3S4B	3 Sensitive	410	2.2 ± 7.0	NB
A	*Piranga olivacea*	Scarlet Tanager				S3S4B	4 Secure	171	2.2 ± 7.0	NB
A	*Coccothraustes vespertinus*	Evening Grosbeak				S3S4B,S4S5N	3 Sensitive	158	5.2 ± 0.0	NB
A	*Morus bassanus*	Northern Gannet				SHB,S5M,S5N	4 Secure	840	13.3 ± 1.0	NB
A	*Lanius ludovicianus*	Loggerhead Shrike				SXB,SNAN	1 At Risk	1	56.6 ± 1.0	NB
C	*Quercus macrocarpa - Acer rubrum / Onoclea sensibilis - Carex arcta*	Bur Oak - Red Maple / Sensitive Fern - Northern Clustered Sedge Forest				S2		1	92.5 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
C	*Acer saccharinum / Onoclea sensibilis - Lysimachia terrestris Forest*	Silver Maple / Sensitive Fern - Swamp Yellow Loosestrife Forest				S3		1	59.4 ± 0.0	NB
C	*Acer saccharum - Fraxinus americana / Polystichum acrostichoides Forest*	Sugar Maple - White Ash / Christmas Fern Forest				S3S4		1	77.5 ± 0.0	NB
I	*Cicindela marginipennis*	Cobblestone Tiger Beetle	Endangered	Endangered	Endangered	S1?	1 At Risk	2	98.2 ± 0.0	NB
I	*Gomphus ventricosus*	Skillet Clubtail	Endangered		Endangered	S1S2	2 May Be At Risk	48	83.4 ± 0.0	NB
I	*Alasmidonta varicosa*	Brook Floater	Special Concern		Special Concern	S1S2	3 Sensitive	1	62.7 ± 0.0	NB
I	*Ophiogomphus howei*	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2	2 May Be At Risk	3	9.9 ± 0.0	NB
I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	81	59.4 ± 0.0	NB
I	*Danaus plexippus*	Monarch	Special Concern	Special Concern	Special Concern	S3B	3 Sensitive	90	7.8 ± 5.0	NB
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern			SU	3 Sensitive	11	84.7 ± 0.0	NB
I	*Lyogyrus granum*	Squat Duskysnail	Data Deficient			S2		33	47.0 ± 0.0	NB
I	*Lycaena dorcas*	Dorcas Copper				S1	2 May Be At Risk	1	39.3 ± 0.0	NB
I	*Erora laeta*	Early Hairstreak				S1	2 May Be At Risk	1	97.3 ± 1.0	NS
I	*Somatochlora septentrionalis*	Muskeg Emerald				S1	2 May Be At Risk	1	86.2 ± 1.0	NB
I	*Celithemis martha*	Martha's Pennant				S1	5 Undetermined	1	43.6 ± 0.0	NB
I	*Arigomphus furcifer*	Lilypad Clubtail				S1	5 Undetermined	6	86.9 ± 0.0	NB
I	*Polites origenes*	Crossline Skipper				S1?	5 Undetermined	5	80.6 ± 0.0	NB
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle				S1S2	2 May Be At Risk	2	48.6 ± 0.0	NB
I	*Plebejus saepiolus*	Greenish Blue				S1S2	4 Secure	3	11.5 ± 0.0	NB
I	*Ophiogomphus colubrinus*	Boreal Snaketail				S1S2	2 May Be At Risk	36	24.0 ± 1.0	NB
I	*Satyrium calanus*	Banded Hairstreak				S2	3 Sensitive	12	86.3 ± 0.0	NB
I	*Satyrium calanus falacer*	Banded Hairstreak				S2	4 Secure	4	89.2 ± 1.0	NB
I	*Strymon melinus*	Grey Hairstreak				S2	4 Secure	4	34.6 ± 1.0	NB
I	*Aeshna clepsydra*	Mottled Darner				S2	3 Sensitive	8	46.5 ± 1.0	NB
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S2	5 Undetermined	4	47.2 ± 1.0	NB
I	*Ladona exusta*	White Corporal				S2	5 Undetermined	9	20.8 ± 0.0	NB
I	*Hetaerina americana*	American Rubyspot				S2	3 Sensitive	2	62.7 ± 0.0	NB
I	*Ischnura posita*	Fragile Forktail				S2	2 May Be At Risk	8	5.3 ± 0.0	NB
I	*Alasmidonta undulata*	Triangle Floater				S2	3 Sensitive	25	27.9 ± 1.0	NB
I	*Anatis labiculata*	Fifteen-spotted Lady Beetle				S2S3	3 Sensitive	1	49.0 ± 0.0	NB
I	*Callophrys henrici*	Henry's Elfin				S2S3	4 Secure	14	74.7 ± 0.0	NB
I	*Hesperia sassacus*	Indian Skipper				S3	4 Secure	4	47.3 ± 0.0	NB
I	*Euphyes bimacula*	Two-spotted Skipper				S3	4 Secure	8	4.9 ± 0.0	NB
I	*Lycaena hyllus*	Bronze Copper				S3	3 Sensitive	4	34.9 ± 1.0	NB
I	*Satyrium acadica*	Acadian Hairstreak				S3	4 Secure	8	44.5 ± 1.0	NB
I	*Callophrys polios*	Hoary Elfin				S3	4 Secure	7	58.7 ± 1.0	NB
I	*Plebejus idas*	Northern Blue				S3	4 Secure	6	24.8 ± 0.0	NB
I	*Plebejus idas empetri*	Crowberry Blue				S3	4 Secure	8	18.4 ± 1.0	NB
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4 Secure	19	4.9 ± 0.0	NB
I	*Boloria bellona*	Meadow Fritillary				S3	4 Secure	32	10.8 ± 1.0	NB
I	*Polygonia satyrus*	Satyr Comma				S3	4 Secure	11	45.8 ± 1.0	NB
I	*Polygonia gracilis*	Hoary Comma				S3	4 Secure	1	90.5 ± 1.0	NB
I	*Nymphalis l-album*	Compton Tortoiseshell				S3	4 Secure	21	48.4 ± 1.0	NB
I	*Gomphus vastus*	Cobra Clubtail				S3	3 Sensitive	55	75.6 ± 0.0	NB

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I	*Gomphus abbreviatus*	Spine-crowned Clubtail				S3	4 Secure	24	48.0 ± 0.0	NB
I	*Gomphaeschna furcillata*	Harlequin Darner				S3	5 Undetermined	10	44.5 ± 1.0	NB
I	*Dorocordulia lepida*	Petite Emerald				S3	4 Secure	22	41.8 ± 0.0	NB
I	*Somatochlora cingulata*	Lake Emerald				S3	4 Secure	11	20.4 ± 1.0	NB
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4 Secure	18	22.6 ± 1.0	NB
I	*Williamsonia fletcheri*	Ebony Boghaunter				S3	4 Secure	13	44.5 ± 1.0	NB
I	*Lestes eurinus*	Amber-Winged Spreadwing				S3	4 Secure	8	42.0 ± 1.0	NB
I	*Lestes vigilax*	Swamp Spreadwing				S3	3 Sensitive	32	5.3 ± 0.0	NB
I	*Enallagma geminatum*	Skimming Bluet				S3	5 Undetermined	8	42.5 ± 1.0	NB
I	*Enallagma signatum*	Orange Bluet				S3	4 Secure	8	42.5 ± 1.0	NB
I	*Stylurus scudderi*	Zebra Clubtail				S3	4 Secure	66	17.1 ± 1.0	NB
I	*Leptodea ochracea*	Tidewater Mucket				S3	4 Secure	56	50.2 ± 1.0	NB
I	*Pantala hymenaea*	Spot-Winged Glider				S3B	4 Secure	5	22.6 ± 1.0	NB
I	*Satyrium liparops*	Striped Hairstreak				S3S4	4 Secure	2	86.3 ± 0.0	NB
I	*Satyrium liparops strigosum*	Striped Hairstreak				S3S4	4 Secure	1	93.0 ± 10.0	NB
I	*Cupido comyntas*	Eastern Tailed Blue				S3S4	4 Secure	9	43.8 ± 0.0	NB
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	SH	1 At Risk	1	32.0 ± 1.0	NB
N	*Degelia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Special Concern	S1	2 May Be At Risk	2	31.4 ± 5.0	NB
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S3	5 Undetermined	17	11.0 ± 0.0	NB
N	*Anomodon viticulosus*	a Moss				S1	2 May Be At Risk	4	55.1 ± 1.0	NB
N	*Bryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1	2 May Be At Risk	1	51.4 ± 1.0	NB
N	*Calliergon trifarium*	Three-ranked Moss				S1	2 May Be At Risk	1	45.7 ± 0.0	NB
N	*Dichelyma falcatum*	a Moss				S1	2 May Be At Risk	2	48.3 ± 1.0	NB
N	*Dicranum bonjeanii*	Bonjean's Broom Moss				S1	2 May Be At Risk	1	88.7 ± 1.0	NB
N	*Ditrichum pallidum*	Pale Cow-hair Moss				S1	2 May Be At Risk	1	79.7 ± 1.0	NB
N	*Eurhynchium hians*	Light Beaked Moss				S1	2 May Be At Risk	1	90.5 ± 1.0	NB
N	*Meesia triquetra*	Three-ranked Cold Moss				S1	2 May Be At Risk	1	98.3 ± 100.0	NB
N	*Plagiothecium latebricola*	Alder Silk Moss				S1	2 May Be At Risk	1	52.2 ± 0.0	NB
N	*Racomitrium ericoides*	a Moss				S1	2 May Be At Risk	1	60.2 ± 3.0	NB
N	*Rhytidiadelphus loreus*	Lanky Moss				S1	2 May Be At Risk	1	63.8 ± 10.0	NB
N	*Sphagnum macrophyllum*	Sphagnum				S1	2 May Be At Risk	2	38.5 ± 0.0	NB
N	*Sphagnum subfulvum*	a Peatmoss				S1	2 May Be At Risk	4	29.4 ± 1.0	NB
N	*Splachnum pennsylvanicum*	Southern Dung Moss				S1	2 May Be At Risk	1	85.4 ± 0.0	NB
N	*Tomentypnum falcifolium*	Sickle-leaved Golden Moss				S1	2 May Be At Risk	1	29.4 ± 1.0	NB
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1	2 May Be At Risk	1	89.4 ± 1.0	NB
N	*Hamatocaulis vernicosus*	a Moss				S1	2 May Be At Risk	1	81.0 ± 100.0	NB
N	*Coscinodon cribrosus*	Sieve-Toothed Moss				S1	2 May Be At Risk	1	55.6 ± 0.0	NB
N	*Peltigera collina*	Tree Pelt Lichen				S1	2 May Be At Risk	1	50.8 ± 10.0	NB
N	*Pohlia filum*	a Moss				S1?	5 Undetermined	2	82.4 ± 3.0	NB
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S1?	5 Undetermined	2	55.6 ± 0.0	NB
N	*Anomobryum filiforme*	a moss				S1?	5 Undetermined	1	90.5 ± 1.0	NB
N	*Platylomella lescurii*	a Moss				S1?	5 Undetermined	1	28.2 ± 1.0	NB
N	*Andreaea rothii*	a Moss				S1S2	3 Sensitive	1	76.0 ± 0.0	NB
N	*Brachythecium digastrum*	a Moss				S1S2	3 Sensitive	2	85.7 ± 0.0	NB

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N	*Bryum pallescens*	Pale Bryum Moss				S1S2	5 Undetermined	2	40.3 ± 1.0	NB
N	*Campylium radicale*	Long-stalked Fine Wet Moss				S1S2	5 Undetermined	1	90.5 ± 1.0	NB
N	*Cynodontium strumiferum*	Strumose Dogtooth Moss				S1S2	3 Sensitive	1	29.1 ± 8.0	NB
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S1S2	3 Sensitive	1	77.7 ± 4.0	NB
N	*Dicranum spurium*	Spurred Broom Moss				S1S2	3 Sensitive	1	20.9 ± 0.0	NB
N	*Didymodon ferrugineus*	a moss				S1S2	3 Sensitive	1	76.2 ± 1.0	NB
N	*Anomodon tristis*	a Moss				S1S2	2 May Be At Risk	1	56.3 ± 1.0	NB
N	*Schistostega pennata*	Luminous Moss				S1S2	3 Sensitive	2	90.5 ± 1.0	NB
N	*Seligeria campylopoda*	a Moss				S1S2	3 Sensitive	1	81.0 ± 100.0	NB
N	*Seligeria diversifolia*	a Moss				S1S2	3 Sensitive	1	95.3 ± 0.0	NB
N	*Sphagnum angermanicum*	a Peatmoss				S1S2	3 Sensitive	2	28.0 ± 1.0	NB
N	*Tortula mucronifolia*	Mucronate Screw Moss				S1S2	3 Sensitive	1	55.1 ± 0.0	NB
N	*Calypogeia neesiana*	Nees' Pouchwort				S1S3	6 Not Assessed	1	76.9 ± 1.0	NB
N	*Cephaloziella elachista*	Spurred Threadwort				S1S3	6 Not Assessed	1	45.7 ± 5.0	NB
N	*Jungermannia obovata*	Egg Flapwort				S1S3	6 Not Assessed	1	64.9 ± 0.0	NB
N	*Porella pinnata*	Pinnate Scalewort				S1S3	6 Not Assessed	2	55.9 ± 1.0	NB
N	*Reboulia hemisphaerica*	Purple-margined Liverwort				S1S3	6 Not Assessed	1	28.6 ± 1.0	NB
N	*Amphidium mougeotii*	a Moss				S2	3 Sensitive	2	29.1 ± 8.0	NB
N	*Bryum uliginosum*	a Moss				S2	3 Sensitive	1	78.6 ± 4.0	NB
N	*Buxbaumia aphylla*	Brown Shield Moss				S2	3 Sensitive	2	29.1 ± 8.0	NB
N	*Campylium polygamum*	a Moss				S2	3 Sensitive	1	71.9 ± 1.0	NB
N	*Cynodontium tenellum*	Delicate Dogtooth Moss				S2	3 Sensitive	1	20.1 ± 1.0	NB
N	*Dicranella palustris*	Drooping-Leaved Fork Moss				S2	3 Sensitive	2	95.2 ± 100.0	NB
N	*Hypnum pratense*	Meadow Plait Moss				S2	3 Sensitive	1	49.1 ± 0.0	NB
N	*Orthotrichum speciosum*	Showy Bristle Moss				S2	4 Secure	3	15.8 ± 2.0	NB
N	*Physcomitrium immersum*	a Moss				S2	3 Sensitive	6	81.5 ± 1.0	NB
N	*Physcomitrium pyriforme*	Pear-shaped Urn Moss				S2	3 Sensitive	3	84.8 ± 0.0	NB
N	*Racomitrium fasciculare*	a Moss				S2	3 Sensitive	1	21.6 ± 0.0	NB
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2	3 Sensitive	4	45.7 ± 0.0	NB
N	*Sphagnum centrale*	Central Peat Moss				S2	3 Sensitive	2	54.1 ± 0.0	NB
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S2	3 Sensitive	6	28.7 ± 1.0	NB
N	*Taxiphyllum deplanatum*	Imbricate Yew-leaved Moss				S2	3 Sensitive	1	20.1 ± 1.0	NB
N	*Tayloria serrata*	Serrate Trumpet Moss				S2	3 Sensitive	1	88.3 ± 1.0	NB
N	*Tetraplodon mnioides*	Entire-leaved Nitrogen Moss				S2	3 Sensitive	3	20.1 ± 1.0	NB
N	*Ulota phyllantha*	a Moss				S2	3 Sensitive	2	20.1 ± 1.0	NB
N	*Zygodon viridissimus*	a Moss				S2	2 May Be At Risk	3	23.9 ± 3.0	NB
N	*Schistidium agassizii*	Elf Bloom Moss				S2	3 Sensitive	2	15.8 ± 2.0	NB
N	*Loeskeobryum brevirostre*	a Moss				S2	3 Sensitive	3	90.2 ± 3.0	NS
N	*Nephroma laevigatum*	Mustard Kidney Lichen				S2	2 May Be At Risk	1	50.8 ± 10.0	NB
N	*Calliergonella cuspidata*	Common Large Wetland Moss				S2S3	3 Sensitive	5	23.3 ± 10.0	NB
N	*Didymodon rigidulus*	Rigid Screw Moss				S2S3	3 Sensitive	1	75.5 ± 8.0	NB
N	*Cephaloziella divaricata*	Common Threadwort				S2S4	6 Not Assessed	1	28.6 ± 1.0	NB
N	*Riccia fluitans*	Floating Crystalwort				S2S4	6 Not Assessed	4	78.2 ± 10.0	NB
N	*Aulacomnium androgynum*	Little Groove Moss				S3	4 Secure	3	25.4 ± 5.0	NB
N	*Dicranella cerviculata*	a Moss				S3	3 Sensitive	3	20.1 ± 1.0	NB

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N	*Dicranum majus*	Greater Broom Moss				S3	4 Secure	6	20.1 ± 1.0	NB
N	*Heterocladium dimorphum*	Dimorphous Tangle Moss				S3	4 Secure	1	15.8 ± 2.0	NB
N	*Hypnum curvifolium*	Curved-leaved Plait Moss				S3	3 Sensitive	1	25.4 ± 5.0	NB
N	*Pleuridium subulatum*	a Moss				S3	3 Sensitive	2	88.0 ± 1.0	NB
N	*Pogonatum dentatum*	Mountain Hair Moss				S3	4 Secure	1	20.1 ± 1.0	NB
N	*Sphagnum torreyanum*	a Peatmoss				S3	4 Secure	4	42.7 ± 0.0	NB
N	*Sphagnum austinii*	Austin's Peat Moss				S3	4 Secure	1	42.5 ± 1.0	NB
N	*Splachnum rubrum*	Red Collar Moss				S3	4 Secure	1	82.3 ± 1.0	NB
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3	4 Secure	4	19.8 ± 0.0	NB
N	*Trichostomum tenuirostre*	Acid-Soil Moss				S3	4 Secure	2	23.6 ± 0.0	NB
N	*Schistidium maritimum*	a Moss				S3	4 Secure	2	20.1 ± 1.0	NB
N	*Dicranella rufescens*	Red Forklet Moss				S3?	5 Undetermined	2	83.5 ± 4.0	NB
N	*Sphagnum contortum*	Twisted Peat Moss				S3?	4 Secure	1	64.2 ± 0.0	NB
N	*Sphagnum lescurii*	a Peatmoss				S3?	5 Undetermined	2	53.5 ± 1.0	NB
N	*Atrichum tenellum*	Slender Smoothcap Moss				S3S4	4 Secure	4	23.1 ± 6.0	NB
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3S4	4 Secure	1	75.5 ± 8.0	NB
N	*Brachythecium campestre*	Field Ragged Moss				S3S4	4 Secure	2	82.4 ± 3.0	NB
N	*Brachythecium velutinum*	Velvet Ragged Moss				S3S4	4 Secure	3	23.6 ± 0.0	NB
N	*Dicranella schreberiana*	Schreber's Forklet Moss				S3S4	4 Secure	1	90.5 ± 1.0	NB
N	*Dicranella subulata*	Awl-leaved Forklet Moss				S3S4	4 Secure	1	80.2 ± 2.0	NB
N	*Distichium capillaceum*	Erect-fruited Iris Moss				S3S4	4 Secure	1	40.7 ± 0.0	NB
N	*Fissidens bryoides*	Lesser Pocket Moss				S3S4	4 Secure	2	75.8 ± 5.0	NB
N	*Hypnum fauriei*	a Moss				S3S4	4 Secure	3	20.1 ± 1.0	NB
N	*Isopterygiopsis muelleriana*	a Moss				S3S4	4 Secure	6	23.6 ± 0.0	NB
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	4 Secure	1	29.1 ± 8.0	NB
N	*Pohlia annotina*	a Moss				S3S4	4 Secure	2	15.8 ± 2.0	NB
N	*Tortula truncata*	a Moss				S3S4	4 Secure	2	82.5 ± 0.0	NB
N	*Racomitrium microcarpon*	a Moss				S3S4	4 Secure	1	23.6 ± 0.0	NB
N	*Sphagnum majus*	Olive Peat Moss				S3S4	4 Secure	1	65.0 ± 5.0	NB
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3S4	4 Secure	1	20.1 ± 1.0	NB
N	*Grimmia anodon*	Toothless Grimmia Moss				SH	5 Undetermined	2	57.0 ± 10.0	NB
N	*Leucodon brachypus*	a Moss				SH	2 May Be At Risk	2	20.5 ± 100.0	NB
N	*Thelia hirtella*	a Moss				SH	2 May Be At Risk	1	98.3 ± 100.0	NB
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	1 At Risk	54	60.8 ± 1.0	NB
P	*Polemonium vanbruntiae*	Van Brunt's Jacob's-ladder	Threatened	Threatened	Threatened	S1	1 At Risk	72	2.2 ± 0.0	NB
P	*Symphyotrichum anticostense*	Anticosti Aster	Threatened	Threatened	Endangered	S1S3	1 At Risk	3	89.9 ± 0.0	NB
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Endangered	S2	1 At Risk	22	52.3 ± 0.0	NB
P	*Pterospora andromedea*	Woodland Pinedrops			Endangered	S1	1 At Risk	11	89.8 ± 0.0	NB
P	*Sanicula trifoliata*	Large-Fruited Sanicle				S1	2 May Be At Risk	1	84.7 ± 5.0	NB
P	*Antennaria parlinii*	a Pussytoes				S1	2 May Be At Risk	7	39.2 ± 0.0	NB
P	*Antennaria howellii ssp. petaloidea*	Pussy-Toes				S1	2 May Be At Risk	4	49.0 ± 1.0	NB
P	*Bidens discoidea*	Swamp Beggarticks				S1	2 May Be At Risk	3	90.3 ± 0.0	NB
P	*Helianthus decapetalus*	Ten-rayed Sunflower				S1	2 May Be At Risk	13	89.9 ± 1.0	NB
P	*Hieracium kalmii*	Kalm's Hawkweed				S1	2 May Be At Risk	5	19.0 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Hieracium kalmii var. kalmii*	Kalm's Hawkweed				S1	2 May Be At Risk	7	18.3 ± 1.0	NB
P	*Hieracium paniculatum*	Panicled Hawkweed				S1	2 May Be At Risk	5	70.6 ± 1.0	NB
P	*Senecio pseudoarnica*	Seabeach Ragwort				S1	2 May Be At Risk	14	54.7 ± 0.0	NB
P	*Solidago simplex var. monticola*	Sticky Goldenrod				S1	2 May Be At Risk	1	91.3 ± 0.0	NB
P	*Cardamine parviflora var. arenicola*	Small-flowered Bittercress				S1	2 May Be At Risk	12	20.7 ± 1.0	NB
P	*Draba arabisans*	Rock Whitlow-Grass				S1	2 May Be At Risk	7	35.0 ± 0.0	NB
P	*Draba breweri var. cana*	Brewer's Whitlow-grass				S1	2 May Be At Risk	10	96.2 ± 0.0	NB
P	*Draba glabella*	Rock Whitlow-Grass				S1	2 May Be At Risk	7	47.7 ± 1.0	NB
P	*Minuartia groenlandica*	Greenland Stitchwort				S1	2 May Be At Risk	4	38.6 ± 0.0	NB
P	*Chenopodium capitatum*	Strawberry-blite				S1	2 May Be At Risk	3	58.0 ± 1.0	NB
P	*Chenopodium simplex*	Maple-leaved Goosefoot				S1	2 May Be At Risk	10	60.0 ± 1.0	NB
P	*Callitriche terrestris*	Terrestrial Water-Starwort				S1	5 Undetermined	1	56.0 ± 0.0	NB
P	*Triadenum virginicum*	Virginia St John's-wort				S1	2 May Be At Risk	7	55.1 ± 0.0	NB
P	*Viburnum acerifolium*	Maple-leaved Viburnum				S1	2 May Be At Risk	10	46.7 ± 0.0	NB
P	*Cuscuta pentagona*	Five-angled Dodder				S1	2 May Be At Risk	1	100.0 ± 10.0	NB
P	*Corema conradii*	Broom Crowberry				S1	2 May Be At Risk	1	55.9 ± 10.0	NB
P	*Vaccinium boreale*	Northern Blueberry				S1	2 May Be At Risk	1	20.1 ± 0.0	NB
P	*Vaccinium corymbosum*	Highbush Blueberry				S1	3 Sensitive	9	37.2 ± 5.0	NB
P	*Chamaesyce polygonifolia*	Seaside Spurge				S1	2 May Be At Risk	8	51.2 ± 0.0	NB
P	*Desmodium glutinosum*	Large Tick-Trefoil				S1	2 May Be At Risk	1	49.6 ± 1.0	NB
P	*Lespedeza capitata*	Round-headed Bush-clover				S1	2 May Be At Risk	3	97.8 ± 0.0	NB
P	*Gentiana rubricaulis*	Purple-stemmed Gentian				S1	2 May Be At Risk	14	18.2 ± 0.0	NB
P	*Lomatogonium rotatum*	Marsh Felwort				S1	2 May Be At Risk	2	24.5 ± 0.0	NB
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S1	2 May Be At Risk	2	16.8 ± 0.0	NB
P	*Pycnanthemum virginianum*	Virginia Mountain Mint				S1	2 May Be At Risk	4	79.9 ± 0.0	NB
P	*Decodon verticillatus*	Swamp Loosestrife				S1	2 May Be At Risk	1	95.4 ± 0.0	NB
P	*Lysimachia hybrida*	Lowland Yellow Loosestrife				S1	2 May Be At Risk	15	43.0 ± 0.0	NB
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	2 May Be At Risk	16	47.4 ± 1.0	NB
P	*Primula laurentiana*	Laurentian Primrose				S1	2 May Be At Risk	7	90.4 ± 1.0	NS
P	*Ranunculus sceleratus*	Cursed Buttercup				S1	2 May Be At Risk	6	41.0 ± 0.0	NB
P	*Crataegus jonesiae*	Jones' Hawthorn				S1	2 May Be At Risk	5	23.0 ± 0.0	NB
P	*Galium brevipes*	Limestone Swamp Bedstraw				S1	2 May Be At Risk	3	42.6 ± 5.0	NB
P	*Saxifraga paniculata ssp. neogaea*	White Mountain Saxifrage				S1	2 May Be At Risk	7	64.7 ± 10.0	NB
P	*Agalinis paupercula var. borealis*	Small-flowered Agalinis				S1	2 May Be At Risk	7	75.0 ± 1.0	NB
P	*Agalinis tenuifolia*	Slender Agalinis				S1	2 May Be At Risk	6	86.5 ± 0.0	NB
P	*Gratiola aurea*	Golden Hedge-Hyssop				S1	3 Sensitive	2	37.2 ± 5.0	NB
P	*Pedicularis canadensis*	Canada Lousewort				S1	2 May Be At Risk	20	22.0 ± 0.0	NB
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S1	2 May Be At Risk	20	47.5 ± 0.0	NB
P	*Alisma subcordatum*	Southern Water Plantain				S1	5 Undetermined	6	58.0 ± 5.0	NB
P	*Carex backii*	Rocky Mountain Sedge				S1	2 May Be At Risk	5	95.8 ± 1.0	NB
P	*Carex cephaloidea*	Thin-leaved Sedge				S1	2 May Be At Risk	2	86.7 ± 0.0	NB
P	*Carex merritt-fernaldii*	Merritt Fernald's Sedge				S1	2 May Be At Risk	2	24.8 ± 0.0	NB
P	*Carex saxatilis*	Russet Sedge				S1	2 May Be At Risk	13	54.7 ± 10.0	NB
P	*Carex sterilis*	Sterile Sedge				S1	2 May Be At Risk	1	89.9 ± 0.0	NB
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	2 May Be At Risk	9	84.8 ± 0.0	NB

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P	*Cyperus diandrus*	Low Flatsedge				S1	2 May Be At Risk	7	86.4 ± 1.0	NB
P	*Cyperus lupulinus*	Hop Flatsedge				S1	2 May Be At Risk	4	92.2 ± 0.0	NB
P	*Cyperus lupulinus ssp. macilentus*	Hop Flatsedge				S1	2 May Be At Risk	12	91.8 ± 0.0	NB
P	*Eleocharis olivacea*	Yellow Spikerush				S1	2 May Be At Risk	4	44.0 ± 1.0	NB
P	*Rhynchospora capillacea*	Slender Beakrush				S1	2 May Be At Risk	3	89.8 ± 0.0	NB
P	*Sisyrinchium angustifolium*	Narrow-leaved Blue-eyed-grass				S1	2 May Be At Risk	2	57.4 ± 1.0	NB
P	*Juncus greenei*	Greene's Rush				S1	2 May Be At Risk	1	9.2 ± 0.0	NB
P	*Juncus subtilis*	Creeping Rush				S1	2 May Be At Risk	1	78.7 ± 5.0	NB
P	*Allium canadense*	Canada Garlic				S1	2 May Be At Risk	11	79.9 ± 0.0	NB
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S1	2 May Be At Risk	1	89.4 ± 0.0	NB
P	*Malaxis brachypoda*	White Adder's-Mouth				S1	2 May Be At Risk	3	50.6 ± 10.0	NB
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S1	2 May Be At Risk	12	27.4 ± 0.0	NB
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S1	2 May Be At Risk	1	88.9 ± 1.0	NB
P	*Spiranthes casei*	Case's Ladies'-Tresses				S1	2 May Be At Risk	6	91.9 ± 0.0	NB
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S1	2 May Be At Risk	9	46.5 ± 5.0	NB
P	*Bromus pubescens*	Hairy Wood Brome Grass				S1	5 Undetermined	6	92.3 ± 0.0	NB
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1	2 May Be At Risk	22	40.9 ± 0.0	NB
P	*Danthonia compressa*	Flattened Oat Grass				S1	2 May Be At Risk	1	86.6 ± 0.0	NB
P	*Dichanthelium dichotomum*	Forked Panic Grass				S1	2 May Be At Risk	19	40.9 ± 0.0	NB
P	*Glyceria obtusa*	Atlantic Manna Grass				S1	2 May Be At Risk	6	23.7 ± 5.0	NB
P	*Sporobolus compositus*	Rough Dropseed				S1	2 May Be At Risk	17	88.9 ± 0.0	NB
P	*Potamogeton friesii*	Fries' Pondweed				S1	2 May Be At Risk	6	48.1 ± 5.0	NB
P	*Potamogeton nodosus*	Long-leaved Pondweed				S1	2 May Be At Risk	4	85.3 ± 1.0	NB
P	*Potamogeton strictifolius*	Straight-leaved Pondweed				S1	2 May Be At Risk	2	70.3 ± 0.0	NB
P	*Xyris difformis*	Bog Yellow-eyed-grass				S1	5 Undetermined	3	55.1 ± 0.0	NB
P	*Asplenium ruta-muraria var. cryptolepis*	Wallrue Spleenwort				S1	2 May Be At Risk	3	64.2 ± 0.0	NB
P	*Botrychium oneidense*	Blunt-lobed Moonwort				S1	2 May Be At Risk	4	58.4 ± 0.0	NB
P	*Botrychium rugulosum*	Rugulose Moonwort				S1	2 May Be At Risk	1	43.5 ± 1.0	NB
P	*Schizaea pusilla*	Little Curlygrass Fern				S1	2 May Be At Risk	18	31.7 ± 0.0	NB
P	*Hieracium kalmii var. fasciculatum*	Kalm's Hawkweed				S1?	5 Undetermined	6	23.0 ± 0.0	NB
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S1?	2 May Be At Risk	2	55.0 ± 1.0	NB
P	*Drosera rotundifolia var. comosa*	Round-leaved Sundew				S1?	5 Undetermined	5	21.1 ± 1.0	NB
P	*Wolffia columbiana*	Columbian Watermeal				S1?	2 May Be At Risk	5	82.4 ± 0.0	NB
P	*Humulus lupulus var. lupuloides*	Common Hop				S1S2	3 Sensitive	4	84.1 ± 0.0	NB
P	*Rumex aquaticus var. fenestratus*	Western Dock				S1S2	2 May Be At Risk	1	81.1 ± 1.0	NB
P	*Saxifraga virginiensis*	Early Saxifrage				S1S2	2 May Be At Risk	14	85.5 ± 0.0	NB
P	*Carex rostrata*	Narrow-leaved Beaked Sedge				S1S2	3 Sensitive	1	44.8 ± 0.0	NB
P	*Potamogeton bicupulatus*	Snailseed Pondweed				S1S2	2 May Be At Risk	5	20.9 ± 0.0	NB
P	*Selaginella rupestris*	Rock Spikemoss				S1S2	2 May Be At Risk	19	88.9 ± 0.0	NB
P	*Thelypteris simulata*	Bog Fern				S1S2	2 May Be At Risk	1	91.7 ± 0.0	NB
P	*Listera australis*	Southern Twayblade			Endangered	S2	1 At Risk	11	69.0 ± 0.0	NB
P	*Sanicula odorata*	Clustered Sanicle				S2	2 May Be At Risk	1	94.6 ± 0.0	NB
P	*Pseudognaphalium macounii*	Macoun's Cudweed				S2	3 Sensitive	9	53.5 ± 0.0	NB

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P	*Solidago altissima*	Tall Goldenrod				S2	4 Secure	6	65.0 ± 0.0	NB
P	*Solidago simplex var. racemosa*	Sticky Goldenrod				S2	2 May Be At Risk	8	88.4 ± 1.0	NB
P	*Solidago simplex ssp. randii*	Sticky Goldenrod				S2	2 May Be At Risk	2	90.7 ± 0.0	NB
P	*Solidago simplex*	Sticky Goldenrod				S2	2 May Be At Risk	2	90.6 ± 0.0	NB
P	*Ionactis linariifolius*	Stiff Aster				S2	3 Sensitive	1	93.1 ± 0.0	NB
P	*Symphyotrichum racemosum*	Small White Aster				S2	3 Sensitive	7	69.8 ± 0.0	NB
P	*Alnus serrulata*	Smooth Alder				S2	3 Sensitive	37	44.5 ± 0.0	NB
P	*Arabis drummondii*	Drummond's Rockcress				S2	3 Sensitive	10	55.1 ± 1.0	NB
P	*Barbarea orthoceras*	American Yellow Rocket				S2	3 Sensitive	4	49.2 ± 10.0	NB
P	*Cardamine concatenata*	Cut-leaved Toothwort				S2	2 May Be At Risk	1	81.8 ± 1.0	NB
P	*Sagina nodosa*	Knotted Pearlwort				S2	3 Sensitive	13	13.3 ± 0.0	NB
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2	3 Sensitive	2	40.9 ± 0.0	NB
P	*Stellaria longifolia*	Long-leaved Starwort				S2	3 Sensitive	5	55.4 ± 10.0	NB
P	*Atriplex franktonii*	Frankton's Saltbush				S2	4 Secure	3	21.6 ± 1.0	NB
P	*Chenopodium rubrum*	Red Pigweed				S2	3 Sensitive	4	52.4 ± 0.0	NB
P	*Callitriche hermaphroditica*	Northern Water-starwort				S2	4 Secure	6	30.6 ± 0.0	NB
P	*Hypericum dissimulatum*	Disguised St John's-wort				S2	3 Sensitive	6	5.4 ± 1.0	NB
P	*Lonicera oblongifolia*	Swamp Fly Honeysuckle				S2	3 Sensitive	13	37.0 ± 6.0	NB
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S2	3 Sensitive	8	87.2 ± 1.0	NB
P	*Viburnum lentago*	Nannyberry				S2	4 Secure	89	41.5 ± 0.0	NB
P	*Viburnum recognitum*	Northern Arrow-Wood				S2	4 Secure	168	4.9 ± 0.0	NB
P	*Astragalus eucosmus*	Elegant Milk-vetch				S2	2 May Be At Risk	10	75.9 ± 0.0	NB
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S2	3 Sensitive	8	63.9 ± 50.0	NB
P	*Quercus macrocarpa*	Bur Oak				S2	2 May Be At Risk	34	24.6 ± 1.0	NB
P	*Gentiana linearis*	Narrow-Leaved Gentian				S2	3 Sensitive	5	90.4 ± 5.0	NB
P	*Myriophyllum humile*	Low Water Milfoil				S2	3 Sensitive	10	68.1 ± 0.0	NB
P	*Hedeoma pulegioides*	American False Pennyroyal				S2	4 Secure	57	24.0 ± 5.0	NB
P	*Nuphar lutea ssp. rubrodisca*	Red-disked Yellow Pond-lily				S2	3 Sensitive	9	31.1 ± 0.0	NB
P	*Orobanche uniflora*	One-Flowered Broomrape				S2	3 Sensitive	13	29.4 ± 0.0	NB
P	*Polygala paucifolia*	Fringed Milkwort				S2	3 Sensitive	11	6.6 ± 1.0	NB
P	*Polygala sanguinea*	Blood Milkwort				S2	3 Sensitive	11	70.5 ± 0.0	NB
P	*Polygala senega*	Seneca Snakeroot				S2	3 Sensitive	2	87.2 ± 1.0	NB
P	*Polygonum amphibium var. emersum*	Water Smartweed				S2	3 Sensitive	22	3.7 ± 0.0	NB
P	*Polygonum careyi*	Carey's Smartweed				S2	3 Sensitive	8	24.2 ± 1.0	NB
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S2	3 Sensitive	26	43.1 ± 0.0	NB
P	*Anemone multifida*	Cut-leaved Anemone				S2	3 Sensitive	1	89.3 ± 0.0	NB
P	*Hepatica nobilis var. obtusa*	Round-lobed Hepatica				S2	3 Sensitive	30	40.8 ± 0.0	NB
P	*Ranunculus flabellaris*	Yellow Water Buttercup				S2	4 Secure	20	48.5 ± 0.0	NB
P	*Ranunculus longirostris*	Eastern White Water-Crowfoot				S2	5 Undetermined	5	17.8 ± 1.0	NB
P	*Crataegus scabrida*	Rough Hawthorn				S2	3 Sensitive	4	63.9 ± 0.0	NB
P	*Crataegus succulenta*	Fleshy Hawthorn				S2	3 Sensitive	1	90.5 ± 5.0	NB
P	*Cephalanthus occidentalis*	Common Buttonbush				S2	3 Sensitive	66	41.3 ± 0.0	NB
P	*Salix candida*	Sage Willow				S2	3 Sensitive	2	81.9 ± 1.0	NB

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P	*Agalinis neoscotica*	Nova Scotia Agalinis				S2	3 Sensitive	30	41.4 ± 1.0	NB
P	*Euphrasia randii*	Rand's Eyebright				S2	2 May Be At Risk	23	20.5 ± 0.0	NB
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S2	3 Sensitive	3	76.1 ± 5.0	NB
P	*Dirca palustris*	Eastern Leatherwood				S2	2 May Be At Risk	5	89.9 ± 1.0	NB
P	*Phryma leptostachya*	American Lopseed				S2	3 Sensitive	2	93.9 ± 1.0	NB
P	*Verbena urticifolia*	White Vervain				S2	2 May Be At Risk	12	86.7 ± 1.0	NB
P	*Viola novae-angliae*	New England Violet				S2	3 Sensitive	5	1.0 ± 1.0	NB
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S2	3 Sensitive	87	2.2 ± 0.0	NB
P	*Carex granularis*	Limestone Meadow Sedge				S2	3 Sensitive	7	62.6 ± 0.0	NB
P	*Carex gynocrates*	Northern Bog Sedge				S2	3 Sensitive	4	48.3 ± 0.0	NB
P	*Carex hirtifolia*	Pubescent Sedge				S2	3 Sensitive	3	86.4 ± 0.0	NB
P	*Carex livida var. radicaulis*	Livid Sedge				S2	3 Sensitive	1	55.6 ± 2.0	NB
P	*Carex prairea*	Prairie Sedge				S2	3 Sensitive	1	90.3 ± 5.0	NS
P	*Carex salina*	Saltmarsh Sedge				S2	3 Sensitive	2	53.8 ± 1.0	NB
P	*Carex sprengelii*	Longbeak Sedge				S2	3 Sensitive	1	91.3 ± 0.0	NB
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S2	2 May Be At Risk	5	41.0 ± 0.0	NB
P	*Carex albicans var. emmonsii*	White-tinged Sedge				S2	3 Sensitive	4	63.1 ± 0.0	NB
P	*Carex vacillans*	Estuarine Sedge				S2	3 Sensitive	4	19.8 ± 1.0	NB
P	*Cyperus squarrosus*	Awned Flatsedge				S2	3 Sensitive	27	81.8 ± 0.0	NB
P	*Eriophorum gracile*	Slender Cottongrass				S2	2 May Be At Risk	2	91.3 ± 0.0	NB
P	*Blysmus rufus*	Red Bulrush				S2	3 Sensitive	3	48.4 ± 0.0	NB
P	*Elodea nuttallii*	Nuttall's Waterweed				S2	3 Sensitive	8	45.0 ± 0.0	NB
P	*Lemna trisulca*	Star Duckweed				S2	4 Secure	17	66.6 ± 1.0	NB
P	*Allium tricoccum*	Wild Leek				S2	2 May Be At Risk	6	77.2 ± 0.0	NB
P	*Najas gracillima*	Thread-Like Naiad				S2	3 Sensitive	11	5.3 ± 0.0	NB
P	*Calypso bulbosa var. americana*	Calypso				S2	2 May Be At Risk	3	61.2 ± 0.0	NB
P	*Coeloglossum viride var. virescens*	Long-bracted Frog Orchid				S2	2 May Be At Risk	5	76.4 ± 5.0	NB
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	2 May Be At Risk	5	46.3 ± 1.0	NB
P	*Spiranthes cernua*	Nodding Ladies'-Tresses				S2	3 Sensitive	15	6.7 ± 1.0	NB
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	3 Sensitive	11	47.7 ± 1.0	NB
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S2	3 Sensitive	9	40.8 ± 0.0	NB
P	*Elymus canadensis*	Canada Wild Rye				S2	2 May Be At Risk	15	82.7 ± 1.0	NB
P	*Leersia virginica*	White Cut Grass				S2	2 May Be At Risk	42	75.8 ± 10.0	NB
P	*Piptatherum canadense*	Canada Rice Grass				S2	3 Sensitive	5	52.5 ± 0.0	NB
P	*Puccinellia phryganodes*	Creeping Alkali Grass				S2	3 Sensitive	15	13.1 ± 0.0	NB
P	*Schizachyrium scoparium*	Little Bluestem				S2	3 Sensitive	23	69.8 ± 0.0	NB
P	*Zizania aquatica var. aquatica*	Indian Wild Rice				S2	5 Undetermined	4	89.6 ± 0.0	NB
P	*Stuckenia filiformis ssp. alpina*	Thread-leaved Pondweed				S2	3 Sensitive	6	55.6 ± 0.0	NB
P	*Potamogeton richardsonii*	Richardson's Pondweed				S2	3 Sensitive	15	55.6 ± 1.0	NB
P	*Potamogeton vaseyi*	Vasey's Pondweed				S2	3 Sensitive	10	44.8 ± 0.0	NB
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S2	3 Sensitive	9	52.4 ± 0.0	NB
P	*Woodwardia virginica*	Virginia Chain Fern				S2	3 Sensitive	19	56.5 ± 1.0	NB
P	*Woodsia alpina*	Alpine Cliff Fern				S2	3 Sensitive	5	64.7 ± 0.0	NB

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P	*Selaginella selaginoides*	Low Spikemoss				S2	3 Sensitive	4	29.6 ± 0.0	NB
P	*Toxicodendron radicans*	Poison Ivy				S2?	3 Sensitive	13	53.2 ± 0.0	NB
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2?	3 Sensitive	3	25.9 ± 0.0	NB
P	*Symphyotrichum novi-belgii var. crenifolium*	New York Aster				S2?	5 Undetermined	9	19.8 ± 0.0	NB
P	*Proserpinaca palustris var. crebra*	Marsh Mermaidweed				S2?	3 Sensitive	24	2.3 ± 0.0	NB
P	*Epilobium coloratum*	Purple-veined Willowherb				S2?	3 Sensitive	11	56.4 ± 1.0	NB
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S2?	4 Secure	9	24.7 ± 3.0	NB
P	*Rubus recurvicaulis*	Arching Dewberry				S2?	4 Secure	4	47.9 ± 1.0	NB
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2?	4 Secure	4	89.0 ± 0.0	NB
P	*Salix myricoides*	Bayberry Willow				S2?	3 Sensitive	7	27.8 ± 0.0	NB
P	*Platanthera huronensis*	Fragrant Green Orchid				S2?	5 Undetermined	2	49.9 ± 1.0	NB
P	*Eragrostis pectinacea*	Tufted Love Grass				S2?	4 Secure	14	23.5 ± 0.0	NB
P	*Ceratophyllum echinatum*	Prickly Hornwort				S2S3	3 Sensitive	16	41.9 ± 0.0	NB
P	*Elatine americana*	American Waterwort				S2S3	3 Sensitive	8	47.7 ± 1.0	NB
P	*Bartonia paniculata*	Branched Bartonia				S2S3	3 Sensitive	4	31.9 ± 0.0	NB
P	*Bartonia paniculata ssp. iodandra*	Branched Bartonia				S2S3	3 Sensitive	14	21.5 ± 1.0	NB
P	*Geranium robertianum*	Herb Robert				S2S3	4 Secure	18	16.9 ± 0.0	NB
P	*Myriophyllum quitense*	Andean Water Milfoil				S2S3	4 Secure	71	48.3 ± 0.0	NB
P	*Rumex pallidus*	Seabeach Dock				S2S3	3 Sensitive	6	15.3 ± 1.0	NB
P	*Galium labradoricum*	Labrador Bedstraw				S2S3	3 Sensitive	3	20.8 ± 1.0	NB
P	*Valeriana uliginosa*	Swamp Valerian				S2S3	3 Sensitive	2	40.5 ± 1.0	NB
P	*Carex adusta*	Lesser Brown Sedge				S2S3	4 Secure	3	52.0 ± 1.0	NB
P	*Carex plantaginea*	Plantain-Leaved Sedge				S2S3	3 Sensitive	1	82.2 ± 1.0	NB
P	*Corallorhiza maculata var. occidentalis*	Spotted Coralroot				S2S3	3 Sensitive	6	24.8 ± 0.0	NB
P	*Corallorhiza maculata var. maculata*	Spotted Coralroot				S2S3	3 Sensitive	2	88.1 ± 1.0	NB
P	*Listera auriculata*	Auricled Twayblade				S2S3	3 Sensitive	9	50.0 ± 1.0	NB
P	*Potamogeton praelongus*	White-stemmed Pondweed				S2S3	4 Secure	14	44.7 ± 0.0	NB
P	*Isoetes acadiensis*	Acadian Quillwort				S2S3	3 Sensitive	9	18.0 ± 1.0	NB
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	3 Sensitive	6	43.0 ± 1.0	NB
P	*Panax trifolius*	Dwarf Ginseng				S3	3 Sensitive	9	49.1 ± 0.0	NB
P	*Artemisia campestris*	Field Wormwood				S3	4 Secure	4	90.6 ± 0.0	NB
P	*Artemisia campestris ssp. caudata*	Field Wormwood				S3	4 Secure	53	52.6 ± 0.0	NB
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	4 Secure	6	43.5 ± 0.0	NB
P	*Prenanthes racemosa*	Glaucous Rattlesnakeroot				S3	4 Secure	64	49.2 ± 1.0	NB
P	*Tanacetum bipinnatum ssp. huronense*	Lake Huron Tansy				S3	4 Secure	22	62.6 ± 1.0	NB
P	*Symphyotrichum boreale*	Boreal Aster				S3	3 Sensitive	12	6.9 ± 0.0	NB
P	*Betula pumila*	Bog Birch				S3	4 Secure	21	51.7 ± 0.0	NB
P	*Arabis hirsuta var. pycnocarpa*	Western Hairy Rockcress				S3	4 Secure	13	55.1 ± 0.0	NB
P	*Cardamine maxima*	Large Toothwort				S3	4 Secure	26	58.1 ± 0.0	NB
P	*Subularia aquatica var. americana*	Water Awlwort				S3	4 Secure	18	4.8 ± 0.0	NB
P	*Lobelia cardinalis*	Cardinal Flower				S3	4 Secure	362	2.9 ± 0.0	NB
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	4 Secure	6	14.9 ± 0.0	NB
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	4 Secure	3	33.3 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Cornus amomum ssp. obliqua*	Pale Dogwood				S3	3 Sensitive	190	40.7 ± 0.0	NB
P	*Crassula aquatica*	Water Pygmyweed				S3	4 Secure	10	55.0 ± 1.0	NB
P	*Rhodiola rosea*	Roseroot				S3	4 Secure	41	9.7 ± 1.0	NB
P	*Penthorum sedoides*	Ditch Stonecrop				S3	4 Secure	62	3.0 ± 0.0	NB
P	*Elatine minima*	Small Waterwort				S3	4 Secure	53	4.4 ± 0.0	NB
P	*Astragalus alpinus var. brunetianus*	Alpine Milk-Vetch				S3	4 Secure	3	84.0 ± 0.0	NB
P	*Hedysarum alpinum*	Alpine Sweet-vetch				S3	4 Secure	2	76.7 ± 0.0	NB
P	*Gentianella amarella ssp. acuta*	Northern Gentian				S3	4 Secure	7	54.8 ± 0.0	NB
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	4 Secure	6	24.3 ± 1.0	NB
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S3	4 Secure	22	6.5 ± 0.0	NB
P	*Myriophyllum heterophyllum*	Variable-leaved Water Milfoil				S3	4 Secure	38	47.0 ± 0.0	NB
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	4 Secure	17	2.4 ± 0.0	NB
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3	4 Secure	25	20.8 ± 1.0	NB
P	*Stachys tenuifolia*	Smooth Hedge-Nettle				S3	3 Sensitive	12	75.6 ± 0.0	NB
P	*Teucrium canadense*	Canada Germander				S3	3 Sensitive	2	52.9 ± 1.0	NB
P	*Utricularia radiata*	Little Floating Bladderwort				S3	4 Secure	43	5.3 ± 0.0	NB
P	*Nuphar lutea ssp. pumila*	Small Yellow Pond-lily				S3	4 Secure	14	55.6 ± 0.0	NB
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	4 Secure	3	24.3 ± 0.0	NB
P	*Epilobium strictum*	Downy Willowherb				S3	4 Secure	19	39.2 ± 0.0	NB
P	*Polygonum arifolium*	Halberd-leaved Tearthumb				S3	4 Secure	11	44.7 ± 0.0	NB
P	*Polygonum punctatum*	Dotted Smartweed				S3	4 Secure	2	88.4 ± 0.0	NB
P	*Polygonum punctatum var. confertiflorum*	Dotted Smartweed				S3	4 Secure	17	39.7 ± 1.0	NB
P	*Polygonum scandens*	Climbing False Buckwheat				S3	4 Secure	30	12.2 ± 0.0	NB
P	*Littorella uniflora*	American Shoreweed				S3	4 Secure	28	2.1 ± 5.0	NB
P	*Primula mistassinica*	Mistassini Primrose				S3	4 Secure	12	48.4 ± 0.0	NB
P	*Pyrola minor*	Lesser Pyrola				S3	4 Secure	2	25.1 ± 0.0	NB
P	*Clematis occidentalis*	Purple Clematis				S3	4 Secure	19	38.5 ± 0.0	NB
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	5	88.2 ± 0.0	NB
P	*Thalictrum venulosum*	Northern Meadow-rue				S3	4 Secure	79	15.2 ± 0.0	NB
P	*Agrimonia gryposepala*	Hooked Agrimony				S3	4 Secure	18	31.9 ± 0.0	NB
P	*Amelanchier canadensis*	Canada Serviceberry				S3	4 Secure	15	0.8 ± 1.0	NB
P	*Rosa palustris*	Swamp Rose				S3	4 Secure	40	2.7 ± 0.0	NB
P	*Rubus chamaemorus*	Cloudberry				S3	4 Secure	54	11.6 ± 1.0	NB
P	*Rubus occidentalis*	Black Raspberry				S3	4 Secure	21	67.9 ± 0.0	NB
P	*Salix interior*	Sandbar Willow				S3	4 Secure	27	80.3 ± 1.0	NB
P	*Salix nigra*	Black Willow				S3	3 Sensitive	92	49.0 ± 1.0	NB
P	*Salix pedicellaris*	Bog Willow				S3	4 Secure	46	2.3 ± 0.0	NB
P	*Geocaulon lividum*	Northern Comandra				S3	4 Secure	9	19.3 ± 1.0	NB
P	*Parnassia glauca*	Fen Grass-of-Parnassus				S3	4 Secure	1	81.7 ± 10.0	NB
P	*Limosella australis*	Southern Mudwort				S3	4 Secure	10	40.7 ± 5.0	NB
P	*Veronica serpyllifolia ssp. humifusa*	Thyme-Leaved Speedwell				S3	4 Secure	2	88.0 ± 100.0	NB
P	*Boehmeria cylindrica*	Small-spike False-nettle				S3	3 Sensitive	139	10.2 ± 0.0	NB
P	*Pilea pumila*	Dwarf Clearweed				S3	4 Secure	23	78.5 ± 0.0	NB
P	*Viola adunca*	Hooked Violet				S3	4 Secure	5	19.7 ± 1.0	NB
P	*Viola nephrophylla*	Northern Bog Violet				S3	4 Secure	7	52.1 ± 0.0	NB
P	*Carex arcta*	Northern Clustered Sedge				S3	4 Secure	43	52.4 ± 0.0	NB
P	*Carex atratiformis*	Scabrous Black Sedge				S3	4 Secure	1	55.6 ± 0.0	NB
P	*Carex capillaris*	Hairlike Sedge				S3	4 Secure	2	55.6 ± 2.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Carex chordorrhiza*	Creeping Sedge				S3	4 Secure	20	28.7 ± 1.0	NB
P	*Carex conoidea*	Field Sedge				S3	4 Secure	24	23.7 ± 1.0	NB
P	*Carex exilis*	Coastal Sedge				S3	4 Secure	80	15.0 ± 0.0	NB
P	*Carex garberi*	Garber's Sedge				S3	3 Sensitive	2	47.6 ± 1.0	NB
P	*Carex haydenii*	Hayden's Sedge				S3	4 Secure	32	15.2 ± 1.0	NB
P	*Carex lupulina*	Hop Sedge				S3	4 Secure	102	41.1 ± 1.0	NB
P	*Carex michauxiana*	Michaux's Sedge				S3	4 Secure	54	2.9 ± 0.0	NB
P	*Carex ormostachya*	Necklace Spike Sedge				S3	4 Secure	8	56.1 ± 0.0	NB
P	*Carex rosea*	Rosy Sedge				S3	4 Secure	16	73.7 ± 0.0	NB
P	*Carex tenera*	Tender Sedge				S3	4 Secure	41	25.3 ± 1.0	NB
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	4 Secure	66	32.1 ± 0.0	NB
P	*Carex vaginata*	Sheathed Sedge				S3	3 Sensitive	10	43.5 ± 6.0	NB
P	*Carex wiegandii*	Wiegand's Sedge				S3	4 Secure	33	14.3 ± 0.0	NB
P	*Carex recta*	Estuary Sedge				S3	4 Secure	7	21.4 ± 0.0	NB
P	*Cyperus dentatus*	Toothed Flatsedge				S3	4 Secure	69	2.7 ± 1.0	NB
P	*Cyperus esculentus*	Perennial Yellow Nutsedge				S3	4 Secure	39	79.5 ± 0.0	NB
P	*Eleocharis intermedia*	Matted Spikerush				S3	4 Secure	3	53.2 ± 0.0	NB
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S3	4 Secure	5	64.2 ± 0.0	NB
P	*Eriophorum russeolum*	Russet Cottongrass				S3	4 Secure	2	46.3 ± 1.0	NB
P	*Rhynchospora capitellata*	Small-headed Beakrush				S3	4 Secure	7	48.6 ± 0.0	NB
P	*Rhynchospora fusca*	Brown Beakrush				S3	4 Secure	36	2.2 ± 0.0	NB
P	*Trichophorum clintonii*	Clinton's Clubrush				S3	4 Secure	6	2.1 ± 5.0	NB
P	*Schoenoplectus fluviatilis*	River Bulrush				S3	3 Sensitive	46	47.8 ± 1.0	NB
P	*Schoenoplectus torreyi*	Torrey's Bulrush				S3	4 Secure	27	16.8 ± 0.0	NB
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3	4 Secure	16	19.7 ± 1.0	NB
P	*Triantha glutinosa*	Sticky False-Asphodel				S3	4 Secure	9	75.5 ± 0.0	NB
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	3 Sensitive	18	47.1 ± 1.0	NB
P	*Liparis loeselii*	Loesel's Twayblade				S3	4 Secure	16	30.2 ± 0.0	NB
P	*Platanthera blephariglottis*	White Fringed Orchid				S3	4 Secure	13	50.3 ± 1.0	NB
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	3 Sensitive	31	3.1 ± 0.0	NB
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	3 Sensitive	2	52.2 ± 0.0	NB
P	*Calamagrostis pickeringii*	Pickering's Reed Grass				S3	4 Secure	103	14.7 ± 0.0	NB
P	*Dichanthelium depauperatum*	Starved Panic Grass				S3	4 Secure	10	52.4 ± 0.0	NB
P	*Muhlenbergia richardsonis*	Mat Muhly				S3	4 Secure	9	89.7 ± 0.0	NB
P	*Poa glauca*	Glaucous Blue Grass				S3	4 Secure	1	55.6 ± 2.0	NB
P	*Heteranthera dubia*	Water Stargrass				S3	4 Secure	54	55.4 ± 0.0	NB
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	4 Secure	13	41.7 ± 0.0	NB
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3	4 Secure	25	20.2 ± 0.0	NB
P	*Zannichellia palustris*	Horned Pondweed				S3	4 Secure	5	48.4 ± 0.0	NB
P	*Adiantum pedatum*	Northern Maidenhair Fern				S3	4 Secure	7	47.5 ± 1.0	NB
P	*Cryptogramma stelleri*	Steller's Rockbrake				S3	4 Secure	1	75.2 ± 1.0	NB
P	*Asplenium trichomanes-ramosum*	Green Spleenwort				S3	4 Secure	15	48.5 ± 1.0	NB
P	*Dryopteris fragrans var. remotiuscula*	Fragrant Wood Fern				S3	4 Secure	2	52.4 ± 0.0	NB
P	*Dryopteris goldiana*	Goldie's Woodfern				S3	3 Sensitive	6	92.6 ± 0.0	NB
P	*Woodsia glabella*	Smooth Cliff Fern				S3	4 Secure	1	85.5 ± 1.0	NB
P	*Equisetum palustre*	Marsh Horsetail				S3	4 Secure	6	83.7 ± 10.0	NB
P	*Isoetes tuckermanii*	Tuckerman's Quillwort				S3	4 Secure	20	17.8 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Lycopodium sabinifolium*	Ground-Fir				S3	4 Secure	7	40.1 ± 1.0	NB
P	*Huperzia appalachiana*	Appalachian Fir-Clubmoss				S3	3 Sensitive	2	57.3 ± 1.0	NB
P	*Botrychium dissectum*	Cut-leaved Moonwort				S3	4 Secure	26	25.8 ± 5.0	NB
P	*Botrychium lanceolatum var. angustisegmentum*	Lance-Leaf Grape-Fern				S3	3 Sensitive	11	52.5 ± 0.0	NB
P	*Botrychium simplex*	Least Moonwort				S3	4 Secure	10	43.0 ± 0.0	NB
P	*Polypodium appalachianum*	Appalachian Polypody				S3	4 Secure	10	20.6 ± 0.0	NB
P	*Utricularia resupinata*	Inverted Bladderwort				S3?	4 Secure	19	20.8 ± 0.0	NB
P	*Crataegus submollis*	Quebec Hawthorn				S3?	3 Sensitive	18	22.4 ± 1.0	NB
P	*Lobelia kalmii*	Brook Lobelia				S3S4	4 Secure	19	23.0 ± 0.0	NB
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	4 Secure	5	23.6 ± 5.0	NB
P	*Utricularia gibba*	Humped Bladderwort				S3S4	4 Secure	41	2.4 ± 0.0	NB
P	*Rumex maritimus*	Sea-Side Dock				S3S4	4 Secure	2	25.2 ± 1.0	NB
P	*Potentilla arguta*	Tall Cinquefoil				S3S4	4 Secure	32	20.0 ± 1.0	NB
P	*Cladium mariscoides*	Smooth Twigrush				S3S4	4 Secure	41	20.8 ± 0.0	NB
P	*Spirodela polyrrhiza*	Great Duckweed				S3S4	4 Secure	36	43.2 ± 0.0	NB
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	3 Sensitive	9	3.9 ± 0.0	NB
P	*Potamogeton oakesianus*	Oakes' Pondweed				S3S4	4 Secure	40	4.3 ± 0.0	NB
P	*Stuckenia pectinata*	Sago Pondweed				S3S4	4 Secure	62	22.0 ± 0.0	NB
P	*Montia fontana*	Water Blinks				SH	2 May Be At Risk	1	21.6 ± 1.0	NB
P	*Solidago caesia*	Blue-stemmed Goldenrod				SX	0.1 Extirpated	2	58.0 ± 1.0	NB
P	*Celastrus scandens*	Climbing Bittersweet				SX	0.1 Extirpated	3	81.9 ± 100.0	NB
P	*Carex swanii*	Swan's Sedge				SX	0.1 Extirpated	45	54.3 ± 1.0	NB

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The recipient of these data shall acknowledge the ACCDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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36	Spicer, C.D. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 211 recs.
34	Mills, E. Connell Herbarium Specimens, 1957-2009. University New Brunswick, Fredericton. 2012.
30	Kennedy, Joseph. 2010. New Brunswick Peregrine records, 2009. New Brunswick Dept Natural Resources, 19 recs (14 active).
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28	Tingley, S. (compiler). 2001. Butterflies of New Brunswick. , Web site: www.geocities.com/Yosemite/8425/buttrfly. 142 recs.
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16	Edsall, J. 2001. Lepidopteran records in New Brunswick, 1997-99. , Pers. comm. to K.A. Bredin. 91 recs.
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14	Bateman, M.C. 2000. Waterfowl Brood Surveys Database, 1990-2000 . Canadian Wildlife Service, Sackville, unpublished data. 149 recs.
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14	Newell, R. E. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University. 2013.
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4	Marx, M. & Kenney, R.D. 2001. North Atlantic Right Whale Database. University of Rhode Island, 4 recs.
4	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/. 582 recs.
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3	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
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2	Brunelle, P.-M. 2005. Wood Turtle observations. Pers. comm. to S.H. Gerriets, 21 Sep. 3 recs, 3 recs.
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1	Benedict, B. Agalinis neoscotica specimen from Grand Manan. 2009.
1	Benjamin, L.K. (compiler). 2002. Significant Habitat & Species Database. Nova Scotia Dept of Natural Resources, 32 spp, 683 recs.
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1	Sabine, D.L. 2004. Specimen data: Whittaker Lake & Marysville NB. Pers. comm. to C.S. Blaney, 2pp, 4 recs.
1	Sabine, D.L. 2012. Bronze Copper records, 2003-06. New Brunswick Dept of Natural Resources, 5 recs.
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1	Taylor, Eric B. 1997. Status of the Sympatric Smelt (genus Osmerus) Populations of Lake Utopia, New Brunswick. Committee on the Status of Endangered Wildlife in Canada, 1 rec.
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1	Toner, M. 2009. Wood Turtle Sightings. NB Dept of Natural Resources. Pers. comm. to S. Gerriets, Jul 13 & Sep 2, 2 recs.
1	Toner, M. 2011. Wood Turtle sighting. NB Dept of Natural Resources. Pers. com. to S. Gerriets, Sep 2, photo, 1 rec.
1	Torenvliet, Ed. 2010. Wood Turtle roadkill. NB Dept of Transport. Pers. com. to R. Lautenschlager, Aug. 20, photos, 1 rec.
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Appendix VII:

Project-Related Greenhouse Gas Emission Estimates

Indirect GHG Reduction from Reduced Electricity Purchases from NB Power - Electrical Load of UASB System VS Low-Rate Anaerobic Digester

Existing UASB continuous running load:	**205**	kW per hour
Proposed low-rate digester running load:	**70**	kW per hour
Continuous load differential:	**135**	kW per hour
Daily electricity reduction:	**3.24**	MW per day
Generation intensity*:	**280**	g CO_{2eq} per kWh
Reduced electricity generation emissions:	**0.91**	tonnes CO_{2eq} per day
Reduced electricity generation emissions†:	**322.06**	tonnes CO_{2eq} annually

NOTES:
*Generation intensity factor from: http://www.publications.gc.ca/site/eng/9.506002/publication.html
†Operations occur for 355 days per year

GHG Reduction from Reduced Energy Production at the LUP Mill - Steam Savings Related to Process Water Storage Tank

LUP direct energy production*:	**1480816**	Gj per year
Steam savings:	**4540**	kg per hour
Annual steam savings†:	**4**	% of total energy production
Annual steam savings:	**59233**	Gj per year
Steam production via natural gas:	**80**	%
Steam production via biogas:	**10**	%
Steam production via woodwaste:	**10**	%
Natural gas combustion emission factor‡:	**53.06**	kg CO_{2eq} per mmBtu
Natural gas emission factor conversion:	**50.29**	kg CO_{2eq} per Gj
Biogas combustion emission factor‡:	**118.17**	kg CO_{2eq} per mmBtu
Biogas emission factor conversion:	**112.00**	kg CO_{2eq} per Gj
Wood and wood residual combustion emission factor‡:	**93.80**	kg CO_{2eq} per mmBtu
Wood and wood residual emission factor conversion:	**88.91**	kg CO_{2eq} per Gj
Steam generation emissions reductions from natural gas:	**2383.10**	tonnes CO_{2eq} annually
Steam generation emissions reductions from biogas:	**663.43**	tonnes CO_{2eq} annually
Steam generation emissons reductions from wood and wood residuals:	**526.61**	tonnes CO_{2eq} annually
Total steam generation emissions reduction:	**3573.14**	tonnes CO_{2eq} annually

NOTES:
*Data From 2015
†Estimate based on LUP's overall operations; steam required within current system during winter months (November through March)
‡Emission factor from https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf

GHG Reduction from Additional Use of Biogas at the LUP Mill - Natural Gas Savings for Steam Generation

LUP's 2015 total greenhouse gas emissions:	**55770.00**	tonnes CO_{2eq} annually
Amount of biogas used from UASB digesters:	**10**	%
Amount of biogas used from low-rate anaerobic digester:	**13**	%
Savings:	**3**	%
Total greenhouse gas emissions reduction:	**1673.10**	tonnes CO_{2eq} annually

Total annual emissions reduction:	**5568.29**	tonnes CO_{2eq} annually

Direct GHG Emissions during Construction from Equipment

Estimated GHG Emissions for On-Site Construction Equipment - Civil Earthworks

Construction period:	**7**	Months
Total work days:	**147**	Days
Hours worked per day:	**12**	Hours per day
Total equipment useage time:	**1764**	Hours

Emission Equipment	#	Fuel Usage (L/h)	Emission Factors (g/L)			Assumptions	Emission Estimates (tonnes)			
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O	CO_{2e}
Dump Trucks	4	53	2690	0.14	0.082	Table A6-10 HDDV, moderate control	1006	5.24E-02	3.07E-02	1016
Loaders	1	8	2690	0.15	1.1	Table A6-10 Off-Road Diesel	38	2.12E-03	1.55E-02	43
Bulldozers	2	8	2690	0.15	1.1	Table A6-10 Off-Road Diesel	76	4.23E-03	3.10E-02	85
Excavators	3	13	2690	0.15	1.1	Table A6-10 Off-Road Diesel	185	1.03E-02	7.57E-02	208
Roller	1	51	2690	0.15	1.1	Table A6-10 Off-Road Diesel	242	1.35E-02	9.90E-02	272
Concrete Pumper Truck	4	50	2690	0.14	0.082	Table A6-10 HDDV, moderate control	949	4.94E-02	2.89E-02	959
						TOTALS	2496	1.32E-01	2.81E-01	**2583**

NOTES:

Fuel usage - Caterpillar Performance Handbook (Edition 29) was used; assumed mid-range, normal load/haul times - with exception to dump trucks, which were assumed mid range, short to medium haul

Emission Factors obtained from Environment Canada's National Inventory Report (1990-2013) of Greenhouse Gas Sources and Sinks in Canada (ISSN: 1719-0487)

Assumes equipment is in operation 100% of the time during the hours worked per day

Estimated GHG Emissions for On-Site Construction Equipment - Building Envelope, Mechanical Installation, Process Water Storage Tank Erection

Construction period:	**9**	Months
Total work days:	**189**	Days
Hours worked per day:	**12**	Hours per day
Total equipment useage time:	**2268**	Hours

Emission Equipment	#	Fuel Usage (L/h)	Emission Factors (g/L)			Assumptions	Emission Estimates (tonnes)			
			CO_2	CH_4	N_2O		CO_2	CH_4	N_2O	CO_{2e}
Large Cranes (150 t)	2	50	2690	0.15	1.1	Table A6-10 Off-Road Diesel	610	3.40E-02	2.49E-01	685
Small Cranes (50 t)	2	50	2690	0.15	1.1	Table A6-10 Off-Road Diesel	610	3.40E-02	2.49E-01	685
Forklifts	2	3	2690	0.15	1.1	Table A6-10 Off-Road Diesel	37	2.04E-03	1.50E-02	41
Generators	4	6	2753	0.006	0.031	Table A-6, Light Fuel Oil, Industrial	150	3.27E-04	1.69E-03	150
Compressors	4	6	2753	0.006	0.031	Table A-6, Light Fuel Oil, Industrial	150	3.27E-04	1.69E-03	150
						TOTALS	1556	7.07E-02	5.17E-01	**1712**

NOTES:

Emission Factors obtained from Environment Canada's National Inventory Report (1990-2013) of Greenhouse Gas Sources and Sinks in Canada (ISSN: 1719-0487)

Assumes equipment is in operation 100% of the time during the hours worked per day

Diesel Fuel Efficiency of Forklift: http://www.yale.com/emea/en-gb/our-products/product-overview/internal-combustion-trucks/diesel-lpg-forklift-truck-2000-3500kg/

Compressor Fuel Efficiency: http://www.americawestdrillingsupply.com/Downloads/Compressors/Portable%20Compressors%20Full%20Line.pdf

Estimated GHG Emissions for Construction Workers Travelling to and From Work

Workers:	**50**	#
Construction period:	**15**	Months
Total work days:	**315**	Days
Vehicle occupants:	**2**	Workers per vehicle
Average round trip distance:	**150**	km
Total distance travelled:	**1,181,250**	km
Gas consumed:	**177,188**	L

Air Emission	EF (g/L)	Emissions (tonnes)
CO_2	2316	410
CH_4	0.14	2.48E-02
N_2O	0.022	3.90E-03
CO_{2e}		**412**

NOTES:

Assuming a 15L/100 km gas consumption based on the middle ground of the most and least fuel efficient vehicle

http://oee.nrcan.gc.ca/fcr-rcf/public/index-e.cfm

Emission Factors from EC NIR - Table A6-10 Assumes Tier II Light Duty Gasoline Vehicles/Trucks (2004-2013)

TOTAL EMISSIONS DURING CONSTRUCTION: **4707** tonnes CO_{2eq}

Appendix VIII:

Project Sightline Survey

NOTES:

1. Plan is shown in metric U.N.O.
2. Property lines, contours, and aerial photograhy supplied by others and should be verified in field.

SURVEYORS:

REV.	REMARKS	BY	DATE

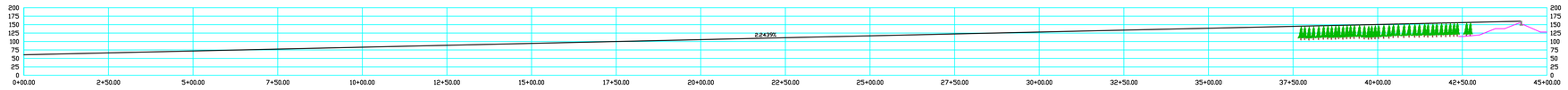
CFM TECHNICAL SERVICES

LAKE UTOPIA PAPER

Sightline Survey

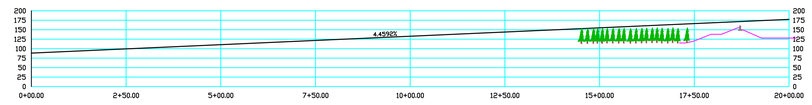
Plan Showing Camera Locations

DRN BY: M. Savoy	CHECKED BY: E. Scott	CFM DRAWING NO: Sightline-locations-009	REV. 0
SCALE 1:4000	PROJECT 44131730	Log # 009 / Date: June 17, 2016	PAGE: 1 of 2

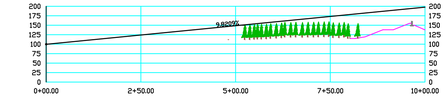


Camera 1

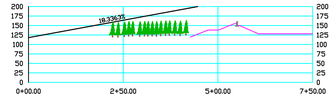
Camera 2



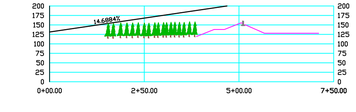
Camera 3



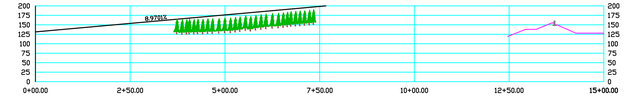
Camera 4



Camera 5



Camera 6



Camera 7

NOTES:
1. Vertical Profiles are only accurate for sightline slope. Trees and ground profiles are for visual only.
2. Section Plan is referenced to "Plan Showing Camera Locations" dated June 17, 2016.
3. Vertical Profiles are shown in Feet U.N.O.

SURVEYORS:

REV.	REMARKS	BY	DATE

DRN BY: M. Savoy
CHECKED BY: E. Scott
SCALE: 1" = 200'
PROJECT: 44131730

CFM TECHNICAL SERVICES

TITLE
LAKE UTOPIA PAPER
Sight Line Survey
Vertical Profile

CFM DRAWING NO: Sightline-profile-010
REV.: 0
Log #: 010
Date: June 17, 2016
PAGE: 2 of 2

Appendix IX:

Public Involvement Information

classified

Villa Chaleur Bathurst NB

Affordable and secure units for people 55 and older. Bachelors, 1 & 2 Bedrooms available
Many services on site:
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- Doctor on site weekly.
- Premises include a vegetable garden and walking trail (1/4 mile).
- All units equipped with fire alarms, heat detectors, stoves and refrigerators.
- Many outside seating areas & tenant parking.
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- One or two bedroom units come with refrigerator and stove and are equipped with cable.
- Heat and electricity are extra.
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- Tenant parking is available.
- A furnished common area is provided for tenants.

Telephone 549-5588

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TENDER/GENERAL NOTICES

TENDER/GENERAL NOTICES

NOTICE - OPEN HOUSE

Open House Notification Prior to Registration of Undertaking
Environmental Impact Assessment Regulation
Clean Environment Act, Opportunity for Public Comment

J.D. Irving, Limited will soon register 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: Low-Rate Anaerobic Digester"

This EIA will examine an effluent treatment upgrade at the Lake Utopia Paper Mill in Utopia, New Brunswick. The upgrade will include the installation of a process water storage tank and a low-rate anaerobic digester. The Project will allow the Mill to continue meeting strict environmental discharge regulations well into the future as part of its on-going modernization program in a very competitive global market place. Overall, this Project will yield positive socio-economic and environmental impacts.

A public open house will be held prior to registration in St. George to incorporate feedback from the public into the registration document.

The Open House will occur on **Tuesday, August 16th, 2016** from **6:00 pm to 8:00 pm** at the following location:

Magaguadavic Center
11 J.D.Spinney Dr
St. George, New Brunswick
E5C 3H6

Another notice will be posted when the EIA is submitted, indicating where the registration documents will be available, as well as additional public involvement opportunities.

Any comments should be submitted directly to the Proponent at:

J.D. Irving, Limited
% Fundy Engineering
27 Wellington Row
Saint John, N.B. E2L 4S1
matt.alexander@jdirving.com

Additional information about the environmental impact assessment process and the public involvement process is available at:

http://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment.html

Notice placed by: J.D. Irving, Limited

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December 3
Christmas Dinner & Music at the Beautiful Estate of Ivan & Vivian Hicks 2 Seats left!

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LEGAL NOTICES

NOTICE OF MORTGAGE SALE

TO: The Estate of David Roy Elliott and Carla Denise Elliott (also known as Carla Denise MacDonald), Original Mortgagors; and All Others to Whom it May Concern

NOTICE IS HEREBY GIVEN that under and by virtue of a certain mortgage bearing the date of February 1, 2011 and registered in the Land Titles Office on February 16, 2011, as number 29805935 made by David Roy Elliott and Carla Denise Elliott as Mortgagors, in favour of **ROYAL BANK OF CANADA** as Mortgagee, and by virtue of the *Property Act*, R.S.N.B. 1973 Chap. P-19 and amendments thereto will for the purpose of obtaining payment of the money secured by the said mortgage, default having been made in the payment thereof, be sold at public auction on Thursday, September 15, 2016 at 1:30 p.m. at the Saint John Courthouse, those lands and premises being situate at 1 Prince Lane, Grand Bay-Westfield, NB, and identified as PID No. 00218845.

TOGETHER WITH all the buildings and improvements thereon, including any personal property, and the rights, privileges and appurtenances thereto or any way appertaining.

AND FURTHER NOTICE is hereby given that if a sufficient offer to purchase is not received for the said lands and premises at such public auction the same may be withdrawn from such sale and disposed of by private contract without further notice given.

DATED at Dartmouth, Province of Nova Scotia, this 3rd day of August, 2016.

Royal Bank of Canada

By Joshua I. Smitiuszew lawyer for Royal Bank of Canada, the mortgagee

LEGAL NOTICES

NOTICE OF MORTGAGE SALE

TO: Norman Gregory Finamore and Sarah Marie Green, Original Mortgagors; and All Others to Whom it May Concern

NOTICE IS HEREBY GIVEN that under and by virtue of a certain mortgage bearing the date of October 15, 2009 and registered in the Land Titles Office on October 19, 2009, as number 27917275 made by Norman Gregory Finamore and Sarah Marie Green as Mortgagors, in favour of Royal Bank of Canada as Mortgagee, and by virtue of the *Property Act*, R.S.N.B. 1973 Chap. P-19 and amendments thereto will for the purpose of obtaining payment of the money secured by the said mortgage, default having been made in the payment thereof, be sold at public auction on Thursday, August 25, 2016 at 1:30 p.m. at the Saint John Courthouse, Justice Building, 46 Peel Plaza, Saint John, New Brunswick, those lands and premises being situate at 185 Montreal Avenue, Saint John, New Brunswick, and identified as PID Numbers 00087704 and 55072557.

TOGETHER WITH all the buildings and improvements thereon, including any personal property, and the rights, privileges and appurtenances thereto or any way appertaining.

AND FURTHER NOTICE is hereby given that if a sufficient offer to purchase is not received for the said lands and premises at such public auction the same may be withdrawn from such sale and disposed of by private contract without further notice given.

DATED at Dartmouth, Province of Nova Scotia, this 25th day of July, 2016.

By Jon D. Warnock, lawyer for Royal Bank of Canada, the mortgagee

LEGAL NOTICES

NOTICE OF MORTGAGE SALE

TO: **Edna Patricia Ingalls**
Estate of Harold Mabury Ingalls
153 Hill Road
Grand Manan, NB E5G 4C5

AND ALL OTHERS TO WHOM IT MAY CONCERN:

NOTICE IS HEREBY GIVEN that under and by virtue of a certain Mortgage bearing the date of April 4, 2008 and registered in the Land Titles System on April 17, 2008, as Number 25429181 made between Edna Patricia Ingalls and Harold Mabury Ingalls as Mortgagors, and Scotia Mortgage Corporation, as Mortgagee, and under and by virtue of the *Property Act* R.S.N.B. 1973 Chap. P-19, there will for the purpose of obtaining payment of monies secured by the said Mortgage, default having been made in the payment thereof, be sold at public auction on September 12, 2016 at 10:45 a.m. at the Service New Brunswick office located at Gateway Place, 73 Millstream Boulevard, St. Stephen, NB

153 HILL ROAD, GRAND MANAN, NB AND IDENTIFIED AS PID 15070470

TOGETHER with all the buildings and improvements thereon and the privileges and appurtenances thereto belong or in any way appertaining.

FURTHER NOTICE is hereby given that if a sufficient offer of purchase is not received for the said lands and premises at the said public auction the same may be withdrawn from said sale and will be disposed of by private contract without further notice given.

DATED at Moncton, Province of New Brunswick, this 9th day of August, 2016.

Adel Gonch
McInnes Cooper
Moncton, NB E1C 6T8
Phone: (506) 857-8970
Solicitor for Scotia Mortgage Corporation

IRVING

LAKE UTOPIA PAPER

INVESTING IN LAKE UTOPIA PAPER

Hello Neighbour,

We're investing $29 million to improve our environmental performance and sustain jobs at Lake Utopia Paper. This page includes details of the project. We welcome you to join us at the civic center, Magaguadavic place, 11 J.O. Spinney Dr. St. George, N.B. E5C 3H8 from 6:00PM-8:00PM on August 16th, 2016 for a public consultation meeting.

Thank you,

Dale Chaffey

Mill Manager, Lake Utopia Paper

PROJECT OVERVIEW

The project will consist of installing a new:

1. effluent digester
2. process water storage tank
3. pipe bridge
4. pump house
5. biogas safety release flare

All of the construction and project-related activities will take place on mill property.

ODOUR REDUCTION

The new effluent digester will be an in-ground basin. It will be internally leak protected with an impermeable synthetic liner. Two additional layers will cover the top of this basin, providing a gas-tight seal to capture the odour-containing methane gas known as biogas. This biogas will then be used as mill boiler fuel, offsetting the use of fossil fuels.

In addition to the digester project, a new process water tank will be constructed. Adding a process water storage tank will dramatically reduce the outdoor storage of untreated, odourous liquids.

IRVING

LAKE UTOPIA PAPER

INVESTING IN LAKE UTOPIA PAPER

The capital cost for the Project is estimated at $29 million.
The Project will be solely funded by company. No provincial or federal monies are being used.

Approximately 90% of the total expenditure will be throughout New Brunswick companies; 40% for material purchases and 50% for labor.

JOBS REQUIRED DURING CONSTRUCTION

Trade	Example	Hours*
Civil	Carpenters, masons, labourers, iron workers, etc.	50 000
Mechanical	Millwrights and boiler makers	12 500
Piping	Pipefitters	20 000
Electrical	Electricians	12 500
Instrumentation	Instrumentation technicians	2 500
Scaffolding	Carpenters and labourers	2 500
Management	Supervisors and support staff	2 500
Services	Testing, surveying, etc.	18 500
Engineering	Detailed design	16 500
Total		137 500 (69 person years) **

NOTES:
*One person year equals 2 000 hrs
** Not included in this total are various company and external management, engineering, and staff responsibilities

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LAKE UTOPIA PAPER

GOOD FOR BUSINESS AND THE ENVIRONMENT

AIR

There are no new sources of air emissions. The project will significantly reduce odours produced through the treatment of process effluent.

WATER

No watercourses on or near the mill site will be impacted by the construction of this project.

LAND

No new solid waste streams will be created nor will existing streams change following the construction phase of this project.

IRVING

LAKE UTOPIA PAPER

INVESTING IN ST. GEORGE

The capital cost for the Project is estimated at $29 million. The Project will be solely funded by J.D. Irving, Limited. No Provincial or federal monies are being used.

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LAKE UTOPIA PAPER

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LAKE UTOPIA PAPER

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LAKE UTOPIA PAPER

BIOGAS PRODUCTION

Producing Biogas reduces Lake Utopia's need for fossil fuels. This reduction in fossil fuel energy can be equated to:

GENERATING POWER

to heat 4,200 New Brunswick homes per year

DRIVING

3,900 cars per year

FLYING

130 round trip flights from Saint John to Toronto per year

IRVING

LAKE UTOPIA PAPER

PROJECT OVERVIEW

Lake Utopia Paper

Effluent Treatment Upgrade Project

J.D. Irving, Limited, St. George, New Brunswick

PROJECT OVERVIEW

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Engineering	Detailed design	16 500
	Total	137 500 (69 person years) **

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*One person year equals 2 000 hrs
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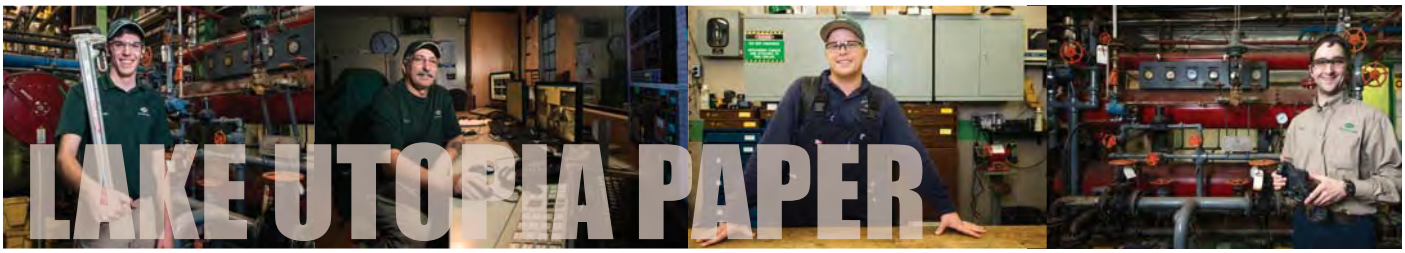

INVESTING IN LAKE UTOPIA PAPER

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to heat 4,200 New Brunswick homes per year

DRIVING

3,900 cars per year

FLYING

130 round trip flights from Saint John to Toronto per year

NEXT STEPS

Submission of the Environmental Impact Assessment (EIA)
Proposal by JD. Irving, Limited will be submitted following the Open House to the Department of the Environment & Local Government under the Environmental Impact Assessment Regulation – Clean Environment Act.

August 16, 2016
Open House
To be held August 16th, 2016 at the Magaguadavic Center in St. George, NB

Public Involvement
The public is encouraged to participate in a public engagement process by sharing their concerns & comments. Official comment period will formally end 60 days after the EIA submission.

Detailed copies of the proposal will be available for review following submission at:

- NBDELG regional office at 8 Castle Street
- St. Stephen NBDELG district office at 41 King Street

IRVING
LAKE UTOPIA PAPER

Contact:

Matt Alexander
Fundy Engineering & Consulting Ltd.
27 Wellington Row
Saint John, NB, E2L 4S1
(506) 674-9422
Email: matt.alexander@fundyeng.com

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