Saint John Airport – Environmental Impact Assessment for Proposed WWTP Upgrade

Final Report

162832.01 ● Final Report ● October 2016

Prepared for:

Aéroport de SAINT JOHN Airport

Prepared by:

CBCL LIMITED
Consulting Engineers

Final Report	Amy Winchester	Oct. 7/16	Carrie Bentley
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Issue or Revision	***Reviewed By:***	***Date***	***Issued By:***

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Solving today's problems with tomorrow in mind

12 October 2016

Pierre Doucet
Project Manager
Environmental Assessment Section
NB Department of Environment and Local Government
Marysville Place
PO Box 6000
Fredericton, NB
E3B 5H1

Dear Mr. Doucet:

RE: Saint John Airport – Environmental Impact Assessment for Proposed WWTP Upgrade

In March 2016, CBCL Limited was engaged to prepare a detailed design for the upgrades to the wastewater treatment plant (WWTP), including the installation of a new treatment process to replace the existing rotating biological contactor (RBC) system. Per Schedule A of the Environmental Impact Assessment (EIA) Regulation (Regulation 87-83) under the Clean Environment Act, construction, modification, or decommissioning of a sewage disposal or treatment facility requires a Determination Review from the New Brunswick Department of Environment and Local Government (NBDELG).

The EIA Registration Document, included within is being submitted to NBDELG to officially register the project. A cheque for $2,750 is being submitted directly from the Proponent.

If you have any questions related to the project or assessment, please do not hesitate to contact me.

Yours very truly,

CBCL Limited

Amy Winchester

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CC: Brian Wiggins, Saint John Airport
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Project No: 162832.01

CANADA'S BEST MANAGED COMPANIES

Contents

Appendices

List of Acronyms

A	Adverse Cumulative Environmental Effect
AAS	Aboriginal Affairs Secretariat
ACAP	Atlantic Coastal Action Program
ACCDC	Atlantic Canada Conservation Data Centre
BOD5	5-day Biochemical Oxygen Demand
BWL	Average Bottom Water Level
^{o}C	Degree Celsius
CBOD5	5-day Carbonaceous Biochemical Oxygen Demand
CCME	Canadian Council of Ministers of Environment
CEAA	*Canadian Environmental Assessment Act*
CoA	Certificate of Approval
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CRA	Commercial, Recreational and/or Aboriginal
CWS	Canada Wildlife Service
DFO	Fisheries and Oceans Canada
DO	Dissolved Oxygen
EIA	Environmental Impact Assessment
EC	Environment Canada
EDOs	Effluent Discharge Objectives
EMP	Environmental Management Plan
EPP	Environmental Protection Plan
ERP	Emergency Response Plan
F/M	Food to Microorganism
gpm	Gallons per Minute
HWL	High Water Level
km	kilometre
km/h	kilometres per hour
m	metre
m^2	square metre
m^3	cubic metre
m^3/d	cubic metres/day

MBBA	Maritime Breeding Bird Atlas
MBCA	*Migratory Birds Convention Act*
MBR	Migratory Bird Regulations
mg/L	Milligrams per Litre
MLSS	Mixed Liquor Suspended Solids
mm	millimetre
MTI	Mi'gmawe'l Tplu'taqunn Incorporated
NBDELG	New Brunswick Department of Environment and Local Government
NBDEM	New Brunswick Department of Energy and Mines
NBESA	New Brunswick *Species at Risk Act*
NBDNR	New Brunswick Department of Natural Resources
NPSs	National Performance Standards
NS	Not Significant Cumulative Residual Effect
OI	Operator Interface
P	Potential Positive Cumulative Environmental Effect
PID	Service New Brunswick Parcel Identifier
PLC	Programmable Logic Controller
PSW	Provincially Significant Wetlands
RBC	Rotating Biological Contactor
S	Significant Cumulative Residual Effect
S-Ranks	Subnational Rarity Ranks
SARA	*Species at Risk Act*
SBR	Sequencing Batch Reactor
SRT	Solids Residence Time
TSS	Total Suspended Solids
UTM	Universal Transverse Mercator
UV	Ultraviolet
VEC	Valued Ecosystem/Environmental Component
WAWA	Watercourse and Wetland Alteration
WHMIS	Workplace Hazardous Materials Information System
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant
YOY	Young-of-Year

CHAPTER 1 INTRODUCTION

1.1 Name of the Project

Saint John Airport Wastewater Treatment Plant Upgrades, East Saint John, NB.

1.2 Project Overview

CBCL Limited (CBCL) was retained by the Saint John Airport (Airport; the Proponent) to conduct an environmental impact assessment (EIA) for the proposed wastewater treatment plant (WWTP) upgrades (the Project). Per Schedule A of the *Environmental Impact Assessment Regulation (Regulation 87-83)* under the New Brunswick *Clean Environment Act*, construction, modification, or decommissioning of a sewage disposal or treatment facility requires a Determination Review by the New Brunswick Department of Environment and Local Government (DELG). This EIA Registration Document has been prepared in accordance with DELG's *Registration Guide* (2012), as well as sector-specific guidance as presented in the DELG document, *Additional Information Requirements for Wastewater Treatment Plants* (2004).

The Airport currently utilizes a WWTP located to the southeast of the main terminal building for the treatment of wastewater influent consisting primarily of domestic waste. The existing WWTP utilizes a rotating biological contactor (RBC) secondary treatment system to meet the 5 day carbonaceous biochemical oxygen demand (CBOD5) and total suspended solids (TSS) effluent requirements pursuant to their current Certificate of Approval (CoA). The existing WWTP currently treats an average of 105m^3/day of influent and discharges the treated effluent to the Mispec River (approximately 110m to the east of the WWTP). The WWTP was constructed in 1976 and still utilizes the original RBC equipment. The existing layout currently meets the effluent requirements of the CoA (i.e., 25mg/L CBOD5 and 25mg/L TSS); however, there are a number of issues that have been identified with the existing system. The most significant concern is related to occupational health and safety.

The Proponent is proposing to upgrade the existing WWTP by moving from a RBC system to a sequencing batch reactor (SBR), increasing the treatment capacity to accommodate a future average day flow of 170m^3/d, while still meeting the prescribed effluent requirements of the current CoA, and replacing the existing chlorination system with an ultraviolet (UV) disinfection system. A conceptual design for upgrades to the WWTP was developed as part of a 2014 assessment report (CBCL, 2014a)

The upgraded system will be installed within the boundaries of the current site and once complete, the above-ground WWTP components will have a similar footprint to the existing WWTP; however, the total footprint of the upgraded WWTP will become approximately twice the size of the existing footprint.

The proposed Project will include:

- Cleaning, demolition and removal of existing concrete structures related to the abandoned trickling filter, sedimentation basin and secondary clarifier;
- Demolition and removal of the chlorination system;
- Cleaning, demolition and removal of the existing concrete structures related to the RBC system and building;
- Conversion of the existing equalization tank to a sludge storage tank;
- Construction of the new SBR system;
- Construction of the new Control Building, housing blowers, the UV disinfection equipment and control system;
- Construction of a new pump station; and
- Construction of 57m of new gravity sewer main, 11m of new forcemain, and two manholes to connect to the existing gravity sewer system and the existing outfall. No modifications will be made to the existing gravity sewer system or to the existing outfall.

Operational activities will include site access, ongoing wastewater treatment and discharge of treated effluent, as well as regular maintenance. The WWTP is being designed to meet the foreseeable needs of the Airport and decommissioning of the upgraded system is not anticipated in the foreseeable future. Therefore, regular maintenance and repair is intended to support the operation of the WWTP indefinitely.

1.3 The Proponent

Table 1.1: Proponent Information

Project Name	Saint John Airport Wastewater Treatment Plant Upgrades
Project Location	Saint John, New Brunswick
Proponent	Saint John Airport 4180 Loch Lomond Road Saint John, NB E2N 1L7
Proponent Contact Person	Brian Wiggins, P.Eng. Director of Operations and Maintenance Telephone: (506) 638-5574 Fax: (506) 638-5550 Email: bwiggins@sjairport.ca
Consultant	CBCL Limited 22 King Street, 4th Floor PO Box 20040

	Saint John, NB E2L 5B2
Consultant Contact Person	Amy Winchester, M.A.Sc., P.Eng. Project Manager Telephone: (506) 633-6650 Fax: (506) 633-6659 Email: amyw@cbcl.ca

1.4 Funding

Saint John Airport Inc. is a “not for profit” entity which manages and operates the Saint John Airport in accordance with the terms of a Ground Lease signed with the Government of Canada. Capital projects are funded through the Replacement Reserve Fund as established and maintained under the direction of the Board of Directors. Capital from the funds comes predominantly from Passenger Facility Fees.

CHAPTER 2 PROJECT DESCRIPTION

2.1 Project Location and Property Ownership

The Project is located at the Saint John Airport in East Saint John, NB, to the northeast of the terminal buildings. The Project is located in property owned by the Government of Canada and is identified by Service New Brunswick Parcel Identifier (PID) number 00354415, the property is approximately 587ha. Figure 2.1 shows a 1:50,000 map highlighting the general location of the WWTP, which is bordered to the north by PID 00354696, owned by the City of Saint John. The WWTP is located at latitude 45.32725404 and longitude -65.88419918.

2.2 Purpose, Rationale and Need for Project

Wastewater influent currently consists primarily of domestic waste, but also includes inputs from a small restaurant and a car wash station located at the Airport. The existing WWTP utilizes a RBC secondary treatment system in order to meet CBOD5 and TSS effluent requirements pursuant to the current CoA. The WWTP was constructed in 1976, and it utilizes the original RBC equipment. There is a trickling filter and sedimentation basin located on the existing WWTP footprint, which have not been in use since before the installation of the RBC system.

Influent is conveyed to the WWTP through two separate systems; the majority of the buildings associated with the Airport, including the main terminal building, are located to the northwest of the wastewater treatment facility and are serviced by a gravity sewer system. Wastewater from the Navigation Canada tower and combined services building, which are located at the south end of the Airport's property, are pumped to the WWTP via a forcemain. Both the gravity sewer system and forcemain discharge to the WWTP's existing pump station at the head of the treatment process.

From the main pump station, influent is supplied to the primary clarifier/influent equalization basin, and then sent to the RBC secondary treatment system. Following treatment, flows are discharged to the secondary clarifier. Sludge from the clarifier is recycled to the head of the RBC system by a progressive cavity pump, whereas clarified effluent overflows to the disinfection chamber where it is chlorinated by calcium hypochlorite tablets. Disinfected effluent is discharged through a 200mm diameter outfall to the Mispec River. Sludge is pumped from the equalization basin and secondary clarifier by a septage hauler and disposed off-site on an irregular basis.

CBCL LIMITED Consulting Engineers	Client: Your YSJ Saint John Airport	Project Description: WWTP SBR UPGRADE GENERAL PROJECT LOCATION	Revision or Issue: ISSUED FOR EIA (2016/09/23)	
			Drawn: SMO	Designed: SMO
			Checked: AMW	Approved: AMW
			Scale: 1:50,000	Project No: 162832.01
			Date: AUG 2016	Figure No: 2.1

Based on the surface area of the contactor media, the existing WWTP was originally designed for a maximum average day flow of approximately 105m^3/day. The data collected by operations staff at the Airport indicate that typical flows are in the range of 65 to 80m^3/day with peak flows of approximately 295m^3/day. However, these data only consist of instantaneous flows measured three times per week by visually estimating the rate as a function of the level above the weir in the chlorine contact tank. CBCL installed a temporary flow meter in an effluent manhole and recorded instantaneous flowrates on five minute intervals over the course of approximately two months. Higher flows were observed compared to the data collected by the operator, indicating that the average flowrate is 105m^3/d. The data also demonstrated that that flows are impacted by inflow and infiltration.

While the WWTP currently meets the effluent requirements of the CoA (i.e., 25mg/L CBOD5 and 25mg/L TSS), there are a number of issues that have been identified with the existing system. The most significant concern is related to occupational health and safety. In order to access the influent pumps and the manual bar screen, operators must enter a space in the existing RBC Building, with poor access and minimal ventilation, and they are forced to use a below-grade platform that has been flooded on various occasions by raw influent. Furthermore, the equipment is heavily corroded due to its age.

Main plant pump station

The chlorination system is located in a very small structure with poor access and ventilation. In order to feed new chlorine pucks to the disinfection system, operators are required to descend from an access platform and balance on a baffle wall of the chlorine contact chamber in order to access the tablet feeder system.

The concern with the RBC system is that it was installed above the operating floor in the RBC Building. As a result, operators may potentially be exposed to contact with raw wastewater from splashing caused by the RBC's bucket pump. This device is essentially a large bucket that is fixed to an arm that rotates with the contactor media. The bucket collects influent from the RBC's inlet chamber, and then dumps the load into the RBC's biozone, or reaction chamber. This creates splashing within the building on each rotation. In addition to the splashing concerns, the RBC system was installed in the late 1970s and has surpassed its mechanical design life.

Chlorine tablet feeder

Other deficiencies noted in the assessment report include: high degree of corrosion on the pipes, valves, and steel tank; corrosion of the roof system in the RBC building; the ventilation system requires upgrades in the RBC building; and the RBC and secondary clarifier are approaching their design capacity (CBCL, 2014a).

Upgrading the existing WWTP will yield the following benefits:

- The RBC system and building will be replaced, including the replacement of all corroded pipes, valves, tanks and the roof;
- The RBC system will be replaced with a new SBR system designed with ample capacity;
- The construction of a new SBR system will replace the RBC system, thereby eliminating the potential for operators to enter a space with poor access and to contact raw wastewater;
- The SBR system has been selected because of its ability to handle large variability in flows; and
- The existing chlorination system will be replaced with a UV disinfection system, housed in a new Control Building which will eliminate the discharge of chlorinated water to Mispec River.

2.3 Project Alternatives

The Proponent and design team evaluated the following two alternatives to the proposed Project:

- Continuation with existing RBC system along with the release of chlorinated water (i.e., do nothing) – however, due to the health, safety and reliability concerns, this was not considered to be an acceptable approach;
- Replacement of the system with a newer RBC system – a technical evaluation of the RBC system against the SBR system revealed multiple advantages of the SBR over the RBC, including the benefit of the SBR system being able to handle highly variable flows, which are typical of the conditions experienced at the Airport.

2.4 Site Layout and Siting Considerations

The upgrades will take place at the existing WWTP. See Figures 2.2 and 2.3 for the existing and proposed upgrades. Influent will be conveyed to a new pump station via the existing collection system. A manhole will be constructed in order to access the existing gravity sewer main coming from the majority of the Airport buildings and the forcemain from the buildings located at the south end of the Airport. The RBC system and building will be demolished. The new SBR system, including new sewer mains, and Control Building, which will house blowers, the UV disinfection system and control equipment, will be located adjacent to the existing facility. Treated effluent from the WWTP will be discharged to the existing outfall. A manhole will be constructed in order to access the existing outfall pipe. No modifications are planned for the existing outfall pipe nor are modifications planned within 30m of the discharge point at the Mispec River.

The Project is located near a property boundary with the City of Saint John. All construction will take place on property owned by the Airport. As part of siting considerations, adjacent land use and the surrounding environment were considered and where possible, the layout was designed to avoid interaction with sensitive environmental features and lands not owned by the Proponent. The layout was also designed to eliminate the requirement for a new collection system, minimize the requirement for new sewer mains, avoid modifications to the outfall pipe and discharge point and reduce the requirement for disturbance of greenfield areas and new site access.

2.5 Physical Components and Dimensions of the Project

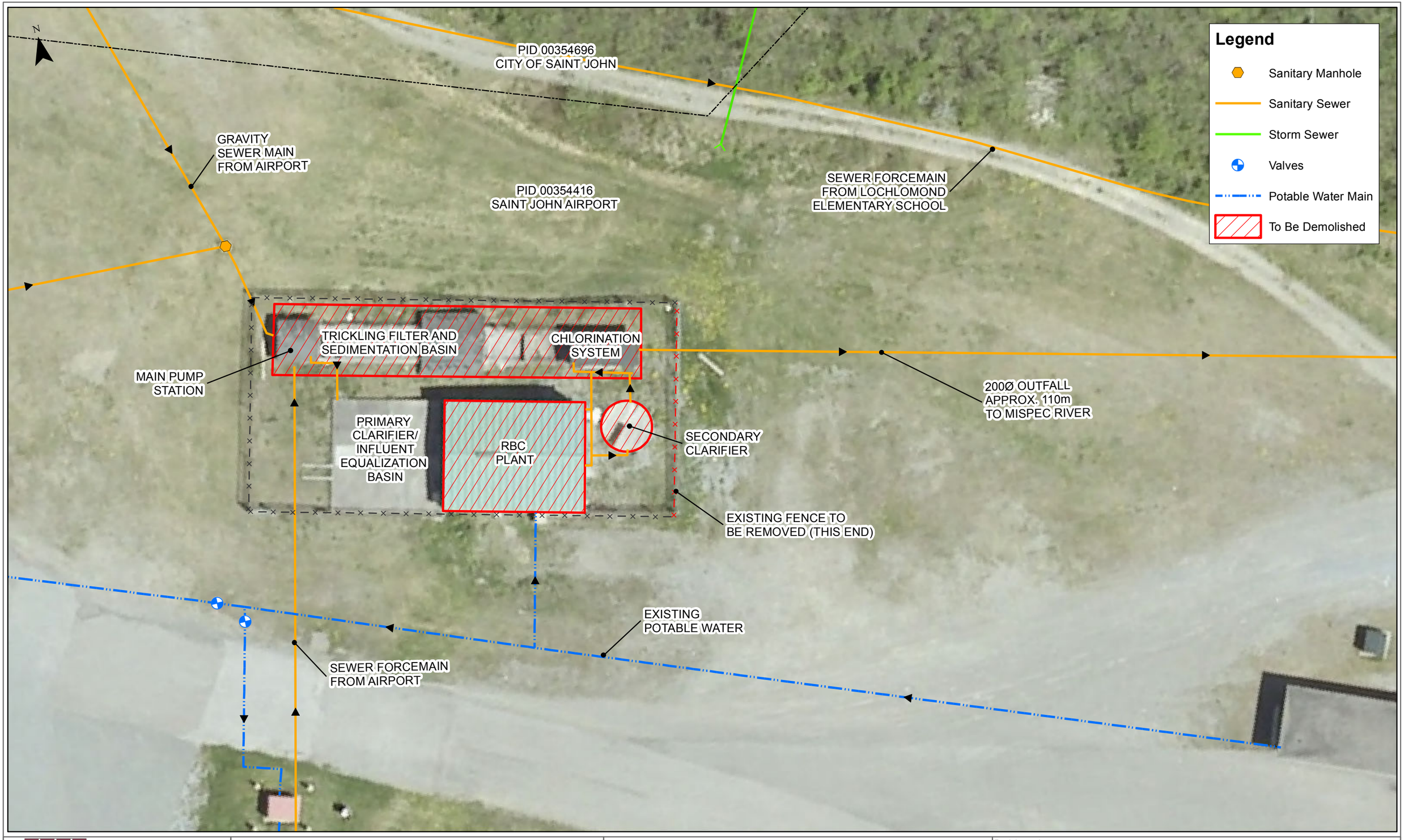
The proposed layout for upgrades to the WWTP is illustrated on Figure 2.3. Once upgrades are complete, above-ground components of the WWTP will have a similar footprint to the existing WWTP, as the existing trickling filter, sedimentation basin, secondary clarifier, RBC system and chlorination system will be demolished and replaced with the SBR tanks and Control Building. The existing equalization tank will be converted to a sludge storage tank. The total footprint of the upgraded WWTP, however, will be approximately twice the size of the existing footprint, as the upgrades will also include the installation of a new pump station and two new manholes to provide access to the existing gravity sewer system and the existing outfall. The footprint of the above-ground WWTP components will increase from approximately 138m^2 to 233m^2. The total footprint of the Project will be approximately 900m^2.

The Project, shown on Figures 2.2 and 2.3, consists of cleaning, demolition and removal of the following components:

- The trickling filter and sedimentation basin;
- The chlorination system and structure;
- The RBC system and secondary clarifier; and
- The RBC building.

The proposed upgrades to the WWTP will include:

- The new manhole constructed on the existing gravity sewer main;
- The new pump station approximately 12.2m^2;
- The new SBR tanks approximately 64m^2;



CBCL LIMITED
Consulting Engineers

Client
Your YSJ Saint John Airport

Project Description
WWTP SBR UPGRADE
SITE PLAN
EXISTING CONDITIONS AND DEMOLITION

Revision or Issue
ISSUED FOR EIA (2016/09/23)

Drawn	Designed	Checked	Approved
SMO	BM	AMW	AMW

Scale	Project No	Date	Figure No
1:200	162832.01	AUG 2016	2.2

N

Legend

- Existing Manhole
- Proposed Manhole
- Existing Sanitary Sewer
- Proposed Sewer Main
- Sewer to be Abandoned
- Existing Storm Sewer
- Valves
- Potable Water Main
- Proposed Structures
- Future Proposed
- To Be Demolished

EXISTING GRAVITY SEWER MAIN FROM AIRPORT

PROPERTY LINE

150mm INFLUENT FORCEMAIN

NEW PUMP STATION

100mm LOW PRESSURE AIR TO SBR

EMERGENCY BYPASS

EXISTING SEWER FORCEMAIN FROM LOCHLOMOND ELEMENTARY SCHOOL

FUTURE SBR

NEW SBR

NEW BLOWER, UV AND CONTROL BUILDING

200Ø OUTFALL APPROX. 85m TO MISPEC RIVER

SLUDGE STORAGE

CONNECT TO EXISTING FORCEMAIN

TREATED EFFLUENT

PROPOSED FENCE

WASTE ACTIVATED SLUDGE PUMP FROM SBR TO SLUDGE STORAGE

SECONDARY EFFLUENT TO UV DISINFECTION SYSTEM

EXISTING POTABLE WATER

LOW PRESSURE AIR TO SLUDGE STORAGE

EXISTING SEWER FORCEMAIN FROM AIRPORT

CBCL LIMITED
Consulting Engineers

Client: Your YSJ Saint John Airport

Project Description: WWTP SBR UPGRADE
PROPOSED SITE PLAN

Revision or Issue: ISSUED FOR EIA (2016/09/23)

Drawn	Designed	Checked	Approved
SMO	BM	AMW	AMW

Scale	Project No	Date	Figure No
1:200	162832.01	AUG 2016	2.3

- The new Control Building with blowers and the UV disinfection system approximately 100m^2;
- Conversion of the existing equalization tank to a sludge storage tank;
- The new manhole constructed on the existing outfall pipe; and
- Approximately 57m of new gravity sewer main and 11m of forcemain connecting the new SBR system with existing infrastructure.

Limited flow and influent data were available from the Airport's WWTP. Flows were recorded several times per week by reading the level above the v-notch weir in the disinfection chamber. BOD5 and TSS data are available from samples that were collected by Airport WWTP operators in the equalization basin/primary clarifier on a monthly basis since 2009. These data were used to develop the design criteria for the WWTP and are summarized in Tables 2.1 and 2.2. Additional wastewater quality data and five minute flow data were collected by CBCL Limited. The influent quality data collected by CBCL demonstrated that the influent quality data collected by Airport operations staff is sufficient for developing the influent design parameters. The additional flow data demonstrated that the flows measured by the airport underestimated the actual influent flows at the facility. The flow data are summarized in Tables 2.1 and 2.2.

Table 2.1: Existing Average Flows at the Saint John Airport WWTP

Year	Flow m^3/d (gpm)	
	Average	Peak
2009	130m^3/d (23gpm)	295m^3/d (54gpm)
2010	90m^3/d (16gpm)	260m^3/d (48gpm)
2011	80m^3/d (14gpm)	295m^3/d (54gpm)
2012	50m^3/d (9gpm)	230m^3/d (42gpm)
2013	50m^3/d (9gpm)	130m^3/d (24gpm)
2014	60m^3/d (11gpm)	230m^3/d (42gpm)
2015	55m^3/d (10gpm)	230m^3/d (42gpm)
2016	54m^3/d (10gpm)	98m^3/d (18gpm)
Total	66m^3/d (12gpm)	295m^3/d (54gpm)

Table 2.2: Summary of Flow Data Collected by CBCL Limited

Parameter	Flow Rate
Peak Instantaneous Flow	620m^3/d
Peak Hour Flow	465m^3/d
Max Day Flow	350m^3/d
Max Month Flow	115m^3/d*
Average Flow	105m^3/d

*Based on 30 day rolling average

Monthly influent wastewater quality data were provided for samples collected by Airport WWTP operators and have been updated with recent data collected by CBCL. In addition to the monthly

monitoring for BOD5 and TSS, the operator also measures influent pH, temperature, and dissolved oxygen several times per week at the WWTP.

Table 2.3: Existing Average Influent Wastewater Quality at the Saint John Airport WWTP

Year	BOD5 (mg/L)	TSS (mg/L)
2009	37	20
2010	64	58
2011	80	92
2012	54	56
2013	87	88
2014	98	139
2015	114	68
2016	170	75
Average	90	80

Average influent BOD5 and TSS concentrations currently experienced at the WWTP are low, and are an indication of inflow and infiltration within the collection system. It should be noted that BOD concentrations have increased in 2015 and 2016.

Existing effluent data collected from the Airport WWTP by operations throughout 2013 are provided in Table 2.4.

Table 2.4: Existing Effluent Wastewater Quality at the Saint John Airport WWTP

Date	pH	CBOD5 (mg/L)	TSS (mg/L)	NH_3 (mg/L)	Total Phosphorus (mg/L)	Nitrate (mg/L)
Jan.02/13		12	7			
Feb.13/13		26	13			
Feb.27/13		30	8			
Mar.13/13		5	6			
April 10/13		1	5			
May 08/13		2	9		3.95	28.7
June 05/13		3	8	4.9		
July 03/13		<1	3		0.8	9.4
Aug.14/13		5	2	<0.5		
Sep.10/13		7	14			
Oct.08/13		11	8		5.4	37
Nov.05/13	6.75	6	21	12.8		
Dec.17/13		2	3	6.4		
Average	**6.8**	**9.2**	**8.2**	**8**	**3.4**	**25**

The average effluent CBOD5 and TSS for the 2013 year were below the WWTP's operating requirement of 25mg/L, in accordance with the CoA; however, in February 2013, CBOD5 exceeded the operating requirement on two occasions. The TSS and CBOD5 concentrations were in compliance with CoA requirements through the remainder of testing in 2013.

The design criteria for the WWTP upgrade, as presented below, was based on available 2009 to 2016 influent data supplied by Airport Staff (as presented above) and flow data collected by CBCL Limited. Given the nature of flows at the WWTP, the Airport selected a SBR system to replace the existing RBC system, designed to meet the effluent requirements of the current CoA, which includes CBOD5 and TSS concentrations of 25 mg/L. Recent discussions with DELG indicate that effluent requirements are not expected to change for the upgraded WWTP (B. Legere, DELG, pers. comm. April 12, 2016). The quality of the effluent being discharged will be clearly defined and regulated through the CoA process administered by the DELG. A copy of the facility's Approval to Operate is included in Appendix A.

Influent loading conditions were selected to allow for moderate growth of 2.0% over a 25 year period, for a future average day flow of 170m^3/d and daily BOD5 and TSS loads of 160mg/L each. The upgraded design will also allocate space for a future reactor, in the event that development at the Airport proceeds above the anticipated rate.

Preliminary treatment for the SBR system will include grinding. The new pump station will be sized to allow flow equalization and some settling of coarse solids before it is pumped to the SBR system. The main treatment components of the upgrades are the SBR system tanks, which will be designed based on the parameters listed in Table 2.5. A total of two SBR tanks will be installed as part of the WWTP upgrades.

Table 2.5: Design Parameters for the SBR System Upgrade at the Saint John Airport WWTP

Design Parameters	
Hydraulic Residence Time	24 hours
Solids Residence Time (SRT)	16 days
MLSS at TWL	3,000mg/L
Food to Microorganism (F/M)	0.07
Sludge Production	30kg/d

MLSS – Mixed liquor suspended solids
TWL – Top water level

The dimensions and water levels of each SBR tank are as follows:

- Length = 7.0m
- Width = 3.0m
- High Water Level (HWL) = 4.9m
- Average Bottom Water Level (BWL) = 3.7m

The proposed upgrades to the WWTP are intended to address system deficiencies that are primarily related to occupational health and safety. The design will allow for future development at the Airport, but the primary reason for the upgrades is not related to the capacity of the WWTP.

The current and proposed design conditions are compared in the tables below. It should be noted that the proposed design conditions are somewhat different from those developed as part of the 2014 assessment report (CBCL, 2014a), due to the availability of additional information.

Table 2.6: Existing and Proposed Influent Design Conditions at the Saint John Airport WWTP

Parameter	Existing Conditions	Proposed Design*
Average Flow	110m^3/d	170m^3/d (peak 510m^3/day)
Average BOD5	140mg/L*	160mg/L
Average TSS	70mg/L*	160mg/L
Average Load	15kg/d of BOD5* 8kg/d of TSS*	27kg/d of BOD5 27kg/d of TSS

*Based on Average BOD and TSS data from 2015 and 2016

Table 2.7: Existing and Proposed Effluent Design Conditions at the Saint John Airport WWTP

Parameter	Existing Conditions	Proposed Design
Average Flow	65m^3/d (observed) 80m^3/d (allowed)	170m^3/d (Eight 30 min. batches 12L/s)
Average CBOD5	25mg/L	25mg/L
Average TSS	25mg/L	25mg/L

In addition to health and safety related issues, the proposed WWTP upgrades are intended to provide a more dependable treatment process and the new SBR system will eliminate the need for chlorine disinfection.

2.6 Construction Details

A brief description of the construction sequence for the proposed WWTP upgrades is included in Table 2.8.

Table 2.8: Description of Construction Activities for the Saint John Airport WWTP Upgrade

Construction Activity	Description
Site access and staging	• Construction access will be provided primarily from Loch Lomond Road via the main Airport entrance. Construction vehicles and work will take place away from the public areas; • Lay-down area will be set up to store contractor's equipment and materials; • Hazardous materials will be stored at least 30m from any waterbody and in a secure location to maintain containment and avoid discharge

Construction Activity	Description
	to the waterbody. This setback is not possible for the wetland, therefore dyking will be constructed to contain any spills; and • Construction equipment will be refuelled at a designated (paved, level) location, a minimum of 30m from any waterbody or wetland. If it is not practical to handle or store these products at this setback, dyking will be constructed to contain any spills.
Installation of environmental controls	• Sediment control measures will be installed prior to commencement of construction and will be maintained appropriately throughout construction; and • Sediment control measures will form part of the Project-specific Environmental Management Plan (EMP).
Grubbing	• Grubbing will be limited at the WWTP due to the nature of the existing conditions. The area of the existing WWTP has been previously cleared and consists primarily of grass and low lying scrub vegetation which will be removed via grubbing; • If required, clearing activities will adhere to applicable regulatory requirements; • Vegetation removal will adhere to applicable regulatory requirements, conditions of any approvals obtained for the Project and the Project-specific EMP; • Grubbing will involve the removal of all organic materials and unsuitable soil from the proposed work areas (e.g., stumps, roots, embedded logs, root mat). Bulldozers will be used to separate the organic material from the underlying soil; and • If grubbed material cannot be reused on site, the material will be removed from the site for disposal, but will not be located within 30m of any watercourse or wetland.
Excavation and grading	• Excavation will include the removal, placement, disposal or stockpiling of materials removed from proposed work areas. The required cut and fills for the Project component footprints will be managed so that all suitable material can be reused on the site; • If fill materials are required, the material will be obtained from an approved local aggregate and fill source and trucked to the site using the existing road network; • Topsoil and subsoil will be stockpiled in separate locations, placed at least 30m from any watercourse or wetland; • Stockpiled materials will be covered and protected from wind and water erosion; and • It is anticipated that construction equipment required for excavation and grading will include excavators, bulldozers, graders, loaders and dump trucks. It is not anticipated that blasting will be required.

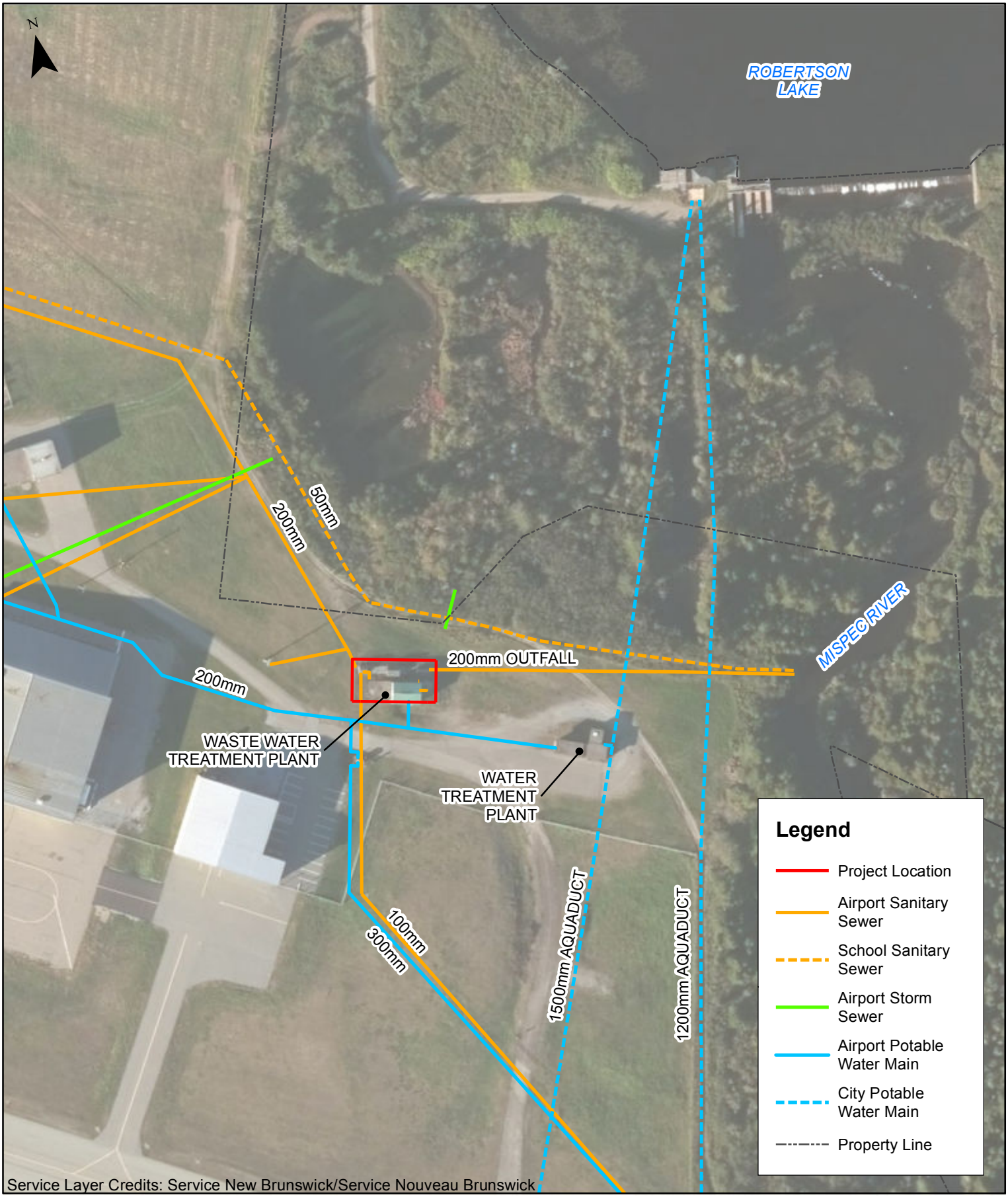
Construction Activity	Description
New component construction	• The existing WWTP will remain operational during the construction of the new facilities; • All construction materials, methods, and testing procedures shall be undertaken in accordance with industry standards; and • If contaminants are detected, proper mitigation techniques will be applied.
Demolition of existing components	• Existing RBC system equipment will be cleaned by approved contractor prior to demolition; • The sedimentation basin, trickling filter, RBC system and secondary clarifier and the RBC building will be demolished; and • Waste material will be handled and disposed of at an approved off-site facility.
Site restoration	• All construction materials and hazardous wastes will be disposed of properly prior to reinstatement of Project site; and • The footprint of the sedimentation basin, trickling filter and secondary clarifier will be topsoiled and hydroseeded.

2.7 Operation and Maintenance Details

The potable water supply for the Airport is from Robertson Lake. Transmission mains transport water from Robertson Lake, upstream of the dam, to Latimer Lake, where the City of Saint John's potable water system is fed. The Airport ties into the 1500mm diameter transmission main from Robertson Lake and supplies the WWTP with screened and chlorinated water. The discharge of the WWTP is located in the Mispec River, downstream of where the potable water supply comes from. The potable water system for the Airport is shown on Figure 2.4. The proposed upgraded plant will continue to need a potable water feed. The service will include a backflow preventer.

The plant is supplied power from the Saint John power transmission system, operated by Saint John Energy.

The WWTP will be operated based on a six hour cycle during average flow. This will result in four batches per tank per day of 21.2m^3 each. Operation will be controlled by a programmable logic controller (PLC) operating with a touch screen Operator Interface (OI) on timer control with a level override. This system will monitor all process equipment status as well as process variables such as wastewater flow rates and tank liquid levels. The operator will adjust process variables through the OI to optimize plant performance. The OI will provide the operator with a visual overview of plant operation. Operation during average flow will contain fill, fill/react, react, settle, decant, and idle cycles. Operation during peak flows will contain fill, fill/react, react, settle, decant, and fill/decant cycles.



Date	Scale	Drawn	Designed	Checked	Approved	Contract
SEPT 2016	1:1,500	SMO	KDT	AMW	AMW	162832.01

CBCL LIMITED
Consulting Engineers

Client
Your YSJ Saint John Airport

Project Description
WWTP UPGRADE
POTABLE WATER SYSTEM

Figure
2.4

The decanter is designed for the removal of 21.2m³ of effluent over a 30 minute period. This results in an average decanter flow rate of 12L/s. The decanter will also be designed to exclude scum and solids. Scum that accumulates in the SBR tanks may be either sprayed down or physically skimmed off and placed in the sludge storage tank. Depending on the final configuration of the decanter, decant rates are expected to be higher than the average rate and may have to be throttled. Under existing conditions, peak effluent flows are in the range of 7L/s. On days with below average flow rates, the SBR effluent could be throttled to reduce the flow rate, which would consequently extend the decant phase of the process.

The aeration system has been designed for nitrification within the SBR system. Air will be supplied to the fine bubble aeration system by two (2) (1 duty and 1 standby) positive displacement rotary lobe blowers that will be located in the Control Building. The blowers will be sized for 100% of the total air requirements of each SBR tank.

Waste activated sludge will be removed on an automated cycle and pumped to the existing equalization basin, which will be used as a new sludge storage tank. Overflow from the storage tank will discharge to the new pump station at the head of the WWTP. The storage tank has capacity to store approximately 30 days of sludge under future loading conditions. Disinfection will be provided by UV irradiation. This will eliminate the need for chemicals at the facility and eliminate chlorinated water discharged to the receiving waters. The UV disinfection system will be housed in a new Control Building located in the same concrete pad as the existing RBC building. Solids are presently pumped out of the two clarifiers and hauled off-site on an irregular basis. This upgrade will result in an increased volume of sludge due to more effective solids removal, which will lead to a slightly increased frequency of hauling. For this reason, it is recommended that the existing equalization basin be used to provide sludge storage. The supernatant in the sludge storage tank can overflow back to the new pump station at the head of the WWTP.

Sludge will be removed every 30 days by a licensed waste hauler and be transported to a licensed waste management facility.

The existing facility has been observed to be impacted through rain events. The SBR system has been selected because of its ability to handle large variability in flows. Under peak flow conditions, the SBR will operate on shorter cycles. The discharge will be through a batch process. It is anticipated that under average conditions, four discharges per SBR tank will be made per day at a rate of 12L/s over the course of 30 minutes, totaling 170m^3/day. The point of discharge will remain the same as the existing system. The new treatment system will connect to the existing outfall through a manhole, which will eliminate the need to modify the outfall.

2.7.1 Emissions and Discharges

As described above, the main discharge from the WWTP will be the treated effluent. The proposed WWTP effluent must meet the applicable National Performance Standards (NPSs) and the site-specific Effluent Discharge Objectives (EDOs) set out in the *Canada-wide Strategy for the Management of Municipal Wastewater Effluent* (CCME, 2009) for facilities located on federal lands discharging into surface water. The effluent must also meet the requirements of the *Wastewater Systems Effluent*

Regulations pursuant to the *Fisheries Act*, as well as the criteria to be defined through the CoA process administered by the DELG. Specifically the proposed WWTP effluent, ultimately being discharged to the Mispec River, must meet criteria for parameters such as CBOD5 and TSS.

There is no combustion equipment associated with the WWTP.

The most likely source of potential odours would be from the sludge storage tank; however, air will be supplied to control odour emissions. Furthermore, the sludge storage tank is enclosed, which should further reduce the release of odours. The other areas typically associated with odours are headworks facilities and pumping stations. This plant will not include a headworks facility. Instead, an inline grinder will be located within the control building, but in the inline configuration, the system is directly connected to the pipes, so there is no potential for odour release. Regarding the pumping station, it is a relatively small collection system, so there shouldn't be issues with odours in the main pumping station. The SBR process itself includes aeration, and should not be a significant source of odours.

2.8 Accidents and Malfunctions

The proposed WWTP upgrades will be designed and constructed in accordance with all relevant Acts, regulations, codes and standards; however, accidental events and malfunctions may still occur. In order to minimize the potential for accidental events and malfunctions, a Project-specific EMP and Emergency Response Plan (ERP) has been developed and will be implemented for the duration of the Project. Accidental events and malfunctions that may occur include:

- SBR system or equipment failure (e.g., pump failure, flow surge, power failure);
- Hazardous material spill;
- Transportation-related accident;
- Fires;
- Extreme weather event;
- Failure of erosion and sediment control measures; and
- Accidental discovery (e.g., archaeological resources, human remains).

In the event of redundant pump failures or a sudden flow surge during the operation of the Project, the proposed design for the WWTP upgrades includes a bypass from the main pump station to the outfall. In the event of a power failure, the SBR system will be connected to the emergency power from the Airport's emergency power system, which consists of a 400 kW diesel generator.

All Project equipment will meet the requirements of industry standards and be safety certified and fit for its intended use. Regular inspections and maintenance programs will ensure the continued reliability and integrity of all equipment. Accidents and malfunctions are considered and discussed in Chapter 7.0.

2.9 Project Schedule

It is expected that the construction of the proposed works will begin in the spring of 2017 and be completed by the spring of 2018 pending environmental permits and approvals. The estimated hours

of construction are from 7 am to 6 pm, Monday through Saturday. The existing WWTP will be in operation throughout the construction period and the upgraded WWTP is expected to commence operations in the spring of 2018. Once in operation, the upgraded WWTP will operate 24 hours a day, seven days a week, with six hour treatment cycles during average flow. Decommissioning of the upgraded WWTP is not being considered at this time, as it is anticipated that the upgraded WWTP will operate indefinitely.

2.10 Environmental Protection

As shown on Figure 2.2, the construction activities will take place within 30m of a mapped wetland. No construction will occur within the footprint of the wetland. The following environmental protection measures will be incorporated as part of the proposed Project design to mitigate potential environmental impacts during construction and operation activities:

- In areas identified as wetlands, high visibility flagging will be used to indicate the limits of the wetlands. No machinery will be allowed within the wetland and no vegetation will be cleared within those limits until all applicable permits and approvals have been acquired;
- The flagging will be maintained throughout construction activities and removed following site restoration;
- No work will take place within 30m of the wetland, when the anticipated precipitation is greater than 25mm per 24-hour period;
- Stockpiled materials will be placed in a location where the risk of runoff from the piles into the wetland is eliminated;
- Sediment and erosion control fencing will be installed 30m perpendicular to the construction footprint;
- Exposed areas will be watered to control dust;
- Site restoration and re-vegetation will be undertaken, as required, as soon as construction activities are complete. Consideration will be given to progressive reclamation, where possible;
- The DELG Regional Wetlands Biologist will be notified weekly via fax on the progression of construction activities; and
- All stockpiled materials will be covered to prevent erosion and contained within the limits of the construction site, away from wetland areas.

With the implementation of the environmental protection measures described above, only the Project activities that are still considered to have potential adverse effects will be brought forward for further assessment.

2.11 Environmental Management

The objective of environmental management is to implement safe, environmentally responsible, and sound engineering, construction, operation, and training practices. The Airport is committed to articulating and adhering to systems, procedures, practices and materials that will ensure the development and operation of the Project is executed in a manner that protects the environment and facilitates the safety of all who work or visit the site. The principle components of an environmental management system include the preparation of the following:

- Environmental Protection Plan (EPP);
- Environmental Compliance and Effects Monitoring Plan; and
- Emergency Response and Contingency Plan.

The intent of the environmental management system is to:

- Define environmental, health and safety responsibilities and accountabilities for personnel;
- Ensure compliance with regulations, goals and objectives;
- Conduct environmental monitoring for potentially affected components;
- Establish minimum standards for a contractor safety and the implementation of environmental protocols in the field;
- Establish safe work practices and procedures documentation that ensure basic precautions for preventing accidents, injuries or illnesses in the performance of work;
- Define environmental practices and procedures that establish minimum standards for all operations that have a potential to cause environmental problems;
- Define minimum safety training standards to ensure that all personnel are aware of potential Hazards and know safe work practices and emergency procedures; and
- Establish an accident/incident reporting system that standardizes prompt reporting of all injuries and environmental incidents.

A draft EMP has been prepared specifically for this Project and is included in Appendix B. Once the EIA review is completed, any additional conditions will be added to the EMP.

2.11.1 Environmental Protection Plan (EPP)

The EPP will be developed by the contractor based on the Project-specific EMP. It will outline specific environmental and engineering measures that will be employed during construction (e.g., the deployment of techniques to control erosion and sedimentation and measures to prevent spills of hazardous materials). The EPP will expand upon measures identified in this EIA and will accommodate recommendations from the regulatory authorities. These requirements will be brought to the attention of all personnel working on the site.

2.11.2 Emergency Response and Contingency Plan

The goal of the Emergency Response and Contingency Plan is to reduce the frequency, extent and duration of accidental events and to reduce the risk to the environment and public safety from such events. This plan will be developed in consultation with relevant federal and provincial agencies for both the construction and operation of the Project. The plan will designate personnel responsible for specific actions, and ensure that an effective communications and reporting system is in place.

CHAPTER 3 REGULATORY FRAMEWORK

The following sections detail the likely regulatory permitting and approval requirements to which the proposed WWTP upgrades will be subject (i.e., requirements for approval of the undertaking in accordance with the DELG's 2012 Registration Guide). It also details the environmental legislation and regulations to which the Proponent and contractors must comply with during construction activities. The review is based on current legislation; any future amendments to existing legislation may modify permitting and approval requirements for the Project. The permitting and approvals processes described below are not exhaustive and represent the more significant regulatory requirements. Additional permitting and approval requirements may exist.

3.1 Federal Regulatory Requirements

3.1.1 Canadian Environmental Assessment Act

The Project does not meet any of the triggering criteria for the *Canadian Environmental Assessment* Act (CEAA) 2012, in accordance with the Regulations *Designating Physical Activities* (Govt. of Canada, 2014). However, for non-designated projects on federal lands, federal authorities must determine whether a project is likely to cause significant adverse environmental effects before they make any decision that would allow a project to proceed, in accordance with CEAA 2012.

3.1.2 Fisheries Act

The *Fisheries Act* was amended in 2012 to focus on protection of the productivity of commercial, recreational and aboriginal (CRA) fisheries. Section 35 of the Act includes a prohibition against causing serious harm to fish that are part of or support a CRA fishery. The discharge of effluent into the Mispec River and nearshore construction activities associated with upgrading the WWTP may therefore require a Section 35 authorization pursuant to the Act. Projects that cause serious harm to fish must offset that harm through the implementation of an offsetting plan. Furthermore, Section 36 of the Act includes a prohibition against the deposition of a deleterious substance into waters that are frequented by fish, however this section of the Act is administered by Environment Canada rather than Fisheries and Oceans (DFO).

The proposed WWTP effluent must meet the requirements of the *Wastewater Systems Effluent Regulations* pursuant to the *Fisheries Act*. The Regulation was developed to fulfill a commitment for

national effluent quality standards under the *Canada-wide Strategy for the Management of Municipal Wastewater Effluent* (CCME, 2009) for facilities located on federal lands discharging into surface water. The Canada-wide Strategy also contains applicable NPSs and site-specific EDOs that must be adhered to during the operation of the Project including CBOD5, TSS and total residual chlorine.

3.1.3 Environment Canada Guidance

The *Atlantic Canada Wastewater Guidelines Manual for Collection, Treatment and Disposal* (Environment Canada, 2006), which provides guidance in the design of infrastructure for the collection, treatment, and disposal of sanitary sewage in the Atlantic Provinces will be adhered to.

3.1.4 Federal Policy on Wetland Conservation

The *Federal Policy on Wetland Conservation* (Govt of Canada, 1991), was created to promote the conservation of Canada's wetlands to sustain their ecological and socio-economic functions. One of the primary objectives of the policy is to achieve no net loss of wetland functions on all federal lands and waters. The policy also contains a number of strategies designed to help achieve the objectives and guiding principles.

3.1.5 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (MBCA) (Govt. of Canada, 2010) is administered by Environment Canada. The Act protects over 500 species of migratory birds, including the protection of their eggs and their nests (MBCA, 1994). The Canadian Wildlife Service (CWS) is a division of Environment Canada and is responsible of administering the Act with assistance from the enforcement branch. It is illegal, under Section 6 of the *Migratory Bird Regulations* (MBR) (Govt. of Canada, 2016) of the MCBA, to disturb, destroy or take migratory birds and their nests and eggs, except by permit for scientific, educational or other specific purposes. Section 5 of the MBCA prohibits the possession, selling, buying or exchanging of a migratory bird or nest, and also prohibits the deposition of substances that may be harmful to migratory birds. Such substances cannot be deposited into waters frequented by migratory birds, or into an area that may enter those waters.

3.2 Provincial Regulatory Requirements

3.2.1 Clean Environment Act

The Project will be subject to a Determination Review pursuant to the provincial *Environmental Impact Assessment Regulation* under the *Clean Environment Act*. The Regulation requires that projects be registered with DELG and that the registration document address all the requirements specified in the Registration Guide (DELG, 2012) including, but not limited to, adequate project detail, environmental baseline information, evidence of public and First Nations consultation, identification of potential and known adverse environmental effects of the project undertakings, and proposed methods for mitigating the adverse effects. Furthermore, the registration document must address all of the requirements in the *Additional Information Requirements for Wastewater Treatment Projects* (DELG, 2004).

The *Water Quality Regulation* (82-126) under the *Clean Environment Act* requires facilities that are a source of water contaminants to obtain an approval for the construction, operation, or modification of the source. The Regulation applies to anyone constructing, operating, or modifying a facility that is considered to be a source of contaminant, which includes most new and existing industrial and some commercial or institutional facilities.

3.2.2 Clean Water Act

Since there is a regulated mapped wetland within 30m of the proposed works, a Watercourse and Wetland Alteration (WAWA) Permit will be required pursuant to the *Watercourse and Wetland Alteration Regulation* established under the Clean Water Act (GNB, 2012a,b).

3.2.3 Clean Air Act

The *Clear Air Act* established the legislative control for the type and amount of contaminants that are released to the atmosphere. An approval pursuant to the *Air Quality Regulation* is required for the release of any contaminant, the conditions of which will specify the conditions under which contaminants can be released, and the amount of those contaminants that can enter the atmosphere. Approvals are classified according to the amount of contaminants being released, with Class 1 sources releasing the most emissions.

3.2.4 Heritage Conservation Act

The *Heritage Conservation Act* provides for the protection of, and confirms the province's ownership, of all archaeological, palaeontological and burial site heritage objects located in the province. Under the Act, it is prohibited to alter any heritage place without specific approval and it is mandatory to report any discoveries of such resources to provincial authorities. Specific standards have been established to govern the conduct of any professional research and the management of all heritage objects, as well as requirements for amateur researchers to obtain an approval for certain types of heritage exploration, subject to detailed conditions. The Act also includes regulations for conducting heritage impact assessments.

3.2.5 Maritime Breeding Bird Atlas

The Maritime Breeding Bird Atlas (MBBA) is a printed volume (Erskine, 1992) and associated online databases are used to assess the status and determine the distribution and abundance of species throughout the Maritimes. The current version of the database displays data from 2006 to 2010. The Project area falls into MBBA square 20KR72 (Appendix C).

3.3 Municipal Regulatory Requirements

3.3.1 Development Approval

The Project is located on land zoned for Transportation and the land use has been designated by the City of Saint John for Federal Transportation. The operation of the WWTP is incidental to the overall use of the land. As such, no changes to the zoning or land use are likely.

3.3.2 Building Permit & Associated Approvals

The Airport will apply for a Building Permit as good practice. The building permit aims to ensure compliance with National Building Codes and all other municipal by-laws. Other municipal permits for the Project may include a plumbing permit and electrical permit.

3.4 Species of Conservation Concern Designation and Legislation

Species of flora and fauna at risk and of conservation concern in New Brunswick are tracked and designated at four levels: federally under the *Species at Risk Act* (SARA); provincially under the *New Brunswick Species at Risk Act* (NBESA) and the New Brunswick Department of Natural Resources (NBDNR) General Status of Wild Species; and regionally via the Atlantic Canada Conservation Data Center (ACCDC) Subnational Rarity Ranks (S-Ranks). Each of these sources provides databases, or a list of species with associated rarity rankings.

3.4.1 Species at Risk Act

The Federal SARA aims to prevent Canadian endangered or threatened species from becoming extinct and to promote their recovery. The Act facilitates the management of species listed as special concern, in order to prevent them from becoming endangered or threatened. The Act also protects critical habitat and stipulates requirements for compensation, permits, and enforcement measures. Critical habitat is defined as that which is necessary for the survival or recovery of a species listed as endangered, threatened or extirpated on Schedule 1 of SARA. Pursuant to the Act, it is an offence to kill, harm, harass, capture, take, possess, collect, buy, sell or trade an individual of a species listed as endangered, threatened or extirpated in Schedule 1 of SARA. The Act also makes it an offence to damage or destroy the residence of one or more individuals of a species listed in Schedule 1 as endangered, threatened or extirpated (SARA, 2016).

3.4.2 New Brunswick Species at Risk Act

The New Brunswick *Species at Risk Act* (Govt. of NB, 2013c) was updated in April 2012 from the previous *Endangered Species Act*. The *Species at Risk Regulation* (Govt. of NB, 2013d) made under the Act lists the species at risk of extirpation from the province, making it illegal to “wilfully or knowingly” harm or disturb their critical habitat. A list of species protected by the under the *Species at Risk Act* is presented in Appendix D.

3.4.3 New Brunswick General Status of Wild Species

The NBDNR General Status of Wild Species (Govt. of NB, 2015b) assesses the security of wildlife species in the province, designating each species with one of the following ranks: extinct; extirpated; at risk; may be at risk; sensitive; secure; undetermined; not assessed; exotic/alien; accidental/vagrant; and occurrence not verified.

3.4.4 Atlantic Canada Conservation Data Centre

The ACCDC provides technical tracking lists of all recorded observations of rare and endangered flora and fauna. An ACCDC listing of rare and endangered species sightings was acquired for a 5km radius around the proposed study area. Species on the ACCDC list are ranked according to the S-Rank of the taxon. For explanation of S-Ranks, see Appendix E. Appendix F lists all the species from the ACCDC

report within the 5km radius. Each entry includes the SARA status, provincial status, S-Rank, NBDNR general status, observation data, survey location and reference. The list is divided by taxon (i.e., birds, mammals, fish, reptiles, invertebrates and vascular plants) and in the case of birds, plants and fish, are discussed further in their respective sections in Chapter 5.

CHAPTER 4 CONSULTATION AND ENGAGEMENT

4.1 Objectives

Given the scale, location and existing land use of the site, it is not anticipated that this Project will impact a large number of stakeholders. The objectives of the consultation and engagement program undertaken for this Project are to:

- Ensure that those potentially affected by the Project are aware of the Registration;
- Advise stakeholders how to obtain additional information about the Project;
- Ensure stakeholders are able to ask any questions or express any concerns they may have about the Project;
- Respond to stakeholders openly and promptly, resolving as many concerns as possible and identifying those which could not be resolved; and
- Provide a report documenting the consultation and engagement process to DELG, including a summary of comments received.

4.2 Discussions with DELG

In June, 2016, the Airport sent DELG a letter describing the proposed upgrades and requested a review to determine whether an EIA would be required. On June 9, 2016, DELG confirmed that an EIA would be required. The letter to the province and the confirmation email have been included in Appendix G. Following confirmation, a meeting was held with the Airport, CBCL, and DELG to discuss the project, walk the site, look at the wetland and determine the extent of study work required. Based on the project and limited impacts, it was determined that the assessment would be primarily desktop. Two follow up emails were received from DELG to confirm that a detailed fish and fish habitat study was not required and that based on the information available, the Aboriginal Affairs Secretariat (AAS) position is that it does not appear that there will be any potential for impacts to Aboriginal or treaty rights, and therefore the proposed project is not likely to require First Nations consultation on behalf of the proponent. However, notification of the proposed project should be provided to First Nations as a good governance measure. The two emails are also included in Appendix G.

4.3 Stakeholder List

A list of stakeholders has been developed and will be updated as required throughout the Project. This list will be used to maintain two-way communication prior to and throughout the consultation and engagement program. The following stakeholder groups in Table 4.1 have been identified to date.

Table 4.1: List of Stakeholders

Category	Organization
Elected Officials	Mayor Don Darling Councillors David Merrithew and Ray Strowbridge Saint John East MLA Glen Savoie MP Wayne Long
Environmental Groups	Atlantic Coastal Action Program (ACAP) Saint John
First Nations	15 First Nations (see Table 4.2)

4.4 Consultation and Engagement Program

4.4.1 Stakeholder Consultation

The Airport will communicate directly with the following stakeholders:

- Elected Officials;
- Community Groups;
- Environmental Groups – ACAP Saint John; and
- First Nations – All First Nations of New Brunswick (See Table 4.2).

This direct communication will consist of a letter that will be sent to each person or group noted above. The letter will include the following information, as recommended in the *Guide to Environmental Impact Assessment in New Brunswick* (GNB, 2012):

- A brief description of the proposed Project and location (including a map);
- Information on how to view the Registration Document;
- The status of the Provincial approvals process;
- A statement indicating that stakeholders can ask questions or raise concerns with the Proponent regarding the environmental impacts;
- Proponent contact information; and
- The date by which comments on the Project must be received.

In accordance with the *EIA Regulation (87-83),* stakeholders must be notified of the Project, and evidence of notification (i.e., copies of the Project information letters) provided to the DELG within 60 days of registration of the Project.

4.4.2 First Nations Consultation

According to correspondence with the Aboriginal Affairs Secretariat (AAS) via the EIA provincial project manager, there are not likely impacts to Aboriginal or treaty rights and therefore the proposed Project is not likely to require First nations consultation on behalf of the Proponent (P. Doucet, DELG, pers. comm. July 2016). In accordance with best practices, a letter with the Project information (as

noted above) will be sent to all 15 First Nations within the province, as identified in Table 4.2. The Project information letter will also be sent to Chief Rebecca Knockwood and Chief George Ginnish, Co-Chairs of the Mi'gmawe'l Tplu'taqunn Incorporated (MTI).

Table 4.2: First Nations Communities of New Brunswick

Community	First Nation
Buctouche	Mi'kmaq
Eel Ground	Mi'kmaq
Eel River Bar First Nation	Mi'kmaq
Elsipogtog First Nation (Big Cove)	Mi'kmaq
Esgenoôpetitj First Nation	Mi'kmaq
Fort Folly	Mi'kmaq
Indian Island	Mi'kmaq
Kingsclear	Maliseet
Madawaska Maliseet First Nation	Maliseet
Metepenagiag Mi'kmaq Nation	Mi'kmaq
Oromocto	Maliseet
Pabineau	Mi'kmaq
Saint Mary's	Maliseet
Tobique	Maliseet
Woodstock	Maliseet

4.4.3 DELG Notifications

The DELG shall place notice of the EIA registration on its website 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, the Airport will provide an electronic version of the registration document (i.e., as a PDF document) and three hard copies to DELG.

4.5 Summary of Consultation and Engagement Program

At the conclusion of the consultation and engagement process and no later than 60 days from Project registration, a summary document will be submitted to the province outlining the consultation that was conducted for the Project and providing a summary of any questions or comments received from stakeholders. Every reasonable effort will be made to address the concerns and questions received from stakeholders.

CHAPTER 5 ENVIRONMENTAL BASELINE

The description of existing environmental conditions presented in this section are based on a desktop review of readily available information sources, as cited herein. No field work or Project-specific sampling or monitoring was completed to describe the environmental baseline conditions in support of this assessment; however, location specific information collected by CBCL in the vicinity of the Robertson Lake Dam and Mispec River for the Safe, Clean Drinking Water Project, located in Saint John, New Brunswick was incorporated into this section, as appropriate (CBCL, 2014b).

5.1 Climate and Meteorological Conditions

The Project site is located away from residential neighbourhood on the Airport property. Surrounding air and noise quality would be impacted by aircrafts taxiing on the runway, taking off and landing. Delivery vehicles also impact local air and noise quality.

At the regional scale, Atlantic Canada lies within a zone of prevailing westerly winds that carry air from the interior of the North American continent. This zone experiences the passage of high and low pressure systems which are in turn influenced by ocean currents and continental topography. The low pressure systems moving through this area typically track across the continent, or up the seaboard, resulting in the onset of wind from an easterly direction, thickening cloud and a gradual drop in pressure. The frequent movement of such systems through Atlantic Canada brings significant precipitation. Winters are usually cold with frequent snowfall and freezing precipitation. Spring is typically late (sometime in May), cool and cloudy. Summers are short in duration, warm and are characterized by less precipitation than in other seasons.

In recent years, extreme weather events have been occurring more frequently. New Brunswick has been subjected to both drought and intense storms. Tropical weather events are expected to be both more intense and frequent as the effects of climate change influence ocean warming and coastal currents. Climate models predict an increase in extreme local events throughout this century.

This section provides a general description of the region's climate (climate norms) over a 30-year period and the meteorological conditions at the Saint John Airport, which is an Environment Canada weather station. Climate norms (30-year averages) for the 1981 to 2010 period are from the weather station located in the City of Saint John (45°19'05.000" N, 65°53'08.050" W), and include data for

temperature, fog, precipitation and wind; which are tabulated in the sections that follow. Extreme weather data are also provided, with their years of occurrences noted (Environment Canada, 2016).

Precipitation data recorded are summarized in Table 5.1. The total annual precipitation (i.e., 1295.5mm) is defined as the total rainfall plus water equivalent of snowfall and other forms of frozen precipitation. Rainfall is generally higher in the fall with snow and freezing precipitation frequent between October and March. (Environment Canada, 2016)

Table 5.1: Precipitation Normals (1981-2010) and Extremes (years as indicated) for the Saint John Weather Station

Month	Mean Rainfall (mm)	Mean Snowfall (cm)	Total Precip. (mm)	Extreme Daily Rainfall (mm)	Extreme Daily Snowfall (cm)	Extreme Daily Precipitation (mm)
Jan.	66.1	64.3	123.5	83 (1978)	42.4 (1975)	83 (1978)
Feb.	49	48.4	91	82.3 (1947)	34.8 (1978)	95 (1947)
Mar.	66.6	44.4	108.2	74 (1980)	40.1 (1963)	74 (1980)
Apr.	85.7	20	105.3	125.5 (1962)	26.2 (1958)	125.5 (1962)
May	108.5	1.2	109.8	66.5 (1973)	10.2 (1967)	66.5 (1973)
June	101	0	101	108.2 (1985)	0	108.2 (1985)
July	88.4	0	88.4	79.4 (1990)	0	79.4 (1990)
Aug.	81.7	0	81.7	125.2 (1970)	0	125.2 (1970)
Sept.	105.6	0	105.6	83.2 (1999)	0	83.2 (1999)
Oct.	115.8	0.5	116.4	85.3 (1963)	19.8 (1974)	85.3 (1963)
Nov.	123.7	10.8	134.1	**154.4 (1975)**	28.4 (1989)	**154.4 (1975)**
Dec.	84	49.9	130.4	92.4 (1981)	**58.2 (1960)**	105.7 (1967)
Year Total	1076	239.6	1295.5	-	-	-

Source: Environment Canada Climate Normals: 1981-2010.

Saint John experiences a large annual temperature variation. Daily mean temperatures range from -8.1°C in January to 22.4°C in July. The annual daily mean is 5.2°C. Daily maximums, minimums and extreme temperatures at the Saint John weather station are summarized in Table 5.2.

Table 5.2: Temperature Normals (1981-2010) and Extremes (years as indicated) for the Saint John Weather Station

Month	Daily Mean (°C)	Daily Maximum (°C)	Daily Minimum (°C)	Extreme Maximum (°C)	Extreme Minimum (°C)
Jan.	-7.9	-2.5	-13.3	14.5 (2006)	-31.7 (1971)
Feb.	-7.1	-1.5	-12.6	13.3 (1994)	**-36.7 (1948)**
Mar.	-2.5	2.4	-7.4	17.5 (1999)	-30 (1948)
Apr.	3.7	8.5	-1.2	22.8 (1976)	-16.7 (1969)
May	9.5	15	3.9	33 (1992)	-7.8 (1947)
June	14	19.6	8.4	32 (1983)	-2.2 (1949)

Month	Daily Mean (°C)	Daily Maximum (°C)	Daily Minimum (°C)	Extreme Maximum (°C)	Extreme Minimum (°C)
July	17.1	22.6	11.6	32.8 (1963)	1.1 (1948)
Aug.	16.8	22.4	11.2	**34.4 (1976)**	-0.6 (1947)
Sept.	13	18.2	7.7	31 (1999)	-6.7 (1947)
Oct.	7.6	12.3	2.8	25.6 (1947)	-10.6 (1974)
Nov.	2.3	6.4	-1.9	21.7 (1956)	-16.9 (1996)
Dec.	-4.4	0.5	-9.3	16.1 (1973)	-34.4 (1989)
Year Total	5.2	10.3	0	-	-

Source: Environment Canada Climate Normals: 1981-2010.

The Saint John weather station has recorded visibility statistics from the period of 1971-2000. The month with the greatest number of hours with less than 1 km of visibility was July with 113.9 hours. The average number of hours per year with visibility less the 1 km is 590.3 hours. Table 5.3 presents a visibility statistics for the 1960 to 2000 period of record.

Table 5.3: Summary of Visibility Statistics for the Saint John Weather Station (1981-2010)

Month	Hours of Visibility < 1km	Hours of Visibility 1 to 9km	Hours of Visibility > 9km
Jan.	22.2	130.1	591.8
Feb.	18.6	121	538.1
Mar.	21.9	130.5	591.6
Apr.	31.2	129	559.8
May	46.6	109.7	587.7
June	72.7	118.7	528.7
July	117.1	123.5	503.4
Aug.	105.5	110.4	528.1
Sept.	57.2	100.2	562.6
Oct.	28.1	97.7	618.2
Nov.	18.2	126.3	575.5
Dec.	16.3	138.7	589.1
Year Total	555.4	1435.8	6774.6

Source: Environment Canada Climate Normals: 1981-2010.

Table 5.4: Summary of Wind Statistics for the Saint John Weather Station (1981-2010)

Month	Mean Speed (km/h)	Most Frequent Direction	Number of Days with Wind >= 52km/h	Number of Days with Wind >= 63km/h
Jan.	16.9	NW	2.4	0.7
Feb.	17.1	NW	2.9	0.5
Mar.	17.5	N	2	0.4
Apr.	17.2	N	1.8	0.4
May	15.4	S	1.1	0.3
June	13.4	S	0.3	0
July	12	S	0.2	0
Aug.	11.3	S	0.1	0.1
Sept.	13	SW	0.5	0.1
Oct.	15.1	SW	1.3	0.1
Nov.	16.4	NW	2.1	0.5
Dec.	17.1	NW	2.7	0.8
Year Total	15.2	SW	17.3	3.8

Source: Environment Canada Climate Normals: 1981-2010.

5.2 Hydrogeology

Surface water flows and topographic maps were used to determine potential groundwater flow direction (Natural Resources Canada 2016). From the proposed Project site groundwater flows are expected to flow towards the Mispec River. Groundwater is anticipated to have an exchange with the Mispec River. Water flow direction in the Mispec River flows south towards Mispec Bay which ultimately ends in the Bay of Fundy.

5.3 Geology and Topography

The Project site is located in the Caledonia Geological Zone of New Brunswick. The Caledonia Geological Zone is underlain by a Middle Proterozoic quartzite carbonate sequence and succession of Late Proterozoic volcanic and associate intrusive rocks. A Cambrian to Early Ordovicial platformal sequence containing a distinctive Acado-Baltic trilobite fauna uncomfortably overlies Precambrian rocks. The Caledonia Zone is generally considered to represent a crustal fragment rifted from the margin of Gondwana during opening of the Early Paleozoic Iapetus Ocean (NBDEM, 2013). The Project is located on Willow Grove Formation bedrock according to the Bedrock Geology of New Brunswick mapping, Department of Natural Resources and Energy Minerals Division.

The Project area falls into the Fundy Coast Ecoregion. Landscape relief within the ecoregion, including the City of Saint John and the general area of the Airport, generally ranges between 30m and 80m (NBDNR, 2003).

The Project site is generally flat, sloping gently toward the wetland and Mispec River to the East. Figure 5.1 shows the drainage pattern for the site.

5.4 Avifauna

Canada seasonally hosts approximately 450 species of native birds, of which approximately 389 occur within New Brunswick. Many of these species are protected under the *Migratory Birds Convention Act*, 1994 which makes it illegal to kill, take or hunt migratory birds or destroy nests or young by project activities. The vast majority of these birds in southeastern New Brunswick, including many of the early and late breeders, are engaged in nesting activities during the months of June and early July (MBBA, 2014). The weeks extending from June 1 to July 15 in the Maritime Provinces are commonly referred to as the peak breeding season.

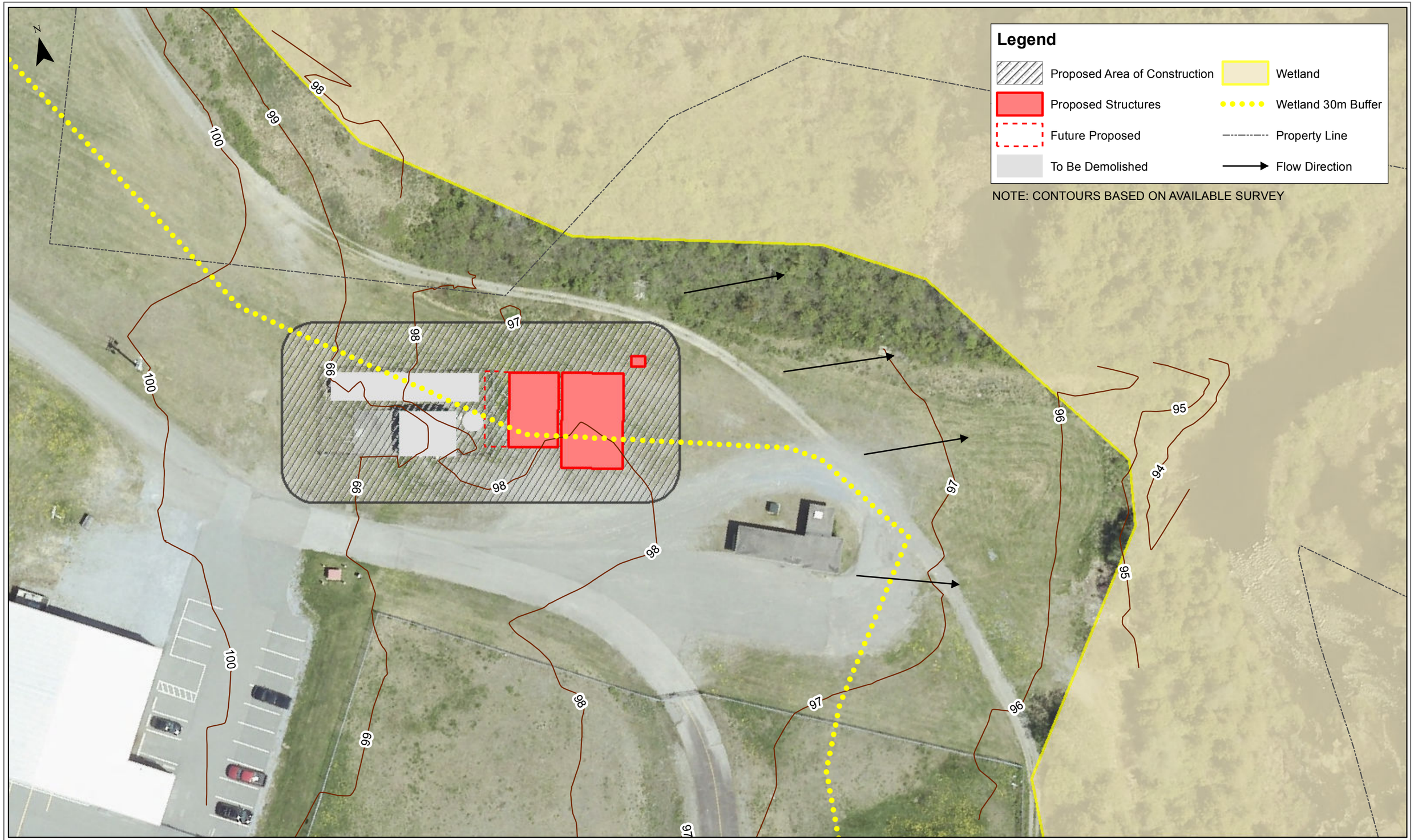
An avian desktop study was conducted to characterize the environmental baseline conditions and included an assessment of habitat types and avian species observation data, (i.e., ACCDC and Maritime Bird Atlas). Additional baseline information was obtained from the results of a 2014 breeding bird survey completed in the vicinity of the Robertson Lake dam, in support of the Safe, Clean Drinking Water Project (CBCL, 2014b).

The breeding bird survey was initiated in July 2014 and consisted of four point counts in the vicinity of Robertson Lake dam, conducted from one-half hour before sunrise to four hours after sunrise (Figure 5.2 and 5.3). All point counts were conducted according to Canadian Bird Studies Point Count protocol and were 10-minutes in length.

In total, 20 species of bird were identified during the course of the breeding bird survey, for a total of 52 individuals. Of these species, 19 are listed pursuant the *Migratory Birds Convention Act*. No avian species listed by SARA or the Provincial *Species at Risk Act* were observed suggesting that none of these species are currently breeding in the vicinity of the Robertson Lake dam. Generally, many of the species observed and identified during the course of the breeding bird survey were those that could be reasonably anticipated in the vicinity of the Project. A summary of the breeding bird survey results for the four point counts in the vicinity of the Robertson Lake dam is shown in Table 5.5.

Table 5.5: Robertson Lake Breeding Bird Survey Quantitative Summary (CBCL, 2014b)

Common Name	*Sum*	*Frequency*	*MBCA*	*SARA*	*NB Species at Risk Act*	*NB General Status Ranking*
American Goldfinch	6	50%	Listed	Not Listed	Not Listed	Secure
Common Yellowthroat	3	25%	Listed	Not Listed	Not Listed	Secure
American Crow	1	25%	Not Listed	Not Listed	Not Listed	Secure
Black-throated Green Warbler	5	50%	Listed	Not Listed	Not Listed	Secure



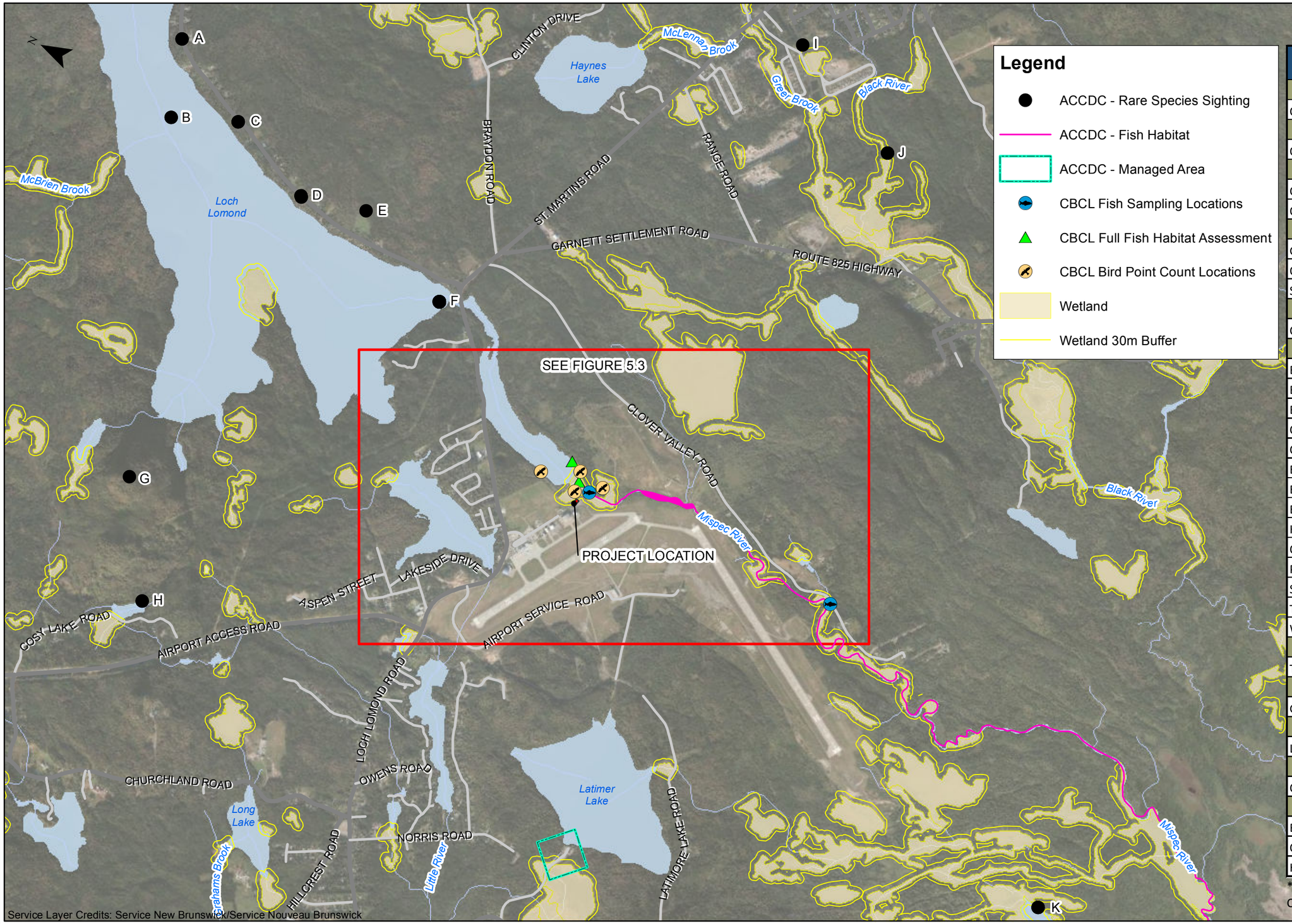
CBCL LIMITED
Consulting Engineers

Client: Your YSJ Saint John Airport

Project Description: WWTP SBR UPGRADE
SITE DRAINAGE

Revision or Issue: ISSUED FOR EIA (2016/09/23)

Drawn	SMO	Designed	AMW	Checked	CB	Approved	AMW
Scale	1:500	Project No	162832.01	Date	AUG 2016	Figure No	5.1



Legend

- ACCDC - Rare Species Sighting
- ACCDC - Fish Habitat
- ACCDC - Managed Area
- CBCL Fish Sampling Locations
- CBCL Full Fish Habitat Assessment
- CBCL Bird Point Count Locations
- Wetland
- Wetland 30m Buffer

Commone Name	Most Recent Sighting*
Site A	
Canada Warbler	2001
Site B	
Oakes' Pondweed	1965
Site C	
Canada Warbler	2008
Olive-sided Flycatcher	2008
Site D	
Great Crested Flycatcher	2000
Olive-sided Flycatcher	2007
Spotted Sandpiper	1999
Site E	
Canadian Lynx	2006
Site F	
Bank Swallow	2010
Bobolink	1986
Brown-headed Cowbird	1987
Canada Warbler	2009
Cape May Warbler	2008
Eastern Kingbird	2007
Eastern Wood-Pewee	1987
Evening Grosbeak	1986
Killdeer	1986
Olive-sided Flycatcher	2008
Pine Siskin	2009
Spotted Sandpiper	2008
Turkey Vulture	2007
Wilson's Snipe	2008
Site G	
Turkey Vulture	1999
Site H	
Ghost Antler Lichen	2004
Site I	
Lance-leaved Figwort	1897
Site J	
Canada Warbler	2009
Site K	
Brown Beakrush	2002
Coastal Sedge	2002
Humped Bladderwort	2002

* Sightings as recorded with the Atlantic Canada Conservation Data Centre (ACCDC)

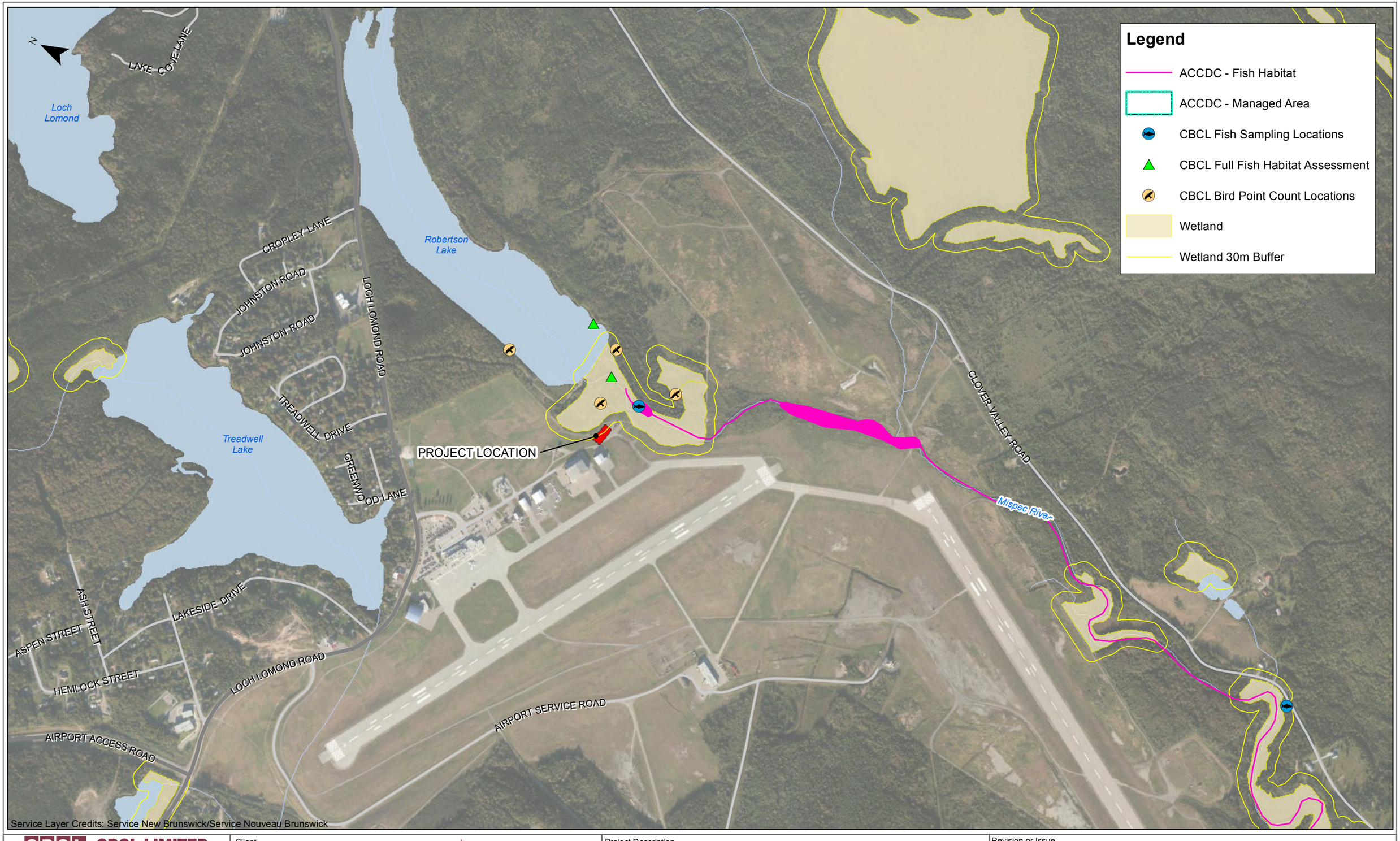
CBCL LIMITED
Consulting Engineers

Client: Your YSJ Saint John Airport

Project Description: WWTP SBR UPGRADE
ENVIRONMENTAL CONSTRAINTS

Revision or Issue: ISSUED FOR EIA (2016/09/23)

Drawn	SMO	Designed	AMW	Checked	CB	Approved	AMW
Scale	1:30,000	Project No	162832.01	Date	AUG 2016	Figure No	5.2



Service Layer Credits: Service New Brunswick/Service Nouveau Brunswick

CBCL LIMITED
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Client: Your YSJ Saint John Airport

Project Description: WWTP SBR UPGRADE
ENVIRONMENTAL CONSTRAINTS

Revision or Issue: ISSUED FOR EIA (2016/09/23)

Drawn	SMO	Designed	AMW	Checked	CB	Approved	AMW
Scale	1:10,000	Project No	162832.01	Date	AUG 2016	Figure No	5.3

Common Name	Sum	Frequency	MBCA	SARA	NB Species at Risk Act	NB General Status Ranking
American Robin	2	25%	Listed	Not Listed	Not Listed	Secure
American Redstart	4	75%	Listed	Not Listed	Not Listed	Secure
White-throated Sparrow	1	25%	Listed	Not Listed	Not Listed	Secure
Black-capped Chickadee	7	75%	Listed	Not Listed	Not Listed	Secure
Red-eyed Vireo	1	25%	Listed	Not Listed	Not Listed	Secure
Cedar Waxwing	3	25%	Listed	Not Listed	Not Listed	Secure
Northern Parula	3	75%	Listed	Not Listed	Not Listed	Secure
Tree Swallow	1	25%	Listed	Not Listed	Not Listed	Secure
Chipping Sparrow	1	25%	Listed	Not Listed	Not Listed	Secure
Black-and-white Warbler	3	50%	Listed	Not Listed	Not Listed	Secure
Yellow-rumped Warbler	1	25%	Listed	Not Listed	Not Listed	Secure
Chestnut-sided Warbler	3	50%	Listed	Not Listed	Not Listed	Secure
Ovenbird	1	25%	Listed	Not Listed	Not Listed	Secure
Golden-crowned Kinglet	4	50%	Listed	Not Listed	Not Listed	Secure
Magnolia Warbler	1	25%	Listed	Not Listed	Not Listed	Secure
Blue-headed Vireo	1	25%	Listed	Not Listed	Not Listed	Secure

5.5 Fish and Fish Habitat

All rivers in the ecoregion flow into the Bay of Fundy or one of its subsidiary bays and basins. Some rivers meet the ocean directly as waterfalls or swift streams, whereas others enter more gently through coastal estuaries or marshes (NBDNR, 2003). The Project is located within the Mispec River watershed; approximately 20m southwest of the Robertson Lake dam. The Robertson Lake dam controls flows from Robertson Lake into the Mispec River, which flows to the southeast of the Project area. The Mispec River watershed drains into the Saint John Harbour.

Following consultation with DELG, it was determined that detailed fish and fish habitat assessments and receiving watercourse studies are not required to characterize the environmental baseline conditions in support of this assessment (P. Doucet, DELG, pers. comm. June 2016). However, in order to provide a thorough description of the existing environment, fish and fish habitat assessments completed at two sites along the Mispec River for the Safe, Clean Drinking Water Project (CBCL, 2014b) have been included to support the determination of presence/absence of commercial, recreational and/or aboriginal (CRA) fisheries species, fish species of concern and significant or sensitive fish habitat that might be negatively impacted from Project activities (Table 5.6) (Figures 5.2 and 5.3).

Table 5.6: Mispec River Fish and Fish Habitat Assessment Sampling (CBCL, 2014b)

Watershed	Site	Coordinates	Assessment
Mispec River	Mispec River (Robertson Lake Spillway)	N 2548412.209 E 7369778.809	• Habitat Assessment • Fish Sampling
	Mispec River (Downstream of Airport)	N 2548492.31 E 7367663.304	• Habitat Assessment • Fish Sampling

5.5.1 Fish and Fish Habitat Assessment

5.5.1.1 Methodology

Reconnaissance level fish habitat assessments were conducted at the identified locations (between June 16 and June 20, 2014) (CBCL, 2014b) (Table 5.7) (Figures 5.2 and 5.3). Data collected for the reconnaissance level assessment was adapted from the *Reconnaissance (1:20,000) Fish and Fish Habitat Inventory for British Columbia: Standards and Procedures* (Resource Inventory Committee, 2001) and is in accordance with DFO protocols. Observed fish habitat conditions were qualified in order to adequately evaluate the quality of fish habitat, specifically for salmonids, for overwintering, rearing and spawning. Fish habitat data collected generally included information on the following:

- Substrate (types and percent) for bedrock, boulders (>256mm), rubble (140-256mm), cobble (65-140mm), large gravel (17-64mm), small gravel (2-16mm) and fines (< 2mm);
- Cover (types and percent) for boulder, overhanging vegetation, large and small woody debris, undercut banks, deep pools and in-stream vegetation;
- Wetted and channel widths (where applicable);
- Water and pool depths (where applicable);
- Morphology of the watercourse (e.g., run, flat, pool, riffle, rapid, cascade, snye, oxbow, glide or pocketwater);
- Bank characteristics (e.g., texture, shape, stability);
- Water quality (standard parameters: dissolved oxygen, temperature and pH);
- Unique watercourse characteristics (e.g., confinement, bars, islands, watercourse pattern);
- Approximate velocity (where applicable);
- Crown closure;
- Incidental vegetation; and
- Photographs and Universal Transverse Mercator (UTM) locations.

Watercourses were classified as ephemeral, intermittent, small permanent or large permanent. Definitions for those watercourse types noted during the assessments are provided below:

- Ephemeral watercourses are not considered fish habitat. These watercourses have no defined channel, bed or banks and are often vegetated across with grasses or mosses. Ephemeral watercourses are usually dry, but can flow or have pockets of water during certain times of the year, especially after heavy rainfall or spring runoff;
- Intermittent watercourses have defined channels, beds and banks and the channel widths are typically less than 2m in size. These watercourses can flow during part or most of the year, but have a period of no flow at some point in the year;
- Small permanent watercourses have defined channels, beds and banks, with channel widths typically between 2m and 5m in size and water flow throughout the year; and
- Large permanent watercourses have defined channels, beds and banks, with channel widths typically >5m in size and water flow throughout the year.

A general evaluation of spawning, rearing and overwinter habitat was also made as follows: spawning habitat quality was based on water flow and substrate; rearing habitat quality was based on cover and water flow; and overwintering habitat quality was based on the presence or absence of deep pools or ponds (≥ 50cm) and the potential for year-round flow. The potential for fish presence year-round was based on the results from the specific water quality measurements, habitat quality at the time of the assessment, the quality of overwintering and spring/summer habitat, and upstream/downstream connectivity of the watercourse to other watercourses. Water quality parameters were also taken into consideration for the evaluation of spawning, rearing, and overwinter habitat (Table 5.7).

Table 5.7: Mispec River Water Quality Parameters

Water Quality Parameter	*Brook Trout Tolerance and Optimum Ranges (Raleigh, 1982)*	*CCME Guidelines (CCME)*
Temperature (°C)	Tolerance: 0 to 24.0 Optimum: 11.0 to 16.0	6.5 - 9.5
pH	Tolerance: 4.0 to 9.5 Optimum: 6.5 to 8.0	5.50 to 9.50
Dissolved Oxygen (mg/L)	Tolerance: ≥ 5.00 Optimum: ≥ 7.00	n/a

A general sensitivity rating of low, moderate or high was assigned to each watercourse as to how resilient a watercourse might be to alteration and how long it might take for the watercourse to return to a pre-alteration state. This assignment was based on the quality of habitat (i.e., good quality habitat being the most sensitive to alteration) and the influence of man-made features currently within the watercourse (i.e., a watercourse with numerous man-made features would be less sensitive to further man-made alteration than one that is in a relatively unaltered state).

Fish sampling was performed at the locations identified in Table 5.7 (CBCL, 2014b) (Figures 5.2 and 5.3). Sampling techniques included minnow trapping, electrofishing, beach seining, gill netting and

fyke netting. As well, local sport anglers were consulted for fish presence. The following parameters were observed during sampling:

- Electrofishing was conducted using a Smith-Root® LR-24 Electrofisher. The quick setup feature was used to determine initial voltage, frequency and duty cycle settings;
- Minnow traps were baited and set for a maximum period of 24 hours; and
- Gill nets and fyke nets were set for a maximum period of four hours.

Information on captured species included species identification, number of individuals, species at risk or conservation concern, photographs and UTM location. Fish were immediately returned to the same location.

5.5.1.2 RESULTS

Fish and Fish Habitat Assessment

Fish and fish habitat assessments were conducted between June 16 and June 20, 2014. Results are provided below:

Robertson Lake Spillway: The Mispec River is a large permanent, watercourse that was at high stage at the time of assessment. Watercourse morphology consisted of runs, flats, pools, riffles with a sinuous pattern. The substrate consisted of cobble (30%), fines (25%), large gravel (20%), boulders (15%) and small gravel (10%). Water depth was greater than 1m and velocity was 1.39m/s. There was abundant overhanging vegetation, deep pools, small woody debris and instream vegetation; moderate boulders and large woody debris; and trace undercut banks. Water temperature was 20.2°C, dissolved oxygen was 10.82mg/L and pH was 7.60 (CBCL, 2014b); and

Downstream of Airport: The Mispec River is a large permanent water course that was at mid/high stage at the time of assessment. Morphology consisted of runs, flats, riffles and rapids and had a regularly meandering pattern with a small, slow-moving side tributary. The substrate consisted of cobble (60%), large gravel (20%), small gravel (10%) and fines (10%). There was abundant overhanging vegetation, deep pools and instream vegetation; moderate large woody debris, undercut banks and small woody debris; and trace boulders. Water temperature was 20.2°C, dissolved oxygen was 10.82mg/L and pH was 7.60 (CBCL, 2014b – permission granted from the City of Saint John).

Fish Sampling

Fish sampling identified species diversity in the Mispec River with eight species, including an American Eel and an unidentified young-of-year (YOY) salmonid. The young salmonid is suspected to be a brown trout due to the shape of the caudal fin and the coloration of the adipose fin. Table 5.8 identifies the species recorded (CBCL 2014b – permission granted from the City of Saint John).

The Robertson Lake Spillway creates a significant fish barrier for fish passage up the Mispec River into Robertson Lake and Loch Lomond Lake. Therefore, it is possible that certain fish species found downstream of the spillway in the Mispec River, particularly migratory fish such as Atlantic salmon and sea-run brook trout, may not be present in Robertson Lake and Loch Lomond Lake due to an inability to access them. However, the American eels may be able to migrate past the spillway be present upstream (CBCL 2014b – permission granted from the City of Saint John).

Table 5.8: Mispec River Fish Sampling Results Between June 16 and June 20, 2014 (CBCL, 2014b)

Watershed	Waterbody	Identified Fish Species	CRA Fishery
Mispec River Watershed	**Mispec River**	• Common Shiner • Finescale Dace • Blacknose Dace • Killifish • Brook Stickleback • American Eel • White Sucker • Unidentified Salmonid	• Brown Trout • American Eel • White Sucker • Unidentified Salmonid

Sampling sites in the Mispec River watershed included the Robertson Lake Spillway, which connects and separates Robertson Lake and Loch Lomond Lake from the Mispec River, and the Mispic River downstream from the Airport. Throughout the Mispec River Watershed, four CRA fishery species were captured: white sucker, American eel, brown trout and an unidentified juvenile salmonid (CBCL, 2014b).

5.5.2 Protected Fish Species

iBoF Atlantic salmon inhabit the Mispec River(DFO 2010). A juvenile salmonid was captured in the Mispec River during fish sampling; however, confirmation could not be made as to whether it was an Atlantic salmon or a trout species. Any Project activities that may impact the Mispec River may require additional environmental protection considerations and regulatory requirements due to the reported presence of the protected species.

The iBoF Atlantic salmon is federally listed as 'Endangered' by SARA and COSEWIC and occur in Nova Scotia and New Brunswick. iBoF Salmon show no obvious morphological distinctions from other Atlantic Salmon (DFO, 2010). They have a pointed head, well-developed teeth on both jaws, and a slightly forked caudal tail fin. Spawning salmon in freshwater become bronze-purple in colour, with red spots on the head and body. Males develop a pronounced hooked lower jaw. Young salmon (parr) in freshwater have 8-11 dark bars on their sides with a red spot between each one. Young salmon leaving freshwater for the sea (smolts) are silvery in colour and are usually about 12-15cm in length (DFO, 2010). Atlantic salmon are an anadromous species, spending part of their life feeding and growing during long migrations at sea and then returning to reproduce in their natal freshwater streams. Atlantic salmon that are ready to spawn begin moving up river from spring through fall. Spawning occurs from October to November usually in gravelly substrates near the head of riffles, or the tail of a pool. Young salmon (smolt) usually live in shallow riffle areas ~25 cm deep that have gravel, rubble, rock or boulder bottoms Page et al., 1991). Adult salmon that have spawned immediately return to sea before winter, or they overwinter in the freshwater stream until spring. iBof Salmon show a more localized migration, an earlier age at maturity, a high survival between annual spawning events, a dependence on repeat spawning for population stability and a distinct genetic profile (DFO, 2010). Almost all iBoF Salmon mature after one winter at sea and spawn in consecutive

years (DFO, 2010). The preferred freshwater habitats for each life stage of Atlantic salmon are riffles and pools with high percentage pebble and gravel substrate.

An American Eel was observed in the Mispec River during 2014 fish and fish habitat assessments completed for the Safe, Clean Drinking Water Project (CBCL, 2014b). Currently they are not listed under SARA but are listed as 'Threatened' by COSEWIC and thus have the potential to become listed under SARA. The American eel is also provincially listed as 'Threatened' under the *Species at Risk Act.*

The American Eel can be found on the western side of the Atlantic Ocean, from Niagara Falls in the Great Lakes up to the mid-Labrador coast. American eels can be considered declining in some locations and be stable elsewhere, such as in New Brunswick where it is listed by the government as 'Secure'. The American Eel is elongate and serpentine, with a single continuous dorsal fin. Juvenile, sexually immature eels (yellow eels) may range in colour from yellowish to green or olive-brown, with a lighter belly. Sexually mature eels (silver eels) acquire a metallic sheen and turn a darker brown or black with a silvery belly. Their skin is thick and secretes copious amounts of slimy mucous. American Eels are catadromous, living in fresh water and returning to salt water to breed. They spawn in the Sargasso Sea and larvae are passively dispersed by the surface currents of the Gulf Stream system to western shores of the Atlantic Ocean (SARA, 2016). Over the continental shelf, the eels metamorphose into small eels termed 'elvers' which then migrate upstream in large numbers when water temperatures reach about 10°C. As they grow, the elvers will turn into yellow eels and will live in freshwater for five to 20 years or longer, depending on their growth rate.

5.5.3 Potential for Fish Species Presence

The results of the 2014 fish and fish habitat assessment and the potential for fish species presence in the Mispec River are summarized in Table 5.9. Overall, the Mispec River is considered to provide good spawning habitat with good to moderate rearing and overwintering habitat and have a high potential for fish presence, both during open water and frozen conditions (CBCL, 2014b).

Table 5.9: Mispec River Fish and Fish Habitat Assessment Summary (CBCL, 2014b)

*Watercourse**	*Watercourse Classification*	*Spawning Habitat*	*Rearing Habitat*	*Overwintering Habitat*	*Potential for Fish Presence Open Water**	*Potential for Fish Presence Frozen**	*CRA Fisheries*	*Species of Concern*	*Sensitivity*
Mispec River (Robertson Lake Spillway)	Large Permanent	Good	Good	Good	High	High	Yes	Yes	High
Mispec River (Downstream of Airport)	Large Permanent	Good	Moderate	Moderate	High	High	Yes	Yes	High

*The potential for fish presence refers specifically to salmonids

5.6 Vegetation,Wetlands and Wildlife and Wildlife Habitat

5.6.1 Vegetation and Wetlands

The project is located within the Fundy Coast Ecoregion of New Brunswick, specifically the Fundy Coastal Ecodistrict which occupies the southern coastline of New Brunswick along the Bay of Fundy from east Passamoquoddy Bay to Shepody Bay. Forest cover in the Fundy Coastal District is dominated by red spruce with white spruce and black spruce, or balsam fir with some red maple, white birch, and yellow birch. Cedar is concentrated on ridges around Saint John in areas of calcareous bedrock (Gov't NB, 2007).

The Project was cleared approximately 40 years ago and consists primarily of grass and low lying scrub vegetation. Flora is common to the local ecotypes and to regions influenced by anthropogenic disturbances.

The New Brunswick *Clean Water Act* requires that any works occurring within a regulated wetland or within an associated 30m buffer receives approval pursuant to the WAWA Regulations. A WAWA Permit is required to conduct any activity that may cause unnecessary harm to a watercourse or a regulated wetland. The location of regulated wetlands and their 30m buffer are available as a GeoNB Regulated Wetlands GIS Layer. Following consultation with DELG, it was determined that wetland delineation and functional assessment is not required to characterize the environmental baseline conditions in support of this assessment (B. Legere, DELG, pers. comm. June 2016).

At present, there are no Provincially Significant Wetlands (PSW) that will be directly impacted by the Project. Based on the layout of the upgraded WWTP, the Project may impact a single regulated wetland, or associated 30m buffer zone (Figures 5.2 and 5.3). Based on the wetland assessments completed on the easternmost portions of the identified wetland in support of the Safe, Clean Drinking Water Project (i.e., on the east side of the Mispec River), it is anticipated that the wetland would be characterized as a cedar-black spruce swamp/shrub swamp (CBCL 2014b – permission granted from the City of Saint John). The following sections provide descriptions of characteristics for each wetland type and common plant species as they pertain to the Project area:

Cedar-Black Spruce Swamp: Cedar-Black Spruce Swamps are forested swamps generally found in wet depressions and are dominated by wooded vegetation. They are characterized by saturated soils during the growing season and occasional standing water at certain times of the year. The tree canopy is dominated by eastern white cedar (*Thuja occidnetalis*), black spruce (*Picea mariana*) with red maple (*Acer rubrum*), white birch (*Betula papyrifera*), eastern larch (*Larix laricina*) and balsam fir (*Abies balsamea*). Shrubs include regenerating tree species, speckled alder (*Alnus incana*), white meadowsweet (*Spiraea alba*) and mountain holly (*Nemopanthus mucronatus*). Other common herbaceous species include bluejoint reed grass (*Calamagrostis canadensis*), cinnamon fern (*Osmunda cinnamomea*), sensitive fern (*Onoclea sensibilis*), royal fern (*Osmunda regalis*), three-seeded sedge (*Carex trisperma*), blue-flag iris (*Iris versicolor*) and Canada rush (*Juncus canadensis*); and

Shrub Swamp: Shrub swamps are transitional wetlands between wet meadows and forested swamps. Tree canopy is minimal and can consist of both wet- and dry-loving species, including gray birch

(*Populus tremuloides*), American mountain ash (*Sorbus americana*), balsam fir (*Abies balsamea*) and white birch (*Betula papyrifera*), eastern larch, and eastern white cedar. Dominant shrub species include white meadowsweet (*Spiraea alba*), speckled alder (*Alnus incana*), sweet gale (*Myrica gale*) and wild raisin (*Viburnum nudum*). Graminoids are common, including Canada rush (*Juncus canadensis*), bluejoint reed grass (*Calamagrostis canadensis*), slender sedge (*Carex lasiocarpa*), soft rush (*Juncus effusus*) and awl-fruited sedge (*Carex stipata*). Ferns and fern allies can be abundant, and include cinnamon fern (*Osmunda cinnamomea*), interrupted fern (*Osmunda claytonia),* royal fern (*Onoclea sensibilis*), and horsetails (*Equisetum spp*.). Soils may consist of both organics and mineral soils. The substrate is typically saturated, and occasionally pooled water may be present. There is generally little or no sphagnum moss blanketing the substrate.

5.6.2 Terrestrial Wildlife and Wildlife Habitat

Since the project is located at the Saint John Airport, the majority of animal species in the general area would be typical of species found within or in proximity to developed areas. Although no field survey was undertaken to identify wildlife at the construction site, it is expected that the project area provides limited habitat for some mammals. Potential mammals in and adjacent to the Project Site would likely include those mammals typically found in developed areas such as the black rat (*Rattus rattus*), house mouse (*Mus musculus*), deer mouse (*Peromyscus maniculatus*), coyote (*Canis latrans*), white-tailed deer (*Odocoileus virginianus*), red squirrel (*Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), racoon (*Procyon lotor*), Eastern chipmunk (*Tamias striatus*) and red fox (*Vulpes vulpes deletrix*). Other more elusive species such as black bear (*Ursus americanus*), mink (*Mustela vison*), weasel (*Mustela* sp.), moose (*Alces alces*), bobcat (*Lynx rufus*) and fisher (*Martes pennant*) likely inhabit the adjacent forest but these species are unlikely to be present on site.

Canada lynx were identified within 3 km of the Project Site by the ACCDC rare taxa report (see Appendix F) (Figure 5.2). The proposed Project activities are not anticipated to interact with this species as this species prefers balsam fir and black spruce forests and may avoid areas of human development (see Poole 2003). Please see Appendix H for more information.

5.7 Commercial, Recreational and Aboriginal Fisheries

Based on email correspondence from Pam Seymour, Regional Biologist NB Department of Natural Resources (DNR) on August 12, 2016, due to its proximity to the city and relatively easy access, the Mispec River receives moderate use by anglers. Fish species sought include brook trout and brown trout. Wild Atlantic salmon still return to the river in low numbers.

No Aboriginal fisheries were identified for the Mispec Point area which was confirmed by Anna Herrington, DFO Aboriginal Fishery Coordinator in 2002 for the LNG Marine Terminal/Multi-purpose Pier Project (Jacques Whitford 2004).

There are no commercial fisheries in the freshwater aquatic environment within the Assessment Area (DELG 2009).

5.8 Socio-economic Environment

5.8.1 Population Profile (CBCL, 2015)

The population of the City of Saint John in 2011 was 70,063 individuals. With the exception of the most recent 2011 census year, the population of the City has been in steady decline since 1971. Between 1971 and 2011, Saint John lost more than 20% of its population, dropping from 89,000 to 68,000 individuals. Despite this substantial population loss, the City remains the second largest in the Maritimes and the largest in New Brunswick. This negative trend ended in the last census period, which saw a 3% population increase.

While the Saint John population declined over 20% in the City since 1971, the population in surrounding communities has more than doubled over the same period. The development of adjacent communities in Rothesay and Quispamsis has triggered a process of suburban flight that saw the population of the surrounding area balloon from approximately 17,500 residents in 1971 to almost 58,000 in 2011. The majority of growth in the area occurred between 1971 and 1996, when the Saint John Throughway and the Mackay Highway extension made it easier to commute into the City, making the suburbs more attractive. See Table 5.10 for detailed yearly population data for the City of Saint John and surrounding areas.

Table 5.10: Populations Data, City of Saint John, New Brunswick

Year	City of Saint John		Surrounding Areas		Total CMA	
	Population	% change	Population	% change	Population	% change
2011	70,063	+3.0%	57,698	6.17%	127,761	4.4%
2006	68,043	-2.3%	54,346	2.51%	122,389	-0.2%
2001	69,661	-3.9%	53,017	-0.36%	122,678	-2.4%
1996	72,494	-3.3%	53,211	4.60%	125,705	-0.1%
1991	74,969	-1.8%	50,869	13.35%	125,838	3.8%
1986	76,381	-5.1%	44,879	33.81%	121,260	6.3%
1981	80,521	-6.3%	33,539	24.06%	114,060	1.0%
1976	85,950	-3.5%	27,035	53.03%	112,985	5.9%
1971	89,039	-	17,666	-	106,705	-

The average age of the population of the City of Saint John is consistently increasing. Almost a quarter of residents fall between the ages of 45 and 59. Furthermore, the median age has increased from 38.6 to 42.3 years over the past decade, which is younger than the provincial median age (43.7 years), but higher than the national median (40.6 years).

5.8.2 Economic Profile (CBCL, 2015)

The City of Saint John is recognized as the economic hub of New Brunswick due to its strategic port location and deep roots in trade, manufacturing and industrial activity. The global shift to a more serviced-based economy in recent decades has resulted in stronger local economies in Moncton and Fredericton, while Saint John has also diversified its economy. Today, all three economic areas feature

a diverse economy but specialize in different areas, with Saint John continuing to lead the way in trade and industry.

In the City of Saint John, almost 65% of the population over the age of 15 (just over 67,000 people) participated in the labour force. Amongst the participating labour force, 8.6% were unemployed, which is higher than elsewhere in the country (7.8%), but lower than the provincial rate (11.0%). The unemployment rate has increased since 2006 when it was 8.0%, as it has throughout most of the province and country.

Historically, the Saint John economy has been underpinned by a strong industrial sector. Although the economic region has transitioned to a service-based industry, it still maintains its industrial roots. In 2011, around 80% of the Saint John labour force was employed in the service sector, compared to around 87% in Fredericton and Moncton. Approximately 4% were employed in the primary sector and 16% in the secondary sector (Table 5.11).

Table 5.11: Sector Breakdown of Labour Force in the City of Saint John, New Brunswick

	Saint John CMA	
2011	**Total**	**Percent (%)**
Total Labour Force	67,355	-
Primary sector	2,680	4.0%
Secondary sector	12,115	15.8%
Service sector	11,670	80.2%

5.9 Land Use

Known uses of the Mispec River near the proposed project site include the following:

- Paddling: The Mispec River is known as a paddling route for kayaking and canoeing. The river is known for white water kayaking providing rapids of different levels (Trailpeak 2016);
- Public Beach: Mispec Park, home to Mispec beach is a community location for recreation. It has been a historic recreation area which was used by World War Two servicemen and women. Following a recent storm the beach was closed, after community outrage funds were found to repair the stairs and sea wall (CBC 2016, Discover Saint John, 2016);
- River dams: The Mispec River has a number of dams which act as partial downstream barriers these are located at Beaver Lake, Latimer Lake, Robertson Lake, with two at McBrien Lake. A waterfall in Ratcliffe Brook also serves as a partial downstream barrier (Amiro et al. 2009); and
- Discharge location from another WWTP: There is a 50mm diameter forcemain that runs parallel to the site and discharges within 2m upstream of the existing WWTP outfall. The forcemain is from a package WWTP that services municipal waste water from the Loch Lomond Elementary School.

Recreational fishing is also common in the Mispec River. Recreational fishing is discussed in Section 5.12.

5.10 Archaeological and Heritage Resources

Excavation activities have the potential to disturb archaeological and heritage resources. In the event that archaeological resources are encountered during excavation activities work must stop and appropriate archaeological mitigation measures must be implemented to protect the resource. The risk of encountering archaeological resources is heightened when working in properties registered as Heritage Conservation Area. According to the provincial archaeological predictive modelling in an email dated August 11, 2016, there is a low potential of encountering archaeological resources in the area of the Saint John Airport.

5.11 Species at Risk and of Conservation Concern

A rare taxa sightings report was acquired from ACCDC (Appendix F) to identify species of concern with the potential to occur in the vicinity of the Project (ACCDC 2016). References noted in the ACCDC report were used to acquire information on the other databases. A screening of the ACCDC list resulted in a shortlist of 24 vascular plants, non-vascular plants, birds, mammals and reptile species that have been sighted within 5km of the Project site, listed in Table 5.12 below (Figure 5.2). Subsequent sections of this report address specific taxa explicitly, and qualify the potential for the species to occur on the Project site. Species descriptions for the 24 species are also included in Appendix H.

In Chapter 6, Species at Risk and of Conservation Concern are addressed within the VECs Avifauna, Surface Water Quality/Quantity and Fish and Fish Habitat and Vegetation, Wetland and Wildlife and Wildlife Habitat.

Table 5.12: Summary of Species of Conservation Concern Recorded within 5 km of the Saint John Airport

Common Name	Scientific Name	ACCDC SRank	NBDNR General Statu Rank	NB *SARA* Designation	COSEWIC	Federal *SARA* Designation	Schedule	Most Recent Sighting*
Non-Vascular Plant								
Ghost Antler Lichen	*Pseudevernia cladonia*	S2S3	Not Listed	Not Listed	Not Listed	Not At Risk	N/A	1996
Vascular Plants								
Lance-leaved Figwort	*Scrophularia lanceolata*	S2	Not Listed	Not Listed	Not Listed	Not Listed	N/A	1897
Coastal Sedge	*Carex exilis*	S3	Not Listed	Not Listed	Not Listed	Not Listed	N/A	2002
Brown Beakrush	*Rhynchospora fusca*	S3	Not Listed	Not Listed	Not Listed	Not Listed	N/A	2002
Humped Bladderwort	*Utricularia gibba*	S3S4	Not Listed	Not Listed	Not Listed	Not Listed	N/A	2002
Oakes' Pondweed	*Potamogeton oakesianus*	S3S4	Not Listed	Not Listed	Not Listed	Not Listed	N/A	1965
Birds								
Bank Swallow	*Riparia riparia*	S2S3B,S2S3M	Sensitive	Not Listed	Threatened	Not Listed	N/A	1986
Barn Swallow	*Hirundo rustica*	S3B,S3M	Sensitive	Threatened	Threatened	Not Listed	N/A	2010
Bobolink	*Dolichonyx oryzivorus*	S3B,S3M	Sensitive	Threatened	Threatened	Not Listed	N/A	1986
Olive-sided Flycatcher	*Contopus cooperi*	S3S4B,S3S4M	At risk	Threatened	Threatened	Threatened	Schedule 1	2008
Canada Warbler	*Wilsonia canadensis*	S3S4B,S3S4M	At risk	Threatened	Threatened	Threatened	Schedule 1	2009
Eastern Wood-Pewee	*Contopus virens*	S4B,S4M	Secure	Special Concern	Special Concerr	Not Listed	N/A	1987
Great Crested Flycatcher	*Myiarchus crinitus*	S2S3B,S2S3M	Sensitive	Not Listed	Not Listed	Not Listed	N/A	2000
Pine Siskin	*Carduelis pinus*	S3	Secure	Not Listed	Not Listed	Not Listed	N/A	2009
Turkey Vulture	*Cathartes aura*	S3B,S3M	Secure	Not Listed	Not Listed	Not Listed	N/A	2007
Killdeer	*Charadrius vociferus*	S3B,S3M	Secure	Not Listed	Not Listed	Not Listed	N/A	1986
Brown-headed Cowbird	*Molothrus ater*	S3B,S3M	May be at risk	Not Listed	Not Listed	Not Listed	N/A	1987
Evening Grosbeak	*Coccothraustes vespertinus*	S3B,S3S4N,SUM	Secure	Not Listed	Not Listed	Not Listed	N/A	1986
Cape May Warbler	*Dendroica tigrina*	S3B,S4S5M	Secure	Not Listed	Not Listed	Not Listed	N/A	2008
Eastern Kingbird	*Tyrannus tyrannus*	S3S4B,S3S4M	Sensitive	Not Listed	Not Listed	Not Listed	N/A	2007
Spotted Sandpiper	*Actitis macularius*	S3S4B,S5M	Secure	Not Listed	Not Listed	Not Listed	N/A	2008

Common Name	Scientific Name	ACCDC SRank	NBDNR General Statu Rank	NB *SARA* Designation	COSEWIC	Federal *SARA* Designation	Schedule	Most Recent Sighting*
Wilson's Snipe	*Gallinago delicata*	S3S4B,S5M	Secure	Not Listed	Not Listed	Not Listed	N/A	2008
Bald Eagle	*Haliaeetus leucocephalus*	Not Listed	At risk	Endangered	Not Listed	Not Listed	N/A	Unknown
Mammals								
Canadian Lynx	*Lynx canadensis*	S3	At risk	Endangered	Not At Risk	Not Listed	N/A	2006
Reptiles								
Snapping Turtle	*Chelydra serpentina*	Not Listed	Secure	Special Concern	Not Listed	Special Concern	Schedule 1	Unknown

* Sightings as recorded with the Atlantic Canada Conservation Data Centre (ACCDC)

5.12 Protected Areas

The ACCDC rare taxa report (Appendix F) also identified special areas in the vicinity of the Project. A screening of the ACCDC list resulted in one managed area, the Dry Marsh Ducks Unlimited site. No biologically significant areas were identified within 5 km of the Project site. The Dry Marsh Ducks Unlimited Canada (DUC) site is approximately 3km to the southwest. The Dry Marsh is a 28.7ha and the wetland complex is located immediately adjacent to Latimer Lake.

Functional assessment of the Dry Marsh site was completed by CBCL in support of the Safe, Clean Drinking Water Project (2014). Modifications to the Dry Marsh site, conducted by DUC in 1986, have altered the site conditions to introduce areas of open water for waterfowl habitat, via installation of a weir structure at the outlet of the wetland and excavation of channels in various locations throughout the site. There is a natural berm surrounding the wetland, within the forested wetland fringe. The marsh is fed by one small, permanent watercourse (Eldersley Brook), as well as a number of other small ephemeral and intermittent watercourses around its perimeter. Water also enters the system from overflows from the Latimer Lake reservoir, located to the east. The primary outflow from the system is at the weir structure, which subsequently flows into the continuation of Eldersley Brook (CBCL, 2014b).

CHAPTER 6 ENVIRONMENTAL ASSESSMENT METHODOLOGY

6.1 Environmental Assessment Methods

The environmental assessment methodology for the Project has been developed to satisfy regulatory requirements for an EIA Registration Document pursuant to Schedule A of the *Environmental Impact Assessment Regulation (Regulation 87-83)* under the New Brunswick *Clean Environment Act*. The approach and methods used have proven very effective for federal, provincial and joint federal-provincial EA processes in various geographic jurisdictions.

The assessment of environmental effects of a project requires a clear understanding and description of all project components and activities, and the environment as it exists prior to undertaking the project. The remaining steps in undertaking the evaluation of a proposed project's environmental effects involve:

- Scoping the assessment: identifying interactions between project activities and the existing environment; establishing parameters against which to measure potential effects;
- Assessing project-related effects: describing mechanisms by which project/environment interactions could result in an environmental effect; proposing measures to mitigate adverse effects and enhance positive effects; and predicting whether, following the application of mitigation measures, significant adverse environmental effects may result;
- Establishing follow-up and/or monitoring programs; and
- Assessing cumulative environmental effects: describing mechanisms by which project/environment interactions may act in combination with other projects or activities that have been or will be carried out.

6.1.1 Scoping the Assessment: Identification of Project-Environment Interactions

A project can only result in an environmental effect where a linkage or pathway exists between a project component or activity (identified in Chapter 2) and the receiving environment (described in Chapter 5). Identifying these project/environment interactions and focusing the assessment on those issues of greatest potential impact and concern is accomplished through scoping of the assessment (Sadar, 1994), a mechanism to support meaningful and effective evaluation of environmental effects accomplished by:

- Identifying potential interactions between the Project and the physical, ecological and socio-economic environments; and

- Determining which project/environment interactions will be carried forward through the assessment as Valued Ecosystem Components (VECs).

Where appropriate, the assessment includes a summary of major concerns or hypotheses of relevance regarding the effect of each Project component or activity on the VEC being considered. Where existing knowledge indicates that an interaction is not likely to result in an effect, certain issues may not warrant further analysis.

6.1.2 Scoping the Assessment: Selection of Valued Environmental Components

Environmental assessments generally follow the method originally proposed by Beanlands and Duinker (1983), whereby the assessment focuses on those components that have the greatest potential for environmental effects and which, should they be altered by the project, would be of concern or interest to stakeholders (e.g., regulators, scientists, special interest groups, Aboriginal peoples, and/or members of the public). VECs can include both biophysical and human environments, and are selected based on consideration of factors such as regulatory guidelines and legislative requirement; regulatory and stakeholder direction and consultation; field reconnaissance; professional judgment; and vulnerability of the potential VEC to project effects.

Each VEC is subject to spatial boundaries (probable geographical extent of the environmental effects) and temporal boundaries (timing and duration of the environmental effects). Temporal boundaries for VECs may include one or more of the identified Project phases. Spatial boundaries are VEC-dependent but generally include the Project footprint, its immediate environs, and an area potentially affected by the undertaking. Other boundaries to be considered as appropriate include administrative and technical boundaries imposed by factors such as finite resources of data, time, cost and labour, as well as technical, political, or administrative considerations or jurisdictions. This report aims to determine the significance of environmental effects to the evaluated VECs associated with upgrading the WWTP.

6.1.3 Assessing Project-Related Effects: Analysis, Mitigation Measures, Residual Effects and Significance Determination

The assessment focuses on the evaluation of the potential interactions between VECS and Project components or activities. A standard evaluation system is used to ensure that potential effects are clearly and completely evaluated. The prediction of residual effects includes:

- Determining whether the environmental effects are adverse;
- Determining whether the adverse environmental effects are significant; and
- Determining whether the significant adverse environmental effects are likely to occur.

Mitigation considers temporal or spatial procedures or changes that can be incorporated into the project, or means by which project construction, operation or decommissioning activities can limit or correct project-related effects on a particular VEC. Depending on the anticipated environmental effects, the mitigation measures are optimized to minimize adverse environmental effects and enhance those that are positive. It is the environmental effects following the application of proposed mitigation measures (i.e., residual effects) for which a significance determination is made regarding whether, following the application of mitigation measures, the effect is likely to be of a significant nature.

Accepted practice in determining the significance of an environmental effect involves establishing evaluation criteria for the determination of significance, which include, among other factors: nature of effect, magnitude, geographic extent, duration, frequency and reversibility and these are defined as:

- Nature of effect (i.e., positive or negative);
- Magnitude of effect on background levels after mitigation implementation:
  - Negligible (no change anticipated);
  - Small (slightly above, but within acceptable standards);
  - Moderate (moderately above, but within acceptable standards; and
  - Large (exceeds acceptable standings).
- Geographic extent of the effect (e.g., immediate area of construction is considered local);
- Duration of the effect:
  - Short term (short term effect during construction or operation); and
  - Long term (continuous during the duration of the Project and in some cases after)
- Frequency of the effect:
  - Accidental (rare);
  - Isolated (to specific phase or period);
  - Occasional (intermittent and sporadic);
  - Periodic (intermittent and repeated); and
  - Continuous;
- Reversibility of the effect:
  - Reversible (immediate, short term, long term); and
  - Permanent (irreversible)].

These criteria have been considered in this assessment with regards to the determination of significance for each VEC.

6.1.4 Establish Follow-up and Monitoring Programs

Follow-up and monitoring, in some cases developed in conjunction with regulators, may be recommended to assess effectiveness of measures implemented to mitigate adverse environmental effects. Follow-up and monitoring may also provide essential feedback with respect to predicted project effects, unanticipated effects and cumulative effects.

Monitoring and follow-up requirements are evaluated for each VEC and are linked to the sensitivity of a VEC to both project-related and cumulative environmental effects. The likelihood and importance of such effects, as well as the level of confidence associated with the adverse residual effects rating, are also taken into consideration.

6.1.5 Cumulative Environmental Effects

When two non-related projects are assessed independently, each may be determined to not be likely to cause significant adverse environmental effects; however, it is possible that the incremental effects of each project could, when considered jointly, result in an overall effect to a VEC and be likely to result in a significant environmental effect. For this assessment, existing and planned projects that could interact with the proposed Project are identified, and cumulative effects are considered where:

- The project is determined to have a residual environmental effect;

- There is overlap or interaction of environmental effects between the two projects; and
- It is reasonable to expect that the project's contribution to cumulative environmental effects could affect the viability or sustainability of the VEC.

Please see Chapter 8 for the cumulative effects assessment.

6.2 Scope of Assessment

6.2.1 Scope of Factors to be Considered

This assessment is being completed to satisfy part of the provincial environmental registration requirements pursuant to the *Clean Environment Act*. The assessment includes consideration of the following factors:

- The environmental effects of the Project, including the environmental effects of accidental events or malfunctions that may occur in connection with the Project, and cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out;
- Measures that are technically and economically feasible and that would mitigate any significant Project-related adverse environmental effects;
- Significance determination of residual environmental effects (i.e., following the application of mitigation); and
- Any other matter relevant to the assessment, such as the need for the Project (Section 2.2), alternatives to the Project (Section 2.3), and effects of the environment on the Project (Section 7.2).

6.2.2 Scope of the Project

Project components and associated activities are described in detail in Chapter 2 and summarized below in Table 6.1. Accidental events and malfunctions (Section 7.1) and potential effects of the environment on the Project (Section 7.2) have also been assessed.

Table 6.1: Project Components and Activities

Project Phase	Project Activity
Construction	Site preparation (includes site access and staging, installation of environmental controls, and grubbing)
	Excavation and grading for new component construction
	New component construction (SBR system and infrastructure, Control Building, pump station and sewer main)
	Demolition of existing components (RBC system and infrastructure, trickling filter and sedimentation basin)
	Site restoration
Operation	Wastewater treatment
	Discharge of treated effluent
Maintenance	Standard building and equipment maintenance
	Sludge Disposal

6.3 Project-Environment Interactions

Potential Project/environment interactions are identified in Table 6.2 below, which also details the nature of the potential interaction between the Project activity, summarized above, and environmental components determined through a review of the existing environment as detailed in Chapter 5. A number representing the degree of potential effect to each Project/environment interaction is assigned, whereby:

- 0 = no interaction occurs between Project activities and the environment;
- 1 = interaction occurs between Project activities and the environment; however, based on professional judgment and past experience, the interaction would either not result in a significant effect, even without mitigation, or would not be significant due to Project design elements that have inherently mitigated the potential effect; and
- 2 = interaction occurs between Project activities and the environment that requires further assessment.

Table 6.2: Project/Environmental Component Interaction Matrix

Project Phase	Project Activity	Environmental Components									
		Air and NoiseQuality	Hydrogeology	Soil Quality/Quantity	Surface Water Quality /Quantity and Fish and Fish Habita	Vegetation, Wetlands and Terrestrial Wildlife and Habitat	Avifauna	Commercial/Recreational/ Aboriginal Fisheries	Socio-economic	Land Use	Archaeological, Cultural and Paleontological Resources
Construction	Site preparation	1	1	1	1	1	1	1	1	1	0
	Excavation and grading for new component construction	1	1	1	1	1	1	1	1	1	0
	New component construction	1	1	1	1	1	1	1	1	1	0
	Demolition of existing components	1	1	1	1	1	1	1	1	1	0
	Site restoration	1	1	1	1	1	1	1	1	1	0
Operation	Wastewater treatment	0	0	0	0	0	0	0	0	0	0
	Discharge of treated effluent	0	1	0	1	0	0	1	0	1	0
Maintenance	Standard building and equipment maintenance	1	0	0	1	0	0	0	0	0	0

'0' = no project/environment interaction; '1' = interaction occurs however would not result in significant effect (even without mitigation) or project design elements have mitigated potential adverse effect; '2' = potential effect to be assessed.

6.3.1 No Interaction Between Project Activity and Environmental Component ('0')

Project components/activities are not anticipated to interact with, or archaeological, cultural or paleontological resources.

6.3.2 No Significant Interaction Between Project Activity and Environmental Component ('1')

Based on the professional judgment and past experience of the study team, interactions between Project components/activities and the following VECs are not anticipated to result in significant adverse effects, even without the application of mitigation measures, and/or due to Project design elements, that have inherently mitigated the potential effects, as discussed in the sub-sections below:

- Air and Noise Quality;
- Hydrogeology;
- Soil quality/quantity;
- Surface water quality/quantity and fish and fish habitat;
- Avifauna;
- Vegetation and Wetlands;
- Terrestrial wildlife and wildlife habitat;

- Commercial/Recreational/Aboriginal fisheries;
- Socio-economic; and
- Land use.

6.3.3 Interaction Requiring Further Assessment ('2')

Interactions that may occur between Project components/activities and those VECs identified in Table 6.2 require further assessment. Upon completion of the assessment, the Project is not anticipated to result in significant adverse effects to any VECs.

6.4 Air and Noise Quality

Air and noise quality was selected as a VEC as the proposed project may have potential to adversely affect air and noise quality during construction/maintenance and air quality during operation. Indoor air quality and greenhouse gas emissions are not included in this VEC as the Project is unlikely to cause adverse environmental effects to these components.

6.4.1 Boundaries

The spatial boundary to air quality and noise is limited to the proposed project area and the immediate vicinity. The temporal impacts to air and noise quality are limited to the construction and maintenance phase of the project, with minor impacts to air quality during operation.

6.4.2 Potential Impacts

The identified potential impacts of the proposed project on air quality and noise are as follows:

- Emission of air pollutants from vehicle exhaust;
- Emission of fugitive dust; and
- Noise disturbance to birds.

Given the natural land use around the site, the present air quality is assumed to be very good. During construction, operational and maintenance periods, vehicular emissions (carbon monoxide, SO_2, NO_2 and particulates) will be released along the transportation corridor to the site and at the site itself. These emissions are expected to be dispersed by ambient winds and in combination with mitigation measures, will not pose a threat to health or environmental quality.

Fugitive dust associated with vehicles and bare areas may be a source of air pollution at the site if unmitigated. Depending on the moisture content of the roadway, truck travel on unpaved road surfaces can generate dust. It is anticipated that dry soil conditions will occur when dry weather persists onsite. Fugitive dust emissions can also be generated from wind erosion during soil handling activities; however, with proper materials handling practices, these levels are not anticipated to be substantial.

See Section 6.8 on potential effects on noise disturbance to birds.

6.4.3 Mitigation Measures

The following mitigation measures are designed to reduce the potential impacts of the project phases to air quality.

- Minimize Vehicle Idling;
- Maintain Motorized Vehicles and Equipment:
  - Operating condition of all vehicles and motorized equipment will be assessed on a regular basis, and maintained to ensure optimal performance;
- Reduce Dust Emissions:
  - Apply water spray to unpaved surfaces when conditions are dry and windy weather persists onsite;
  - Unpaved road surfaces onsite will be monitored during dry periods to ensure water application is timely and effective; visible signs of dust plumes will trigger an immediate response from onsite construction managers and field supervisors;
  - Soils will be placed using a leading-edge infill method with minimum disturbance of surface materials;
  - Infill work areas will be monitored during dry-windy weather conditions; visible signs of dust plumes will trigger an immediate response from onsite construction managers and field supervisors; and
  - Ensure soil loads in the haulage vehicles are secured in a manner that they cannot create dust emissions (i.e., by tarping).

Please see Section 6.8 for noise mitigation.

6.4.4 Residual Effects and Significance Determination

A significant effect on air quality would be exceedance of provincial or federal air quality standards. Residual effects may occur after the implementation of mitigation measures. The evaluation criteria is as follows.

- Nature of effect: Negative;
- Magnitude: Small;
- Geographic Extent: Local;
- Duration: Short Term/Construction and Operation and Maintenance;
- Frequency: Isolated; and
- Reversibility: Reversible - short term.

Following the implementation of mitigation measures, the Project is not anticipated to have a significant residual environmental effect on air quality, i.e., the impact is Not Significant.

6.5 Hydrogeology

Hydrogeology was selected as a VEC due to its potential interaction with the project and groundwater which could ultimately impact adjacent habitats such as the Mispec River.

6.5.1 Boundaries

The physical boundaries encompass the project site and the temporal boundaries are those associated with construction and operation.

6.5.2 Potential Impacts

Impacts to groundwater quality (e.g., contamination) was the identified potential impact on hydrogeology. Although effluent will be discharged through a 200mm diameter outfall to the Mispec River, there could be a potential exchange between groundwater and surface water. For example, if there was treatment malfunction at the WWTP and/or a leak in the pipes and it seeped into the groundwater it could end up in the Mispec River and impact aquatic life. In addition, leaks and spills during construction could ultimately end up in the groundwater which could flow into the river.

6.5.3 Mitigation Measures

Mitigation measures to reduce the potential impacts to hydrology are provided below:

- Avoid contamination of groundwater;
  - Please see Section 7.1.2;
- Test Effluent According to the Saint John Airport Approval to Operate:
  - The new WWTP will be a Class 2; therefore, biweekly testing for $CBOD_5$ and TSS and monthly e-coli testing will be required; and
- Regular inspection and maintenance of pipes and other equipment.

6.5.4 Residual Effects and Significance Determination

A significant impact on hydrology/groundwater would be exceedances above the CofA requirements and/or criteria listed in the CCME (1999) *Water Quality Guidelines for the Protection of Aquatic Life*. Residual effects may occur after the implementation of mitigation measures. The evaluation criteria for hydrogeology is as follows:

- Nature of effect: Negative;
- Magnitude: Small;
- Geographic Extent: Local;
- Duration: Short Term/Construction and Operation;
- Frequency: Accidental; and
- Reversibility: Reversible – short term.

Following the implementation of mitigation measures, the Project is not anticipated to have a significant residual environmental effect on hydrogeology, i.e., the impact is Not Significant.

6.6 Soil Quality and Quanity

Soil Quality and Quantity was selected as a VEC since there is the potential for soil runoff from disturbed areas of the site or from stockpiled materials, to be transported offsite and possibly to enter the watercourse. In addition, there is a small risk of encountering contaminated soils during excavation.

6.6.1 Boundaries

The physical boundaries encompass the project site and the temporal boundaries are those associated with construction.

6.6.2 Potential Impacts

During the construction phase of the Project, there is the potential for soil quantity (e.g. loss of soil) to be impacted via soil runoff from disturbed areas of the site or from stockpiled materials into the watercourse which could negatively affect surface water quality. The area to be excavated for the Project (i.e., the construction footprint) will be relatively small (~550m^2), reduced to that which is absolutely necessary, and will be reclaimed immediately following completion of the WWTP upgrades.

There is also a small risk of encountering contaminated soils during excavation of the site soils.

6.6.3 Mitigation Measures

If contaminated soils are encountered during the excavation of the site soils, these soils should be properly tested for contaminants and removed from the site and disposed of at an approved off-site location. Please see Sections 6.7.3 and 6.9.3 for additional soil quality and quantity mitigation.

6.6.4 Residual Effects and Significance Determination

A significant effect on soil quality would be excavation of soils with concentrations of parameters exceeding the *Guidelines for the Management of Contaminated Sites* (DELG, 2003). During the construction phase of the Project, there will be excavation, movement and storage of soils from areas within the construction footprint. There is no evidence to suggest that contaminated soils are present on the site; however, if contaminated soil is encountered during construction activities it will be properly managed and disposed of, as necessary, at an approved off-site facility.

A significant effect to soil quantity would be the loss of soil via the release of sediment laden runoff in excess of the maximum values listed in the CCME (1999) *Water Quality Guidelines for the Protection of Aquatic Life*.

The evaluation criteria for soil quality and quantity is as follows.

- Nature of effect: Negative;
- Magnitude: Small;
- Geographic Extent: Local;
- Duration: Short Term/Construction;
- Frequency: Isolated/Accidental; and
- Reversibility: Reversible – short term.

Following the implementation of mitigation measures, the Project is not anticipated to have a significant residual environmental effect on soil quality, i.e., the impact is Not Significant.

6.7 Surface Water Quality/Quantity and Fish and Fish Habitat

Direct interaction with the surface water quality/quantity and fish and fish habitat VEC is anticipated during the construction and operation phases of the project.

The discharge of the WWTP is located in the Mispec River, downstream of where the Airport's potable water supply comes from (i.e., Robertson Lake). The potable water system for the Airport is shown on Figure 2.4. There will be no changes to the water supply location or volume of water that will be withdrawn for processing as a result of the upgrades. The only discharge to surface water and fish and fish habitat is the treated effluent via the existing outfall. Peak flows are anticipated to be higher with the new WWTP. No construction is proposed to the outfall or within 30m of the watercourse.

6.7.1 Boundaries

The spatial boundaries are limited to the Mispec River adjacent to the proposed WWTP and the Mispec River downstream from the proposed effluent input. Temporal boundaries are those associated with construction, operation and maintenance.

6.7.2 Potential Impacts

The identified potential negative impacts of the proposed project on surface water quality/quantity and fish and fish habitat are as follows:

- Change in surface water flow and water level (i.e. impacts to instream flow needs of fish);
- Sediment laden runoff reaching surface water;
- Contaminated discharge into Mispec river; and
- Accidental spills and leaks.

The identified positive impacts of the proposed project on surface water quality/quantity and fish and fish habitat are as follows:

- Elimination of chlorine into the Mispec River.

Potential impacts to surface water quantity and instream flow needs of fish could occur as a result of changes in surface water flows. There is potential during both the construction and operational phases of the Project for hydrological regime changes, which may in turn affect surface water quantity and fish and fish habitat. During the operational phase, peak flows could be higher than the previous WWTP outputs. Alterations in flow can cause potential impacts to fish and fish habitat and food sources. For example, a change in river flow can cause disruption to spawning and invertebrate production, scouring of spawning areas and can leave fish stranded and disconnected to the stream (Burt and Mundie 1986).

During the construction phase of the Project, there is the potential for sediment laden runoff from disturbed areas of the site or from stockpiled materials to enter the nearby watercourse and negatively affect surface water quality and therefore fish and fish habitat. The area to be excavated is expected to be relatively small (~550m^2). Increases in sedimentation above background levels can have negative impacts on both fish and fish habitat. For example, elevated levels of sediment in rivers can decrease invertebrate production and alter fish habitat by infilling in pools and spaces for cover (Cairns 2002).

Another potential impact to surface water quality and fish would be contaminated discharge from the WWTP into the Mispec River with exceedances above the current CCME (1999) Water Quality Guidelines for the Protection of Aquatic Life. Although the proposed WWTP upgrades will be designed to meet the effluent requirements of the current CofA which includes $CBOD_5$ and TSS requirements of 25mg/L, there is a risk of a malfunction which could result in untreated discharge entering the river.

During construction, operation, and maintenance of the WWTP accidental spilling of fuels, lubricants, or hydraulic fluids into the surrounding environment may negatively impact water quality and fish. Please also refer to Chapter 7.

Although the amount of chlorine currently being put into the Mispec River is below the permissible threshold for the protection of aquatic life, the new WWTP will not be using chlorine for disinfection since a new UV disinfection system will be used. Therefore, no chlorine discharges will occur into the Mispec River from the new WWTP. Chlorine is known to have negative impacts on fish, such as reduced respiration, increased predation risk and death in extreme cases (Cooke and Schreer 2001). With the elimination of chlorine discharge occurring in the Mispec River with the design of the new WWTP, there is anticipated to be no risk of sublethal or lethal impacts of chlorine to fish downstream of the effluent output. The overall health of the aquatic environment with regards to chlorine impacts is anticipated to improve.

6.7.3 Mitigation Measures

Mitigation measures to reduce the potential impacts to surface water quality/quantity and fish and fish habitat are provided below:

- Test Effluent According to the Saint John Airport Approval to Operate:
  - The new WWTP will be a Class 2; therefore, biweekly testing for $CBOD_5$ and TSS and monthly e-coli testing will be required;
  - Regular testing of DO, pH and temperature is recommended;
  - Ensure that effluent meets the requirements of the *Wastewater Systems Effluent Regulations* pursuant to the *Fisheries Act.*
- Ensure that effluent and site run-off into the aquatic environment meets the CCME Guidelines (1999) which recommend the following suspended solids criteria (TSS) for the protection of aquatic life (both freshwater and marine):
  - Clear flow: maximum increase of 25mg/L from background levels for any short-term exposure (e.g., 24-h period). Maximum average increase of 5mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d);
  - High flow: maximum increase of 25mg/L from background levels at any time when background levels are between 25 and 250mg/L. Should not increase more than 10% of background levels when background is ≥ 250mg/L;
- Use of Sediment Erosion Control Measures:
  - The use of sediment erosion control measures (e.g., properly installed silt fences, sand bags and poly plastic) is recommended in appropriate locations to reduce sedimentation;
  - Soil and material piles will be covered and located where materials cannot run-off into the aquatic environment and in a manner that limits the potential for wind or water erosion;

  - Reduce sedimentation through the use of existing cleared and disturbed land;
  - The ground surface will be contoured so that runoff will remain free from sediment and will continue to be discharged to the same areas of the site as before construction;
  - It is anticipated that the area of disturbance will be geographically small and temporary (e.g., will be reinstated/hydroseeded immediately following construction), such that there will be no change in the volume and peak rate of runoff discharged from the site during, or following, construction;
- Monitor flows according to the Saint John Airport Approval to Operate:
  - The new WWTP will be a Class 2; therefore, biweekly testing of flow will be required;
- Adhere to The *Atlantic Canada Wastewater Guidelines Manual for Collection, Treatment and Disposal* (Environment Canada, 2006) when designing the WWTP;
- Avoid Spills and Leaks:
  - Please see Chapter 7 for mitigation measures.
- Minimize risks associated with malfunctions leading to release of untreated effluent into the Mispec River:
  - Develop an Emergency Response Plan to address malfunctions (e.g., in the event of redundant pump failures or a sudden flow surge during the operation of the Project, the proposed design for the WWTP upgrades includes a bypass from the main pump station to the outfall; and in the event of a power failure, the SBR system will be connected to the emergency power from the Airport's emergency power system, which consists of a 400 kW diesel generator; and
  - Refer to Chapter 7 for further discussion of accidental events and malfunctions.

6.7.4 Residual Effects and Significance Determination

A significant effect to surface water quality and fish and fish habitat would be a release of contaminants or sediments to surface water in excess of existing CofA requirements and/or criteria listed in the current CCME (1999) *Water Quality Guidelines for the Protection of Aquatic Life* (i.e., TSS values).

A significant effect to surface water quantity and fish and fish habitat instream flow needs would be a sustained long term change in Mispec River flow compared to background levels. These changes would need to be substantial enough to cause harm to fish and fish habitat.

The evaluation criteria is as follows.

- Nature of effect: The overall change to treated effluent being released to the environment will be positive since chlorination will be eliminated with the upgrade to UV disinfection. Changes will be negative if changes in surface water flow and water levels, sediment laden runoff reaching surface water, contaminated discharge into Mispec river; and if accidental spills and leaks;
- Magnitude: Small for negative and positive
- Geographic Extent: Local;
- Duration: Positive: Long term, Negative: Short Term/Construction, Operation Maintenance;
- Frequency: Positive: Continuous, Negative: Peak Flows – Occasional, Release of contaminants, or spills – Accidental, Release of Sediments - Isolated; and
- Reversibility: Reversible – short term.

Following the implementation of mitigation measures, the Project is not anticipated to have a significant residual environmental effect on surface water quality/quantity and fish and fish habitat, i.e., the impact is Not Significant.

Positive impacts from the elimination of chlorination is also anticipated to not be significant since the amount of chlorine disposed into the Mispec River with the previous WWTP was less than the concentration for the protection of aquatic life (CCME 1999).

6.8 Avifauna

Avifauna was selected as a VEC since some ground nesting species could potentially nest in the low lying vegetation proposed to be cleared. In addition, the proposed Project is adjacent to a forest. An edge habitat has been created between the forest and the area for the WWTP which is suitable habitat for many bird species including some species at risk and conservation concern.

6.8.1 Boundaries

The spatial boundary associated with the determination of effects for birds encompasses the entirety of the Project site and the immediate adjacent habitat. The temporal boundaries are those associated with project construction.

6.8.2 Potential Impacts

The identified potential impacts of the proposed project on birds are as follows:

- Habitat loss;
- Noise disturbances; and
- Accidental mortality.

Some ground nesting species could potentially nest in the low lying vegetation and shrubs proposed to be cleared. If clearing were to occur during the active breeding bird season (i.e. May 1-August 15), nests or eggs could potentially be destroyed. Killdeer is an example of one potential species of conservation concern which could nest within the proposed project area.

Many species of migratory birds utilize edge forest habitat which is located adjacent to the project area. Increased noise during the construction phase may temporarily discourage birds from using adjacent habitat or cause temporary displacement. For example, Burton et al. (2002) found that feeding activity declined for certain species during construction. Noises and disturbances can also cause birds to leave nests for extended periods of time thereby negatively impacting the incubation of eggs or care of young, or even to abandon nests permanently. Some identified species at risk and conservation concern (e.g. pine siskin and the brown headed cowbird) could potentially nest in the habitat adjacent to the project area (see Appendix F for more potentially impacted species). Bald eagles have been identified within 5 km of the project site. Due to the close proximity of the Mispec River and Robertson Lake, there is a potential for bald eagles species to nest near the Project site. Bald eagles are typically impacted from distances occurring between 50-100m for low to medium disturbances (ASRD 2011).

Accidental mortality during Project construction could occur directly to birds and eggs via collisions with vehicles, machinery and equipment, or through accidental destruction of active nests with eggs or young. These impacts can be minimized or reduced through the implementation of mitigation measures.

6.8.3 Mitigation Measures

The following mitigation measures are designed to reduce the potential impacts of the project phases to birds:

- Conduct a Breeding Bird Survey Prior to Construction:
  - Due to the potential of species at risk and conservation concern identified by ACCDC, a breeding bird survey is recommended prior to construction; ideally, this would be undertaken within the months of May or June.
  - A search for potential bald eagle nests would be recommended to be conducted in April or May. If a bald eagle nest is discovered, setback distances from construction activities between 50-100m are recommended until young have fledged;
- If possible, remove vegetation outside of the breeding bird season (i.e. May 1-August 15):
  - If vegetation removal must occur during the breeding bird season, conduct a nest search within 5 days of vegetation removal;
- Obey Posted Speed Limits:
  - Obeying posted speed limits should minimize accidental mortality to birds.
- Reduce unnecessary noise:
  - Avoid idling vehicles;
  - If possible, conduct the highest noise activities during the warmest periods of the day and minimize noise during the early morning or evening hours.

Please note that all of the conditions will be complied with except in situations where doing so could interfere with the Airport's responsibility to the public safety and defined by their Wildlife Management Plan as approved by Transport Canada.

6.8.4 Residual Effects and Significance Determination

Significant impacts to avifauna would include:

- Destruction of critical habitat of a species at risk or conservation concern; and
- Impacts which could significantly decrease bird diversity or abundance in the area.

The evaluation criteria is as follows:

- Nature of effect: Negative;
- Magnitude: Small;
- Geographic Extent: Local;
- Duration: Short Term/Construction
- Frequency: Isolated; and
- Reversibility: Noise: Reversible – short term; Accidental Mortality and Habitat Loss: Reversible - long term.

Following the implementation of mitigation measures, the Project is not anticipated to have a significant residual environmental effect on avifauna, i.e., the impact is Not Significant.

6.9 Vegetation, Wetlands and Terrestrial Wildlife and Wildlife Habitat

Vegetation, wetlands and terrestrial wildlife and wildlife habitat were selected as a VEC as the construction phase of the project may directly or indirectly interact with vegetation, wildlife, wildlife habitat and wetlands.

6.9.1 Boundaries

The spatial boundaries are limited to the physical extent of the identified habitats and the physical interaction between these habitats and the proposed developed. The temporal boundaries are those associated with project construction.

6.9.2 Potential Impacts

All of the interactions between the Project and vegetation and terrestrial wildlife and wildlife habitat will occur as a result of the ground disturbance and other activities associated with the construction phase of the Project. These activities will result in temporary or permanent effects from site preparation (i.e., grubbing/grading) and construction, and may also be caused by associated dust or erosion/sedimentation. Specifically, during construction, potential adverse effects on vegetation, wetlands and terrestrial wildlife and wildlife habitat include:

- Accidental mortality;
- Noise disturbances and visual impacts;
- Alteration of wetland function; and
- Loss and alteration of habitat.

Accidental mortality during Project construction could occur directly to wildlife via collisions with vehicles, machinery and equipment, or through accidental destruction of burrows. Slow moving fauna are most susceptible to direct mortality resulting from the use of heavy equipment/vehicles on site. Wildlife may also be attracted to the Project area due to unsuitable waste management which can increase the likelihood of an interaction. These impacts can be minimized or reduced through the implementation of mitigation measures.

Construction noise and visual impacts from the presence of humans/equipment in the area, may have deleterious effects on wildlife in and near the construction area, but these effects are likely to be temporary and minor. Negative effects from noise and visual disturbance vary from species to species, because of interspecies differences in both hearing/sight abilities and in behavioural and physiological responses to stimuli.

The construction activities will occur within 30m of a mapped wetland, although no construction activities will occur within the wetland itself. The proposed project could impact this wetland by erosion/sedimentation and changes to hydrology. These impacts can interfere with wetland function, including species diversity. Sediment laden runoff may affect the nearby wetland and the habitat they provide since sediments carried into wetlands could smother existing vegetation and change nutrients

levels. Changes in nutrient levels will change water quality and potentially plant communities in the wetlands. Wetlands require a certain level of soil humidity, such that a change in the water regime can result in changes to the vegetation, character and functionality of the wetland.

Site preparation activities will result in the removal of vegetation and potential wildlife habitat (see Section 5.6) in areas of the construction footprint not already occupied by the existing WWTP components (approximately 550m^2). This represents a permanent loss of availability of vegetation habitat, as well as the direct removal of the vascular and non-vascular plants in the areas affected. Site preparation, as well as construction activities, will also result in disturbed soils, without the cover of vegetation, making these areas vulnerable to erosion. Sediment laden surface water may smother vegetation or impair its growth. In addition, site preparation and construction activities will also result in the movement of soils and may result in the development of fugitive dust. Dust may settle on vegetation and temporary inhibit its growth, or may deposit minerals and nutrients into wetlands.

6.9.3 Mitigation Measures

The following mitigation measures are designed to reduce the potential impacts of the project phases to vegetation, wetlands and wildlife and wildlife habitat:

- Minimize or Avoid Impacts to Wetlands and Vegetation:
  - Whenever possible, use existing cleared and disturbed land;
  - The construction footprint and areas requiring the removal of vegetation should be reduced to that which is absolutely necessary;
  - Avoid or minimize traversing through wetlands and native vegetation. The use of wetland matts (i.e., wooden boards) are recommended if traversing through wetlands is necessary; and
  - Construction activities within 30m of the wetland will be carried out in accordance with a WAWA permit;
- Obey Posted Speed Limits and Yield to Wildlife:
  - Vehicles should yield the right-of-way to wildlife when safe to do so;
- Properly Dispose of Waste to Minimize Wildlife Encounters:
  - All Project areas will be kept clean of food scraps and garbage will be collected and removed from the site daily. In the case that wildlife is encountered during construction activities, no attempt will be made by any worker to catch, divert or otherwise harass wildlife;
- Use of Sediment Erosion Control Measures:
  - The use of sediment erosion control measures (e.g., properly installed silt fences, sand bags and poly plastic) is recommended in appropriate locations to reduce sedimentation into wetlands and native vegetation;
  - Temporary piles of soil and material will be stored more than 30m from the wetland and will be covered and be located where materials cannot enter a wetland or native vegetation and in a manner that limits the potential for wind or water erosion; and
  - The ground surface will also be contoured during construction so that once the WWTP upgrades are complete, storm water runoff will remain free from sediment and will continue to be discharged to the same areas of the site, and in the same volumes, as before construction;
  - See Mitigation in Section 6.4.3 for dust control.

- Reduce unnecessary noise:
  - Avoid idling vehicles.

Please note that all of the conditions will be complied with except in situations where doing so could interfere with the Airport's responsibility to the public safety and defined by their Wildlife Management Plan as approved by Transport Canada.

6.9.4 Residual Effects and Significance Determination

A significant effect to vegetation and terrestrial wildlife and wildlife habitat would be a decline in abundance and/or a change in distribution beyond which natural recruitment (i.e., reproduction and immigration from unaffected areas) would not return the population to its pre-project level within several (e.g., 3-5) generations.

A significant adverse effect on wetlands is defined as an effect that is likely to cause a permanent net loss of wetland function. An adverse effect that does not cause a permanent net loss in wetland function is considered to be not significant.

The evaluation criteria is as follows:

- Nature of effect: Negative;
- Magnitude: Small;
- Geographic Extent: Local;
- Duration: Short Term/Construction;
- Frequency: Isolated; and
- Reversibility: Noise, Visual and Wetland Function: Reversible –short term; Accidental Mortality and Habitat Loss –Reversible – long term.

Following the implementation of mitigation measures, the Project is not anticipated to have a significant residual environmental effect on vegetation, wetlands, wildlife and wildlife habitat, i.e., the impact is Not Significant.

6.10 Commercial/Recreational/Aboriginal Fisheries

While Aboriginal and Commercial fisheries do not exist in the Mispec River, recreational fishing does occur. As the Mispec River will receive effluent from the WWTP which has the potential to impact recreationally important fish species and habitat, recreational fishing is selected as a VEC. No construction is proposed to the outfall or within 30m of the watercourse.

6.10.1 Boundaries

The spatial boundary is the Mispec River. Temporal boundaries are those associated with the construction and operational phases of the Project.

6.10.2 Potential Impacts

Potential impacts to recreational fisheries may occur should changes in water quality at drainage areas reduce the ability of recreationally important species (e.g. brown and brook trout) to survive in the

Mispec River. For example, an increase in total suspended solids (TSS) and decaying organic matter may reduce levels of dissolved oxygen (DO) levels resulting in fish mortality and a decline in the recreational fishing industry (Environment and Climate Change Canada, 2016).
Please also see potential effects for Fish and Fish Habitat in Section 6.7.

6.10.3 Mitigation Measures

Please see mitigation measures for Fish and Fish Habitat in Section 6.7.

6.10.4 Residual Effects and Significance Determination

A significant negative effect is one that causes an uncompensated loss of habitat of those fish species that are used for, or support a CRA fishery; or a sustained decrease in earnings from a fishery due to lower catch quantity and/or quality, or increased fishing costs (i.e., due to longer travel times, loss of gear, additional license fees, etc.).

Overall, the effects on recreational fisheries are not considered to be significant since any potential impacts are expected to be infrequent and a water capacity difference of 65m^3/day will not have a significant impact on flow/water quantity. It is expected that the overall impact to recreational fishing will be positive due to an improvement in water quality as chlorinated effluent will no longer be released into the Mispec River using the upgraded UV disinfection system.

The evaluation criteria is as follows:

- Nature of effect: Positive/Negative;
- Magnitude: Small;
- Geographic Extent: Local;
- Duration: Positive: Long term, Negative Short term/construction and operation;
- Frequency: Positive: Continuous, Negative: Peak Flows – Occasional, Release of contaminants, or spills – Accidental, Release of Sediments - Isolated; and
- Reversibility: Reversible – short term.

Following the implementation of mitigation measures, the Project is not anticipated to have a significant residual environmental effect on commercial, aboriginal or recreational fisheries, i.e., the impact is Not Significant.

6.11 Socio-economic

The socio-economic environment is selected as a VEC as employment and the local economy may be impacted by the proposed Project.

6.11.1 Boundaries

The spatial boundaries are the project site and adjacent businesses. Temporal boundaries are those associated with the construction phase of the proposed project.

6.11.2 Potential Impacts

The identified potential impacts of the Project on the socio-economic environment are as follows:

- Direct increase in employment opportunities during the construction phase;
- Temporary reduction in unemployment rate; and
- Indirect benefits to local economy during the construction phase of the project.

The socio-economic environment of the Project has the potential to be affected during the construction phase as a result of employing a local labour force, resulting in a temporary decline in the unemployment rate. A smaller number of permanent staff will be employed during operation, which will be the same size work force as currently used to operate the WWTP, such that there is a negligible effect during operation.

During the construction phase of the Project, economic conditions will improve as employers purchase supplies from local businesses and employees spend their earnings within the community in which they are working and reside resulting in indirect employment benefits.

6.11.3 Mitigation Measures

A mitigation measure to reduce potential impacts to the socio-economic environment will be the hiring of local contractors, skilled tradespersons and/or general labourers to complete the construction phase of the Project.

6.11.4 Residual Effects and Significance Determination

A significant negative effect on the socio-economic environment is one that would result in a long-term decrease in employment opportunities. Overall, the effects are not considered to be significant for the socio-economic environment since any potential impacts, although positive in direction, are expected to be limited due to the size of the labour force required and the short duration of the construction period.

The evaluation criteria is as follows:

- Nature of effect: Positive;
- Magnitude: Small;
- Geographic Extent: Local;
- Duration: Short Term/Construction;
- Frequency: Isolated
- Reversibility: Reversible – short term.

Following the implementation of mitigation measures, the Project is not anticipated to have a significant residual environmental effect on the socio-economic environment, i.e., the impact is Not Significant.

6.12 Land Use

Land Use is selected as a VEC as the Project may impact existing or planned land uses on and/or adjacent to the WWTP site.

6.12.1 Boundaries

The spatial boundaries include the Project site and extend to the Mispec River, adjacent to the WWTP. Temporal boundaries are those associated with the construction and operational phases of the Project.

6.12.2 Potential Impacts

The identified potential negative impacts of the Project on land use are as follows:

- Malfunction of the upgraded WWTP; and
- Higher peak flows flooding land.

The identified potential positive impacts of the Project on land use are as follows:

- Improvement in water quality; and
- Increased use of Mispec River and lands for recreational purposes.

In the event that the upgraded WWTP should malfunction, there is potential for flooding of the land surrounding the facility and/or the release of untreated effluent into the Mispec River. The Mispec River is located approximately 100m to the east of WWTP and borders Mispec Park/Beach. The release of untreated effluent could cause the public beach to be temporarily shut down.

There is potential that an increase in treatment capacity, and subsequent discharge, may lead to higher peak flows thereby impacting recreational activities (e.g. kayaking, canoeing) and potential flooding of land used for recreational purposes (e.g. Mispec Park/Beach).

Alternatively, the Project may positively impact recreational use of the Mispec River and adjacent lands. Replacing the existing chlorination system with a UV disinfection system, thereby eliminating the discharge of chlorinated water to Mispec River, is expected to improve water quality, thereby having a positive effect at the public beach and enhancing the aesthetic appeal of these recreational areas.

6.12.3 Mitigation Measures

Mitigation measure to reduce potential impacts to land use will include:

- Minimize risks associated with malfunctions:
  - Adhere to The *Atlantic Canada Wastewater Guidelines Manual for Collection, Treatment and Disposal* (Environment Canada, 2006) when designing of the WWTP;
  - Develop an Emergency Response Plan to address malfunctions (e.g. in the event of redundant pump failures or a sudden flow surge during the operation of the Project, the proposed design for the WWTP upgrades includes a bypass from the main pump station to the outfall; and in the event of a power failure, the SBR system will be connected to the emergency power from the Airport's emergency power system, which consists of a 400 kW diesel generator.
  - Regular inspections and maintenance programs will ensure the continued reliability and integrity of all equipment (see Section 6.7.3); and
  - Refer to Section 7.1 for further discussion of accidental events and malfunctions;
- Minimize potential for flooding along the Mispec River:
  - Review river flow and storm surge data prior to finalizing design plans;

- Perform regular monitoring of output levels (see Section 6.7.3); and
- Monitor weather forecasts and if possible, aim to reduce flow during and/or after heavy rainfall events.

6.12.4 Residual Effects and Significance Determination

A significant effect on land use is one that results in a pervasive change in existing or future land use patterns and/or that is inconsistent with a land use designated through a municipal planning process.

The Project is located on land zoned for Transportation and the land use has been designated by the City of Saint John for Federal Transportation. The operation of the WWTP is incidental to the overall use of the land as an Airport. As such, no changes the zoning or land use are likely.

Overall, the effects on land use are not considered to be significant since any potential impacts are expected to be infrequent and a water capacity difference of 65 m^3/day will not have a significant impact on flows or water quantity in the Mispec River. It is expected that the overall impact to use of recreational areas in the vicinity of the WWTP will be positive in nature due to an improvement in water quality.

The evaluation criteria is as follows:

- Nature of effect: Positive owing to improvement in water quality, negative due to potential higher peak flows and WWTP malfunction;
- Magnitude: Small;
- Geographic Extent: Local;
- Duration: Positive: Long term, Negative Short term/ construction and operation;
- Frequency: Positive: Continuous, Negative: Peak Flows – Occasional, Malfunction – Accidental;
- Reversibility: Reversible – short term.

Following the implementation of mitigation measures, the Project is not anticipated to have a significant residual environmental effect on land use, i.e., the impact is Not Significant.

CHAPTER 7 ACCIDENTAL EVENTS AND MALFUNCTIONS

7.1 Accidental Events and Malfunctions

Accidental events and malfunctions are unplanned events with a low probability for occurrence. Although unlikely, an accidental event or malfunction can cause significant adverse environmental effects and have the potential to affect all environmental components identified in Table 6.2. It is difficult to predict the exact nature of events and their severity should they occur, however, the probability of serious accidental events causing significant adverse environmental effects is low since both construction and operational procedures will be designed to incorporate contingency and emergency response planning.

This section details the potential adverse environmental effects associated with accidents and malfunctions during both the construction and operational phase of the proposed Project and provides mitigation measures to reduce potential impacts. This assessment will not address all conceivable accidents, malfunctions or unplanned events, but only those that are perceived to have a reasonable probability of occurring, and which may have an effect on VECs considering the design of the Project and the site specific conditions. Accidents malfunctions and unplanned events may also be instigated by external factors (natural or manmade). This assessment considered the likelihood of such instigating events as well as the resulting effects of such events.

All of the identified accidents, malfunctions or unplanned events are likely to be temporary in nature and limited in duration. Considering the Project specific mitigative measures contained throughout this document, accidents, malfunctions and unplanned events are expected to be rare, and the consequences temporary and subject to immediate clean-up and remedial measures, if required.

7.1.1 Equipment Failure

Equipment failure and power failure are a risk during the operational phase of the Project. There is also a risk of a malfunction during operation which could result in untreated discharge entering the river. Mitigation measures are provided below.

7.1.1.1 MITIGATIVE MEASURES

The plant will be designed for redundancy in the process, pumping and disinfection. However, there is always a chance that one of the redundant system fails. A plant bypass will be installed to allow influent to be pumped from the pump station directly to the outfall.

The proposed design for the WWTP upgrades includes a bypass from the main pump station to the outfall; and in the event of a power failure, the SBR system will be connected to the emergency power from the Airport's emergency power system, which consists of a 400 kW diesel generator.

Effluent should be tested according to the Saint John Airport Approval to Operate. The new WWTP will be a Class 2; therefore, biweekly testing for $CBOD_5$ and TSS and monthly e-coli testing will be required. This process should detect any malfunctions. In the event of a malfunction the issue should follow reporting terms and conditions in the Approval to Operate and be dealt with immediately.

7.1.2 Hazardous Materials Spills

Project activities could result in a hazardous material spill. Fuel storage, refuelling and the operation of vehicles and construction equipment have the potential to be involved in a hazardous material spill. Hazardous material spills have the potential to adversely affect air, soil, wetland and surface and groundwater quality and could pose risks to human health and safety. Such events could also result in the alteration of terrestrial and aquatic habitat and the direct mortality of flora and fauna. A hazardous material spill has the potential to cause significant adverse environmental effects depending the size and location of the spill; however, it is most likely that such spills would be limited to relatively small quantities, and would be highly localized and easily cleaned up by Project crews using standard equipment. A major spill is unlikely given the limited amounts of hazardous materials that would be available at any given time; however, if such an event occurred, procedures will be in place to respond to and investigate the occurrence and put corrective actions in place. The likelihood and significance of the environmental effects associated with a hazardous material spill can be reduced with the application of appropriate mitigation measures.

7.1.2.1 Mitigation Measures

The construction contractor will be required to include emergency response measures as part of the site-specific EPP and EMP. The emergency response measures will include, but not be limited to, the following mitigation measures to minimize the likelihood of, and contingency measures to minimize effects in the event of, a hazardous material spill:

- Dangerous goods, whose release into the environment could cause adverse effect, shall be stored and handled in a manner that gives due regard for workers and public safety, and for the protection of the environment;
- Qualified personnel will handle these materials in accordance with manufacturer's instructions and WHMIS and Applicable Law;
- Proper equipment selection, regular inspections and maintenance programs will ensure the reliability and integrity of Project equipment and vehicles;
- Refuelling of equipment and vehicles in a designated area on a low permeability surface and no refuelling within 30m of wetlands and watercourses;
- Use secondary containment for pumps and generators;
- Equipment operators will remain with equipment and vehicles at all times during refuelling;
- An emergency spill response plan shall be implemented to contain and remediate releases of hazardous materials into the environment prior to the commencement of construction;
- The spill response plan shall be detailed in the EPP;

- Environmental training shall include spill response training;
- Operate machinery in-the-dry where possible;
- Spill response equipment for use in both terrestrial and aquatic environments shall be readily available onsite;
- Exercise care in handling of fuels or dangerous materials shall be exercised to minimize potential for spills. All spills shall be reported immediately;
- All spills shall be responded to immediately to minimize environmental damage and for clean-up, repair or rehabilitation resulting from any spills. In the event of a spill, follow reporting requirements in Saint John Airport Approval to Operate;
- Site emergency response material shall be supplied and maintained to contain spills and minimize environmental damage; and
- All contaminated media and cleanup materials will be collected and stored in a manner ensuring that it will not be re-released into the environment until it is transported offsite to an approved disposal facility.

7.1.3 Transportation-Related Accidents

Accidents and malfunctions of vehicles and construction equipment have the potential to adversely affect the Project and the environment, and could pose human health and safety risks. Accidents and malfunction can cause the release of hazardous materials which are discussed above. The risk of an accident or collision is expected to be extremely low based on compliance with standard procedures. In the unlikely event that an accident or collision cannot be avoided, the site-specific EPP and EMP will contain detailed response procedures.

7.1.3.1 Mitigation Measures

The construction contractor will be required to include emergency response measures as part of the site-specific EPP and EMP. The emergency response measures will include, but not be limited to the following mitigation measures:

- Accident, collision and malfunction response procedures;
- Vehicles will travel at speeds no greater than posted speed limits and will reduce speeds during inclement weather conditions; and
- Spill response procedures, as described above.

7.1.4 Fires

Construction activities could potentially cause a fire, and fuel storage, buildings, construction equipment and vehicles all have the potential to be involved in a fire. Although unlikely to occur, fires and explosions have the potential to adversely affect air and soil quality and could pose risks to human health and safety. Such events could also result in terrestrial habitat alteration and the direct mortality of flora and fauna. Firefighting chemicals and spilled materials could enter aquatic habitat and adversely affect biota and habitat. Habitats would begin to recover from a fire after a single generation and continue through the natural phases of succession; however, return to the natural state pre-fire may take multiple generations. Sustained fire events and those that lead to explosions, although considered very unlikely, may cause significant adverse environmental impacts.

As with all accidents, malfunctions and unplanned events, the most important step in preventing effects of a fire is to prevent fires from occurring. Material management and operational procedures will reduce the frequency and extent of accidental fires related to the Project. Burning of vegetation and debris will not be permitted.

7.1.4.1 Mitigation Measures

The construction contractor will be required to include emergency response measures as part of the site-specific EPP and EMP. The emergency response measures will include, but not be limited to the following mitigation measures, to minimize the likelihood of, and contingency measures, to minimize effects in the event of, a fire:

- Fire response procedures shall be established;
- Flammable waste shall be disposed in an appropriate manner;
- Fire prevention and response training shall be provided for all on-site personnel;
- Firefighting equipment, sufficient to mitigate on-site fire hazards, shall be maintained in proper operating condition and to the manufacturer's / National Fire Protection Association standards; and
- Communication and response procedures to be implemented in the event of a fire include:
  - Saint John Fire Department shall be contacted immediately (911);
  - All nearby personnel shall be notified immediately; and
  - Contractor shall immediately notify the Airport.

7.1.5 Extreme Weather Event

Extreme weather events have the potential to adversely affect the Project and the environment, and could pose risks to human health and safety. Extreme weather events may include high wind, heavy rainfall or snowfall, extreme cold, lightning and fog. Severe weather could cause failure of sediment containment and catchment basins, thereby releasing contaminants and adversely impacting water quality, aquatic habitat and terrestrial habitat. Extreme weather will also affect driving conditions and increase the likelihood of vehicle accidents. The likelihood and significance of the environmental effects associated with a potential extreme weather event can be reduced with the application of the following mitigations.

7.1.5.1 Mitigation Measures

The construction contractor will be required to include emergency response measures as part of the site-specific EPP. The emergency response measures will include, but not be limited to the following mitigation measures, to minimize the likelihood of, and contingency measures, to minimize effects in the event of, weather events:

- Weather conditions shall be assessed on a daily basis to determine the potential risk of extreme weather on the Project;
- Work shall be scheduled to avoid extreme weather events; and
- The Project site shall be secured during periods of extreme weather.

7.1.6 Accidental Discovery of Archaeological Resources

Although the risk of encountering archaeological resources is low according to the provincial archaeological predictive modelling, there is a small risk that excavation activities could disturb archaeological and heritage resources.

7.1.6.1 Mitigation Measures

In the event that archaeological resources are encountered during excavation, all activities must stop and appropriate archaeological mitigation measures must be implemented to protect the resource. The following procedure is recommended:

- Immediately stop all excavation activities and flag the area; and
- The Archaeological Service Branch of the NB Department of Tourism, Heritage and Culture shall be contacted for further archaeological mitigations.

7.1.7 Failure of Erosion and Sediment Control Measures

Failure of erosion and sediment control measures has the potential to adversely affect the Project and the environment. Although unlikely, it is possible that erosion and sediment control measures (e.g., sediment fences) could fail during construction activities. The failure of these control measures during a severe weather event could cause the release of sediment and has the potential to cause localized significant adverse environmental effects to wetlands, surface waters and terrestrial habitat. In the event of a failure, Project construction will be shut down until controls are restored.

7.1.7.1 Mitigation Measures

The construction contractor will be required to include emergency response measures as part of the site-specific EPP. The emergency response measures will include, but not be limited to the following mitigation measures, to minimize the likelihood of, and contingency measures, to minimize effects in the event of, a failure of erosion and sediment control measures:

- Sediment and erosion controls structures shall be installed as per manufacturer's recommendations and industry best practices;
- Site-specific EPP shall detail the specific location and installation procedures for all erosion and sediment control structures;
- Excavations and disturbed areas shall be compacted and reclaimed as soon as reasonably possible during construction and stockpiled materials will be appropriately covered; and
- The contractor shall conduct regular monitoring of all sediment and erosion control structures to ensure they are functioning optimally and not at risk of failure. Any remedial action shall be taken as rapidly as possible.

7.1.8 Residual Environmental Effects

Potential adverse effects of accidental events/malfunctions can be minimized with the application of appropriate mitigation measures, as described above. The contractor and will include response protocol to manage accidental events and malfunctions in the unlikely event that one should occur.

7.1.9 Significance Criteria

An adverse significant residual effect with respect to Accidental Events or Malfunctions is defined as an effect that would be considered significant as defined in Chapter 6 significance criteria section for each VEC.

7.1.10 Significance Determination

With the implementation of mitigation measures, the identified accidental events and malfunctions are not anticipated to pose a significant adverse effect on the Project, as most of the identified events would only cause repairable damages and temporary delays in construction or operation.

7.2 Effects of the Environment on the Project

The definition of an environmental effect includes any change to the project that may be caused by the environment. Environmental events which could potentially have an adverse effect on the Project and Project activities include: extreme weather events (e.g., heavy precipitation) and climate change. No other environmental event would likely have a significant effect on the Project site.

7.2.1.1 Extreme Weather

Extreme weather includes events such as severe thunderstorms, tornados, high winds and hurricanes. During construction, these events could delay construction or damage equipment and materials being used during construction. During operation, any of these events has the potential to cause damage to the facilities which could cause Project activities to be temporarily shut down.

7.2.1.2 Climate Change

Climate change can be defined as a change in normal temperature or weather patterns such as abnormal or frequent extreme weather events that are thought to be caused by natural events such as solar activity, plate tectonics, ocean changes (e.g., ice melt, current changes) and/or anthropogenic events such greenhouse gas emissions and the destruction of large forests. Changes in weather patterns caused by climate change could occur during the construction or operational phases of the Project; however, climate change is most likely to impact the operational phase of the Project. Climate change may result in more frequent or extreme weather events and the events could adversely interfere with the regular operation of the Project.

7.2.2 Mitigation and Residual Environmental Effects

Potential adverse effects of environmental events can be minimized with the application of appropriate mitigation measures. Many of the proposed structures will be designed to withstand extreme weather resulting in minor flooding events. Furthermore, Project components will be designed using the most up to date information on climate change and will consider the life expectancy of the Project.

The contractor will include response protocol during extreme weather and environmental events, such as ceasing work activities during extreme weather events, referring to weather forecasts regularly, and taking measures to protect certain equipment and infrastructure from anticipated severe weather.

7.2.3 Significance Criteria

An adverse negative significant residual effect with respect to Effects of the Environment would be a catastrophic event that causes long-term damage to facilities or long-term disruption of day-to-day operations.

7.2.4 Significance Determination

With the implementation of mitigation measures, the identified environmental events are not anticipated to pose a significant adverse effect on the Project, as most of the identified events would only cause repairable damages and temporary delays in construction or operation.

CHAPTER 8 CUMULATIVE EFFECTS ASSESSMENT

A cumulative effects assessment was undertaken to determine how the proposed Project activities may interact with past, current or proposed future activities within identified spatial and temporal boundaries. Cumulative effects can be defined as changes to the physical, biophysical, cultural and socio-economic environments which are caused by the additive combination of past, current and future activities. For example, a single project may not cause significant residual effects, but when the effects of the project are combined or "added" to the effects of another project, the effects may be significant. Cumulative effects for the Project are assessed where:

- The Project is determined to have a residual environmental effect;
- There is overlap or interaction of environmental effects between the two projects; and
- It is reasonable to expect that the Project's contribution to cumulative environmental effects could affect the viability or sustainability of the VEC.

Only those VECs with an interaction between Project activities and the environment were used to determine whether past, current or future activities have the potential to interact cumulatively with the proposed Project. Spatial and temporal boundaries are VEC-dependent and would not, therefore, interact cumulatively with projects beyond the boundaries as described in their respective VEC sections in Chapter 6.

8.1 Assessment of Potential Cumulative Interactions with Project VECs

A list of known potential past, current and future activities that may interact cumulatively with the Project is provided in Table 8.1, which also describes the potential cumulative interactions for each identified activity. Project VECs with the potential to interact with past, present or future activities are discussed in the following sections.

A significant cumulative adverse effect would be a residual effect caused by the proposed Project and a past, present or future activity which would cause an additive effect that would be considered significant as defined in Chapter 6 significance criteria section for each VEC.

Table 8.1: Past, Current and Future Activities and the Potential Cumulative Adverse or Positive Environmental Interactions with Project VECs

Other Past, Current and Future Activities and Project VEC Interaction	Air and Noise Quality	Hydrogeology	Soil Quality/Quantity	Surface Water Quality / Quantity and Fish and Fish	Vegetation, Wetlands and Terrestrial Wildlife and Habitat	Avifauna	Commercial/Recreational/ Aboriginal Fisheries	Socio-economic	Land Use
Past Projects/Activities									
None Identified									
Current Projects/Activities									
Existing school wastewater discharge	-	X	-	X	-	-	X	-	X
Future Projects/Activities									
None Identified									

'-' = no anticipated cumulative interaction with Project VEC; 'X' = Potential cumulative interaction with Project VEC

8.1.1 Hydrogeology

Adverse cumulative effects could occur to hydrogeology considering that the discharge location from the other WWTP is located approximately 2 m upstream of the existing WWTP's outfall pipe. In the rare event that treatment malfunctions and/or leaks occurred on both WWTP's, the impacts could have an additive negative cumulative effect on groundwater which could ultimately end up in the Mispec River and impact aquatic life.

The mitigation measures described in Section 6.5.3, Hydrogeology VEC, will be implemented and will reduce the likelihood of significant adverse cumulative effects from occurring.

The residual cumulative effects to hydrogeology are not anticipated to be significant with the implementation of mitigation measures identified in Section 6.5.3.

8.1.2 Surface Water Quality/Quantity and Fish and Fish Habitat

Adverse cumulative effects could occur to surface water quality/quantity and fish and fish habitat considering that the discharge location from the other WWTP is located approximately 2 m upstream of the existing WWTP's outfall pipe. The identified potential cumulative effects include:

- Changes in surface water flow and water level; and
- Contaminated discharge entering into the Mispec River.

During the operational phases of both WWTP's there is the potential for hydrological regime changes to have an additive cumulative effect on surface water quantity and fish and fish habitat. For example, if both

WWTP's experience peak flows simultaneously the impacts to surface water quantity and fish and fish habitat could have a negative adverse cumulative effect.

In addition, in the rare event that treatment malfunctions and/or leaks occurred on both WWTP's into the Mispec River, the impacts could have an additive negative cumulative effect on surface water quality and fish and fish habitat.

The mitigation measures described in Section 6.7.3 will be implemented and will reduce the likelihood of significant adverse cumulative effects from occurring.

The residual cumulative effects to surface water quality/quantity and fish and fish habitat are not anticipated to be significant with the implementation of mitigation measures identified in Section 6.7.3.

8.1.3 Commercial/Recreational and Aboriginal Fisheries

While Aboriginal and Commercial fisheries do not exist in the Mispec River, recreational fishing does occur. Adverse cumulative effects for recreational fishing would be similar to surface water quality/quantity and fish and fish habitat.

8.1.4 Land-use

Adverse cumulative effects could occur to land use considering that the discharge location from the other WWTP is located approximately 2 m upstream of the existing WWTP'. The identified potential cumulative effects include:

- Malfunction of the upgraded WWTP; and
- Higher peak flows flooding land; and.

In the rare event that treatment malfunctions and/or leaks occurred on both WWTP's into the Mispec River, the impacts could have an additive negative cumulative effect on water quality which could impact the recreational swimming at the public beach located near the WWTP's.

During the operational phases of both WWTP's there is the potential for hydrological regime changes to have an additive cumulative effect on water quantity which could result in the flooding of lands and impact recreational activities (e.g. kayaking, canoeing).

The mitigation measures described in Section 6.12.3 will be implemented and will reduce the likelihood of significant adverse cumulative effects from occurring (Table 8.2).

The residual cumulative effects to land use are not anticipated to be significant with the implementation of mitigation measures identified in Section 6.12.3 (Table 8.2).

Table 8.2: Summary of the Cumulative Effects Assessment of the Project

Project VEC	Potential Positive (P) or Adverse (A) Cumulative Environmental Effect	Mitigation	Residual Cumulative Environmental Effect (YES/NO)	Significant Cumulative Residual Effect Significant(S) Not Significant(NS)
Hydrogeology	Contamination of groundwater impacting the Mispec River (A)	Please see mitigation measures described in Section 6.5.3	Y	NS
Surface water quality/quantity and fish and fish habitat	Changes in surface water flow and water level (A) Contaminated discharge entering into the Mispec River (A)	Please see mitigation measures described in Section 6.7.3	Y	NS
Commercial/Recreational/Aboriginal Fisheries	Please see surface water quality/quantity and fish and fish habitat	Please see surface water quality/quantity and fish and fish habitat	Y	NS
Land-Use	Malfunction of the upgraded WWTP (A) Higher peak flows flooding land (A)	Please see mitigation measures described in Section 6.12.3	Y	NS

CHAPTER 9 ENVIRONMENTAL MONITORING PROGRAM

An Environmental Monitoring Program including environmental effects and environmental compliance monitoring will be implemented during Project construction and operational activities. Environmental compliance monitoring will be used to determine if the Project-related adverse environmental effects are within acceptable regulatory and environmental protection design criteria. If environmental compliance monitoring determines that these criteria are being exceeded, appropriate regulatory agencies will be contacted and additional mitigation measures will be implemented. Environmental effects monitoring will be implemented to characterize residual adverse environmental effects on the receiving environment from Project-related activities.

Adaptive management principles will be incorporated into the monitoring program and adaptive management criteria established. In general, adaptive management is a planned and systematic process for continuously improving environmental management practices by learning about their outcomes. Adaptive management provides flexibility to identify and implement new mitigation measures or to modify existing ones during the life of a project.

The following section details the minimum monitoring requirements for the proposed Project. Additional monitoring requirements may be determined through the regulatory approvals process.

9.1 Monitoring Requirements during Construction Activities

Environmental compliance monitoring requirements during construction activities will include monitoring of the wetland. The compliance monitoring will also include identifying and resolving environmental issues observed by Project personnel on site and public complaints (both formal and informal). The contractor will advise the Airport and appropriate regulatory agencies if personnel observe an environmental issue or receive a complaint from a member of the public. Additional environmental protection measures will be applied if environmental issues are observed.

The environmental compliance monitoring will include, but not be limited to, the following:

- **Erosion and Sediment Control Measures:** Implemented erosion control measures will be monitored during construction to ensure they are effective and maintained; should any be found to be ineffective or failing, erosion control methods and installation techniques will be re-evaluated and adapted to adequately control erosion and sedimentation; and

- ***Vegetation:*** Post construction vegetation monitoring will be performed in order to assess the establishment of vegetation and the extent to which exotic and invasive species have colonized the site.

9.2 Monitoring Requirements during Operational Activities

Environmental compliance monitoring requirements during operation will include the monitoring of the treated effluent as directed in the CoA as follows:

- Monitor Effluent According to the Saint John Airport Approval to Operate:
  - The new WWTP will be a Class 2; therefore, biweekly testing for $CBOD_5$ and TSS and monthly e-coli testing will be required; and
- Monitor flows according to the Saint John Airport Approval to Operate:
  - The new WWTP will be a Class 2; therefore, biweekly testing of flow will be required.

CHAPTER 10 CONCLUSIONS

The results from the environmental assessment indicate that following the implementation of mitigation measures (see Chapter 6), there will be no adverse significant impacts associated with the construction, operational and maintenance phases of the proposed development.

CHAPTER 11 CLOSURE

The services performed as described in this report were conducted in a manner consistent with the level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services.

This report provides a professional opinion and therefore no warranty is expressed, implied, or made as to the conclusions, advice, and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and interpretation of regulatory statues are subject to change.

Please feel free to contact the undersigned at your convenience, if you have any questions or require additional information.

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APPENDIX A

Approval to Operate

APPROVAL TO OPERATE

S-2443

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

Saint John Airport Inc.
for the operation of the
Saint John Airport Wastewater Treatment Plant

Description of Source:	**This Approval covers the discharge of effluent from the locations contained in the Federal Effluent Regulatory Reporting Information System for the following system.** **Rotating Biological Contactor Facility** **WWC: Class 1 / WWT: Class 1**
Source Classification:	**Fees for Industrial Approvals Regulation - Clean Water Act** **Class 16**
Parcel Identifier:	**00354415**
Mailing Address:	**4180 Loch Lomond Road** **Saint John, NB E2N 1L7**
Conditions of Approval:	**See attached Schedule "A" of this Approval**
Supersedes Approval:	**S-2410**
Valid From:	**December 06, 2013**
Valid To:	**December 05, 2018**

Recommended by: _____
Environment Division

Issued by: _____ December 4, 2013
for the Minister of Environment and Local Government Date

SCHEDULE "A"

GENERAL INFORMATION

APPLICABIITY

This standard applies to all non-municipal wastewater works (with an average daily flow of 100 m^3 or less) operating within New Brunswick, but does not include conventional sewage disposal systems. This standard may be cited as the "Sector Standard for Non-Municipal Wastewater Works."

DEFINITIONS

"Approval Holder" means the person or entity to which the Approval is issued, as named on the first (certificate) page of this Approval.

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

"Certified" means a valid certificate of qualification that states the class of the Operator issued by the Atlantic Canada Water and Wastewater Voluntary Certification Program.

"Operator" means a person who directs, adjusts, inspects, tests or evaluates an operation or process that controls the effectiveness or efficiency of the Wastewater works.

"statutory holiday" means New Years Day, Good Friday, Easter Monday, the day fixed by proclamation of the Governor-in-Council for the celebration of the birthday of the Sovereign (Victoria Day), Canada Day, New Brunswick Day, Labour Day, the day fixed by proclamation of the Governor-in-Council as a general day of Thanksgiving, Remembrance Day, Christmas Day, and Boxing Day. If the Statutory Holiday falls on a Sunday, the following day shall be considered as the Statutory Holiday.

"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, or any other time in which the direct contact cannot be made with the Department.

"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.

"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. This does not include wastewater overflows that are the result of excessive rainfall or snowmelt.

"ACWWVCP" means the Atlantic Canada Water and Wastewater Voluntary Certification Program.

"**Accredited**" means accreditation to ISO/IEC 17025 by the Standards Council of Canada (SCC), the Canadian Association for Laboratory Accreditation Inc. (CALA), or accreditation to ISO/IEC 17025:2005 from another body that is recognized to grant such accreditation per ISO-IEC 17011 criteria.

"$CBOD_5$" or "Carbonaceous Biochemical Oxygen Demanding Matter" means carbonaceous matter that consumes, by biochemical oxidation, oxygen dissolved in the water, over a period of five days.

"Suspended Solids" means any solid matter contained in effluent that is retained on a filter of 2.0 micrometer (um) or smaller pore size.

"Total Residual Chlorine" means the sum of free chlorine and combined chlorine, including inorganic chloramines.

TERMS AND CONDITIONS - EMERGENCY REPORTING

1a. Immediately following the discovery of an environmental emergency the Approval Holder shall notify the Department in the following manner.

During normal business hours, telephone the applicable Department Regional Office **until personal contact is made** (i.e. no voice mail messages will be accepted) and provide as much information that is known about the environmental emergency. The telephone numbers for the six Regional Offices within the Department are provided in the table below.

After hours and during normal business hours, when personal contact is not possible, telephone the Canadian Coast Guard **until personal contact is made** and provide as much information that is known about the environmental emergency. The telephone number for the **Canadian Coast Guard** is **1-800-565-1633.**

1b. Within 24-hours of the time of initial notification, a **Preliminary Emergency Report** shall be faxed by the Approval Holder to the applicable Regional Office within the Department using the fax numbers provided below. The Preliminary Emergency Report shall clearly communicate as much information that is available at the time about the environmental emergency.

Within five (5) days of the time of initial notification, a **Detailed Emergency Report** shall be faxed by the Approval Holder to the applicable Regional Office within the Department using the fax numbers provided below. The Detailed Emergency Report shall include, as 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.

Office Location	Phonne	Fax
Bathurst Regional Office	(506) 547-2092	(506) 547-7655
Miramichi Regional Office	(506) 778-6032	(506) 778-6796
Moncton Regional Office	(506) 856-2374	(506) 856-2370
Saint John Regional Office	(506) 658-2558	(506) 658-3046
Fredericton Regional Office	(506) 444-5149	(506) 453-2893
Grand Falls Regional Office	(506) 473-7744	(506) 475-2510

TERMS AND CONDITIONS - LIMITS

2. The Approval Holder shall ensure that the concentration of contaminants in the final effluent from the wastewater works does not exceed the limiting criteria specified in Schedule "B".

TERMS AND CONDITIONS - OPERATOR CERTIFICATION

3. The Approval Holder shall employ and have available the following Certified Operator(s) based on the Class of the wastewater works listed on the Certificate Page of this Approval.

Class of Wastewater Treatment (WWT)	Certification and Number of Operator(s)
I	Minimum one Class I
II	Minimum one Class II and one Class I

Additionally, the Approval Holder shall ensure that the Certified Operator has taken a basic course in wastewater collection systems.

For wastewater works with a discharge of less than 10 m^3/day, the Approval Holder shall employ, and have available, an Operator who, at a minimum, has completed a basic course in wastewater treatment.

TERMS AND CONDITIONS - TESTING AND MONITORING

4. The Approval Holder shall ensure that all samples are collected using the methods described in the latest edition of the ISO 5667-10, *Water quality - Sampling - Part 10: Guidance on sampling of waste waters,* or an alternative method approved, in writing, by the Department.

5. The Approval Holder shall collect grab samples of the final effluent at the frequency indicated below:

Parameters	**Frequency**[1]	
	Wastewater Treatment (WWT) Class I	***Wastewater Treatment (WWT) Class II***
Flow	Monthly	Bi-weekly
CBOD5 and Suspended Solids	Monthly	Bi-monthly

6. The Approval Holder shall ensure that all parameters that are required to be analyzed by this Approval are analyzed by Accredited laboratories whose accreditation includes the analytical method used to make the determination.

7. The Approval Holder shall ensure that all equipment used at the wastewater works for monitoring parameters required by this Approval is calibrated in accordance with manufacturer's recommendations.

TERMS AND CONDITIONS - REPORTING

8. 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 fax, 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.

[1] *For wastewater works designed to meet the limits from May to October*: samples shall be collected from April to November
For seasonal wastewater works: samples shall be collected when the wastewater works is in operation.

9. **By February 15th of each year**, the Approval Holder shall submit an Annual Environmental Report to the Department. The report shall provide the following information for the previous calendar year:

a) the laboratory certificates of analysis for all sampling and testing required in the Testing and Monitoring section of this Approval,
b) a description of the sampling and testing location(s),
c) a description of the method used to determine the flow rate of the final effluent,
d) a summary report of all small spill and/or leak events at the wastewater works, including the date, location, approximate volume, and method of clean-up for each spill and/or leak,
e) a summary report of all by-passing events that were directly caused by excessive rain or snow melt, including the date, location, and duration of the by-passing event,
f) a summary report of all events at the wastewater works that were reported through the Emergency Reporting procedure described in this approval,
g) a list identifying the Operator(s) and indicating the certification level of each, and
h) the results of the calibration required under the Testing and Monitoring section of this approval.

SCHEDULE "B"

TERMS AND CONDITIONS - EFFLUENT PERFORMANCE STANDARDS

Pursuant to Sections 8(2) of the Water Quality Regulation, this Approval is subject to the following conditions:

For wastewater works designed to meet CBOD5 of 25 mg/L and Suspended Solids of 25 mg/L:

For wastewater works designed to meet the limiting criteria between May - October:

1. Between May 1 and October 31 of each year, the Approval Holder shall ensure that the concentrations of contaminants in the final effluent from the wastewater works do not exceed the following limiting criteria:

   a) CBOD5 shall not exceed 25 mg/L; and
   b) Suspended Solids shall not exceed 25 mg/L.

   Between November 1 and April 30 of each year, the Approval Holder shall ensure that the Wastewater works is operated in such a manner as to ensure that the levels of CBOD5 and Suspended Solids, in the final effluent, are reduced to the extent possible for the wastewater works.

SCHEDULE "C"

TERMS AND CONDITIONS - DISINFECTION REQUIREMENTS

Pursuant to Sections 8(2) of the *Water Quality Regulation*, this Approval is subject to the following conditions:

For Wastewater works providing disinfection due to potential shellfish harvesting or drinking water supply impacts:

1. The Approval Holder shall ensure that the disinfection system is operational at all times.

For wastewater works providing disinfection due to the proximity of recreational waters used for primary contact activities, shellfish harvesting or a drinking water source:

2. The Approval Holder shall ensure that the concentration of *E. Coli,* in the final effluent of the wastewater works, does not exceed 200 MPN/100 ml.

For wastewater works using chlorine only:

3. The Approval Holder shall ensure that the concentration of Total Residual Chlorine in the final effluent of the wastewater works is a minimum of 0.5 mg/L.

For wastewater works using chlorine disinfection and/or de-chlorination:

4. The Approval Holder shall collect grab samples of the final effluent at the frequency indicated below:

Parameters	**Frequency**[1]	
	Wastewater Treatment (WWT) Class 1	**Wastewater Treatment (WWT) Class II**
E.coli	Monthly	Monthly
Total Residual Chlorine (chlorination only)	Weekly	Bi-weekly
Total Residual Chlorine (with dechlorination)	Weekly	Bi-weekly

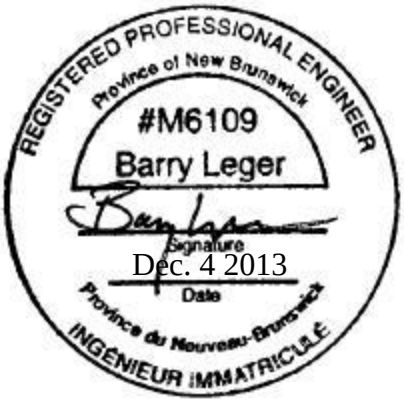
For wastewater works using chlorination only, include:

If chlorine residual falls below 0.5 mg/L during two successive tests, the Approval Holder shall collect samples twice a month, analyzing for E.coli, until the chlorine residual is equal or greater than 0.5 mg/L during two successive tests.

[1] *For wastewater works designed to meet the limiting criteria from May to October*: samples shall be collected April - November
For seasonal wastewater works: samples shall be collected when the wastewater works is in operation.

Prepared by: _____
Barry Leger, P.Eng.
Regional Engineer, Region #4, Saint John

Reviewed by: _____
Patrick Stull
Director, Region #4, Saint John



APPENDIX B

Draft Environmental Management Plan

Saint John Airport Proposed WWTP Upgrades Environmental Management Plan

Draft Report V2

162832.01 ● Environmental Management Plan ● October 2016

Prepared for:

Aéroport de SAINT JOHN Airport

Prepared by:

CBCL LIMITED
Consulting Engineers

Draft Report V2	Carrie Bentley	Oct. 14/16	Amy Winchester
Draft Report	Carrie Bentley	Oct. 05/16	Amy Winchester
Issue or Revision	***Reviewed By:***	***Date***	***Issued By:***

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Solving today's problems with tomorrow in mind

14 October 2016

Pierre Doucet, Project Manager
Environmental Assessment Section
NB Department of Environment and Local Government
Marysville Place
PO Box 6000
Fredericton, NB
E3B 5H1

Dear Mr. Doucet:

RE: Environmental Management Plan – Saint John Airport Proposed WWTP Upgrades

The Draft Environmental Management Plan (EMP) is being submitted on behalf of the Saint John Airport in reference to the Environmental Impact Assessment Registration Document. The EMP has been prepared in draft form based on the results of the EIA. Once the Determination for the project is issued, the EMP will be updated as needed prior to construction.

Yours very truly,

CBCL Limited

Prepared by:
Amy Winchester, M.A.Sc., P.Eng.
Project Manager
Direct: 506-633-6650
E-Mail: amyw@cbcl.ca

Reviewed by:
Carrie Bentley, B.Sc. H., M.Sc.
Senior Environmental Scientist

Project No: 162832.01

BEST MANAGED COMPANIES

Contents

Appendices

CHAPTER 1 INTRODUCTION

1.1 Environmental Management System

The purpose of an environmental management system is to implement safe and environmentally responsible engineering, construction, operation and training practices pertinent to a project or undertaking. The Saint John Airport (Airport) has contracted the services of CBCL Limited to complete the necessary studies and environmental permitting associated with the proposed upgrades to the wastewater treatment plant (WWTP), located on the Airport property, Saint John, NB. The Airport is committed to adhering to systems, procedures, practices and materials that will enable the planned works to be undertaken in a manner that protects the environment and facilitates the safety of all who work at or visit the site.

The principal components of an environmental management system include the following:

- An Environmental Management Plan (EMP) that outlines the environmental protection and human health and safety requirements to be met for the duration of a project and details the environmental specifications and mitigation measures that will be adhere to onsite during construction and operation;
- A Contingency Plan that identifies measures that will be implemented to protect the environment and human health and safety and mitigate potential adverse effects in the case of an emergency;
- A Health and Safety Plan that outlines the policy and procedures that will be implemented to protect the health and safety of onsite personnel and the public; and
- A Waste Management Plan that presents the handling, storage and disposal procedures and requirements for waste streams generated during a project.

This information presented in this document pertains to an EMP to be adhered to by the Contractor(s) during construction of the upgrades.

1.2 Environmental Management Plan

An EMP is a document that provides a framework for managing environmental issues and considerations with an objective to prevent potential adverse environmental effects associated with the site and the proposed project.

The purpose of this EMP is to describe the general environmental protection and management procedures to be implemented during the demolition of existing facilities and construction of new infrastructure at the Airport.

This document discusses the fundamental environmental management procedures that shall be executed during the WWTP Upgrades Project. It is not, however, intended to supersede regulatory requirements or serve as an all-inclusive procedural manual. Specifically, this EMP includes the following:

- Roles and responsibilities (Chapter 1);
- Staff training and awareness (Chapter 1);
- Project Description (Chapter 2);
- General and specific environmental risk identification, management and mitigation (Chapter 3);
- Contingency and Safety Planning and Response (Chapter 4); and
- Environmental Monitoring (Chapter 5).

1.3 Regulatory Framework Documents

The following documents provide the regulatory framework for this EMP include, but are not necessarily limited to, the following:

- *Fisheries Act*;
- Federal Policy on Wetland Conservation;
- *Species at Risk Act*;
- *Migratory Birds Convention Act*;
- *New Brunswick Clean Environment Act*;
- *New Brunswick Clean Water Act*; and
- *New Brunswick Clean Air Act*.

The proposed works have triggered the New Brunswick Department of Environment and Local Government (NBDELG) Environmental Impact Assessment (EIA) process under Regulation 87-83 (EIA Regulation) of New Brunswick's *Clean Environment Act (NBDELG, 2007)*. As such, an EIA Registration Document has been prepared for the project. The EMP has been prepared in draft format and included as an appendix to the EIA Registration Document. Once the EIA is completed and a Determination issued, the EMP will be updated as needed prior to construction.

The Contractor(s) engaged by the Airport will be required to comply with the necessary legislative requirements, including applicable permit and approval conditions and shall conduct their work in a safe and environmentally responsible manner. The Contractor(s) will be responsible for obtaining any permits required to conduct the work for this Project.

At a minimum, the project will require a Watercourse and Wetland Alteration (WAWA) permit under the Clean Water Act.

1.4 Management Responsibility outlined under this EMP

The Airport and its representatives are committed to the following environmental principles:

- That the protection of the environment is the responsibility of each individual involved with the undertaking; and
- That all activities undertaken by the Airport and its representatives will be executed in compliance with applicable environmental laws and regulations.

The Airport will assign a representative for the project during demolition, construction and reinstatement. The Owner's Representative will monitor the Contractor(s)' compliance with the environmental practices outlined under this EMP and any associated environmental plans.

1.5 Contractor(s)' Responsibility outlined under this EMP

The Contractor(s) is responsible for reviewing this EMP, Contingency and Safety Plan, and the Environmental Monitoring Plan, and agreeing to all requirements described in this document prior to the start of any work. An Environmental Protection Plan (EPP) will be developed by the Contractor prior to the start of work. The EPP will adhere to the EMP and provide additional site specific details on the mitigation measures, processes and procedures that will be implemented to address, at a minimum, the environmental concerns outlined in this EMP. The Contractor(s) is responsible during demolition, construction and reinstatement to provide environmental protection in accordance with requirements of NBDELG, the Project EMP, Project specifications and in accordance with regulatory requirements of authorities having jurisdictions.

Prior to the start of work, the Contractor(s) will assign one of its employee's onsite to be the Environmental Coordinator for the Project. The Environmental Coordinator will be in direct charge of the onsite work and will have overall responsibility for the necessary environmental management and the onsite implementation of the EMP for the work being undertaken by the Contractor(s). The Environmental Coordinator will ensure compliance with all relevant regulations, authorizations and approvals and will initiate revisions to the EMP and other plans, in consultation with the Owner's Engineer, should any be warranted. The Environmental Coordinator must be readily available at all times to address environmental concerns including day-to-day inspections and monitoring, and to maintain onsite environmental protection measures. The Environmental Coordinator will ensure that necessary training for personnel working onsite is provided and that the environmental management and protection plans are implemented.

The Contractor(s) will be responsible for providing a site specific Health and Safety Plan detailing the processes and procedures for responding to emergencies and for protecting human health and safety for the duration of the Project. These plans will meet all applicable by-laws, regulations, permit conditions and best management practices and will, at a minimum, address the concerns identified in this EMP. The site specific Health and Safety Plan will be reviewed by the Owner's Representative prior to the start of any work onsite.

The Contractor(s) will be responsible for providing a Waste Management Plan detailing the handling, storage, transportation and disposal methods for all streams of waste generated onsite. A record of waste quantities (e.g., waste audit) will also be conducted by the Contractor(s).

1.6 Environmental Training and Orientation

The Contractor(s) will provide a mandatory environmental training and orientation session for all onsite personnel prior to the start of work. Topics to be discussed include but are not limited to an overview of environmental risks and mitigation, waste management, emergency response, contingency plans, etc. In general this will be a review of the EMP, permits and permit conditions, Project conditions of approval, environmental legislation and standard practices and procedures. It will also detail protocols for environmental inspection and reference the monitoring programs that will be instigated. Sessions will also be held periodically throughout the Project as necessary.

CHAPTER 2 PROJECT DESCRIPTION

2.1 Project Overview

The Airport currently utilizes a WWTP located to the southeast of the main terminal building for the treatment of wastewater influent consisting primarily of domestic waste. The existing WWTP utilizes a rotating biological contactor (RBC) secondary treatment system to meet the 5 day carbonaceous biochemical oxygen demand (CBOD5) and total suspended solids (TSS) effluent requirements pursuant to their current Certificate of Approval (CoA). The existing WWTP currently treats an average of 105m^3/day of influent and discharges the treated effluent to the Mispec River (approximately 110m to the east of the WWTP). The WWTP was constructed in 1976 and continues to use the original RBC equipment. The existing layout is provided in Figure A1. The existing WWTP currently meets the effluent requirements of the CoA (i.e., 25mg/L CBOD5 and 25mg/L TSS); however, there are a number of issues that have been identified with the existing system. The most significant concern is related to occupational health and safety.

The Proponent is proposing to upgrade the existing WWTP by moving from a RBC system to a sequencing batch reactor (SBR), increasing the treatment capacity to accommodate a future average day flow of 170m^3/d, while still meeting the prescribed effluent requirements of the current CoA, and replacing the existing chlorination system with an ultraviolet (UV) disinfection system. A conceptual design for upgrades to the WWTP is provided in Figure A2.

The proposed Project will include:

- Cleaning, demolition and removal of existing concrete structures related to the abandoned trickling filter, sedimentation basin and secondary clarifier;
- Demolition and removal of the chlorination system;
- Cleaning, demolition and removal of the existing concrete structures related to the RBC system and building;
- Conversion of the existing equalization tank to a sludge storage tank;
- Construction of the new SBR system;
- Construction of the new Control Building, housing blowers, the UV disinfection equipment and control system;
- Construction of a new pump station; and

- Construction of 57m of new gravity sewer main, 11m of new forcemain, and two manholes to connect to the existing gravity sewer system and the existing outfall. No modifications will be made to the existing gravity sewer system or to the existing outfall.

2.2 Construction Details

Table 2.1 outlines the draft construction sequence.

Table 2.1: Description of Construction Activities for the Saint John Airport WWTP Upgrade

Construction Activity	Description
Site access and staging	• Construction access will be provided primarily from Loch Lomond Road via the main Airport entrance. Construction vehicles and work will take place away from the public areas; • Lay-down area will be set up to store contractor's equipment and materials; • Whenever possible, hazardous materials will be stored at least 30m from any waterbody and in a secure location to maintain containment and avoid discharge to the waterbody. This setback is not possible for the wetland, therefore dyking will be constructed to contain any spills; and • Construction equipment will be refuelled at a designated (paved, level) location, a minimum of 30m from any waterbody or wetland. If it is not practical to handle or store these products at this setback, dyking will be constructed to contain any spills.
Installation of environmental controls	• Sediment control measures will be installed prior to commencement of construction and will be maintained appropriately throughout construction until the area revegetates; and • Sediment control measures will form part of the EMP.
Grubbing	• Grubbing will be limited at the WWTP due to the nature of the existing conditions. The area of the existing WWTP has been previously cleared and consists primarily of grass and low lying scrub vegetation which will be removed via grubbing; • If required, clearing activities will adhere to applicable regulatory requirements; • Vegetation removal will adhere to applicable regulatory requirements, conditions of any approvals obtained for the Project and the EMP; • Grubbing will involve the removal of all organic materials and unsuitable soil from the proposed work areas (e.g., stumps, roots, embedded logs, root mat). Bulldozers will be used to separate the organic material from the underlying soil; and

Construction Activity	Description
	• If grubbed material cannot be reused on site, the material will be removed from the site for disposal, but will not be located within 30m of any watercourse or wetland.
Excavation and grading	• Excavation will include the removal, placement, disposal or stockpiling of materials removed from proposed work areas. The required cut and fills for the Project component footprints will be managed so that all suitable material can be reused on the site; • If fill materials are required, the material will be obtained from an approved local aggregate and fill source and trucked to the site using the existing road network; • Topsoil and subsoil will be stockpiled in separate locations, placed at least 30m from any watercourse or wetland; • Stockpiled materials will be covered and protected from wind and water erosion; and • It is anticipated that construction equipment required for excavation and grading will include excavators, bulldozers, graders, loaders and dump trucks. It is not anticipated that blasting will be required.
New component construction	• The existing WWTP will remain operational during the construction of the new facilities; • All construction materials, methods, and testing procedures shall be undertaken in accordance with industry standards; and • If contaminants are detected, proper mitigation techniques will be applied.
Demolition of existing components	• Existing RBC system equipment will be cleaned by approved contractor prior to demolition; • The sedimentation basin, trickling filter, RBC system and secondary clarifier and the RBC building will be demolished; and • Waste material will be handled and disposed of at an approved off-site facility.
Site restoration	• All construction materials and hazardous wastes will be disposed of properly prior to reinstatement of Project site; and • The footprint of the sedimentation basin, trickling filter and secondary clarifier will be topsoiled and hydroseeded.

2.3 Construction Schedule

It is expected that the construction of the proposed works will begin in the spring of 2017 and be completed by the spring of 2018 pending environmental permits and approvals.

It is expected that demolition and construction activities will take place between the hours of 7 AM and 7 PM from Monday to Saturday.

CHAPTER 3 ENVIRONMENTAL MITIGATION

3.1 Overview

The Project includes the necessary site preparation works and establishment of environmental protection measures onsite, such as erosion and sedimentation control; pollution and waste control; and precautions for fuel spill containment and remediation. The preliminary environmental protection measures (e.g., run-off control) will be completed prior to any disturbances of the site.

Environmental mitigation includes both those practices and procedures incorporated into the design and execution of a project to avoid adverse environmental impacts and those measures adopted to address effects caused by the construction and operation of any facet of a project. Mitigation includes the adoption of good engineering practices and the avoidance of detrimental activities. Mitigative measures will also be incorporated to ensure that the safety of the public and of all onsite personnel is protected.

This section of the EMP identifies the measures that will be taken by the Airport to protect the environment during demolition, construction and reinstatement. These measures will be employed by the Contractor(s) working on the site. The Owner's Representative and Environmental Coordinator will monitor construction activities in accordance with the requirements of the EMP and the conditions of applicable permits and authorizations.

3.2 General Migation Measures

General measures to be implemented to mitigate impacts to the environment during construction include:

- Inspection and visual monitoring of mitigation shall be done by the Owner's Representative and Environmental Coordinator daily and after high wind and rainfall events to ensure mitigation measures are performing properly;
- The EMP will be onsite at all times with the Contractor(s) during construction;
- The Owner's Representative will complete periodic site observations and to provide assistance related to environmental issues and necessary mitigation;
- Clearing will be minimized;
- The general public will be excluded from the site at all times. No one will be allowed onsite unless they sign in at the security desk.

- Posted speed limits will be obeyed speed limits to minimize accidental mortality to birds and wildlife; and
- Construction activities are to be coordinated around seasonal constraints and weather; and
- Hours of demolition will be limited from 7:00 AM to 7:00 PM, Monday to Saturday.

3.3 Air / Noise Quality

The following mitigation measures will be employed to reduce the potential impacts of the demolition, construction and reinstatement to air and noise quality:

- Vehicle idling will be minimized;
- Operating condition of all vehicles and motorized equipment will be assessed on a regular basis, and maintained to ensure optimal performance;
- Dust emissions will be reduced by:
  - Applying water spray to unpaved surfaces when conditions are dry and windy weather persists onsite;
  - Monitoring unpaved road surfaces onsite during dry periods to ensure water application is timely and effective; visible signs of dust plumes will trigger an immediate response from Environmental Coordinator;
  - Ensuring soil loads in the haulage vehicles are secured in a manner that they cannot create dust emissions (i.e., by tarping).

3.4 Surface Quality / Quantity and Fish and Fish Habitat

The following mitigation measures will be employed to reduce the potential impacts of the demolition, construction and reinstatement to surface water quality/quantity and fish and fish habitat:

- Site run-off into the aquatic environment will be monitored to ensure it meets the CCME Guidelines (1999) which recommend the following suspended solids criteria (TSS) for the protection of aquatic life (both freshwater and marine):
  - Clear flow: maximum increase of 25mg/L from background levels for any short-term exposure (e.g., 24-h period). Maximum average increase of 5mg/L from background levels for longer term exposures (e.g., inputs lasting between 24 h and 30 d);
  - High flow: maximum increase of 25mg/L from background levels at any time when background levels are between 25 and 250mg/L. Should not increase more than 10% of background levels when background is ≥ 250mg/L;
- Sediment erosion control measures such as properly installed silt fences, sand bags and poly plastic will be used in appropriate locations to reduce sedimentation;
- Soil and material piles will be covered and located where materials cannot run-off into the aquatic environment and in a manner that limits the potential for wind or water erosion;
- The ground surface will be contoured so that runoff will remain free from sediment and will continue to be discharged to the same areas of the site as before construction; and
- Reinstatement / hydroseeding will occur as immediately as reasonably possible following construction such that there is no change in the volume and peak rate of runoff discharged from the site.

3.5 Birds

The following mitigation measures will be employed to reduce the potential impacts of the demolition, construction and reinstatement to birds:

- Due to the potential of species at risk and conservation concern identified by ACCDC, a breeding bird survey will be conducted prior to construction; ideally, this would be undertaken within the months of May or June;
- A search for potential bald eagle nests will be conducted in April or May. If a bald eagle nest is discovered, setback distances from construction activities between 50-100m are recommended until young have fledged;
- If possible, vegetation will be removed outside of the breeding bird season (i.e. May 1-August 15):
- If vegetation removal must occur during the breeding bird season, a nest search will be conducted within 5 days of vegetation removal; and
- If possible, the highest noise activities will be conducted during the warmest periods of the day and minimized during the early morning or evening hours.

Please note that all of the conditions of the EMP will be complied with except in situations where doing so could interfere with the Airport's responsibility to the public safety and defined by their Wildlife Management Plan as approved by Transport Canada.

3.6 Vegetation, Wetlands and Wildlife and Wildlife Habitat

As shown on Figure A2, the construction activities will take place within 30m of a mapped wetland. No construction will occur within the footprint of the wetland. The following mitigation measures will be employed to reduce the potential impacts of the demolition, construction and reinstatement to vegetation, wetlands and wildlife and wildlife habitat:

- In areas identified as wetlands, high visibility flagging will be used to indicate the limits of the wetlands. No machinery will be allowed within the wetland and no vegetation will be cleared within those limits until all applicable permits and approvals have been acquired;
- Construction activities within 30m of the wetland will be carried out in accordance with a WAWA permit;
- The flagging will be maintained throughout construction activities and removed following site restoration;
- No work will take place within 30m of the wetland, when the anticipated precipitation is greater than 25mm per 24-hour period;
- Temporary piles of soil and material will be stored more than 30m from the wetland and will be covered and be located where materials cannot enter a wetland or native vegetation and in a manner that limits the potential for wind or water erosion;
- Sediment and erosion control fencing such as properly installed silt fences, sand bags and poly plastic will be installed 30m perpendicular to the construction footprint;
- Site restoration and re-vegetation will be undertaken, as required, as soon as construction activities are complete. Consideration will be given to progressive reclamation, where possible;
- The DELG Regional Wetlands Biologist will be notified weekly via fax on the progression of construction activities;
- Vehicles will yield the right-of-way to wildlife when safe to do so; and

- All Project areas will be kept clean of food scraps and garbage will be collected and removed from the site daily. In the case that wildlife is encountered during construction activities, no attempt will be made by any worker to catch, divert or otherwise harass wildlife.

Please note that all of the conditions of the EMP will be complied with except in situations where doing so could interfere with the Airport's responsibility to the public safety and defined by their Wildlife Management Plan as approved by Transport Canada.

3.7 Contaminated Soil

If contaminated soils are encountered during demolition activities they will be managed appropriately in accordance with applicable guidelines under the supervision of a site professional.

3.8 Waste Management Plan

The Contractor(s) is responsible for the waste handling, management and disposal strategy for the Project. Any vehicle that hauls waste from the site must provide the Owner's Representative with a transport manifest and weigh bill from the disposal facility. Anticipated waste generated during the Project includes:

- Non-hazardous demolition debris;
- Waste residuals in the trickling filter and RBC, etc.;
- Hazardous building materials;
- Domestic waste: lunch bags, coffee cups;
- Human waste;
- Recyclable materials such as rebar; and
- Hazardous materials (fuels).

The proper transportation and management of these wastes is crucial to reducing the potential for negative environmental impacts. All transportation will be done in accordance with applicable legislation including the Transportation of Dangerous Goods Act.

General mitigation measures that must be addressed by the Contractor(s) include:

- Food waste will be stored in a manner that ensures wildlife will not be attracted;
- Waste containers will be provided onsite for the storage of lunch bags, coffee cups, etc. Domestic waste will be removed from site on a regular time schedule and disposed of at a landfill. No burning will be permitted;
- All scrap material will be disposed of at an approved licensed facility;
- Recyclable materials such as steel and other metals will be salvaged and recycled. Non-hazardous waste that is not recyclable will be disposed of at an appropriate licensed facility in accordance with applicable regulations; and
- Hazardous waste will be handled, stored, transported and disposed of in accordance with applicable regulations.

The Contractor(s) will ensure that, wherever possible, materials such as steel and other metals will be salvaged and recycled. All remaining non-hazardous waste will removed from the site by the Contractor(s) and disposed of at the appropriate regional sanitary landfill as construction and demolition debris.

3.9 Accidental Discovery of Archaeological Resources

Although the risk of encountering archaeological resources is low according to the provincial archaeological predictive modelling, there is a small risk that excavation activities could disturb archaeological and heritage resources.

In the event that archaeological resources are encountered during excavation, all activities must stop and appropriate archaeological mitigation measures must be implemented to protect the resource. The following procedure is recommended:

- All excavation activities will be stopped immediately and the area will be flagged; and
- The Archaeological Service Branch of the NB Department of Tourism, Heritage and Culture will be contacted for further archaeological mitigations.

CHAPTER 4 CONTINGENCY AND SAFETY PLANNING

4.1 Contingency and Safety Planning

A Contingency and Safety Plan for this Project has been developed according to regulations of relevant federal and provincial agencies. The goal of the Contingency and Safety Plan is to reduce the frequency, extent and duration of accidental events and to minimize the risk to public safety and the environment as a result of such events. This plan designates the personnel responsible for specific actions and defines measures to ensure that an effective communications and reporting system is in place to address contingency events.

4.2 Objectives

The Contingency and Safety Plan is developed to establish practices that will facilitate safety and to define responses for incidents or malfunctions that may arise during demolition. Such incidents could include injury, near-misses, spills and property damage. The objectives of the plan are:

- To establish best practices to ensure a safe working environment;
- To identify potential site-specific hazards to enable all site workers and emergency responders to be fully informed and to respond appropriately and safely to an emergency at the site;
- To provide emergency services with the information necessary to respond to an emergency on the site in a safe and effective manner; and
- To provide the public with an awareness of the nature of potential emergency situations and the expected responses.

4.3 Notifications

Responses to emergencies onsite will include the immediate notification of key response personnel and the instigation of onsite remedial actions to control the emergency. Emergency contact personnel are listed in Table 4.1. The responding organizations will be contacted, informed of project details and schedule, and given copies of the Emergency Access Plan (prepared by the Contractor and included in the EPP) prior to project initiation.

Table 4.1: Emergency Notification List

Organization	Address	Contact Name/ Service	Phone Number
Emergency Organization			
Fire Department		Saint John Fire Department	911
Police Department		Saint John Police Force	911
Ambulance		Ambulance Services	911
Hospital	400 University Ave. Saint John, NB E2L 4L2	Saint John Regional Hospital	(506) 648-6000
Poison Control		Emergency Response	911
	400 University Ave. Saint John, NB E2L 4L2	Emergency Department - Saint John Regional Hospital	(506) 648-6222
CANUTEC, the Canadian Transport Emergency Centre of the Department of Transport	330 Sparks Street Ottawa, ON K1A 0N5	Dangerous Goods Emergencies	(613) 996-6666 (collect) *666 (cellular)
New Brunswick Emergency Measures Organization (EMO)	Victoria Health Centre 65 Brunswick Street Fredericton, NB E3B 1G5	Ernie McGillivray Director	1-800-561-4034 (506) 453-2133
WorkSafe NB	1 Portland St. PO Box 160 Saint John, NB E2L 3X9		1-800-222-9775
Maritimes Regional Office Canadian Coast Guard Fisheries and Oceans Canada		Environmental Emergency	1-800-565-1633
Utility Contacts			
Saint John Energy	325 Simms Street Saint John, NB E2M 3L6	Report Power Interruption	1-877-907-5550
Project Contacts			
Saint John Airport (Proponent)	4180 Loch Lomond Rd Saint John, NB E2N 1L7	Brian Wiggins Director of Operations and Maintenance	(506) 638-5574
CBCL Limited	22 King Street Saint John, NB E2L 5B2	Amy Winchester, M.A.Sc., P.Eng. Project Manager	(506) 633-6650

Organization	Address	Contact Name/ Service	Phone Number
Regulatory Contacts			
New Brunswick Department of Environment	Saint John Regional Office 8 Castle Street Saint John, NB E2L 3B8	Environmental Accident	1-800-565-1633 (506) 658-2558
	Marysville Place 20 McGloin Street Fredericton, NB E3A 5T8	Disposal Permits for Spill Materials	(506) 453-2690
New Brunswick Department of Transportation	50 Crown St., Suite 105 Saint John, NB E2L 2X6	Alan Kerr, P.Eng. District Engineer	(506) 643-7463 1-888-915-1011
New Brunswick Department of Natural Resources	1045 Main Street Hampton, NB E5N 6E8	Wildlife Encounter	(506) 832-6055
New Brunswick Department of Wellness, Culture and Sport		Archaeological or Heritage Encounter	(506) 453-3014
Environment and Climate Change Canada, Canadian Wildlife Service	17 Waterfowl Lane Sackville, NB E4L 1G6	Migratory Bird Nest Encounter Peter Thomas, Landbird biologist	(506) 364-5013
Habitat, Species at Risk and Protected Areas	Hugh John Flemming Forestry Centre P. O. Box 6000 Fredericton, NB E3B 5H1 Canada	Species at Risk Encounter	(506) 453-3826
Maritimes Regional Office Canadian Coast Guard Fisheries and Oceans Canada		Environmental Emergency	1-800-565-1633

4.4 Incident Response

In the event of a serious incident, pre-planning and preparedness are the critical elements to maximize personal safety, minimize confusion and control damage. This plan provides information to address reasonably conceivable emergency situations that could occur during project activities. The nature of

the emergency will dictate the action taken. Safety of personnel and the protection of the environment are the prime concerns, and actions must be taken with these in mind.

All onsite personnel are responsible for responding to an incident deemed to require immediate action. The Environmental Coordinator will oversee this response.

Task responsibilities in the following critical areas will be assigned to supervisors or other responsible employees in each of the following areas:

- Personal injury or fatality;
- Failure of Erosion and Sediment Control Measures;
- Hazardous Materials Spills;
- Transportation- and equipment-related incidents;
- Breakage of, or damage to utility services;
- Explosion or fire;
- Criminal activity; and
- Disruption by weather events (lightning, ice, wind, rain, etc.).

4.4.1 Personal Injury

The potential for personal injury exists as a result of activities conducted in association with Project demolition. Personal injury may include cuts, broken bones, respiratory failure, hypothermia or heat exhaustion.

The contractor will be required to include emergency response measures as part of the site-specific EPP. The emergency response measures will include, but not be limited to the following mitigation measures:

- All personal injuries will be responded to immediately. Appropriate first aid measures will be applied to injured personnel provided the measures will not aggravate the condition of the victim. Only individuals with current First Aid Certification will perform first aid;
- At least one person with appropriate First Aid Certification will be onsite during all work activities;
- Continuous monitoring of the injured person(s) will be conducted and ambulance services (911) will be contacted if additional medical attention is required;
- Responding medical personnel shall be told of the incident causing the injury, a brief background of the site conditions and other relevant information;
- If the victim requires rescue, an assessment of the situation shall be conducted to determine what needs to be done and the feasibility of the necessary rescue operations. If rescue is not feasible by onsite personnel, 911 shall be called;
- The area surrounding the incident shall be secured immediately to prevent and minimize unauthorized and unnecessary access; and
- Any confined space work will be completed by qualified personnel and supported by a trained team of rescue workers in accordance with applicable guidelines.

4.4.2 Failure of Erosion and Sediment Control Measures

Failure of erosion and sediment control measures has the potential to adversely affect the Project and the environment. Although unlikely, it is possible that erosion and sediment control measures (e.g.,

sediment fences) could fail during construction activities. The failure of these control measures during a severe weather event could cause the release of sediment and has the potential to cause localized significant adverse environmental effects to wetlands, surface waters and terrestrial habitat. In the event of a failure, Project construction will be shut down until controls are restored.

The contractor will be required to include emergency response measures as part of the site-specific EPP. The emergency response measures will include, but not be limited to the following mitigation measures, to minimize the likelihood of, and contingency measures, to minimize effects in the event of, a failure of erosion and sediment control measures:

- Sediment and erosion controls structures will be installed as per manufacturer's recommendations and industry best practices;
- Site-specific EPP will detail the specific location and installation procedures for all erosion and sediment control structures;
- Excavations and disturbed areas will be compacted and reclaimed as soon as reasonably possible during construction and stockpiled materials will be appropriately covered; and
- The contractor will conduct regular monitoring of all sediment and erosion control structures to ensure they are functioning optimally and not at risk of failure. Any remedial action will be taken as rapidly as possible.

4.4.3 Hazardous Materials Spills

Fuel storage, refuelling and the operation of vehicles and construction equipment have the potential to be involved in a hazardous material spill. Hazardous material spills have the potential to adversely affect air, soil, wetland and surface and groundwater quality and could pose risks to human health and safety. Such events could also result in the alteration of terrestrial and aquatic habitat and the direct mortality of flora and fauna. A hazardous material spill has the potential to cause significant adverse environmental effects depending the size and location of the spill; however, it is most likely that such spills would be limited to relatively small quantities, and would be highly localized and easily cleaned up by the Contractor(s) using standard equipment. A major spill is unlikely given the limited amounts of hazardous materials that would be available at any given time; however, if such an event occurred, procedures will be in place to respond to and investigate the occurrence and put corrective actions in place. The likelihood and significance of the environmental effects associated with a hazardous material spill can be reduced with the application of appropriate mitigation measures.

Any spillage will be reported to NBDELG Saint John Regional Office at 506-658-2558 during business hours and after hours to (800) 565-1633.

The contractor will be required to include emergency response measures as part of the site-specific EPP. The emergency response measures will include, but not be limited to, the following mitigation measures to minimize the likelihood of, and contingency measures to minimize effects in the event of, a hazardous material spill:

- Dangerous goods, whose release into the environment could cause adverse effect, will be stored and handled in a manner that gives due regard for workers and public safety, and for the protection of the environment;

- Qualified personnel will handle these materials in accordance with manufacturer's instructions and WHMIS and Applicable Law;
- Material Safety Data Sheets (MSDS) will be readily available onsite for all hazardous materials in use or stored onsite;
- Proper equipment selection, regular inspections and maintenance programs will ensure the reliability and integrity of Project equipment and vehicles;
- Refuelling of equipment and vehicles will be done in a designated area on a low permeability surface and no refuelling will occur within 30m of wetlands and watercourses;
- Secondary containment will be used for pumps and generators;
- Equipment operators will remain with equipment and vehicles at all times during refuelling;
- An emergency spill response plan will be implemented to contain and remediate releases of hazardous materials into the environment prior to the commencement of construction;
- The spill response plan will be detailed in the EPP;
- Environmental training will include spill response training;
- Machinery will be operated in-the-dry where possible;
- Spill response equipment for use in both terrestrial and aquatic environments will be readily available onsite;
- Used oil filters, grease cartridge containers and other products associated with equipment maintenance shall be collected and disposed of in accordance with regulatory guidelines;
- Any toxic products (POLs, paint, solvents) will be kept in containers to protect wildlife exposure;
- Care in handling of fuels or dangerous materials will be exercised to minimize potential for spills;
- All spills will be responded to immediately to minimize environmental damage and for clean-up, repair or rehabilitation resulting from any spills. In the event of a spill, reporting requirements in Saint John Airport CoA will be followed;
- Site emergency response material will be supplied and maintained to contain spills and minimize environmental damage; and
- All contaminated media and cleanup materials will be collected and stored in a manner ensuring that it will not be re-released into the environment until it is transported offsite to an approved disposal facility.

4.4.4 Transportation- and Equipment-Related Incidents

Accidents and malfunctions of vehicles and construction equipment have the potential to adversely affect the Project and the environment, and could pose human health and safety risks. Accidents and malfunction can cause the release of hazardous materials which are discussed above. The risk of an accident or collision is expected to be extremely low based on compliance with standard procedures.

The contractor will be required to include emergency response measures as part of the site-specific EPP. The emergency response measures will include, but not be limited to the following mitigation measures:

- Accident, collision and malfunction response procedures will be prepared and adhered to;
- Equipment will be removed and repaired as needed;
- Damaged area will be restored;
- Vehicles will travel at speeds no greater than posted speed limits and will reduce speeds during inclement weather conditions; and

- All passenger and staff vehicles will be directed to locations at a safe distance from construction activities, and/or the vicinity of any project malfunctions (i.e., to appropriate staff/visitor parking areas);
- The Contractor(s) will ensure that work does not resume until a safe environment is re-established;
- Spill response procedures will be followed as described above.

4.4.5 Breakage of, or Damage to, Utility Services

All utility services will be identified before the commencement of work in a particular area. In the event of any contact with either known, or previously unidentified services, appropriate responses will be taken in accordance with the severity of the incident:

- Safety measures and remedial actions will be taken in the event of any breakage or damage to utility services by appropriately trained personnel;
- The proper responders will be immediately notified, and all non-essential personnel will be evacuated from the area;
- The area of breakage or damage, will be visually identified to facilitate action by the responder; and
- The danger must be completely removed and the location restored to an acceptable condition before work can resume.

4.4.6 Explosion or Fire

Construction activities could potentially cause a fire, and fuel storage, buildings, construction equipment and vehicles all have the potential to be involved in a fire. Although unlikely to occur, fires and explosions have the potential to adversely affect air and soil quality and could pose risks to human health and safety. Such events could also result in terrestrial habitat alteration and the direct mortality of flora and fauna. Firefighting chemicals and spilled materials could enter aquatic habitat and adversely affect biota and habitat. Habitats would begin to recover from a fire after a single generation and continue through the natural phases of succession; however, return to the natural state pre-fire may take multiple generations. Sustained fire events and those that lead to explosions, although considered very unlikely, may cause significant adverse environmental impacts.

As with all accidents, malfunctions and unplanned events, the most important step in preventing effects of a fire is to prevent fires from occurring. Material management and operational procedures will reduce the frequency and extent of accidental fires related to the Project.

The contractor will be required to include emergency response measures as part of the site-specific EPP. The emergency response measures will include, but not be limited to the following mitigation measures, to minimize the likelihood of, and contingency measures, to minimize effects in the event of, a fire or explosion:

- Burning of vegetation and debris will not be permitted;
- Fire response procedures will be established;
- Flammable waste will be disposed in an appropriate manner;
- Fire prevention and response training will be provided for all on-site personnel. Only individuals trained in the proper use of fire extinguishers may attempt to manage fire occurrences;

- Firefighting equipment, sufficient to mitigate on-site fire hazards, will be maintained in proper operating condition and to the manufacturer's / National Fire Protection Association standards; and
- For all explosions or fires that occur within the site, the local fire department will be called to respond. Communication and response procedures to be implemented in the event of a fire include:
  - Saint John Fire Department will be contacted immediately (911);
  - All nearby personnel will be notified immediately; and
  - Contractor will immediately notify the Airport;
- Personal protective equipment as required will be used by responding personnel to ensure protection from the fire and other hazardous materials potentially emitted in the process;
- The area will be continuously monitored until there is no more evidence of the fire; and
- The site will be restored to a safe condition before work can resume.

Any incident resulting in an explosion will result in the immediate shutdown and evacuation of the work site. The fire department will be called to manage and investigate the incident.

4.4.7 Criminal Activity

Any construction project has the potential to attract acts of vandalism, especially at night or during times of non-operation. All persons entering / leaving the site must sign in / out at the security desk. Acts of vandalism can often cause other types of incidents (e.g., fire, spill, etc.) to occur. The response will depend on the nature of the vandalism.

- Outside responders will be called in as necessary, including the police, when the vandalism is severe enough to warrant an investigation;
- If the damage caused by vandalism is confined to the facility buildings, machinery or equipment, the Contractor(s) must ensure it is safe to operate before resuming operations;
- To minimize the potential for vandalism, the Contractor(s) must ensure that the work site is left in a secure state;
- Equipment should never be left running while unattended. Equipment should be removed or monitored during prolonged absence of personnel from the site;
- In the event of criminal activity, steps will be taken in accordance with the nature of the incident (spill, fire, etc.); and
- RCMP will be notified and permitted to investigate the site to their satisfaction before work resumes.

4.4.8 Disruption by Weather Events

Extreme weather events have the potential to adversely affect the Project and the environment, and could pose risks to human health and safety. Extreme weather events may include high wind, heavy rainfall or snowfall, extreme cold, lightning and fog. Severe weather could cause failure of sediment containment, thereby releasing contaminants and adversely impacting water quality, aquatic habitat and terrestrial habitat. Extreme weather will also affect driving conditions and increase the likelihood of vehicle accidents. The likelihood and significance of the environmental effects associated with a potential extreme weather event can be reduced with the application of the following mitigations.

- Construction and operating staff will be trained to respond in the event of a technical failure due to a weather related event;
- Weather conditions will be assessed on a daily basis to determine the potential risk of extreme weather on the Project;
- Flooding caused by heavy precipitation could force construction to stop;
- If there is any doubt as to the severity of the impending weather, construction operations should be shut down, and appropriate protective and precautionary measures taken. The evacuation of the site should follow if deemed necessary. Any necessary outside support to facilitate safety and the implementation of environmental protective measures should be called in; and
- Site conditions should be safely restored before construction or operational activities are resumed.

4.5 Reporting to WorkSafe NB

Any serious injury, (i.e., resulting in hospitalization, loss of limbs) or any incident that has the potential for serious injury must be reported to WorkSafe NB (1-800-222-9775).

Written notice shall be sent to WorkSafe NB whenever a fire or accident at the workplace results in the bodily injury of an employee:

- If an explosion occurs at the work place, whether any person is injured or not, within 24 hours of its occurrence; and
- When a person is fatally injured from any cause, or in a manner likely to be fatal, within 24 hours of the occurrence of death or injury.

CHAPTER 5 ENVIRONMENTAL MONITORING

5.1 Onsite Environmental Monitoring

The Owner's Representative and the Environmental Coordinator will monitor activities throughout construction to ensure that the environmental protection measures are being implemented, that the site work complies with all conditions of the applicable permits and that day-to-day construction activities are implemented and monitored as outlined by the EMP and other pertinent plans and guidance documents.

The role of the Owner's Representative includes:

- Field surveillance of environmental conditions;
- Liaison with federal and/or provincial regulatory staff; and
- Work with the Environmental Coordinator to determine any necessary procedural modifications or schedule changes arising from environmental conditions.

The Environmental Coordinator will be briefed at the outset of the Project with respect to specific environmental concerns, contract specifications, field study reports, EMP, EPP, and associated plans. The role of the Environmental Coordinator includes:

- Field surveillance of environmental conditions;
- Implementation of environmental protection measures;
- Compliance with environmental commitments;
- Liaison with federal and/or provincial regulatory staff;
- Work with the Owner's Representative to determine any necessary procedural modifications or schedule changes arising from environmental conditions;
- Monitoring the storage and handling of hazardous materials;
- Responsible for decisions such as wet weather shut downs or courses of action to deal with major unexpected environmental conditions;
- Ensuring that waste products are disposed of in an authorized manner;
- Reporting any spills in accordance with federal and/or provincial regulations and advising on the clean-up and disposal of spilled material;
- Documenting site environmental conditions and concerns;
- Discussing environmental concerns with workers, regulators and the Owner's Representative; and
- Reviewing construction and restoration methods with the Owner's Representative.

DRAFT

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APPENDIX A

Figures

N

PID 00354696
CITY OF SAINT JOHN

GRAVITY
SEWER MAIN
FROM AIRPORT

PID 00354416
SAINT JOHN AIRPORT

SEWER FORCEMAIN
FROM LOCHLOMOND
ELEMENTARY SCHOOL

TRICKLING FILTER AND
SEDIMENTATION BASIN

CHLORINATION
SYSTEM

MAIN PUMP
STATION

200Ø OUTFALL
APPROX. 110m
TO MISPEC RIVER

PRIMARY
CLARIFIER/
INFLUENT
EQUALIZATION
BASIN

RBC
PLANT

SECONDARY
CLARIFIER

EXISTING FENCE TO
BE REMOVED (THIS END)

EXISTING
POTABLE WATER

SEWER FORCEMAIN
FROM AIRPORT

Legend

- Sanitary Manhole
- Sanitary Sewer
- Storm Sewer
- Valves
- Potable Water Main
- To Be Demolished

Client

Project Description

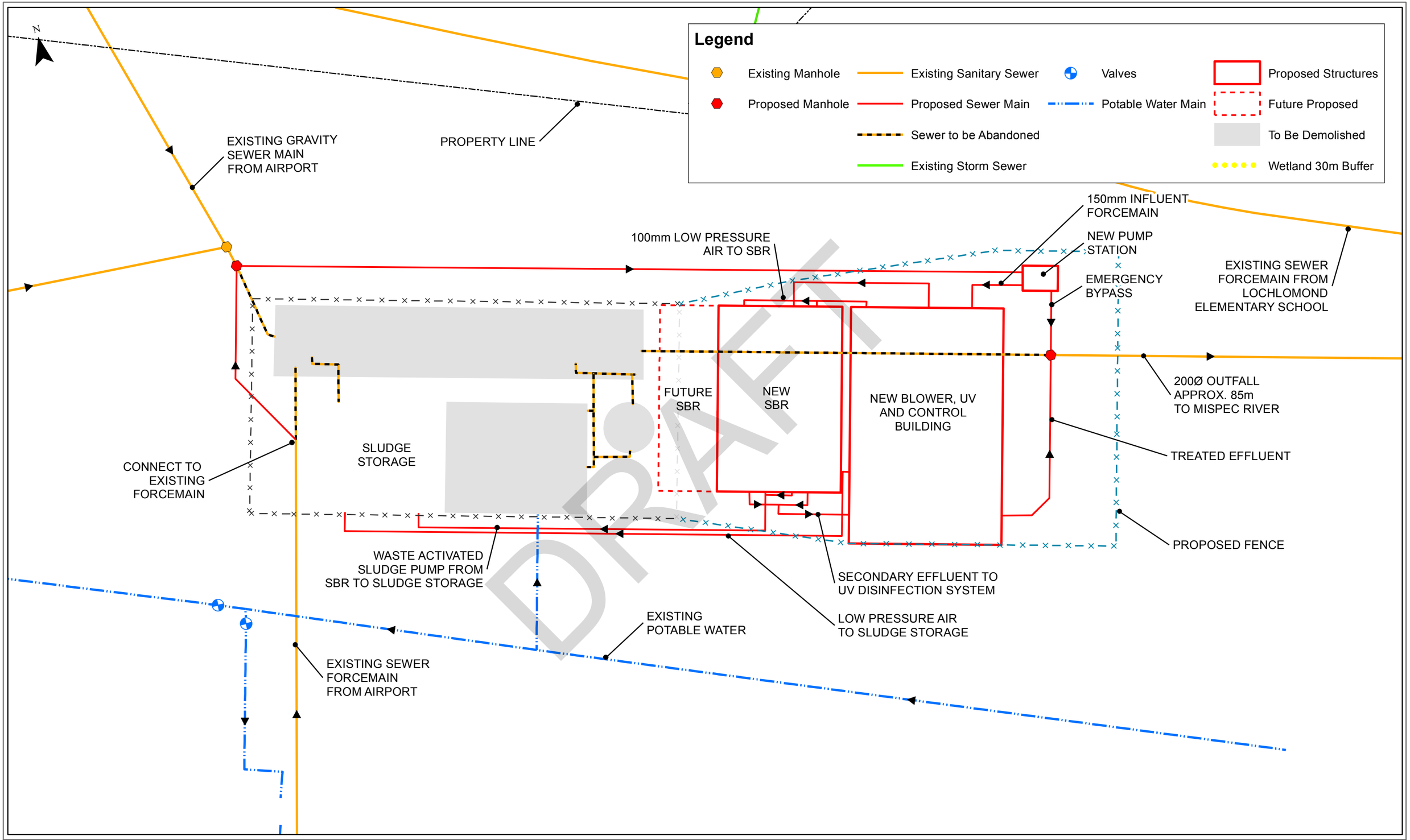
WWTP SBR UPGRADE
SITE PLAN
EXISTING CONDITIONS AND DEMOLITION

Revision or Issue

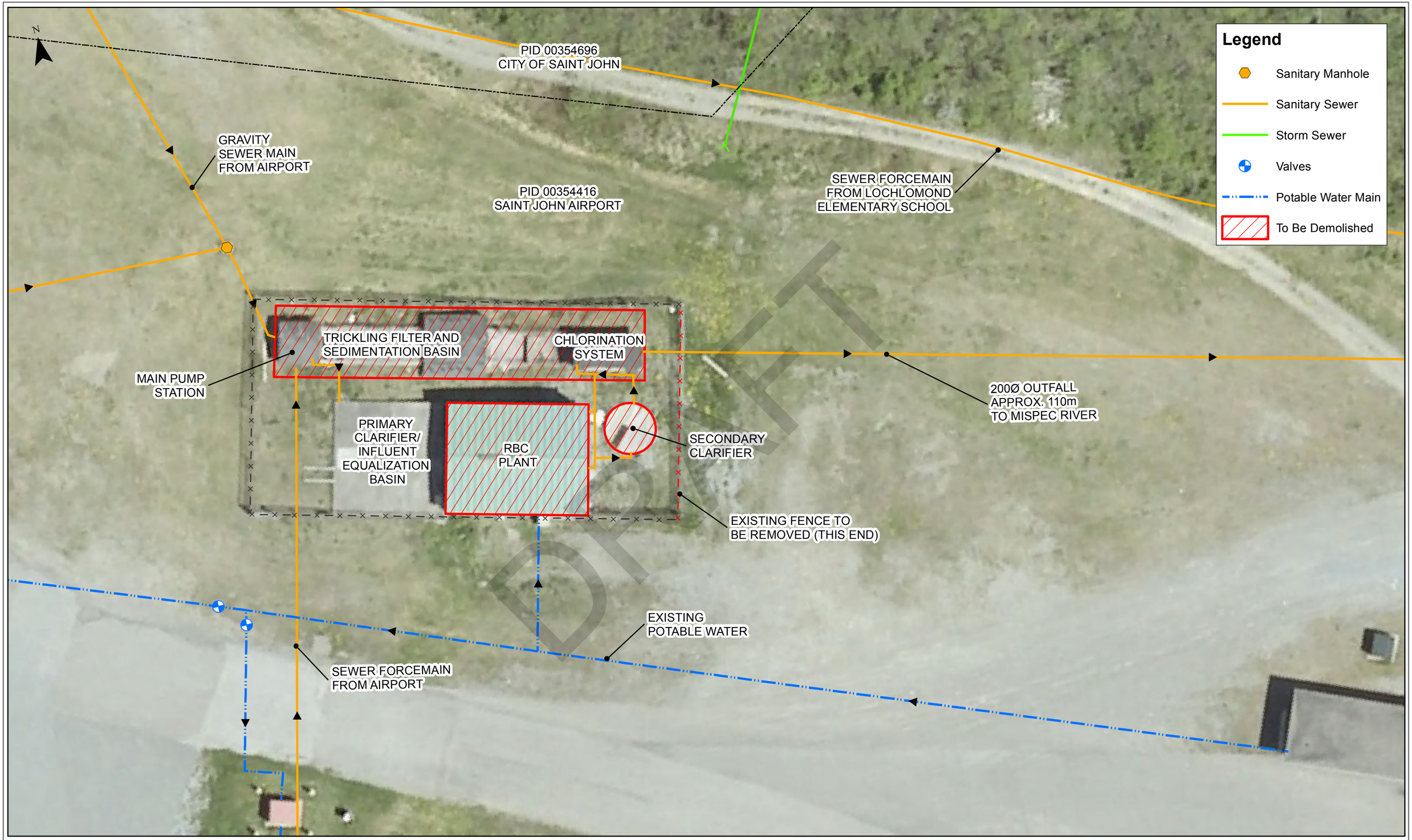
ISSUED FOR DRAFT EMP (2016/10/04)

Drawn	Designed	Checked	Approved
SMO	BM	AMW	AMW

Scale	Project No	Date	Figure No
1:200	162832.01	AUG 2016	A1



	Client	Project Description: WWTP SBR UPGRADE PROPOSED SITE PLAN	Revision or Issue: ISSUED FOR DRAFT EMP (2016/10/04)			
			Drawn: SMO	Designed: BM	Checked: AMW	Approved: AMW
			Scale: 1:200	Project No: 162832.01	Date: AUG 2016	Figure No: A2



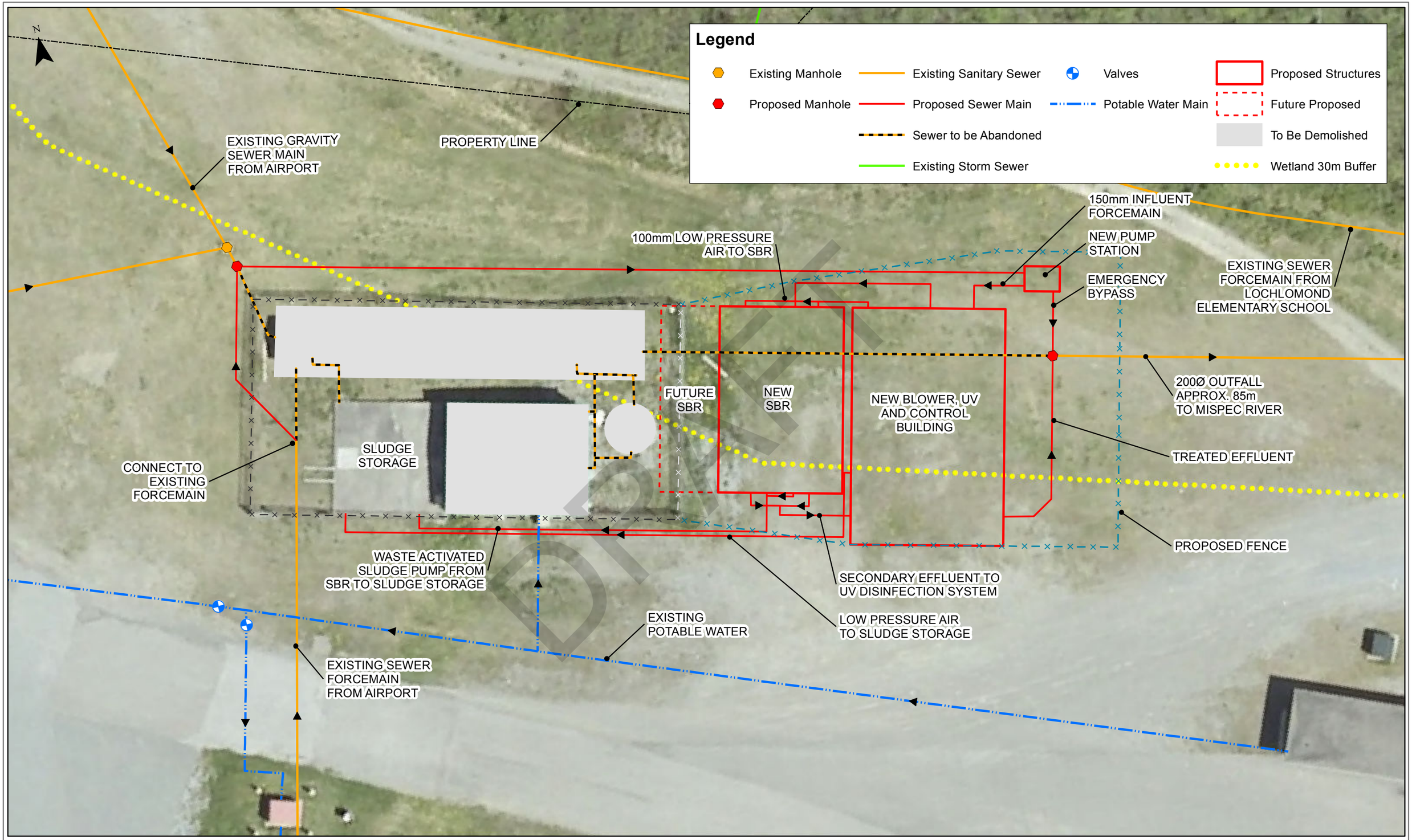
CBCL LIMITED
Consulting Engineers

Client: Your YSJ Saint John Airport

Project Description:
WWTP SBR UPGRADE
SITE PLAN
EXISTING CONDITIONS AND DEMOLITION

Revision or Issue: ISSUED FOR DRAFT EMP (2016/10/04)

Drawn	SMO	Designed	BM	Checked	AMW	Approved	AMW
Scale	1:200	Project No	162832.01	Date	AUG 2016	Figure No	A1



CBCL LIMITED
Consulting Engineers

Client: Your YSJ Saint John Airport

Project Description: WWTP SBR UPGRADE
PROPOSED SITE PLAN

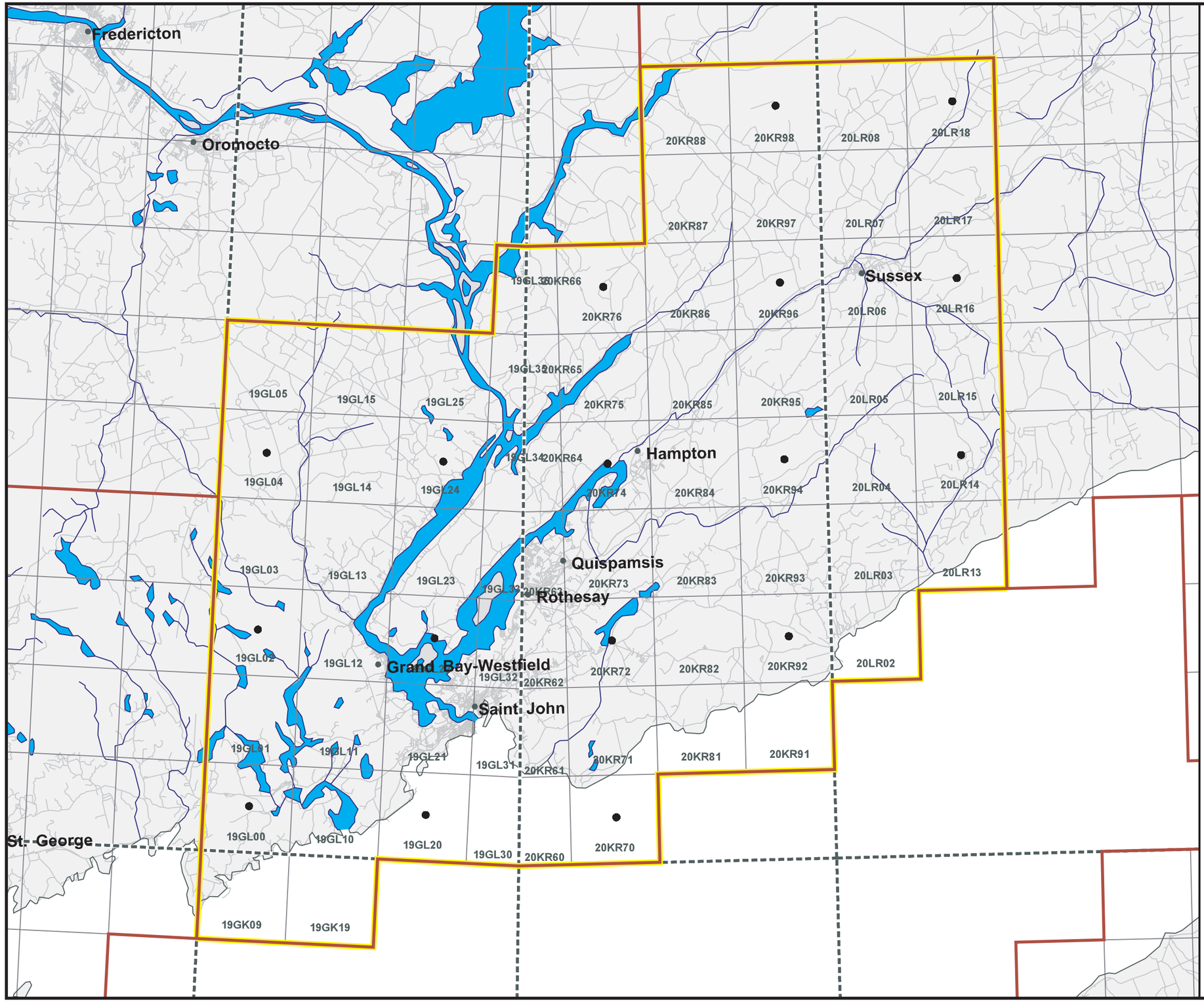
Revision or Issue: ISSUED FOR DRAFT EMP (2016/10/04)

Drawn	Designed	Checked	Approved
SMO	BM	AMW	AMW

Scale	Project No	Date	Figure No
1:200	162832.01	AUG 2016	A2

APPENDIX C

Maritime Breading Bird Atlas Maps



Region / Région 12
Saint John

- Atlas squares / Carrés Atlas
- Atlas Regions / Régions Atlas
- Atlas Blocks / Blocs Atlas
- Priority squares / Carrés prioritaires
- Roads / Routes
- Rivers / Rivières
- Lakes / Lacs

ATLAS DES OISEAUX NICHEURS DES MARITIMES
BREEDING BIRD ATLAS

BIRD STUDIES CANADA
ÉTUDES D'OISEAUX
understand appreciate conserve
comprendre apprécier conserver

Region/région:12 *New Brunswick* **Saint John West** *Nouveau-Brunswick* 19GL21

Maritime Breeding Bird Atlas 2006 - 2010 Atlas des oiseaux nicheurs des Maritimes

Saint John West

Region/région: 12 **19GL21**

Roadside Point Count Coordinates/
Coordonnées de points d'écoute
de bordure de route

#	Easting/ Abscisse	Northing/ Ordonnée
1	723,905	5,012,766
2	726,894	5,012,494
3	727,983	5,019,800
4	721,692	5,011,155
5	728,709	5,019,176
6	726,306	5,012,078
7	722,161	5,011,731
8	726,155	5,018,923
9	725,367	5,012,506
10	723,362	5,017,659
11	720,800	5,018,960
12	727,268	5,016,845
13	722,944	5,017,939
14	728,833	5,015,479
15	720,687	5,016,574
16	721,475	5,016,937
17	727,404	5,017,321
18	727,179	5,016,351
19	725,044	5,012,899
20	729,164	5,015,884
21	727,121	5,012,944
22	729,800	5,019,576
23	725,779	5,012,806
24	728,112	5,014,462
25	725,083	5,015,019
26	727,151	5,015,848
27	727,344	5,013,412
28	724,019	5,015,249
29	726,768	5,016,980
30	721,948	5,010,578
31	722,562	5,018,458
32	720,200	5,014,019
33	727,493	5,013,886
34	724,546	5,013,040
35	728,417	5,015,202
36	729,499	5,016,759
37	724,953	5,013,400
38	720,290	5,018,959
39	726,208	5,019,800
40	727,619	5,015,602

Legend/Légende

Highway	Route
Forest Road	Route forestière
Seasonal Road	Chemin saisonnier
Trail	Sentier
Railway, Abandoned Railway or Trail	Voie ferrée, Voie ferrée abandonnée ou sentier
PipeLine	Gazoduc ou conduite d'eau
Transmission Line	Ligne électrique
Contour 20 m	Courbe de niveau 20 m
Contour 100 m (index)	Courbe de niveau 100 m (index)
Stream	Ruisseau
Lake, River, Ocean	Lac, rivière, océan
Open Wetland	Marécage
Bog, Fen or Shrub Wetland	Tourbière ou marécage arbustif
Mature Deciduous Forest	Forêt de feuillus mature
Mature Coniferous Forest	Forêt de conifères mature
Mature Pine Forest	Forêt de pins mature
Young Forest	Jeune fôret
Upland Open Country	Terrain ouvert: agricole, non-boisé
Occupied, Urban, Other	Terrain occupé, zone urbaine, autre
Gravel Pit	Gravière

Cartographic production by New Brunswick Department of Natural Resources, Fish & Wildlife Branch, 2006
Disclaimer
The New Brunswick Department of Natural Resources accepts no liability for any errors, deficiencies, or faults on this map.

This map is for use in Maritime Breeding Bird Atlas work only.

Production cartographique de la Province du Nouveau-Brunswick, Ministère des Ressources naturelles, Direction de la pêche sportive et de la chasse, 2006
Avis
Le Ministère des Ressources naturelles du Nouveau-Brunswick ne peut être tenu responsable pour des erreurs, défectuosités, ou anomalies dans la présente carte.

L'usage de cette carte est limité aux activités de l'Atlas des oiseaux nicheurs des Maritimes seulement.

6° Universal Transverse Mercator (UTM) Projection; Zone 19, Central Meridian 69° West; North American Datum 1983 (NAD 83)

Projection universelle transverse de Mercator (UTM) 6°
Zone 19, méridien central 69° ouest;
Système de référence géodésique nord-américain 1983 (NAD 83)

Atlas des oiseaux nicheurs des Maritimes Breeding Bird Atlas
New Nouveau Brunswick Natural Resources Ressources naturelles
Bird Studies Canada Études d'oiseaux Canada

ATLAS DES OISEAUX NICHEURS DES MARITIMES
BREEDING BIRD ATLAS

Square Summary (19GL21)

#species (1st atlas)				#species (2nd atlas)				#hours		#pc done	
poss	prob	conf	total	poss	prob	conf	total	1st	2nd	road	offrd
18	38	42	98	0	0	0	0	146	64.5	0	0

Region summary (#12: Saint John)

#squares	#sq with data		#species		#pc done	target #pc
	1st	2nd	1st	2nd		
70	61	0	152	0	0	262

Target number of point counts in this square: 14 road side, 1 off road (1 in Mature deciduous). Please try to ensure that each off-road station is located such that the entire 100m radius circle is within the prescribed habitat.

SPECIES	Code		%	
	1st	2nd	1st	2nd
Canada Goose		NY	0	0
Wood Duck		H	24	0
Gadwall ‡	NE	FY	1	0
Eurasian Wigeon ‡			1	0
American Wigeon	NE	FY	31	0
American Black Duck	FL	FY	73	0
Mallard	P	NE	26	0
Mallard x Am. Black Duck ‡			0	0
Blue-winged Teal	P	H	29	0
Northern Shoveler		FY	4	0
Northern Pintail	T		6	0
Green-winged Teal	A	FY	18	0
Redhead †			0	0
Ring-necked Duck		P	22	0
Greater Scaup †			4	0
Common Eider §	NY	NE	14	0
Common Goldeneye		FY	24	0
Hooded Merganser	H		9	0
Common Merganser		FY	24	0
Red-breast Merganser	H		16	0
Ruddy Duck †			0	0
Ring-necked Pheasant			4	0
Ruffed Grouse	T	FY	63	0
Spruce Grouse ‡			3	0
Common Loon	P	FY	45	0
Pied-billed Grebe		FY	9	0
Double-crest Cormorant §	NY	NE	4	0
American Bittern			32	0
Least Bittern †			3	0

SPECIES	Code		%	
	1st	2nd	1st	2nd
Great Blue Heron §	NY	AE	52	0
Snowy Egret ‡		H	0	0
Green Heron †			4	0
Black-crown N.-Heron † §	FL		3	0
Glossy Ibis †	NE		1	0
Turkey Vulture ‡¤			1	0
Osprey	H	NY	49	0
Bald Eagle ¤		NB	16	0
Northern Harrier	T	T	59	0
Sharp-shinned Hawk	T		40	0
Cooper's Hawk †	H		1	0
Northern Goshawk	H		14	0
Red-should Hawk †			3	0
Broad-winged Hawk		H	49	0
Red-tailed Hawk		FY	39	0
Virginia Rail †			13	0
Sora			16	0
Common Gallinule †			3	0
American Coot †			1	0
Killdeer	FL	DD	91	0
Spotted Sandpiper	T	FY	81	0
Solitary Sandpiper †			1	0
Upland Sandpiper †			0	0
Wilson's Snipe			62	0
American Woodcock	H	S	60	0
Wilson's Phalarope †	P		6	0
Ring-billed Gull ‡§		NE	1	0
Herring Gull §	NY	NY	11	0
Great Black-backed Gull §	NY	NY	14	0

SPECIES	Code		%	
	1st	2nd	1st	2nd
Black Tern ‡§			6	0
Common Tern §			18	0
Black Guillemot ‡§			4	0
Rock Pigeon	ON	FY	57	0
Mourning Dove	FL	FY	77	0
Black-billed Cuckoo		H	50	0
Eastern Screech-Owl ‡			1	0
Great Horned Owl	T	FY	37	0
Barred Owl			18	0
Long-eared Owl †		H	1	0
Short-eared Owl †			0	0
North Saw-whet Owl			4	0
Common Nighthawk †	T		47	0
Whip-poor-will ‡			9	0
Chimney Swift †			32	0
Ruby-thr Hummingbird	T	FY	55	0
Belted Kingfisher	H	A	59	0
Yellow-bellied Sapsucker			72	0
Downy Woodpecker	A	NY	88	0
Hairy Woodpecker	H	FY	72	0
Black-back Woodpecker ‡			9	0
Northern Flicker			93	0
Pileated Woodpecker			27	0
American Kestrel	H	T	77	0
Merlin	H	P	14	0
Peregrine Falcon †		AE	0	0
Olive-sided Flycatcher †			63	0
Eastern Wood-Pewee			88	0
Yellow-bellied Flycatcher		CF	85	0

Maritimes Breeding Bird Atlas - Summary Sheet for Square 19GL21 (page 2 of 3)

SPECIES	Code		%	
	1st	2nd	1st	2nd
Alder Flycatcher	T	CF	90	0
Willow Flycatcher †	H	S	11	0
Least Flycatcher	P	P	83	0
Eastern Phoebe	T	NB	37	0
Gr Crested Flycatcher			27	0
Eastern Kingbird			65	0
Blue-headed Vireo		S	85	0
Warbling Vireo †	H		21	0
Philadelphia Vireo ‡			19	0
Red-eyed Vireo	T	CF	98	0
Gray Jay			36	0
Blue Jay	FL	FY	91	0
American Crow	FL	NY	98	0
Common Raven	FL	NB	93	0
Horned Lark †			8	0
Purple Martin ‡			29	0
Tree Swallow	V	CF	96	0
North Rgh-wing Swallow †			3	0
Bank Swallow §	ON	AE	78	0
Cliff Swallow §	ON		77	0
Barn Swallow	FL	AE	91	0
Black-capp Chickadee	NB	NY	93	0
Boreal Chickadee	H		36	0
Red-breast Nuthatch	FL	CF	88	0
White-breast Nuthatch			13	0
Brown Creeper			47	0
House Wren †	T	A	1	0
Winter Wren	T	T	90	0
Marsh Wren †			1	0

SPECIES	Code		%	
	1st	2nd	1st	2nd
Golden-crown Kinglet	H	H	88	0
Ruby-crown Kinglet		H	86	0
Eastern Bluebird †			16	0
Veery	T	S	91	0
Bicknell's Thrush †			4	0
Swainson's Thrush	T	CF	95	0
Hermit Thrush		CF	91	0
Wood Thrush †			50	0
American Robin	NY	NB	98	0
Gray Catbird	AY	CF	95	0
Northern Mockingbird †	FL	CF	13	0
Brown Thrasher †		S	4	0
European Starling	AY	CF	86	0
Cedar Waxwing	NY	CF	98	0
Ovenbird	T	P	93	0
North Waterthrush			70	0
Black-white Warbler	T	CF	93	0
Tennessee Warbler	H	T	77	0
Nashville Warbler	T	FY	93	0
Mourning Warbler			67	0
Common Yellowthroat	AY	CF	98	0
American Redstart	A	CF	98	0
Cape May Warbler			8	0
Northern Parula	T	CF	95	0
Magnolia Warbler	T	CF	98	0
Bay-breasted Warbler		FY	44	0
Blackburnian Warbler	H		91	0
Yellow Warbler	NY	CF	96	0
Chestn-sided Warbler	FL	FY	90	0

SPECIES	Code		%	
	1st	2nd	1st	2nd
Blackpoll Warbler ‡			0	0
Black-thr Blue Warbler		H	44	0
Palm Warbler		H	26	0
Pine Warbler †			0	0
Yellow-rumped Warbler	AY	CF	96	0
Black-thr Green Warbler	T	CF	96	0
Canada Warbler †	A		91	0
Wilson's Warbler			72	0
Eastern Towhee ‡			1	0
Chipping Sparrow	NY	CF	95	0
Field Sparrow †			0	0
Vesper Sparrow †			16	0
Savannah Sparrow	T	CF	83	0
Nelson's Sh.-tail Sparrow	FL	CF	21	0
Song Sparrow	FL	CF	96	0
Lincoln's Sparrow	A		78	0
Swamp Sparrow	FL		75	0
White-throat Sparrow	FL	CF	98	0
Dark-eyed Junco	T	FY	95	0
Scarlet Tanager †			27	0
Northern Cardinal	FL	CF	4	0
Rose-breast Grosbeak		S	86	0
Indigo Bunting ‡			8	0
Bobolink	A		80	0
Red-wing Blackbird	FL	CF	88	0
Eastern Meadowlark †			9	0
Rusty Blackbird †			27	0
Common Grackle	AY	FY	95	0
Brown-head Cowbird	FL		90	0

SPECIES	Code		%	
	1st	2nd	1st	2nd
Baltimore Oriole			34	0
Purple Finch	T	FY	91	0
House Finch †	FL	P	6	0
Red Crossbill †	P		4	0
White-winged Crossbill	H		22	0
Pine Siskin	H	CF	70	0
American Goldfinch	NB	NE	98	0
Evening Grosbeak		FY	77	0
House Sparrow	FL	NB	75	0

This list includes all species found during the Maritimes Breeding Bird Atlas (1st atlas: 1986-1990, 2nd atlas: 2006-2010) in the region #12 (Saint John). Underlined species are those that you should try to add to this square (19GL21). They have not yet been reported during the 2nd atlas, but were found during the 1st atlas in this square or have been reported in more than 50% of the squares in this region during the 2nd atlas so far. "Code" is the code for the highest breeding evidence for that species in square 19GL21 during the 2nd and 1st atlas respectively. The % columns give the percentage of squares in that region where that species was reported during the 2nd and 1st atlas (this gives an idea of the expected chance of finding that species in region #12). Rare/Colonial Species Report Forms should be completed for species marked: § (Colonial), ‡ (regionally rare), † (rare in the Maritimes) or ¤ (rare in the Maritimes, documentation only required for confirmed records). Current as of 20/02/2015. An up-to-date version of this sheet is available fromhttp://www.mba-aom.ca/jsp/summaryform.jsp?squareID=19GL21?lang=en

APPENDIX D

NB Species at Risk Act – Species List

I went thru Species Registry at http://www1.gnb.ca/0078/SpeciesAtRisk/search-e.asp And this list looks correct

New Brunswick Species at Risk Act

SCHEDULE A – List of Species at Risk - Consolidated to May 22, 2013.

EXTIRPATED SPECIES

Mammals

Caribou, Woodland (*Rangifer tarandus caribou*)

Walrus, Atlantic (*Odobenus rosmarus rosmarus*)

Wolf, Grey (*Canis lupus*)

Wolverine (*Gulo gulo*)

Molluscs

Wedgemussel, Dwarf (*Alasmidonta heterodon*)

ENDANGERED SPECIES

Mammals

Bat, Tri-colored (*Perimyotis subflavus*)

Lynx, Canada (*Lynx canadensis*)

Myotis, Little Brown (*Myotis lucifugus*)

Myotis, Northern (*Myotis septentrionalis*)

Whale, Blue (*Balaenoptera musculus*) Atlantic population

Whale, North Atlantic Right (*Eubalaena glacialis*)

Birds

Curlew, Eskimo (*Numenius borealis*)

Duck, Harlequin (*Histrionicus histrionicus*) Eastern population

Eagle, Bald (*Haliaeetus leucocephalus*)

Falcon anatum/tundrius, Peregrine (*Falco peregrinus anatum/tundrius*)

Knot rufa subspecies, Red (*Calidris canutus rufa*)

Plover melodus subspecies, Piping (*Charadrius melodus melodus*)

Tern, Roseate (*Sterna dougallii*)

Reptiles

Sea Turtle, Leatherback (*Dermochelys coriacea*) Atlantic population

Sea Turtle, Loggerhead (*Caretta caretta*)

Fishes

Bass, Striped (*Morone saxitilis*) Bay of Fundy population

Cod, Atlantic (*Gadus morhua*) Laurentian South population

Cod, Atlantic (*Gadus morhua*) Southern population

Cusk (*Brosme brosme*)

Porbeagle (*Lamna nasus*)

Salmon, Atlantic (*Salmo salar*) Inner Bay of Fundy population

Salmon, Atlantic (*Salmo salar*) Outer Bay of Fundy population

Shark, White (*Carcharodon carcharias*) Atlantic population

Skate, Winter (*Leucoraja ocellata*) Southern Gulf of St. Lawrence population

Bluefin Tuna, Atlantic (*Thunnus thynnus*)

Arthropods

Clubtail, Skillet (*Gomphus ventricosus*)

Ringlet, Maritime (*Coenonympha nipisiquit*)

Tiger Beetle, Cobblestone (*Cicindela marginipennis*)

Vascular Plants

Aster, Anticosti (*Symphyotrichum anticostense*)

Aster, Bathurst (*Symphyotrichum subulatum*) Bathurst population

Aster, Gulf of St. Lawrence (*Symphyotrichum laurentianum*)

Butternut (*Juglans cinerea*)

Lousewort, Furbish's (*Pedicularis furbishiae*)

Pinedrops (*Pterospora andromedea*)

Pipewort, Parker's (*Eriocaulon parkeri*)

Quillwort, Prototype (*Isoetes prototypus*)

Twayblade, Southern (*Listera australis*)

Lichens

Lichen, Vole Ears (*Erioderma mollissimum*)

Lichen, Boreal Felt (*Erioderma pedicellatta*) Atlantic population

THREATENED SPECIES

Birds

Bittern, Least (*Ixobrychus exilis*)

Bobolink (*Dolichonyx oryzivorus*)

Flycatcher, Olive-sided (*Contopus cooperi*)

Meadowlark, Eastern (*Sturnella magna*)

Nighthawk, Common (*Chordeiles minor*)

Swallow, Barn (*Hirundo rustica*)

Swift, Chimney (*Chaetura pelagica*)

Thrush, Bicknell's (*Catharus bicknelli*)

Thrush, Wood (*Hylocichla mustelina*)

Warbler, Canada (*Wilsonia canadensis*)

Whip-poor-will (*Caprimulgus vociferus*)

Reptiles

Turtle, Wood (*Glyptemys insculpta*)

Fishes

Eel, American (*Anguilla rostrata*)

Plaice, American (*Hippoglossoides platessoides*) Maritime population

Redfish, Acadian (*Sebastes fasciatus*) Atlantic population

Shortfin, Mako (*Isurus oxyrinchus*) Atlantic population

Smelt, Rainbow (*Osmerus mordax*) Lake Utopia large-bodied population

Smelt, Rainbow (*Osmerus mordax*) Lake Utopia small-bodied population

Sturgeon, Atlantic (*Acipenser oxyrinchus*) Maritimes populations

Vascular Plants

Jacob's-ladder, Van Brunt's (*Polemonium vanbruntiae*)

SPECIES OF SPECIAL CONCERN

Mammals

Porpoise, Harbour (*Phocoena phocoena*) Northwest Atlantic population

Whale, Fin (*Balaenoptera physalus*) Atlantic population

Birds

Blackbird, Rusty (*Euphagus carolinus*)

Goldeneye, Barrow's (*Bucephala islandica*) Eastern population

Grebe, Horned (*Podiceps auritus*) Western population

Owl, Short-eared (*Asio flammeus*)

Rail, Yellow (*Coturnicops noveboracensis*)

Wood-pewee, Eastern (*Contopus virens*)

Reptiles

Turtle, Snapping (*Chelydra serpentina*)

Fishes

Bass, Striped (*Morone saxitilis*) Southern Gulf of St. Lawrence population

Dogfish, Spiny (*Squalus acanthias*) Atlantic population

Salmon, Atlantic (*Salmo salar*) Gaspe-Southern Gulf of St. Lawrence population

Shark, Blue (*Prionace glauca*) Atlantic population

Skate, Smooth (*Malacoraja senta*) Laurentian-Scotian population

Skate, Thorny (*Amblyraja radiata*)

Skate, Winter (*Leucoraja ocellata*) Georges Bank-Western Scotian Shelf-Bay of Fundy population

Sturgeon, Shortnose (*Acipenser brevirostrum*)

Wolffish, Atlantic (*Anarhichas lupus*)

Molluscs

Floater, Brook (*Alasmidonta varicosa*)

Lampmussel, Yellow (*Lampsilis cariosa*)

Arthropods

Monarch (*Danaus plexippus*)

Snaketail, Pygmy (*Omphiogomphus howei*)

Vascular Plants

Pinweed, Beach (*Lechea maritima*)

Lichens

Lichen, Blue Felt (*Degelia plumbea*)

APPENDIX E

Explanation of Species Ranks

Atlantic CDC Ranks Definitions	
S1	Extremely rare throughout its range in the province (typically five or fewer occurrences or very few remaining individuals). May be especially vulnerable to extirpation.
S2	Rare throughout its range in the province (six to 20 occurrences or few remaining individuals). May be vulnerable to extirpation due to rarity or other factors.
S3	Uncommon throughout its range in the province, or found only in a restricted range, even if abundant at some locations (21 to 100 occurrences).
S4	Usually widespread, fairly common throughout its range in the province, and apparently secure with many occurrences, but the species is of long-term concern, e.g., watch list (100+ occurrences).
SU	Unrankable: Possibly in peril throughout its range in the province, but status uncertain: need more information. Used for new species not previously identified.
SX	Extinct/Extirpated: Believed to be extirpated within the province.
S#S#	Numeric range rank: A range between two consecutive numeric ranks. Denotes uncertainty about the exact rarity of the species, e.g., S1S2.
?	Inexact or uncertain: For numeric ranks, denotes uncertainty, e.g., SE? Denotes uncertainty of exotic status.
NBDNR General Status Ranks	
Extinct	Species that are extirpated worldwide (i.e., they no longer exist anywhere).
Extirpated	Species that are no longer present in New Brunswick but occur in other areas.
At Risk	Species for which a formal detailed risk assessment has been completed, and have been determined to be at risk of extirpation or extinction (i.e. Endangered) or is likely to become at risk of extirpation or extinction if limiting factors are not reversed (i.e. Threatened).
May be At Risk	Species or populations that may be at risk of extirpation or extinction, and are therefore candidates for a detailed risk assessment by COSEWIC or the New Brunswick equivalent.

Sensitive	Species which are not believed to be at risk of immediate extirpation or extinction, but which may require special attention or protection to prevent them from becoming at risk.
Secure	Species that are not believed to be At Risk, May Be At Risk, Sensitive, Extirpated, Extinct, Accidental or Exotic.
Status Undetermined	Species for which there is insufficient data, information, or knowledge available to reliably evaluate their general status.
Not Assessed	Species known or believed to be present in New Brunswick but which have not yet been assessed by the general status program.
Exotic	Species that have been moved beyond their natural range as a result of human activity, whether intentional or not intentional.
Accidental	Species occurring infrequently and unpredictably outside their usual range.
Occurrence Not Verified	Species which have been reported in New Brunswick, but for which there is no documented evidence, or species which are suspected to occur in New Brunswick because they occur in neighbouring provinces or states.
***SARA* Ranks**	
Endangered	A species facing imminent extirpation or extinction
Threatened	A species likely to become endangered if limited factors are not reversed
Special Concern	A species of concern because of characteristics that make it particularly sensitive to human activities or natural events**.**

APPENDIX F

ACCDC Rare Taxa Report

ACCDC DATA REQUEST 5602: Saint John Airport NB (ref.162832)

Prepared 10 August 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
StJohnAirporNB_5602ob.xls	All Rare and legally protected *Flora and Fauna* within 5 km of your study area
StJohnAirporNB_5602ob100km.xls	A list of Rare and legally protected *Flora and Fauna* within 100 km of your study area
StJohnAirporNB_5602ma.xls	All *Managed Areas* in your study area
StJohnAirporNB_5602ff.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
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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

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Eastern: Donald Anderson
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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

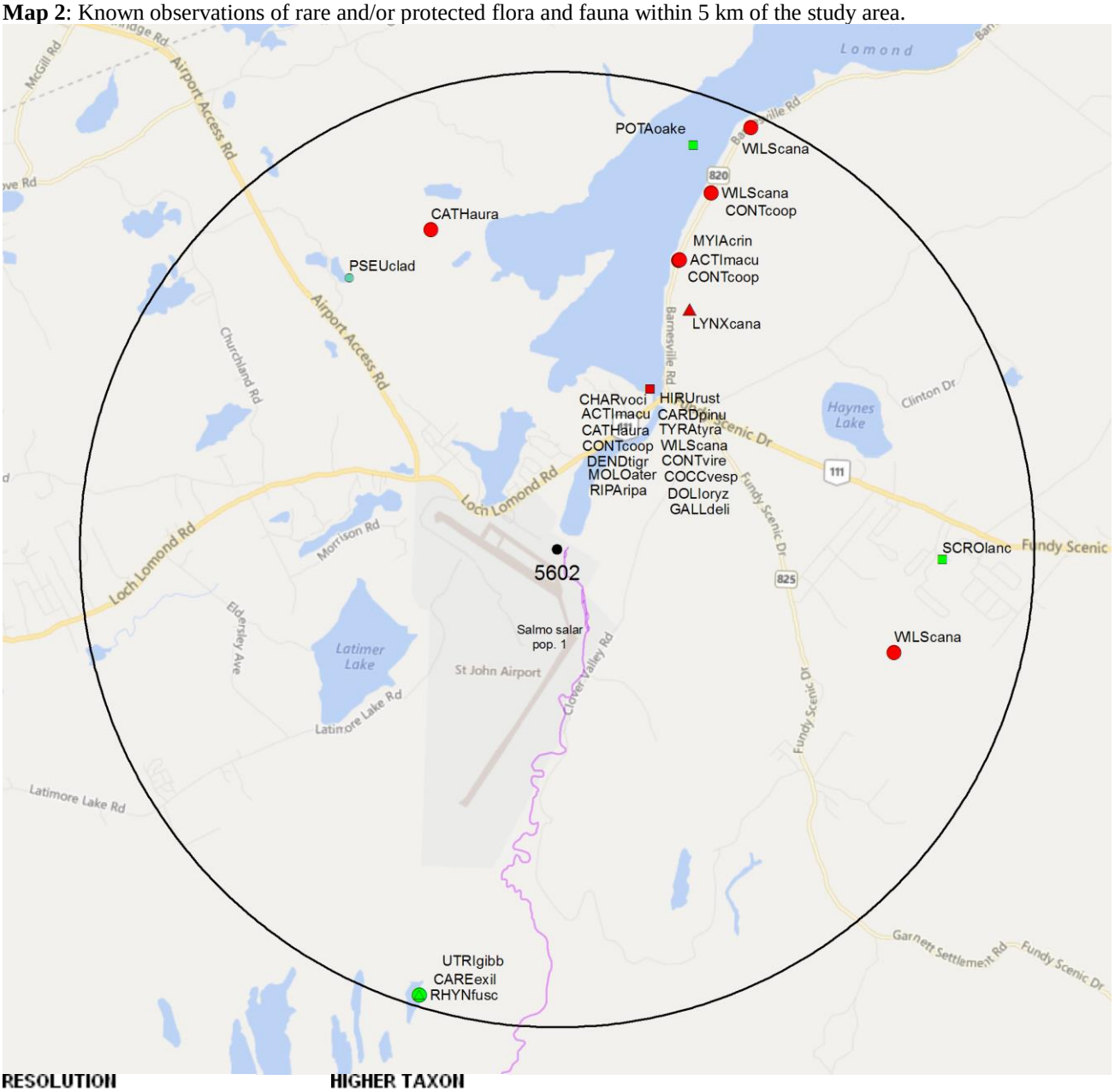
2.1 FLORA

A 5 km buffer around the study area contains 6 records of 5 vascular, 2 records of 1 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

A 5 km buffer around the study area contains 35 records of 17 vertebrate, no records of 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.



RESOLUTION
- 4.7 within 50s of kilometers
- 4.0 within 10s of kilometers
- 3.7 within 5s of kilometers
- 3.0 within kilometers
- 2.7 within 500s of meters
- 2.0 within 100s of meters
- 1.7 within 10s of meters

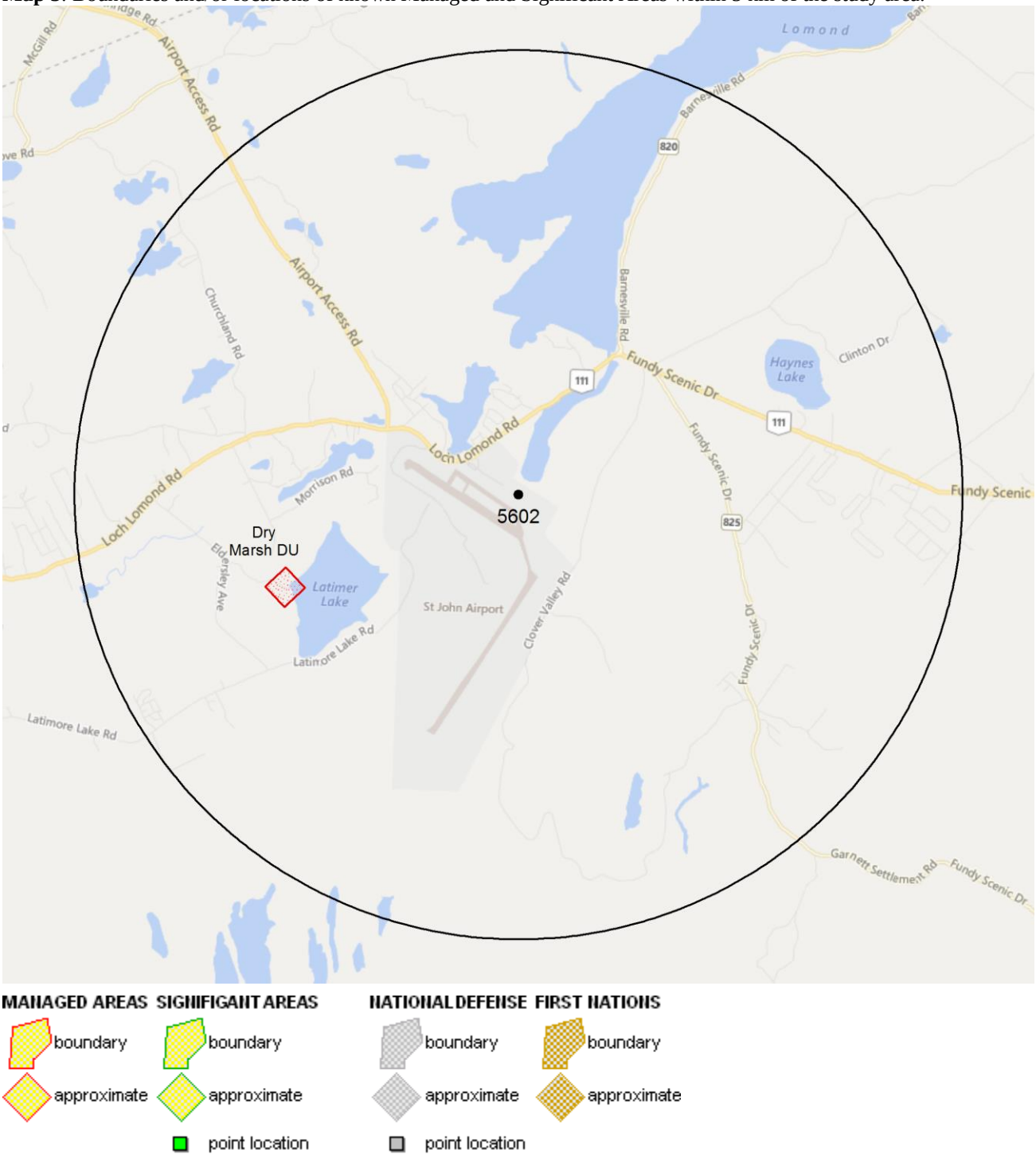
HIGHER TAXON
- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora

3.0 SPECIAL AREAS

3.1 MANAGED AREAS
The GIS scan identified 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 no biologically significant sites in the vicinity of the study area (Map 3)

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)
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	5 Undetermined	2	3.6 ± 0.0
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S2	3 Sensitive	1	4.0 ± 5.0
P	*Carex exilis*	Coastal Sedge				S3	4 Secure	1	4.9 ± 0.0
P	*Rhynchospora fusca*	Brown Beakrush				S3	4 Secure	1	4.9 ± 0.0
P	*Utricularia gibba*	Humped Bladderwort				S3S4	4 Secure	1	4.9 ± 0.0
P	*Potamogeton oakesianus*	Oakes' Pondweed				S3S4	4 Secure	2	4.5 ± 5.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Riparia riparia*	Bank Swallow	Threatened			S2S3B,S2S3M	3 Sensitive	1	1.9 ± 7.0
A	*Hirundo rustica*	Barn Swallow	Threatened		Threatened	S3B,S3M	3 Sensitive	3	1.9 ± 7.0
A	*Dolichonyx oryzivorus*	Bobolink	Threatened		Threatened	S3B,S3M	3 Sensitive	1	1.9 ± 7.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	5	1.9 ± 7.0
A	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	10	1.9 ± 7.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern		Special Concern	S4B,S4M	4 Secure	1	1.9 ± 7.0
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S3	1 At Risk	1	2.9 ± 1.0
A	*Myiarchus crinitus*	Great Crested Flycatcher				S2S3B,S2S3M	3 Sensitive	1	3.3 ± 0.0
A	*Carduelis pinus*	Pine Siskin				S3	4 Secure	1	1.9 ± 7.0
A	*Cathartes aura*	Turkey Vulture				S3B,S3M	4 Secure	2	1.9 ± 7.0
A	*Charadrius vociferus*	Killdeer				S3B,S3M	3 Sensitive	1	1.9 ± 7.0
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	1	1.9 ± 7.0
A	*Coccothraustes vespertinus*	Evening Grosbeak				S3B,S3S4N,SUM	3 Sensitive	1	1.9 ± 7.0
A	*Dendroica tigrina*	Cape May Warbler				S3B,S4S5M	4 Secure	1	1.9 ± 7.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	1	1.9 ± 7.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	4 Secure	2	1.9 ± 7.0
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	4 Secure	2	1.9 ± 7.0

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**	**YES**
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.

# recs	CITATION
19	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
9	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
5	Pardieck, K.L. & Ziolkowski Jr., D.J.; Hudson, M.-A.R. 2014. North American Breeding Bird Survey Dataset 1966 - 2013, version 2013.0. U.S. Geological Survey, Patuxent Wildlife Research Center <www.pwrc.usgs.gov/BBS/RawData/>.
3	Blaney, C.S.; Spicer, C.D.; Popma, T.M.; Hanel, C. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 2252 recs.
2	Clayden, S.R. 2005. Confidential supplement to Status Report on Ghost Antler Lichen (Pseudevernia cladonia). Committee on the Status of Endangered Wildlife in Canada, 27 recs.
2	Conservation Council of New Brunswick Inc. 2007. Pers.comm. to R. Lautenschlager.
2	Hinds, H.R. 1986. Notes on New Brunswick plant collections. Connell Memorial Herbarium, unpubl, 739 recs.
1	Atlantic Canada Conservation Area Database (ARCAD)
1	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
1	Erskine, A.J. 1999. Maritime Nest Records Scheme (MNRS) 1937-1999. Canadian Wildlife Service, Sackville, 313 recs.
1	Sollows, M.C,. 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 25956 records of 143 vertebrate and 1029 records of 71 invertebrate fauna; 5365 records of 342 vascular, 686 records of 185 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	59	6.6 ± 1.0	NB
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	19	11.9 ± 1.0	NB
A	*Perimyotis subflavus*	Eastern Pipistrelle	Endangered	Endangered	Endangered	S1	1 At Risk	10	20.1 ± 0.0	NB
A	*Eubalaena glacialis*	North Atlantic Right Whale	Endangered	Endangered	Endangered	S1		4	76.6 ± 50.0	NS
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1?B,S1?M	1 At Risk	4	67.5 ± 0.0	NB
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	1 At Risk	28	13.9 ± 0.0	NB
A	*Dermochelys coriacea (Atlantic pop.)*	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	1 At Risk	3	12.8 ± 50.0	NB
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered	Endangered	S2	2 May Be At Risk	55	8.5 ± 1.0	NB
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered		Endangered	S2M	1 At Risk	282	13.9 ± 0.0	NB
A	*Morone saxatilis*	Striped Bass	Endangered			S3	2 May Be At Risk	4	15.6 ± 10.0	NB
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gasp ├⌐sie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	4	8.6 ± 5.0	NB
A	*Sturnella magna*	Eastern Meadowlark	Threatened		Threatened	S1B,S1M	2 May Be At Risk	39	21.6 ± 7.0	NB
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened	Threatened	S1S2B,S1S2M	1 At Risk	30	12.1 ± 0.0	NB
A	*Hylocichla mustelina*	Wood Thrush	Threatened		Threatened	S1S2B,S1S2M	2 May Be At Risk	141	11.1 ± 7.0	NB
A	*Caprimulgus vociferus*	Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	76	11.3 ± 7.0	NB
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Special Concern	Threatened	S2B,S2M	1 At Risk	20	23.5 ± 1.0	NB
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2S3	1 At Risk	102	14.6 ± 10.0	NB
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	327	7.6 ± 0.0	NB
A	*Riparia riparia*	Bank Swallow	Threatened			S2S3B,S2S3M	3 Sensitive	373	1.9 ± 7.0	NB
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened		Threatened	S3	4 Secure	1	54.9 ± 1.0	NB
A	*Hirundo rustica*	Barn Swallow	Threatened		Threatened	S3B,S3M	3 Sensitive	1107	1.9 ± 7.0	NB
A	*Dolichonyx oryzivorus*	Bobolink	Threatened		Threatened	S3B,S3M	3 Sensitive	817	1.9 ± 7.0	NB
A	*Chordeiles minor*	Common Nighthawk	Threatened	Threatened	Threatened	S3B,S4M	1 At Risk	290	6.2 ± 0.0	NB
A	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	351	1.9 ± 7.0	NB
A	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3S4B,S3S4M	1 At Risk	660	1.9 ± 7.0	NB
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S4	4 Secure	52	29.4 ± 0.0	NB
A	*Osmerus mordax pop. 2*	Lake Utopia Smelt large-bodied pop.	Threatened		Threatened			2	72.7 ± 10.0	NB
A	*Coturnicops noveboracensis*	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B,SUM	2 May Be At Risk	3	54.5 ± 7.0	NB
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	1 At Risk	129	46.1 ± 17.0	NB
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Endangered	S1B,S3M	1 At Risk	497	10.0 ± 16.0	NB
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern	Special Concern	S2B,S2M	3 Sensitive	19	48.7 ± 0.0	NB
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	3 Sensitive	47	11.1 ± 0.0	NB
A	*Balaenoptera physalus*	Fin Whale - Atlantic pop.	Special Concern	Special Concern	Special Concern	S2S3		5	12.5 ± 0.0	NB
A	*Acipenser brevirostrum*	Shortnose Sturgeon	Special Concern	Special Concern	Special Concern	S3	3 Sensitive	6	16.0 ± 0.0	NB
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	3 Sensitive	33	2.9 ± 0.0	NB
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	2 May Be At Risk	107	8.0 ± 2.0	NB
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern			S3M	3 Sensitive	153	22.0 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Phocoena phocoena (NW Atlantic pop.)*	Harbour Porpoise - Northwest Atlantic pop.	Special Concern	Threatened		S4		203	13.3 ± 0.0	NB
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern		Special Concern	S4B,S4M	4 Secure	618	1.9 ± 7.0	NB
A	*Podiceps auritus*	Horned Grebe	Special Concern		Special Concern	S4N,S4M	4 Secure	172	13.9 ± 4.0	NB
A	*Odobenus rosmarus rosmarus*	Atlantic Walrus	Special Concern		Extirpated	SX		1	69.7 ± 5.0	NS
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S1?	5 Undetermined	13	66.9 ± 0.0	NS
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	4 Secure	16	13.7 ± 0.0	NB
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1S2B,S1S2M	2 May Be At Risk	14	21.0 ± 7.0	NB
A	*Fulica americana*	American Coot	Not At Risk			S1S2B,S1S2M	3 Sensitive	9	42.6 ± 7.0	NB
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B,SUM	2 May Be At Risk	3	13.8 ± 7.0	NB
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk	Special Concern		S2	3 Sensitive	2	33.1 ± 1.0	NB
A	*Buteo lineatus*	Red-shouldered Hawk	Not At Risk	Special Concern		S2B,S2M	2 May Be At Risk	47	14.8 ± 0.0	NB
A	*Chlidonias niger*	Black Tern	Not At Risk			S2B,S2M	3 Sensitive	107	23.1 ± 7.0	NB
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3		3	13.5 ± 1.0	NB
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S3	1 At Risk	11	2.9 ± 1.0	NB
A	*Desmognathus fuscus*	Northern Dusky Salamander	Not At Risk			S3	3 Sensitive	44	24.0 ± 1.0	NB
A	*Megaptera novaeangliae*	Humpback Whale (NW Atlantic pop.)	Not At Risk	Special Concern		S3		2	91.9 ± 5.0	NB
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	3 Sensitive	139	6.2 ± 0.0	NB
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S3M,S2N	3 Sensitive	275	14.7 ± 0.0	NB
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4		1	13.5 ± 1.0	NB
A	*Haliaeetus leucocephalus*	Bald Eagle	Not At Risk		Endangered	S4	1 At Risk	1135	1.9 ± 7.0	NB
A	*Canis lupus*	Gray Wolf	Not At Risk		Extirpated	SX	0.1 Extirpated	4	14.7 ± 1.0	NB
A	*Puma concolor pop. 1*	Cougar - Eastern pop.	Data Deficient		Endangered	SU	5 Undetermined	106	12.5 ± 1.0	NB
A	*Salvelinus alpinus*	Arctic Char				S1	3 Sensitive	3	53.9 ± 0.0	NB
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S5M	4 Secure	803	13.1 ± 0.0	NB
A	*Gallinula chloropus*	Common Moorhen				S1B,S1M	3 Sensitive	27	12.4 ± 1.0	NB
A	*Bartramia longicauda*	Upland Sandpiper				S1B,S1M	3 Sensitive	44	43.1 ± 0.0	NB
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B,S1M	3 Sensitive	55	13.1 ± 0.0	NB
A	*Leucophaeus atricilla*	Laughing Gull				S1B,S1M	3 Sensitive	56	10.0 ± 16.0	NB
A	*Progne subis*	Purple Martin				S1B,S1M	2 May Be At Risk	223	11.7 ± 7.0	NB
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S2S3M	4 Secure	52	12.5 ± 0.0	NB
A	*Uria aalge*	Common Murre				S1B,S3N,S3M	4 Secure	94	27.3 ± 15.0	NB
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	4 Secure	200	11.1 ± 0.0	NB
A	*Aythya marila*	Greater Scaup				S1B,S4M,S2N	4 Secure	36	12.5 ± 0.0	NB
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	32	18.5 ± 5.0	NB
A	*Sterna paradisaea*	Arctic Tern				S1B,SUM	2 May Be At Risk	72	21.6 ± 0.0	NB
A	*Fratercula arctica*	Atlantic Puffin				S1B,SUN,SUM	3 Sensitive	122	27.3 ± 15.0	NB
A	*Branta bernicla*	Brant				S1N, S2S3M	4 Secure	175	20.4 ± 0.0	NB
A	*Chroicocephalus ridibundus*	Black-headed Gull				S1N,S2M	3 Sensitive	37	13.9 ± 0.0	NB
A	*Butorides virescens*	Green Heron				S1S2B,S1S2M	3 Sensitive	17	12.1 ± 0.0	NB
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B,S1S2M	3 Sensitive	36	12.4 ± 1.0	NB
A	*Empidonax traillii*	Willow Flycatcher				S1S2B,S1S2M	3 Sensitive	103	6.7 ± 5.0	NB
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B,S1S2M	2 May Be At Risk	17	27.0 ± 7.0	NB
A	*Troglodytes aedon*	House Wren				S1S2B,S1S2M	5 Undetermined	23	16.3 ± 7.0	NB
A	*Rissa tridactyla*	Black-legged Kittiwake				S1S2B,S4N,S5M	4 Secure	41	57.1 ± 7.0	NB
A	*Calidris bairdii*	Baird's Sandpiper				S1S2M	3 Sensitive	72	13.9 ± 0.0	NB
A	*Cistothorus palustris*	Marsh Wren				S2B,S2M	3 Sensitive	68	12.0 ± 7.0	NB
A	*Mimus polyglottos*	Northern Mockingbird				S2B,S2M	3 Sensitive	121	12.3 ± 7.0	NB
A	*Toxostoma rufum*	Brown Thrasher				S2B,S2M	3 Sensitive	71	21.2 ± 7.0	NB
A	*Pooecetes gramineus*	Vesper Sparrow				S2B,S2M	2 May Be At Risk	82	13.2 ± 7.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Anas strepera*	Gadwall				S2B,S3M	4 Secure	103	6.2 ± 0.0	NB
A	*Alca torda*	Razorbill				S2B,S3N,S3M	4 Secure	67	27.3 ± 15.0	NB
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	3 Sensitive	35	44.4 ± 7.0	NB
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	4 Secure	169	12.3 ± 0.0	NB
A	*Oceanodroma leucorhoa*	Leach's Storm-Petrel				S2B,SUM	3 Sensitive	40	35.8 ± 0.0	NB
A	*Chen caerulescens*	Snow Goose				S2M	4 Secure	5	21.6 ± 1.0	NB
A	*Phalacrocorax carbo*	Great Cormorant				S2N,S2M	4 Secure	157	17.4 ± 1.0	NB
A	*Somateria spectabilis*	King Eider				S2N,S2M	4 Secure	17	27.3 ± 0.0	NB
A	*Larus hyperboreus*	Glaucous Gull				S2N,S2M	4 Secure	140	13.7 ± 2.0	NB
A	*Asio otus*	Long-eared Owl				S2S3	5 Undetermined	20	21.2 ± 7.0	NB
A	*Picoides dorsalis*	American Three-toed Woodpecker				S2S3	3 Sensitive	11	67.3 ± 0.0	NB
A	*Salmo salar*	Atlantic Salmon				S2S3	2 May Be At Risk	60	33.1 ± 0.0	NB
A	*Anas clypeata*	Northern Shoveler				S2S3B,S2S3M	4 Secure	88	12.3 ± 0.0	NB
A	*Myiarchus crinitus*	Great Crested Flycatcher				S2S3B,S2S3M	3 Sensitive	215	3.3 ± 0.0	NB
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	496	6.7 ± 5.0	NB
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	3 Sensitive	224	12.9 ± 0.0	NB
A	*Calcarius lapponicus*	Lapland Longspur				S2S3N,SUM	3 Sensitive	30	13.4 ± 1.0	NB
A	*Cepphus grylle*	Black Guillemot				S3	4 Secure	443	18.5 ± 20.0	NB
A	*Loxia curvirostra*	Red Crossbill				S3	4 Secure	128	16.3 ± 7.0	NB
A	*Carduelis pinus*	Pine Siskin				S3	4 Secure	342	1.9 ± 7.0	NB
A	*Prosopium cylindraceum*	Round Whitefish				S3	4 Secure	1	74.8 ± 0.0	NB
A	*Salvelinus namaycush*	Lake Trout				S3	3 Sensitive	4	34.5 ± 0.0	NB
A	*Sorex maritimensis*	Maritime Shrew				S3	4 Secure	1	70.6 ± 0.0	NS
A	*Eptesicus fuscus*	Big Brown Bat				S3	3 Sensitive	41	14.7 ± 1.0	NB
A	*Cathartes aura*	Turkey Vulture				S3B,S3M	4 Secure	304	1.9 ± 7.0	NB
A	*Rallus limicola*	Virginia Rail				S3B,S3M	3 Sensitive	113	12.4 ± 1.0	NB
A	*Charadrius vociferus*	Killdeer				S3B,S3M	3 Sensitive	760	1.9 ± 7.0	NB
A	*Tringa semipalmata*	Willet				S3B,S3M	3 Sensitive	104	22.0 ± 0.0	NB
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B,S3M	4 Secure	166	8.4 ± 7.0	NB
A	*Vireo gilvus*	Warbling Vireo				S3B,S3M	4 Secure	222	6.7 ± 5.0	NB
A	*Piranga olivacea*	Scarlet Tanager				S3B,S3M	4 Secure	106	11.3 ± 0.0	NB
A	*Passerina cyanea*	Indigo Bunting				S3B,S3M	4 Secure	88	12.5 ± 0.0	NB
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	284	1.9 ± 7.0	NB
A	*Icterus galbula*	Baltimore Oriole				S3B,S3M	4 Secure	194	11.7 ± 7.0	NB
A	*Coccothraustes vespertinus*	Evening Grosbeak				S3B,S3S4N,SUM	3 Sensitive	292	1.9 ± 7.0	NB
A	*Somateria mollissima*	Common Eider				S3B,S4M,S3N	4 Secure	1112	6.7 ± 5.0	NB
A	*Dendroica tigrina*	Cape May Warbler				S3B,S4S5M	4 Secure	122	1.9 ± 7.0	NB
A	*Anas acuta*	Northern Pintail				S3B,S5M	3 Sensitive	54	21.2 ± 7.0	NB
A	*Mergus serrator*	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	297	12.7 ± 7.0	NB
A	*Arenaria interpres*	Ruddy Turnstone				S3M	4 Secure	493	13.0 ± 0.0	NB
A	*Phalaropus fulicarius*	Red Phalarope				S3M	3 Sensitive	71	35.8 ± 0.0	NB
A	*Melanitta nigra*	Black Scoter				S3M,S1S2N	3 Sensitive	315	13.9 ± 4.0	NB
A	*Bucephala albeola*	Bufflehead				S3M,S2N	3 Sensitive	803	10.0 ± 16.0	NB
A	*Calidris maritima*	Purple Sandpiper				S3M,S3N	4 Secure	186	14.9 ± 0.0	NB
A	*Uria lomvia*	Thick-billed Murre				S3N,S3M	5 Undetermined	44	26.8 ± 8.0	NB
A	*Synaptomys cooperi*	Southern Bog Lemming				S3S4	4 Secure	95	23.3 ± 1.0	NB
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	463	1.9 ± 7.0	NB
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	4 Secure	760	1.9 ± 7.0	NB
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	4 Secure	661	1.9 ± 7.0	NB
A	*Larus delawarensis*	Ring-billed Gull				S3S4B,S5M	4 Secure	230	12.9 ± 0.0	NB
A	*Dendroica striata*	Blackpoll Warbler				S3S4B,S5M	4 Secure	60	21.0 ± 7.0	NB

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A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	4 Secure	630	13.1 ± 0.0	NB
A	*Limosa haemastica*	Hudsonian Godwit				S3S4M	4 Secure	76	22.0 ± 0.0	NB
A	*Calidris pusilla*	Semipalmated Sandpiper				S3S4M	4 Secure	1238	10.0 ± 16.0	NB
A	*Calidris melanotos*	Pectoral Sandpiper				S3S4M	4 Secure	272	12.9 ± 0.0	NB
A	*Calidris alba*	Sanderling				S3S4M,S1N	3 Sensitive	451	10.0 ± 16.0	NB
A	*Morus bassanus*	Northern Gannet				SHB,S5M	4 Secure	587	14.7 ± 0.0	NB
C	*Quercus macrocarpa - Acer rubrum / Onoclea sensibilis - Carex arcta Forest*	Bur Oak - Red Maple / Sensitive Fern - Northern Clustered Sedge Forest				S2		1	65.5 ± 0.0	NB
C	*Acer saccharinum / Onoclea sensibilis - Lysimachia terrestris Forest*	Silver Maple / Sensitive Fern - Swamp Yellow Loosestrife Forest				S3		1	66.8 ± 0.0	NB
C	*Acer saccharum - Fraxinus americana / Polystichum acrostichoides Forest*	Sugar Maple - White Ash / Christmas Fern Forest				S3S4		1	14.3 ± 0.0	NB
I	*Cicindela marginipennis*	Cobblestone Tiger Beetle	Endangered	Endangered	Endangered	S1	1 At Risk	34	66.6 ± 0.0	NB
I	*Gomphus ventricosus*	Skillet Clubtail	Endangered		Endangered	S1S2	2 May Be At Risk	49	52.7 ± 0.0	NB
I	*Ophiogomphus howei*	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2	2 May Be At Risk	2	75.0 ± 0.0	NB
I	*Alasmidonta varicosa*	Brook Floater	Special Concern		Special Concern	S2	3 Sensitive	3	89.2 ± 1.0	NB
I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	95	26.7 ± 0.0	NB
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern			S3?	3 Sensitive	16	29.8 ± 0.0	NB
I	*Danaus plexippus*	Monarch	Special Concern	Special Concern	Special Concern	S3B,S3M	3 Sensitive	109	10.0 ± 0.0	NB
I	*Appalachina sayana*	Spike-lip Crater	Not At Risk			S3?		2	10.5 ± 1.0	NB
I	*Haematopota rara*	Shy Cleg				S1	5 Undetermined	1	91.8 ± 1.0	NB
I	*Lycaena dorcas*	Dorcas Copper				S1	2 May Be At Risk	1	90.7 ± 0.0	NB
I	*Erora laeta*	Early Hairstreak				S1	2 May Be At Risk	1	75.8 ± 1.0	NS
I	*Celithemis martha*	Martha's Pennant				S1	5 Undetermined	1	28.8 ± 0.0	NB
I	*Arigomphus furcifer*	Lilypad Clubtail				S1	5 Undetermined	6	58.2 ± 0.0	NB
I	*Polites origenes*	Crossline Skipper				S1?	5 Undetermined	4	46.6 ± 0.0	NB
I	*Plebejus saepiolus*	Greenish Blue				S1S2	4 Secure	4	70.1 ± 0.0	NB
I	*Ophiogomphus colubrinus*	Boreal Snaketail				S1S2	2 May Be At Risk	34	49.8 ± 1.0	NB
I	*Brachyleptura circumdata*	a Longhorned Beetle				S2		6	70.1 ± 0.0	NB
I	*Satyrium calanus*	Banded Hairstreak				S2	3 Sensitive	14	70.3 ± 1.0	NS
I	*Satyrium calanus falacer*	Banded Hairstreak				S2	4 Secure	2	89.5 ± 1.0	NB
I	*Strymon melinus*	Grey Hairstreak				S2	4 Secure	6	37.3 ± 0.0	NB
I	*Aeshna clepsydra*	Mottled Darner				S2	3 Sensitive	15	15.6 ± 1.0	NB
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S2	5 Undetermined	5	84.9 ± 0.0	NS
I	*Ladona exusta*	White Corporal				S2	5 Undetermined	7	78.2 ± 1.0	NS
I	*Ischnura posita*	Fragile Forktail				S2	2 May Be At Risk	22	70.2 ± 1.0	NS
I	*Callophrys henrici*	Henry's Elfin				S2S3	4 Secure	14	75.8 ± 1.0	NS
I	*Agonum excavatum*	a Ground Beetle				S3	4 Secure	1	76.4 ± 0.0	NB
I	*Badister neopulchellus*	a Ground Beetle				S3	4 Secure	1	76.4 ± 0.0	NB
I	*Calathus gregarius*	a Ground Beetle				S3	4 Secure	1	73.2 ± 1.0	NB
I	*Clivina americana*	a Ground Beetle				S3	4 Secure	1	76.4 ± 0.0	NB
I	*Elaphrus americanus*	a Ground Beetle				S3	4 Secure	2	76.4 ± 0.0	NB
I	*Olisthopus parmatus*	a Ground Beetle				S3	4 Secure	1	70.1 ± 0.0	NB
I	*Paratachys scitulus*	a Ground Beetle				S3	5 Undetermined	1	76.4 ± 0.0	NB
I	*Sphaeroderus nitidicollis*	a Ground Beetle				S3	4 Secure	1	70.1 ± 0.0	NB

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I	*Harpalus fulvilabris*	a Ground Beetle				S3	4 Secure	1	98.0 ± 0.0	NB
I	*Coccinella hieroglyphica kirbyi*	a Ladybird Beetle				S3	4 Secure	1	14.3 ± 1.0	NB
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	4 Secure	2	14.3 ± 1.0	NB
I	*Stenocorus vittigera*	a Longhorned Beetle				S3		1	76.3 ± 0.0	NB
I	*Trachysida aspera*	a Longhorned Beetle				S3		1	92.0 ± 0.0	NB
I	*Hesperia sassacus*	Indian Skipper				S3	4 Secure	4	87.5 ± 2.0	NB
I	*Euphyes bimacula*	Two-spotted Skipper				S3	4 Secure	6	67.5 ± 0.0	NB
I	*Lycaena hyllus*	Bronze Copper				S3	3 Sensitive	7	38.5 ± 1.0	NB
I	*Satyrium acadica*	Acadian Hairstreak				S3	4 Secure	17	14.3 ± 1.0	NB
I	*Callophrys polios*	Hoary Elfin				S3	4 Secure	8	14.3 ± 1.0	NB
I	*Plebejus idas*	Northern Blue				S3	4 Secure	14	28.6 ± 1.0	NB
I	*Plebejus idas empetri*	Crowberry Blue				S3	4 Secure	6	25.8 ± 1.0	NB
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4 Secure	23	14.3 ± 1.0	NB
I	*Boloria bellona*	Meadow Fritillary				S3	4 Secure	31	39.9 ± 0.0	NB
I	*Polygonia satyrus*	Satyr Comma				S3	4 Secure	9	33.1 ± 1.0	NB
I	*Polygonia gracilis*	Hoary Comma				S3	4 Secure	2	86.0 ± 1.0	NB
I	*Nymphalis l-album*	Compton Tortoiseshell				S3	4 Secure	17	14.3 ± 1.0	NB
I	*Gomphus vastus*	Cobra Clubtail				S3	3 Sensitive	57	31.5 ± 0.0	NB
I	*Gomphus abbreviatus*	Spine-crowned Clubtail				S3	4 Secure	19	28.8 ± 0.0	NB
I	*Gomphaeschna furcillata*	Harlequin Darner				S3	5 Undetermined	12	88.7 ± 1.0	NS
I	*Dorocordulia lepida*	Petite Emerald				S3	4 Secure	36	14.4 ± 0.0	NB
I	*Somatochlora cingulata*	Lake Emerald				S3	4 Secure	8	13.8 ± 0.0	NB
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4 Secure	15	73.7 ± 1.0	NB
I	*Williamsonia fletcheri*	Ebony Boghaunter				S3	4 Secure	3	62.4 ± 0.0	NB
I	*Lestes eurinus*	Amber-Winged Spreadwing				S3	4 Secure	2	31.3 ± 1.0	NB
I	*Lestes vigilax*	Swamp Spreadwing				S3	3 Sensitive	23	13.8 ± 0.0	NB
I	*Enallagma geminatum*	Skimming Bluet				S3	5 Undetermined	11	28.8 ± 0.0	NB
I	*Enallagma signatum*	Orange Bluet				S3	4 Secure	9	58.4 ± 0.0	NB
I	*Stylurus scudderi*	Zebra Clubtail				S3	4 Secure	67	31.5 ± 0.0	NB
I	*Alasmidonta undulata*	Triangle Floater				S3	3 Sensitive	47	11.7 ± 0.0	NB
I	*Leptodea ochracea*	Tidewater Mucket				S3	4 Secure	58	23.5 ± 1.0	NB
I	*Neohelix albolabris*	Whitelip				S3		2	45.8 ± 0.0	NB
I	*Spurwinkia salsa*	Saltmarsh Hydrobe				S3		34	11.1 ± 0.0	NB
I	*Pantala hymenaea*	Spot-Winged Glider				S3B,S3M	4 Secure	3	27.2 ± 1.0	NB
I	*Satyrium liparops*	Striped Hairstreak				S3S4	4 Secure	2	86.9 ± 0.0	NB
I	*Satyrium liparops strigosum*	Striped Hairstreak				S3S4	4 Secure	1	92.6 ± 10.0	NB
I	*Cupido comyntas*	Eastern Tailed Blue				S3S4	4 Secure	6	11.0 ± 5.0	NB
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle				SH	2 May Be At Risk	2	14.3 ± 1.0	NB
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered		Endangered	SH	2 May Be At Risk	1	69.1 ± 1.0	NB
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	SH	1 At Risk	3	76.1 ± 0.0	NS
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened			S1	5 Undetermined	4	69.2 ± 1.0	NB
N	*Anzia colpodes*	Black-foam Lichen	Threatened			S1S2	5 Undetermined	2	73.5 ± 1.0	NB
N	*Degelia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Special Concern	S1	2 May Be At Risk	3	76.1 ± 0.0	NS
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	5 Undetermined	23	3.6 ± 0.0	NB
N	*Bryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1	2 May Be At Risk	1	22.2 ± 1.0	NB
N	*Dicranoweisia crispula*	Mountain Thatch Moss				S1	2 May Be At Risk	1	77.3 ± 0.0	NB
N	*Didymodon rigidulus var. gracilis*	a moss				S1	2 May Be At Risk	1	72.1 ± 1.0	NB

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N	*Sphagnum macrophyllum*	Sphagnum				S1	2 May Be At Risk	3	31.0 ± 0.0	NB
N	*Syntrichia ruralis*	a Moss				S1	2 May Be At Risk	1	54.4 ± 0.0	NB
N	*Coscinodon cribrosus*	Sieve-Toothed Moss				S1	2 May Be At Risk	1	17.3 ± 0.0	NB
N	*Cladonia metacorallifera*	Reptilian Pixie-cup Lichen				S1	5 Undetermined	5	66.4 ± 1.0	NB
N	*Coccocarpia palmicola*	Salted Shell Lichen				S1	2 May Be At Risk	1	81.0 ± 1.0	NB
N	*Peltigera malacea*	Veinless Pelt Lichen				S1	5 Undetermined	1	68.8 ± 1.0	NB
N	*Bryoria bicolor*	Electrified Horsehair Lichen				S1	2 May Be At Risk	1	68.8 ± 1.0	NB
N	*Hygrobiella laxifolia*	Lax Notchwort				S1?	6 Not Assessed	1	66.5 ± 1.0	NB
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S1?	2 May Be At Risk	1	91.4 ± 3.0	NS
N	*Bartramia ithyphylla*	Straight-leaved Apple Moss				S1?	2 May Be At Risk	2	66.5 ± 0.0	NB
N	*Calliergon trifarium*	Three-ranked Moss				S1?	2 May Be At Risk	1	26.5 ± 0.0	NB
N	*Dichelyma falcatum*	a Moss				S1?	2 May Be At Risk	2	36.5 ± 1.0	NB
N	*Dicranum bonjeanii*	Bonjean's Broom Moss				S1?	2 May Be At Risk	1	91.5 ± 1.0	NB
N	*Dicranum condensatum*	Condensed Broom Moss				S1?	2 May Be At Risk	1	77.1 ± 0.0	NB
N	*Entodon brevisetus*	a Moss				S1?	2 May Be At Risk	1	84.5 ± 10.0	NB
N	*Eurhynchium hians*	Light Beaked Moss				S1?	2 May Be At Risk	3	50.8 ± 0.0	NB
N	*Homomallium adnatum*	Adnate Hairy-gray Moss				S1?	2 May Be At Risk	3	84.5 ± 10.0	NB
N	*Plagiothecium latebricola*	Alder Silk Moss				S1?	2 May Be At Risk	2	22.1 ± 0.0	NB
N	*Racomitrium ericoides*	a Moss				S1?	2 May Be At Risk	1	96.2 ± 3.0	NB
N	*Rhytidium rugosum*	Wrinkle-leaved Moss				S1?	2 May Be At Risk	2	52.0 ± 0.0	NB
N	*Seligeria recurvata*	a Moss				S1?	2 May Be At Risk	2	95.9 ± 1.0	NB
N	*Splachnum pennsylvanicum*	Southern Dung Moss				S1?	2 May Be At Risk	1	86.0 ± 1.0	NB
N	*Platylomella lescurii*	a Moss				S1?	5 Undetermined	1	94.2 ± 1.0	NB
N	*Cladopodiella francisci*	Holt's Notchwort				S1S2	6 Not Assessed	4	72.1 ± 1.0	NB
N	*Harpanthus flotovianus*	Great Mountain Flapwort				S1S2	6 Not Assessed	2	68.8 ± 1.0	NB
N	*Jungermannia obovata*	Egg Flapwort				S1S2	6 Not Assessed	2	13.6 ± 0.0	NB
N	*Pallavicinia lyellii*	Lyell's Ribbonwort				S1S2	6 Not Assessed	2	12.3 ± 1.0	NB
N	*Radula tenax*	Tenacious Scalewort				S1S2	6 Not Assessed	1	77.2 ± 0.0	NB
N	*Brachythecium acuminatum*	Acuminate Ragged Moss				S1S2	5 Undetermined	6	56.0 ± 100.0	NB
N	*Bryum salinum*	a Moss				S1S2	2 May Be At Risk	2	54.9 ± 1.0	NB
N	*Campylium radicale*	Long-stalked Fine Wet Moss				S1S2	5 Undetermined	1	92.9 ± 1.0	NB
N	*Tortula obtusifolia*	a Moss				S1S2	2 May Be At Risk	1	28.5 ± 0.0	NB
N	*Distichium inclinatum*	Inclined Iris Moss				S1S2	2 May Be At Risk	5	71.9 ± 0.0	NB
N	*Ditrichum pallidum*	Pale Cow-hair Moss				S1S2	2 May Be At Risk	2	62.0 ± 3.0	NS
N	*Drummondia prorepens*	a Moss				S1S2	2 May Be At Risk	1	81.4 ± 0.0	NS
N	*Hygrohypnum bestii*	Best's Brook Moss				S1S2	3 Sensitive	5	59.5 ± 0.0	NB
N	*Timmia norvegica*	a moss				S1S2	2 May Be At Risk	3	39.5 ± 0.0	NB
N	*Timmia norvegica var. excurrens*	a moss				S1S2	2 May Be At Risk	1	71.9 ± 0.0	NB
N	*Tomentypnum falcifolium*	Sickle-leaved Golden Moss				S1S2	2 May Be At Risk	1	45.9 ± 1.0	NB
N	*Tortella humilis*	Small Crisp Moss				S1S2	2 May Be At Risk	7	67.6 ± 0.0	NB
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1S2	2 May Be At Risk	3	54.9 ± 1.0	NB
N	*Hamatocaulis vernicosus*	a Moss				S1S2	2 May Be At Risk	1	8.8 ± 100.0	NB
N	*Bryohaplocladium microphyllum*	Tiny-leaved Haplocladium Moss				S1S2	2 May Be At Risk	1	62.0 ± 3.0	NS
N	*Umbilicaria vellea*	Grizzled Rocktripe Lichen				S1S2	5 Undetermined	1	72.2 ± 1.0	NB
N	*Peltigera scabrosa*	Greater Toad Pelt Lichen				S1S2	2 May Be At Risk	4	78.4 ± 1.0	NB

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N	*Calypogeia neesiana*	Nees' Pouchwort				S1S3	6 Not Assessed	1	13.7 ± 1.0	NB
N	*Cephaloziella elachista*	Spurred Threadwort				S1S3	6 Not Assessed	1	26.6 ± 5.0	NB
N	*Porella pinnata*	Pinnate Scalewort				S1S3	6 Not Assessed	1	21.1 ± 1.0	NB
N	*Tritomaria scitula*	Mountain Notchwort				S1S3	6 Not Assessed	1	79.8 ± 1.0	NB
N	*Amphidium mougeotii*	a Moss				S2	3 Sensitive	12	66.6 ± 0.0	NB
N	*Anomodon viticulosus*	a Moss				S2	2 May Be At Risk	6	11.9 ± 1.0	NB
N	*Cirriphyllum piliferum*	Hair-pointed Moss				S2	3 Sensitive	4	53.7 ± 0.0	NB
N	*Dicranella palustris*	Drooping-Leaved Fork Moss				S2	3 Sensitive	10	38.0 ± 100.0	NB
N	*Didymodon ferrugineus*	a moss				S2	3 Sensitive	2	11.8 ± 1.0	NB
N	*Anomodon tristis*	a Moss				S2	2 May Be At Risk	4	73.4 ± 10.0	NB
N	*Hypnum pratense*	Meadow Plait Moss				S2	3 Sensitive	1	23.1 ± 0.0	NB
N	*Isopterygiopsis pulchella*	Neat Silk Moss				S2	3 Sensitive	8	71.3 ± 0.0	NB
N	*Meesia triquetra*	Three-ranked Cold Moss				S2	2 May Be At Risk	1	56.0 ± 100.0	NB
N	*Physcomitrium immersum*	a Moss				S2	3 Sensitive	6	21.1 ± 1.0	NB
N	*Platydictya jungermannioides*	False Willow Moss				S2	3 Sensitive	3	68.8 ± 0.0	NB
N	*Pohlia elongata*	Long-necked Nodding Moss				S2	3 Sensitive	10	67.6 ± 0.0	NB
N	*Seligeria calcarea*	Chalk Brittle Moss				S2	3 Sensitive	2	78.4 ± 0.0	NB
N	*Sphagnum centrale*	Central Peat Moss				S2	3 Sensitive	7	67.6 ± 0.0	NB
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S2	3 Sensitive	7	12.3 ± 1.0	NB
N	*Sphagnum flexuosum*	Flexuous Peatmoss				S2	3 Sensitive	2	75.1 ± 0.0	NB
N	*Tayloria serrata*	Serrate Trumpet Moss				S2	3 Sensitive	8	17.3 ± 1.0	NB
N	*Tetrodontium brownianum*	Little Georgia				S2	3 Sensitive	7	71.5 ± 1.0	NB
N	*Tetraplodon mnioides*	Entire-leaved Nitrogen Moss				S2	3 Sensitive	3	48.7 ± 0.0	NB
N	*Thamnobryum alleghaniense*	a Moss				S2	3 Sensitive	11	39.4 ± 0.0	NB
N	*Tortula mucronifolia*	Mucronate Screw Moss				S2	3 Sensitive	1	17.5 ± 0.0	NB
N	*Ulota phyllantha*	a Moss				S2	3 Sensitive	5	54.9 ± 1.0	NB
N	*Anomobryum filiforme*	a moss				S2	5 Undetermined	5	35.0 ± 0.0	NB
N	*Cladonia macrophylla*	Fig-leaved Lichen				S2	5 Undetermined	3	75.5 ± 1.0	NB
N	*Nephroma laevigatum*	Mustard Kidney Lichen				S2	2 May Be At Risk	1	68.7 ± 0.0	NS
N	*Andreaea rothii*	a Moss				S2?	3 Sensitive	6	8.6 ± 0.0	NB
N	*Anomodon minor*	Blunt-leaved Anomodon Moss				S2?	2 May Be At Risk	1	88.5 ± 1.0	NB
N	*Brachythecium digastrum*	a Moss				S2?	3 Sensitive	2	54.3 ± 0.0	NB
N	*Bryum pallescens*	Pale Bryum Moss				S2?	5 Undetermined	2	17.0 ± 1.0	NB
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S2?	3 Sensitive	1	84.9 ± 3.0	NB
N	*Dicranum spurium*	Spurred Broom Moss				S2?	3 Sensitive	2	40.6 ± 0.0	NB
N	*Hygrohypnum montanum*	a Moss				S2?	3 Sensitive	2	49.6 ± 1.0	NB
N	*Schistostega pennata*	Luminous Moss				S2?	3 Sensitive	3	38.0 ± 100.0	NB
N	*Seligeria campylopoda*	a Moss				S2?	3 Sensitive	1	8.8 ± 100.0	NB
N	*Seligeria diversifolia*	a Moss				S2?	3 Sensitive	2	35.0 ± 0.0	NB
N	*Sphagnum angermanicum*	a Peatmoss				S2?	3 Sensitive	3	43.6 ± 10.0	NB
N	*Trichodon cylindricus*	Cylindric Hairy-teeth Moss				S2?	3 Sensitive	2	89.8 ± 3.0	NS
N	*Plagiomnium rostratum*	Long-beaked Leafy Moss				S2?	3 Sensitive	7	39.3 ± 0.0	NB
N	*Ramalina pollinaria*	Chalky Ramalina Lichen				S2?	5 Undetermined	1	75.3 ± 1.0	NB
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2?	3 Sensitive	1	69.6 ± 1.0	NB
N	*Bryum uliginosum*	a Moss				S2S3	3 Sensitive	2	7.5 ± 4.0	NB
N	*Buxbaumia aphylla*	Brown Shield Moss				S2S3	3 Sensitive	1	98.1 ± 15.0	NB
N	*Calliergonella cuspidata*	Common Large Wetland Moss				S2S3	3 Sensitive	8	9.4 ± 0.0	NB
N	*Campylium polygamum*	a Moss				S2S3	3 Sensitive	1	70.2 ± 0.0	NB

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N	*Palustriella falcata*	a Moss				S2S3	3 Sensitive	2	66.6 ± 0.0	NB
N	*Didymodon rigidulus*	Rigid Screw Moss				S2S3	3 Sensitive	8	71.9 ± 0.0	NB
N	*Ephemerum serratum*	a Moss				S2S3	3 Sensitive	4	53.9 ± 0.0	NB
N	*Fissidens bushii*	Bush's Pocket Moss				S2S3	3 Sensitive	1	91.4 ± 3.0	NS
N	*Orthotrichum speciosum*	Showy Bristle Moss				S2S3	5 Undetermined	3	81.4 ± 0.0	NS
N	*Pohlia proligera*	Cottony Nodding Moss				S2S3	3 Sensitive	4	71.6 ± 1.0	NB
N	*Racomitrium fasciculare*	a Moss				S2S3	3 Sensitive	4	66.6 ± 0.0	NB
N	*Racomitrium affine*	a Moss				S2S3	3 Sensitive	1	77.8 ± 1.0	NB
N	*Saelania glaucescens*	Blue Dew Moss				S2S3	3 Sensitive	2	77.3 ± 0.0	NB
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2S3	3 Sensitive	4	9.4 ± 0.0	NB
N	*Sphagnum subfulvum*	a Peatmoss				S2S3	2 May Be At Risk	3	45.9 ± 1.0	NB
N	*Taxiphyllum deplanatum*	Imbricate Yew-leaved Moss				S2S3	3 Sensitive	3	54.9 ± 1.0	NB
N	*Zygodon viridissimus*	a Moss				S2S3	2 May Be At Risk	5	76.8 ± 1.0	NB
N	*Schistidium agassizii*	Elf Bloom Moss				S2S3	3 Sensitive	5	66.8 ± 0.0	NB
N	*Loeskeobryum brevirostre*	a Moss				S2S3	3 Sensitive	14	60.1 ± 2.0	NB
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2S3	3 Sensitive	6	66.6 ± 0.0	NB
N	*Cladonia acuminata*	Scantily Clad Pixie Lichen				S2S3	5 Undetermined	2	69.1 ± 1.0	NB
N	*Cladonia ramulosa*	Bran Lichen				S2S3	5 Undetermined	4	73.5 ± 1.0	NB
N	*Cladonia sulphurina*	Greater Sulphur-cup Lichen				S2S3	5 Undetermined	1	83.0 ± 1.0	NB
N	*Parmeliopsis ambigua*	Green Starburst Lichen				S2S3	5 Undetermined	1	66.7 ± 1.0	NB
N	*Sphaerophorus globosus*	Northern Coral Lichen				S2S3	3 Sensitive	5	65.5 ± 1.0	NB
N	*Cynodontium tenellum*	Delicate Dogtooth Moss				S3	3 Sensitive	1	54.9 ± 1.0	NB
N	*Hypnum curvifolium*	Curved-leaved Plait Moss				S3	3 Sensitive	17	66.5 ± 3.0	NS
N	*Tortella fragilis*	Fragile Twisted Moss				S3	3 Sensitive	1	71.9 ± 0.0	NB
N	*Schistidium maritimum*	a Moss				S3	4 Secure	7	54.9 ± 1.0	NB
N	*Hymenostylium recurvirostre*	Hymenostylium Moss				S3	3 Sensitive	4	71.6 ± 1.0	NB
N	*Solorina saccata*	Woodland Owl Lichen				S3	5 Undetermined	6	66.7 ± 1.0	NB
N	*Normandina pulchella*	Rimmed Elf-ear Lichen				S3	5 Undetermined	3	67.9 ± 1.0	NB
N	*Cladonia farinacea*	Farinose Pixie Lichen				S3	5 Undetermined	5	75.3 ± 1.0	NB
N	*Leptogium lichenoides*	Tattered Jellyskin Lichen				S3	5 Undetermined	6	72.2 ± 1.0	NB
N	*Nephroma bellum*	Naked Kidney Lichen				S3	4 Secure	3	68.9 ± 1.0	NB
N	*Peltigera degenii*	Lustrous Pelt Lichen				S3	5 Undetermined	3	69.2 ± 1.0	NB
N	*Usnea strigosa*	Bushy Beard Lichen				S3	5 Undetermined	1	78.4 ± 1.0	NB
N	*Leptogium laceroides*	Short-bearded Jellyskin Lichen				S3	3 Sensitive	2	74.7 ± 1.0	NB
N	*Peltigera membranacea*	Membranous Pelt Lichen				S3	5 Undetermined	6	66.7 ± 1.0	NB
N	*Cladonia carneola*	Crowned Pixie-cup Lichen				S3	5 Undetermined	1	75.5 ± 1.0	NB
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S3	4 Secure	5	66.4 ± 1.0	NB
N	*Aulacomnium androgynum*	Little Groove Moss				S3?	4 Secure	7	62.0 ± 3.0	NS
N	*Dicranella rufescens*	Red Forklet Moss				S3?	5 Undetermined	3	71.9 ± 0.0	NB
N	*Rhytidiadelphus loreus*	Lanky Moss				S3?	2 May Be At Risk	1	72.1 ± 1.0	NB
N	*Sphagnum lescurii*	a Peatmoss				S3?	5 Undetermined	5	9.4 ± 0.0	NB
N	*Stereocaulon subcoralloides*	Coralloid Foam Lichen				S3?	5 Undetermined	1	75.3 ± 1.0	NB
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	3 Sensitive	3	75.9 ± 1.0	NS
N	*Brachythecium velutinum*	Velvet Ragged Moss				S3S4	4 Secure	3	68.7 ± 1.0	NB
N	*Dicranella cerviculata*	a Moss				S3S4	3 Sensitive	6	54.9 ± 1.0	NB
N	*Dicranella varia*	a Moss				S3S4	4 Secure	1	89.8 ± 3.0	NS

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N	*Dicranum majus*	Greater Broom Moss				S3S4	4 Secure	19	48.7 ± 0.0	NB
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	4 Secure	1	72.1 ± 0.0	NB
N	*Encalypta ciliata*	Fringed Extinquisher Moss				S3S4	3 Sensitive	1	72.3 ± 0.0	NB
N	*Fissidens bryoides*	Lesser Pocket Moss				S3S4	4 Secure	3	13.4 ± 5.0	NB
N	*Heterocladium dimorphum*	Dimorphous Tangle Moss				S3S4	4 Secure	4	76.1 ± 0.0	NB
N	*Isopterygiopsis muelleriana*	a Moss				S3S4	4 Secure	19	71.3 ± 0.0	NB
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	4 Secure	2	71.6 ± 0.0	NB
N	*Physcomitrium pyriforme*	Pear-shaped Urn Moss				S3S4	3 Sensitive	5	52.0 ± 0.0	NB
N	*Pogonatum dentatum*	Mountain Hair Moss				S3S4	4 Secure	4	54.9 ± 1.0	NB
N	*Sphagnum quinquefarium*	Five-ranked Peat Moss				S3S4	4 Secure	1	72.3 ± 0.0	NB
N	*Sphagnum torreyanum*	a Peatmoss				S3S4	4 Secure	5	30.6 ± 0.0	NB
N	*Sphagnum austinii*	Austin's Peat Moss				S3S4	4 Secure	1	30.8 ± 1.0	NB
N	*Sphagnum contortum*	Twisted Peat Moss				S3S4	4 Secure	1	9.8 ± 0.0	NB
N	*Splachnum rubrum*	Red Collar Moss				S3S4	4 Secure	1	14.1 ± 1.0	NB
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3S4	4 Secure	13	25.7 ± 0.0	NB
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3S4	4 Secure	2	54.9 ± 1.0	NB
N	*Weissia controversa*	Green-Cushioned Weissia				S3S4	4 Secure	2	68.8 ± 0.0	NS
N	*Abietinella abietina*	Wiry Fern Moss				S3S4	4 Secure	1	71.9 ± 0.0	NB
N	*Trichostomum tenuirostre*	Acid-Soil Moss				S3S4	4 Secure	6	62.6 ± 3.0	NS
N	*Pannaria rubiginosa*	Brown-eyed Shingle Lichen				S3S4	3 Sensitive	2	71.0 ± 1.0	NB
N	*Ramalina thrausta*	Angelhair Ramalina Lichen				S3S4	5 Undetermined	11	65.5 ± 1.0	NB
N	*Hypogymnia vittata*	Slender Monk's Hood Lichen				S3S4	4 Secure	22	65.5 ± 1.0	NB
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	4 Secure	3	67.6 ± 1.0	NB
N	*Hypocenomyce friesii*	a Lichen				S3S4	5 Undetermined	1	72.2 ± 1.0	NB
N	*Melanelia panniformis*	Shingled Camouflage Lichen				S3S4	5 Undetermined	4	68.8 ± 1.0	NB
N	*Nephroma parile*	Powdery Kidney Lichen				S3S4	4 Secure	6	72.2 ± 1.0	NB
N	*Protopannaria pezizoides*	Brown-gray Moss-shingle Lichen				S3S4	4 Secure	11	66.7 ± 1.0	NB
N	*Pseudocyphellaria perpetua*	Gilded Specklebelly Lichen				S3S4	3 Sensitive	2	74.3 ± 1.0	NB
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	3 Sensitive	3	74.3 ± 1.0	NB
N	*Peltigera neopolydactyla*	Undulating Pelt Lichen				S3S4	5 Undetermined	8	66.7 ± 1.0	NB
N	*Cladonia cariosa*	Lesser Ribbed Pixie Lichen				S3S4	4 Secure	3	77.1 ± 1.0	NB
N	*Hypocenomyce scalaris*	Common Clam Lichen				S3S4	5 Undetermined	1	75.3 ± 1.0	NB
N	*Dermatocarpon luridum*	Brookside Stippleback Lichen				S3S4	4 Secure	5	66.4 ± 1.0	NB
N	*Grimmia anodon*	Toothless Grimmia Moss				SH	5 Undetermined	2	15.3 ± 10.0	NB
N	*Leucodon brachypus*	a Moss				SH	2 May Be At Risk	9	69.7 ± 3.0	NS
N	*Thelia hirtella*	a Moss				SH	2 May Be At Risk	2	56.0 ± 100.0	NB
N	*Cyrto-hypnum minutulum*	Tiny Cedar Moss				SH	2 May Be At Risk	3	81.2 ± 10.0	NB
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	1 At Risk	38	24.9 ± 1.0	NB
P	*Polemonium vanbruntiae*	Van Brunt's Jacob's-ladder	Threatened	Threatened	Threatened	S1	1 At Risk	72	50.0 ± 0.0	NB
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Endangered	S2	1 At Risk	27	34.8 ± 0.0	NB
P	*Pterospora andromedea*	Woodland Pinedrops			Endangered	S1	1 At Risk	6	99.7 ± 0.0	NB
P	*Cryptotaenia canadensis*	Canada Honewort				S1	2 May Be At Risk	1	53.2 ± 1.0	NB

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P	*Sanicula trifoliata*	Large-Fruited Sanicle				S1	2 May Be At Risk	1	24.1 ± 5.0	NB
P	*Antennaria parlinii*	a Pussytoes				S1	2 May Be At Risk	7	49.6 ± 1.0	NB
P	*Antennaria howellii ssp. petaloidea*	Pussy-Toes				S1	2 May Be At Risk	2	16.7 ± 5.0	NB
P	*Bidens discoidea*	Swamp Beggarticks				S1	2 May Be At Risk	3	70.4 ± 0.0	NB
P	*Pseudognaphalium obtusifolium*	Eastern Cudweed				S1	2 May Be At Risk	6	81.7 ± 0.0	NB
P	*Hieracium kalmii*	Kalm's Hawkweed				S1	2 May Be At Risk	6	42.0 ± 1.0	NB
P	*Hieracium kalmii var. kalmii*	Kalm's Hawkweed				S1	2 May Be At Risk	7	42.7 ± 1.0	NB
P	*Hieracium paniculatum*	Panicled Hawkweed				S1	2 May Be At Risk	8	37.3 ± 0.0	NB
P	*Hieracium robinsonii*	Robinson's Hawkweed				S1	3 Sensitive	5	66.8 ± 0.0	NB
P	*Cardamine parviflora var. arenicola*	Small-flowered Bittercress				S1	2 May Be At Risk	17	25.1 ± 0.0	NB
P	*Draba arabisans*	Rock Whitlow-Grass				S1	2 May Be At Risk	22	13.3 ± 0.0	NB
P	*Draba breweri var. cana*	Brewer's Whitlow-grass				S1	2 May Be At Risk	10	99.7 ± 0.0	NB
P	*Draba glabella*	Rock Whitlow-Grass				S1	2 May Be At Risk	12	13.3 ± 0.0	NB
P	*Minuartia groenlandica*	Greenland Stitchwort				S1	2 May Be At Risk	4	36.6 ± 0.0	NB
P	*Chenopodium capitatum*	Strawberry-blite				S1	2 May Be At Risk	4	14.6 ± 1.0	NB
P	*Chenopodium simplex*	Maple-leaved Goosefoot				S1	2 May Be At Risk	11	56.6 ± 1.0	NB
P	*Triadenum virginicum*	Virginia St John's-wort				S1	2 May Be At Risk	5	23.4 ± 0.0	NB
P	*Corema conradii*	Broom Crowberry				S1	2 May Be At Risk	6	17.0 ± 10.0	NB
P	*Vaccinium boreale*	Northern Blueberry				S1	2 May Be At Risk	2	53.3 ± 0.0	NB
P	*Chamaesyce polygonifolia*	Seaside Spurge				S1	2 May Be At Risk	2	96.3 ± 0.0	NB
P	*Desmodium glutinosum*	Large Tick-Trefoil				S1	2 May Be At Risk	1	95.3 ± 7.0	NS
P	*Lespedeza capitata*	Round-headed Bush-clover				S1	2 May Be At Risk	7	66.6 ± 0.0	NB
P	*Gentiana rubricaulis*	Purple-stemmed Gentian				S1	2 May Be At Risk	5	68.4 ± 0.0	NB
P	*Lomatogonium rotatum*	Marsh Felwort				S1	2 May Be At Risk	2	79.6 ± 0.0	NB
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S1	2 May Be At Risk	2	55.8 ± 0.0	NB
P	*Pycnanthemum virginianum*	Virginia Mountain Mint				S1	2 May Be At Risk	4	29.6 ± 0.0	NB
P	*Decodon verticillatus*	Swamp Loosestrife				S1	2 May Be At Risk	5	98.5 ± 0.0	NS
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	2 May Be At Risk	16	24.1 ± 1.0	NB
P	*Primula laurentiana*	Laurentian Primrose				S1	2 May Be At Risk	34	65.7 ± 2.0	NS
P	*Ranunculus sceleratus*	Cursed Buttercup				S1	2 May Be At Risk	4	21.7 ± 0.0	NB
P	*Crataegus jonesiae*	Jones' Hawthorn				S1	2 May Be At Risk	5	90.3 ± 1.0	NB
P	*Potentilla canadensis*	Canada Cinquefoil				S1	5 Undetermined	1	93.5 ± 0.0	NB
P	*Galium brevipes*	Limestone Swamp Bedstraw				S1	2 May Be At Risk	1	88.9 ± 5.0	NB
P	*Saxifraga paniculata ssp. neogaea*	White Mountain Saxifrage				S1	2 May Be At Risk	24	13.3 ± 10.0	NB
P	*Agalinis paupercula var. borealis*	Small-flowered Agalinis				S1	2 May Be At Risk	8	11.9 ± 1.0	NB
P	*Agalinis tenuifolia*	Slender Agalinis				S1	2 May Be At Risk	6	86.4 ± 0.0	NB
P	*Gratiola aurea*	Golden Hedge-Hyssop				S1	3 Sensitive	5	34.1 ± 0.0	NB
P	*Pedicularis canadensis*	Canada Lousewort				S1	2 May Be At Risk	3	76.8 ± 0.0	NB
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S1	2 May Be At Risk	36	65.0 ± 0.0	NS
P	*Alisma subcordatum*	Southern Water Plantain				S1	5 Undetermined	3	19.3 ± 0.0	NB
P	*Carex atlantica ssp. atlantica*	Atlantic Sedge				S1	2 May Be At Risk	1	52.9 ± 0.0	NB
P	*Carex backii*	Rocky Mountain Sedge				S1	2 May Be At Risk	8	53.6 ± 0.0	NB
P	*Carex merritt-fernaldii*	Merritt Fernald's Sedge				S1	2 May Be At Risk	3	86.7 ± 0.0	NB
P	*Carex saxatilis*	Russet Sedge				S1	2 May Be At Risk	13	11.7 ± 5.0	NB

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P	*Carex sterilis*	Sterile Sedge				S1	2 May Be At Risk	1	90.0 ± 2.0	NB
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	2 May Be At Risk	10	32.4 ± 0.0	NB
P	*Cyperus diandrus*	Low Flatsedge				S1	2 May Be At Risk	4	86.4 ± 1.0	NB
P	*Cyperus lupulinus*	Hop Flatsedge				S1	2 May Be At Risk	6	65.1 ± 0.0	NB
P	*Cyperus lupulinus ssp. macilentus*	Hop Flatsedge				S1	2 May Be At Risk	16	62.0 ± 0.0	NB
P	*Eleocharis olivacea*	Yellow Spikerush				S1	2 May Be At Risk	1	99.3 ± 0.0	NS
P	*Scirpus pendulus*	Hanging Bulrush				S1	2 May Be At Risk	5	85.2 ± 0.0	NB
P	*Sisyrinchium angustifolium*	Narrow-leaved Blue-eyed-grass				S1	2 May Be At Risk	8	16.7 ± 1.0	NB
P	*Juncus greenei*	Greene's Rush				S1	2 May Be At Risk	1	65.6 ± 0.0	NB
P	*Juncus subtilis*	Creeping Rush				S1	2 May Be At Risk	1	44.0 ± 5.0	NB
P	*Allium canadense*	Canada Garlic				S1	2 May Be At Risk	1	30.0 ± 0.0	NB
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S1	2 May Be At Risk	15	65.1 ± 0.0	NB
P	*Malaxis brachypoda*	White Adder's-Mouth				S1	2 May Be At Risk	1	70.4 ± 0.0	NS
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S1	2 May Be At Risk	14	67.2 ± 0.0	NB
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S1	2 May Be At Risk	4	51.6 ± 1.0	NB
P	*Spiranthes casei*	Case's Ladies'-Tresses				S1	2 May Be At Risk	6	99.8 ± 0.0	NB
P	*Bromus pubescens*	Hairy Wood Brome Grass				S1	5 Undetermined	6	65.4 ± 0.0	NB
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1	2 May Be At Risk	5	35.9 ± 0.0	NB
P	*Danthonia compressa*	Flattened Oat Grass				S1	2 May Be At Risk	9	54.0 ± 1.0	NB
P	*Dichanthelium dichotomum*	Forked Panic Grass				S1	2 May Be At Risk	1	20.9 ± 1.0	NB
P	*Festuca subverticillata*	Nodding Fescue				S1	2 May Be At Risk	2	75.8 ± 1.0	NS
P	*Glyceria obtusa*	Atlantic Manna Grass				S1	2 May Be At Risk	5	58.4 ± 0.0	NB
P	*Potamogeton friesii*	Fries' Pondweed				S1	2 May Be At Risk	6	24.5 ± 5.0	NB
P	*Potamogeton nodosus*	Long-leaved Pondweed				S1	2 May Be At Risk	4	76.4 ± 0.0	NB
P	*Potamogeton strictifolius*	Straight-leaved Pondweed				S1	2 May Be At Risk	2	15.1 ± 0.0	NB
P	*Xyris difformis*	Bog Yellow-eyed-grass				S1	5 Undetermined	6	23.3 ± 0.0	NB
P	*Asplenium ruta-muraria var. cryptolepis*	Wallrue Spleenwort				S1	2 May Be At Risk	3	13.3 ± 0.0	NB
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S1	2 May Be At Risk	1	51.6 ± 1.0	NB
P	*Dryopteris filix-mas*	Male Fern				S1	2 May Be At Risk	2	98.9 ± 1.0	NB
P	*Botrychium oneidense*	Blunt-lobed Moonwort				S1	2 May Be At Risk	4	65.4 ± 0.0	NB
P	*Botrychium rugulosum*	Rugulose Moonwort				S1	2 May Be At Risk	1	97.9 ± 1.0	NB
P	*Schizaea pusilla*	Little Curlygrass Fern				S1	2 May Be At Risk	26	30.4 ± 0.0	NB
P	*Hieracium kalmii var. fasciculatum*	Kalm's Hawkweed				S1?	5 Undetermined	5	90.2 ± 1.0	NB
P	*Drosera rotundifolia var. comosa*	Round-leaved Sundew				S1?	5 Undetermined	5	75.7 ± 1.0	NB
P	*Carex laxiflora*	Loose-Flowered Sedge				S1?	5 Undetermined	3	67.7 ± 5.0	NS
P	*Wolffia columbiana*	Columbian Watermeal				S1?	2 May Be At Risk	5	71.7 ± 0.0	NB
P	*Rumex aquaticus var. fenestratus*	Western Dock				S1S2	2 May Be At Risk	1	87.8 ± 1.0	NB
P	*Saxifraga virginiensis*	Early Saxifrage				S1S2	2 May Be At Risk	1	99.7 ± 0.0	NB
P	*Potamogeton bicupulatus*	Snailseed Pondweed				S1S2	2 May Be At Risk	5	44.9 ± 0.0	NB
P	*Selaginella rupestris*	Rock Spikemoss				S1S2	2 May Be At Risk	19	51.8 ± 1.0	NB
P	*Thelypteris simulata*	Bog Fern				S1S2	2 May Be At Risk	7	67.8 ± 0.0	NB
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S1S3	2 May Be At Risk	2	14.9 ± 0.0	NB
P	*Listera australis*	Southern Twayblade			Endangered	S2	1 At Risk	10	82.0 ± 0.0	NB
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2	3 Sensitive	1	98.1 ± 0.0	NB
P	*Pseudognaphalium macounii*	Macoun's Cudweed				S2	3 Sensitive	9	17.3 ± 0.0	NB

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P	*Ionactis linariifolius*	Stiff Aster				S2	3 Sensitive	1	97.3 ± 0.0	NB
P	*Symphyotrichum racemosum*	Small White Aster				S2	3 Sensitive	7	60.5 ± 5.0	NB
P	*Impatiens pallida*	Pale Jewelweed				S2	2 May Be At Risk	4	69.5 ± 0.0	NS
P	*Alnus serrulata*	Smooth Alder				S2	3 Sensitive	8	46.6 ± 0.0	NB
P	*Arabis drummondii*	Drummond's Rockcress				S2	3 Sensitive	15	17.5 ± 1.0	NB
P	*Sagina nodosa*	Knotted Pearlwort				S2	3 Sensitive	14	55.2 ± 1.0	NB
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2	3 Sensitive	2	35.3 ± 0.0	NB
P	*Stellaria longifolia*	Long-leaved Starwort				S2	3 Sensitive	7	17.1 ± 10.0	NB
P	*Atriplex franktonii*	Frankton's Saltbush				S2	4 Secure	4	26.7 ± 1.0	NB
P	*Chenopodium rubrum*	Red Pigweed				S2	3 Sensitive	4	16.0 ± 1.0	NB
P	*Hypericum dissimulatum*	Disguised St John's-wort				S2	3 Sensitive	4	71.5 ± 1.0	NB
P	*Viburnum lentago*	Nannyberry				S2	4 Secure	12	98.5 ± 0.0	NB
P	*Viburnum recognitum*	Northern Arrow-Wood				S2	4 Secure	1	76.9 ± 0.0	NB
P	*Astragalus eucosmus*	Elegant Milk-vetch				S2	2 May Be At Risk	3	12.7 ± 0.0	NB
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S2	3 Sensitive	14	13.4 ± 50.0	NB
P	*Quercus macrocarpa*	Bur Oak				S2	2 May Be At Risk	43	19.5 ± 1.0	NB
P	*Gentiana linearis*	Narrow-Leaved Gentian				S2	3 Sensitive	5	92.4 ± 5.0	NB
P	*Myriophyllum humile*	Low Water Milfoil				S2	3 Sensitive	11	70.6 ± 1.0	NB
P	*Proserpinaca palustris var. crebra*	Marsh Mermaidweed				S2	3 Sensitive	10	29.8 ± 0.0	NB
P	*Hedeoma pulegioides*	American False Pennyroyal				S2	4 Secure	59	16.5 ± 1.0	NB
P	*Nuphar lutea ssp. rubrodisca*	Red-disked Yellow Pond-lily				S2	3 Sensitive	9	26.3 ± 0.0	NB
P	*Orobanche uniflora*	One-Flowered Broomrape				S2	3 Sensitive	13	10.5 ± 1.0	NB
P	*Polygala paucifolia*	Fringed Milkwort				S2	3 Sensitive	14	66.5 ± 1.0	NB
P	*Polygonum amphibium var. emersum*	Water Smartweed				S2	3 Sensitive	24	29.8 ± 0.0	NB
P	*Polygonum careyi*	Carey's Smartweed				S2	3 Sensitive	14	21.2 ± 5.0	NB
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S2	3 Sensitive	8	61.3 ± 0.0	NB
P	*Hepatica nobilis var. obtusa*	Round-lobed Hepatica				S2	3 Sensitive	24	44.6 ± 1.0	NB
P	*Ranunculus flabellaris*	Yellow Water Buttercup				S2	4 Secure	14	41.6 ± 0.0	NB
P	*Ranunculus longirostris*	Eastern White Water-Crowfoot				S2	5 Undetermined	5	89.4 ± 1.0	NB
P	*Crataegus scabrida*	Rough Hawthorn				S2	3 Sensitive	9	13.3 ± 0.0	NB
P	*Crataegus succulenta*	Fleshy Hawthorn				S2	3 Sensitive	1	92.9 ± 5.0	NB
P	*Cephalanthus occidentalis*	Common Buttonbush				S2	3 Sensitive	19	58.3 ± 0.0	NB
P	*Salix candida*	Sage Willow				S2	3 Sensitive	1	85.1 ± 1.0	NS
P	*Agalinis neoscotica*	Nova Scotia Agalinis				S2	3 Sensitive	18	70.7 ± 1.0	NS
P	*Euphrasia randii*	Rand's Eyebright				S2	2 May Be At Risk	12	34.5 ± 0.0	NB
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S2	3 Sensitive	7	4.0 ± 5.0	NB
P	*Dirca palustris*	Eastern Leatherwood				S2	2 May Be At Risk	1	99.8 ± 0.0	NB
P	*Viola novae-angliae*	New England Violet				S2	3 Sensitive	4	25.5 ± 0.0	NB
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S2	3 Sensitive	66	13.5 ± 0.0	NB
P	*Carex comosa*	Bearded Sedge				S2	2 May Be At Risk	5	85.0 ± 1.0	NS
P	*Carex granularis*	Limestone Meadow Sedge				S2	3 Sensitive	2	53.2 ± 5.0	NB
P	*Carex gynocrates*	Northern Bog Sedge				S2	3 Sensitive	1	54.0 ± 1.0	NB
P	*Carex hirtifolia*	Pubescent Sedge				S2	3 Sensitive	3	34.8 ± 0.0	NB
P	*Carex livida var. radicaulis*	Livid Sedge				S2	3 Sensitive	1	17.3 ± 2.0	NB

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P	*Carex plantaginea*	Plantain-Leaved Sedge				S2	3 Sensitive	1	70.2 ± 0.0	NB
P	*Carex prairea*	Prairie Sedge				S2	3 Sensitive	1	87.3 ± 5.0	NS
P	*Carex rostrata*	Narrow-leaved Beaked Sedge				S2	3 Sensitive	2	68.8 ± 0.0	NB
P	*Carex salina*	Saltmarsh Sedge				S2	3 Sensitive	2	19.0 ± 1.0	NB
P	*Carex sprengelii*	Longbeak Sedge				S2	3 Sensitive	2	49.3 ± 0.0	NB
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S2	2 May Be At Risk	2	84.5 ± 10.0	NB
P	*Carex albicans var. emmonsii*	White-tinged Sedge				S2	3 Sensitive	6	14.0 ± 0.0	NB
P	*Cyperus squarrosus*	Awned Flatsedge				S2	3 Sensitive	31	21.5 ± 0.0	NB
P	*Eriophorum gracile*	Slender Cottongrass				S2	2 May Be At Risk	5	67.8 ± 0.0	NB
P	*Blysmus rufus*	Red Bulrush				S2	3 Sensitive	2	95.7 ± 0.0	NB
P	*Elodea nuttallii*	Nuttall's Waterweed				S2	3 Sensitive	6	25.3 ± 0.0	NB
P	*Juncus vaseyi*	Vasey Rush				S2	3 Sensitive	4	79.2 ± 0.0	NB
P	*Allium tricoccum*	Wild Leek				S2	2 May Be At Risk	13	12.0 ± 0.0	NB
P	*Najas gracillima*	Thread-Like Naiad				S2	3 Sensitive	11	59.3 ± 0.0	NB
P	*Calypso bulbosa var. americana*	Calypso				S2	2 May Be At Risk	5	8.9 ± 0.0	NB
P	*Coeloglossum viride var. virescens*	Long-bracted Frog Orchid				S2	2 May Be At Risk	8	20.8 ± 5.0	NB
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	2 May Be At Risk	6	11.9 ± 1.0	NB
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	3 Sensitive	14	12.5 ± 0.0	NB
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S2	2 May Be At Risk	6	78.1 ± 1.0	NS
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S2	3 Sensitive	9	42.8 ± 0.0	NB
P	*Elymus canadensis*	Canada Wild Rye				S2	2 May Be At Risk	2	76.0 ± 1.0	NB
P	*Leersia virginica*	White Cut Grass				S2	2 May Be At Risk	37	41.3 ± 0.0	NB
P	*Piptatherum canadense*	Canada Rice Grass				S2	3 Sensitive	4	58.7 ± 0.0	NB
P	*Poa glauca*	Glaucous Blue Grass				S2	4 Secure	14	17.3 ± 2.0	NB
P	*Puccinellia phryganodes*	Creeping Alkali Grass				S2	3 Sensitive	10	49.5 ± 0.0	NB
P	*Schizachyrium scoparium*	Little Bluestem				S2	3 Sensitive	32	25.7 ± 0.0	NB
P	*Zizania aquatica var. aquatica*	Indian Wild Rice				S2	5 Undetermined	5	35.7 ± 0.0	NB
P	*Piptatherum pungens*	Slender Rice Grass				S2	2 May Be At Risk	4	79.1 ± 0.0	NB
P	*Potamogeton vaseyi*	Vasey's Pondweed				S2	3 Sensitive	4	24.5 ± 1.0	NB
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S2	3 Sensitive	12	14.8 ± 0.0	NB
P	*Woodwardia virginica*	Virginia Chain Fern				S2	3 Sensitive	13	92.5 ± 0.0	NB
P	*Woodsia alpina*	Alpine Cliff Fern				S2	3 Sensitive	7	13.3 ± 0.0	NB
P	*Lycopodium sitchense*	Sitka Clubmoss				S2	3 Sensitive	1	97.2 ± 5.0	NB
P	*Selaginella selaginoides*	Low Spikemoss				S2	3 Sensitive	11	17.3 ± 6.0	NB
P	*Toxicodendron radicans*	Poison Ivy				S2?	3 Sensitive	16	27.0 ± 0.0	NB
P	*Symphyotrichum novi-belgii var. crenifolium*	New York Aster				S2?	5 Undetermined	7	15.3 ± 0.0	NB
P	*Humulus lupulus var. lupuloides*	Common Hop				S2?	3 Sensitive	4	88.9 ± 0.0	NB
P	*Rubus recurvicaulis*	Arching Dewberry				S2?	4 Secure	5	10.1 ± 5.0	NB
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2?	4 Secure	4	35.9 ± 1.0	NB
P	*Salix myricoides*	Bayberry Willow				S2?	3 Sensitive	2	81.7 ± 0.0	NB
P	*Carex vacillans*	Estuarine Sedge				S2?	3 Sensitive	3	87.6 ± 1.0	NB
P	*Platanthera huronensis*	Fragrant Green Orchid				S2?	5 Undetermined	1	81.0 ± 10.0	NS
P	*Solidago altissima*	Tall Goldenrod				S2S3	4 Secure	4	12.0 ± 1.0	NB

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P	*Barbarea orthoceras*	American Yellow Rocket				S2S3	3 Sensitive	5	11.5 ± 0.0	NB
P	*Ceratophyllum echinatum*	Prickly Hornwort				S2S3	3 Sensitive	15	16.4 ± 0.0	NB
P	*Callitriche hermaphroditica*	Northern Water-starwort				S2S3	4 Secure	10	19.3 ± 2.0	NB
P	*Lonicera oblongifolia*	Swamp Fly Honeysuckle				S2S3	3 Sensitive	1	35.2 ± 6.0	NB
P	*Elatine americana*	American Waterwort				S2S3	3 Sensitive	7	17.6 ± 0.0	NB
P	*Bartonia paniculata*	Branched Bartonia				S2S3	3 Sensitive	5	36.6 ± 0.0	NB
P	*Bartonia paniculata ssp. iodandra*	Branched Bartonia				S2S3	3 Sensitive	36	30.7 ± 0.0	NB
P	*Geranium robertianum*	Herb Robert				S2S3	4 Secure	31	13.4 ± 0.0	NB
P	*Myriophyllum quitense*	Andean Water Milfoil				S2S3	4 Secure	71	11.1 ± 0.0	NB
P	*Epilobium coloratum*	Purple-veined Willowherb				S2S3	3 Sensitive	5	14.7 ± 1.0	NB
P	*Rumex pallidus*	Seabeach Dock				S2S3	3 Sensitive	6	13.0 ± 0.0	NB
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S2S3	4 Secure	18	12.1 ± 0.0	NB
P	*Galium labradoricum*	Labrador Bedstraw				S2S3	3 Sensitive	5	75.4 ± 1.0	NB
P	*Carex adusta*	Lesser Brown Sedge				S2S3	4 Secure	7	20.9 ± 1.0	NB
P	*Corallorhiza maculata var. occidentalis*	Spotted Coralroot				S2S3	3 Sensitive	5	67.4 ± 1.0	NB
P	*Corallorhiza maculata var. maculata*	Spotted Coralroot				S2S3	3 Sensitive	2	90.3 ± 1.0	NB
P	*Listera auriculata*	Auricled Twayblade				S2S3	3 Sensitive	9	22.5 ± 1.0	NB
P	*Spiranthes cernua*	Nodding Ladies'-Tresses				S2S3	3 Sensitive	20	65.6 ± 0.0	NB
P	*Eragrostis pectinacea*	Tufted Love Grass				S2S3	4 Secure	11	34.9 ± 1.0	NB
P	*Stuckenia filiformis ssp. alpina*	Thread-leaved Pondweed				S2S3	3 Sensitive	7	6.9 ± 0.0	NB
P	*Stuckenia pectinata*	Sago Pondweed				S2S3	3 Sensitive	67	11.1 ± 0.0	NB
P	*Potamogeton praelongus*	White-stemmed Pondweed				S2S3	4 Secure	11	6.8 ± 0.0	NB
P	*Isoetes acadiensis*	Acadian Quillwort				S2S3	3 Sensitive	9	62.2 ± 0.0	NB
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	3 Sensitive	10	19.4 ± 1.0	NB
P	*Panax trifolius*	Dwarf Ginseng				S3	3 Sensitive	15	31.1 ± 0.0	NB
P	*Artemisia campestris*	Field Wormwood				S3	4 Secure	23	57.2 ± 0.0	NB
P	*Artemisia campestris ssp. caudata*	Field Wormwood				S3	4 Secure	75	57.3 ± 0.0	NB
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	4 Secure	28	12.0 ± 0.0	NB
P	*Prenanthes racemosa*	Glaucous Rattlesnakeroot				S3	4 Secure	59	11.1 ± 1.0	NB
P	*Tanacetum bipinnatum ssp. huronense*	Lake Huron Tansy				S3	4 Secure	11	11.2 ± 1.0	NB
P	*Symphyotrichum boreale*	Boreal Aster				S3	3 Sensitive	7	12.5 ± 0.0	NB
P	*Betula pumila*	Bog Birch				S3	4 Secure	15	70.2 ± 1.0	NB
P	*Arabis glabra*	Tower Mustard				S3	5 Undetermined	1	57.4 ± 0.0	NB
P	*Arabis hirsuta var. pycnocarpa*	Western Hairy Rockcress				S3	4 Secure	18	17.0 ± 5.0	NB
P	*Cardamine maxima*	Large Toothwort				S3	4 Secure	26	13.7 ± 0.0	NB
P	*Subularia aquatica var. americana*	Water Awlwort				S3	4 Secure	14	48.7 ± 0.0	NB
P	*Lobelia cardinalis*	Cardinal Flower				S3	4 Secure	269	67.6 ± 0.0	NB
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	4 Secure	16	22.6 ± 0.0	NB
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	4 Secure	3	40.6 ± 0.0	NB
P	*Cornus amomum ssp. obliqua*	Pale Dogwood				S3	3 Sensitive	57	25.1 ± 0.0	NB
P	*Crassula aquatica*	Water Pygmyweed				S3	4 Secure	4	42.5 ± 0.0	NB
P	*Rhodiola rosea*	Roseroot				S3	4 Secure	51	13.4 ± 0.0	NB
P	*Penthorum sedoides*	Ditch Stonecrop				S3	4 Secure	41	22.5 ± 0.0	NB
P	*Elatine minima*	Small Waterwort				S3	4 Secure	27	16.4 ± 0.0	NB

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P	*Hedysarum alpinum*	Alpine Sweet-vetch				S3	4 Secure	2	11.5 ± 0.0	NB
P	*Gentianella amarella ssp. acuta*	Northern Gentian				S3	4 Secure	3	16.7 ± 0.0	NB
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	4 Secure	10	24.1 ± 0.0	NB
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S3	4 Secure	16	12.2 ± 0.0	NB
P	*Myriophyllum heterophyllum*	Variable-leaved Water Milfoil				S3	4 Secure	49	22.8 ± 0.0	NB
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	4 Secure	20	9.0 ± 5.0	NB
P	*Stachys tenuifolia*	Smooth Hedge-Nettle				S3	3 Sensitive	6	18.5 ± 0.0	NB
P	*Teucrium canadense*	Canada Germander				S3	3 Sensitive	5	69.5 ± 5.0	NS
P	*Utricularia radiata*	Little Floating Bladderwort				S3	4 Secure	49	24.9 ± 0.0	NB
P	*Nuphar lutea ssp. pumila*	Small Yellow Pond-lily				S3	4 Secure	15	15.6 ± 1.0	NB
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	4 Secure	5	48.7 ± 0.0	NB
P	*Epilobium hornemannii ssp. hornemannii*	Hornemann's Willowherb				S3	4 Secure	1	69.0 ± 0.0	NB
P	*Epilobium strictum*	Downy Willowherb				S3	4 Secure	10	14.2 ± 0.0	NB
P	*Polygala sanguinea*	Blood Milkwort				S3	3 Sensitive	18	52.0 ± 0.0	NB
P	*Polygonum arifolium*	Halberd-leaved Tearthumb				S3	4 Secure	17	41.8 ± 0.0	NB
P	*Polygonum punctatum*	Dotted Smartweed				S3	4 Secure	2	70.1 ± 0.0	NB
P	*Polygonum punctatum var. confertiflorum*	Dotted Smartweed				S3	4 Secure	4	70.5 ± 2.0	NB
P	*Polygonum scandens*	Climbing False Buckwheat				S3	4 Secure	27	23.0 ± 0.0	NB
P	*Littorella uniflora*	American Shoreweed				S3	4 Secure	18	19.8 ± 0.0	NB
P	*Primula mistassinica*	Mistassini Primrose				S3	4 Secure	10	11.8 ± 0.0	NB
P	*Pyrola minor*	Lesser Pyrola				S3	4 Secure	5	38.6 ± 1.0	NB
P	*Clematis occidentalis*	Purple Clematis				S3	4 Secure	19	14.7 ± 5.0	NB
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	13	35.7 ± 1.0	NB
P	*Thalictrum venulosum*	Northern Meadow-rue				S3	4 Secure	73	11.0 ± 5.0	NB
P	*Amelanchier canadensis*	Canada Serviceberry				S3	4 Secure	17	11.0 ± 1.0	NB
P	*Rosa palustris*	Swamp Rose				S3	4 Secure	24	10.1 ± 5.0	NB
P	*Rubus occidentalis*	Black Raspberry				S3	4 Secure	3	37.8 ± 0.0	NB
P	*Sanguisorba canadensis*	Canada Burnet				S3	4 Secure	15	75.1 ± 0.0	NB
P	*Galium boreale*	Northern Bedstraw				S3	4 Secure	7	24.9 ± 1.0	NB
P	*Salix interior*	Sandbar Willow				S3	4 Secure	14	58.9 ± 0.0	NB
P	*Salix nigra*	Black Willow				S3	3 Sensitive	122	11.5 ± 1.0	NB
P	*Salix pedicellaris*	Bog Willow				S3	4 Secure	43	29.8 ± 0.0	NB
P	*Comandra umbellata*	Bastard's Toadflax				S3	4 Secure	1	69.7 ± 10.0	NB
P	*Limosella australis*	Southern Mudwort				S3	4 Secure	1	99.5 ± 0.0	NB
P	*Veronica serpyllifolia ssp. humifusa*	Thyme-Leaved Speedwell				S3	4 Secure	10	69.7 ± 1.0	NS
P	*Boehmeria cylindrica*	Small-spike False-nettle				S3	3 Sensitive	37	70.4 ± 0.0	NB
P	*Pilea pumila*	Dwarf Clearweed				S3	4 Secure	22	35.9 ± 0.0	NB
P	*Viola adunca*	Hooked Violet				S3	4 Secure	9	52.1 ± 1.0	NB
P	*Viola nephrophylla*	Northern Bog Violet				S3	4 Secure	4	12.5 ± 0.0	NB
P	*Carex aquatilis*	Water Sedge				S3	4 Secure	21	9.0 ± 1.0	NB
P	*Carex arcta*	Northern Clustered Sedge				S3	4 Secure	49	35.0 ± 0.0	NB
P	*Carex atratiformis*	Scabrous Black Sedge				S3	4 Secure	1	17.3 ± 0.0	NB
P	*Carex capillaris*	Hairlike Sedge				S3	4 Secure	16	11.7 ± 0.0	NB
P	*Carex chordorrhiza*	Creeping Sedge				S3	4 Secure	20	57.5 ± 1.0	NB
P	*Carex conoidea*	Field Sedge				S3	4 Secure	25	12.0 ± 1.0	NB
P	*Carex eburnea*	Bristle-leaved Sedge				S3	4 Secure	2	69.4 ± 0.0	NB
P	*Carex exilis*	Coastal Sedge				S3	4 Secure	85	4.9 ± 0.0	NB
P	*Carex garberi*	Garber's Sedge				S3	3 Sensitive	2	12.2 ± 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	*Carex haydenii*	Hayden's Sedge				S3	4 Secure	34	25.0 ± 0.0	NB
P	*Carex lupulina*	Hop Sedge				S3	4 Secure	73	23.3 ± 5.0	NB
P	*Carex michauxiana*	Michaux's Sedge				S3	4 Secure	62	9.8 ± 0.0	NB
P	*Carex ormostachya*	Necklace Spike Sedge				S3	4 Secure	10	57.5 ± 1.0	NB
P	*Carex rosea*	Rosy Sedge				S3	4 Secure	22	12.1 ± 0.0	NB
P	*Carex tenera*	Tender Sedge				S3	4 Secure	39	26.7 ± 0.0	NB
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	4 Secure	63	24.8 ± 0.0	NB
P	*Carex wiegandii*	Wiegand's Sedge				S3	4 Secure	102	14.5 ± 0.0	NB
P	*Carex recta*	Estuary Sedge				S3	4 Secure	11	31.9 ± 0.0	NB
P	*Cyperus dentatus*	Toothed Flatsedge				S3	4 Secure	143	8.8 ± 5.0	NB
P	*Cyperus esculentus*	Perennial Yellow Nutsedge				S3	4 Secure	35	32.3 ± 0.0	NB
P	*Eleocharis intermedia*	Matted Spikerush				S3	4 Secure	1	66.1 ± 0.0	NB
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S3	4 Secure	3	9.8 ± 0.0	NB
P	*Rhynchospora capitellata*	Small-headed Beakrush				S3	4 Secure	9	53.0 ± 0.0	NB
P	*Rhynchospora fusca*	Brown Beakrush				S3	4 Secure	35	4.9 ± 0.0	NB
P	*Trichophorum clintonii*	Clinton's Clubrush				S3	4 Secure	24	12.0 ± 0.0	NB
P	*Schoenoplectus fluviatilis*	River Bulrush				S3	3 Sensitive	46	21.5 ± 0.0	NB
P	*Schoenoplectus torreyi*	Torrey's Bulrush				S3	4 Secure	30	17.9 ± 0.0	NB
P	*Lemna trisulca*	Star Duckweed				S3	4 Secure	20	9.7 ± 1.0	NB
P	*Triantha glutinosa*	Sticky False-Asphodel				S3	4 Secure	3	12.3 ± 0.0	NB
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	3 Sensitive	7	11.7 ± 10.0	NB
P	*Liparis loeselii*	Loesel's Twayblade				S3	4 Secure	13	11.0 ± 0.0	NB
P	*Platanthera blephariglottis*	White Fringed Orchid				S3	4 Secure	16	80.6 ± 0.0	NB
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	3 Sensitive	26	24.7 ± 1.0	NB
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	3 Sensitive	2	61.1 ± 0.0	NB
P	*Calamagrostis pickeringii*	Pickering's Reed Grass				S3	4 Secure	108	27.1 ± 0.0	NB
P	*Dichanthelium depauperatum*	Starved Panic Grass				S3	4 Secure	27	60.3 ± 0.0	NB
P	*Heteranthera dubia*	Water Stargrass				S3	4 Secure	51	16.4 ± 0.0	NB
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	4 Secure	11	23.1 ± 1.0	NB
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3	3 Sensitive	16	17.3 ± 1.0	NB
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3	4 Secure	23	9.7 ± 0.0	NB
P	*Zannichellia palustris*	Horned Pondweed				S3	4 Secure	7	13.0 ± 1.0	NB
P	*Adiantum pedatum*	Northern Maidenhair Fern				S3	4 Secure	2	26.2 ± 1.0	NB
P	*Cryptogramma stelleri*	Steller's Rockbrake				S3	4 Secure	2	5.3 ± 1.0	NB
P	*Asplenium trichomanes-ramosum*	Green Spleenwort				S3	4 Secure	18	11.7 ± 1.0	NB
P	*Dryopteris fragrans var. remotiuscula*	Fragrant Wood Fern				S3	4 Secure	29	19.9 ± 0.0	NB
P	*Woodsia glabella*	Smooth Cliff Fern				S3	4 Secure	23	14.3 ± 1.0	NB
P	*Equisetum palustre*	Marsh Horsetail				S3	4 Secure	5	80.7 ± 10.0	NB
P	*Isoetes tuckermanii*	Tuckerman's Quillwort				S3	4 Secure	26	35.7 ± 1.0	NB
P	*Lycopodium sabinifolium*	Ground-Fir				S3	4 Secure	15	25.2 ± 1.0	NB
P	*Huperzia appalachiana*	Appalachian Fir-Clubmoss				S3	3 Sensitive	16	12.3 ± 5.0	NB
P	*Botrychium dissectum*	Cut-leaved Moonwort				S3	4 Secure	27	15.1 ± 0.0	NB
P	*Botrychium lanceolatum var. angustisegmentum*	Lance-Leaf Grape-Fern				S3	3 Sensitive	9	19.7 ± 0.0	NB
P	*Botrychium simplex*	Least Moonwort				S3	4 Secure	4	92.7 ± 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	*Polypodium appalachianum*	Appalachian Polypody				S3	4 Secure	17	16.8 ± 1.0	NB
P	*Utricularia resupinata*	Inverted Bladderwort				S3?	4 Secure	19	22.5 ± 1.0	NB
P	*Crataegus submollis*	Quebec Hawthorn				S3?	3 Sensitive	15	17.8 ± 1.0	NB
P	*Mertensia maritima*	Sea Lungwort				S3S4	4 Secure	28	12.8 ± 0.0	NB
P	*Lobelia kalmii*	Brook Lobelia				S3S4	4 Secure	11	9.4 ± 1.0	NB
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	4 Secure	6	26.1 ± 1.0	NB
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	4 Secure	28	12.1 ± 0.0	NB
P	*Stachys pilosa*	Hairy Hedge-Nettle				S3S4	5 Undetermined	4	50.4 ± 1.0	NB
P	*Utricularia gibba*	Humped Bladderwort				S3S4	4 Secure	30	4.9 ± 0.0	NB
P	*Rumex maritimus*	Sea-Side Dock				S3S4	4 Secure	1	94.5 ± 1.0	NB
P	*Potentilla arguta*	Tall Cinquefoil				S3S4	4 Secure	16	11.3 ± 0.0	NB
P	*Rubus chamaemorus*	Cloudberry				S3S4	4 Secure	52	7.8 ± 1.0	NB
P	*Geocaulon lividum*	Northern Comandra				S3S4	4 Secure	11	14.9 ± 0.0	NB
P	*Juniperus horizontalis*	Creeping Juniper				S3S4	4 Secure	19	23.1 ± 1.0	NB
P	*Cladium mariscoides*	Smooth Twigrush				S3S4	4 Secure	29	9.5 ± 0.0	NB
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	4 Secure	7	27.1 ± 1.0	NB
P	*Triglochin gaspensis*	Gasp ├╴ Arrowgrass				S3S4	4 Secure	16	21.7 ± 1.0	NB
P	*Spirodela polyrrhiza*	Great Duckweed				S3S4	4 Secure	34	22.8 ± 0.0	NB
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	3 Sensitive	16	14.6 ± 1.0	NB
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S3S4	4 Secure	5	24.8 ± 2.0	NB
P	*Distichlis spicata*	Salt Grass				S3S4	4 Secure	4	57.9 ± 0.0	NB
P	*Potamogeton oakesianus*	Oakes' Pondweed				S3S4	4 Secure	40	4.5 ± 5.0	NB
P	*Montia fontana*	Water Blinks				SH	2 May Be At Risk	3	76.8 ± 1.0	NB
P	*Solidago caesia*	Blue-stemmed Goldenrod				SX	0.1 Extirpated	2	14.6 ± 1.0	NB
P	*Carex swanii*	Swan's Sedge				SX	0.1 Extirpated	52	66.6 ± 2.0	NS

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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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APPENDIX G

Email Communication with Provincial Regulators

Winchester, Amy

From: Seymour, Pam (ERD/DER) <Pam.Seymour@gnb.ca>
Sent: August-12-16 8:25 AM
To: Winchester, Amy
Subject: Mispec River

Categories: Filed by Newforma

Hi Amy:

From discussion with staff, I would characterize the recreational fishery on the Mispec River as follows:

Due to its proximity to the city and relatively easy access, it receives moderate use by anglers. Fish species sought include brook trout and brown trout. Wild Atlantic salmon still return to the river in low numbers.

I hope this helps.

Pam

Pam Seymour
Regional Biologist
Region 3
Department of Natural Resources

Winchester, Amy

From: Jarratt, Tricia (THC/TPC) <Tricia.Jarratt@gnb.ca>
Sent: August-11-16 2:48 PM
To: Winchester, Amy
Subject: Saint John Airport

Categories: Filed by Newforma

Hi Amy,

I took a quick glance at the archaeological predictive modelling and can confirm that there is low potential of archaeological potential in the area of the Saint John airport.

Tricia

Tricia L. Jarratt, MA, RPA
(506) 238-3512 | tricia.jarratt@gnb.ca | FAX: (506) 457-4880
Manager – Regulatory Services | Gestionnaire – Services de réglementation
Archaeological Services Branch | Direction des services d'archéologie
Tourism, Heritage and Culture | Tourisme, Patrimoine et Culture
http://www2.gnb.ca/content/gnb/en/departments/thc/heritage/content/archaeology.html http://www2.gnb.ca/content/gnb/fr/ministeres/tpc/patrimoine/content/archeo

Winchester, Amy

From: Doucet, Pierre (ELG/EGL) <Pierre.Doucet@gnb.ca>
Sent: July-04-16 11:58 AM
To: Winchester, Amy
Cc: Tays, Kent
Subject: RE: 162832.00 Update on SJ Airport EIA File

Categories: Filed by Newforma

Hi Amy,

Further to the previous messages below, the Aboriginal Affairs Secretariat (AAS) has also reviewed the project description for the Saint John Airport Wastewater Treatment Facility upgrade. Based on the information available, it is AAS's position that it does not appear that there will be any potential for impacts to Aboriginal or treaty rights, and therefore the proposed project is not likely to require First Nations consultation on behalf of the proponent. However, providing notification of the proposed project to First Nations would be preferable as a good governance measure, highlighting the project's benefits for improving the effluent quality and reducing/eliminating chlorine treatment, which should result in an overall increase in water quality. Appropriate contact information for First Nations can be obtained from AAS.

Please note that AAS still reserves the right to revise this assessment pending review of the complete EIA registration document when it becomes available. Further instruction might be provided at that point, if deemed necessary.

I hope this information is helpful. As always, please don't hesitate to contact me if you have any questions or if you'd like to further discuss.

Thanks, and have a good day,
Pierre

From: Winchester, Amy [mailto:amyw@cbcl.ca]
Sent: Thursday, June 30, 2016 11:51 AM
To: Doucet, Pierre (ELG/EGL)
Cc: Tays, Kent
Subject: RE: 162832.00 Update on SJ Airport EIA File

Thanks for the quick response Pierre. Much appreciated.

Have a great long weekend!
Amy

From: Doucet, Pierre (ELG/EGL) [mailto:Pierre.Doucet@gnb.ca]
Sent: June-30-16 10:35 AM
To: Winchester, Amy <amyw@cbcl.ca>
Cc: Tays, Kent <kentt@cbcl.ca>
Subject: RE: 162832.00 Update on SJ Airport EIA File

Hi Amy,

Winchester, Amy

From: Doucet, Pierre (ELG/EGL) <Pierre.Doucet@gnb.ca>
Sent: June-30-16 10:35 AM
To: Winchester, Amy
Cc: Tays, Kent
Subject: RE: 162832.00 Update on SJ Airport EIA File

Categories: Filed by Newforma

Hi Amy,

Further to my previous message, I consulted with appropriate members of the Technical Review Committee regarding potential receiving watercourse studies for the Saint John Airport Wastewater Treatment Facility upgrade. They indicated that given the context of the project (the new facility will use the existing outfall pipe, the effluent quality is expected to be improved, there will be no instream works), there would be no need for detailed fish and fish habitat assessments, or other receiving watercourse studies. However, please note that the EIA registration document will still need to contain a thorough description of the existing environment, as well as a description of potential impacts to the watercourse and the proposed measures to avoid or mitigate those impacts.

As for First Nation consultation, as previously mentioned, I will get back to you as soon as I receive a response regarding that issue.

As always, please don't hesitate to contact me if you have any questions or if you would like to further discuss.

Thanks, and have a good weekend,
Pierre

From: Doucet, Pierre (ELG/EGL)
Sent: Wednesday, June 29, 2016 4:26 PM
To: 'Winchester, Amy'
Cc: Tays, Kent
Subject: RE: 162832.00 Update on SJ Airport EIA File

Hi Amy,

I've shared the project description with the appropriate reviewers and asked for their input on the issues that we had discussed last week (potential receiving watercourse studies and First Nation consultation), but I haven't heard back from them yet. I will let you know as soon as I get a response on either/both of those issues.

Thanks, and have a good evening,
Pierre

Pierre Doucet
Project Manager/Gestionnaire de projets
Environmental Assessment Section/Section d'Évaluation environnementale
New Brunswick Department of Environment and Local Government/Ministère de l'Environnement et des Gouvernements locaux du Nouveau-Brunswick
Tel: 506-457-6757
Fax: 506-453-2627

Winchester, Amy

From: Doucet, Pierre (ELG/EGL) <Pierre.Doucet@gnb.ca>
Sent: June-09-16 1:19 PM
To: Winchester, Amy
Cc: Maguire, David (ELG/EGL)
Subject: RE: File Transfer: EIA Review - Modification to WWTP - 162832.00 - SAINT JOHN AIRPORT WWTP UPGRADE

Categories: Filed by Newforma

Hi Amy,

After having reviewed the information submitted regarding the proposed modification to the Saint John Airport's wastewater treatment facility, it is the Department of Environment and Local Government's (DELG) Environmental Assessment Section's position that the project does have to be registered for an environmental impact assessment (EIA) review, as it is considered to be a significant modification of a wastewater treatment facility. I realize you are very familiar with the EIA review process, but just as a reminder, additional information and guidance on this process can be found on DELG's website: http://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment.html.

Please don't hesitate to contact me if you have any questions or if you would like to further discuss.

Thanks,
Pierre

From: Doucet, Pierre (ELG/EGL)
Sent: Thursday, June 09, 2016 8:14 AM
To: 'Winchester, Amy'
Subject: RE: File Transfer: EIA Review - Modification to WWTP - 162832.00 - SAINT JOHN AIRPORT WWTP UPGRADE

Hi Amy,

No worries. Thanks for sending a version with the figures. We should be able to get back to you regarding this project in the very near future.

Thanks, and have a good day,
Pierre

From: Winchester, Amy [mailto:amyw@cbcl.ca]
Sent: Wednesday, June 08, 2016 6:55 PM
To: Doucet, Pierre (ELG/EGL)
Subject: RE: File Transfer: EIA Review - Modification to WWTP - 162832.00 - SAINT JOHN AIRPORT WWTP UPGRADE

Hi Pierre,

Sorry about that. I just sent you a new link that will get you're the letter PLUS the figures you need to complete your review.

If you have any questions, please let me know.

CBCL LIMITED
Consulting Engineers

June 02, 2016

David Maguire, Manager
Environmental Assessment Section
NB Department of Environment and Local Government
Marysville Place
PO Box 6000
Fredericton, NB
E3B 5H1

Dear Mr. Maguire:

RE: EIA Request for Project Review - Proposed Wastewater Treatment Plant Upgrade at Saint John Airport

1489 Hollis Street
PO Box 606
Halifax, Nova Scotia
Canada B3J 2R7

Telephone: 902 421 7241
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E-mail: info@cbcl.ca
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In September 2014, CBCL Limited completed a preliminary assessment report of the water and wastewater systems at the Saint John Airport. Various issues were identified with the wastewater treatment plant, particularly related to occupational health and safety concerns associated with the configuration of the existing system. In March 2016, CBCL Limited was engaged to prepare a detailed design for the upgrades to the facility, including the installation of a new treatment process to replace the existing rotating biological contactor (RBC) system. Per Schedule A of the Environmental Impact Assessment Regulation (Regulation 87-83) under the Clean Environment Act, construction, modification, or decommissioning of a sewage disposal or treatment facility could require a Determination Review. The purpose of this letter report is to provide information to New Brunswick Department of Environment and Local Government (NBDELG) about the proposed project at the Saint John Airport, in order to determine whether an Environmental Impact Assessment (EIA) would be required for this upgrade.

Background

The existing facility utilizes a RBC secondary treatment process to meet CBOD5 and TSS effluent requirements. The plant was constructed in 1976, and it still utilizes the original RBC equipment. The existing layout is provided in the attached Figure 1.

From the main pump station, influent is supplied to the primary clarifier/influent equalization basin, and then sent to the RBC secondary treatment process. Following the RBC process, flows are discharged to the secondary clarifier. Sludge from the clarifier is recycled to the head of the RBC system by a progressive cavity pump, whereas clarified effluent overflows to the disinfection chamber where it is chlorinated by calcium hypochlorite tablets. Disinfected effluent is discharged through a 100 m - 200mm diameter outfall to the Mispec River. Sludge is pumped from the equalization basin and secondary clarifier by a septage hauler and disposed off-site on an irregular basis.

Based on the surface area of the contactor media, the plant was originally designed for a maximum average day flow of approximately 105 m^3/day. The available data at this time are limited, however, it indicates that typical flows are currently in the range of 65 to 80 m^3/day with peak flows of approximately 295 m^3/day. Flow data and influent quality results suggest that flows are impacted by inflow and infiltration.

Existing Flows and Loads

Wastewater influent consists primarily of domestic waste, but also includes inputs from a small restaurant, and a car wash station. Influent is conveyed to the plant through two

separate systems. The majority of the buildings, including the main terminal building, are located to the northwest of the wastewater treatment facility, and are serviced by a gravity sewer system. Wastewater from the Navigation Canada Tower and Combined Services Building, which are located at the south end of the site, are pumped to the treatment facility. Both the gravity sewer and forcemain discharge to the main plant pump station at the head of the treatment process.

Limited flow and influent data were available from the Airport. Flows were recorded several times per week by reading the level above the v-notch weir in the disinfection chamber. BOD5 and TSS data are available from samples that were collected in the equalization basin/primary clarifier on a monthly basis since 2009. These data were used to make an initial estimate of loads at the facility and are summarized in Tables 1 and 2. Additional wastewater quality data and five minute flow data are currently being collected by CBCL Limited in order to obtain better loading characteristics.

Table 1: Average WWTP Flows

Year	Flow m^3/d (gpm)	
	Average	Peak
2009	130 m^3/d (23 gpm)	295 m^3/d (54 gpm)
2010	90 m^3/d (16 gpm)	260 m^3/d (48 gpm)
2011	80 m^3/d (14 gpm)	295 m^3/d (54 gpm)
2012	50 m^3/d (9 gpm)	230 m^3/d (42 gpm)
2013	50 m^3/d (9 gpm)	130 m^3/d (24 gpm)
2014	60 m^3/d (11 gpm)	230 m^3/d (42 gpm)
2015	55 m^3/d (10 gpm)	230 m^3/d (42 gpm)
Total	65 m^3/d (12 gpm)	295 m^3/d (54 gpm)

Monthly influent wastewater quality data were provided for samples collected between 2009 and 2013 and are shown in Table 2. In addition to the monthly monitoring for BOD5 and TSS, the operator also measures influent pH, temperature, and dissolved oxygen several times per week.

Table 2: Average Influent Wastewater Quality

Year	BOD5 (mg/L)	TSS (mg/L)
2009	37	20
2010	64	58
2011	80	92
2012	54	56
2013	87	88
2014	98	139
2015	114	68
Average	76	74

Average influent BOD5 and TSS concentrations are low, and are an indication of inflow and infiltration within the collection system.

Existing effluent data are provided in Table 3.

Table 3: Existing Effluent Data

Date	pH	cBOD5 (mg/L)	TSS (mg/L)	NH_3 (mg/L)	Total Phosphorus (mg/L)	Nitrate (mg/L)
Jan.02/13		12	7			
Feb.13/13		26	13			
Feb.27/13		30	8			
Mar.13/13		5	6			
April 10/13		1	5			
May 08/13		2	9		3.95	28.7
June 05/13		3	8	4.9		
July 03/13		<1	3		0.8	9.4
Aug.14/13		5	2	<0.5		
Sep.10/13		7	14			
Oct.08/13		11	8		5.4	37
Nov.05/13	6.75	6	21	12.8		
Dec.17/13		2	3	6.4		
Average	**6.8**	**9.2**	**8.2**	**8**	**3.4**	**25**

Average effluent cBOD5 and TSS are below the facility's operating requirement of 25 mg/L. In February 2013, cBOD5 exceeded the operating requirement on two occasions. However, TSS and cBOD5 were in compliance through the remainder of testing.

Existing Deficiencies

While the plant currently meets the effluent requirements of the approval to operate (25 mg/L CBOD5 and 25 mg/L TSS), there are a number of issues that have been identified with the existing system. The most significant concern is related to occupational health and safety. In order to access the influent pumps and the manual bar screen, operators must enter a confined space with poor access and minimal ventilation, and they are forced to use a below-grade platform that has been flooded on various occasions by raw influent. Furthermore, the equipment is heavily corroded due to its age.

Main plant pump station

The chlorination system is located in a very small building with poor access and ventilation. In order to feed new chlorine pucks to the disinfection system, operators are required to descend from an access platform and balance on a baffle wall of the chlorine contact chamber in order to access the tablet feeder system.

Chlorine tablet feeder

The concern with the RBC system is that it was installed above the operating floor in the RBC building. As a result, operators may potentially be exposed to contact with raw wastewater from splashing caused by the RBC's bucket pump. This device is essentially a large bucket that is fixed to an arm that rotates with the contactor media. The bucket collects influent from the RBC's inlet chamber, and then dumps the load into the RBC's biozone, or reaction chamber. This creates splashing within the building on each rotation. In addition to the splashing concerns, the RBC system was installed in the late 1970s and has surpassed its mechanical design life.

Other deficiencies noted in the assessment report include: high degree of corrosion on the pipes, valves, and steel tank; corrosion of the roof system in the RBC building; the ventilation system requires upgrades in the RBC building; and the RBC and secondary clarifier are approaching their design capacity.

Proposed Upgrades

A conceptual design for upgrades to the plant was developed as part of the 2014 assessment report. The design, as presented below, was based on available influent data and flow data supplied by Airport Staff. CBCL is presently collecting additional data to better understand the typical loads at the facility.

Because of the nature of flows at the plant, the Airport has selected a sequencing batch reactor (SBR) process to replace the existing system. The new system will be installed within the current site. Plans showing the existing layout and proposed demolitions are provided in Figure 1, and the proposed layout is provided in Figure 2. The new treatment plant will have a similar footprint to the existing facility, as the existing trickling filter will be replaced with the SBR tanks. The total area of the construction, however, will be approximately twice the size of the current facility, as the upgrades will include the installation of a new pump station and two new manholes to connect to the existing gravity sewer system and the existing outfall. The footprint of treatment plant components will decrease from approximately 195 m^2 to 152 m^2.

The system will be designed to meet the effluent requirements of the current Certificate of Approval, which includes CBOD5 and TSS requirements of 25 mg/L. Recent discussions with NBDELG indicate that effluent requirements are not expected to change. Influent loading conditions in the preliminary assessment report were selected to allow for moderate growth of 2.5% over a 20 year period, for a future average day flow of 130 m^3/d and daily BOD5 and

TSS loads of 16 kg/d each. The design will also allocate space for a future reactor, in the event that development at the airport proceeds above the anticipated rate.

Preliminary treatment requirements for SBR treatment systems typically include screening and grit removal. The new pump station will be sized to allow sufficient settling before it is pumped to the SBR.

The main treatment components of the plant are the SBRs, which will be designed based on the design parameters listed below.

Table 4 – Design Parameters for SBR

Design Parameters	
Hydraulic Residence Time	24 h
Solids Residence Time (SRT)	16 days
MLSS at TWL	3,000 mg/L
F/M	0.07
Sludge Production	30 kg/d

MLSS – Mixed liquor suspended solids
TWL – Top water level
F/M – Food to microorganism

The dimensions and water levels of each SBR tank are as follows:

- Length = 6.1 m
- Width = 3.1 m
- High Water Level (HWL) = 4.9 m
- Average Bottom Water Level (BWL) = 3.7 m

The SBR will be operated based on a six hour cycle during average flow. This will result in 4 batches per tank per day of 23.6 m^3 each. Operation will be controlled by a PLC operating on timer control with a level override. Operation during average flow will contain fill, fill/react, react, settle, decant, and idle cycles. Operation during peak flows will contain fill, fill/react, react, settle, decant, and fill/decant cycles.

The decanter is designed for the removal of 16 m^3 of effluent over a 30 minute period. This results in an average decanter flowrate of 9 L/s. The decanter will also be designed to exclude scum and solids. Scum that accumulates in the SBR tanks may be either sprayed down or physically skimmed off and placed in the sludge storage tank. Depending on the configuration of the decanter, decant rates are expected to be higher than the average rate and may have to be throttled. Under existing conditions, peak effluent flows are in the range of 7 L/s. On days with below average flow rates, the SBR effluent could be throttled to reduce the flow rate, which would consequently extend the decant phase of the process.

The aeration system has been designed for nitrification within the SBR. Air will be supplied to the fine bubble aeration system by two (2) (1 duty and 1 standby) positive displacement rotary lobe blowers that will be located in the Control Building. The blowers will be sized for 100% of the total air requirements of each SBR.

Waste activated sludge will be removed on an automated cycle and pumped to the existing equalization basin, which will be used as a new sludge storage tank. Overflow from the storage tank will discharge to the new pump station at the head of the plant.

Disinfection will be provided by UV irradiation. The UV disinfection system will be housed in a new building located in the same concrete pad as the existing RBC building.

Solids are presently pumped out of the two clarifiers and hauled off-site on an irregular basis. This upgrade will result in an increased volume of sludge due to more effective solids removal, which will lead to a slightly increased frequency of hauling. For this reason, it is recommended that the existing equalization basin be used to provide sludge storage. The supernatant in the sludge storage tank can overflow back to the new pump station at the head of the plant.

The SBR will be controlled by a Programmable Logic Controller (PLC) with a touch screen Operator Interface (OI). This system will monitor all process equipment status as well as process variables such as wastewater flow rates and tank liquid levels. The operator will adjust process variables through the OI to optimize plant performance. The OI will provide the operator with a visual overview of plant operation.

Site Layout

The new treatment process will be situated at the current site, with tanks being installed adjacent to the abandoned trickling filter. See Figure 2 (attached) for the proposed layout. The building will be replaced with a new structure, which will house blowers and the UV disinfection system. Influent will be conveyed to a new main plant pump station through the existing collection system. Treated effluent from the plant will be discharged to the existing outfall. No modifications are planned for the existing outfall pipe nor are modifications planned within 30m of the discharge point at the Mispec River.

It should be noted that construction of these upgrades will take place within 30 m of a wetland. As a result, the project will require a Watercourse and Wetland Alteration (WAWA) permit.

The facility is also located near a property boundary with the City of Saint John. All construction will take place on Saint John Airport property.

Operation and Maintenance

The point of discharge will remain the same as the existing system. The new treatment process will connect to the existing outfall through a manhole, which will prevent the need to modify the outfall. Disinfection will be achieved using a UV disinfection system. This will eliminate the need for chemicals at the facility and eliminate chlorinated water discharged to the receiving waters.

The existing facility has been observed to be impacted through rain events. This treatment process has been selected because of its ability to handle large variability in flows. Under peak flow conditions, the SBR will operate on shorter cycles. The discharge will be through a batch process. It is anticipated that under average conditions, four discharges per SBR will be made per day at a rate of 9 L/s over the course of 30 minutes, totaling 130 m^3/day.

Summary

The proposed upgrades are intended to address deficiencies that are primarily related to occupational health and safety. The design will allow for development at the airport, but the primary reason for the upgrades is not related to the capacity of the facility.

The current and proposed design conditions are compared in the tables below. It should be noted, however, that the proposed design conditions were developed as part of the 2014 assessment report, and may change to some extent based on the current sampling and flow monitoring that is being conducted by CBCL Limited.

Table 5 – Current and Proposed Influent Design Conditions

Parameter	Current Condition	Proposed Design*
Average Flow	65 m^3/d (observed) 80 m^3/d (allowed)	130 m^3/d
Average BOD5	75 mg/L	125 mg/L
Average TSS	75 mg/L	125 mg/L
Average Load	7.5 kg/d of BOD5 10 kg/d of TSS	16 kg/d of BOD5 16 kg/d of TSS

*Proposed design values are subject to change based on data that is currently being collected by CBCL

Table 6 – Current and Proposed Effluent Design Conditions

Parameter	Current Condition	Proposed Design
Average Flow	65 m^3/d (observed) 80 m^3/d (allowed)	130 m^3/d (Eight 30 min. batches 9 L/s)
Average cBOD5	25 mg/L	25 mg/L
Average TSS	25 mg/L	25 mg/L

In addition to health and safety related issues, the upgrades are intended to provide a more dependable treatment process and the new system will eliminate the need for chlorine disinfection.

Construction will be within 30 m of a wetland, so the work will require a WAWA permit. The existing plant outfall is located approximately 100 m from the existing facility. The proposed upgrades will connect to the existing 200 mm outfall, near the existing plant. The work will be performed at a distance of at least 60 m from the point where it discharges to the Mispec River.

The Airport's objective is to complete the design for the upgrades in 2016 in order to allow construction to proceed early in 2017. We are submitting the above information for the purpose of confirming whether or not an EIA might be required.

Should you require any further information, please do not hesitate to contact the undersigned.

CBCL LIMITED
Consulting Engineers

Yours truly,

CBCL Limited

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Figure 1: Site Plan Existing Conditions and Demolition
Figure 2: Proposed Site Plan

CC: Brian Wiggins, P. Eng., Amy Winchester, P. Eng.,

Project No: 162832.00

Legend

- Valves
- Sewer Main
- Potable Water Main
- To Be Demolished

WW FROM AIRPORT

GRAVITY SEWER

MAIN PUMP STATION

TRICKLING FILTER, SEDIMENTATION BASIN AND CHLORINATION SYSTEM

200Ø OUTFALL APPROX. 100m TO MISPEC RIVER

PRIMARY CLARIFIER/ INFLUENT EQUALIZATION BASIN

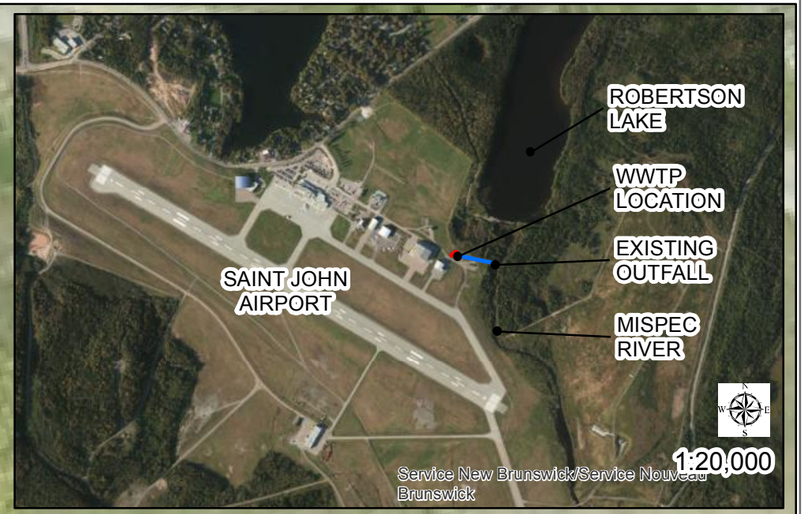
RBC PLANT

SECONDARY CLARIFIER

FORCE MAIN

EXISTING POTABLE WATER

WW FROM AIRPORT



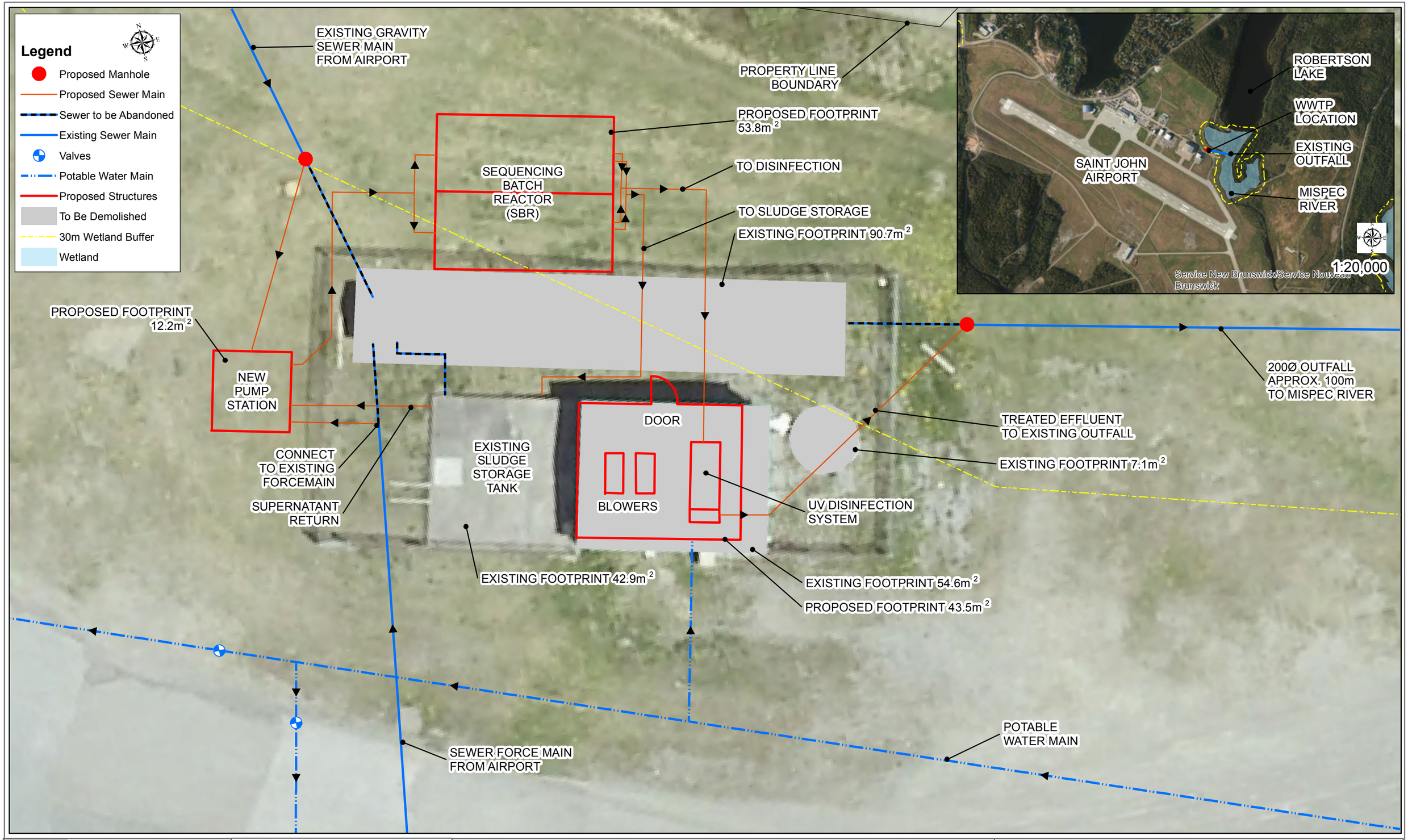
CBCL LIMITED
Consulting Engineers

Client: Your YSJ Saint John Airport

Project Description: WWTP SBR UPGRADE
SITE PLAN
EXISTING CONDITIONS AND DEMOLITION

Revision or Issue: ISSUED FOR NBDELG (2016-05-10)

Drawn	JB	Designed	BM	Checked	AW	Approved	KT
Scale	1:150	Contract No	162832	Date	APR 2016	Figure No	1



CBCL LIMITED Consulting Engineers	Client: Your YSJ Saint John Airport	Project Description: WWTP SBR UPGRADE PROPOSED SITE PLAN	Revision or Issue: ISSUED FOR NBDELG (2016-05-10)	
			Drawn: JB	Designed: BM
			Checked: AW	Approved: KT
			Scale: 1:150	Contract No: 162832
			Date: APR 2016	Figure No: 2

APPENDIX H

ACCDC Species' Descriptions

Vascular and Non-Vascular Plant

Species descriptions for vascular and non-vascular plants identified by ACCDC (2016) are provided below:

Ghost Antler Lichen (*Pseudevernia cladonia*): Ghost antler lichen is listed as S2S3 by the ACCDC. This large lichen grows on the twigs and branches of young conifers. It grows to around 12cm diameter and 4cm thick. In Canada, ghost antler lichen can only be found in Quebec, New Brunswick and Nova Scotia. This lichen needs cool, moist montane or coastal coniferous forests with red spruce and balsam fir being the dominant tree species. The extent of ghost antler lichen populations in the Maritimes is likely stable (SARA, 2016). It is unlikely that this project will impact this species, especially with the avoidance of clearing forests.

Lance-leaved Figwort (*Scrophularia lanceolate*): This species is listed as S2 by the ACCDC. Lance-leaved figwort can be found in open woods. It is unlikely that this project will impact this species, especially with the avoidance of clearing woods.

Coastal Sedge (*Carex exilis*): This sedge is listed as S3 by the ACCDC. It can be found in open and peaty bogs. It is unlikely this species would be found in the project site due to the lack of suitable habitat.

Brown Beakrush (*Rhynchospora fusca*): The brown beakrush is listed as S3 by the ACCDC. It grows in peat bogs, and can also be found on sandy pond shores. It is unlikely this species would be found in the project site due to the lack of suitable habitat.

Humped Bladderwort (*Utricularia gibba*): This plant is listed as S3S4 by the ACCDC. It grows in ponds, or other shallow freshwater or wet soils. The plant has bladder structures used to catch small invertebrates. It is unlikely this species would be found in the project site due to the lack of suitable habitat.

Oakes' Pondweed (*Potamogeton oakesianus*): Oakes' pondweed is listed as S3S4 by the ACCDC. This aquatic plant grows in lakes and ponds. It is unlikely this species would be found in the project site due to the lack of suitable habitat.

Birds

Species descriptions for birds identified by ACCDC (2016) are provided below:

Bank Swallow (*Riparia riparia*): The bank swallow is listed as S2S3B, S2S3M by the ACCDC, *Sensitive* by NBDNR, and *Threatened* by COSEWIC. These birds excavate their nest burrows in vertical banks, which may include piles of soil, road cuts, aggregate pits, riverbanks and bluffs (COSEWIC, 2013). Breeding sites are often located next to open terrestrial landscapes ideal for foraging. Additionally, large wetlands offer communal nocturnal roosting areas after breeding, or during migration and wintering periods (COSEWIC, 2013). Bird Studies Canada (2016) indicates that >80% of bank swallow nests are active between May 25 and August 1. The wetlands near the site may provide post-breeding, migration and wintering habitats, however, the project site itself does not contain ideal habitat for bank swallow nest burrows.

Barn Swallow (*Hirundo rustica*): This species is listed as S3B, S3M by the ACCDC, *Sensitive* by NBDNR, and *Threatened* by NB SARA and COSEWIC. Barn swallows may nest in a variety of natural habitats including caves, holes, ledges and cliff crevices, in addition to human-made habitats including buildings (COSEWIC, 2011). Foraging habitat used by this species may include grassy fields, agricultural cropland, lake and river shorelines, and wetlands. Bird Studies Canada (2016) indicates that >80% of barn swallow nests are active between May 20 and August 18. There is potential for the project site to contain suitable habitat for the barn swallow due to the presence of buildings, grass, and low-lying vegetation. There is potential for this species to be impacted by construction noise during its breeding season (~May 20 and August 18).

Bobolink (*Dolichonyx oryzivorus*): Bobolink is listed as S3B, S3M by the ACCDC, *Sensitive* by NBDNR, and *Threatened* by NB SARA and COSEWIC. This species has declined sharply in numbers in Nova Scotia and throughout its eastern range in part because of more intense haying practice. Bobolink can be found in tall grassy meadows and ditches, hayfields and some croplands. They are increasingly using coastal meadowlands and sand dunes with wax myrtle and other low growth vegetation. It is unlikely this species would be found near the project site due to its level of disturbance.

Olive-sided Flycatcher (*Contopus cooperi*): This species is listed as S3S4B, S3S4M by the ACCDC, *At Risk* by NBDNR, *Threatened* by NB SARA and COSEWIC and as *Threatened* (Schedule 1) pursuant to the federal SARA. Approximately 54% of the olive-sided flycatcher breeding range is in Canada, but the bird can also be found in western and northeastern United States, Panama, and the Andes Mountains. Suitable habitat for the olive-sided flycatcher includes coniferous or mixed coniferous forests, open areas, and wetlands. This medium-sized songbird uses forest openings containing tall trees or snags for perching. Openings can include forest edges, or human-made clearings although there may be evidence that nests in harvested habitats experience significantly lower success than those in natural habitats (COSEWIC, 2007). Bird Studies Canada (2016) indicates that >80% of olive-sided flycatcher nests are active between June 5 and August 10. There is potential for the project site to contain suitable habitat for the olive-sided flycatcher due to the wetland, open areas and forest edges. There is potential for this species to be impacted by construction noise during its breeding season (~June 5 and August 10).

Canada Warbler (*Wilsonia canadensis*): The Canada warbler is listed as S3S4B, S3S4M by the ACCDC, *At Risk* by the NBDNR, as *Threatened* by NB SARA and COSEWIC and as *Threatened* (Schedule 1) pursuant to the federal SARA. These birds build their nests on or near the ground in wet, swampy places typically in mature mixed-wood forests. This species will inhabit a variety of forest habitats, but shows a preference for mature forests with a well-developed deciduous understory, particularly areas where large trees have long since been uprooted and tangled debris remains (Sibley, 2003; Erskine, 1992). They are also found in riparian areas, shrub forests on slopes, in ravines and in old-growth forests with canopy openings, as well as regenerating stands (Sibley, 2003). The ACCDC identified two occurrences of the Canada warbler in the vicinity of the Robertson Lake Dam and Mispec River and near the proposed Project. One was at the northern end of Robertson Lake and the other in South Bay near Spruce Lake Stream. It is unlikely that this species is encountered near the proposed Project's footprint, but it could be negatively impacted by noise disturbances if construction activities or land clearing occur during the breeding season (~May 1 to August 15).

Eastern Wood-Pewee (*Contopus virens*): The eastern wood-pewee is listed as S4B, S4M by the ACCDC, and as *Special Concern* by NB SARA and COSEWIC. This species is mostly found in deciduous forest and

woodland, but can also be found in other forested habitats including woodlots or other treed areas (Cornell University, 2015). Populations of this bird have declined significantly in the past 40 years for reasons that are still unknown. Possible threats to the eastern wood-pewee include loss of breeding ground and wintering ground habitat (COSWEIC, 2012). Avoidance of construction activities during the breeding season (~June 5 to August 15) may reduce impacts. It is unlikely that this species is encountered near the proposed Project's footprint, but it could be negatively impacted by noise disturbances if construction activities or land clearing occur during its breeding season (~June 5 to August 15).

Great Crested Flycatcher (*Myiarchus crinitus*): Listed as S2S3B, S2S3M by the ACCDC, and *Sensitive* by NBDNR. This species of aerial insectivore hunts high the canopy, making them less noticeable. They nest in cavities and live in woodlots and open wooded areas containing deciduous trees and prefer the less dense, edges of habitats. They can also be located in shrubby habitat. Tall standing dead trees play an important role in providing nesting cavities. They prey on a variety of flying insects, and will also eat berries and other fruit (Cornell University, 2015). Avoidance of construction activities during the breeding season (~May 26 to July 20) may reduce impacts. There is potential for the project site to contain suitable habitat for the great crested flycatcher due to the open areas and forest edges. There is potential for this species to be impacted by construction noise during its breeding season (~May 26 to July 20).

Pine Siskin (*Carduelis pinus*): The pine siskin is listed as S3 by the ACCDC. This is a very small songbird that prefers nesting in coniferous or mixed coniferous and deciduous forests, and can be found foraging in open, weedy fields, scrubby thickets, and woodlands. This finch has a wide North American range; it feeds on seeds of pines and other conifers, and will also eat the seeds of grasses and flowering herbs and shrubs. Insects and grubs also make up the pine siskin's diet. This bird has a wide active nesting window, Bird Studies Canada (2016) indicates that >80% of pine siskin nests are active between April 10 and August 15. Avoidance of construction activities during its breeding season may reduce impacts.

Turkey Vulture (*Cathartes aura*): This species is listed as S3B, S3M by the ACCDC. A carrion eater, the turkey vulture finds its food on agricultural lands, forests and rangeland. They nest in rock and log crevices, caves, ledges, burrows and thickets located far from human interaction. They are a common large carnivorous bird in North America, but are threatened to poisoning of their food source by lead (Cornell University, 2015). It is unlikely this species would be found near the project site due to the high level of human disturbance.

Killdeer (*Charadrius vociferus*): The killdeer is listed as S3B, S3M by the ACCDC. This bird is commonly found on sandbars and mudflats, but can also be found on fields, roofs, driveways, and parking lots. All of these habitats are potential nesting sites. Killdeer feed on earthworms, snails, crayfish, beetles, and aquatic insect larvae. There is a potential for this species to nest in the proposed Project site. Avoidance of construction activities during its breeding season (~May 1 to July 15) may reduce impacts.

Brown-headed Cowbird (*Molothrus ater*): This species is listed as S3B, S3M by the ACCDC and *May be at risk* by NBDNR. The brown-headed cowbird lays its eggs in the nests of other birds. Preferred foraging habitat is on the ground including in fields, pastures, meadows and lawns. A variety of nesting habitat is suitable for this bird including the forest floor, shrubs, treetops, marshes, and tree cavities. Avoidance of construction activities during its breeding season (~May 5 to August 5) may reduce impacts. There is

potential for the Project site to contain suitable habitat for the brown-headed cowbird due to the available shrubs. There is potential for this species to be impacted by construction noise.

Evening Grosbeak (*Coccothraustes vespertinus*): The evening grosbeak is listed as S3B, S3S4N by the ACCDC. Preferred breeding habitat for this species is mature and second-growth coniferous forests. They will also breed in deciduous woodlands, parks and orchards. Nests are located high in trees or large shrubs. Coniferous and deciduous forests play an important role in the wintering habitat for this bird as well. Evening grosbeak diets include invertebrates, seeds, and small fruits (Cornell University, 2015). This species is unlikely to be negatively impacted by construction, however if removal of large shrubs is required, there is a potential to disturb or destroy evening grosbeak nests. Avoidance of construction activities during its breeding season (~May 25 to August 22) may reduce impacts.

Cape May Warbler (*Dendroica tigrina*): The cape may warbler is listed as S3B, S4S5M by the ACCDC. This warbler creates its nest from moss, twigs, pine needles and bark, which it locates in coniferous forests. These birds feed on insects, and due to its curled, semitubular tongue, it also eats nectar. Its diet largely consists of the spruce budworm, making its population fluctuate with increases and decreases of this food source. Avoidance of construction activities during its breeding season (~June 5 to July 20) may reduce impacts.

Eastern Kingbird (*Tyrannus tyrannus*): The eastern kingbird is listed as S3S4B, S3S4M by the ACCDC, and as *Sensitive* by NBDNR. This passerine breeds in fields with scattered shrubs and trees, which may include orchards and forest edges (Cornell University, 2015). They feed on insects, which they catch mid-air after perching on shrubs, wires and fence posts. They will also eat fruit especially during fall migration. Bird Studies Canada (2016) indicates that >80% of pine siskin nests are active between June 4 and August 2. Avoidance of construction activities during its breeding season may reduce impacts. There is potential for the project site to contain suitable habitat for the eastern kingbird due to the presence of grass and low-lying vegetation. There is potential for this species to be impacted by construction noise.

Spotted Sandpiper (*Actitis macularius*): This species is listed as S3S4B, S5M by the ACCDC. The most widespread sandpiper in North America, this bird is common on the shorelines of freshwater bodies and saltwater. It breeds on shorelines where there are semi-open areas near vegetated areas where chicks may shelter. It uses its long bill to find prey in sand and mud, but additionally will eat small invertebrates from the air or off of plants (Cornell University, 2015). Despite its wide range, the spotted sandpiper has seen declines in its population in recent years (Audobon, 2016). Bird Studies Canada (2016) indicates that >80% of spotted sandpiper nests are active between May 31 and July 19. Due to the distance from the coastline, project activities are not expected to disturb or destroy spotted sandpiper nests.

Wilson's Snipe (*Gallinago delicata*): Wilson's snipe is listed as S3S4B, S5M by the ACCDC. This species can be found in wet areas including marshes, bogs, river banks, and flooded farm fields. They build their nests on the ground and breed in and around marshes, bogs, and shrubby riparian areas (Audobon, 2016). Wilson's snipe feed on insects and earthworms, which it catches by probing its bill into soft mud. Bird Studies Canada (2016) indicates that >80% of Wilson's snipe nests are active between May 24 and July 13. This species may be impacted by construction noise.

Bald Eagle (*Haliaeetus leucocephalus*): The bald eagle is listed as *At Risk* by NBDNR, and *Endangered* by NB SARA. While the bald eagle is a fairly common bird in much of western Canada, in New Brunswick, it has never bred commonly. In this province, bald eagles can mostly be found in the southwest, along

coasts, rivers and large lakes (New Brunswick Museum, 2016; Audobon, 2016). This species nests in forested areas adjacent to water bodies where it can feed on fish, reptiles, amphibians, invertebrates and even other birds (Cornell University, 2015). Bald eagle nests are typically 1.5-1.8m in diameter, and are located in tall sturdy conifers or cliff faces. Due to the close proximity of the Mispec River and Robertson Lake, there is a potential for this species to nest near the Project site. Avoidance of construction activities during its breeding season (April and May) may reduce impacts (New Brunswick Museum 2016).

Mammals

Species descriptions for mammals identified by ACCDC (2016) are provided below:

Canadian Lynx (*Lynx canadensis*): The Canadian lynx is listed as S3 by ACCDC, *At Risk* by NBDNR, and *Endangered* by NB SARA. This medium sized cat relies heavily on its primary prey: snowshoe hare, who's habitat and range the lynx closely parallels. Canadian lynx are mostly found in boreal, sub-boreal and western montane forests that are mature. They generally avoid younger stands and those that are highly disturbed or greatly fragmented (Poole, 2003). Canadian lynx are likely more common in Northern New Brunswick, as the province is near the southern limit for this species (GNB, 2016). Due to the close proximity of the airport, project activities are not expected to interact with Canadian lynx.

Reptiles

Species descriptions for reptiles identified by ACCDC (2016) are provided below:

Snapping Turtle (*Chelydra serpentina*): This species is listed as *Special Concern* by NB SARA, and as *Special Concern* (Schedule 1) pursuant to the federal SARA . As snapping turtle are considered "location-sensitive", meaning the locations of this species in New Brunswick has not been released to reduce the risk of exploitation. The species is known to be present in Southern New Brunswick, where its habitat includes shallow, slow moving water. Due to the lack of suitable habitat, project activities are not expected to disturb snapping turtles.