



# GEMTEC

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**Regulator Final Report  
Environmental Impact Assessment  
Registration Document  
Fredericton Landfill Maximum Height Increase Project  
Fredericton, New Brunswick**

October 22, 2020

GEMTEC Project: 10115.69-R01



# GEMTEC

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Submitted to:

Regional Service Commission 11  
Fredericton Regional Solid Waste Landfill  
P.O. Box 21, Station A  
Fredericton, New Brunswick  
E3B 4Y2

**Regulator Final Report  
Environmental Impact Assessment  
Registration Document  
Fredericton Landfill Maximum Height Increase Project  
Fredericton, New Brunswick**

October 22, 2020  
GEMTEC Project: 10115.69-R01

GEMTEC Consulting Engineers and Scientists Limited  
191 Doak Road  
Fredericton, New Brunswick, Canada  
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October 22, 2020

File: 10115.69-R01

Regional Service Commission 11  
Fredericton Regional Solid Waste Landfill  
P.O. Box 21, Station A  
Fredericton, New Brunswick  
E3B 4Y2

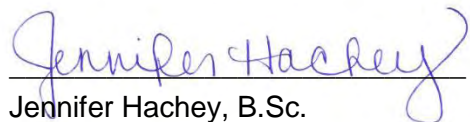
Attention: Mr. Brett McCrea, General Manager

**Re: Regulator Final Report - Environmental Impact Assessment  
Fredericton Landfill Maximum Height Increase Project, Fredericton, New Brunswick**

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GEMTEC Consulting Engineers and Scientists Limited is pleased to submit this electronic copy of the Regulator Final Report of the Environmental Impact Assessment (EIA) for the proposed Fredericton Landfill Maximum Height Increase Project. The proposed Project is located at the Fredericton Regional Solid Waste (FRSW) Landfill located at 1775 Alison Boulevard in Fredericton, New Brunswick. The landfill property consists of 10 parcels, identified by Service New Brunswick (SNB) as Property Identifier (PID) 75435552, PID 75289272, PID 75227959, PID 60042553, PID 60164852, PID 60164845, PID 60029428, PID 60116746, PID 60034444, and PID 60151438.

If you have any questions or concerns about the report or the information presented herein, please do not hesitate to contact the undersigned.



Jennifer Hachey, B.Sc.  
Environmental Biologist  
GEMTEC



Ivy Stone, BA(Hon), M.Sc.  
Senior Environmental Scientist  
GEMTEC

cc: David Maguire, Manager, Environmental Impact Assessment Branch, New Brunswick  
Department of Environment and Local Government (NBDELG), Marysville Place,  
Fredericton, New Brunswick

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## 1.0 INTRODUCTION

The Regional Service Commission (RSC) 11 has retained GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) to prepare an Environmental Impact Assessment (EIA) registration document for the proposed Fredericton Landfill Maximum Height Increase Project (herein referred to as “the Project”). The proposed Project is located at the Fredericton Regional Solid Waste (FRSW) Landfill (herein referred to as “the Landfill”) located at 1775 Alison Boulevard in Fredericton, New Brunswick. The general locations of the proposed Project and the Landfill are presented in Figure 1.

RSC 11 and GEMTEC personnel met with representatives of the New Brunswick Department of Environment and Local Government (NBDELG) on February 6, 2020 to discuss the proposed Project. NBDELG requested that GEMTEC, on behalf of RSC 11, provide a description of the Project (submitted to NBDELG on May 6, 2020), so that a decision could be made on the need for an EIA registration or the need for certain field studies in support of an EIA registration, should one be required. NBDELG issued a letter dated June 3, 2020, stating that the proposed Project is considered a significant modification to the Landfill facility, and as such will require an EIA registration. However, based on the Project description, a desktop review of the existing environment would be sufficient, combined with a reconnaissance site visit by an environmental biologist. The Project Description document and the NBDELG correspondence is presented in Appendix A.

This document is the Regulator Draft Report of the EIA registration for the proposed Project. The document details the necessary information as outlined in the NBDELG document “A Guide to Environmental Impact Assessment in New Brunswick” dated January, 2018 and the sector guideline document “Additional Information Requirement for Waste Disposal Facilities (July, 2004)”.

The proposed project type is specified as an undertaking outlined in Schedule A of the *New Brunswick Environment Impact Assessment Regulation 87-83* under paragraph:

(m): all waste disposal facilities or systems.

The proposed Project involves increasing the maximum height of the municipal solid waste containment cells from the currently approved maximum height of 59.0 metres to 88.0 metres. The height increase will only be in select areas in order to maintain a stable 4:1 slope of the covered Landfill. The proposed additional waste storage, at a proposed maximum height of 88.0 metres, will utilize the existing leachate collection system and leachate treatment system. The Project will not involve an increase in the lateral footprint of the Landfill; however, it is expected to extend the lifetime of the Landfill by up to 17 years.

Project	
ENVIRO FREDERICTON	
Drawn By	Date
CHG	Sf



## 1.1 Name of the Undertaking and Project Proponent

### 1.1.1 Name of the Undertaking

Fredericton Landfill Maximum Height Increase Project, Fredericton, New Brunswick

### 1.1.2 Project Proponent

The name and contact information of the Proponent is presented in Table 1.

**Table 1 Proponent Information**

<b>Name of Proponent</b>	Regional Service Commission 11 Fredericton Regional Solid Waste Landfill
<b>Address of Proponent</b>	1775 Alison Boulevard Fredericton, New Brunswick E3C 2M2
<b>Mailing Address of Proponent</b>	P.O. Box 21, Station A Fredericton, New Brunswick E3B 4Y2
<b>Proponent Contact</b>	Mr. Brett McCrea, General Manager Fredericton Regional Solid Waste Landfill Telephone: (506) 453-9930 Email: brett@frswc.ca
<b>Principal Contact Person for EIA</b>	Ms. Jennifer Hachey, B.Sc. GEMTEC Consulting Engineers and Scientists Limited 191 Doak Road, Fredericton, New Brunswick, E3C 2E6 Telephone: (506) 453-1025 Email: jennifer.hachey@gemtec.ca
<b>Property Ownership</b>	Regional Service Commission 11

## 2.0 PROJECT DESCRIPTION

The Landfill property consists of 10 parcels, identified by Service New Brunswick (SNB) as Property Identifier (PID) 75435552, PID 75289272, PID 75227959, PID 60042553, PID 60164852, PID 60164845, PID 60029428, PID 60116746, PID 60034444, and PID 60151438 (herein collectively referred to as the “Project Site”). The Project activities are limited to a portion of two of the aforementioned parcels: PID 60042553 and PID 75227959, encompassing an approximate area of 13 hectares (ha). The Project Site is owned by the RSC 11 and is utilized as an active municipal solid waste landfill. A detailed aerial image of the Project Site, with respect to the Landfill configuration, is presented on Figure 2.

The Project is in support of the on-going Landfill operations that will see an increase in the maximum height of select municipal solid waste containment cells from the currently approved maximum height of 59.0 metres to 88.0 metres. The on-going progression of the Landfill has necessitated the development of additional disposal space to house the incoming municipal solid waste. This document focuses on the need to increase the height of the containment cells in order to maximize the existing footprint of the Landfill. It is our understanding that the current maximum height (*i.e.*, 59.0 metres) was mandated as part of the original EIA registration submitted for the construction and operation of the FRSW Landfill (approximately 1984); however, a record of the EIA document and any other associate documents could not be found or reviewed at the time of this submission.

It is expected that an increase in the height of the existing containment cells (*i.e.*, 59.0 metres to 88.0 metres) will result in a reduction of construction and operational costs/uncertainties as the Landfill nears the end of its expected lifetime. The current expected end of Landfill life is 2036 based on the “do nothing” approach of landfilling to an elevation of 59.0 metres within the existing footprint. The increased height will add a total usable volume space of 1,996,879 cubic metres (m<sup>3</sup>), extending the Landfill lifetime by up to 17 years. Extending the lifetime of the existing Landfill ultimately would benefit landfill users, including the municipalities and local service districts encompassed in the RSC 11 jurisdiction, when compared to the possible expenditures of finding an alternative waste disposal site or establishing a new landfill.

The proposed additional municipal solid waste storage, to a proposed maximum height of 88.0 metres, will utilize the existing leachate collection system and leachate treatment system. Utilization of the existing leachate collection system and leachate treatment system will result in reduced construction, operation and maintenance costs, and a significant savings to the Landfill rate payers through tipping fees.

The Project will not involve: an increase in the lateral footprint of the Landfill; habitat destruction; or natural vegetation removal. Additionally, the Project is not located within 30-metres of any watercourse or wetland. Operational activities/conditions will not differ from those currently undertaken at the Landfill (*e.g.*, noise levels, emissions, traffic patterns, *etc.*).

## 2.1 Purpose / Rationale / Need for the Undertaking

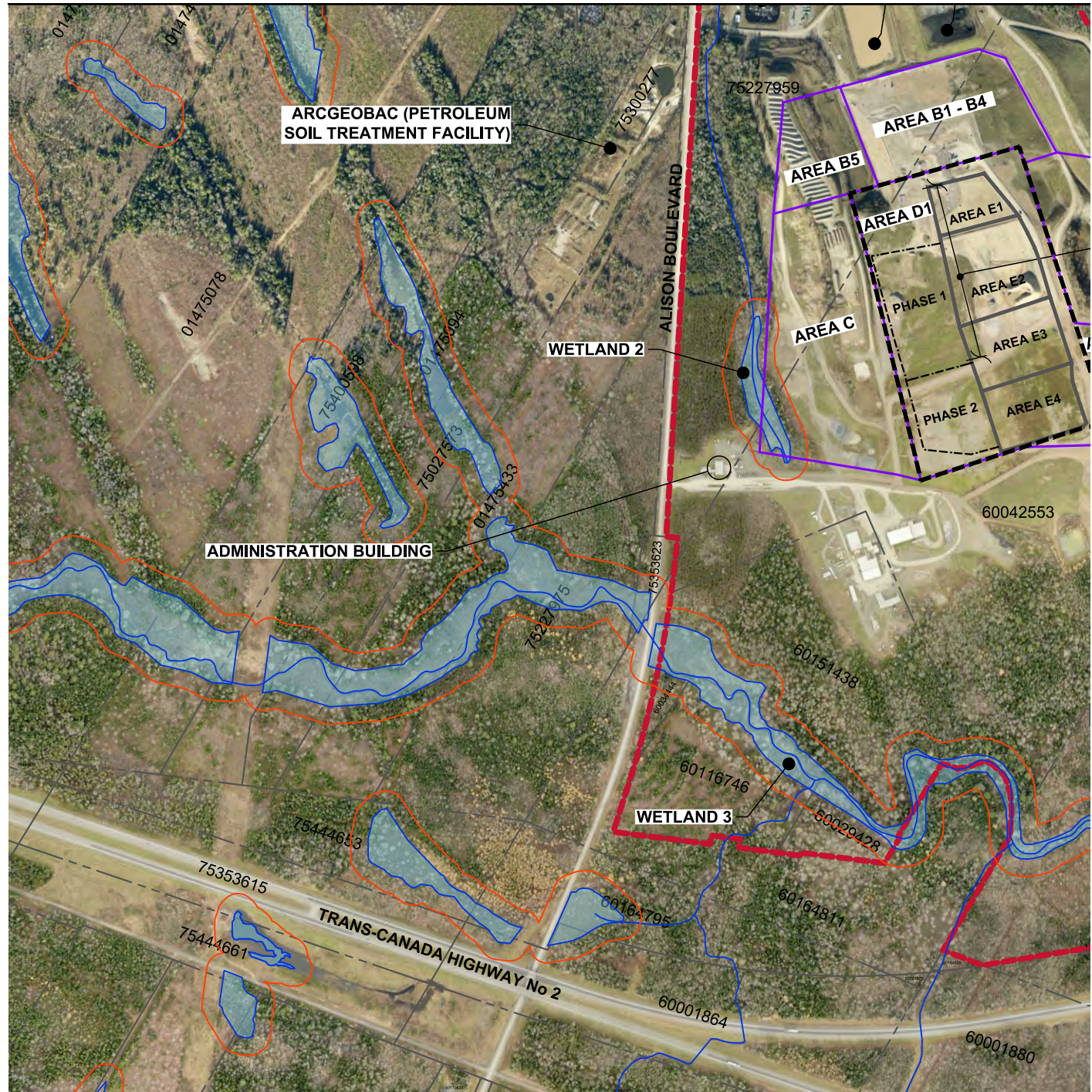
The Landfill (FRSW) was established in 1986 as the first managed landfill in New Brunswick. In 1993, the FRWC joined the RSC 11 to provide community services to the Greater Fredericton Region (*i.e.*, Local Service District of (LSD) Burton, Village of Cambridge-Narrows, LSD Chipman, City of Fredericton, Village of Gagetown, LSD Hanwell, LSD Keswick Ridge, Town of Nackawic, Village of New Maryland, Town of Oromocto, LSD Saint Mary's, and Village of Stanley, *etc.*), with the Landfill specifically providing municipal waste disposal services. The funding model for the RSC 11 is based on the regional tax base and population; however, the Landfill operation is funded solely through tipping fees. The Project is to be funded by the Landfill's annual operational budgets.

The Landfill opened in 1986 with an engineered expected lifetime of approximately 50 years (*i.e.*, 2036). The operational plan of a sanitary landfill requires the continued construction of disposal containment cells. Two reiterations of waste containment cell design have been undertaken within the Landfill property boundaries:

- Containment cell construction began in 1986 and was coined a “second generation” landfill to incorporate a leachate collection system, including a main header through the centre of the site, with sub-headers throughout the various cells, forming a “herring bone” system. This design established the sanitary Landfill in Area D shown in Figure 2 and Figure 3 (disposal areas are not termed in successional order); and
- A “third generation” landfill design was implemented in 2000 in the northern portion of Area D, and subsequently, the disposal cells in Area B (Figure 2 and Figure 3). This system comprises a composite liner (90 millimetre (mm) high-density polyethylene (HDPE) geomembrane over re-compacted clayey till), with a comprehensive leachate collection system.

Beginning in 2015, and as a means to maximize the currently approved waste containment cell elevation (59.0 metres), the Landfill constructed new cells in Area D. These are referred to as the E cells (Area E1 - Area E4; Figure 2). This procedure is commonly referred to as “piggy backing” and involves constructing a new solid waste containment cell atop existing covered waste. The Area E cells include a clay liner, separation berms and a comprehensive leachate collection system (*i.e.*, “third generation” as described above; Figure 3). It is anticipated that Area E will be filled to capacity with municipal solid waste, to the currently approved waste elevation of 59.0 metres, by late 2022. At that time, the Landfill will begin municipal solid waste disposal in Area C (Figure 2 and Figure 3). Based on anticipated high construction costs and limited storage capacity, Area A (Figure 2 and Figure 3) is not deemed feasible for development of productive landfilling at this time.

As previously stated, the key justification for the Project is to extend the life of the Landfill. This is anticipated to result in direct benefits to the municipalities and local service districts in the RSC 11 jurisdiction, as to prolong the need for establishing a new landfill site for the region.






Rev No.	Revision	YYYY/MM/DD
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- LEGEND
- SECOND GENERATION LEACHATE COLLECTION SYSTEM
  - THIRD GENERATION LEACHATE COLLECTION SYSTEM NORTHERN PORTION OF AREA D
  - THIRD GENERATION LEACHATE COLLECTION SYSTEM CELLS IN AREA B
  - LEACHATE COLLECTION SYSTEM ON TOP OF THE EXISTING LANDFILL CELLS IN AREA E
  - FUTURE LEACHATE COLLECTION SYSTEM ON TOP OF THE EXISTING LANDFILL - CELLS IN AREA D
  - FUTURE LEACHATE COLLECTION SYSTEM - CELLS IN AREA A and C

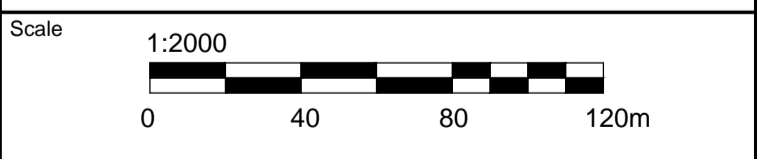

Number	Issue	YYYY/MM/DD
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Engineer's Stamp

Drawn By	LK	Checked By	C.G.K.
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Project  
**Fredericton Region Solid Waste**  
 A Division of Regional Service Commission 11  
 Environmental Impact Assessment

Drawing  
**LEACHATE COLLESTION SYSTEM**



File No. 101156901  
 Sheet No. FIGURE 3



## 2.2 Project Location

The Project will be carried out within the City of Fredericton limits, on the FRSW Landfill property located at 1775 Alison Boulevard. The Landfill property consists of 10 parcels, identified by SNB as PID 75435552, PID 75289272, PID 75227959, PID 60042553, PID 60164852, PID 60164845, PID 60029428, PID 60116746, PID 60034444, and PID 60151438 (the “Project Site”). The Project activities are limited to the central/northern portion of PID 60042553 and the southern portion of PID 75227959 (Figure 2). Central coordinates of the Project Site are 45.883113°, -66.603753°.

The Project Development Area (PDA) is defined as the physical footprint required for the Project (a portion of PID 60042553 and a portion of PID 75227959). It is expected that the PDA will include active municipal solid waste containment cells, final covered containment cells, any required access/hauling routes, and temporary structures (*i.e.*, trailer, portable toilets, equipment storage, *etc.*). Within the Project Site, the estimated footprint of the PDA is 13 ha atop the existing Landfill disposal cells (Figure 2).

The EIA Assessment Area encompasses nearby sensitive receptors (*i.e.*, neighbouring residential dwellings, environmentally sensitive areas, *etc.*) within a 2 kilometre (km) radius of the Project Site (Figure 1).

## 2.3 Siting Considerations

The proposed increased height of the municipal solid waste containment cells at the FRSW Landfill will allow the existing footprint to be maximized; thereby, reducing environmental impacts by extending the life of the Landfill, and providing cost savings to the public.

The Project will not involve an increase in the lateral footprint of the Landfill, thus no habitat disturbance/destruction or natural vegetation removal is required. The PDA will be established atop the existing Landfill disposal cells. Additionally, the Project is not located within 30-metres of any watercourses or wetlands. The Project Site is not located within either a wellfield or watershed protected area (GeoNB, 2020).

The Project will utilize the existing leachate collection and treatment systems at the Landfill. Stormwater drainage patterns and on-site stormwater storage facilities will remain unchanged from the conditions currently observed on the Project Site. The use of the existing infrastructure on the Project Site is expected to have positive impacts the construction and operational costs of the Landfill during the Project.

The RSC 11 determined that the best option for expansion was to increase the height of the existing containment cells and future containment cells from 59.0 metres to 88.0 metres. No reasonable alternative sites were identified for the proposed Project.

## 2.4 Project Overview

The Project and associated PDA are located atop the existing Landfill footprint and will “piggy-back” the most recent municipal solid waste containment cells (*i.e.*, Area D and Area E, Figure 2). The Project will utilize the existing Landfill infrastructure and no new or unique materials/activities are required outside of regular landfilling.

The Project will be accessed via the established hauling route along Alison Boulevard and the existing roadway network within the Project Site (Figure 2). No new roadways or access points are required. The additional storage capacity for municipal solid waste will not increase traffic type or volume into the Landfill. The Project activities will typically only be completed during Landfill operational hours (*i.e.*, day-time hours, Monday to Saturday).

Based on preliminary Project plans, the FRSW is proposing to commence Project activities in the summer of 2021, pending receipt of the required regulatory approvals. Based on future projected waste volumes, the PDA may be utilized for municipal solid waste disposal for up to 17 years. The Project is described in one general phase: the operational phase. Site preparation and construction is not required as the PDA is an active landfill site. Site conceptual closure and reclamation is considered outside the scope of this Project.

### 2.4.1 Landfill Cell Design

The general construction sequence for the proposed disposal cells for the Project (*i.e.*, “piggy-backing”) is presented in Appendix B (Engineering Details D07 and D08 for Cell Design) and is described below:

- The existing cover of closed municipal solid waste cells will be maintained. A liner system will be constructed on the closed cells to provide a barrier between the new disposal cell and the existing underlining disposal cell;
- Grading material is placed to form a base for the new cell and to promote positive drainage, while maintaining the existing cover material;
- A liner system is then constructed, including a low permeability clay fill, geotextile and a leachate collection layer (clear stone and perforated HDPE piping);
- The leachate collection system leads to the low end of the disposal cell and then to the existing treatment system through a network for solid piping and manholes;
- Once the cell has been constructed, the disposal of waste will occur on a daily basis. The waste material will be compacted and bailed, then capped with daily cover material (aggregate) to reduce odours, mitigate against animal pests, and to reduce windblown waste; and
- The expected lifetime of each cell varies on the quantity of deposited waste and the size of the cell. Generally, the Landfill cells are constructed to last 1 to 2 years. Once full, the

cell is capped with an additional layer of the low permeability capping material (*i.e.*, clay material and/or geosynthetic clay liner (GCL)). Landfill gas collection wells have also been historically installed on closed/capped Landfill cells. Landscaping is undertaken via erosion control structures and re-vegetation efforts.

Operational equipment will mobilize to the PDA, as required. It is expected that during the Project, the required equipment will include, but is not limited to, bulldozer(s), front-end loader(s), dump truck(s), excavator(s), and personnel truck(s). A temporary mobile work and/or storage trailer and temporary toilets may also be maintained on-site.

#### **2.4.2 Leachate Collection and Treatment**

It was determined that the existing leachate collection system could facilitate the requirements of the Project. No additional volume storage of the Leachate Pond (Figure 2) is deemed to be necessary as open surface areas (*i.e.*, active disposal cells) subjected to surface water infiltration will remain similar to the conditions currently observed on site. The vertical expansion of the Landfill is expected to result in significantly less leachate production when compared to a lateral expansion, as the surface footprint of the landfilling area is maintained rather than increased.

The additional weight of the proposed containment cells is not expected to compromise any existing collection system. The “third generation” leachate collection system installed in Area E, and proposed for the Project, have been constructed with HDPE piping which is designed to withstand the loads of the vertical expansion.

With the exception of tie-ins for each new containment cell, no new leachate collection infrastructure is deemed required for the Project.

### **2.5 Project Related Documents**

There are two known EIAs that were previously prepared for the Landfill. One EIA was registered with the NBDELG around 1984 for the initial construction and operation of the Landfill, and the second was registered in 1998 for the expansion of the Landfill site. Neither EIA nor any associated documents were available for review by NBDELG, RSC 11 or GEMTEC for this submission.

An Environmental Management Plan (EMP) is currently implemented at the Landfill (Environmental Management Plan Fredericton Regional Sanitary Landfill, Riley Environmental Limited, May, 2006). The EMP is presented in Appendix C.



### 3.0 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

This EIA report has been written to meet the requirements of the *New Brunswick Environmental Impact Assessment Regulation 87-83* (as described in Section 1.0), and in particular:

- Considers the potential for both positive and negative changes on the environment;
- Assesses potential environmental effects of the Project;
- Outlines mitigation and impact management measures; and
- Identifies any monitoring needs associated with the Project.

The EIA focuses on issues directly relevant to increasing the height of the Landfill containment cells to a maximum of 88.0 metres above grade. The approach of this assessment is to focus on project-specific valued environmental components (VECs) in a method consistent with New Brunswick EIA regulatory requirements. However, the Project will not involve an increase in the footprint of the Landfill, habitat destruction or vegetation removal, nor is the Project located within 30-metres of any watercourse or wetland. Thereby, the VEC assessments are generally limited to desktop investigations, as approved by NBDELG in a letter dated June 3, 2020 (Appendix A).

The Guide to Environmental Impact Assessment in New Brunswick (January, 2018) outlines a list of environmental attributes that have the potential to be affected by a project. This EIA identifies the VECs (Table 2) that were assessed within and surrounding the Project Site, to determine whether activities related to the Project activities would affect them.

Specific to the EIA document, potential interactions or effects of the Project on the environment have been identified and are discussed herein. Where residual effects are anticipated, the proposed methods for mitigating the potential effects have been presented.

<b>Table 2 VECs and Factors to be considered for VECS</b>	
<b>Valued Environmental Component</b>	<b>Factors to be Considered</b>
<b>Atmospheric Environment</b>	<ul style="list-style-type: none"> <li>• Climate conditions;</li> <li>• Air quality;</li> <li>• Sound quality; and</li> <li>• Odorous emissions.</li> </ul>
<b>Groundwater Resources</b>	<ul style="list-style-type: none"> <li>• Drainage and topography;</li> <li>• Geology and hydrogeology; and</li> <li>• Groundwater quality and quantity.</li> </ul>
<b>Ecological Environment</b>	<ul style="list-style-type: none"> <li>• Terrestrial habitat;</li> <li>• Ecologically significant areas (ESAs);</li> <li>• Wetlands and watercourses;</li> <li>• Flora;</li> <li>• Wildlife and birds and their habitat;</li> <li>• Species at Risk (SAR) and critical habitat; and</li> <li>• Species of conservation concern (SOCC) and their habitat.</li> </ul>
<b>Land Use and Economy</b>	<ul style="list-style-type: none"> <li>• Residential land use;</li> <li>• Commercial and industrial land use;</li> <li>• Visual landscape; and</li> <li>• Local economy and local socio-economic structure.</li> </ul>

Archaeological resources and any use of land by Aboriginal persons are not discussed in this document as the Project will take place only within the current footprint of an existing Landfill and no new ground disturbing activities are required. However, the Aboriginal Affairs Secretariat and the nearby First Nations communities will be consulted during the Public Involvement aspect of this EIA.

Any potential effects to the environment as a result of the existing Landfill footprint and landfilling construction, operations, and reclamation (conceptual closure) were assumed to be identified and discussed in the original EIA document (1984) and are considered outside the scope of this assessment.

## 4.0 DESCRIPTION OF EXISTING ENVIRONMENT

The assessment of the existing environment has been completed for three spatial boundaries:

- The PDA is defined as the footprint of ground disturbance required for the Project activities (a portion PID 60042553 and a portion of PID 75227959; Figure 2);
- The Project Site is defined as the Landfill facility located at 1775 Alison Boulevard in Fredericton, New Brunswick. The Landfill consists of 10 parcels, identified by SNB as PID 75435552, PID 75289272, PID 75227959, PID 60042553, PID 60164852, PID 60164845, PID 60029428, PID 60116746, PID 60034444, and PID 60151438 (Figure 1 and Figure 2); and
- The Assessment Area encompasses nearby sensitive receptors (*i.e.*, neighbouring residential dwellings, environmentally sensitive areas, *etc.*) within a 2 km radius of the Project Site (Figure 1).

The temporal assessment of the existing environment has been completed for the operational phase of the Project only. No site preparation (*i.e.*, construction phase) is required for the Project. A conceptual closure plan (*i.e.*, reclamation phase) for the Landfill is outside the scope of this Project.

### 4.1 Atmospheric Environment

The atmospheric environment is impacted by concentrations of various natural and anthropogenic contaminants. Climatological processes can influence the transport or dispersal of airborne contaminants, as well as the deposition of contaminants in terrestrial and aquatic ecosystems. As such, Project related activities (*i.e.*, fuel combustion, particulate matter release, *etc.*) may release contaminants into the atmosphere that could potentially impact human and/or ecosystem health.

In order to assess any potential impacts of the Project on the atmospheric environment, four components have been identified for this VEC:

- *Climate Conditions* are the long-term weather conditions of an area that are typically influenced by latitude, altitude and proximity to oceans. The climate conditions are measured by assessing the patterns of temperature, wind, precipitation, and other meteorological aspects;
- *Air Quality* is the concentration of naturally occurring or anthropogenic air pollutants that are present in the atmosphere. The concentration of the air pollutants is influenced by source location, meteorological processes (*i.e.*, wind, rain, air temperature) and topographical conditions. The air pollutant particles can be deposited on soil, water, vegetation, and other object surfaces;

- *Sound Quality* is the type, frequency, intensity, and duration of ambient noise. Sound quality also encompasses any vibration related stress on nearby structures; and
- *Odorous emissions* are evaluated as the offensive smells recognized in the surrounding ambient air.

#### 4.1.1 Climate Conditions

The climate conditions of the Assessment Area are based upon Environment and Climate Change Canada (ECCC) climate normals recorded at the Fredericton Airport weather station (approximately 45.8733°, -66.5298°), located approximately 5.7 km east of the Project Site. Due to the proximity to the Assessment Area, the climate conditions measured at this monitoring station are assumed to be comparable to those within the Assessment Area boundaries.

The Canadian Climate Normals (1981 to 2010) recorded from the Fredericton Airport climate station indicate an annual daily average temperature of 5.6 degree Celsius (°C), with a daily maximum temperature of 25.5°C (July) and daily minimum temperature of -15.0°C (January). An extreme maximum temperature was recorded in August 1975 (37.2°C) and an extreme minimum temperature was recorded in February 1962 (-37.2°C). According to the climate normals, January is typically the coldest month with a daily average temperature of -9.4°C and July is the warmest month with a daily average temperature of 19.3°C (ECCC, 2020).

Average annual precipitation in the Fredericton Airport area is 1077.7 millimetres (mm); the average rainfall is 859.1 mm and the average snowfall is 252.3 centimetres (cm). An extreme daily rainfall event was recorded in August 1989 (148.6 mm) and an extreme daily snowfall event was recorded in December 1967 (78.0 cm). On average, May is the rainiest month and January is the snowiest (ECCC, 2020).

The prevailing winds are generally from the south/southwest between May and October and from the west/northwest between November and April. The average annual wind speed is 12.0 km per hour (km/hr). April is typically the windiest month with an average wind speed of 14.2 km/hr and August is typically the least windy month with an average wind speed of 9.6 km/hr (ECCC, 2020).

#### 4.1.2 Air Quality

Air quality is monitored by both provincial and federal agencies across New Brunswick. The air quality monitoring data at the NBDELG monitoring station closest to the Project Site (Fredericton – Needham Street, located approximately 8.5 km northwest of the Project Site, outside the Assessment Area) were reviewed for this VEC. This station monitors ozone, fine particulate matter, nitrogen dioxide, relative humidity, ambient temperature, barometric pressure, wind speed, and wind direction.

The Province of New Brunswick has Air Quality Objectives (Table 3) for regulated air contaminants under the *Air Quality Regulation* of the *New Brunswick Clean Air Act*.

**Table 3 New Brunswick Air Quality Objectives**

Pollutant	Averaging Period			
	1 Hour	8 Hours	24 Hours	1 Year
Carbon Monoxide (CO)	35,000 µg/m <sup>3</sup> (30 ppm)	15,000 µg/m <sup>3</sup> (13 ppm)	-	-
Hydrogen Sulphide (H <sub>2</sub> S)	15 µg/m <sup>3</sup> (11 ppb)	-	5 µg/m <sup>3</sup> (3.5 ppb)	-
Nitrogen Dioxide (NO <sub>2</sub> )	400 µg/m <sup>3</sup> (210 ppb)	-	200 µg/m <sup>3</sup> (105 ppb)	100 µg/m <sup>3</sup> (52 ppb)
Sulphur Dioxide (SO <sub>2</sub> )	900 µg/m <sup>3</sup> (339 ppb)	-	300 µg/m <sup>3</sup> (113 ppb)	60 µg/m <sup>3</sup> (23 ppb)
Total Suspended Particulate (PM <sub>2.5</sub> )	-	-	120 µg/m <sup>3</sup>	70 µg/m <sup>3</sup>
<b>Notes:</b> µg/m <sup>3</sup> = micrograms per cubic metre ppm = parts per million ppb = parts per billion				

The Fredericton Air Quality Monitoring Station records for two of the parameters outlined in Table 3; nitrogen dioxide and total suspended particulate (fine particulate matter). No exceedances of the air quality objectives were logged at this monitoring stations between 2017 and 2020, with the exception of total suspended particulate in October, 2017 (80 µg/m<sup>3</sup>; NBDELG, Air Quality Data Portal, 2020).

#### 4.1.2.1 Emission Sources

There are two major industrial sources (as identified by NBDELG) of emissions located in the Assessment Area:

- Urban Machinery Corporation is a polyvinyl chloride (PVC) welding and weld cleaning machinery manufacturing plant operating under a Class 3 Air Industrial Approval and is located approximately 2.0 km north of the Project Site; and
- XL Plating & Machining Inc. is a chromium electroplating facility operating under a Class 3 Air Industrial Approval and is located approximately 2.0 km north of the Project Site.

The Landfill operates under a NBDELG Class 4 Approval to Operate (I-9667, valid to March 18, 2022; presented in Appendix D). According to the Approval to Operate, potential atmospheric emissions as a result of the Landfill operations include:

- fugitive dust emissions from truck traffic and other on-site activities;
- elevated odour and/or noise emissions; and/or
- emissions associated with the operation of the household hazardous waste depot.

The Project is not expected to result in additional or increased atmospheric emissions beyond what is outlined in the current Approval to Operate I-9667 (Appendix D).

#### 4.1.3 Sound Quality

Within the Assessment Area, there are several noise and vibration sources:

- The Landfill and the associated operational activities include: industrial and heavy equipment traffic, public traffic, dumping, excavating, and compaction activities. Noise emissions from the Landfill are approved, with conditions, in an NBDELG Approval to Operate (I-9667, valid to March 18, 2022; Appendix D);
- There are major roadways located to the east and south of the Project Site (Figure 1), the Route 7 right-of-way (ROW), the Route 7/Highway 2 interchange and Trans-Canada Highway 2 ROW. All of these roadways experience high traffic volumes, especially during commuter intervals; and
- Several industrial businesses with expected noise/vibrational outputs including: Capital City Autopart Salvage located approximately 250 metres northwest of the Project Site (Figure 2); Arcgeobac (petroleum, soil treatment facility), located approximately 50 metres west of the Project Site (Figure 2); and Shaw Brick located approximately 75 metres north of the Project Site.

The remaining area within the Assessment Area is generally undeveloped forested land, rural residential communities and a transmission line (Figure 1).

#### 4.1.4 Odorous Emissions

In 2006, the Landfill established the Landfill Gas Utilization System (LGUS) to collect and convert the odorous gases produced by the landfilling activities into electric power, with approved conditions in the current Approval to Operate (I-9667, valid to March 18, 2022; Appendix D). The LGUS is capable of producing 2.1 megawatts of energy, which is sold directly to Énergie NB Power. The LGUS also serves as an odour reducing agent, as any excess gases are burnt off via a flare at a destructive rate greater than 99 percent (%). The Project will contribute to the established LGUS.

## 4.2 Groundwater Resources

Thousands of residents in New Brunswick rely on groundwater resources for their domestic water supply. Groundwater can be impacted by concentrations of naturally occurring and anthropogenic sourced contaminants such as mineral deposits surrounding the aquifer, or from an accidental release of pollutants. Project related activities (e.g., waste disposal and petroleum product use and storage, etc.) may release contaminants into the groundwater that could potentially adversely impact human and/or ecosystem health.

In order to assess any potential impacts of the Project on the groundwater resources, three components have been identified for this VEC:

- *Drainage and Topography* are the patterns that describe the physical geography of the landscape;
- *Geology and Hydrogeology* describe the subsurface soil and drainage conditions; and
- *Known Groundwater Quality and Quantity* data that provide baseline conditions for the project area.

### 4.2.1 Drainage and Topography

The Landfill is located between two drumlins that tend generally north-south and represent the high points within the Project Site, with maximum elevations of 55 metres and 48 metres for the west and east elevations, respectively. The ground slopes from these high points towards Alison Boulevard and Route 7 at grades between 15% and 20%, respectively. From north to south, slopes across the Project Site are observed at approximately 3% to 6% (GEMTEC, 1998).

In general, surface runoff from the Project Site is directed towards the stormwater infrastructure and ultimately, the Sedimentation Pond (Figure 2). Any surface water not captured in the stormwater collection system will flow into Baker Brook or an unnamed tributary to Baker Brook, either directly or via roadway ditching along Alison Boulevard (Figure 2).

### 4.2.2 Geology and Hydrogeology

The original overburden at the Landfill ranges in thickness from 15 to 42 cm. The overburden is comprised of marine silts and clays atop a very dense deposit of lodgement glacial till. The marine soils are present only in a central bank, between the drumlins (GEMTEC, 1998).

The glacial till is comprised of clay, silt, sand and gravel with varying amounts of cobbles and boulders. The clay content is typically 10% to 15%; the combined silt and clay content ranges from 20% to 45%. The natural moisture content of the glacial till ranges from 9% to 13% (10% average), inclusive of the very dense nature of the deposit (GEMTEC, 1998).

Bedrock underlying the Landfill is comprised of an interbedded sequence of Pennsylvanian age sandstones, siltstones and mudstones. The interpreted bedrock surface indicates a bedrock low

in the central part of the Landfill (approximate elevation 0.0 metres) with upward sloping to the north, south and west (GEMTEC, 1998).

Based on the composition of the on-site marine soils, very low permeability in the vertical direction is expected. Groundwater flow within the bedrock is likely to the northeast at a gradient of 1% to 2%; the interpreted groundwater flow is to the northeast at a hydrologic gradient of approximately 0.5% to 1.5%. It is believed that there is very little flow in the glacial till of the marine soils. The shallow groundwater and surface water flow is controlled by the surface topography which is typically towards the north (*i.e.*, the Sedimentation Pond and/or the unnamed tributary to Baker Brook; Figure 2; GEMTEC, 1998).

#### **4.2.3 Groundwater Quality and Quantity**

The NBDELG Online Well Log System (OWLS) was accessed to identify groundwater extraction wells located within a 1 km radius of the Project Site. The OWLS database is maintained by NBDELG and contains information on water wells constructed since 1994. The NBDELG takes no responsibility and makes no guarantee as to the completeness, accuracy or timeliness of the data provided in this database. Available water chemistry data from the NBDELG database were compared to the Canadian Drinking Water Quality Guidelines (CDWQG; Health Canada, June, 2019).

There were 15 groundwater wells, drilled between 2003 and 2019, identified in the NBDELG database that occur within the 1 km radius of the Project site. Well driller reports are presented in Appendix E and well construction details for these wells are summarized in Table 4.



**Table 4 Construction Details for Wells Reported within 1 km of the Project Site**

Well Construction Component	Minimum	Maximum	Average
Total Well Depth (m)	21.34	99.67	57.83
Casing Depth (m)	3.96	61.87	25.79
Casing Diameter (centimetres)	15.24	20.32	15.57
Estimated Safe Yield (L/min (igpm))	13.65 (3.00)	910 (200.17)	146.05 (32.13)
Water Bearing Fracture Zones (m)	9.75	82.3	46.48
Depth to Bedrock (m)	0	28.96	12.822
Bedrock Type	Sandstone, Shale, Mudstone		
<b>Notes:</b> m = Metres L/min = Litres per minute igpm = Imperial gallons per minute			

Based on the available data (*i.e.*, 12 groundwater chemistry records), exceedances of the CDWQG were noted in one or more wells for the following: aluminium, arsenic, iron, manganese, total coliforms, turbidity, and uranium. Table E1 in Appendix E summarizes the analytical data from the 12 records.

The Project is situated within the active Landfill site, which has an Approval to Operate (I-9667, valid to March 18, 2022; Appendix D) that requires compliance monitoring. In accordance with the Approval to Operate, sampling the existing network of 44 groundwater monitoring wells is required three times per year, at seasonal intervals. Groundwater samples are submitted for laboratory analysis of benzene, toluene, ethylbenzene and xylenes (BTEX)/modified total petroleum hydrocarbons (mTPH), general chemistry parameters, trace metals, chemical oxygen demand (COD), five-day biochemical oxygen demand (BOD<sub>5</sub>), vinyl chloride (VC) and chloroform. Exceedances of the CDWQG are typically noted in one or more groundwater monitoring wells for the following: aluminium, arsenic, iron, pH, sulphide, turbidity, and uranium.

### 4.3 Ecological Environment

The PDA is currently utilized as an active landfill site and is generally considered to be an anthropogenic habitat. On-going land disturbances required for the landfilling activities have broadly altered the natural habitat, including the topography, drainage patterns, vegetation communities, and surficial geology. Although these alterations have diminished much of the natural habitat within the PDA, environmental features (*i.e.*, watercourses, wetlands and forested area, *etc.*) exist within the Project Site boundaries.

In order to assess any influence of the Project on the ecological environment, five VECs have been identified are described below:

- *Terrestrial Habitat* describes the general environmental conditions observed within the Project Site. Terrestrial habitat types were determined by reviewing the readily available aerial imagery (*i.e.*, Google Earth, GeoNB, *etc.*) and then field verified. A GEMTEC Environmental Biologist (Ms. Jennifer Hachey, B.Sc.) conducted a terrestrial habitat survey on July 2, 2020;
- *Ecologically Significant Areas* (ESAs) are areas designated as protected or managed by federal, provincial, or non-government agencies;
- *Wetlands and Watercourses* are features that offer biologically diverse ecosystems that support a wide variety of vegetation and wildlife species:
  - *Wetlands* are lands where the water table is at, near, or above the land's surface, or which is saturated, for a long enough period to promote wetland or aquatic processes as indicated by hydric soils, hydrophytic vegetation, and various kinds of biological activities adapted to the wet environment (NBDELG, 2002). In New Brunswick, wetlands are regulated under the *Clean Water Act - Watercourse and Wetland Alteration Regulation (90-80)* administered by NBDELG;
  - *Watercourses* are considered the "full width and length, including the bed, banks, sides and shoreline, or any part, of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not" per the *Clean Water Act*;
- Flora is primarily focused on flora SAR and SOCC:
  - *Flora SAR* include vegetation species that have a protective status under Schedule 1 of the federal *Species at Risk Act (SARA)* or are protected under the provincial *New Brunswick Species At Risk Act (NBSAR)*; and
  - *Flora SOCC* are species not protected by federal or provincial legislation but are:
    - Considered rare in New Brunswick with an Atlantic Canada Conservation Data Centre (ACCDC) rank of S1 (imperiled) to S3 (vulnerable); and/or

- Ranked At Risk, May Be At Risk or Sensitive by the New Brunswick Department of Natural Resources and Energy Development (NBDNRED);
- *Wildlife and Birds*, which for the purpose of this assessment includes any wildlife (terrestrial and aquatic) SAR and SOCC, and migratory birds protected under the federal *Migratory Bird Convention Act (MBCA)*. Wildlife SAR are considered species that have a protective status under Schedule 1 of the federal *SARA* or are protected under the provincial *NBSAR*. Wildlife SOCC include species that are:
  - Considered rare in New Brunswick with a ACCDC S-rank of S1 (imperiled) to S3 (vulnerable); and/or
  - Ranked At Risk, May Be At Risk or Sensitive by the NBDNRED.

Field studies for flora and wildlife (including birds) are considered outside the scope of this assessment as the Project footprint is situated within an active landfill site (Appendix A).

#### 4.3.1 Terrestrial Habitat

The Assessment Area is located within the Grand Lake Lowlands Ecoregion, an environment characterized by widespread alluvial floodplains and the warmest climate in New Brunswick. This Ecoregion encompasses the Grand Lake basin, the Oromocto River Watershed and the mid-section of the lower Saint John River and has moist, rich soils, combined with a lengthy growing season. The topography forms a low-lying trough centred on Grand Lake, with expansive, shallow river valleys and the geology is composed almost entirely of Carboniferous, non-calcareous sedimentary rocks, ranging from fine siltstones through sandstones to coarse conglomerates (Ecological Framework of Canada, 2020).

The Project Site is approximately 165 ha in size and is developed as an operational landfill that encompasses: capped and active landfill cells (Photo 1 to Photo 4, Appendix F), a leachate treatment pond, a sedimentation pond, an ash disposal site, construction & demolition disposal site, contaminated soil disposal site (leased and independently operated by Elm Tree Environmental Limited), administrative buildings, a weigh scale and associated building, a recycling depot and associated storage buildings, access roadways, and construction material stockpile areas. The perimeters of the Project Site are vegetated and/or wetland and watercourse areas (Figure 2). The vegetated area is characterized as mixed forest with predominately Red Maple (*Acer rubrum*), White Birch (*Betula papyrifera*) and Balsam Fir (*Abies balsamea*; Photo 5 and Photo 6, Appendix F). The low-lying riparian areas along Baker Brook and an unnamed tributary to Baker Brook are generally characterized as Speckled Alder (*Alnus incana*) swales.

The PDA is restricted to active landfilling disposal cells atop previously capped cells (Figure 2; Photo 2 to Photo 4, Appendix F). The capped landfill cells are covered in a 300 mm granular layer, 600 mm of clayey till, a 150 mm granular protection layer, and overlain by a 150 mm vegetative cover medium. Capping material is graded to a slope of 4:1 to promote surface water run-off from

the cells. A highway blend hydro-seed mixture is applied to the cover material (Photo 1, Appendix F). Active landfill cells are open disposal sites where municipal solid waste is deposited on a daily basis (Photo 2, Appendix F). Landfill personnel and/or the general public have access to the disposal cells via existing hauling roadways.

#### 4.3.2 Ecological Significant Areas (ESAs)

A data request was submitted to the ACCDC for a 5 km radius of the Project Site. The ACCDC report provides the location and information on significant or managed natural areas. A Managed Area (MA) is a site with some level of protection for wildlife within the boundaries. The ESAs are sites that may or may not have legal protection. The ACCDC report is presented in Appendix E.

The ACCDC report identified three MAs and three ESAs within a 5 km radius of the Project Site (ACCDC, Appendix E):

- The University of New Brunswick (UNB) Refuge MA (commonly referred to as the UNB Woodlot) is located approximately 3.6 km west of the Project Site and is a wildlife protected area and wildlife refuge, and approximately 1,518 ha in size. This MA was established in 1949 and is legally protected by the NBDNRED under the *New Brunswick Fish & Wildlife Act*;
- The Fredericton Research Station MA is a federally managed facility that was established in 1912, and is located approximately 2.5 km north of the Project Site. Currently, the facility is used to research sustainable and diverse potato cropping systems; pest and disease management; genetics and genomics tools; and end-use traits (Canada, 2020);
- The Guthrie Meadows MA is owned by Ducks Unlimited Canada and is a 31 ha managed floodplain habitat, located approximately 4 km east of the Project Site;
- The Baker Brook ESA, located approximately 4 km east of the Project Site, is a significant site for invertebrates as it is one of three known sites where the Rusty Spire Snail (*Lyogyrus granum*) has been collected in New Brunswick;
- The Lower St. Marys Shoreline/Carman Creek ESA, located approximately 5 km north of the Project Site, is a significant site for wetlands and plants as it has high interspersion and habitat diversity; and
- The Lower St. John River (Sheffield-Jemseg) ESA is an Important Bird Area (IBA) that is 751,000 ha in size. The Project Site is contained within the boundaries of this ESA. The site includes the Portobello National Wildlife Area, Gilbert Island, French Lake, Big Timber Lake, Grand Lake Meadows, and the southern edge of Grand Lake. The area is under tidal influence and experiences extensive spring flooding which has resulted in the creation of a unique hardwood and flora complex, creating the single largest wetland complex in Atlantic Canada. This ESA provides significant breeding habitat for three bird

species: Yellow Rail (*Coturnicops noveboracensis*), Black Tern (*Chlidonias niger*), and the Greater Scaup (*Aythya marila*; Birds Canada, 2020).

No National Wildlife Areas, Migratory Bird Sanctuaries, Ramsar Sites, or New Brunswick Protected Natural Areas are located within 2 km of the Project Site (Assessment Area; Environment Canada Protected Areas Network, 2020, Ramsar Sites Information Service, 2020, and NBDNRED Protected Natural Areas, 2020).

### 4.3.3 Wetlands and Watercourse

#### 4.3.3.1 Wetlands

No regulated wetlands are situated within 30 metres of the PDA.

Three regulated wetlands are present within the Project Site and are described per the GeoNB mapping (Figure 2; GeoNB Mapping, Appendix E). A formal wetland delineation was not completed (Appendix A). Descriptions of the wetlands based on a desktop assessment and the known site conditions are presented below:

- Wetland 1 (Figure 2): A wetland associated with an unnamed tributary to Baker Brook, situated in the northern portion of the Project Site, beyond the Leachate Pond, Sedimentation Pond and Ash Disposal Cell. Approximately 2.8 ha of this 4.5 ha wetland falls within the Project Site (PID 75227959 and 75289272). Within the Project Site, the western portion of the wetland is a meadow marsh, seasonally containing open-water. The eastern portion of the wetland is a riparian fringe along the watercourse;
- Wetland 2 (Figure 2): This 0.9 ha wetland is currently in an altered state (Photo 5, Appendix F) and will be in-filled for non-Project related landfilling activities, as per the Watercourse and Wetland Alteration (WAWA) permit #46145'19 issued by the NBDELG on September 30, 2019. The FRSW has completed the NBDELG approved wetland compensation requirements; therefore, this wetland is considered obsolete and is not discussed further herein; and
- Wetland 3 (Figure 2): A meandering riparian fringe wetland associated with Baker Brook. Approximately 6.6 ha of this 7.9 ha wetland falls along the southern boundary of the Project Site (PID 60034444, PID 60116746, PID 60029428, PID 60151438, PID 60042553, PID 60164845, and PID 60164852).

#### 4.3.3.2 Watercourses

No regulated watercourses are situated within 30 metres of the PDA.

Two regulated watercourses are present within the Project Site and are described per the GeoNB mapping (Figure 2; GeoNB Mapping, Appendix E). A formal watercourse assessment was not completed (Appendix A). Descriptions of the watercourses based on a desktop assessment and the known site conditions are presented below:

- Baker Brook (Figure 2): This watercourse flows west to east through Wetland 3, in the southern portion of the Project Site. The watercourse enters the western boundary of the Project Site via a culvert under Alison Boulevard, and ultimately crosses under the Route 7 ROW approximately 1.2 km downstream, just west of the Project Site boundary; and
- An unnamed tributary to Baker Brook (Figure 2): This watercourse meanders along the northern Project Site boundary, north of the Leachate Pond, Sedimentation Pond, and Ash Disposal Cell. The main channel enters the Project Site via a culvert under Alison Boulevard, flows west to east through Wetland 1, and ultimately exits the eastern Project Site boundary. Roadside ditching along Alison Boulevard, landfill access roadways, and Route 7 likely influence surface water inputs into the watercourse, as well as the steep surrounding topography that directs overland flow into the channel. Although a branch of this watercourse originates in Wetland 2, it is currently in an altered state for non-Project related landfilling activities (Photo 5, Appendix F), as per the WAWA permit #46145'19 issued by the NBDELG on September 30, 2019.

#### 4.3.4 Flora

A data request was submitted to the ACCDC for a 5 km radius of the Project Site. The ACCDC report provides the location of known flora SAR and SOCC, any location sensitive species and information on protected or managed natural areas.

The ACCDC report identified 11 flora species (vascular plants) as occurring within 5 km of the Project Site. The ACCDC report and a Species Habitat Comparison table (Table E2) outlining the species and their habitat requirements is presented in Appendix E.

A rare vascular flora survey was not completed as part of this assessment as no new ground disturbance or new landfill operational activities are included in the Project (Appendix A).

##### 4.3.4.1 Flora Species at Risk and Critical Habitat

The ACCDC had no records of flora SAR occurring within 5 km of the Project Site (ACCDC, 2019).

#### 4.3.4.2 Flora Species of Conservation Concern

The ACCDC lists 10 flora species considered to be SOCC that are known to occur within 5 km of the Project Site. Two of the SOCC species were reported to occur in the Assessment Area (less than 2 km from the Project Site; ACCDC, 2019). These species include:

- Cut-Leaved Toothwort (*Cardamine concatenate*); and
- Loesel's Twayblade (*Liparis loeselii*).

Cut-Leaved Toothwort is ranked S1 (critically imperiled) by the ACCDC and “May be at Risk” by NBDNRED. The species generally occurs along floodplain (river or stream floodplains), or in forests, talus and on rocky slopes (GoBotany, 2020). There is one record of this species in the ACCDC report, located along the Trans-Canada Highway 2, southwest of the Project Site (ACCDC, Appendix E).

Loesel's Twayblade is ranked S3 (vulnerable) by ACCDC and “Secure” by NBDNRED. Preferred habitat for this species includes fens and bogs (Ontario Wildflowers, 2020). There is one record of this species in the ACCDC report, located in an industrial area northeast of the Project Site (ACCDC, Appendix E).

The preferred habitat descriptions for all flora SOCC are presented in Table E2 in Appendix E.

#### 4.3.5 Wildlife and Birds

The ACCDC report also provides the location of recorded wildlife SAR or SOCC and the presence or absence of any location sensitive species within a 5 km radius of the Project Site.

A bird survey (e.g., point counts) was not completed as part of this assessment as no new ground disturbance or new landfill operational activities are included in the Project (Appendix A).

##### 4.3.5.1 Wildlife Species at Risk (SAR)

The ACCDC listed 17 wildlife species as occurring within 5 km of the Project Site (excluding birds; bird SAR and SOCC are discussed in Section 4.3.5.3 and Section 4.3.5.4, respectively). Two of the 17 wildlife species are considered SAR under this assessment:

- The Monarch Butterfly (*Danaus plexippus*) is listed as Endangered under COSEWIC and Special Concern under SARA and NBSAR. Monarchs prefer open habitat such as field, meadows, weedy areas, marshes, and roadsides (Butterflies and Moths of North America, 2020); particularly with the presence of Milkweed (*Asclepias spp*). These habitats are found within the Project Site but not the PDA; and
- The Yellow Lampmussel (*Lampsilis cariosa*) is listed as Special Concern under COSEWIC, SARA and NBSAR. This species is found in large rivers with fast flowing water (SARA, 2018) and is not expected in the PDA or Project Site.

The Wood Turtle (*Glyptemys insculpta*) and Bat Hibernaculum (consisting of three species of bats: Little Brown Myotis (*Myotis lucifugus*), Long-Eared Myotis (*Myotis septentrionalis*), and Tri-Coloured Bat (*Perimyotis subflavus*)) were listed in the ACCDC as location sensitive species (*i.e.*, known to in-habitat areas within 5 km of the Project Site) and are discussed below:

- The Wood Turtle is listed as Threatened under *SARA* and the *NBSAR*. This species is generally found in forested habitats and require daily water resources; thus are associated with clear, freshwater streams and the associated floodplains. The preferred streams contain a year-around flow with substrate beds of sand, gravel and sometimes cobble. Wood Turtles also use bogs, marshy pastures, beaver ponds, oxbow lakes, riparian and shrub areas, meadows, hay and agricultural fields, and transmission line right-of-ways (*SARA*, 2016). These habitats were not observed within the Project Site or PDA; and
- The three species included in the Bat Hibernaculum are listed as Endangered under *SARA* and *NBSAR*. These species are most susceptible to White Nose Syndrome, a fungus that kills bats by awakening them during their hibernation periods when there is no food and depletes their fat reserves. These bats over-winter in caves, abandoned mines or in buildings (NBDNRED, 2018c). Suitable habitat for Bat Hibernaculum was not observed within the PDA.

The preferred habitat descriptions for all wildlife SAR are presented in Table E2 in Appendix E.

No wildlife SAR or associated critical habitat were observed within the PDA during the field investigation.

#### **4.3.5.2 Wildlife Species of Conservation Concern (SOCC)**

The ACCDC listed 17 wildlife species as occurring within 5 km of the Project Site (excluding birds; bird SAR and SOCC are discussed in Section 4.3.5.3 and Section 4.3.5.4, respectively). Of the 17 of the wildlife species, 15 are considered SOCC under this assessment. Table 5 summarizes SOCC wildlife (excluding birds) and the potential interactions with the Project based on known habitats in the PDA.

None of the SOCC have a high potential for occurring within the PDA. The preferred habitat descriptions for all wildlife SOCC are presented in Table E2 in Appendix E.



**Table 5 Wildlife Species of Conservation Concern Recorded within 5 km of the Project Site**

Common Name	Scientific Name	S-Rank	NBDNRED General Status	Nesting Habitat	Probability of Occurrence in PDA
Greenish Blue	<i>Plebejus saepiolus</i>	S1S2	Secure	Bogs, roadsides, stream edges, open fields, meadows, open forests.	Low
Banded Hairstreak	<i>Satyrium calanus</i>	S2	Sensitive	Forest areas and neighboring open edges and fields, perched on low shrubs and tree branches.	Low
Henry's Elfin	<i>Callophrys henrici</i>	S2S3	Secure	Edges and openings in barrens and near pine or pine-oak woodland.	Low
Indian Skipper	<i>Hesperia sassacus</i>	S3	Secure	Old brushy fields, pastures, clearings, headlands.	Low
Two-spotted Skipper	<i>Euphyes bimacula</i>	S3	Secure	Marshes, bogs, wet streamsides, and wet sedge meadows.	Low
Acadian Hairstreak	<i>Satyrium acadica</i>	S3	Secure	Willow-lined streams, marshes, moist woodlands.	Low
Hoary Elfin	<i>Callophrys polios</i>	S3	Secure	Open sunny glades in barrens, rocky ridges, dunes, forest edges, adjacent to bogs.	Low

**Table 5 Wildlife Species of Conservation Concern Recorded within 5 km of the Project Site**

Common Name	Scientific Name	S-Rank	NBDNRED General Status	Nesting Habitat	Probability of Occurrence in PDA
Aphrodite Fritillary	<i>Speyeria aphrodite</i>	S3	Secure	Moist prairies, openings in barrens, brushland, dry fields, open oak woods, bogs.	Low
Meadow Fritillary	<i>Boloria bellona</i>	S3	Secure	Usually wet places marshes, wet aspen groves.	Low
Satyr Comma	<i>Polygonia satyrus</i>	S3	Secure	Valley bottoms, along streams, marshes, openings in riparian woods, fields and edges near moist woods.	Low
Compton Tortoiseshell	<i>Nymphalis l-album</i>	S3	Secure	Upland deciduous or coniferous forests.	Low
Cobra Clubtail	<i>Gomphus vastus</i>	S3	Sensitive	Large rivers with fast currents, and lake shores where there are alternating stretches of sand and gravel.	Low
Tidewater Mucket	<i>Leptodea ochracea</i>	S3	Secure	New Brunswick waterbodies.	Low

**Table 5 Wildlife Species of Conservation Concern Recorded within 5 km of the Project Site**

Common Name	Scientific Name	S-Rank	NBDNRED General Status	Nesting Habitat	Probability of Occurrence in PDA
Striped Hairstreak	<i>Satyrium liparops</i>	S3S4	Secure	Deciduous forest openings and edges.	Low
Eastern Tailed Blue	<i>Cupido comyntas</i>	S3S4	Secure	Many open, sunny places including weedy areas and disturbed habitats.	Moderate

#### 4.3.5.3 Bird Species at Risk (SAR)

The ACCDC report lists 33 bird species that have been recorded within 5 km of the Project Site. Eight (8) of the 33 bird species are considered SAR, including: Wood Thrush (*Hylocichla mustelina*), Eastern Whip-Poor-Will (*Antrastomus vociferous*), Bank Swallow (*Riparia riparia*), Barn Swallow (*Hirundo rustica*), Canada Warbler (*Wilsonia canadensis*), Bobolink (*Dolichonyx oryzivorus*), Olive-sided Flycatcher (*Contopus cooperi*), and Common Nighthawk (*Chordeiles minor*). Table 6 summarizes SAR birds, their legal protection, and the potential interactions with the Project based on known habitats in the PDA.

None of the bird SAR have a high probability to utilize the Project Site for breeding habitat. The preferred habitat descriptions for all wildlife SAR are presented in E2 in Appendix E.

The ACCDC listed the Bald Eagle (*Haliaeetus leucocphalus*) as a location sensitive species that has a known nesting location within 5 km of the Project Site. The Bald Eagle is considered regionally endangered under the *NBSAR*. These birds will often establish a nest in the top of a tall tree or near water. Concern over exploitation of the Bald Eagle prevents NBDNRED from publishing the precise location of their nests. Although Bald Eagles can be found throughout New Brunswick, they are more common in southern New Brunswick and near open water (All About Birds, 2020). No nests were encountered but Bald Eagles were observed during the field survey in July, 2020. The Landfill presents a foraging opportunity that regularly attracts a number of Bald Eagles.

#### 4.3.5.4 Bird Species of Conservation Concern (SOCC)

The remaining 25 bird species recorded by ACCDC are considered SOCC; however, none of the SOCC have a high potential for nesting within the PDA. Table 7 summarizes SOCC birds and the potential interactions with the Project based on known habitats in the PDA. The preferred habitat descriptions for all wildlife SOCC are presented in Table E2 in Appendix E.

**Table 6 Bird SAR within 5 km of the Project Site + Potential Use of PDA**

Common Name	Scientific Name	COSEWIC <sup>1</sup>	SARA <sup>2</sup>	Prov Legal Prot <sup>3</sup>	S-Rank <sup>4</sup>	NBDNRED General Status <sup>5</sup>	Nesting Habitat	Probability of Nesting in PDA
Wood Thrush	<i>Hylocichla mustelina</i>	Threatened	Threatened	Threatened	S1S2B,S1S2M	May be at Risk	Mature deciduous and mixed forests.	Low
Eastern Whip-Poor-Will	<i>Antrostomus vociferous</i>	Threatened	Threatened	Threatened	S2B,S2M	Sensitive	Mixed forest with open understories.	Low
Barn Swallow	<i>Hirundo rustica</i>	Threatened	Threatened	Threatened	S2B, S2M	Sensitive	Artificial structures, bridges, barns, and other outbuildings.	Low
Bank Swallow	<i>Riparia riparia</i>	Threatened	Threatened	-	S2S3B,S2S3M	Sensitive	Riverbanks, road cuts, lake and ocean bluffs.	Low
Bobolink	<i>Dolichonyx oryzivorus</i>	Threatened	Threatened	Threatened	S3B, S3M	Sensitive	Hayfields and pastures.	Low
Canada Warbler	<i>Wilsonia canadensis</i>	Threatened	Threatened	Threatened	S3B, S3M	At Risk	Moist dense thickets near wetlands.	Low
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Special Concern	Threatened	Threatened	S3B,S3B	At Risk	Boreal forests or meadows, rivers and streams.	Low
Common Nighthawk	<i>Chordeiles minor</i>	Special Concern	Threatened	Threatened	S3B, S4M	At Risk	Open area habitats, abandoned agriculture areas, disturbed areas, bogs, rock outcrops and gravel roofs.	Low
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Not at Risk	-	Endangered	S3B	At Risk	Nests in forests near water bodies and avoids heavily developed areas.	Low

**Notes:**

1. Committee on the Status of Endangered Wildlife in Canada;
2. Species at Risk Act;
3. Provincial (New Brunswick) Legal Protection;
4. Sub-national (provincial) rank;
5. NBDNRED general status of Wildlife Species.

**Table 7 Bird SOCC Recorded within 5 km of the Project Site + Potential Use of PDA**

Common Name	Scientific Name	S-Rank	NBDNRED General Status	Nesting Habitat	Probability of Nesting in PDA
Wilson's Phalarope	<i>Phalaropus tricolor</i>	S1B, S1M	Sensitive	A shorebird that prefers wetland, upland shrubby areas, marshes and roadside ditches.	Low
Purple Martin	<i>Progne subis</i>	S1B, S1M	May be at Risk	Forest edges and rivers or nest boxes.	Low
Horned Lark	<i>Eremophila alpestris</i>	S1B, S4N, S5M	May be at Risk	Grazed pastures, mowed expanses with short, sparse vegetation.	Low
Green Heron	<i>Butorides virescens</i>	S1S2B, S1S2M	Sensitive	Coastal and inland wetlands.	Low
Willow Flycatcher	<i>Empidonax traillii</i>	S1S2B, S1S2M	Sensitive	Shrub thickets, especially willows, near standing water or along streams.	Low
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	S1S2B, S1S2M	May be at Risk	Open areas near water.	Low
Northern Mockingbird	<i>Mimus polyglottos</i>	S2B, S2M	Sensitive	Urban/suburban, farms, roadsides, shrub thickets Favors areas with dense low shrubs and open ground.	Low

**Table 7 Bird SOCC Recorded within 5 km of the Project Site + Potential Use of PDA**

Common Name	Scientific Name	S-Rank	NBDNRED General Status	Nesting Habitat	Probability of Nesting in PDA
Solitary Sandpiper	<i>Tringa solitaria</i>	S2B,S5M	Secure	Freshwater lakes, ponds and creeks of muskeg bogs and spruce trees.	Low
Glaucous Gull	<i>Larus hyperboreus</i>	S2N, S2M	Secure	Sea cliffs and coastlines.	Low
Northern Shoveler	<i>Petrochelidon pyrrhonota</i>	S2S3B, S2S3M	Secure	Shallow wetlands with submerged vegetation in saltmarshes, estuaries, lakes and flooded fields.	Low
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	S2S3B, S2S3M	Sensitive	Open broadleaf or mixed woodlands.	Low
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	S2S3B,S2S3M	Sensitive	Bridges, farms, cliffs, and river bluffs.	Low
American Golden-Plover	<i>Pluvialis dominica</i>	S2S3M	Sensitive	Low vegetation on rocky slopes.	Low
Lapland Longspur	<i>Calcarius lapponicus</i>	S2S3N, SUM	Sensitive	Open, treeless habitat.	Low

**Table 7 Bird SOCC Recorded within 5 km of the Project Site + Potential Use of PDA**

Common Name	Scientific Name	S-Rank	NBDNRED General Status	Nesting Habitat	Probability of Nesting in PDA
Virginia Rail	<i>Rallus limicola</i>	S3B, S3M	Sensitive	Shallow freshwater wetlands.	Low
Killdeer	<i>Charadrius vociferus</i>	S3B,S3M	Sensitive	Open habitat, pastures, plowed fields, large lawns, mudflats, lake shores, coastal estuaries.	Low
Black-Billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	S3B,S3M	Secure	Deciduous thickets and shrub thickets on the edges of woodland or marshes. Also along shrubby edges of second growth of mixed forest.	Low
Warbling Vireo	<i>Vireo gilvus</i>	S3B, S3M	Secure	Deciduous woodlands.	Low
Indigo Bunting	<i>Passerina cyanea</i>	S3B, S3M	Secure	Brushy areas along forest edges.	Low



**Table 7 Bird SOCC Recorded within 5 km of the Project Site + Potential Use of PDA**

Common Name	Scientific Name	S-Rank	NBDNRED General Status	Nesting Habitat	Probability of Nesting in PDA
Brown-Headed Cowbird	<i>Molothrus ater</i>	S3B,S3M	May be at Risk	Grasslands with low and scattered trees, forest edges, shrub thickets, fields, pastures, orchards, and residential areas.	Low
Baltimore Oriole	<i>Icterus galbula</i>	S3B, S3M	Secure	Leafy deciduous trees in open woodland or forest edges.	Low
Eastern Kingbird	<i>Tyrannus tyrannus</i>	S3S4B, S3S4M	Sensitive	Fields with scattered shrubs and trees, in orchards, and along forest edges.	Low
Spotted Sandpiper	<i>Actitis macularius</i>	S3S4B, S5M	Secure	Freshwater lakes, ponds and creeks.	Low
Wilson's Snipe	<i>Gallinago delicata</i>	S3S4B, S5M	Secure	Wetland or marsh areas and long rivers and ponds.	Low

## 4.4 Land Use and Economy

In order to assess any influence of the Project on land use and economy, three VECs have been identified and are described below:

- *Existing Land Use* describes the current residential, industrial, and commercial arrangements within proximity to the Project, as well as, the land use compatibility of the Project;
- *Visual Landscape* is the impact to the local vistas within proximity to the Project, from various viewpoints accessible to the general public; and
- *Local Economy and Local Socio-economic Structure* identifies the economic background of the regional area.

### 4.4.1 Existing Land Use

#### 4.4.1.1 Residential Land Use

Within the Assessment Area, the neighbouring residential properties are generally located to the north/northwest (Lincoln) and to the west (Doak Settlement; Figure 1). The closest residential property is located approximately 1.5 km east of the Project Site (Garden Grove Street in Lincoln). The Assessment Area is situated between two urban communities - the City of Fredericton and the Town of Oromocto, and the nearby arterial roadways (Route 7 and Trans-Canada Highway 2) provide a direct transportation network between the centres.

A list of all adjoining property uses is presented in Table E3 in Appendix E, per SNB Registry and Mapping of Real Property Information (SNB Planet, 2020).

#### 4.4.1.2 Commercial and Industrial Land Use

The Treasury Board of Canada Secretariat maintains an inventory of federal contaminated sites. This inventory was reviewed, in conjunction with the SNB Planet, to determine the current and historical extent of commercial and/or industrial sites within and adjoining the Project Site. Neither the Project Site nor any adjoining properties are known to be contaminated. The Land Registry does have records of contamination remediation for nearby properties on PID 75027573 and PID 75027573 (SNB Planet, 2020). These properties are associated with the Arcgeobac (petroleum soil treatment facility), located west of the Project Site (Figure 2). The Federal Contaminated Sites mapping, relative to the Project Site, is included in Appendix E.

The FRSW Landfill is the central feature within the Project Site. The Landfill manages municipal solid waste, recycling, compost, household hazardous waste, and construction and demolition debris for the Greater Fredericton Region. Since opening in 1986, the Landfill has operated as an engineered sanitary landfill with environmental compliance programs in accordance with a NBDELG Approval to Operate. The Project is required to support future landfill operations and to maximize the longevity of the Landfill.

#### **4.4.2 Visual Landscape**

The Project Site is located within the City of Fredericton municipal limits, and is currently considered within a Heavy Industrial (HI) zone. The Project Site is saddled by major arterial roadways including: the Route 7 ROW, the Route 7/Trans-Canada Highway 2 interchange and Trans-Canada Highway 2 ROW; all experience high traffic volumes, especially during commuter intervals. The Project Site and PDA are currently accessed via Alison Boulevard (Figure 1).

The Landfill entrance and western portions of the Project Site are visible from Alison Boulevard (Figure G-1, Appendix G). When travelling by vehicle on Route 7 (north and south bound), a vegetated berm along the eastern boundary of the Project Site currently obstructs the view of the PDA. The Landfill is not readily visible during most periods of the year from vehicles traffic the Trans-Canada Route 2 ROW (Figure G-2 and Figure G-3, Appendix G).

It is not known whether the Landfill is currently visible from any nearby residential dwelling(s) and/or commercial enterprise(s).

#### **4.4.3 Local Economy and Local Socio-economic Structure**

Accessible information from the City of Fredericton and Canada Census records was reviewed for the purposes of identifying indicators of the local economy with respect to the Project.

According to 2016 Canada Census data, the City of Fredericton has a population of 58,220 people, approximately 7.5% of the provincial population. The median household income in 2015 was \$60,592 and the average annual household income in 2015 was \$76,366 (STATCan, 2020). In 2018, the City of Fredericton has a tax rate range of 1.4211% (inner city) and 1.0658% (outer city; NBDELG, 2020).

The RSC 11 and the Landfill provide service to the Greater Fredericton with a total combined population of these areas of 129,484 (RSC 11, 2018). Although the funding model for the RSC 11 is based on each communities' tax base and population, the Landfill is funded solely through the tipping fees. This Project is funded by the Landfill's general operation budget.

## **5.0 SUMMARY OF POTENTIAL EFFECTS**

### **5.1 Atmospheric Environment Potential Effects**

The Project is not expected to affect climate conditions, air quality, sound quality, or ambient odour emissions beyond what is currently observed on the Project Site. The Project involves general landfilling practices within the existing footprint of the Landfill facility. An increase in airborne contaminants within the PDA, Project Site and/or Assessment Area is not expected and will not exceed regulatory limits as outlined in the current Approval to Operate (I-9667, valid to March 18, 2022; Appendix D) and/or the New Brunswick Air Quality Objectives.

#### **5.1.1 Climate Conditions Potential Effects**

It is not expected that the Project will affect climate conditions such as ambient temperatures, precipitation amounts and wind patterns; therefore, climate conditions are not discussed further in this EIA.

#### **5.1.2 Air Quality Potential Effects**

There are a number of potential adverse effects to ambient air quality during the Project. There will be a short-term increase of particulate matter and dust within the PDA during ground disturbing activities such as the removal/installation of cell cover material and the placement of cell liner material. Dispersed garbage debris is also expected at any landfill facility; however, the Landfill implements a bailing technique to reduce the release of such debris into the surrounding environment. The bailing technique will be used throughout the Project, as applicable.

It is anticipated that there will be gaseous emissions within the PDA from Project machinery and equipment (*i.e.*, excavator, crusher, dump trucks, garbage trucks, personnel trucks, *etc.*).

All of the aforementioned effects are currently observed within the PDA and Project Site as part of on-going Landfill operations and approved in the current Approval to Operate (I-9667, valid to March 18, 2022; Appendix D). It is not anticipated that there will be a significant increase to adverse impacts on air quality as a result of the Project activities.

#### **5.1.3 Sound Quality Potential Effects**

Sound production within the PDA is expected from operating Project machinery and equipment (*i.e.*, excavator, crusher, dump trucks, garbage trucks, personnel trucks, bailer, *etc.*). However, it is not anticipated that there will be significant increase to sound quality impacts as a result of the Project beyond what is currently observed from the operating activities at the Landfill and approved in the current Approval to Operate (I-9667, valid to March 18, 2022; Appendix D).

#### **5.1.4 Odorous Emissions Potential Effects**

The LGUS currently releases the emissions of spent methane gas collected at the Landfill. The Project is not expected to produce additional odorous gases that exceed the capabilities of the LGUS. Thus, odorous emissions are not discussed further in this EIA.

### **5.2 Groundwater Resources Potential Effects**

Potential effects to regional groundwater resources as a result of Project activities are not expected. Some localized changes in topography within the PDA as a result of the proposed Project are expected. However, overland surface water flow and overall drainage patterns are expected to remain similar to pre-Project conditions (*i.e.*, utilize existing underdrains, leachate holding pond, stormwater infrastructure, and the Sedimentation Pond).

#### **5.2.1 Drainage and Topography Potential Effects**

Potential effects to regional topography as a result of Project activities are not expected. Some localized changes in topography within the PDA are expected but are restricted to the vertical height increase of the Landfill (*i.e.*, from 59.0 metres elevation to 88.0 metres elevation). The side slopes of 4:1 will be maintained and all new, capped disposal cells will be integrated into the existing Landfill face.

The overall drainage patterns and volumes will remain consistent or similar to existing conditions (*i.e.*, flow patterns continuing to be directed toward existing stormwater infrastructure). The drainage patterns are not expected to interact with groundwater resources within the Assessment Area; and any failure of the existing infrastructure (*i.e.*, Sedimentation Pond or Leachate Pond) is currently considered within the NBDELG Approval to Operate (I-9667, valid to March 18, 2022; Appendix D) and the EMP (Appendix C). Drainage and topography are not discussed further in this EIA.

#### **5.2.2 Geology and Hydrogeology Potential Effects**

Potential effects to surficial geology as a result of Project activities include ground disturbance, excavation and the placement of fill atop an existing landfill site. These activities in the PDA are not expected to interact with groundwater resources, and are therefore not discussed further in this EIA.

#### **5.2.3 Groundwater Quality and Quantity Potential Effects**

Potential effects to groundwater quality as a result of Project activities include the potential for contaminants to be released through spills of fuels and lubricants from on-site equipment, and/or the release of leachate, with subsequent infiltration into a groundwater resource. The Landfill implements petroleum and chemical spill/leak response plans and leachate release response plans in the established EMP (Appendix C), and per the Approval to Operate (I-9667, valid to March 18, 2022; Appendix D). The Project is limited to on-going activities currently undertaken

within the existing footprint of the Landfill; no new or unique activities outside the scope of these documents will be undertaken as part of the Project.

Routine compliance monitoring of surface, groundwater and select treatment system conditions is completed by the FRSW, per the Approval Operate (I-9667, valid to March 18, 2022; Appendix D). The focus of the compliance monitoring program is to assess the potential environmental impact of the Landfill on the groundwater and surface water systems in the vicinity of the Landfill.

Based on the mitigation currently implemented by the Landfill (*i.e.*, EMP), and the on-going compliance monitoring of groundwater conditions within the Project, effects (*i.e.*, any changes in private groundwater quality and/or quantity) within the Assessment Area are not expected. Therefore, groundwater quality and quantity is not discussed further in this EIA.

### **5.3 Ecological Environment Potential Effects**

The Project is not expected to affect the terrestrial habitat, ESAs, wetlands and watercourses, flora, or wildlife beyond what is currently observed on the Project Site. The Project involves general landfilling practices within the existing footprint of the Landfill facility and no new or unique activities will be undertaken as part of the Project.

#### **5.3.1 Terrestrial Habitat Potential Effects**

No new ground disturbance or new operational activities are proposed as part of the Project. The Project involves the construction of new landfill disposal cells atop the existing footprint. No further discussion on terrestrial habitat is presented in this EIA.

#### **5.3.2 Ecological Significant Areas (ESAs) Potential Effects**

The Project is not expected to interact with any ESAs or MAs. Although, the Project Site is encompassed within the Lower St. John River (Sheffield-Jemseg) ESA, it does not provide the breeding habitat identified as the IBA; therefore, is not discussed further in this EIA.

#### **5.3.3 Wetlands and Watercourses Potential Effects**

No new ground disturbance or new operational activities are proposed as part of the Project. The Project involves the construction of new landfill disposal cells atop the existing footprint and no regulated wetlands or watercourses are present within the PDA. The existing Landfill infrastructure (*i.e.*, stormwater ditching, Sedimentation Pond, leachate underdrain system, Leachate Pond, *etc.*) currently mitigate against the release of contaminants into this habitat; therefore, it is unlikely there will be any adverse effects on wetlands or watercourses as a result of the Project. An EMP is currently implemented for the Landfill and includes emergency response procedures to protect the surrounding environment (Appendix C). No further discussion on wetlands and watercourses is presented in this EIA.

Any potential effects to wetlands and watercourses with respect to the established Landfill footprint and landfilling activities were assumed to be identified and discussed in the original EIA document (1984) and are considered outside the scope of this assessment.

#### 5.3.4 Flora Potential Effects

No flora SAR were identified within the Assessment Area. Therefore, it is not anticipated that there will be any adverse effects to flora SAR populations as a result of this Project. Flora SAR are not discussed further in this EIA.

The ACCDC database identified two flora SOCC that occur within the Assessment Area; however, the preferred habitat is not present in the PDA. Flora SOCC are not discussed further in this EIA.

Any potential for the introduction of invasive plant species to the Project Site via construction equipment, machinery and/or workers is considered outside the scope of this assessment as these are not considered new Project-related activities as they currently occur at the Landfill.

#### 5.3.5 Wildlife and Bird Habitat Potential Effects

The identified potential effects to wildlife and bird habitat as a result of the Project include:

- Vegetation clearing will take place within the proposed PDA. This vegetation community is limited to highway grade hydro-seed on capped landfill cells. Wildlife will not be able to utilize this area during the Project or expected lifetime of the Landfill. The affected habitat is not considered to be of high value for wildlife;
- Noise from Project activities may disrupt wildlife and birds; however, this is not considered new Project-related activity as heavy equipment is currently utilized within the PDA and Project Site;
- Motor vehicle traffic will occur during the Project and vehicular collisions may cause injury or death to involved wildlife and birds. This is not considered new Project-related activity as vehicle traffic is currently observed within the PDA and Project Site;
- There is a possibility of human interaction with wildlife as a result of personnel within the Project Site. In addition, there is a possibility of wildlife attraction to waste, garbage and stockpiled material stored on site. This is not considered new Project-related activity as human presence is currently observed within the PDA and Project Site;
- There is low potential for migratory birds to utilize the habitat within the PDA due to the frequent ground disturbance and human presence. The Project is unlikely to alter or destroy migratory bird habitat as described in *MBCA*, with the exception of the following:
  - Attraction to cleared or stockpile areas may result in an increase in bird injuries or deaths, and/or destruction of nests. This is not considered new Project-related activities as stockpiles are currently observed within the PDA and Project Site.

- Use of artificial light during nighttime operations may attract bird species. In general, Project activities will be limited to daylight hours. This is not considered new Project-related activity as artificial lights are currently observed within the PDA and Project Site.
- Increasing the height of the Landfill may influence the foraging bird population to fly at a higher elevation than the currently observed conditions. The change in elevation (*i.e.*, 30 metres) is considered negligible and is not expected to impact the accessibility of the Project Site or migratory patterns of any bird species.

Although Bald Eagles (a bird SAR) were identified during the field investigation on the Project Site, no Bald Eagle nests were observed, nor is any available nesting habitat available within the PDA. Suitable nesting habitat is not limiting in surrounding areas.

## **5.4 Land Use and Economy**

### **5.4.1 Residential Land Use**

Potential effects to residential land use are generally limited to the changes in the visual landscape of the Project Site. It is not known whether the Landfill is currently visible from any nearby residential dwellings. Based on the distance between the Landfill and existing developments, and the future landscape projections presented herein (Appendix G), it is not expected that any new viewpoints will arise from residential communities as a result of the Project. Potential effects to visual landscape are discussed further in Section 5.4.3.

The additional storage capacity of the Landfill will not increase traffic type or volume along the established hauling routes (Alison Boulevard). Similar traffic volumes will be observed as per the current conditions.

Operational activities required for landfilling (*i.e.*, heavy equipment use, construction sequencing, garbage disposal/bailing, noise and odours, *etc.*), are currently undertaken at the Landfill and no new activities/impacts to residential dwellings are expected as a result of the Project. Emergency and spill response procedures are in place as outlined in the established EMP (Appendix C). As such, potential effects to residential land use is not discussed further in this EIA.

### **5.4.2 Commercial and Industrial Land Use**

Any effects to local commercial business within the Assessment Area are expected to be similar to the effects presented in Section 5.4.1.

The Project is required to support future landfill operations and to maximize the longevity of the Landfill and is expected to have a positive impact on the Landfill by extending the expected lifetime by up to 17 years.



Emergency and spill response procedures are in place as outlined in the established EMP (Appendix C). Potential effects to commercial and industrial land use are not discussed further in this EIA.

### 5.4.3 Visual Landscape

The southwestern portion of the PDA will be visible from the main Landfill entrance at Alison Boulevard (Figure G-1, Appendix G; this figure excludes the on-site administration buildings). The existing Project Site and on-going Landfill operations/traffic are currently observed from this viewpoint. It is not expected that the PDA will be viewed from other locations along Alison Boulevard (Figure G-4 and Figure G-5, Appendix G).

The only anticipated Project-related change in viewscape for vehicle traffic along the Trans-Canada Highway 2 ROW is at the Route 7 eastbound lane overpass, located at approximately 45.871956°, -66.595999° (Figure G-2, Figure G-3 and Figure G-5, Appendix G). Currently, the Landfill is not visible from this location. Following the completion of the Project, the uppermost 5 metres of the PDA will be observable from this locale (Figure G-5, Appendix G).

The existing vegetated berm will be maintained for the duration of the Project to limit the view of the PDA and Landfill by commuter traffic along Route 7 (Figure G-6, Appendix G).

### 5.4.4 Local Economy and Local Socio-economic Structure

The Project is expected to extend the lifetime of the Landfill by up to 17 years, which will provide a secure and consistent municipal waste disposal site for the Greater Fredericton Region until approximately 2053. It is expected that raising the height of the existing containment cells from 59.0 metres to 88.0 metres will result in a reduction of construction and operational costs/uncertainties as the Landfill nears the end of its expected lifetime. Extending the lifetime of the existing Landfill ultimately would benefit landfill users (tipping fee rate payers), including the municipalities and local service districts included in the RSC 11 jurisdiction, when compared to the possible expenditures of finding an alternative waste disposal site or establishing a new landfill.

No impacts to local contractors are expected as a result of the Project. Construction, operation and landfilling activities will remain as per the existing conditions and the Landfill may continue to use a public tendering process to construct their capital projects, such as the new disposal cells.

The Project Site is an active landfill site and as such the proposed Project will occur in an area that is considered compatible with other land uses in the area (*i.e.*, zoned HI). The on-going implementation of the mitigation measures outlined in the EMP (Appendix C) will minimize adverse impacts on local economy and local socio-economic structure, and therefore, the interaction of the Project on this VEC is considered to be non-significant.

## **6.0 SUMMARY OF PROPOSED MITIGATION**

The potential effects and proposed mitigation measures to minimize the potential adverse effects to the environment during the Project are summarized in Table 8. An EMP has been established for the on-going operations of the Landfill and is referenced below when applicable (Appendix C).

**Table 8 Summary of Proposed Mitigation Measures**

<b>Project Component</b>	<b>Summary of Potential Interaction</b>	<b>Mitigation Measures</b>
<b>Air Quality</b>	Potential for particulate matter and dust.	<p>Dust suppressants may be used during periods of dry weather;</p> <p>Dry materials/stockpiles may be covered or windrowed to prevent blowing dust or debris. Similarly, dusty material may be transported in covered haulage vehicles;</p> <p>Dust generating activities will be limited during periods of dry or windy conditions; and</p> <p>Wind prone areas will be stabilized in a timely manner.</p>
	Potential for gaseous emissions from equipment and truck traffic.	<p>Any non-essential internal combustion engines will be shut off when not in use, and heavy equipment will not remain idling for periods exceeding 15 continuous minutes as a best management practice; and</p> <p>Equipment will be maintained according to emission standards and in good working order.</p>
<b>Sound Quality</b>	Noise levels and vibration from equipment and truck traffic.	<p>Equipment will be maintained according to emission standards and in good working order;</p> <p>Equipment will be muffled, when feasible;</p> <p>A vegetated buffer may be maintained around the Project Site to reduce sound impacts to the surrounding receptors; and</p> <p>Generally, on-site activities will be limited to day-time hours (<i>i.e.</i>, 12 hours per day).</p>

**Table 8 Summary of Proposed Mitigation Measures**

Project Component	Summary of Potential Interaction	Mitigation Measures
<b>Wildlife and Birds</b>	<p>Vegetation clearing will alter/destroy habitat within the PDA;</p> <p>Noise from Project activities may disrupt wildlife and birds;</p> <p>Possibility of human interaction as a result of personnel within the Project Site, possible attraction to waste/garbage stored on site; and</p> <p>Attraction to cleared/stockpile areas may result in an increase in bird injuries and/or deaths or destruction of nests.</p>	<p>Nearby wildlife will likely be deterred by the noise on the Project Site during Project activities and more suitable habitat types are not limiting on adjoining properties;</p> <p>Equipment will be maintained in good working order;</p> <p>Equipment will be muffled, if feasible;</p> <p>A vegetated buffer will be maintained around the PDA to reduce sound impacts to the surrounding receptors;</p> <p>If a nesting bird species is encountered, contact with and disturbance of the species and its habitat will be avoided; and</p> <p>An appropriate vegetated buffer will be established around any nests encountered to protect them from disturbance and work in that area will be avoided until after the birds have fledged or vacated.</p>
<b>Land Use</b>	<p>Potential for contaminants to be released into adjoining properties through the accidental release of fuels and lubricants from construction equipment.</p>	<p>No new chemical or petroleum storage will occur within 30 metres of a regulated area (<i>i.e.</i>, wetland, watercourses, <i>etc.</i>);</p> <p>Equipment will be kept in good working order; and</p> <p>Emergency and spill response procedures are in place as outlined in the EMP (Appendix C).</p>

**Table 8 Summary of Proposed Mitigation Measures**

<b>Project Component</b>	<b>Summary of Potential Interaction</b>	<b>Mitigation Measures</b>
<b>Land Use</b>	Potential for the degradation of surface water and adjoining properties via the failure of erosion and sediment control structures.	<p>Erosion and sediment control (ESC) structures will be properly installed around the work area prior to commencement of any on-site activities, as applicable. All structures will be inspected regularly to ensure that they are functioning as intended;</p> <p>At the first evidence that runoff of sediment is starting to occur, Project work will temporarily cease. All siltation prevention devices shall be inspected and monitored. Any necessary repairs will be made such that they accomplish their intended function prior to work commencing;</p> <p>Once the Project work is complete, all exposed, erodible soil will be permanently stabilized against erosion with landfill cover; and</p> <p>Existing vegetation will be retained whenever possible.</p>

**Table 8 Summary of Proposed Mitigation Measures**

Project Component	Summary of Potential Interaction	Mitigation Measures
	Potential change in visual landscape from commuter ROWs ( <i>i.e.</i> , Alison Boulevard and Trans-Canada Highway 2).	<p>A vegetated berm will be maintained around the Landfill property boundary;</p> <p>Vegetation clearing will be kept to a minimum;</p> <p>Bailing techniques for municipal solid waste will continue to be used, when feasible; and</p> <p>In-active or full disposal cells will be sequentially closed with final cover, stabilized and hydro-seeded.</p>
<b>Accidents, Malfunctions &amp; Unplanned Events</b>		
<b>Vehicle Mishaps</b>	Potential for injury, death or destruction of infrastructure from vehicle accidents within the Project Site.	<p>Vehicles will travel at appropriate speeds within the Project Site;</p> <p>Vehicles will kept in good working order;</p> <p>Restricted access protocols will be implemented as outlined in the EMP (Appendix C); and</p> <p>Emergency and spill response procedures are in place as outlined in the EMP (Appendix C).</p>

**Table 8 Summary of Proposed Mitigation Measures**

<b>Project Component</b>	<b>Summary of Potential Interaction</b>	<b>Mitigation Measures</b>
<b>Fire</b>	Potential for destruction of infrastructure, habitat and wildlife death from fire.	<p>No new chemical or petroleum storage will occur within 30 metres of an environmental sensitive area (<i>i.e.</i>, wetland, watercourse);</p> <p>Equipment will be kept in good working order; and</p> <p>Emergency procedures are in place and Landfill personnel are trained in emergency response, as outlined in the EMP (Appendix C).</p>
<b>Accidental Release of Contaminants</b>	Potential for contaminants to be released into surrounding habitat through the accidental release of fuels and lubricants from equipment.	<p>No new chemical or petroleum storage will occur within 30 metres of an environmental sensitive area (<i>i.e.</i>, wetland, watercourse);</p> <p>Equipment will be kept in good working order; and</p> <p>Emergency procedures are in place and Landfill personnel are trained in emergency response, as outlined in the EMP (Appendix C).</p>
<b>Failure of Erosion Control Structures</b>	Potential for sediment loading in habitats from ground disturbance.	<p>Appropriate ESC structures will be properly installed around work areas prior to commencement of Project activities, as applicable. All structures will be inspected regularly to ensure that they are functioning as intended;</p> <p>At the first evidence that runoff of sediment is starting to occur, Project work will temporarily cease. All siltation prevention devices shall be inspected and monitored; any necessary repairs will be made such that</p>

**Table 8 Summary of Proposed Mitigation Measures**

Project Component	Summary of Potential Interaction	Mitigation Measures
		<p>they accomplish their intended function prior to work commencing;</p> <p>On-site water may be treated in a sedimentation pond, as required, prior to discharge into the surrounding environment;</p> <p>Once the Project work is complete, all exposed, erodible soil will be permanently stabilized against erosion;</p> <p>Existing vegetation will be retained whenever possible and tree/vegetation clearing will be kept to a minimum; and</p> <p>Emergency procedures are in place and Landfill personnel are trained in emergency response, as outlined in the EMP (Appendix C).</p>



## 7.0 PUBLIC INVOLVEMENT

The public involvement standards for registered projects is outlined in the Guide to Environmental Impact Assessment in New Brunswick (January, 2018).

A detailed public consultation report will be prepared and submitted by RSC 11 under separate cover once the EIA is registered. It is expected that public involvement will include, at a minimum:

- A published notice of registration in the local newspaper (the Daily Gleaner);
- A Project information letter to Members of the Legislative Assembly (MLAs) for the Regional Service Commission 11 catchment area;
- A Project information letter to local governments including the City of Fredericton and the Town of Oromocto;
- A Project information letter to nearby First Nations communities, the Wolastoqey Nation in New Brunswick, and the Aboriginal Affairs Secretariat;
- A notice of registration will be distributed (via registered mail) to nearby landowners of the Project Site;
- The Fredericton YFC International Airport (Fredericton Airport) will be consulted and provided with Project plans for comment on the potential for interaction between air traffic and the proposed vertical height increase of the Landfill; and
- The registration and supporting documents will be made available in the Region 5 (Fredericton) office of NBDELG and online at [https://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental\\_impactassessment.html](https://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment.html)

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## 9.0 STATEMENT OF LIMITATIONS

This report has been prepared for the sole benefit of the Regional Service Commission 11. Any other person or entity without the express written consent of GEMTEC Consulting Engineers and Scientists Limited and the Regional Service Commission 11 may not rely upon this report.

Any use that a third party makes of this report, or any reliance or decisions made based on it, is the responsibility of such third parties. GEMTEC Consulting Engineers and Scientists Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Some of the information presented in this report was provided through existing documents and interviews. Although attempts were made, whenever possible, to obtain a minimum of two confirmatory sources of information, in certain instances, GEMTEC Consulting Engineers and Scientists Limited has been required to assume that the information provided is accurate.

The conclusions presented represent the best judgment of the trained professional and technical staff based on current environmental standards and on the Project Site conditions observed by staff at the time the work was performed.

Should additional information become available, GEMTEC Consulting Engineers and Scientists Limited requests that this information be brought to our attention so that we may re-assess the conclusions presented herein.



## **APPENDIX A**

### NBDELG Project Description and Correspondence

May 6, 2020

File: 10115.69

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

Attention: Mr. Pierre Doucet, Project Manager

**Re: Project Description, Proposed Landfill Maximum Height Increase, Regional  
Service Commission 11, Fredericton Region Solid Waste Landfill, Fredericton, NB**

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GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by Regional Service Commission (RSC) 11 to prepare a project description for a proposed modification to the original Environmental Impact Assessment (EIA) at the Fredericton Region Solid Waste (FRSW) Landfill (herein referred to as “the Landfill”). The proposed modification (herein referred to as “the Project”) involves increasing the currently approved maximum height of the Landfill from 59.0 metres to 88.0 metres.

RSC 11 and GEMTEC personnel met with representatives of the New Brunswick Department of Environment and Local Government (NBDELG) on February 6, 2020 to discuss the proposed Project. NBDELG requested that GEMTEC on behalf of RSC 11 provide a description of the Project, so that a decision could be made on the need for an EIA registration or the need for certain field studies in support of an EIA registration, should one be required.

## **PROJECT DESCRIPTION**

### **Project Name**

Proposed Landfill Maximum Height Increase, Regional Service Commission 11, FRSW Landfill, Fredericton, New Brunswick.

### **Project Location**

The proposed Project is located at the FRSW Landfill located at 1775 Alison Boulevard in Fredericton, New Brunswick (Figure 1 in Attachment A).

## **Project Overview**

The proposed Project involves increasing the maximum height of the municipal solid waste containment cells (Figure 2, Attachment A) from the currently approved maximum height of 59.0 metres to 88.0 metres (Figure 3, Attachment A). As shown in Figure 3, the height increase will only be in certain areas in order to maintain a 4:1 slope. The proposed additional waste storage, at a proposed maximum height of 88 metres, will utilize the existing leachate collection system and leachate treatment system.

The Project will not involve an increase in the footprint of the Landfill cells, habitat destruction or vegetation removal. Additionally, the Project is not located within 30 metres of any watercourses or wetlands.

## **Need for the Project**

The Landfill comprises a number of solid waste containment cells as shown on Figure 2 in Attachment A. Currently, all cells are situated in the areas identified as B, D, and E. Areas A and C are designated for future development. A total of six of the eight existing waste containment cells are at the currently approved maximum elevation of 59.0 metres. The two active waste containment cells (cells E3 and E4) that are currently receiving waste are anticipated to reach the maximum elevation of 59.0 metres in June 2021. Ongoing growth of the Landfill has necessitated the development of additional containment cells and/or increasing the height of the waste to house the incoming municipal solid waste. Allowing for an increased height of waste at the Landfill will allow waste storage in the existing footprint of the landfill to be maximized; thereby, reducing environmental impacts by extending the life of the Landfill, and providing cost savings to the public.

## **Project Background**

The Landfill, which was established in 1986, services the greater Fredericton area. The boundaries of the Landfill Site, as shown in Figure 1, were developed based on the provincial requirements for municipal landfill locations and the minimum allowable setbacks from roadways.

Cell construction began in Area D in 1986 as a second generation landfill. The containment system in the original construction comprises a leachate collection system including a main header through the centre of the site with sub-headers throughout the various cells, forming a “herring bone” collection system.

The third generation landfill construction began in 2000 in the northern portion of Area D. This system comprises a composite liner system (90 mil high-density polyethylene (HDPE) geomembrane over re-compacted clayey till), with a comprehensive leachate collection system. Subsequently, the cells in Area B were constructed in the same manner.



Beginning in 2015, and as a means to maximize the currently approved waste elevation (59.0 metres), RSC 11 constructed new cells in Area D. These are referred to as the E cells. This procedure is commonly referred to as “piggy backing” and involves constructing a new solid waste containment cell on existing waste. The E cells include a clay liner, separation berms and a leachate collection system. As previously mentioned, it is anticipated that this area will be filled to capacity with municipal solid waste (to the currently approved waste elevation of 59.0 metres) by 2021.

As ongoing growth of the Landfill has necessitated the development of additional containment cells and/or increasing the height of the waste to house the incoming municipal solid waste, it has been determined by the RSC 11 that the best option moving forward is to increase the height of the existing containment cells and future containment cells from 59.0 m to 88.0 m, pending regulatory approval. The proposed additional waste storage, at a proposed maximum height of 88.0 m will utilize the existing leachate collection system and leachate treatment system.

The advantages increasing the maximum height of the landfill to 88.0 m include:

- Maximizing the use of the municipal solid waste contaminated cells and the existing footprint of the Landfill; thereby, extending the life of the Landfill;
- Maximizing the uses of the existing leachate collection system and leachate treatment system;
- Reducing capital and maintenance costs; and
- Providing cost savings to the public.

By increasing the maximum elevation from 59.0 m to 88.0 m, a total volume of 1,996,879 cubic metres (m<sup>3</sup>) of municipal solid waste could be added to the existing footprint of the Landfill. Approximately 114,000 m<sup>3</sup> of municipal solid waste into the Landfill annually; therefore, heightening the cells by increasing the approved maximum elevation to 88.0 m would allow approximately 17.5 years of municipal solid waste disposal.

It should be noted that municipal solid waste will continue to be disposed of in the current active containment cells (E3 and E4) until the maximum elevation has been met. Before placing municipal solid waste above the elevation of 59.0 m, the existing landfill cover in the applicable areas will be removed and will be completed in small sections while maintaining the maximum permanent landfill cover during the process to reduce leachate quantity.

### **Proposed Environmental Impact Assessment Requirements**

It is our understanding that this proposed height increase, which constitutes a modification to the original Landfill EIA, may require a provincial EIA under triggering Condition (m) of “Schedule A” of the *Environmental Impact Assessment Regulation (Regulation 87-83)* under the *New Brunswick Clean Environment Act*, which includes all waste disposal facilities or systems.

However, as the Project will be located within an area of existing development (i.e., within the existing footprint of the Landfill), it is GEMTEC's opinion that a reduced description of environmental features is appropriate for this project.

The assessment will be conducted in accordance with the NBDELG guidance document "A Guide to Environmental Impact Assessment in New Brunswick (January, 2018)" and the sector guideline document "Additional Information Requirement for Waste Disposal Facilities (July, 2004)" and will include a description of the socio-economic, biological and physical settings, and public engagement (including stakeholders, First Nations and potentially affected members of the public).

As the project area is located above the existing waste contaminated cells at the Landfill (increase in waste height from 59.0 m to 88.0 m) and will neither result in habitat destruction nor result in activities/conditions different than those currently occurring at the Landfill (e.g., noise levels and activity levels will be similar), it is GEMTEC's opinion that a desktop review of the existing environment would be sufficient for this Project EIA and the following field studies would not be required: a rare plant survey; a bird survey; watercourse and wetland delineation and an aquatic habitat assessment; an archeological assessment; and a noise or air quality assessment. These field studies are not deemed to be required based on the following reasons:

- The Project area is located above the existing municipal waste containment cells and will not result in an increased footprint of waste at the landfill; the Project will not result in habitat destruction or alteration; the Project is not located within 30 metres of any watercourses or wetlands; and the Project will not require any vegetation clearing. As no rare plant, bird, wildlife or aquatic habitat will be destroyed or disturbed; as the existing leachate collection system and leachate treatment system will be utilized, and as the on-going operations at the Landfill will be similar to those current occurring, rare plant, bird and aquatic environment surveys are not deemed to be required in support of the EIA registration.
- By increasing the height of the waste contaminant cells, noise levels and air quality are not expected to be significantly different than those currently observed at the landfill; therefore, noise monitoring or air quality testing is not deemed to be required in support of the EIA registration.
- As no new ground disturbance will be required for the project, an archeological field assessment is not deemed to be required in support of the EIA registration.

The existing environment would be presented through a desktop review of relevant currently available information, including but not limited to:

- Watercourse and wetland mapping;
- Data obtained from various wildlife and natural area databases for the proposed project area (e.g., Atlantic Canada Conservation Data Centre (ACCDC), Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Environment and Climate Change Canada (ECCC), and New Brunswick National Resources and Energy Development (NBNRED));
- Climate and atmospheric data by reviewing the NBDELG Annual New Brunswick Air Quality data and any published data from ECCC within proximity of the project area;
- Hydrogeological and hydrological information/reports to determine the potential impacts to natural hydrological budget, stratigraphy, groundwater elevation, flow directions, and water quality within the drainage area. The hydrological study will include the size of the drainage area, and annual precipitation data; and
- Land use mapping/land zoning information.

In addition to the desktop assessment of the existing environment, GEMTEC proposes to have an environmental biological complete a Site visit to confirm via cursory observation the existing conditions in the Project area including potential habitat types present in the immediate area, adjoining land uses, and environmental features. Routine compliance monitoring data of surface water and groundwater collected by GEMTEC on behalf of RSC 11 will be used to supplement the desktop review, where applicable.

Following submission of the EIA Registration document, GEMTEC will also submit a plan for carrying out the public notification component of the EIA. Following the public notification period (typically 30 days), a Public Notification Summary Report will be submitted to the NBDELG in accordance with the EIA guidelines. Following consultation with NBDELG, a public meeting will be scheduled, as required.

In addition to the proposed work presented above, a line-of-sight desktop assessment will also be completed to evaluate any potential effects of the proposed increased height of the landfill on aircraft landing and taking off from the Fredericton International Airport.

### **Proposed Project Schedule**

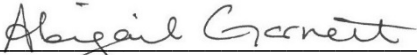
The proposed Project is scheduled to commence in June 2021, immediately following the exhaustion of the currently available waste disposal room in the two active cells (E3 and E4). The need to have the Project approved by prior to June 2021 is vital to ensuring the continued operation of the Landfill. As such, if any field studies are deemed to be required by NBDELG, following the review of this document, they would need to be completed in the 2020 field season. GEMTEC requests that this project description be reviewed and a decision regarding the required

studies in support of this EIA be determined by June 1, 2020, to allow for field studies to proceed, as required.

## **CLOSURE**

If you have any questions, please do not hesitate to contact the undersigned at your convenience.

Sincerely,

  
\_\_\_\_\_  
Abigail Garnett, M.Sc.Eng., P.Eng.  
Senior Environmental Engineer / Hydrogeologist

Attachment A  
Figures





**Legend**

- MONITORING WELL
- SURFACE WATER
- CELL BOUNDARY LINE
- CELL E1 - E4 BOUNDARY LINE
- PROPERTY LINE
- FREDERICTON LANDFILL PROPERTY LINE

**Note**

- This drawing is a schematic representation. Sizes, loca and dimensions are approximate.
- Coordinate system: New Brunswick; Stereographic pro NAD83 (CSRS) Datum.
- Aerial photograph from 2015. Source GeoNB Imagery.

Drawn By	CHG	Checked By	KW
Calculations By	---	Checked By	---

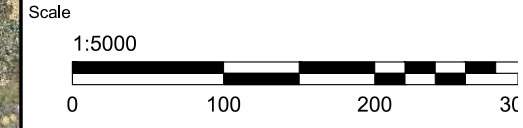
Date: APRIL 2020

**Project**

ENVIRONMENTAL IMPACT ASSESSMENT,  
FREDERICTON REGIONAL SOLID WASTE,  
FREDERICTON, NB

**Drawing**

LOCATION OF CONTAINMENT CELL PLAN



File No.	Drawing	Revision No.
10115.69	FIGURE 2	0



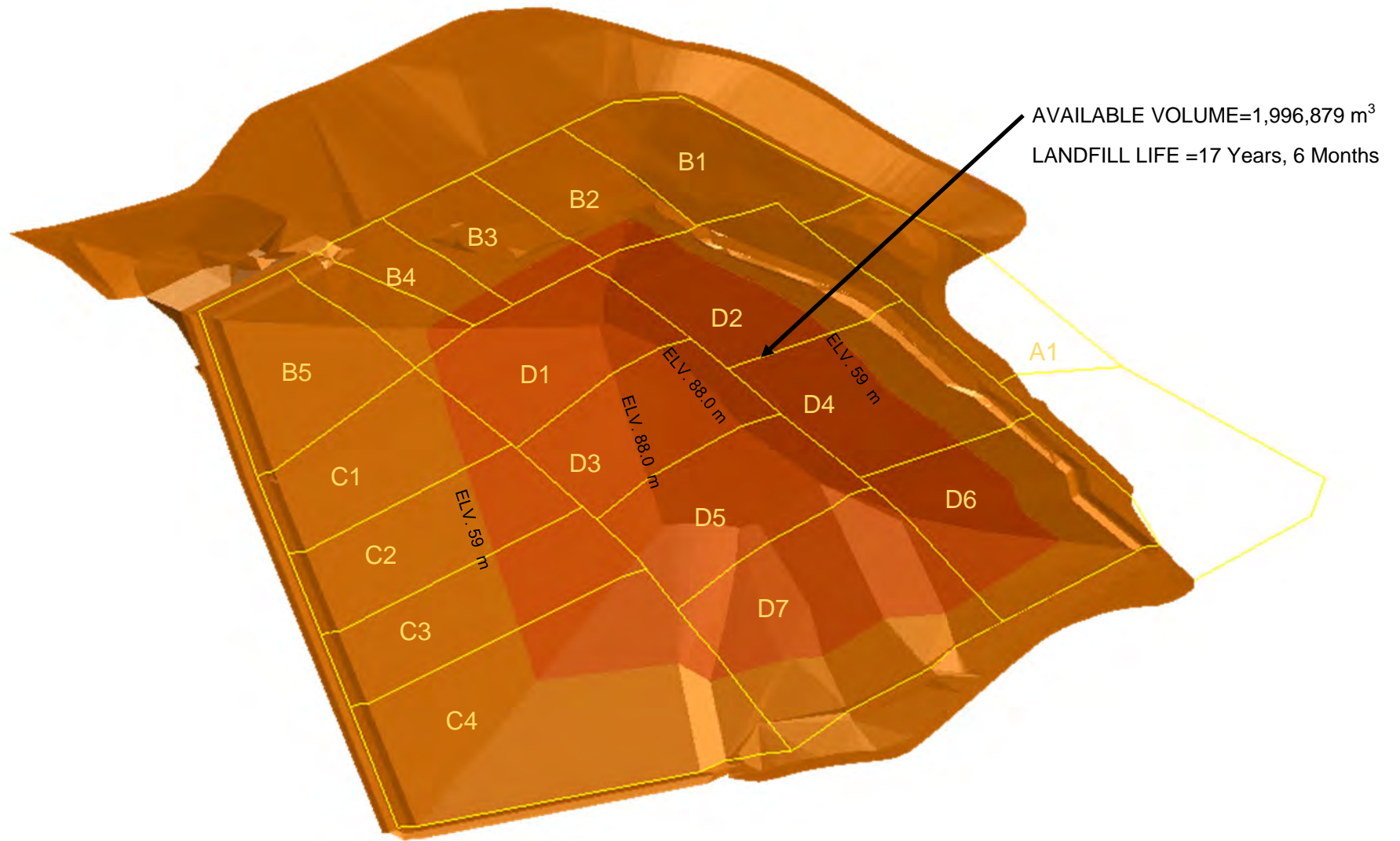


Figure 3, Proposed Height Change





June 3, 2020

Abigail Garnett, M.Sc.Eng., P.Eng.  
Senior Environmental Engineer/Hydrogeologist  
GEMTEC Limited  
191 Doak Road  
Fredericton, New Brunswick  
E3C 2E6

Ms. Garnett,

**RE: Project Description, Proposed Landfill Maximum Height Increase, Regional Service Commission 11, Fredericton Region Solid Waste Landfill, Fredericton, NB**

Thank you for your May 6, 2020 submission of information regarding the above-mentioned issue. The Department of Environment and Local Government's Environmental Impact Assessment (EIA) Branch has reviewed the project description and has determined that it is considered to be a significant modification to the landfill facility, and as such it will have to be registered for an EIA review as per item (m) of *Schedule A* of the *EIA Regulation* ("all waste disposal facilities or systems") before it can proceed. Additional information regarding the EIA review process and the information requirements for the registration document can be found in the Guide to EIA in New Brunswick, which is available online at the following address: <https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/EIA-EIE/GuideEnvironmentalImpactAssessment.pdf>.

Furthermore, the proposal regarding the description of environmental features included in the May 6, 2020 information was also forwarded to certain provincial and federal agencies who will likely be represented on the Technical Review Committee (TRC) for the EIA review of this project. The TRC generally agrees with the proposal put forward regarding a primarily desktop review of the existing environment, with the following caveats:

- It is understood that a site visit will be conducted by an environmental biologist and that confirmation will be provided following this site visit if a watercourse or wetland was identified on the ground. Please note that watercourses in New Brunswick are defined as follows: A feature in which the primary function is the conveyance or containment of water, which includes: a) the bed, banks and sides of any watercourse that is depicted on the New Brunswick Hydrographic Network layer; b) the bed, banks and sides of any incised channel greater than 0.5 metres in width that displays a rock or soil (mineral or organic) bed, that is not depicted on New Brunswick Hydrographic Network layer; water/flow does not have to be continuous and may be absent during any time of year; or, c) a natural or man-made basin

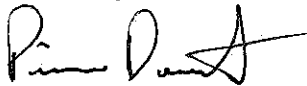


(i.e. lakes and ponds). Also, wetlands in New Brunswick are defined as land that either periodically or permanently has a water table at, near, or above the land's surface, or that is saturated and sustains aquatic processes as indicated by the presence of hydric soils, hydrophytic vegetation, and biological activities adapted to wet conditions.

- Condition # 37 of the facility's *Approval to Operate* (I-9667) stipulates that "The Approval Holder shall ensure that the necessary engineering documentation is submitted to the Director, and approved in writing by the Department, prior to the construction, modification or expansion of 1) additional waste disposal cells; 2) landfill gas management systems; 3) sludge handling facilities; 4) leachate treatment systems; 5) facilities for processing recyclables or managing organics; or, 6) storage of waste including household hazardous waste or any other construction activity at the Facility." Please note that some of the engineering issues that will have to be addressed as part of the EIA review of this project include, but are not necessarily limited to, the integrity of the slope being maintained from the increased height, appropriate drainage being provided, and confirmation of the liner's ability to support the additional load resulting from the increased cell height. (Please note that this does not preclude the submission of any other information deemed relevant in order to properly complete the EIA review of the proposed height increase.)

If you have any questions, feel free to contact me at (506) 457-6757, or by fax at (506) 453-2627, or by email at [pierre.doucet@gnb.ca](mailto:pierre.doucet@gnb.ca).

Sincerely,



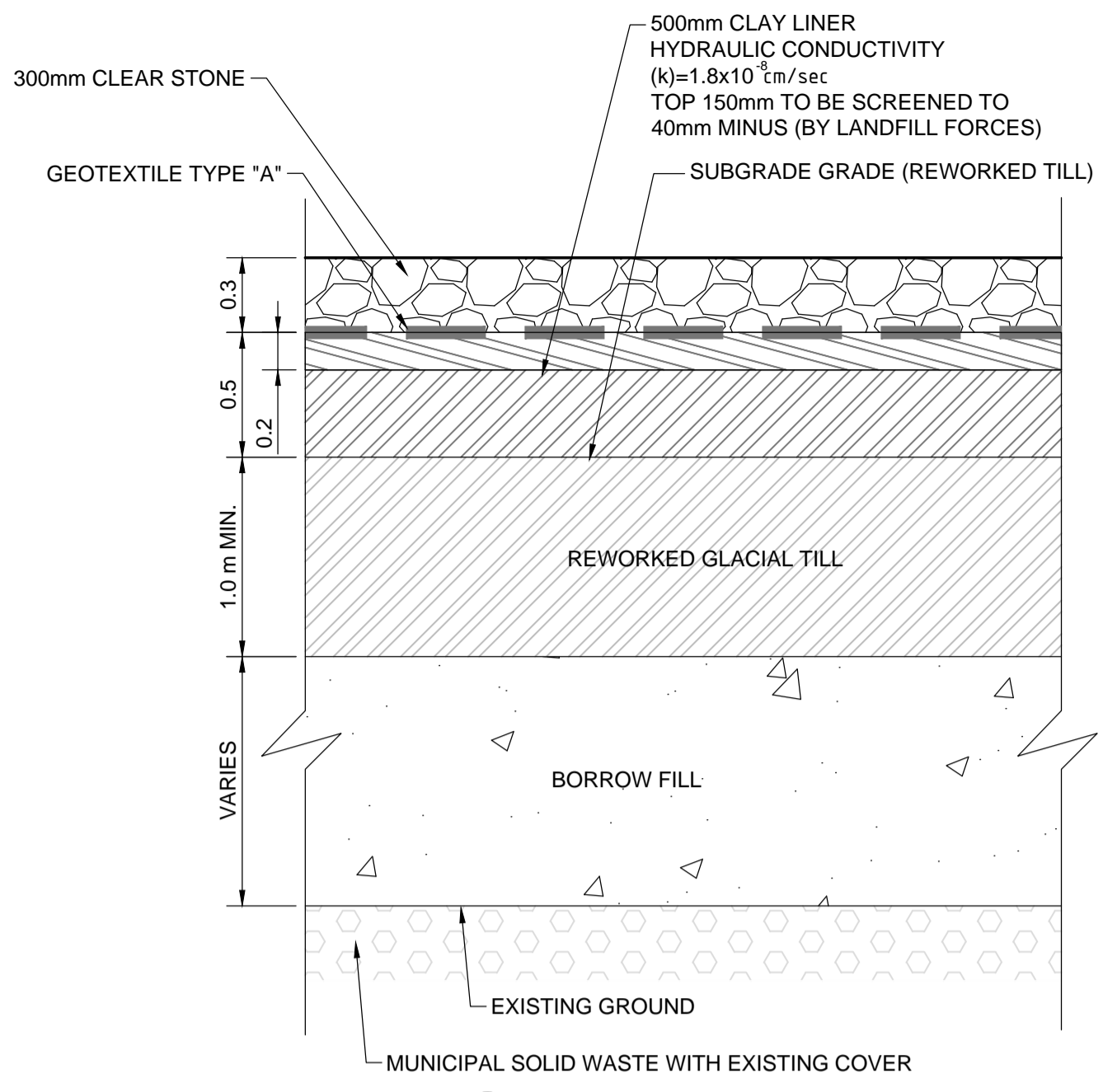
Pierre Doucet  
Project Manager  
Department of Environment and Local Government



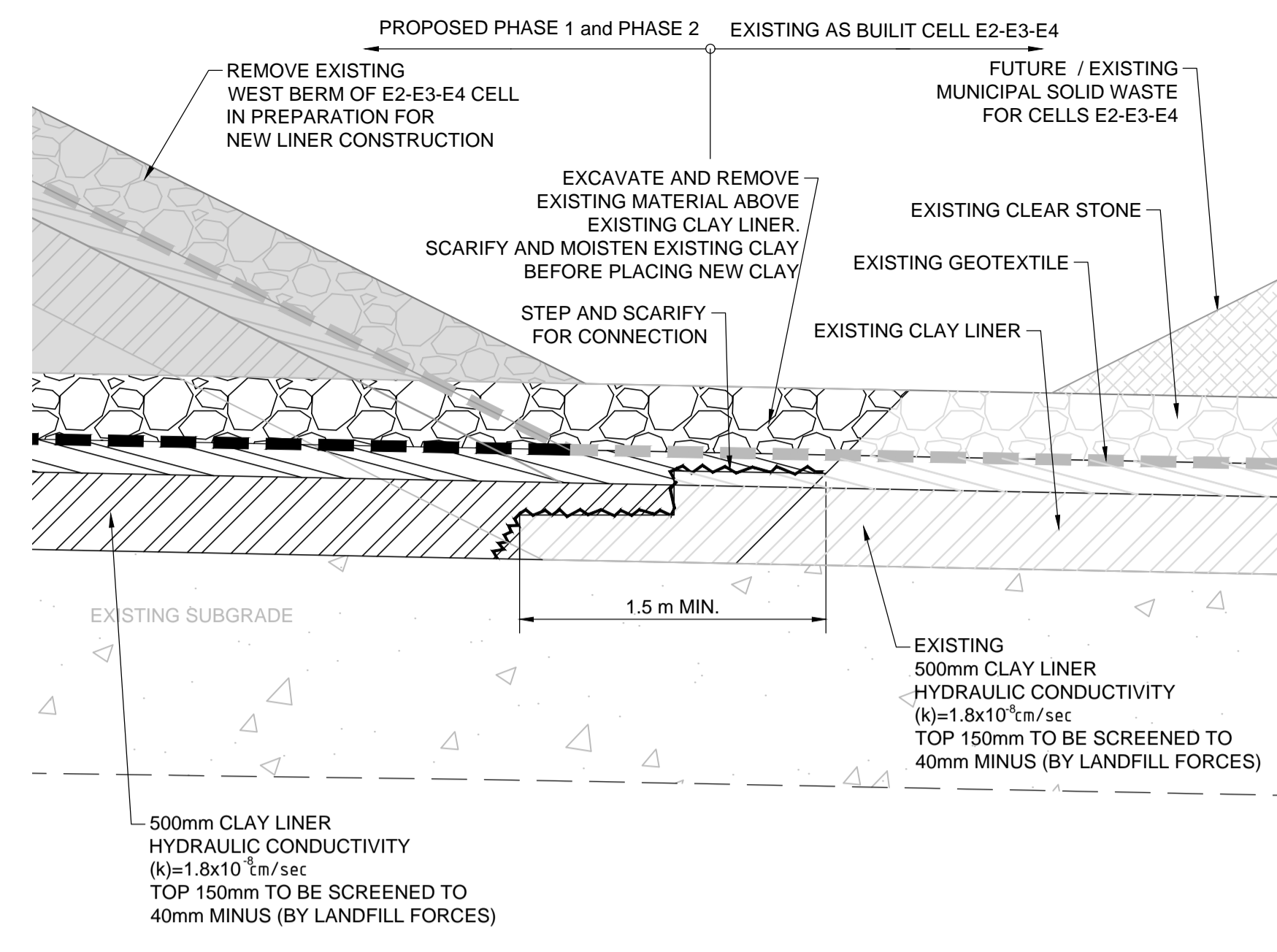
## **APPENDIX B**

### Engineering Details for Cell Design

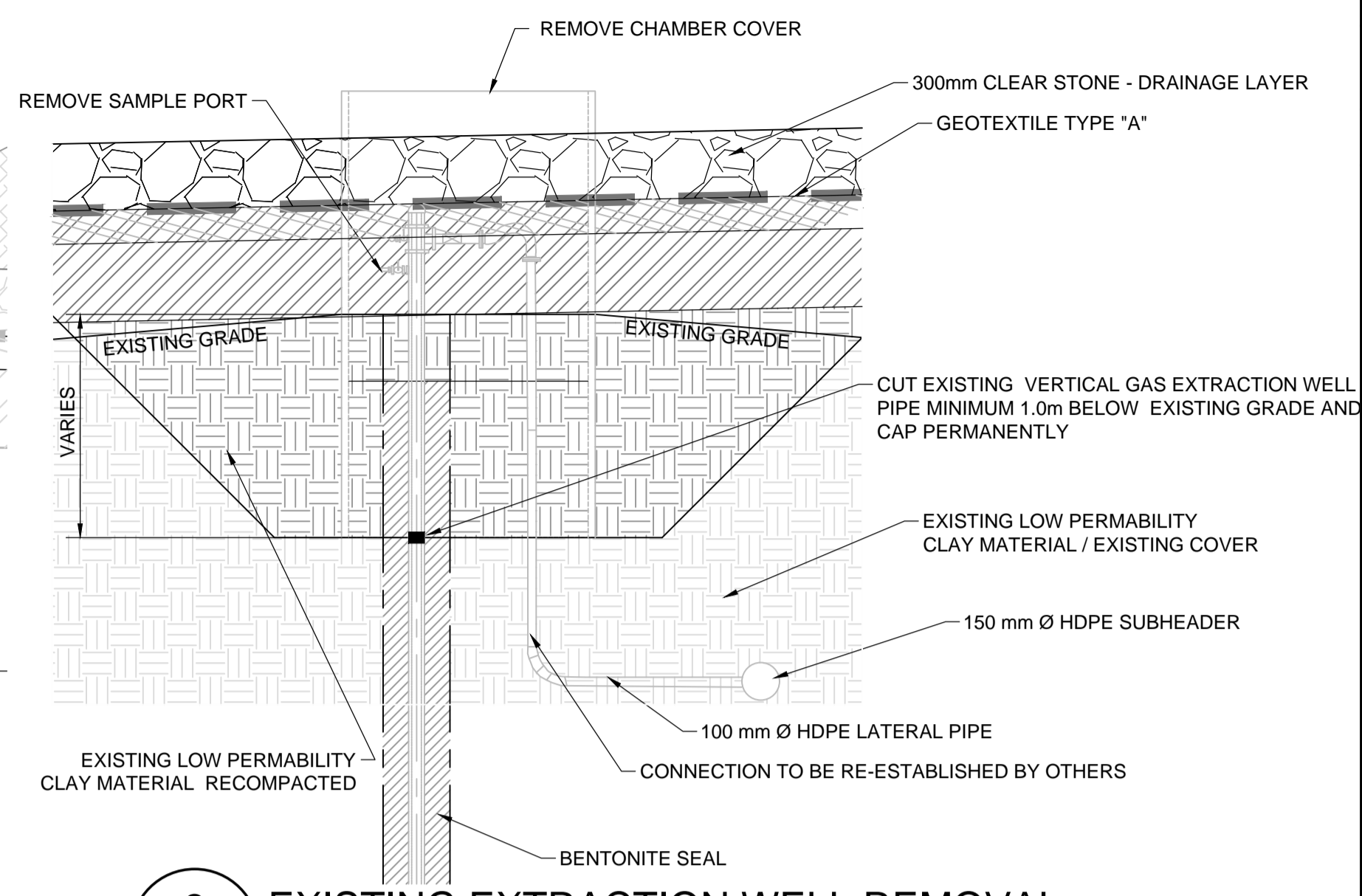
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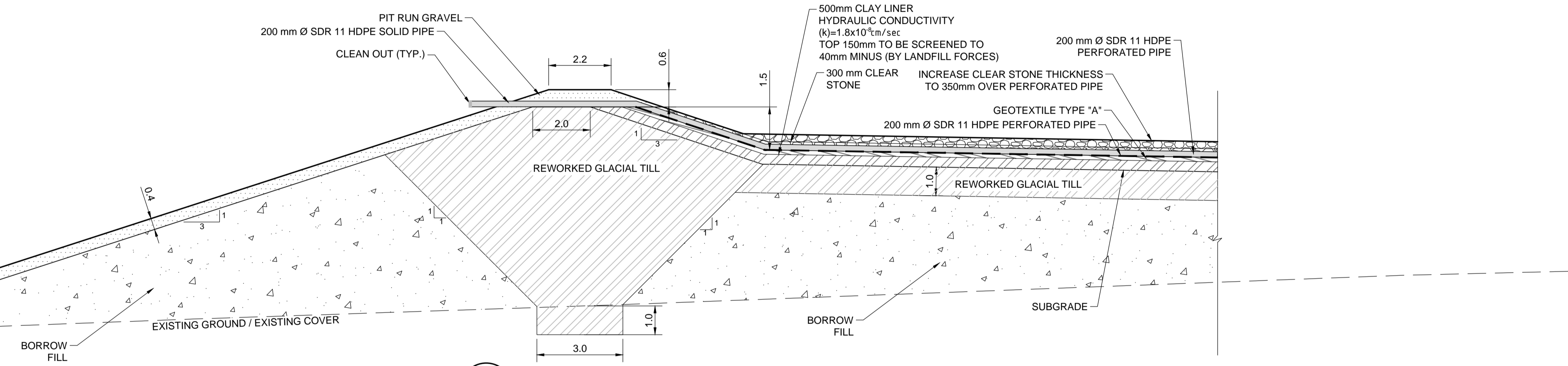
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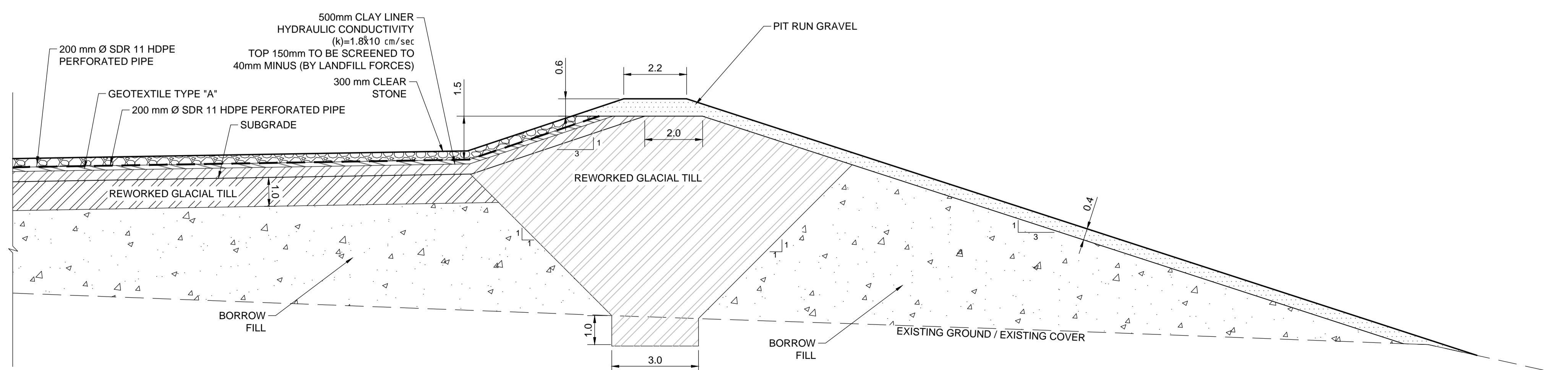
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**3**  
D07 **EXISTING EXTRACTION WELL REMOVAL**  
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**4**  
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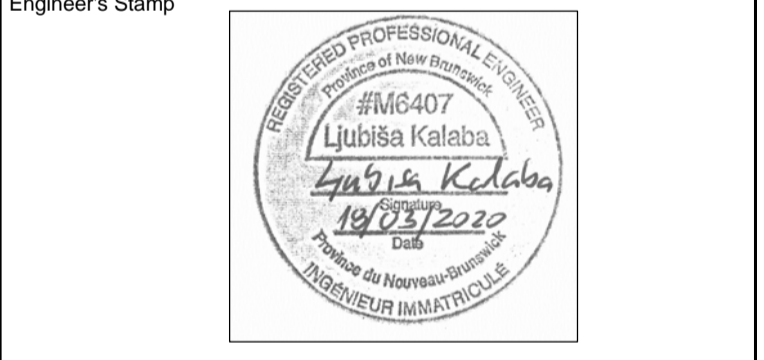


**5**  
D07 **PERIMETER BERM - SOUTH SIDE (PHASE 2)**  
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Rev No.	Revision	YYYY/MM/DD
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LEGEND

1	Issued for Approval	2020/03/18
Number	Issue	YYYY/MM/DD



Drawn By: LK Checked By: C.G.K.

Project: Fredericton Region Solid Waste  
A Division of Regional Service  
Commission 11  
Phase 1 and Phase 2  
Cells - 2020

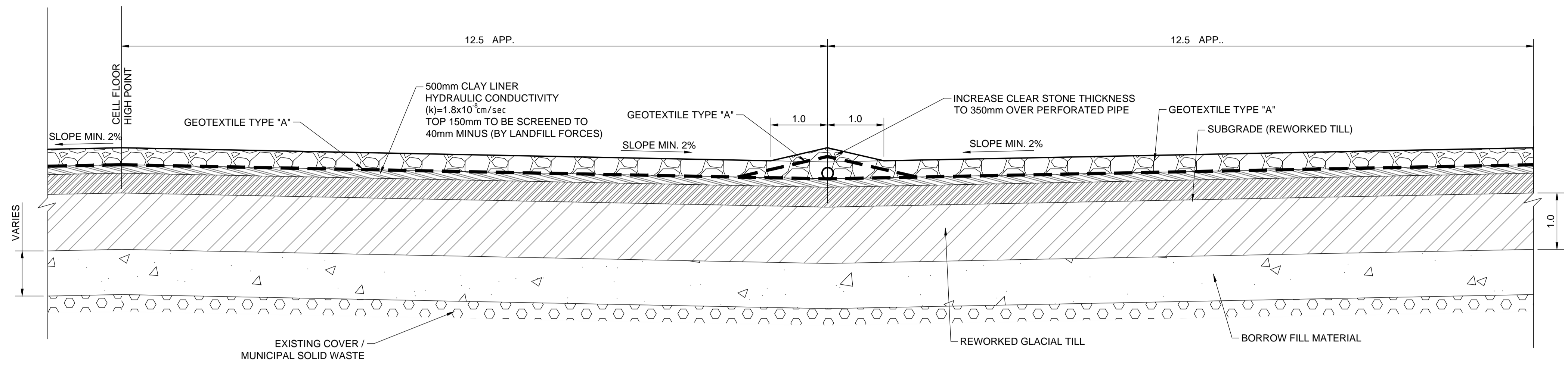
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Scale: **AS SHOWN**

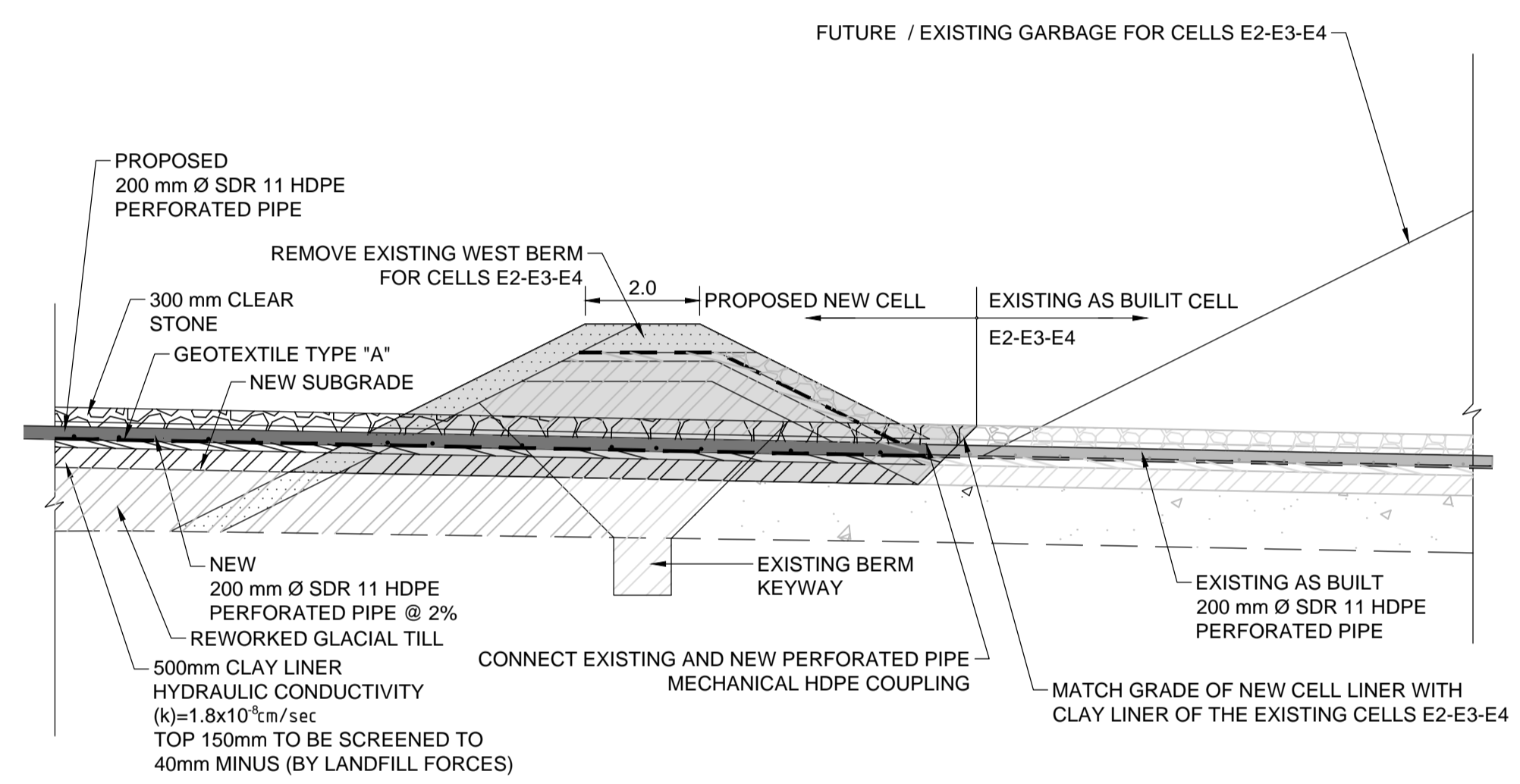
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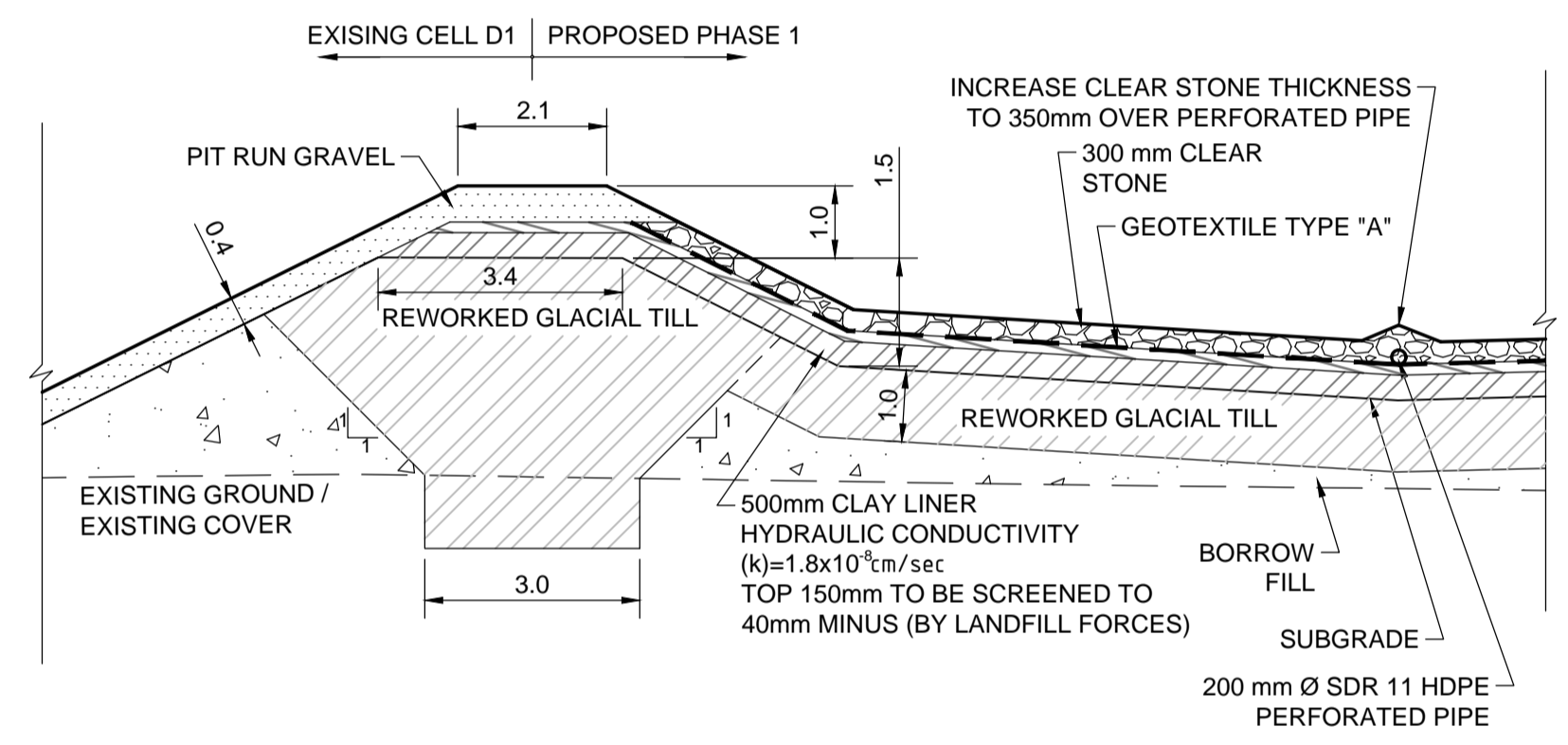
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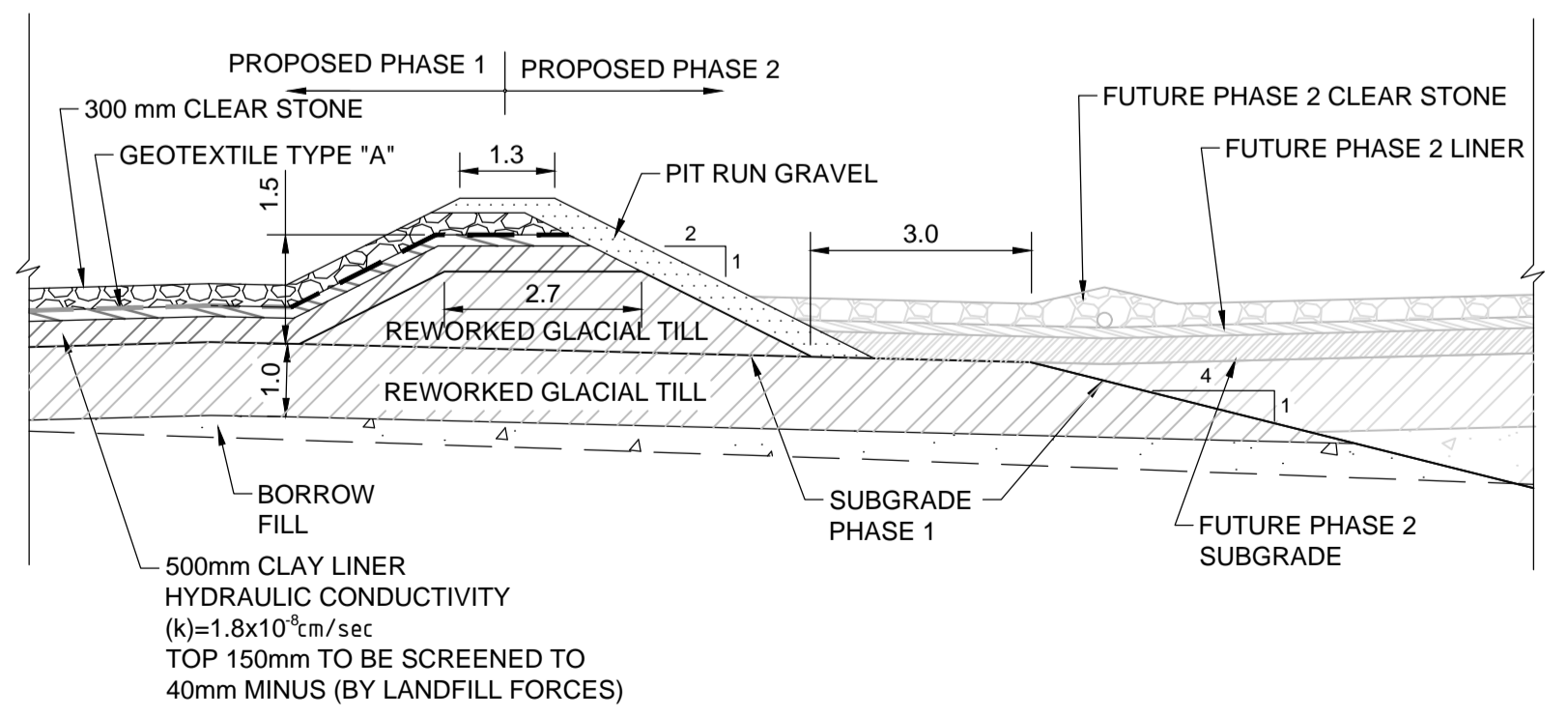
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**D08** SCALE 1:50



**2** CELL CONNECTION AT EAST SIDE  
**D08** SCALE 1:100



**3** PERMANENT CELL SEPARATION BERM - NORTH SIDE  
**D08** SCALE 1:100



**4** PHASE 1 - PHASE 2 SEPARATION BERM  
**D08** SCALE 1:100

Rev No.	Revision	YYYY/MM/DD

LEGEND		

1	Issued for Approval	2020/03/18
Number	Issue	YYYY/MM/DD



Drawn By	LK	Checked By	C.G.K.
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Project: Fredericton Region Solid Waste  
 A Division of Regional Service  
 Commission 11  
 Phase 1 and Phase 2  
 Cells - 2020

DETAILS

Scale: AS SHOWN

File No.	Sheet No.
101157002	D08





## **APPENDIX C**

### Environmental Management Plan (EMP)

**ENVIRONMENTAL MANAGEMENT PLAN  
FREDERICTON REGIONAL  
SANITARY LANDFILL**

**Fredericton Region Solid Waste Commission**  
1115 Alison Boulevard  
Fredericton, NB  
E3B 4Y2

Revision 1.0  
May 2006

1. Greg Shanks
2. Brett McCreaw
3. J.P. Astorino
4. File
5. G. Wilson

**Riley Environment Limited**  
64 Linden Crescent  
Fredericton, NB E3A 4Z9  
(506) 457-2004  
mdriley@nb.sympatico.ca



May 31, 2006

**Fredericton Region Solid Waste Commission**

PO Box 21, Station A  
Fredericton, NB E3B 4Y2

Attention: Mr. Gordon Wilson  
General Manager

**Environmental Management Plan  
Fredericton Regional Sanitary Landfill**

Riley Environment Limited is pleased to submit five (5) copies of the Environmental Management Plan (EMP) for the Fredericton Landfill. This document meets the requirement of Condition 31 of your Certificate of Approval to Operate S-1164.

We trust this is sufficient for your present requirements. If you have any questions, please contact the undersigned.

**Riley Environment Limited**

Michael D. Riley P.Eng.  
President

Attachment

06-0069





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## 1.0 INTRODUCTION

### 1.1 Background

The Fredericton Region encompasses an area of over 250 kms<sup>2</sup> with a population of about 115 000. The Fredericton Region Solid Waste Commission (FRSWC), which is comprised of representatives from the municipalities and local service districts within its geographical boundaries, is responsible for the management of solid wastes generated within the Fredericton Region.

FRSWC currently operates a landfill on Alison Boulevard (formerly Wilsey Road) in Fredericton. The Fredericton Regional Sanitary Landfill (Landfill), which opened in 1986, was the first managed landfill in New Brunswick. Since opening, over one million tonnes of Municipal Solid Waste (MSW) have been placed in the Landfill. The annual solid waste generation rate for the Fredericton Region is approximately 75 000 tonnes per year.

FRSWC utilizes a waste-baling system that helps control wind-blown litter and provides effective compaction of the waste to be disposed. In addition, FRSWC operates a construction and demolition debris (C&D) disposal site, household hazardous waste (HHW) depot, and a recycling facility (M RF) at the Landfill. A designated area is provided for the temporary storage of metal, tires, wood, white goods and other such salvageable/recyclable materials. An ash disposal cell developed in conjunction with the University of New Brunswick is also utilized.

### 1.2 Certificate of Approval to Operate

The New Brunswick Department of the Environment (NBDOE), through the Stewardship Branch, is responsible for ensuring the Fredericton Landfill operates in an environmentally responsible fashion. Under both paragraph 8(1) of the *Water Quality Regulation-Clean Environment Act* and paragraph 5 (3) of the *Air Quality Regulation-clean Environment Act*, NBDOE issues to FRSWC a Certificate of Approval to Operate (COA).

The most recently issued COA S-1164, is valid from January 1, 2006 to December 31, 2009. COA S-1164 outlines the various conditions under which the Fredericton Landfill must operate to manage the potential environmental impacts from the operation of the regional solid waste disposal facility. A copy of S-1164 is provided in Appendix A. Condition 31 of the noted COA requires FRSWC to have an Environmental Management Plan (EMP) in place. The following sections address all the issues required by Condition 31.



### 1.3 Organization of the Environmental Management Plan

The following EMP is broken down into five sections as follows:

- Section 1 - Introduction
- Section 2 - Environmental Objective and Philosophy
- Section 3 - Emergencies and Unplanned Events
- Section 4 - Emergency Response Plans
- Section 5 - Training

The condensed Contingency Plan for the HHW Depot is provided in Appendix B

The EMP is considered a 'living document' which will be continually updated to reflect both changes in technology and operating requirements. Each page of this EMP is numbered, dated, and contains a revision number. As changes occur, the appropriate pages will be revised and the document updated.

### 2.0 ENVIRONMENTAL OBJECTIVE AND PHILOSOPHY

The objective of FRSWC, from an environment perspective, is to:

**“Operate an integrated solid waste management system that is environmentally and economically sound and that minimizes any potential negative environmental effects on the biophysical and socio-economic environments”**

**FRSWC is committed to operating a solid waste management facility that ensures all environmental obligations are met or exceeded, operations are carried out with the highest regard for environmental protection, and that no unacceptable impacts are incurred. FRSWC is committed to a program of continual improvement.**



### **3.0 EMERGENCIES AND UNPLANNED EVENTS**

#### **3.1 General**

Human error, extreme weather conditions, or other situations can result in emergencies or other unplanned events. FRSWC recognizes that a well-developed response plan can decrease the impact of such an event on the environment. FRSWC has implemented such plans and has provided the resources for emergency response and training.

The objective of the Emergency Response Plans (ERP) is to minimize/prevent the potential impact to human health and the environment from an unplanned event or emergency. The ERP sets-out methods for preventing the unplanned event or emergency, action to be taken should the emergency occur and the reporting requirements after the emergency situation.

#### **3.2 Roles and Responsibilities**

All responses to emergencies or unplanned events will be the responsibility of the Emergency Response Leader (Leader). The Leader, or designated alternate, reports to the General Manager or his designate. The Leader has authority to commit resources, direct response operations and assumes total control over site activities in the event of an emergency or unplanned event. The specific responsibilities of the Leader are to:

- Prepare and organise of the background review of the situation, the work plan and the response team.
- Provide for site access and co-ordinate activities with appropriate officials.
- Execute the work and ensures it is completed and on schedule.
- Instruct and manage the response team.
- Ensure that safety, health, and environmental requirements are met.
- Enforce site control.
- Document field activities.
- Ensure proper disposal of contaminated material and equipment.
- Prepare the final report and support files on the response activities.

The Leader will be supported during each emergency or unplanned event by trained FRSWC staff. The composition of the emergency response team will vary depending on the type and size of the



emergency or unplanned event and may include external personnel (i.e. fire department, police). The emergency response team will safely complete the on-site tasks required to implement the work plan.

### 3.3 Communication

The key to a responsive emergency response plan is effective communication

During normal working hours, the Leader will be notified immediately of any emergency or unplanned event. It is the Leader's responsibility to specify and initiate the immediate response by on-site personnel to deal with the emergency. The Leader will initiate calls as required to the New Brunswick Department of the Environment (NBDOE), Canadian Coast Guard Centre (CCG), Fredericton Fire Department, Fredericton Police Department, and Ambulance Services.

There is typically no FRSWC staff on site during off-hours. However, the leachate pond is alarmed so that the appropriate personnel are notified should an emergency or unplanned event arise during off-hours.

### 3.4 Emergency Contact List

The following is a listing of the emergency contacts for the Fredericton Landfill

(a)	<b>Fredericton Fire Department</b>	<b>911</b>
(b)	<b>Fredericton Police Department</b>	<b>911</b>
(c)	<b>Ambulance Dr. Everett Chalmers Hospital</b>	<b>911</b>
(d)	<b>Canadian Coast Guard</b>	<b>1 (800) 565-1633</b>
(e)	<b>New Brunswick Department of Environment</b>	<b>1 (506) 444-5149</b>



#### **4.0 EMERGENCY RESPONSE PLANS**

The following sections contain Emergency Response Plans for various emergencies or unplanned events. The emergencies or unplanned events for which plans have been prepared include:

##### **4.1 Petroleum Hydrocarbon Leak or Spill**

##### **4.2 Leachate Release**

##### **4.3 Chemical Spills**

##### **4.4 Forest Fires**

##### **4.5 Failure of Sedimentation Pond**

##### **4.6 Failure of Leachate Treatment Pond**

##### **4.7 Restricted Access to Facility**



## 4.1 Petroleum Hydrocarbon Leak or Spill

### Risks

Potential sources of petroleum spills at the Fredericton Landfill include:

- On-site petroleum storage areas.
- On-site equipment
- During fueling of on-site equipment
- Discharge from a non-FRSWC operated vehicle

### Prevention

The following measures will be undertaken to decrease the likelihood of a petroleum hydrocarbon leak or spill:

- Weekly inspection of petroleum hydrocarbon product storage areas.
- Weekly inspection of each fuel tank on the mobile equipment.
- Vehicles fueled in a designated area.
- Strictly enforce all traffic controls and speed limits.
- Immediate follow-up to address any deficiencies noted during the inspections.

### Response Procedures

1. All leaks or spills of petroleum hydrocarbons regardless of size will be reported to the Emergency Response Leader.
2. The Emergency Response Leader will contact NBDOE and /or the Canadian Coast Guard and relay information about the incident.
3. The Emergency Response Leader will insure that the spill area is secured.
4. The spill area will be contained with absorbent material such as sand, peat moss, straw, synthetic absorbent material or cloth.
5. All manholes, sewers, ditches, and culverts will be blocked to contain the leak.
6. In the case of a vehicle accident, absorbent material will be placed around the site for the collection and containment of petroleum hydrocarbons. Once contained, pump remaining petroleum hydrocarbons to an appropriate container prior to moving.
7. Record the time and location of the spill or leak, substance and quantity of substance, source, and action taken to minimise impact.

### Remediation

- 1) Remediation will be initiated once the spill or leak has been contained.
- 2) If necessary, any free spilled product will be pumped into an appropriate container.
- 3) Contaminated absorbent materials will be placed into appropriate storage containers and transport offsite for disposal.



- 4) Under the direction of a Site Professional, all impacted soil will be excavated and transported off-site for disposal.
- 5) The site will be restored to condition comparable to its original state.

### **Reporting and Evaluation**

FRSWC will retain a Site Professional to prepare all reports required under NBDOE's Management Process for Contaminated Sites.





## 4.2 Leachate Release

### Risks

Potential unplanned release of leachate could occur as a result of:

- Failure of the leachate treatment pond
- Failure of the leachate collection systems.

### Prevention

The leachate collection and treatment system at the Fredericton Landfill has been designed using the best available technology so as to minimize the risk of an unplanned release. To reduce the risk of a release, alarm systems have been installed in the leachate pond to notify personnel in the event of a potential impending release. The alarm systems have been set to notify personnel if leachate levels in the pond rise above or drop below a predetermined level. The predetermined levels have been set so as to allow FRSWC personnel time to respond to the situation before any release occurs.

The Fredericton Landfill COA has a number of requirements for the periodic sampling and analyses of both groundwater and leachate. FRSWC has a contract with a qualified environmental consulting firm with an office in the Fredericton Region and with the resources, expertise, and experience to carry out the compliance-monitoring program at the Alison Boulevard facility. The qualified environmental consulting firm submits the results of each monitoring event to FRSWC along with comments on any abnormalities.

The results of this testing, when interpreted by an experienced professional, are used as potential indicators of unplanned leachate releases.

### Response Procedure

In the event the results of compliance monitoring indicate an impact has occurred or is suspected of occurring, the qualified environmental consulting firm must provide FRSWC with a proposal for remediation of the unplanned leachate release.

### Remediation

The proposal for remediation, once approved by NBDOE, will be implemented.

### Reporting and Evaluation

The Site Professional responsible for implementation of the remediation will prepare all reports.



## 4.3 Chemical Spills

### Risks

Potential sources of chemical spills at the Fredericton Landfill include:

- On-site chemical storage areas.
- Discharge from a non-FRSWC operated vehicle.

### Prevention

The following measures will be undertaken to decrease the likelihood of a chemical leak or spill:

- Weekly inspection of chemical storage areas.
- Weekly inspection of each fuel tank on the mobile equipment.
- Strictly enforce all traffic controls and speed limits.
- Immediate follow-up to address any deficiencies noted during the inspections.

### Response Procedures

1. All leaks or spills of chemicals regardless of size will be reported to the Emergency Response Leader.
2. The Emergency Response Leader will contact NBDOE, the HAZMAT RESPONSE TEAM, and Fredericton Fire Department and relay information about the incident.
3. The Emergency Response Leader will brief the HAZMAT RESPONSE TEAM as to the emergency and initiate further containment and remediation actions under their direction.
4. The Emergency Response Leader will secure the area.
5. All manholes, sewers, ditches, and culverts will be blocked to contain the spill or leak.
6. The time and location of the spill or leak, substance and quantity of substance, source, and action taken to minimise impact will be recorded.

### Remediation

- 1) Remediation will be initiated once the spill or leak has been contained.
- 2) Remediation of chemical spills on-site will be directed by the HAZMAT RESPONSE TEAM.
- 3) Contaminated absorbent materials will be placed into appropriate storage containers and transport off-site for disposal.
- 4) Under the direction of a Site Professional, all impacted soil will be excavated and transported off-site for disposal.
- 5) The site will be restored to a condition comparable to its original state.

### Reporting and Evaluation

FRSWC will retain a Site Professional to prepare all reports required under NBDOE's Management Process for Contaminated Sites.



#### 4.4 Forest Fires

##### **Risks**

Open burning at the Fredericton Landfill is not permitted. However there is a potential of a forest fire in the forested land surrounding the Landfill.

##### **Prevention**

The following measures will be undertaken to decrease the likelihood of a forest fire:

- Follow all operating procedures with respect to working with hot loads.
- Quickly contain and extinguish any fires at the working face or elsewhere at the Landfill.
- Maintain a cleared area between the disposal cell and adjacent woods.
- Prohibit workers from smoking at the active face.

##### **Response Procedures**

- 1) The Emergency Response Leader will be notified as soon as fire is observed in the forested area adjacent to the Landfill.
- 2) The on-site personnel will initiate calls to the Fire Department and/or Fredericton HazMat in the event of a fire.
- 3) The Emergency Response Leader will notify selected staff to gather fire-fighting equipment and proceed to the fire area.
- 4) FRSWC personnel will meet the Fire Department at the front gate to provide access and provide preliminary information on the emergency.
- 5) There may be situations where the Fire Department arrives before FRSWC personnel are on site. In this situation the Fire Department may enter the site. An up-to-date inventory of the Fredericton Landfill will be available for the Fire Department at the Scale House.
- 6) Access to the fire scene for emergency responders will be maintained clear of vehicles, staff, site users or any other obstruction.
- 7) Emergency responders will be assisted as directed by fire commander at scene.

##### **Remediation**

For areas within the boundaries of the Landfill, the fire area will be graded and prepared for planting once fire has been extinguished. Where practical, run-off from burned area will be directed over vegetated areas and away from nearby watercourses.

##### **Reporting and Evaluation**

The Emergency Response Leader is responsible for preparing the Emergency Response Report. Information to be presented in this report includes time and location of fire, name of person reporting and time reported, cause of fire, weather conditions, detailed description of response procedures, and extent of fire.



## 4.5 Failure of Sedimentation Pond

### Risks

The sedimentation control system at the Landfill is being operated as a total retention pond, designed to accommodate 1:100 year storm flows. The sedimentation pond is operated such that water is discharged on a regular basis as the suspended solids settle out. Failure of the Sedimentation Pond may result in a release to surface waters having a high concentration of suspended solids.

The Sedimentation Pond is not likely to fail when operated in this manner and, if it does, impact would be minimal.

### Prevention

Preventative measures including diligent operation and regular inspection of the Sedimentation Pond ensure that a low water level is maintained. This will minimize the risk of failure and impact should it occur.

### Response Procedures

- 1) Failure of the Sedimentation Pond will be reported to the Emergency Response Leader.
- 2) The Emergency Response Leader will contact NBDOE and/or the Canadian Coast Guard and relay information about the incident.
- 3) All reasonable and practical methods will be undertaken by Landfill staff under the direction of the Emergency Response Leader to prevent serious impacts on receiving streams downstream of the failure.
- 4) The Emergency Response Leader will assess the situation to determine the most practical method of repairing the Sedimentation Pond
- 5) The time and location of the failure, substance and quantity of releases, and action taken to minimise impact will be recorded.

### Reporting and Evaluation

The Emergency Response Leader is responsible for preparing the Emergency Response Report. Information to be presented in this report includes time and location of failure, name of person reporting and time reported, estimate quantity of release, weather conditions, detailed description of response procedures, and NBDOE response.



## **4.6 Failure of Leachate Treatment Pond**

### **Risks**

The Leachate Treatment Pond at the Landfill has been constructed with an underlying impermeable membrane with a leak detection system. The Leachate Treatment Pond is also alarmed so that FRSWC staff are notified well in advance of any impending failure.

### **Prevention**

Preventative measures including diligent operation and regular inspection of the Leachate Treatment Pond will minimize the risk of failure.

### **Response Procedures**

- 1) Failure of the Leachate Treatment Pond will be reported to the Emergency Response Leader.
- 2) The Emergency Response Leader will contact NBDOE and/or the Canadian Coast Guard and relay information about the incident.
- 3) The Emergency Response Leader will assess the situation in consultation with the General Manager, the site consultant and the NBDOE to determine the most appropriate response.
- 4) All reasonable and practical methods will be undertaken by Landfill staff, under the direction of the Emergency Response Leader, to prevent serious impacts on receiving streams downstream of the failure.
- 5) The Emergency Response Leader will assess the situation to determine the most practical method of repairing the pond.
- 6) The time and location of the failure, substance and quantity of releases, and action taken to minimise impact will be recorded.

### **Reporting and Evaluation**

The Emergency Response Leader is responsible for preparing the Emergency Response Report. Information to be presented in this report includes time and location of failure, name of person reporting and time reported, estimate quantity of release, weather conditions, detailed description of response procedures, and NBDOE response



## 4.7 Restricted Access to Facility

### Risks

There is potential that access to the site will be restricted, either as a result of an accident or a blockade.

### Response Procedures

- 1) If an accident occurred along the main access road to the scales, traffic will be rerouted via the north gate by the Treatment Pond.
- 2) A traffic accident along Alison Blvd North will require rerouting traffic from the south along Alison Blvd via route 655 (Waasis Road).
- 3) If the Fredericton Landfill was blockaded, no garbage or recyclable materials would arrive on site. Thus, this part of the operation would be halted until the blockade is removed.
- 4) In this instance the only important issues to deal with are the safety of the site (Buildings, vehicles, property) and the verification that the leachate treatment system (pond, pumps, blowers) was operating properly.
- 5) FRSWC will solicit the assistance of the local authorities to gain access to the site.
- 6) The decision as to who would be sent to the site would be made by the General Manager in consultation with the Emergency Response Leader.

### Reporting and Evaluation

The Emergency Response Leader is responsible for preparing the Emergency Response Report. Information to be presented in this report includes time and location of the restricted access, name of person reporting and time reported, weather conditions, and detailed description of response procedures.



## 5.0 TRAINING

As a minimum, appropriate FRSWC personnel will be provided training for spills, first aid and CPR, WHMIS, and Transportation of Dangerous Goods (TDG). The interval for refresher training will be as directed by the agency responsible for each training element.

The employee files will be annotated to ensure training received is recorded. At the beginning of the year, the Administration Office will produce a list of all training requirements for the year.



**Appendix A**

**Certificate of Approval to Operate S-1164**



**APPROVAL TO OPERATE**

**S-1164**

---

Pursuant to paragraph 8(1) of the *Water Quality Regulation - Clean Environment Act*, and paragraph 5 (3) (a) of the *Air Quality Regulation - Clean Air Act*, this Approval to Operate is hereby issued to:

**The Fredericton Region Solid Waste Commission**  
for the operation of the  
**Fredericton Landfill**

Description of Source: A regional solid waste disposal facility with leachate collection, treatment and disposal.

Source Classification: Fees for Industrial Approvals Class 4  
Regulation - Clean Water Act  
Air Quality Regulation Class 4

Parcel Identifier: 60042553, 75227959, 60029428, 60151438

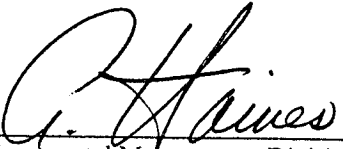
Mailing Address: P.O. Box Station A  
P.O. Box 21  
Fredericton E3B 4Y2

Conditions of Approval: See attached Schedule (s)"A" and "B" of this Approval

Supersedes Approval: SL1-R2003

Valid From: January 01, 2006

Valid To: December 31, 2009

Recommended by:   
Environmental Management Division

Issued by:   
Minister of the Environment and Local Government

**DEC 23 2005**

Date

## SCHEDULE "A"

### A. DESCRIPTION AND LOCATION OF SOURCE

The Fredericton Region Solid Waste Commission operates a regional solid waste disposal facility located on Alison Boulevard that is commonly referred to as the Fredericton Landfill. The Landfill is primarily designed to serve the approximate 115,000 residents in the Fredericton Region of central New Brunswick. The Commission utilizes a waste-baling system that helps control wind-blown litter and is effective in generating greater compaction of the waste to be disposed. In addition, the Commission operates a construction and demolition debris disposal site and household hazardous waste depot at the landfill. A designated area is provided for the temporary storage of metal, tires, wood, white goods and other such salvageable/recyclable materials. An ash disposal cell developed in conjunction with the University of New Brunswick is also utilized.

As a result of the operation of the regional solid waste disposal facility, there exist *potential* environmental impacts from: 1) the generation of leachate in the landfill containment cells and the construction and demolition debris disposal site; 2) spillage, release or mishandling of leachate, a petroleum product or other material; 3) the operation of the household hazardous waste depot; 4) accidental discharge of leachate from the leachate treatment pond or collection system; 5) site run-off or suspended solids discharge from the sedimentation pond; 6) fugitive dust emissions from truck traffic and other on-site activities; and 7) elevated odour and/or noise emissions.

The operation of the regional solid waste disposal facility by the Fredericton Region Solid Waste Commission, located in the City of Fredericton / local service district of Rusagonis-Waasis, County of York / Sunbury, and the Province of New Brunswick and identified by Parcel Identifier (PID) numbers 60042553, 60029428, 60151438 & 75227959, is hereby approved **subject to the following**:

### B. DEFINITIONS

1. **"Approval Holder"** means The Fredericton Region Solid Waste Commission.
2. **"Department"** means the New Brunswick Department of the Environment and Local Government.
3. **"Minister"** means the Minister of the Department and includes any person designated to act on the Minister's behalf.
4. **"Director"** means the Director of the Stewardship Branch of the Department and includes any person designated to act on the Director's behalf.

5. **"Facility"** means the property, leachate collection and treatment systems, buildings, equipment and any other activities involved with the operation of the regional solid waste disposal facility operated by the Fredericton Region Solid Waste Commission, located on Parcel Identifier (PID) numbers 60042553, 60029428, 60151438 & 75227959.
6. **"containment cell"** means the area at the Facility approved in writing by the Department for the disposal of solid waste.
7. **"watercourse"** means the full width and length, including the beds, banks, sides and shoreline, or any part of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not.
8. **"friable asbestos"** means waste material containing asbestos fibre or asbestos dust in a concentration greater than 1% by weight that is **not** tightly bound within a solid matrix such that it is easily crumbled by the hands.
9. **"petroleum product"** means a mixture of hydrocarbons, or their by-products, of any kind and in any form, including airplane fuel, asphalt, bunker "C" oil, crude oil, diesel fuel, engine oil, fuel oil, gasoline, kerosene, lubricants, mineral spirits, naphtha, petroleum based solvents regardless of specific gravity, transformer oil and waste petroleum products and excluding propane and paint.
10. **"biomedical waste"** means,
  - a) any part of the human body, including tissues and bodily fluids, but excluding fluids, extracted teeth, hair, nail clippings and the like, that are not infectious,
  - b) any part of the carcass of an animal infected with a communicable disease or suspected by a licensed veterinary practitioner to be infected with a communicable disease,
  - c) non-anatomical waste infected with communicable disease,
  - d) a mixture of a waste referred to in clause (a), (b) or (c) and any other waste or material; or
  - e) a waste derived from a waste referred to in clause (a), (b) or (c), unless the waste that is derived from the waste referred to in clause (a), (b) or (c) is produced in accordance with a certificate of approval that states that, in the opinion of the Director, the waste that is produced in accordance with the certificate of approval does not have characteristics similar to the characteristics of waste referred to in clause (a), (b) or (c)
11. **"hazardous waste"** means any waste identified as a dangerous good as defined by the federal *Transportation of Dangerous Goods Act, 1992* and does not include waste generated in the residential waste stream in quantities less than five litres or five kilograms.
12. **"sludge"** means a solid, semi-solid or liquid residue having less than 15% solids generated during the treatment of municipal and/or industrial wastewater, or generated as a result of other processes.

13. **“liquid waste”** means bulk liquids in a volume greater than 20 litres.
14. **“liquid oily waste”** means any waste containing free flowing petroleum products.
15. **“petroleum contaminated soil”** means soil that contains petroleum products at quantities determined, to the satisfaction of the Department, to be above the level indicated in the most recent version of the RBCA Tier I Risk-Based Screening Level (RBSL) Guidelines for Soil: Commercial, Non-potable, Coarse-grained for Gas (Modified TPH). The current level is 450 mg/kg (ppm).
16. **“C&D debris”** means
  - a) concrete, brick and untreated wood,
  - b) siding, ceiling tile, gyproc, insulation,
  - c) asbestos that is not friable asbestos,
  - d) solid roofing materials such as asphalt shingles,
  - e) glass from doors and windows,
  - f) metal, wood and durable plastic structural materials from the demolition of a building,
  - g) wiring and incandescent light fixtures that do not contain fluorescent tubing/lighting,
  - h) toilets, bathtubs, wash basins, and plumbing fixtures,
  - i) floor coverings attached to a building during demolition,
  - j) broken and aged asphalt, or
  - k) any mixture of (a) thru (j)

that has been obtained during the construction, renovation or demolition of a building or structure. Debris or other materials obtained from commercial, industrial and manufacturing sources is not acceptable. Debris: i) from a building that has or may have manufactured, contained, transferred or distributed contaminated or hazardous (such as a pesticide storage warehouse) products; or ii) that contains PCB's (polychlorinated biphenyls), or iii) that contains lead paint of a known concentration greater than 1000ppm (parts per million) or that has been deemed leachable toxic (exceeds 5 mg/L) or contains lead paint that is flaking/chipping/peeling is not considered C&D debris for the purpose of this Approval.

17. **“C&D Site”** means the portion of the Facility approved by the Department for the disposal of C&D debris.
18. **“disposal cell”** means the area at the C&D Site approved by the Department for the disposal of C&D debris.
19. **“sorting area”** means a location at the C&D Site, if approved in writing by the Director, where loads of C&D debris may be dumped and sorted. Unapproved materials may temporarily be stored here.

### C. EMERGENCY REPORTING

20. The Approval Holder, operator or any person in charge of the Site **shall immediately** notify the Department where:
- a) there has been, or is likely to be, any spill or unauthorized release of leachate, wastewater, petroleum products, hazardous materials, or gaseous material from the Facility to the environment, surface water, groundwater or atmosphere; or
  - b) a release of a contaminant or contaminants from the Facility is of such magnitude or duration that there is a concern for the health or safety of the public, or there could be an impact to the environment.

#### Notification Procedure

Verbal notification should immediately be made to the **Region 5 (Fredericton) Office by calling (506) 444-5149**. If contact cannot be made for any reason the problem should immediately be reported to the **Canadian Coast Guard at 1-800-565-1633**. At this time the problem that occurred, its resulting impact and what was done to minimize the impact should be clearly expressed.

Within 24 hours of the original notification, a copy of an "Incident Report" shall be faxed to the Region 5 (Fredericton) Office at (506) 453-2893. The "Incident Report" shall clearly detail as much information about the incident that is available. As a minimum the faxed report should include: details of the problem, its resulting impact and what was done to minimize the impact.

Within five (5) working days from the original notification, a faxed "Detailed Emergency Report" shall be sent to the Region 5 (Fredericton) Office and also to Central Office in Fredericton at (506) 453-2390. The "Detailed Emergency Report" shall describe in detail the problem that occurred, why the problem occurred, what the environmental impact was, what was done to minimize the impact, and what measures have been taken to prevent a re-occurrence of the problem

21. The Approval Holder shall ensure that the Region 5 (Fredericton) Office and Director are notified within 24 hours of any public complaint received at the Facility.

### D. GENERAL INFORMATION

22. The issuance of this Approval does not relieve the Approval Holder from the responsibility of complying with other applicable federal, provincial or municipal legislation and/or bylaws.
23. A copy of this Approval to Operate should be maintained on-site or in the office of the Approval Holder.
24. The Approval Holder shall immediately notify the Department in writing of any change in the legal name or address of the Facility.

25. Any operating problems or other matters that could cause the Facility to be in non-compliance with this Approval should be reported to the Department immediately.

## E. TERMS AND CONDITIONS

### GENERAL CONDITIONS

26. **Prior to September 30, 2008**, the Approval Holder shall submit a written application to the Department for a renewal of this Approval on a form provided by the Minister. The application shall include documentation supporting any proposed changes to the terms and conditions of this Approval.
27. In the event of Facility closure, the Approval Holder shall, in addition to any requirements under the *Environmental Impact Assessment Regulation 87-83* filed under the *Clean Environment Act*, prepare plans and an engineering proposal for complete site rehabilitation and ongoing monitoring and leachate treatment if appropriate. The plans shall be submitted to the Director for review and approval **at least six (6) months** before the planned closure date. The plans must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick.
28. In the event of closure of the C&D Site at the Facility, the Approval Holder shall ensure that a Closure Plan is prepared and submitted to the Director for review and approval **at least three (3) months** before the planned closure date. The plans must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick and include, but not necessarily be limited to, updated site plans and an engineering proposal for the site rehabilitation, monitoring, leachate treatment if appropriate and closure.
29. The Approval Holder shall ensure that any item received at the Facility containing ozone-depleting substances, including but not limited to those utilized for refrigeration and/or air conditioning, are decommissioned according to the *Ozone Depleting Substances Regulation 97-132* filed under the *Clean Air Act*.
30. The Approval Holder shall ensure that waste, including C&D debris and friable asbestos, that originates from outside of New Brunswick is not accepted at the Facility unless specifically approved by the Minister following an evaluation under the *Environmental Impact Assessment Regulation*.

31. The Approval Holder shall ensure that an Environmental Management Plan (EMP) is in place at the Facility. The EMP should include detailed emergency and contingency response procedures resulting from the spillage, release or mishandling of leachate, a petroleum product, or other dangerous materials at the Facility. The EMP should also include details on how the Facility will respond to emergency situations that may arise such as forest fires, restricted access to the Facility (traffic accidents or other blockade for example), failure of the leachate treatment and sedimentation ponds or leachate collection systems or other events that would interrupt normal operation of the Facility.

#### OPERATING CONDITIONS

32. The Approval Holder shall ensure that any solid waste disposed of at the Facility is done so in the containment cells at the Facility unless otherwise approved in writing by the Director.
33. The Approval Holder shall ensure that the minimum 25-year breakthrough requirement for the containment cells at the Facility is maintained.
34. The Approval Holder shall ensure that the Facility is not used for the disposal of:
- petroleum contaminated soil,
  - liquid wastes (with the exception of septage from the Facility sewage system),
  - sludge (with the exception of sludge from the Facility leachate treatment system),
  - liquid oily wastes,
  - hazardous wastes,
  - biomedical waste or
  - any mixture of the above.
35. The Approval Holder shall provide supervision when any material is being disposed of at the Facility, including the C&D Site. No disposal at the Facility, including the C&D Site, is permitted otherwise.
36. The Approval Holder shall ensure that the incoming waste at the Facility is routinely scrutinized to ensure that unacceptable waste is not received at the Facility.
37. The Approval Holder shall ensure that the household hazardous waste depot at the Facility is operated in accordance with an operating manual approved by the Department.

#### CONSTRUCTION

38. The Approval Holder shall ensure that the necessary engineering documentation is submitted to the Director, and approved in writing by the Department, prior to the construction, modification or expansion of 1) additional waste disposal cells, 2) landfill gas management systems; 3) sludge handling facilities, 4) leachate treatment systems, 5) facilities for processing recyclables or managing organics, 6) storage of waste including household hazardous waste or any other construction activity at the Facility.

39. The Approval Holder shall ensure that final cover applied to the containment cells at the Facility shall be a minimum of 300 mm granular layer, 600 mm low permeability clayey till @  $1 \times 10^{-7}$  cm/sec hydraulic conductivity, 150 mm granular protection layer, 150 mm growing medium and vegetative cover and shall be sloped a minimum of 2% to promote precipitation runoff from the disposal cell. All holes, cave-ins and faults shall be filled in or repaired, as required, until the final cover has been properly stabilized. Upper side slopes shall be less than 4 horizontal to 1 vertical.

If approved in writing by the Director, an alternative final cover plan may be used.

40. The Approval Holder shall ensure that a Quality Assurance and Quality Control (QA/QC) report is submitted to the Department upon completion of the installation of final cover on a containment cell or cells at the Facility. The report must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick or is licensed to practise as a professional engineer pursuant to the *Engineering Profession Act* and include as a minimum:
- commentary that confirms that all construction activities and testing associated with the installation of final cover were supervised by a qualified independent third party and that the final cover meets the Department's requirements as detailed in the previous condition;
  - all test parameters, the number of tests and locations;
  - copies of any inspection and testing reports;
  - a summary of any problems or deficiencies encountered and how they were corrected;
- and
- other information as requested by the Department.

The QA/QC report should be forwarded to the Department no later than 3 months upon completion of the final cover.

41. The Approval Holder shall ensure that all future containment cells at the Facility are designed such that the installed leachate piping can be inspected in the future by video to ensure that the leachate piping is in proper working condition.
42. The Approval Holder shall ensure that, prior to decommissioning any wells at the Facility, a decommissioning plan and schedule is submitted to the Department and approved in writing by the Director

#### LEACHATE AND SURFACE WATER

43. The Approval Holder shall ensure that no leachate, or water that has come in contact with solid waste, is released from the Facility to the environment or to the Facility's surface water drainage system including the sedimentation pond.
44. The Approval Holder shall ensure that all leachate and all water at the Facility that has come in contact with solid waste is directed to the Facility's leachate collection and treatment system.



45. The Approval Holder shall ensure that surface water at the Facility that has not been in contact with leachate or solid waste is directed to the sedimentation pond(s). Clean surface water that has a total suspended solids (TSS) value of 25mg/l or less may be diverted from the sedimentation pond(s) if approved in writing by the Department. Water from empty disposal cells that has not been in contact with leachate or solid waste should bypass the leachate storage and treatment system and be directed to the surface water drainage system at the Facility. Drainage ditches must be maintained with a proper grade that directs surface water away from the waste disposal area and into the sedimentation pond(s).
46. The Approval Holder shall ensure that there is a continuous, permeable layer of gravel surrounding the waste at the Facility from the top of the upper side slopes through the top of the berm area to the leachate collection system. Particular care must be exercised at the top of berm area so that the final cover will properly intersect the top of berm.
47. The Approval Holder shall ensure that the leachate collection piping at the Facility is properly maintained to ensure they remain free flowing.
48. **Prior to December 31, 2007**, and at least once every two years thereafter, the Approval Holder shall ensure that the leachate collection piping at the Facility is inspected by video or other method pre-approved in writing by the Director, to ensure the leachate collection system is in proper working condition.

#### WASTE DISPOSAL

49. The Approval Holder shall ensure that hot loads arriving at the Facility containing ashes or other materials that could potentially cause a fire in the containment cells are temporarily stored in a separate secure location approved by the Department until the risk of fire has been eliminated. The material shall then be disposed of in the designated area at the Facility.
50. The Approval Holder shall ensure that any friable asbestos accepted at the Facility for disposal has been wetted, placed in securely tied, double bagged 6 mil polyethylene bags or securely tied single 6 mil polyethylene bag that has been placed in a drum or cardboard box with all seams securely taped and each bag, cardboard box and/or drum is clearly labelled "WASTE ASBESTOS UN2590" or "DECHETS D'AMIANTE UN2590" and there are no punctures in the containers (if they are punctured, the contents must be wetted and repackaged prior to land filling) and they are placed at a dedicated location within the containment cells and are immediately covered with a minimum of 300 mm of clean cover material, or 1000 mm of municipal solid waste. Asbestos should be accepted at the Facility by appointment only, and not disposed during windy conditions.
51. The Approval Holder shall ensure that there is a sufficient quantity of wetting agent on-site when asbestos is being handled and disposed at the Facility.

52. The Approval Holder shall ensure that any unloading of friable asbestos at the Facility is done by the driver (or assistant) and that they or any personnel at the Facility who handle the asbestos are wearing the proper respirators and clothing during the unloading and disposal of the asbestos waste. Appropriate facility staff must supervise the unloading and covering of the asbestos waste.
53. The Approval Holder shall ensure that an "Asbestos Disposal Record" is maintained. The Record shall include, but not necessarily be limited to, the disposal date, volume of asbestos waste, origin of the shipment, contractor delivering the asbestos waste and a detailed plan of the disposal location at the Facility.

#### SITE MANAGEMENT

54. The Approval Holder shall ensure that areas of the containment cells at the Facility that will be inactive for at least three months are covered with a 300 mm intermediate cover layer, graded to promote drainage and minimize erosion and infiltration. Any leachate or any water that has, or could, come in contact with waste in the containment cells must be directed to the leachate collection system.
55. The Approval Holder shall ensure that white goods, scrap metals, electronics, propane tanks/canisters, wood, tires and any other materials being salvaged at the Facility are stored in a secured area separate from the main waste disposal area that has been approved by the Department.
56. The Approval Holder shall ensure that the drainage ditches at the Facility are maintained to ensure they remain free flowing at all times.
57. The Approval Holder shall ensure that wind blown debris and litter at the Facility is controlled. Adequate barriers and/or fencing shall be utilized to confine debris and litter to the immediate disposal area. Any debris or litter found along the access roads or otherwise not contained in the disposal cells shall be routinely collected and disposed in an appropriate location.
58. The Approval Holder shall ensure that unauthorized access to the Facility is controlled.
59. The Approval Holder shall ensure that a Pest Management Program is in place at the Facility that is in compliance with "Pest Control at NB Landfill Sites and Transfer Stations", attached as Schedule "B".

#### CONSTRUCTION AND DEMOLITION DEBRIS

60. The Approval Holder shall ensure that only C&D debris is disposed of at the C&D Site. Any material at the C&D Site that is not located in a designated sorting area is considered disposed.

61. The Approval Holder shall ensure that C&D debris disposed of at the C&D Site is done so in the disposal cell.
62. The Approval Holder shall ensure that the area between the property line of the Facility and the C&D Site disposal cell is maintained with a treed or bermed buffer zone.
63. The Approval Holder shall ensure that the C&D debris disposed of at the C&D Site is regularly compacted to minimize voids. Compaction with a dozer or equivalent is recommended.
64. The Approval Holder shall ensure that clean/uncontaminated granular cover material at least 150 mm deep is applied to all exposed C&D debris at the C&D Site at least once per week.
65. The Approval Holder shall ensure that the side slopes of the disposal area of the C&D Site are properly stabilized (using riprap or a vegetative layer as part of the cover system for example) and maintained to limit erosion.
66. The Approval Holder shall ensure that any final cover applied at the C&D Site is sloped in such a manner to ensure positive drainage and prevent standing or pooling of water on the surface.
67. The Approval Holder shall ensure that a minimum of 1.5 metres of overburden is maintained between the C&D debris and the bedrock and seasonal high groundwater.
68. The Approval Holder shall ensure that the C&D Site is designed and operated such that surface water is prevented from entering the C&D debris disposal cell. No C&D debris shall be disposed of in free standing water.

#### EMISSIONS AND DISCHARGES

69. The Approval Holder shall ensure that any discharge from the Facility, including the sedimentation pond, to a watercourse has a total suspended solids (TSS) value of 25 mg/l or less.
70. The Approval Holder shall ensure that no leachate (including treated leachate) generated at the Facility is released to the environment or to the Facility's surface water drainage system including the sedimentation pond.
71. The Approval Holder shall ensure that treated leachate from the Facility is discharged to the wastewater collection system operated by the City of Fredericton.
72. The Approval Holder shall ensure that there is no open burning conducted at the Facility, including the C&D Site, at any time.

73. The Approval Holder shall ensure that both odour and noise emissions released from the Facility are controlled to prevent impacts to off-site receptors. In the event that odour or noise emission impacts do occur, the Department may require the Approval Holder to develop, submit and implement a Control Plan that mitigates the impacts such that they no longer cause a nuisance to off-site receptors. The Control Plan shall be submitted to the Director for review and approval prior to implementation.
74. The Approval Holder shall ensure that fugitive dust emissions generated from truck traffic or other activities at the Facility are controlled by the use of water. Written permission from the Department must first be obtained if calcium chloride or other chemical compounds are to be used for dust control. The use of a petroleum product for dust control is **prohibited**.

TESTING AND MONITORING

75. The Approval Holder shall ensure that the groundwater monitoring wells for the Facility are sampled at least **three times each calendar year** by a qualified technician. The groundwater monitoring wells should be sampled at seasonal intervals that will provide an accurate representation of groundwater quality at the Facility. The existing network of groundwater monitoring wells at the Facility is as follows:

<u>Well</u>	<u>Clay</u>	<u>Deep Clay</u>	<u>Shallow Till</u>	<u>Deep Till</u>	<u>Shallow Bedrock</u>	<u>Mid Bedrock</u>
2S	2S(R)-S		2S(R)-I		2S(R)-D	
3B						3B
3S				3S(R)-I	3S(R)-D	
4S			4S-S	4S-I	4S-D	
4B						4B
5S				5S-D		
6S				6S-I	6S-D	
7S				7S(R)-I	7S(R)-D	
8S				8S-I	8S-D	
25					25A	
28					28A	
29	29C		29B		29A	
41	41B				41A	
42					56-06	
43					55-05	
44					54-05	
45					45A	
46					46A	
47			47B		47A	
48					48A	
49	49B				49A	
50	50B					50A
51	51B					51A
52	52S	52M			52D	
53	53A	53B			53C	

76. The Approval Holder shall ensure that all ground water samples required to be obtained for the Facility are analyzed by a laboratory that is, as a minimum, a member in good standing of the Canadian Association of Environmental Analytical Laboratories (CAEAL) Proficiency Testing Program for Environmental Laboratories, for the following parameters:

BTEX/TPH, GENERAL CHEMISTRY, TRACE METALS, COD, BOD<sub>5</sub>, Vinyl Chloride and Chloroform

where, for the purpose of this Approval, "GENERAL CHEMISTRY" shall include the following analyses:

Ammonia	Alkalinity (as CaCO <sub>3</sub> )	Calcium
Chemical Oxygen Demand	Chloride	Colour
Copper	Hardness (as CaCO <sub>3</sub> )	Iron
Nitrate-Nitrite (as N)	Magnesium	Manganese
o-Phosphate (as P)	Phenols	Potassium
r-Silica (as SiO <sub>2</sub> )	Sodium	Sulphur (Sulphate & Sulphide)
Total Suspended Solids	Total Organic Carbon	Turbidity
Total Kjeldahl Nitrogen (TKN)		Zinc

with the associated calculated parameters: Bicarbonate, Carbonate, Hydroxide, Cation Sum, Anion Sum, % difference, Theoretical conductance, Saturation pH (5°C) and Langelier Index (5°C).

and "TRACE METALS" shall include the following analyses:

Aluminum	Arsenic	Barium	Boron
Cadmium	Calcium	Chromium	Copper
Iron	Lead	Lithium	Magnesium
Manganese	Mercury (CVAAS)	Nickel	Potassium
Sodium	Zinc		

and "BTEX/TPH" shall be analysed in accordance with the Atlantic RBCA Tier 1 Guidelines for Laboratories and shall include the following parameters:

Benzene	C6-C10 Hydrocarbons
Toluene	>C10-C21 Hydrocarbons
Ethylbenzene	>C21-<C32 Hydrocarbons
Xylene	Modified TPH (Tier 1)

- % Rec. iso-butylbenzene-Volatile
- % Rec. iso-butylbenzene-Extractable
- % Rec. n-dotriacontane-Extractable

- 77. The Approval Holder shall ensure that prior to obtaining a ground water sample from a monitoring well at the Facility, a minimum of one well volume and a maximum of three well volumes be purged from that monitoring well.
- 78. The Approval Holder shall ensure that all field testing equipment is calibrated before and after each sampling event conducted at the Facility.
- 79. The Approval Holder shall ensure that the following field parameters are obtained during each sampling event at the Facility:

Conductivity	Dissolved Oxygen	pH
Temperature	ground water elevations (referenced to geodetic datum)	

- 80. The Approval Holder shall ensure that groundwater samples to be submitted for analysis of TRACE METALS are field filtered using 0.45 µm in-line waterra filter or equivalent. All other samples should be unfiltered.
- 81. The Approval Holder shall ensure that for each discharge of water from the sedimentation pond at the Facility a sample is obtained prior to the discharge event and at the mid-point of the discharge event and analyzed for Total Suspended Solids (TSS).
- 82. The Approval Holder shall ensure that leachate discharged from the waste disposal cells at the Facility and treated leachate discharged to the City of Fredericton waste water treatment system are sampled three times per year and analyzed for the following parameters:

Ammonia (as N)	BOD5	BTEX/TPH
COD	Chloride	Chromium
Copper	Conductivity (field)	Iron
Manganese	Nickel	Nitrite-Nitrate
pH	TKN	Total Organic Carbon (TOC)
Total Phosphate	Zinc	

- 83. The Approval Holder shall ensure that the leak detection manhole and the subdrain collection manhole for the leachate treatment pond at the Facility are monitored monthly for the following parameters:

GENERAL CHEMISTRY, TRACE METALS and BTEX/TPH.

- 84. The Approval Holder shall ensure that the surface water sampling locations SW1, SW2, SW3, SW4, SW5, SW6 and SW7 at the Facility are sampled and analyzed monthly for the following parameters:

GENERAL CHEMISTRY, TRACE METALS, BTEX/TPH, BOD<sub>5</sub> and TSS

85. The Approval Holder shall ensure that the results of all sampling and analysis conducted at the Facility are kept on file in both a hardcopy and electronic version.

## REPORTING

86. On or before **June 30, October 31 & March 1 of each year**, the Approval Holder shall ensure that an environmental monitoring report is submitted to the Director. It is understood that the June report will include monitoring from January to April, the October report will include monitoring from May to August and the March report will include monitoring from September to December. The reports must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick or is licensed to practise as a professional engineer pursuant to the *Engineering Profession Act* and include, as a minimum, a copy of the analysis, a comparison of the analysis with previous analytical results from the Facility, and commentary indicating whether there is an indication of any immediate, or potential threat or impact to the environment, ground or any surface waters. If an impact has occurred or is suspected the report must include a proposal for further investigation and/or remediation.
87. On or before **March 31 of each year**, the Approval Holder shall ensure that an Annual Environmental Report for the previous calendar year is submitted to the Director. The report must include as a minimum:
- a copy of the Asbestos Disposal Record;
  - a summary of daily precipitation data obtained from the nearest reporting station;
  - recommendations for any future monitoring, groundwater well installation or other work at the Facility;
  - confirmation that all field testing equipment has been calibrated before and after each sampling event conducted at the Facility;
  - dates of all sampling conducted at the Facility;
  - dates of each discharge from the sedimentation pond;
  - a copy of the analytical results of the sampling and monitoring data obtained from the Facility for the previous calendar year and a review of those analytical results that is completed by a professional engineer or geoscientist licensed with the Association of Professional Engineers and Geoscientists of New Brunswick that includes as a minimum:
    - comparisons with historical results from the Facility;
    - identification of possible analytical anomalies;
    - an evaluation and discussion of the results for the surface water sampling points, groundwater monitoring wells, any underdrains and the leachate pond leak detection and subdrain collection manholes and commentary on whether or not there is evidence of an immediate or potential impact to the environment, ground or surface waters and if so, recommendations for additional investigation, monitoring and remediation to mitigate the impacts;
    - confirmation that the containment cells and leachate pond(s) have been operated such that the minimum breakthrough requirements have been maintained; and
    - trending graphs for each monitoring well at the Facility and the leachate pond leak detection and cell underdrain manholes for the following indicator parameters showing results vs. time:

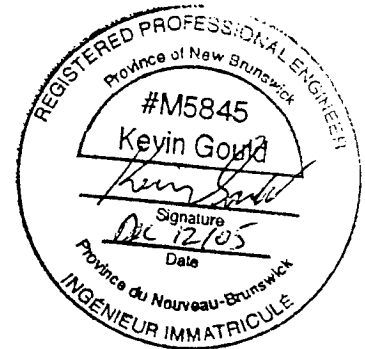
Alkalinity, Ammonia, Barium, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, pH, Sodium, Sulphate, and Dissolved Organic Carbon.

Note: Trending graphs should be completed on an annual basis but an alternate schedule may be accepted if approved in writing by the Director.

88. **Prior to April 03, 2006**, the Approval Holder shall ensure that an updated Household Hazardous Waste Operations Manual is submitted to the Department for review and approval.
89. **Prior to June 09, 2006**, the Approval Holder shall ensure that a copy of the Environmental Management Plan, as detailed in condition 31, is submitted to the Department.
90. **Prior to June 09, 2006**, the Approval Holder shall ensure that a Surface Water Management Plan is submitted to the Department. The Plan should detail how all surface water at the Facility (including water from all access roads, capped portions of the cells, and any other areas that are not directed to the sedimentation pond) is managed to ensure that there is no discharge of total suspended solids from the Facility to a watercourse in excess of 25 mg/l. An updated scaled site map that illustrates the surface water management system for the Facility must also be included.

Prepared by: Kevin Gould  
Kevin Gould, P.Eng.  
Solid Waste Engineer, Stewardship Branch

Reviewed by: Timothy R. LeBlanc  
Timothy R. LeBlanc, P.Eng.  
Manager, Waste Management Section, Stewardship Branch





## SCHEDULE "B"

### PEST CONTROL AT NB LANDFILL SITES AND TRANSFER STATIONS

1. **Terms and Conditions for Rodent Control at NB Landfill Sites and Transfer Stations**

1. All personnel directly involved in the mixing, loading and application of the pesticides for the control of rodents at waste disposal facilities must hold a valid Class F or Class L Pesticide Applicator's Certificate, which must be in their immediate possession.
2. Professional companies hired to conduct this work must hold a valid Provincial Operator's License and Pesticide Use Permit.
3. The treatment area must be posted with an approved sign prior to the treatment.
4. The signs are to be conspicuously posted at all ordinary points of access.
5. The applicator shall ensure that the signs are removed after either the completion of treatment or the expiration of their permit.
6. The sign shall be rectangular in shape with a minimum size of 14 cm x 21 cm, rain resistant with type or letters of sufficient size and clarity to be easily read together with a symbol of a cautionary raised hand inside a symbol of a stop sign. The information on the sign must be bilingual and must contain the words "Attention, Pesticide Application", the name of the pesticide, the Pest Control Product registration number, date of application, name of applicator, operator name or logo and telephone number.
7. Industry approved tamper resistant bait stations must be attempted before using other methods of baiting.
8. The Director of Pesticides Control or any member of the Pesticides Management Unit must approve areas that require alternative baiting methods. They can be contacted at (506) 453-7945.

November 8, 2005



## **Appendix B**

### **Condensed Contingency Plan (HHH Depot)**

## **CONTINGENCY PLAN CONDENSED**

### **SITE DESCRIPTION**

Specific Site Location: Fredericton Landfill, 1775 Alison Blvd.  
Contact: JP Astorino, Operations Manager  
Mailing Address: P. O. Box 21, Station A  
Fredericton, NB  
E3B 4Y2  
Phone: (506) 453-9932  
Cellular: (506) 476-6545

### **TYPES OF POTENTIAL INCIDENTS AND PREVENTATIVE MEASURES TO BE TAKEN FOR THEIR CONTROL**

Fire: Non-combustible, grounded, metal depot  
Spill/Release: Secondary containment inside depot; plastic tarps placed on curbside asphalt receiving area outside depot  
Injury: Fully trained FRSWC staff in TDG and WHMIS. Appropriate personal protective equipment available at all times. All depot clients are required to remain in their vehicles with the engines off.  
Vehicular Incidents: Traffic control through depot entrance and receiving area. Speed limits throughout site.

### **COMMUNICATION**

Primary Communication: Site Radio  
Secondary Communication (If Needed): Telephone

### **LOCATION OF EMERGENCY EQUIPMENT**

Phone: Scale House, Administrative Office, Recycle Facility  
Eyewash: Two eyewash stations, one in each depot storage area

First Aid Kit: Two first aid kits, one in each depot storage area  
Spill Kit: Located in Compartment II of the depot.  
Fire Extinguishers: Two ABC fire extinguishers, one in each depot storage area

### **EMERGENCY PHONE NUMBERS**

Hospital: 911  
Ambulance: 911  
Police: 911  
Fire: 911  
Environmental Emergency Reporting (including spills):  
New Brunswick Department of Environment & Local Government  
Regional Office 8:15AM – 4:30PM 444-5149  
Coast Guard (24 hours, seven days per week) 1-800-565-1633

### **DIRECTIONS TO HOSPITAL**

Exit main FRSWC gate, turn right onto Alison Blvd. Proceed 2.7 km to the Vanier Highway (Route 7). Proceed on the Vanier Highway to the traffic lights at the corner of Regent St and Prospect St. Turn right onto Regent St. Travel on Regent St to the traffic lights at the corner of Regent St and Priestman St. Turn right onto Priestman St. Travel on Priestman St for approximately 200 metres. Turn right at the Dr. Everett Chalmer's Hospital entrance.

### **EVACUATION**

Assembly Areas: The FRSWC Scale House near the main gate.



## **APPENDIX D**

Approval to Operate I-9667



## APPROVAL TO OPERATE

**I-9667**

Pursuant to paragraph 8(1) of the *Water Quality Regulation - Clean Environment Act*, and paragraph 5 (3) (a) of the *Air Quality Regulation - Clean Air Act*, this Approval to Operate is hereby issued to:

### **Regional Service Commission 11** for the operation of the **Fredericton Landfill**

Description of Source: **A regional solid waste management facility**

Source Classification: **Fees for Industrial Approvals Class 4**  
**Regulation - Clean Water Act**  
**Air Quality Regulation Class 4**

Parcel Identifier: **60042553, 75227959, 60151438, 75289272, 75435552**

Mailing Address: **P.O. Box 21 Station A**  
**Fredericton, NB E3B 4Y2**

Conditions of Approval: **See attached Schedule (s)"A" and "B" of this Approval**

Supersedes Approval: **I-9041**

Valid From: **March 19, 2017**

Valid To: **March 18, 2022**

Recommended by:  \_\_\_\_\_

Issued by:  \_\_\_\_\_  
for the Minister of Environment and Local Government

March 13, 2017  
Date

## SCHEDULE "A"

### A. DESCRIPTION AND LOCATION OF SOURCE

The Regional Service Commission 11 operates a regional solid waste disposal facility located on Alison Boulevard that is commonly referred to as the Fredericton Landfill. The landfill is primarily designed to serve the approximate 115,000 residents in the Fredericton Region of central New Brunswick. The Commission utilizes a waste-baling system that helps control wind-blown litter and is effective in generating greater compaction of the waste to be disposed. In addition, the Commission operates a construction and demolition debris disposal site, household hazardous waste depot, and a landfill gas control and collection system at the landfill. A designated area is provided for the temporary storage of metal, tires, wood, white goods and other such salvageable/recyclable materials. An ash disposal cell developed in conjunction with the University of New Brunswick is also utilized.

As a result of the operation of the regional solid waste disposal facility, there exist *potential* environmental impacts from:

- i) the generation of leachate in the landfill containment cells and the construction and demolition debris disposal site;
- ii) spillage, release or mishandling of leachate, a petroleum product or other material;
- iii) the operation of the household hazardous waste depot;
- iv) accidental discharge of leachate from the leachate treatment pond or collection system;
- v) site run-off or suspended solids discharge from the sedimentation pond;
- vi) fugitive dust emissions from truck traffic and other on-site activities; and,
- vii) elevated odour and/or noise emissions.

The operation of the regional solid waste disposal facility by the Regional Service Commission 11, located in the City of Fredericton / local service district of Rusagonis-Waasis, County of York / Sunbury, and the Province of New Brunswick and identified by Parcel Identifier (PID) numbers 60042553, 75227959, 60151438, 75289272, and 75435552 is hereby approved **subject to the following:**

### B. DEFINITIONS

1. "**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.
2. "**Approval Holder**" means the entity to which this Approval is issued, as named on the Certificate page of this Approval.

3. **“Biomedical Waste”** means,
- i) any part of the human body, including tissues and bodily fluids, but excluding fluids, extracted teeth, hair, nail clippings and the like, that are not infectious;
  - ii) any part of the carcass of an animal infected with a communicable disease or suspected by a licensed veterinary practitioner to be infected with a communicable disease;
  - iii) non-anatomical waste infected with communicable disease;
  - iv) a mixture of a waste referred to in clause (i), (ii) or (iii) and any other waste or material; or,
  - v) a waste derived from a waste referred to in clause (i), (ii) or (iii), unless the waste that is derived from the waste referred to in clause (i), (ii) or (iii) is produced in accordance with a certificate of approval that states that, in the opinion of the Director, the waste that is produced in accordance with the certificate of approval does not have characteristics similar to the characteristics of waste referred to in clause (i), (ii) or (iii).
4. **“C&D Debris”** means,
- a) concrete, brick and untreated wood;
  - b) siding, ceiling tile, gyproc, insulation;
  - c) asbestos that is not friable asbestos;
  - d) solid roofing materials such as asphalt shingles;
  - e) glass from doors and windows;
  - f) metal, wood and durable plastic structural materials from the demolition of a building;
  - g) wiring and incandescent light fixtures that do not contain fluorescent tubing/lighting;
  - h) toilets, bathtubs, wash basins, and plumbing fixtures;
  - i) floor coverings attached to a building during demolition;
  - j) broken and aged asphalt; or,
  - k) any mixture of (a) thru (j).

that has been obtained during the construction, renovation or demolition of a building or structure. Debris or other materials obtained from commercial, industrial and manufacturing sources is not acceptable. Debris: i) from a building that has or may have manufactured, contained, transferred or distributed contaminated or hazardous (such as a pesticide storage warehouse) products; or ii) that contains PCB's (polychlorinated biphenyls); or iii) that contains lead paint of a known concentration greater than 1000 ppm (parts per million) or that has been deemed leachable toxic (exceeds 5 mg/L) or contains lead paint that is flaking/chipping/peeling is not considered C&D debris for the purpose of this Approval.

5. **“C&D Site”** means the portion of the Facility approved by the Department for the disposal of C&D debris.



6. **"Containment Cell"** means the area at the Facility, approved in writing by the Department, for the disposal of solid waste.
7. **"Department"** means the New Brunswick Department of the Environment and Local Government.
8. **"Director"** means the Director of the Impact Management Branch of the Department and includes any person designated to act on the Director's behalf.
9. **"Disposal Cell"** means the area at the C&D site approved by the Department for the disposal of C&D debris.
10. **"Facility"** means the property, leachate collection and treatment systems, buildings, equipment and any other activities involved with the operation of the regional solid waste disposal facility operated by the Regional Service Commission 11, located on Parcel Identifier (PID) numbers 60042553, 75227959, 60151438, 75289272, and 75435552.
11. **"Friable Asbestos"** means waste material containing asbestos fibre or asbestos dust in a concentration greater than 1% by weight that is **not** tightly bound within a solid matrix such that it is easily crumbled by the hands.
12. **"Hazardous Waste"** means any waste material intended for disposal or recycling, that is identified as a hazardous waste or hazardous recyclable material by the federal *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*, and/or is included in Class 1 and/or Class 7 of the federal *Transportation of Dangerous Goods Regulations*. This definition excludes any waste(s) for which the Director has issued a written exemption.
13. **"Landfill Gas Control and Collection System"** is the system used to capture and flare landfill gas from the containment cells. The system consists of the collection wells, piping, flare and skid mount blower.
14. **"Liquid Oily Waste"** means any waste containing free flowing petroleum products.
15. **"Liquid Waste"** means bulk liquids in a volume greater than 20 litres.
16. **"Minister"** means the Minister of the Department and includes any person designated to act on the Minister's behalf.
17. **"Petroleum Contaminated Soil"** means soil that contains petroleum products at quantities determined, to the satisfaction of the Department, to be above the level indicated in the most recent version of the *RBCA Tier I Risk-Based Screening Level (RBSL) Guidelines for Soil: Commercial, Non-potable, Coarse-grained for Gas (Modified TPH)*.

18. **"Petroleum Product"** means a mixture of hydrocarbons, or their by-products, of any kind and in any form, including airplane fuel, asphalt, bunker "C" oil, crude oil, diesel fuel, engine oil, fuel oil, gasoline, kerosene, lubricants, mineral spirits, naphtha, petroleum based solvents regardless of specific gravity, transformer oil and waste petroleum products and excluding propane and paint.
19. **"Sludge"** means a solid, semi-solid or liquid residue having less than 15% solids generated during the treatment of municipal and/or industrial wastewater, or generated as a result of other processes.
20. **"Sorting Area"** means a location at the C&D site, if approved in writing by the Director, where loads of C&D debris may be dumped and sorted. Unapproved materials may temporarily be stored at this location.
21. **"Watercourse"** means the full width and length, including the beds, banks, sides and shoreline, or any part of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not.

## C. EMERGENCY REPORTING

22. The Approval Holder, operator or any person in charge of the Facility **shall immediately** notify the Department where:
  - a) there has been, or is likely to be, any spill or unauthorized release of leachate, wastewater, petroleum products, hazardous materials, or gaseous material from the Facility to the environment, surface water, groundwater or atmosphere; or,
  - b) a release of a contaminant or contaminants from the Facility is of such magnitude or duration that there is a concern for the health or safety of the public, or there could be an impact to the environment.

### Notification Procedure

Verbal notification should immediately be made to the **Region 5 (Fredericton) Office by calling (506) 444-5149**. If contact cannot be made for any reason the problem should immediately be reported to the **Canadian Coast Guard at 1-800-565-1633**. At this time, the problem that occurred, its resulting impact, and what was done to minimize the impact should be clearly expressed.

Within 24 hours of the original notification, a copy of an "Incident Report" shall be faxed to the Region 5 (Fredericton) Office at (506) 453-2893. The "Incident Report" shall clearly detail as much information about the incident that is available. As a minimum the faxed report should include: details of the problem, its resulting impact and what was done to minimize the impact.

Within five (5) working days from the original notification, a faxed “Detailed Emergency Report” shall be sent to the Region 5 (Fredericton) Office and also to Central Office in Fredericton at (506) 453-2390. The “Detailed Emergency Report” shall describe in detail the problem that occurred, why the problem occurred, what the environmental impact was, what was done to minimize the impact, and what measures have been taken to prevent a re-occurrence of the problem

23. The Approval Holder shall ensure that the Region 5 (Fredericton) Office and Director are notified within 24 hours of any public complaint received at the Facility.

#### **D. GENERAL INFORMATION**

24. This Certificate of Approval does not relieve the Approval Holder from compliance with other bylaws, federal or provincial acts or regulations, or any guidelines or directives pursuant to regulations.
25. The Approval Holder shall immediately notify the Department in writing of any change in the legal name or address of the Facility.

#### **E. TERMS AND CONDITIONS**

##### GENERAL CONDITIONS

26. In the event of Facility closure, the Approval Holder shall, in addition to any requirements under the *Environmental Impact Assessment Regulation 87-83* filed under the *Clean Environment Act*, ensure that a Closure Plan is submitted to the Director **at least six (6) months** before the planned closure date. The plans must be prepared by a Professional Engineer licensed to practice in the Province of New Brunswick.
27. In the event of closure of the C&D Site at the Facility, the Approval Holder shall ensure that a Closure Plan is submitted to the Director **at least three (3) months** before the planned closure date. The plan must be prepared by a Professional Engineer licensed to practice in the Province of New Brunswick.
28. The Approval Holder shall ensure that any item received at the Facility containing ozone-depleting substances, including but not limited to those utilized for refrigeration and/or air conditioning, are decommissioned according to the *Ozone Depleting Substances Regulation 97-132* filed under the *Clean Air Act*.
29. The Approval Holder shall ensure that waste, including C&D debris and friable asbestos, that originates from outside of New Brunswick is not accepted at the Facility unless specifically approved by the Minister following an evaluation under the *Environmental Impact Assessment Regulation*.

30. The Approval Holder shall ensure that an Environmental Management Plan (EMP) is in place at the Facility. The EMP should include detailed emergency and contingency response procedures resulting from the spillage, release or mishandling of leachate, a petroleum product, or other dangerous materials at the Facility. The EMP should also include details on how the Facility will respond to emergency situations that would interrupt normal operation of the Facility.

#### OPERATING CONDITIONS

31. The Approval Holder shall ensure that the minimum 25-year breakthrough requirement for the containment cells at the Facility is maintained.
32. The Approval Holder shall ensure that any solid waste disposed of at the Facility is done so in the containment cells at the Facility unless otherwise approved in writing by the Director.
33. The Approval Holder shall ensure that the Facility is not used for the disposal of the following materials listed, unless otherwise approved in writing by the Director:
  - a) petroleum contaminated soil;
  - b) liquid wastes (with the exception of septage from the Facility sewage system);
  - c) sludge (with the exception of sludge from the Facility leachate treatment system);
  - d) liquid oily wastes;
  - e) hazardous wastes;
  - f) biomedical waste; or,
  - g) any mixture of the above.
34. The Approval Holder shall provide supervision when any material is being disposed of at the Facility, including the C&D Site. No disposal at the Facility, including the C&D Site, is permitted otherwise.
35. The Approval Holder shall ensure that the incoming waste at the Facility is routinely scrutinized to ensure that unacceptable waste is not received at the Facility.
36. The Approval Holder shall ensure that the household hazardous waste depot at the Facility is operated in accordance with an operating manual approved by the Department.

#### CONSTRUCTION

37. The Approval Holder shall ensure that the necessary engineering documentation is submitted to the Director, and approved in writing by the Department, prior to the construction, modification or expansion of 1) additional waste disposal cells; 2) landfill gas management systems; 3) sludge handling facilities; 4) leachate treatment systems; 5) facilities for processing recyclables or managing organics; or, 6) storage of waste including household hazardous waste or any other construction activity at the Facility.

38. The Approval Holder shall ensure that final cover applied to the containment cells at the Facility shall be a minimum of 300 mm granular layer, 600 mm low permeability clayey till with  $1 \times 10^{-7}$  cm/s hydraulic conductivity, 150 mm granular protection layer, 150 mm growing medium and vegetative cover, and shall be sloped a minimum of 2% to promote precipitation runoff from the disposal cell. All holes, cave-ins and faults shall be filled in or repaired, as required, until the final cover has been properly stabilized. Upper side slopes shall be less than 4 horizontal to 1 vertical. If approved in writing by the Director, an alternative final cover plan may be used.
39. The Approval Holder shall ensure that a Quality Assurance and Quality Control (QA/QC) report is submitted to the Department upon completion of the installation of final cover on a containment cell or cells at the Facility. The report must be prepared by a Professional Engineer licensed to practice in New Brunswick. The report must include, as a minimum, the following:
- i) confirmation that all construction activities and testing associated with the installation of final cover were supervised by a qualified independent third party and that the final cover meets the Department's requirements;
  - ii) all test parameters, the number of tests and locations;
  - iii) copies of any inspection and testing reports;
  - iv) a summary of any problems or deficiencies encountered and how they were corrected; and,
  - v) other information as requested by the Department.

The QA/QC report should be forwarded to the Department no later than three (3) months upon completion of the final cover.

40. The Approval Holder shall ensure that all future containment cells at the Facility are designed such that the installed leachate piping can be inspected in the future by video to ensure that the leachate piping is in proper working condition.
41. The Approval Holder shall ensure that, prior to decommissioning any wells at the Facility, a decommissioning plan is submitted to the Department and approved in writing by the Director

#### LEACHATE AND SURFACE WATER

42. The Approval Holder shall ensure that no leachate, or water that has come in contact with solid waste, is released from the Facility to the environment or to the Facility's surface water drainage system including the sedimentation pond.
43. The Approval Holder shall ensure that all leachate and all water at the Facility that has come in contact with solid waste is directed to the Facility's leachate collection and treatment system.

44. The Approval Holder shall ensure that surface water at the Facility that has not been in contact with leachate or solid waste is directed to the sedimentation pond(s). Surface water that has a total suspended solids (TSS) value of 25 mg/L or less may be diverted from the sedimentation pond(s) if approved in writing by the Department. Water from empty disposal cells that has not been in contact with leachate or solid waste must bypass the leachate storage and treatment system and be directed to the surface water drainage system at the Facility. Drainage ditches must be maintained with a proper grade that directs surface water away from the waste disposal area and into the sedimentation pond(s).
45. The Approval Holder shall ensure that there is a continuous, permeable layer of gravel surrounding the waste at the Facility from the top of the upper side slopes through the top of the berm area to the leachate collection system. Particular care must be exercised at the top of berm area so that the final cover will properly intersect the top of berm.
46. The Approval Holder shall ensure that the leachate collection piping at the Facility is properly maintained to ensure they remain free flowing.
47. At least once every two (2) years, the Approval Holder shall ensure that the leachate collection piping at the Facility is inspected by video, or another method approved in writing by the Director, to ensure the leachate collection system is in proper working condition.

#### LANDFILL GAS MANAGEMENT

48. The Approval Holder shall ensure that the landfill gas control and collection system is properly operated and maintained.
49. The Approval Holder shall ensure that the flare of the landfill gas control and collection system is operated with a minimum gas residence time of 0.75 seconds at a minimum temperature of 875 degrees Celsius to maximize the destruction efficiency.
50. The Approval Holder shall ensure that a continuous temperature monitor is fully functional and in operation at all times when the landfill gas control and collection system is in use. The temperature shall be recorded once every hour. An electronic record of the temperature results shall be maintained for a minimum of two (2) years and shall be made available upon request.
51. The Approval Holder shall notify the Department if the continuous temperature monitor is taken out of service for maintenance or repair while the landfill gas control and collection system is in operation. During the maintenance or repair the temperature shall be manually monitored and recorded on a schedule approved in writing by the Department.

## WASTE DISPOSAL

52. The Approval Holder shall ensure that hot loads arriving at the Facility containing ashes or other materials that could potentially cause a fire in the containment cells are temporarily stored in a separate secure location approved by the Department until the risk of fire has been eliminated. The material shall then be disposed of in the designated area at the Facility.
53. The Approval Holder shall ensure that any friable asbestos accepted at the Facility for disposal has been wetted, placed in securely tied, double bagged 6 mil polyethylene bags or securely tied single 6 mil polyethylene bag that has been placed in a drum or cardboard box with all seams securely taped and each bag, cardboard box and/or drum is clearly labelled "WASTE ASBESTOS UN2590" or "DECHETS D'AMIANTE UN2590" and there are no punctures in the containers (if they are punctured, the contents must be wetted and repackaged prior to land filling) and they are placed at a dedicated location within the containment cells and are immediately covered with a minimum of 300 mm of clean cover material, or 1000 mm of municipal solid waste. Asbestos should be accepted at the Facility by appointment only, and not disposed during windy conditions.
54. The Approval Holder shall ensure that there is a sufficient quantity of wetting agent on site when asbestos is being handled and disposed at the Facility.
55. The Approval Holder shall ensure that any unloading of friable asbestos at the Facility is done by the driver (or assistant) and that they or any personnel at the Facility who handle the asbestos are wearing the proper respirators and clothing during the unloading and disposal of the asbestos waste. Appropriate Facility staff must supervise the unloading and covering of the asbestos waste.
56. The Approval Holder shall ensure that an "Asbestos Disposal Record" is maintained. The record shall include, but not necessarily be limited to, the disposal date, volume of asbestos waste, origin of the shipment, contractor delivering the asbestos waste, and a detailed plan of the disposal location at the Facility.

## SITE MANAGEMENT

57. The Approval Holder shall ensure that areas of the containment cells at the Facility that will be inactive for at least three (3) months are covered with a 300 mm intermediate cover layer, graded to promote drainage and minimize erosion and infiltration. Any leachate or any water that has, or could, come in contact with waste in the containment cells must be directed to the leachate collection system.
58. The Approval Holder shall ensure that white goods, scrap metals, electronics, propane tanks/canisters, wood, tires and any other materials being salvaged at the Facility are stored in a secured area separate from the main waste disposal area that has been approved by the Department.

59. The Approval Holder shall ensure that the drainage ditches at the Facility are maintained to ensure they remain free flowing at all times.
60. The Approval Holder shall ensure that wind-blown debris and litter at the Facility is controlled. Adequate barriers and/or fencing shall be utilized to confine debris and litter to the immediate disposal area. Any debris or litter found along the access roads or otherwise not contained in the disposal cells shall be routinely collected and disposed in an appropriate location.
61. The Approval Holder shall ensure that unauthorized access to the Facility is controlled.
62. The Approval Holder shall ensure that a Pest Management Program is in place at the Facility that is in compliance with "*Pest Control at NB Landfill Sites and Transfer Stations*", attached as Schedule "B" of this Approval.

#### CONSTRUCTION AND DEMOLITION DEBRIS

63. The Approval Holder shall ensure that only C&D debris is disposed of at the C&D Site. Any material at the C&D Site that is not located in a designated sorting area is considered disposed.
64. The Approval Holder shall ensure that C&D debris disposed of at the C&D Site is done so in the disposal cell.
65. The Approval Holder shall ensure that the area between the property line of the Facility and the C&D Site disposal cell is maintained with a treed or bermed buffer zone.
66. The Approval Holder shall ensure that the C&D debris disposed of at the C&D Site is regularly compacted to minimize voids.
67. The Approval Holder shall ensure that clean/uncontaminated granular cover material at least 150 mm deep is applied to all exposed C&D debris at the C&D Site at least once per week.
68. The Approval Holder shall ensure that the side slopes of the disposal area of the C&D Site are properly stabilized and maintained to limit erosion.
69. The Approval Holder shall ensure that any final cover applied at the C&D Site is sloped in such a manner to ensure positive drainage and prevent standing or pooling of water on the surface.
70. The Approval Holder shall ensure that a minimum of 1.5 m of overburden is maintained between the C&D debris and the bedrock and seasonal high groundwater.



71. The Approval Holder shall ensure that the C&D Site is designed and operated such that surface water is prevented from entering the C&D debris disposal cell. No C&D debris shall be disposed of in free standing water.

#### EMISSIONS AND DISCHARGES

72. The Approval Holder shall ensure that any discharge from the Facility, including the sedimentation pond, to a watercourse has a total suspended solids (TSS) value of 25 mg/L or less.
73. The Approval Holder shall ensure that no leachate (including treated leachate) generated at the Facility is released to the environment or to the Facility's surface water drainage system including the sedimentation pond.
74. The Approval Holder shall ensure that treated leachate from the Facility is discharged to the wastewater collection system operated by the City of Fredericton.
75. The Approval Holder shall ensure that both odour and noise emissions released from the Facility are controlled to prevent impacts to off-site receptors. In the event that odour or noise emission impacts do occur, the Department may require the Approval Holder to develop, submit and implement a Control Plan that mitigates the impacts such that they no longer cause a nuisance to off-site receptors.
76. The Approval Holder shall ensure that there is no open burning conducted at the Facility, including the C&D Site, at any time.
77. The Approval Holder shall ensure that fugitive dust emissions generated from truck traffic or other activities at the Facility are controlled by the use of water. Written permission from the Department must first be obtained if calcium chloride or other chemical compounds are to be used for dust control. The use of a petroleum product for dust control is **prohibited**.

#### TESTING AND MONITORING

78. The Approval Holder shall ensure that the groundwater monitoring wells for the Facility are sampled at least **three (3) times per year** by a qualified technician. The groundwater monitoring wells should be sampled at seasonal intervals that will provide an accurate representation of groundwater quality at the Facility. The existing network of groundwater monitoring wells at the Facility is as follows:

Well Nest	Shallow Overburden (0-8m)	Intermediate Overburden (Clay, Glacial Till)	Bedrock
2S	2S(R)-S	2S(R)-I	2S(R)-D
3B			3B
4B			4B
5S		5S-D	
6S		6S-I	6S-D
7S		7S(R)-I	7S(R)-D
8S		8S-I	8S-D
25			25A
29	29C	29B	29A
41	41B		41A
46			46A
47	47B		47A
48			48B
49	49B		49A
50	50B		50A
51	51B		51A
52	52C, 52B	52A	
53	53A, 53B		53C
54			54-05
55			55-05
56			56-05
57			57
58			58
59	59S	59I	59D
60	60S	60I	60D

79. The Approval Holder shall ensure that the groundwater samples obtained for the Facility are analyzed for the following parameters by accredited laboratories whose accreditation includes the analytical method used to make the determination: BTEX/TPH, GENERAL CHEMISTRY, TRACE METALS, COD, BOD<sub>5</sub>, Vinyl Chloride and Chloroform.

For the purpose of this Approval, “GENERAL CHEMISTRY” shall include the following parameters:

Ammonia	Alkalinity (as CaCO <sub>3</sub> )	Calcium
Chemical Oxygen Demand	Chloride	Colour
Copper	Hardness (as CaCO <sub>3</sub> )	Iron
Nitrate-Nitrite (as N)	Magnesium	Manganese
o-Phosphate (as P)	Phenols	Potassium
r-Silica (as SiO <sub>2</sub> )	Sodium	Sulphur (Sulphate & Sulphide)
Total Suspended Solids (TSS)	Total Organic Carbon	Turbidity
Total Kjeldahl Nitrogen (TKN)	Zinc	

with the associated calculated parameters: Bicarbonate, Carbonate, Hydroxide, Cation Sum, Anion Sum, % difference, Theoretical conductance, Saturation pH (5°C) and Langelier Index (5°C).

For the purpose of this Approval, “TRACE METALS” shall include the following parameters:

Aluminum	Arsenic	Barium
Boron	Cadmium	Calcium
Chromium	Copper	Iron
Lead	Lithium	Magnesium
Manganese	Mercury (CVAAS)	Nickel
Potassium	Sodium	Zinc

“BTEX/TPH” shall be analyzed in accordance with the *Atlantic RBCA Tier 1 Guidelines for Laboratories* and shall include the following parameters: Benzene, Toluene, Ethylbenzene, and Xylene.

- 80. The Approval Holder shall ensure that prior to obtaining a groundwater sample from a monitoring well at the Facility, that a minimum of one (1) well volume and a maximum of three (3) well volumes be purged from that monitoring well.
- 81. The Approval Holder shall ensure that all field testing equipment is calibrated before and after each sampling event conducted at the Facility.

- 82. The Approval Holder shall ensure that the following field parameters are obtained during each sampling event at the Facility:

Conductivity	Dissolved Oxygen	pH
Temperature	Groundwater elevations (referenced to geodetic datum)	

- 83. The Approval Holder shall ensure that groundwater samples to be submitted for analysis of TRACE METALS are field filtered using 0.45 µm in-line waterra filter or equivalent. All other samples should be unfiltered.
- 84. The Approval Holder shall ensure that for each discharge of water from the sedimentation pond at the Facility a sample is obtained prior to the discharge event and at the mid-point of the discharge event and analyzed for Total Suspended Solids (TSS).
- 85. The Approval Holder shall ensure that leachate discharged from the waste disposal cells at the Facility and treated leachate discharged to the City of Fredericton wastewater collection system are sampled three (3) times per year and analyzed for the following parameters:

Ammonia (as N)	BOD <sub>5</sub>	BTEX/TPH
COD	Chloride	Chromium
Copper	Conductivity (field)	Iron
Manganese	Nickel	Nitrite-Nitrate
pH	TKN	Total Organic Carbon (TOC)
Total Phosphate	Zinc	

- 86. The Approval Holder shall ensure that the leak detection manhole and the subdrain collection manhole for the leachate treatment pond at the Facility are monitored monthly for the following parameters: GENERAL CHEMISTRY, TRACE METALS and BTEX/TPH.

87. The Approval Holder shall ensure that the surface water sampling locations SW1, SW2, SW3, SW4, SW5, SW6 and SW7 at the Facility are sampled and analyzed monthly for the following parameters: GENERAL CHEMISTRY, TRACE METALS, BTEX/TPH, BOD<sub>5</sub> and TSS.
88. The Approval Holder shall ensure that the results of all sampling and analysis conducted at the Facility are kept on file in both a hardcopy and electronic version.

## REPORTING

89. On or before **June 30, October 31 and March 1 of each year**, the Approval Holder shall ensure that an environmental monitoring report is submitted to the Director. The June report shall include monitoring from January to April, the October report to include monitoring from May to August and the March report to include monitoring from September to December. The reports must be prepared by a Professional Engineer licensed to practice in New Brunswick. The reports must include, as a minimum, a copy of the analyses performed during the reported period, a comparison of the analyses with previous analytical results from the Facility, and a summary of whether there is an indication of any immediate, or potential threat or impact to the environment, ground or surface waters. If an impact has occurred or is suspected, the report must include a proposal for further investigation and/or remediation.
90. On or before **March 31 of each year**, the Approval Holder shall ensure that an Annual Environmental Report for the previous calendar year is submitted to the Director. At a minimum, the report prepared by a Professional Engineer licensed to practice in New Brunswick, must include:
- a) a copy of the Asbestos Disposal Record;
  - b) a summary of daily precipitation data obtained from the nearest reporting station;
  - c) recommendations for any future monitoring, groundwater well installation or other work at the Facility;
  - d) confirmation that all field testing equipment has been calibrated before and after each sampling event conducted at the Facility;
  - e) dates of all sampling conducted at the Facility;
  - f) dates of each discharge from the sedimentation pond;
  - g) a copy of the analytical results of the sampling and monitoring data; and,
  - h) a commentary of, at a minimum, the following discussion points:
    - i) comparisons with historical results from the Facility;
    - ii) identification of possible analytical anomalies;
    - ii) an evaluation and discussion of the results for the surface water sampling points, groundwater monitoring wells, any underdrains and the leachate pond leak detection and subdrain collection manholes and commentary on whether or not there is evidence of an immediate or potential impact to the environment, ground or surface waters and if so, recommendations for additional investigation, monitoring and remediation to mitigate the impacts;

iv) confirmation that the containment cells and leachate pond(s) have been operated such that the minimum breakthrough requirements have been maintained; and,

iv) trending graphs for each monitoring well at the Facility and the leachate pond leak detection and cell underdrain manholes for the following indicator parameters showing results vs. time: Alkalinity, Ammonia, Barium, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, pH, Sodium, Sulphate, and Dissolved Organic Carbon.



Prepared by: \_\_\_\_\_  
Sylvie Morton, M.Sc.E., P.Eng.  
Impact Management Branch

## SCHEDULE "B"

### PEST CONTROL AT NB LANDFILL SITES AND TRANSFER STATIONS

1. **Terms and Conditions for Rodent Control at NB Landfill Sites and Transfer Stations**

1. All personnel directly involved in the mixing, loading and application of the pesticides for the control of rodents at waste disposal facilities must hold a valid Class F or Class L Pesticide Applicator's Certificate, which must be in their immediate possession.
2. Professional companies hired to conduct this work must hold a valid Provincial Operator's License and Pesticide Use Permit.
3. The treatment area must be posted with an approved sign prior to the treatment.
4. The signs are to be conspicuously posted at all ordinary points of access.
5. The applicator shall ensure that the signs are removed after either the completion of treatment or the expiration of their permit.
6. The sign shall be rectangular in shape with a minimum size of 14 cm x 21 cm, rain resistant with type or letters of sufficient size and clarity to be easily read together with a symbol of a cautionary raised hand inside a symbol of a stop sign. The information on the sign must be bilingual and must contain the words "Attention, Pesticide Application", the name of the pesticide, the Pest Control Product registration number, date of application, name of applicator, operator name or logo and telephone number.
7. Industry approved tamper resistant bait stations must be attempted before using other methods of baiting.
8. The Director of Pesticides Control or any member of the Pesticides Management Unit must approve areas that require alternative baiting methods. They can be contacted at (506) 453-7945.

November 8, 2005



## **APPENDIX E**

### Supporting Documents

**Well Driller's Report**

Date printed 8/25/2020

Drilled by			
Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Cable Tool	11/26/2003

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
8220	Steel	15.24cm	0m	26.52m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	12.19m	0 lpm	0hr	0m	31.85 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting			
Well Log	Grout Type	From	End
8220	Other	1.83m	25.91m

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine Pucks	Submersible
	Qty 0L	Intake Setting (BTC)
		91.44m

Driller's Log				
Well Log	From	End	Colour	Rock Type
8220	0m	0.91m	Brown	Gravel
8220	0.91m	11.58m	Grey	Till
8220	11.58m	12.19m	Red	Shale
8220	12.19m	18.90m	Red	Sandstone
8220	18.90m	22.56m	Red	Shale
8220	22.56m	24.99m	Red and grey	Mudstone
8220	24.99m	29.87m	Red	Shale
8220	29.87m	86.87m	Red	Sandstone
8220	86.87m	99.67m	Grey	Sandstone

Overall Well Depth  
99.67m  
Bedrock Level  
11.58m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
8220	44.20m	13.65 lpm
8220	70.10m	13.65 lpm
8220	96.01m	4.55 lpm

Setbacks		
Well Log	Distance	Setback From
8220	60.96m	Septic Tank
8220	64.01m	Leach Field



**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Cable Tool	10/17/2008

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
14027	Steel	15.24cm	0m	29.26m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	15.24m	27.3 lpm	1hr 30min	39.62m	13.65 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine Pucks	Submersible Intake Setting (BTC)
	Qty 0L	45.72m

Driller's Log				
Well Log	From	End	Colour	Rock Type
14027	0m	1.22m	Brown	Till
14027	1.22m	28.65m	Dark brown	Broken Shale
14027	28.65m	51.51m	Brown	Rock

Overall Well Depth  
51.51m  
Bedrock Level  
28.65m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
14027	38.10m	4.55 lpm
14027	48.77m	13.65 lpm

Setbacks		
Well Log	Distance	Setback From
14027	91.44m	Septic Tank
14027	91.44m	Leach Field

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Cable Tool	03/16/2009

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
14041	Steel	15.24cm	0m	29.26m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
	27.43m	13.65 lpm	1hr 30min	27.43m	13.65 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine Pucks	N/A
	Qty 0L	Intake Setting (BTC) 0m

Driller's Log				
Well Log	From	End	Colour	Rock Type
14041	0m	28.96m	Red	Shale
14041	28.96m	50.29m	Brown	Shale
14041	50.29m	59.44m	Grey	Shale
14041	59.44m	67.06m	Brown	Shale

Overall Well Depth  
67.06m  
Bedrock Level  
0m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
14041	50.29m	4.55 lpm
14041	60.96m	13.65 lpm

Setbacks		
Well Log	Distance	Setback From
14041	24.38m	Septic Tank
14041	36.58m	Septic Tank
14041	45.72m	Leach Field
14041	33.53m	Leach Field
14041	356.92m	Right of any Public Way Road

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well		06/02/2009

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
14046	Steel	15.24cm	0m	21.95m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	24.38m	27.3 lpm	1hr 45min	44.20m	13.65 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine Pucks	N/A
	Qty 0L	Intake Setting (BTC) 48.77m

Driller's Log				
Well Log	From	End	Colour	Rock Type
14046	0m	5.49m	Brown	Till
14046	5.49m	13.72m	Brown	Sand and Gravel
14046	13.72m	21.34m	Brown	Shale
14046	21.34m	36.58m	Brown	Rock
14046	36.58m	54.86m	Brown	Clay and Stone

Overall Well Depth  
54.86m  
Bedrock Level  
13.72m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
14046	36.58m	4.55 lpm
14046	54.86m	13.65 lpm

Setbacks		
Well Log	Distance	Setback From
14046	65.53m	Right of any Public Way Road

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Cable Tool	05/19/2007

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
18354	Steel	15.24cm	0m	28.96m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	24.38m	27.3 lpm	2hrs 30min	38.10m	13.65 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine Pucks	Submersible Intake Setting (BTC)
	Qty 0L	48.77m

Driller's Log				
Well Log	From	End	Colour	Rock Type
18354	0m	12.19m	Brown	Clay
18354	12.19m	28.96m	Brown	Sand and Gravel
18354	28.96m	51.82m	Red	Rock

Overall Well Depth  
51.82m  
Bedrock Level  
28.96m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
18354	44.20m	4.55 lpm
18354	51.82m	13.65 lpm

Setbacks		
Well Log	Distance	Setback From
18354	99.06m	Septic Tank
18354	99.06m	Leach Field
18354	29.26m	Right of any Public Way Road

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Rotary	08/22/2006

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
18396	Steel	20.32cm	0m	61.87m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	5.49m	136.5 lpm	1hr	57.91m	910 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

<b>Well Grouting</b>
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine Pucks	Submersible
	Qty 0L	Intake Setting (BTC)
		36.58m

Driller's Log				
Well Log	From	End	Colour	Rock Type
18396	0m	7.32m	Brown	Sand
18396	7.32m	36.58m	Grey	Clay
18396	36.58m	48.77m	Brown	Till
18396	48.77m	61.87m	Brown	Sand and Gravel

Overall Well Depth  
61.87m  
Bedrock Level  
0m

<b>Water Bearing Fracture Zone</b>		
Well Log	Depth	Rate
18396	61.87m	910 lpm

<b>Setbacks</b>		
Well Log	Distance	Setback From
18396	18.29m	Septic Tank
18396	22.86m	Leach Field
18396	30.48m	Right of any Public Way Road

Drilled by			
Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	08/22/2006

Casing Information		Casing above ground		Drive Shoe Used?	
Well Log	Casing Type	Diameter	From	End	Slotted?
18396	Steel	20.32cm	0m	61.87m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	5.49m	136.5 lpm	1hr	57.91m	910 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine Pucks	Submersible
	Qty	Intake Setting (BTC)
	0L	36.58m

Driller's Log				
Well Log	From	End	Colour	Rock Type
18396	0m	7.32m	Brown	Sand
18396	7.32m	36.58m	Grey	Clay
18396	36.58m	48.77m	Brown	Till
18396	48.77m	61.87m	Brown	Sand and Gravel

Overall Well Depth  
61.87m  
Bedrock Level  
0m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
18396	61.87m	910 lpm

Setbacks		
Well Log	Distance	Setback From
18396	18.29m	Septic Tank
18396	22.86m	Leach Field
18396	30.48m	Right of any Public Way Road

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Rotary	09/11/2006

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
18404	Steel	15.24cm	0m	30.48m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	16.76m	31.85 lpm	0hr	88.39m	13.65 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine Pucks	Submersible
	Qty 0L	Intake Setting (BTC)
		82.30m

Driller's Log				
Well Log	From	End	Colour	Rock Type
18404	0m	1.83m	Brown	Topsoil
18404	1.83m	25.91m	Brown	Till
18404	25.91m	28.96m	Red	Shale
18404	28.96m	31.39m	Red	Sandstone
18404	31.39m	35.36m	Red	Shale
18404	35.36m	40.23m	Red	Sandstone
18404	40.23m	50.29m	Grey	Conglomerate
18404	50.29m	71.63m	Red	Sandstone
18404	71.63m	74.98m	Grey	Conglomerate
18404	74.98m	89.61m	Red	Shale

Overall Well Depth  
89.61m  
Bedrock Level  
25.91m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
18404	57.91m	2.28 lpm
18404	74.98m	4.55 lpm
18404	82.30m	6.82 lpm

Setbacks		
Well Log	Distance	Setback From
18404	18.29m	Septic Tank
18404	22.86m	Leach Field
18404	25.91m	Right of any Public Way Road

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Cable Tool	10/17/2011

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
24875	Steel	15.24cm	0m	23.16m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	18.29m	27.3 lpm	1hr 45min	68.58m	13.65 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine Pucks	N/A
	Qty 0L	Intake Setting (BTC) 33.53m

Driller's Log				
Well Log	From	End	Colour	Rock Type
24875	0m	1.83m	Brown	Till
24875	1.83m	12.19m	Grey	Clay
24875	12.19m	22.25m	Light brown	Claystone
24875	22.25m	53.64m	Brown	Rock
24875	53.64m	60.96m	Grey	Rock
24875	60.96m	68.58m	Brown	Rock

Overall Well Depth  
68.58m  
Bedrock Level  
22.25m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
24875	35.66m	13.65 lpm

Setbacks		
Well Log	Distance	Setback From
24875	22.86m	Septic Tank
24875	28.96m	Leach Field
24875	152.40m	Septic Tank
24875	152.40m	Leach Field
24875	29.57m	Right of any Public Way Road



**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Cable Tool	08/06/2010

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
25918	Steel	15.24cm	0m	3.96m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	3.66m	27.3 lpm	1hr 30min	9.14m	22.75 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting				Drilling Fluids Used	Disinfectant	Pump Installed
Well Log	Grout Type	From	End	None	Chlorine Pucks	Submersible Intake Setting (BTC)
25918	Bentonite	2.74m	8.53m		Qty 0L	24.38m

Driller's Log					Overall Well Depth 30.48m
Well Log	From	End	Colour	Rock Type	
25918	0m	3.35m	Brown	Till	
25918	3.35m	30.48m	Brown	Rock	Bedrock Level 3.35m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
25918	9.75m	9.1 lpm
25918	24.38m	22.75 lpm

Setbacks		
Well Log	Distance	Setback From
25918	21.34m	Septic Tank
25918	27.43m	Leach Field
25918	50.29m	Right of any Public Way Road

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Cable Tool	03/24/2011

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
25945	Steel	15.24cm	0m	19.81m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	28.04m	27.3 lpm	1hr 30min	45.72m	18.2 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Other	Submersible
	Qty	Intake Setting (BTC)
	0L	45.72m

Driller's Log				
Well Log	From	End	Colour	Rock Type
25945	0m	7.62m	Brown	Mud and Stone and Shale
25945	7.62m	19.81m	Brown	Clay and Sand
25945	19.81m	53.34m	Brown	Rock

Overall Well Depth  
53.34m  
Bedrock Level  
19.81m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
25945	50.29m	18.2 lpm

Setbacks		
Well Log	Distance	Setback From
25945	21.95m	Septic Tank
25945	24.99m	Leach Field
25945	54.86m	Right of any Public Way Road

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Cable Tool	07/06/2009

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
26984	Steel	15.24cm	0m	28.04m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	24.38m	27.3 lpm	1hr 45min	44.20m	13.65 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine Pucks	Submersible Intake Setting (BTC)
	Qty 0L	53.34m

Driller's Log				
Well Log	From	End	Colour	Rock Type
26984	0m	6.10m	Brown	Till
26984	6.10m	18.29m	Red	Claystone
26984	18.29m	19.81m	Grey	Sand and Gravel
26984	19.81m	27.43m	Red	Shale
26984	27.43m	44.20m	Red	Rock
26984	44.20m	59.44m	Brown	Rock

Overall Well Depth  
59.44m  
Bedrock Level  
19.81m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
26984	36.58m	2.28 lpm
26984	44.20m	9.1 lpm
26984	57.91m	13.65 lpm

Setbacks		
Well Log	Distance	Setback From
26984	48.46m	Right of any Public Way Road

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Cable Tool	07/14/2009

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
26991	Steel	15.24cm	0m	26.82m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	18.29m	27.3 lpm	1hr 45min	25.91m	22.75 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine Pucks	Submersible Intake Setting (BTC)
	Qty 0L	45.72m

Driller's Log				
Well Log	From	End	Colour	Rock Type
26991	0m	4.57m	Brown	Till
26991	4.57m	14.63m	Brown	Sand and Gravel
26991	14.63m	26.21m	Brown	Shale
26991	26.21m	54.25m	Brown	Rock

Overall Well Depth  
54.25m  
Bedrock Level  
14.63m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
26991	42.67m	9.1 lpm
26991	50.29m	22.75 lpm

Setbacks		
Well Log	Distance	Setback From
26991	23.16m	Septic Tank
26991	29.26m	Leach Field
26991	20.42m	Right of any Public Way Road

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Cable Tool	08/01/2012

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
31652	Steel	15.24cm	0m	12.19m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	8.23m	45.5 lpm	1hr 45min	12.19m	40.95 lpm	No	0 lpm
<i>(BTC - Below top of casina)</i>							

Well Grouting				Drilling Fluids Used	Disinfectant	Pump Installed
Well Log	Grout Type	From	End	None	Chlorine pellets	Submersible Intake Setting (BTC)
31652	Bentonite	6.10m	11.58m		Qty 0L	19.81m

Driller's Log					Overall Well Depth 21.34m  Bedrock Level 0.91m
Well Log	From	End	Colour	Rock Type	
31652	0m	0.91m	Brown	Till	
31652	0.91m	9.14m	Brown	Rock	
31652	9.14m	10.06m	Blue and yellow	Claystone	
31652	10.06m	21.34m	Brown	Rock	

Water Bearing Fracture Zone		
Well Log	Depth	Rate
31652	20.42m	45.5 lpm

Setbacks		
Well Log	Distance	Setback From
31652	21.34m	Septic Tank
31652	24.38m	Leach Field
31652	78.64m	Right of any Public Way Road

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Cable Tool	06/13/2017

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
36058	Steel	15.24cm	0m	23.16m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Bailer	27.43m	54.6 lpm	3hrs 30min	59.44m	15.92 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine pellets	Submersible Intake Setting (BTC)
	Qty 0L	54.86m

Driller's Log				
Well Log	From	End	Colour	Rock Type
36058	0m	19.81m	Brown	Till
36058	19.81m	22.56m	Brown	Claystone
36058	22.56m	53.34m	Red	Rock
36058	53.34m	60.96m	Grey	Rock

Overall Well Depth  
60.96m  
Bedrock Level  
22.56m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
36058	36.58m	9.1 lpm
36058	51.82m	9.1 lpm

Setbacks		
Well Log	Distance	Setback From
36058	26.82m	Septic Tank
36058	68.58m	Septic Tank
36058	73.15m	Leach Field
36058	28.96m	Leach Field
36058	64.01m	Center of road
36058	121.92m	Center of road

**Well Driller's Report**

Date printed 8/25/2020

Drilled by	Well Use	Work Type	Drill Method	Work Completed
	Drinking Water, Domestic	New Well	Rotary	11/08/2018

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
37197	Steel	15.24cm	0m	21.34m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	12.19m	136.5 lpm	1hr	12.19m	136.5 lpm	No	0 lpm
<i>(BTC - Below top of casina)</i>							

<b>Well Grouting</b>
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine pellets	Submersible Intake Setting (BTC)
	Qty 0L	24.38m

Driller's Log				
Well Log	From	End	Colour	Rock Type
37197	0m	5.49m	Grey	Sandstone
37197	5.49m	19.81m	Brown	Clay
37197	19.81m	36.58m	Grey	Sandstone
37197	36.58m	42.67m	Brown	Clay

Overall Well Depth  
42.67m  
Bedrock Level  
0m

<b>Water Bearing Fracture Zone</b>		
Well Log	Depth	Rate
37197	36.58m	136.5 lpm

<b>Setbacks</b>		
Well Log	Distance	Setback From
37197	18.29m	Septic Tank
37197	24.38m	Leach Field
37197	22.86m	Right of any Public Way Road
37197	24.38m	Center of road

Drilled by			
Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/08/2018

Casing Information		Casing above ground		Drive Shoe Used?	
Well Log	Casing Type	Diameter	From	End	Slotted?
37197	Steel	15.24cm	0m	21.34m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	12.19m	136.5 lpm	1hr	12.19m	136.5 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine pellets	Submersible
	Qty	Intake Setting (BTC)
	0L	24.38m

Driller's Log				
Well Log	From	End	Colour	Rock Type
37197	0m	5.49m	Grey	Sandstone
37197	5.49m	19.81m	Brown	Clay
37197	19.81m	36.58m	Grey	Sandstone
37197	36.58m	42.67m	Brown	Clay

Overall Well Depth  
42.67m  
Bedrock Level  
0m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
37197	36.58m	136.5 lpm

Setbacks		
Well Log	Distance	Setback From
37197	18.29m	Septic Tank
37197	24.38m	Leach Field
37197	22.86m	Right of any Public Way Road
37197	24.38m	Center of road



Drilled by			
Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/08/2018

Casing Information		Casing above ground		Drive Shoe Used?	
Well Log	Casing Type	Diameter	From	End	Slotted?
37197	Steel	15.24cm	0m	21.34m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	12.19m	136.5 lpm	1hr	12.19m	136.5 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine pellets	Submersible
	Qty	Intake Setting (BTC)
	0L	24.38m

Driller's Log				
Well Log	From	End	Colour	Rock Type
37197	0m	5.49m	Grey	Sandstone
37197	5.49m	19.81m	Brown	Clay
37197	19.81m	36.58m	Grey	Sandstone
37197	36.58m	42.67m	Brown	Clay

Overall Well Depth  
42.67m  
Bedrock Level  
0m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
37197	36.58m	136.5 lpm

Setbacks		
Well Log	Distance	Setback From
37197	18.29m	Septic Tank
37197	24.38m	Leach Field
37197	22.86m	Right of any Public Way Road
37197	24.38m	Center of road

Drilled by			
Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/08/2018

Casing Information		Casing above ground			Drive Shoe Used?
Well Log	Casing Type	Diameter	From	End	Slotted?
37197	Steel	15.24cm	0m	21.34m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	12.19m	136.5 lpm	1hr	12.19m	136.5 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine pellets	Submersible
	Qty	Intake Setting (BTC)
	0L	24.38m

Driller's Log				
Well Log	From	End	Colour	Rock Type
37197	0m	5.49m	Grey	Sandstone
37197	5.49m	19.81m	Brown	Clay
37197	19.81m	36.58m	Grey	Sandstone
37197	36.58m	42.67m	Brown	Clay

Overall Well Depth  
42.67m  
Bedrock Level  
0m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
37197	36.58m	136.5 lpm

Setbacks		
Well Log	Distance	Setback From
37197	18.29m	Septic Tank
37197	24.38m	Leach Field
37197	22.86m	Right of any Public Way Road
37197	24.38m	Center of road

Drilled by			
Well Use	Work Type	Drill Method	Work Completed
Drinking Water, Domestic	New Well	Rotary	11/08/2018

Casing Information		Casing above ground		Drive Shoe Used?	
Well Log	Casing Type	Diameter	From	End	Slotted?
37197	Steel	15.24cm	0m	21.34m	

Aquifer Test/Yield							
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Estimated Safe Yield	Flowing Well?	Rate
Air	12.19m	136.5 lpm	1hr	12.19m	136.5 lpm	No	0 lpm
<i>(BTC - Below top of casing)</i>							

Well Grouting
There is no Grout information.

Drilling Fluids Used	Disinfectant	Pump Installed
None	Chlorine pellets	Submersible
	Qty	Intake Setting (BTC)
	0L	24.38m

Driller's Log				
Well Log	From	End	Colour	Rock Type
37197	0m	5.49m	Grey	Sandstone
37197	5.49m	19.81m	Brown	Clay
37197	19.81m	36.58m	Grey	Sandstone
37197	36.58m	42.67m	Brown	Clay

Overall Well Depth  
42.67m

Bedrock Level  
0m

Water Bearing Fracture Zone		
Well Log	Depth	Rate
37197	36.58m	136.5 lpm

Setbacks		
Well Log	Distance	Setback From
37197	18.29m	Septic Tank
37197	24.38m	Leach Field
37197	22.86m	Right of any Public Way Road
37197	24.38m	Center of road



Table E1 - Well Log Water Quality

Parameter	Units	CDWQG <sup>1</sup>		Analytical Results (NBDELG OWLS, 2020)											
		MAC <sup>2</sup>	AO <sup>3</sup>	Result 1	Result 2	Result 3	Result 4	Result 5	Result 6	Result 7	Result 8	Result 9	Result 10	Result 11	Result 12
Total Alkalinity	mg/L	-	-	-	-	-	120	-	173	165	164	-	180	-	-
Aluminium	mg/L	-	0.1 / 0.2 <sup>4</sup>	-	-	-	<0.025	-	<0.025	-	<b>0.17</b>	-	0.095	-	-
Arsenic	µg/L	10	-	-	-	-	<1.5	-	<b>18</b>	4.1	4.2	-	4.4	-	-
Boron	mg/L	5	-	-	-	-	0.024	-	0.019	0.03	0.032	-	0.035	-	-
Barium	mg/L	1.0	-	-	-	-	0.055	-	0.026	0.02	0.015	-	0.017	-	-
Bromium	mg/L	-	-	-	-	-	0.315	-	<0.1	<0.1	< 0.1	-	<0.1	-	-
Conductivity	µSIE/cm	-	-	-	-	-	624	-	407	404	413	-	405	-	-
Calcium	mg/L	-	-	-	-	-	37	-	14.5	6.03	5.33	-	7.76	-	-
Cadmium	µg/L	5	-	-	-	-	< 0.5	-	<0.5	<0.5	< 0.5	-	<0.5	-	-
Chloride	mg/L	-	≤ 250	-	-	-	104	-	1.01	1.29	1.96	-	2.09	-	-
Chromium	µg/L	50	-	-	-	-	10	-	<10	< 10	< 10	-	<10	-	-
Copper	µg/L	2000	≤ 1000	-	-	-	<10	-	<10	< 10	< 10	-	<10	-	-
E.coli	Present (Pr) / Absent (Ab)	0 (Ab)	-	Ab	Ab	Ab	-	Ab	Ab	-	Ab	Ab	Ab	Ab	Ab
Fluoride	mg/L	1.5	-	-	-	-	0.435	-	0.465	0.383	0.381	-	0.54	-	-
Iron	mg/L	-	≤ 0.3	-	-	-	0.213	-	0.053	0.446	0.172	-	<b>0.373</b>	-	-
Hardness	mg/L	-	-	-	-	-	110	-	38.2	15.9	13.8	-	20.6	-	-
Potassium	mg/L	-	-	-	-	-	1.4	-	0.6	-	0.3	-	0.4	-	-
Magnesium	mg/L	-	-	-	-	-	4.13	-	0.48	0.21	0.12	-	0.29	-	-
Manganese	mg/L	0.12	≤ 0.02	-	-	-	<b>0.43</b>	-	0.018	0.036	0.02	-	0.026	-	-
Nitrite (NO <sub>2</sub> )	mg/L	3	-	-	-	-	< 0.05	-	<0.05	<0.05	< 0.05	-	<0.05	-	-
Nitrate (NO <sub>3</sub> )	mg/L	45	-	-	-	-	<0.05	-	<0.05	<0.05	< 0.05	-	<0.05	-	-
Nitrogen Oxides (NO <sub>x</sub> )	mg/L	-	-	-	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	-	-
Sodium	mg/L	-	≤ 200	-	-	-	80.8	-	83.4	85.6	91.7	-	88.2	-	-
Lead	µg/L	5	-	-	-	-	<1	-	<1	< 1	<1	-	<1	-	-
Sulphate	mg/L	-	≤ 500	-	-	-	29.5	-	38.9	35.3	37.2	-	33.3	-	-
Antimony	µg/L	6	-	-	-	-	<1	-	<1	< 1	<1	-	<1	-	-
Selenium	µg/L	50	-	-	-	-	<1.5	-	<1.5	< 1.5	< 1.5	-	<1.5	-	-
Total Coliform	Present (Pr) / Absent (Ab)	0 (Ab)	-	Ab	Ab	Ab	-	<b>Pr</b>	Ab	-	Ab	Ab	Ab	Ab	Ab
Turbidity	NTU	1	-	-	-	-	0.98	-	0.61	<b>66</b>	<b>9.9</b>	-	<b>3.7</b>	-	-
Titanium	µg/L	-	-	-	-	-	<1	-	<1	<1	< 1	-	<	-	-
Uranium	µg/L	20	-	-	-	-	3.5	-	<b>24</b>	13	13	-	10	-	-
Zinc	µg/L	-	≤ 5000	-	-	-	43	-	<5	< 5	9	-	<5	-	-
pH	unitless	-	7.0-10.5	-	-	-	8.2	-	8.39	8.58	8.6	-	8.73	-	-
Total Dissolved Solids	mg/L	-	≤ 500	-	-	-	330.523	-	243.588	228.757	236.094	-	241.412	-	-

Notes:

Guidelines:

1. Health Canada. June 2019. Guidelines for Canadian Drinking Water Quality
2. MAC - Maximum Acceptable Concentrations (health-based)
3. AO - Aesthetic Objectives (based on aesthetic considerations)
4. Operational Guideline (OG) for: conventional treatment / other treatment types

"-" None Established

Results that exceed the AO guideline are in bold.

Results that exceed the MAC guideline are in bold and shaded.

Results that exceed the OG are italicized.

# DATA REPORT 6574: Fredericton Landfill, NB

Prepared 18 March 2020  
by J. Churchill, Data Manager

## CONTENTS OF REPORT

### 1.0 Preface

- 1.1 Data List
- 1.2 Restrictions
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### 5.0 Rare Species within 100 km

- 5.1 Source Bibliography



**Map 1.** A 100 km buffer around the study area

## 1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; [www.accdc.com](http://www.accdc.com)) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The AC CDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the AC CDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

### 1.1 DATA LIST

Included datasets:

<u>Filename</u>	<u>Contents</u>
FrederictonLNB_6574ob.xls	Rare and legally protected Flora and Fauna in your study area
FrederictonLNB_6574ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
FrederictonLNB_6574ma.xls	Managed Areas in your study area
FrederictonLNB_6574sa.xls	Significant Natural Areas in your study area
FrederictonLNB_6574ff.xls	Rare and common Freshwater Fish in your study area (DFO database)

## 1.2 RESTRICTIONS

The AC CDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting AC CDC data, recipients assent to the following limits of use:

- a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
- b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
- c) The AC CDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
- d) AC CDC data responses are restricted to the data in our Data System at the time of the data request.
- e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
- f) AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area.
- g) The absence of a taxon cannot be inferred by its absence in an AC CDC data response.

## 1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

Please direct any additional questions about AC CDC data to the following individuals:

### **Plants, Lichens, Ranking Methods, All other Inquiries**

Sean Blaney, Senior Scientist, Executive Director

Tel: (506) 364-2658

[sean.blaney@accdc.ca](mailto:sean.blaney@accdc.ca)

### **Animals (Fauna)**

John Klymko, Zoologist

Tel: (506) 364-2660

[john.klymko@accdc.ca](mailto:john.klymko@accdc.ca)

### **Plant Communities**

Sarah Robinson, Community Ecologist

Tel: (506) 364-2664

[sarah.robinson@accdc.ca](mailto:sarah.robinson@accdc.ca)

### **Data Management, GIS**

James Churchill, Data Manager

Tel: (902) 679-6146

[james.churchill@accdc.ca](mailto:james.churchill@accdc.ca)

### **Billing**

Jean Breau

Tel: (506) 364-2657

[jean.breau@accdc.ca](mailto:jean.breau@accdc.ca)

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

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 Hubert Askanas, Energy and Resource Development: (506) 453-5873.

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 Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

**Western:** Emma Vost  
(902) 670-8187  
[Emma.Vost@novascotia.ca](mailto:Emma.Vost@novascotia.ca)

**Western:** Sarah Spencer  
(902) 634-7555  
[Sarah.Spencer@novascotia.ca](mailto:Sarah.Spencer@novascotia.ca)

**Central:** Shavonne Meyer  
(902) 893-6350  
[Shavonne.Meyer@novascotia.ca](mailto:Shavonne.Meyer@novascotia.ca)

**Central:** Kimberly George  
(902) 890-1046  
[Kimberly.George@novascotia.ca](mailto:Kimberly.George@novascotia.ca)

**Eastern:** Harrison Moore  
(902) 497-4119  
[Harrison.Moore@novascotia.ca](mailto:Harrison.Moore@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

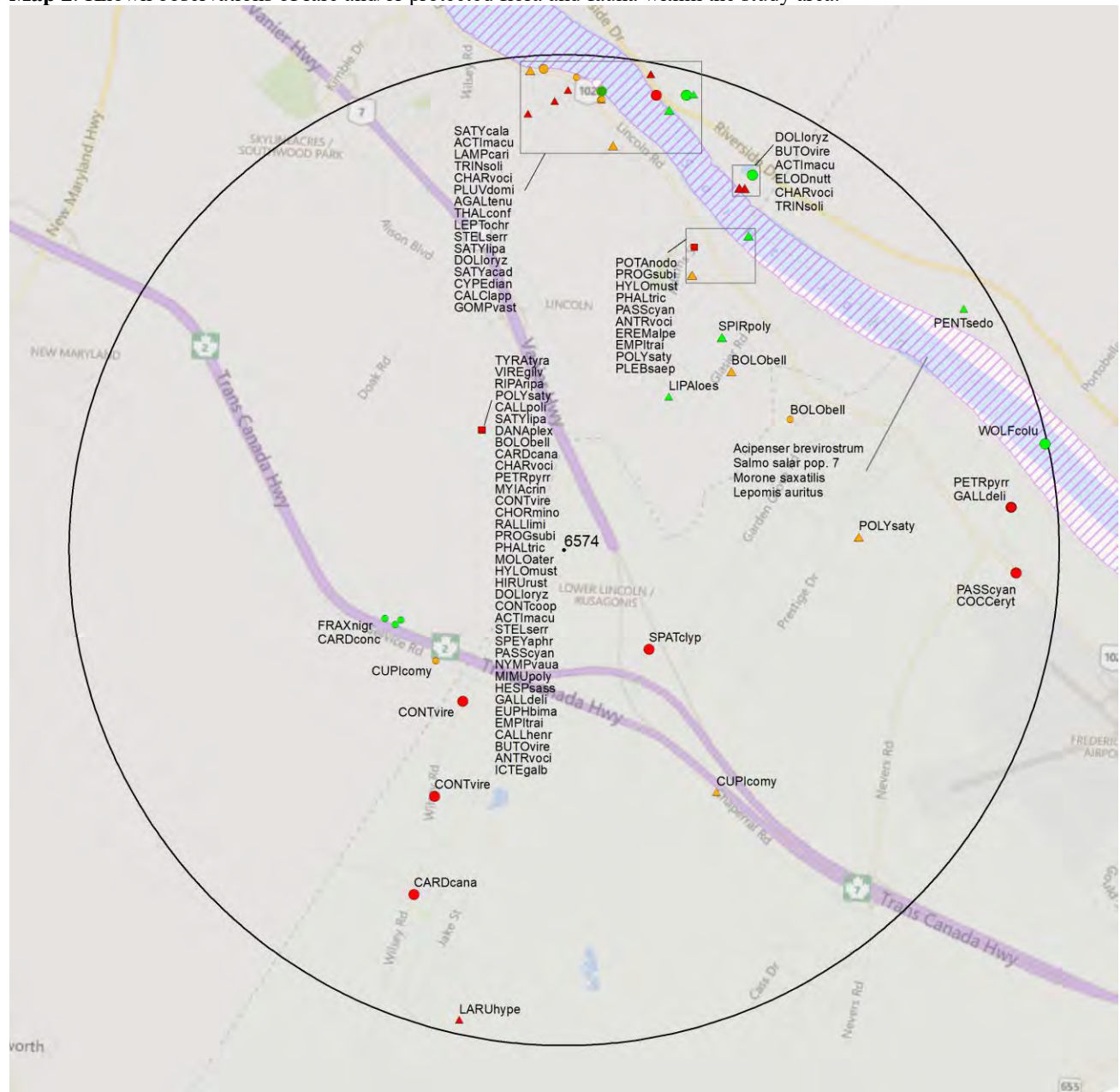
### 2.1 FLORA

The study area contains 14 records of 11 vascular, no records of nonvascular flora (Map 2 and attached: \*ob.xls).

### 2.2 FAUNA

The study area contains 127 records of 33 vertebrate, 41 records of 17 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 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 TAXONII

- vertebrate fauna
- invertebrate fauna
- vascular flora
- nonvascular flora



### 3.0 SPECIAL AREAS

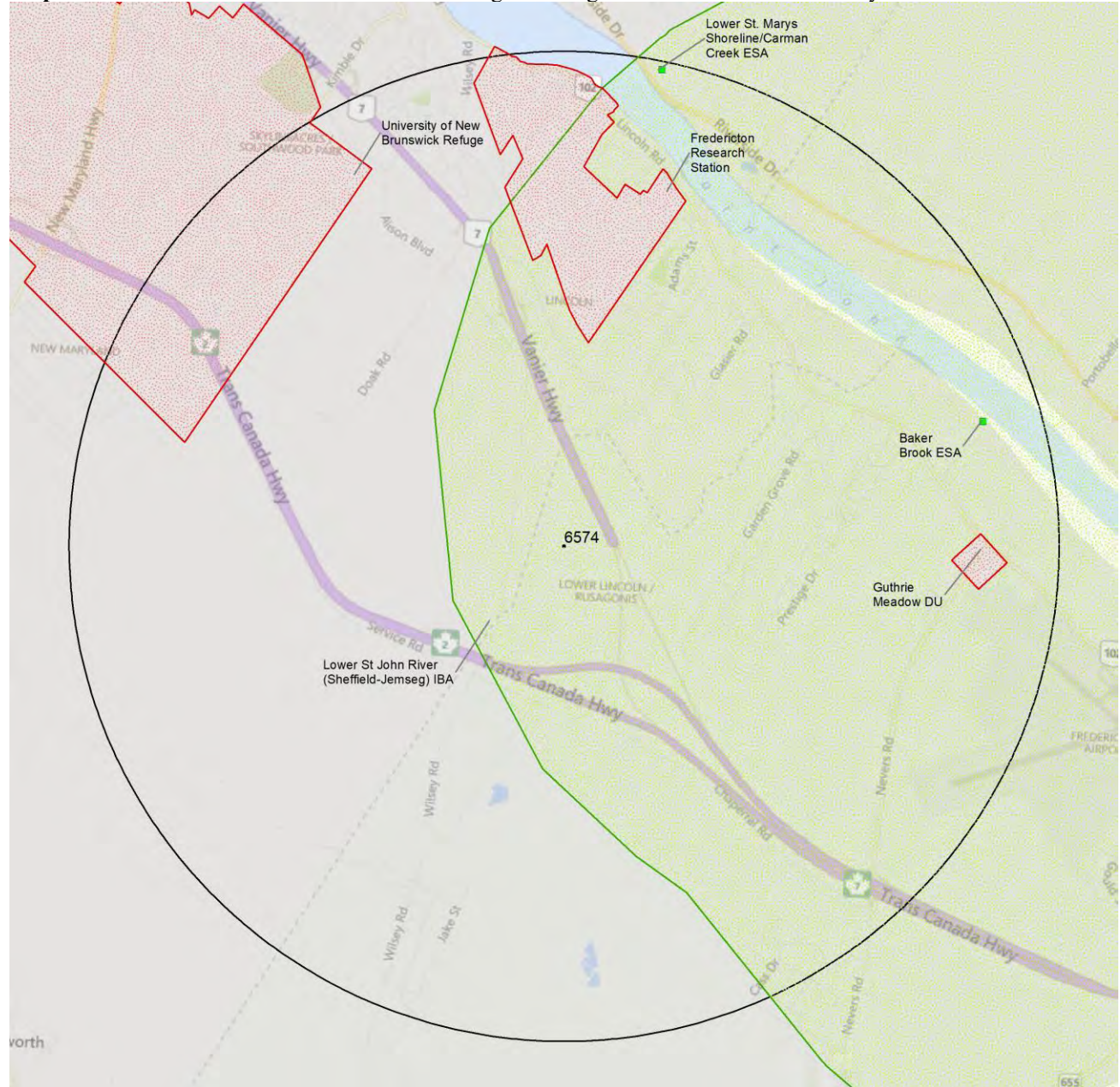
#### 3.1 MANAGED AREAS

The GIS scan identified 3 managed areas in the vicinity of the study area (Map 3 and attached file: \*ma\*.xls).






#### 3.2 SIGNIFICANT AREAS

The GIS scan identified 3 biologically significant sites in the vicinity of the study area (Map 3 and attached file: \*sa\*.xls).

**Map 3:** Boundaries and/or locations of known Managed and Significant Areas within the study area.



**MANAGED AREAS      SIGNIFIGANT AREAS**

-  boundary
-  boundary
-  approximate
-  approximate
-  point location

## 4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding “location-sensitive” species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation ( $\pm$  the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files \*ob.xls/\*ob.shp only.

### 4.1 FLORA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
P	<i>Fraxinus nigra</i>	Black Ash	Threatened			S4S5	4 Secure	2	1.9 $\pm$ 0.0
P	<i>Cardamine concatenata</i>	Cut-leaved Toothwort				S1	2 May Be At Risk	1	1.8 $\pm$ 0.0
P	<i>Agalinis tenuifolia</i>	Slender Agalinis				S1	2 May Be At Risk	1	4.8 $\pm$ 0.0
P	<i>Cyperus diandrus</i>	Low Flatsedge				S1	2 May Be At Risk	2	4.6 $\pm$ 1.0
P	<i>Potamogeton nodosus</i>	Long-leaved Pondweed				S1	2 May Be At Risk	2	3.7 $\pm$ 1.0
P	<i>Wolffia columbiana</i>	Columbian Watermeal				S1?	2 May Be At Risk	1	5.0 $\pm$ 0.0
P	<i>Elodea nuttallii</i>	Nuttall's Waterweed				S2	3 Sensitive	1	4.2 $\pm$ 0.0
P	<i>Penthorum sedoides</i>	Ditch Stonecrop				S3	4 Secure	1	4.7 $\pm$ 0.0
P	<i>Thalictrum confine</i>	Northern Meadow-rue				S3	4 Secure	1	4.8 $\pm$ 0.0
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3	4 Secure	1	1.9 $\pm$ 0.0
P	<i>Spirodela polyrhiza</i>	great duckweed				S3S4	4 Secure	1	2.7 $\pm$ 1.0

### 4.2 FAUNA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened	Threatened	Threatened	S1S2B,S1S2M	2 May Be At Risk	3	1.5 $\pm$ 7.0
A	<i>Antrostomus vociferus</i>	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	6	1.5 $\pm$ 7.0
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened	Threatened	Threatened	S2B,S2M	3 Sensitive	5	1.5 $\pm$ 7.0
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	3 Sensitive	2	1.5 $\pm$ 7.0
A	<i>Cardellina canadensis</i>	Canada Warbler	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	4	1.5 $\pm$ 7.0
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	3 Sensitive	4	1.5 $\pm$ 7.0
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B,S3M	1 At Risk	1	1.5 $\pm$ 7.0
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	1 At Risk	2	1.5 $\pm$ 7.0
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	4 Secure	5	1.5 $\pm$ 7.0
A	<i>Phalaropus tricolor</i>	Wilson's Phalarope				S1B,S1M	3 Sensitive	2	1.5 $\pm$ 7.0
A	<i>Progne subis</i>	Purple Martin				S1B,S1M	2 May Be At Risk	4	1.5 $\pm$ 7.0
A	<i>Eremophila alpestris</i>	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	1	3.3 $\pm$ 7.0
A	<i>Butorides virescens</i>	Green Heron				S1S2B,S1S2M	3 Sensitive	2	1.5 $\pm$ 7.0
A	<i>Empidonax traillii</i>	Willow Flycatcher				S1S2B,S1S2M	3 Sensitive	4	1.5 $\pm$ 7.0
A	<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow				S1S2B,S1S2M	2 May Be At Risk	2	1.5 $\pm$ 7.0
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S2B,S2M	3 Sensitive	3	1.5 $\pm$ 7.0
A	<i>Tringa solitaria</i>	Solitary Sandpiper				S2B,S5M	4 Secure	8	4.1 $\pm$ 1.0
A	<i>Larus hyperboreus</i>	Glaucous Gull				S2N,S2M	4 Secure	1	4.9 $\pm$ 0.0
A	<i>Spatula clypeata</i>	Northern Shoveler				S2S3B,S2S3M	4 Secure	1	1.3 $\pm$ 0.0
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S2S3B,S2S3M	3 Sensitive	4	1.5 $\pm$ 7.0
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	13	1.5 $\pm$ 7.0
A	<i>Pluvialis dominica</i>	American Golden-Plover				S2S3M	3 Sensitive	1	4.6 $\pm$ 0.0
A	<i>Calcarius lapponicus</i>	Lapland Longspur				S2S3N,SUM	3 Sensitive	1	4.4 $\pm$ 0.0
A	<i>Rallus limicola</i>	Virginia Rail				S3B,S3M	3 Sensitive	1	1.5 $\pm$ 7.0
A	<i>Charadrius vociferus</i>	Killdeer				S3B,S3M	3 Sensitive	9	1.5 $\pm$ 7.0
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B,S3M	4 Secure	1	4.6 $\pm$ 0.0
A	<i>Vireo gilvus</i>	Warbling Vireo				S3B,S3M	4 Secure	1	1.5 $\pm$ 7.0
A	<i>Passerina cyanea</i>	Indigo Bunting				S3B,S3M	4 Secure	4	1.5 $\pm$ 7.0
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	3	1.5 $\pm$ 7.0
A	<i>Icterus galbula</i>	Baltimore Oriole				S3B,S3M	4 Secure	6	1.5 $\pm$ 7.0

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	5	1.5 ± 7.0
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B,S5M	4 Secure	12	1.5 ± 7.0
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3S4B,S5M	4 Secure	6	1.5 ± 7.0
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	3 Sensitive	1	1.5 ± 7.0
I	<i>Lampsilis cariosa</i>	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	3	4.6 ± 0.0
I	<i>Plebejus saepiolus</i>	Greenish Blue				S1S2	4 Secure	1	3.1 ± 1.0
I	<i>Satyrrium calanus</i>	Banded Hairstreak				S2	3 Sensitive	8	4.6 ± 0.0
I	<i>Callophrys henrici</i>	Henry's Elfin				S2S3	4 Secure	1	1.5 ± 7.0
I	<i>Hesperia sassacus</i>	Indian Skipper				S3	4 Secure	1	1.5 ± 7.0
I	<i>Euphyes bimacula</i>	Two-spotted Skipper				S3	4 Secure	1	1.5 ± 7.0
I	<i>Satyrrium acadica</i>	Acadian Hairstreak				S3	4 Secure	1	4.6 ± 0.0
I	<i>Callophrys polios</i>	Hoary Elfin				S3	4 Secure	1	1.5 ± 7.0
I	<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3	4 Secure	1	1.5 ± 7.0
I	<i>Boloria bellona</i>	Meadow Fritillary				S3	4 Secure	4	1.5 ± 7.0
I	<i>Polygonia satyrus</i>	Satyr Comma				S3	4 Secure	8	1.5 ± 7.0
I	<i>Nymphalis l-album</i>	Compton Tortoiseshell				S3	4 Secure	1	1.5 ± 7.0
I	<i>Gomphus vastus</i>	Cobra Clubtail				S3	3 Sensitive	4	4.1 ± 1.0
I	<i>Leptodea ochracea</i>	Tidewater Mucket				S3	4 Secure	1	4.6 ± 0.0
I	<i>Satyrrium liparops</i>	Striped Hairstreak				S3S4	4 Secure	2	1.5 ± 7.0
I	<i>Cupido comyntas</i>	Eastern Tailed Blue				S3S4	4 Secure	2	1.7 ± 0.0

#### 4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species “location sensitive”. Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are indicated below with “YES”.

##### New Brunswick

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
<i>Chrysemys picta picta</i>	Eastern Painted Turtle			No
<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	No
<b><i>Glyptemys insculpta</i></b>	<b>Wood Turtle</b>	<b>Threatened</b>	<b>Threatened</b>	<b>YES</b>
<b><i>Haliaeetus leucocephalus</i></b>	<b>Bald Eagle</b>		<b>Endangered</b>	<b>YES</b>
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Endangered	No
<i>Cicindela marginipennis</i>	Cobblestone Tiger Beetle	Endangered	Endangered	No
<i>Coenonympha nipisiquit</i>	Maritime Ringlet	Endangered	Endangered	No
<b><i>Bat Hibernaculum</i></b>		<b>[Endangered]<sup>1</sup></b>	<b>[Endangered]<sup>1</sup></b>	<b>YES</b>

<sup>1</sup> *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NB Species at Risk Act.

#### 4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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## 5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 24669 records of 151 vertebrate and 1569 records of 82 invertebrate fauna; 11504 records of 384 vascular, 459 records of 146 nonvascular flora (attached: \*ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including “location-sensitive” species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation ( $\pm$  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	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	62	7.8 $\pm$ 1.0	NB
A	<i>Myotis septentrionalis</i>	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	17	10.0 $\pm$ 1.0	NB
A	<i>Perimyotis subflavus</i>	Eastern Pipistrelle	Endangered	Endangered	Endangered	S1	1 At Risk	8	74.1 $\pm$ 100.0	NB
A	<i>Osmerus mordax</i> pop. 2	Lake Utopia Smelt large-bodied pop.	Endangered	Threatened	Threatened	S1		2	79.6 $\pm$ 10.0	NB
A	<i>Sterna dougallii</i>	Roseate Tern	Endangered	Endangered	Endangered	S1?B,S1?M	1 At Risk	2	95.3 $\pm$ 0.0	NB
A	<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	1 At Risk	7	80.3 $\pm$ 0.0	NB
A	<i>Dermochelys coriacea</i> (Atlantic pop.)	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	1 At Risk	3	84.0 $\pm$ 50.0	NB
A	<i>Salmo salar</i> pop. 1	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered	Endangered	S2	2 May Be At Risk	430	20.8 $\pm$ 0.0	NB
A	<i>Calidris canutus rufa</i>	Red Knot rufa ssp	Endangered	Endangered	Endangered	S2M	1 At Risk	26	79.7 $\pm$ 0.0	NB
A	<i>Pagophila eburnea</i>	Ivory Gull	Endangered	Endangered		SNA	8 Accidental	2	95.2 $\pm$ 14.0	NB
A	<i>Melanerpes erythrocephalus</i>	Red-headed Woodpecker	Endangered	Threatened		SNA	8 Accidental	1	78.2 $\pm$ 7.0	NB
A	<i>Empidonax virescens</i>	Acadian Flycatcher	Endangered	Endangered		SNA	8 Accidental	2	8.9 $\pm$ 0.0	NB
A	<i>Protonotaria citrea</i>	Prothonotary Warbler	Endangered	Endangered		SNA	8 Accidental	1	81.4 $\pm$ 2.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Icteria virens</i>	Yellow-Breasted Chat	Endangered	Endangered		SNA	8 Accidental	4	84.3 ± 0.0	NB
A	<i>Rangifer tarandus pop. 2</i>	Woodland Caribou (Atlantic-Gasp /rsie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	4	57.3 ± 1.0	NB
A	<i>Colinus virginianus</i>	Northern Bobwhite	Endangered	Endangered				4	52.2 ± 0.0	NB
A	<i>Sturnella magna</i>	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B,S1M	2 May Be At Risk	55	15.3 ± 7.0	NB
A	<i>Ixobrychus exilis</i>	Least Bittern	Threatened	Threatened	Threatened	S1S2B,S1S2M	1 At Risk	35	11.2 ± 7.0	NB
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened	Threatened	Threatened	S1S2B,S1S2M	2 May Be At Risk	245	1.5 ± 7.0	NB
A	<i>Antrostomus vociferus</i>	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	100	1.5 ± 7.0	NB
A	<i>Hirundo rustica</i>	Barn Swallow	Threatened	Threatened	Threatened	S2B,S2M	3 Sensitive	1190	1.5 ± 7.0	NB
A	<i>Catharus bicknelli</i>	Bicknell's Thrush	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	3	83.1 ± 1.0	NB
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2S3	1 At Risk	1218	2.8 ± 1.0	NB
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	445	7.4 ± 0.0	NB
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	3 Sensitive	377	1.5 ± 7.0	NB
A	<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	Threatened		Threatened	S3	4 Secure	1	31.4 ± 1.0	NB
A	<i>Cardellina canadensis</i>	Canada Warbler	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	1419	1.5 ± 7.0	NB
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	3 Sensitive	1036	1.5 ± 7.0	NB
A	<i>Limosa haemastica</i>	Hudsonian Godwit	Threatened			S3S4M	4 Secure	25	79.9 ± 0.0	NB
A	<i>Anguilla rostrata</i>	American Eel	Threatened		Threatened	S4	4 Secure	129	14.8 ± 0.0	NB
A	<i>Coturnicops noveboracensis</i>	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B,SUM	2 May Be At Risk	3	27.3 ± 7.0	NB
A	<i>Histrionicus histrionicus pop. 1</i>	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	1 At Risk	61	19.3 ± 0.0	NB
A	<i>Asio flammeus</i>	Short-eared Owl	Special Concern	Special Concern	Special Concern	S2B,S2M	3 Sensitive	15	33.1 ± 0.0	NB
A	<i>Bucephala islandica (Eastern pop.)</i>	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	3 Sensitive	54	5.1 ± 0.0	NB
A	<i>Balaenoptera physalus</i>	Fin Whale	Special Concern	Special Concern		S2S3		2	86.6 ± 1.0	NB
A	<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	Special Concern	Special Concern	Special Concern	S3	3 Sensitive	8	20.5 ± 10.0	NB
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	3 Sensitive	33	11.7 ± 1.0	NB
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	2 May Be At Risk	227	8.4 ± 2.0	NB
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B,S3M	1 At Risk	693	1.5 ± 7.0	NB
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	3 Sensitive	330	10.8 ± 0.0	NB
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	1 At Risk	525	1.5 ± 7.0	NB
A	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Special Concern	Special Concern		S3M	3 Sensitive	5	82.3 ± 0.0	NB
A	<i>Phocoena phocoena pop. 1</i>	Harbour Porpoise - Northwest Atlantic pop.	Special Concern		Special Concern	S4		70	77.9 ± 100.0	NB
A	<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern			S4	4 Secure	32	7.8 ± 1.0	NB
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	4 Secure	808	1.5 ± 7.0	NB
A	<i>Podiceps auritus</i>	Horned Grebe	Special Concern	Special Concern	Special Concern	S4N,S4M	4 Secure	95	11.2 ± 0.0	NB
A	<i>Calidris subruficollis</i>	Buff-breasted Sandpiper	Special Concern	Special Concern		SNA	8 Accidental	16	81.9 ± 1.0	NB
A	<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	Not At Risk	Special Concern	Endangered	S1B,S3M	1 At Risk	193	7.3 ± 0.0	NB
A	<i>Bubo scandiacus</i>	Snowy Owl	Not At Risk			S1N,S2S3M	4 Secure	10	10.9 ± 1.0	NB
A	<i>Accipiter cooperii</i>	Cooper's Hawk	Not At Risk			S1S2B,S1S2M	2 May Be At Risk	20	11.9 ± 1.0	NB
A	<i>Fulica americana</i>	American Coot	Not At Risk			S1S2B,S1S2M	3 Sensitive	10	40.1 ± 7.0	NB
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk			S1S2B,SUM	2 May Be At Risk	2	95.5 ± 0.0	NB
A	<i>Sorex dispar</i>	Long-tailed Shrew	Not At Risk			S2	3 Sensitive	2	51.6 ± 5.0	NB
A	<i>Buteo lineatus</i>	Red-shouldered Hawk	Not At Risk			S2B,S2M	2 May Be At Risk	58	8.9 ± 7.0	NB
A	<i>Chlidonias niger</i>	Black Tern	Not At Risk			S2B,S2M	3 Sensitive	343	8.9 ± 7.0	NB
A	<i>Globicephala melas</i>	Long-finned Pilot Whale	Not At Risk			S2S3		3	83.6 ± 1.0	NB
A	<i>Lynx canadensis</i>	Canadian Lynx	Not At Risk		Endangered	S3	1 At Risk	30	24.1 ± 10.0	NB
A	<i>Desmognathus fuscus (Quebec/New Brunswick pop.)</i>	Northern Dusky Salamander (Quebec/New Brunswick pop.)	Not At Risk			S3	3 Sensitive	91	10.0 ± 1.0	NB
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B,SUM	3 Sensitive	222	8.9 ± 0.0	NB
A	<i>Podiceps grisegena</i>	Red-necked Grebe	Not At Risk			S3M,S2N	3 Sensitive	76	8.9 ± 0.0	NB
A	<i>Lagenorhynchus acutus</i>	Atlantic White-sided Dolphin	Not At Risk			S3S4		1	84.0 ± 1.0	NB
A	<i>Haliaeetus leucocephalus</i>	Bald Eagle	Not At Risk		Endangered	S4	1 At Risk	841	0.1 ± 0.0	NB
A	<i>Canis lupus</i>	Gray Wolf	Not At Risk		Extirpated	SX	0.1 Extirpated	4	35.0 ± 1.0	NB
A	<i>Puma concolor pop. 1</i>	Eastern Cougar	Data Deficient		Endangered	SNA	5 Undetermined	68	10.9 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Morone saxatilis</i>	Striped Bass	E,SC			S3	2 May Be At Risk	10	26.4 ± 1.0	NB
A	<i>Salmo salar</i>	Atlantic Salmon	E,T,SC			S2S3	2 May Be At Risk	270	26.4 ± 1.0	NB
A	<i>Salvelinus alpinus</i>	Arctic Char				S1	3 Sensitive	1	90.9 ± 1.0	NB
A	<i>Vireo flavifrons</i>	Yellow-throated Vireo				S1?B,S1?M	8 Accidental	15	8.7 ± 0.0	NB
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S1?B,S5M	4 Secure	385	5.9 ± 0.0	NB
A	<i>Aythya americana</i>	Redhead				S1B,S1M	8 Accidental	4	48.6 ± 7.0	NB
A	<i>Gallinula galeata</i>	Common Gallinule				S1B,S1M	3 Sensitive	29	11.2 ± 7.0	NB
A	<i>Antigone canadensis</i>	Sandhill Crane				S1B,S1M	8 Accidental	11	62.1 ± 0.0	NB
A	<i>Bartramia longicauda</i>	Upland Sandpiper				S1B,S1M	3 Sensitive	39	9.2 ± 7.0	NB
A	<i>Phalaropus tricolor</i>	Wilson's Phalarope				S1B,S1M	3 Sensitive	44	1.5 ± 7.0	NB
A	<i>Leucophaeus atricilla</i>	Laughing Gull				S1B,S1M	3 Sensitive	9	7.8 ± 1.0	NB
A	<i>Progne subis</i>	Purple Martin				S1B,S1M	2 May Be At Risk	289	1.5 ± 7.0	NB
A	<i>Thryothorus ludovicianus</i>	Carolina Wren				S1B,S1M	8 Accidental	39	7.4 ± 0.0	NB
A	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B,S2S3M	4 Secure	45	8.9 ± 0.0	NB
A	<i>Uria aalge</i>	Common Murre				S1B,S3N,S3M	4 Secure	6	95.3 ± 0.0	NB
A	<i>Aythya affinis</i>	Lesser Scaup				S1B,S4M	4 Secure	198	5.1 ± 0.0	NB
A	<i>Aythya marila</i>	Greater Scaup				S1B,S4M,S2N	4 Secure	32	19.1 ± 7.0	NB
A	<i>Eremophila alpestris</i>	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	27	3.3 ± 7.0	NB
A	<i>Sterna paradisaea</i>	Arctic Tern				S1B,SUM	2 May Be At Risk	7	93.2 ± 0.0	NB
A	<i>Fratercula arctica</i>	Atlantic Puffin				S1B,SUN,SUM	3 Sensitive	8	95.1 ± 1.0	NB
A	<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S1N,S2M	3 Sensitive	9	7.8 ± 1.0	NB
A	<i>Branta bernicla</i>	Brant				S1N,S2S3M	4 Secure	32	11.2 ± 0.0	NB
A	<i>Butorides virescens</i>	Green Heron				S1S2B,S1S2M	3 Sensitive	19	1.5 ± 7.0	NB
A	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron				S1S2B,S1S2M	3 Sensitive	11	56.0 ± 0.0	NB
A	<i>Empidonax traillii</i>	Willow Flycatcher				S1S2B,S1S2M	3 Sensitive	104	1.5 ± 7.0	NB
A	<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow				S1S2B,S1S2M	2 May Be At Risk	28	1.5 ± 7.0	NB
A	<i>Troglodytes aedon</i>	House Wren				S1S2B,S1S2M	5 Undetermined	32	17.7 ± 0.0	NB
A	<i>Rissa tridactyla</i>	Black-legged Kittiwake				S1S2B,S4N,S5M	4 Secure	2	89.4 ± 7.0	NB
A	<i>Calidris bairdii</i>	Baird's Sandpiper				S1S2M	3 Sensitive	29	79.5 ± 0.0	NB
A	<i>Cistothorus palustris</i>	Marsh Wren				S2B,S2M	3 Sensitive	396	9.0 ± 0.0	NB
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S2B,S2M	3 Sensitive	126	1.5 ± 7.0	NB
A	<i>Toxostoma rufum</i>	Brown Thrasher				S2B,S2M	3 Sensitive	111	6.8 ± 0.0	NB
A	<i>Pooecetes gramineus</i>	Vesper Sparrow				S2B,S2M	2 May Be At Risk	91	30.3 ± 7.0	NB
A	<i>Mareca strepera</i>	Gadwall				S2B,S3M	4 Secure	86	9.3 ± 30.0	NB
A	<i>Alca torda</i>	Razorbill				S2B,S3N,S3M	4 Secure	5	89.0 ± 2.0	NB
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S2B,S4S5N,S4S5M	3 Sensitive	51	17.6 ± 7.0	NB
A	<i>Tringa solitaria</i>	Solitary Sandpiper				M				
A	<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel				S2B,S5M	4 Secure	132	4.1 ± 1.0	NB
A	<i>Anser caerulescens</i>	Snow Goose				S2B,SUM	3 Sensitive	2	95.3 ± 0.0	NB
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2M	4 Secure	6	19.0 ± 0.0	NB
A	<i>Somateria spectabilis</i>	King Eider				S2N,S2M	4 Secure	19	21.8 ± 0.0	NB
A	<i>Larus hyperboreus</i>	Glaucous Gull				S2N,S2M	4 Secure	5	95.2 ± 9.0	NB
A	<i>Asio otus</i>	Long-eared Owl				S2S3	4 Secure	102	4.9 ± 0.0	NB
A	<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S2S3	5 Undetermined	15	15.6 ± 7.0	NB
A	<i>Spatula clypeata</i>	Northern Shoveler				S2S3B,S2S3M	3 Sensitive	26	8.8 ± 1.0	NB
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S2S3B,S2S3M	4 Secure	95	1.3 ± 0.0	NB
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	385	1.5 ± 7.0	NB
A	<i>Pluvialis dominica</i>	American Golden-Plover				S2S3M	3 Sensitive	570	1.5 ± 7.0	NB
A	<i>Calcarius lapponicus</i>	Lapland Longspur				S2S3N,SUM	3 Sensitive	57	4.6 ± 0.0	NB
A	<i>Cephus grylle</i>	Black Guillemot				S3	3 Sensitive	17	4.4 ± 0.0	NB
A	<i>Loxia curvirostra</i>	Red Crossbill				S3	4 Secure	94	79.4 ± 7.0	NB
A	<i>Spinus pinus</i>	Pine Siskin				S3	4 Secure	121	11.2 ± 7.0	NB
A	<i>Prosopium cylindraceum</i>	Round Whitefish				S3	4 Secure	277	11.0 ± 7.0	NB
A	<i>Salvelinus namaycush</i>	Lake Trout				S3	4 Secure	3	25.6 ± 0.0	NB
A	<i>Sorex maritimensis</i>	Maritime Shrew				S3	3 Sensitive	7	59.0 ± 0.0	NB
A						S3	4 Secure	1	30.4 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	<i>Eptesicus fuscus</i>	Big Brown Bat				S3	3 Sensitive	47	3.1 ± 1.0	NB
A	<i>Cathartes aura</i>	Turkey Vulture				S3B, S3M	4 Secure	320	6.1 ± 0.0	NB
A	<i>Rallus limicola</i>	Virginia Rail				S3B, S3M	3 Sensitive	287	1.5 ± 7.0	NB
A	<i>Charadrius vociferus</i>	Killdeer				S3B, S3M	3 Sensitive	693	1.5 ± 7.0	NB
A	<i>Tringa semipalmata</i>	Willet				S3B, S3M	3 Sensitive	16	5.9 ± 0.0	NB
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B, S3M	4 Secure	194	4.6 ± 0.0	NB
A	<i>Vireo gilvus</i>	Warbling Vireo				S3B, S3M	4 Secure	296	1.5 ± 7.0	NB
A	<i>Piranga olivacea</i>	Scarlet Tanager				S3B, S3M	4 Secure	330	6.0 ± 0.0	NB
A	<i>Passerina cyanea</i>	Indigo Bunting				S3B, S3M	4 Secure	133	1.5 ± 7.0	NB
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S3B, S3M	2 May Be At Risk	288	1.5 ± 7.0	NB
A	<i>Icterus galbula</i>	Baltimore Oriole				S3B, S3M	4 Secure	238	1.5 ± 7.0	NB
A	<i>Somateria mollissima</i>	Common Eider				S3B, S4M, S3N	4 Secure	448	14.4 ± 199.0	NB
A	<i>Setophaga tigrina</i>	Cape May Warbler				S3B, S4S5M	4 Secure	170	14.1 ± 7.0	NB
A	<i>Anas acuta</i>	Northern Pintail				S3B, S5M	3 Sensitive	49	8.4 ± 1.0	NB
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3B, S5M, S4S5N	4 Secure	75	14.9 ± 7.0	NB
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	4 Secure	112	40.6 ± 0.0	NB
A	<i>Phalaropus fulicarius</i>	Red Phalarope				S3M	3 Sensitive	3	91.1 ± 0.0	NB
A	<i>Melanitta americana</i>	Black Scoter				S3M, S1S2N	3 Sensitive	148	7.5 ± 0.0	NB
A	<i>Bucephala albeola</i>	Bufflehead				S3M, S2N	3 Sensitive	626	5.1 ± 0.0	NB
A	<i>Calidris maritima</i>	Purple Sandpiper				S3M, S3N	4 Secure	126	82.3 ± 0.0	NB
A	<i>Uria lomvia</i>	Thick-billed Murre				S3N, S3M	5 Undetermined	11	92.7 ± 1.0	NB
A	<i>Synaptomys cooperi</i>	Southern Bog Lemming				S3S4	4 Secure	75	8.3 ± 1.0	NB
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B, S3S4M	3 Sensitive	731	1.5 ± 7.0	NB
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B, S5M	4 Secure	739	1.5 ± 7.0	NB
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3S4B, S5M	4 Secure	984	1.5 ± 7.0	NB
A	<i>Larus delawarensis</i>	Ring-billed Gull				S3S4B, S5M	4 Secure	210	5.4 ± 0.0	NB
A	<i>Setophaga striata</i>	Blackpoll Warbler				S3S4B, S5M	4 Secure	47	15.6 ± 7.0	NB
A	<i>Pluvialis squatarola</i>	Black-bellied Plover				S3S4M	4 Secure	231	5.9 ± 0.0	NB
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3S4M	4 Secure	388	5.9 ± 0.0	NB
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S3S4M	4 Secure	125	5.9 ± 0.0	NB
A	<i>Calidris alba</i>	Sanderling				S3S4M, S1N	3 Sensitive	152	5.9 ± 0.0	NB
A	<i>Morus bassanus</i>	Northern Gannet				SHB, S5M	4 Secure	39	77.9 ± 0.0	NB
C	<i>Quercus macrocarpa</i> - <i>Acer rubrum</i> / <i>Onoclea sensibilis</i> - <i>Carex arcta</i> Forest	Bur Oak - Red Maple / Sensitive Fern - Northern Clustered Sedge Forest				S2		1	32.9 ± 0.0	
C	<i>Acer saccharinum</i> / <i>Onoclea sensibilis</i> - <i>Lysimachia terrestris</i> Forest	Silver Maple / Sensitive Fern - Swamp Yellow Loosestrife Forest				S3		1	23.3 ± 0.0	NB
C	<i>Acer saccharum</i> - <i>Fraxinus americana</i> / <i>Polystichum acrostichoides</i> Forest	Sugar Maple - White Ash / Christmas Fern Forest				S3S4		1	73.9 ± 0.0	NB
I	<i>Cicindela marginipennis</i>	Cobblestone Tiger Beetle	Endangered	Endangered	Endangered	S1	1 At Risk	81	30.6 ± 0.0	NB
I	<i>Gomphus ventricosus</i>	Skilllet Clubtail	Endangered	Endangered	Endangered	S1S2	2 May Be At Risk	50	5.6 ± 1.0	NB
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Special Concern	S3B, S3M	3 Sensitive	100	1.5 ± 7.0	NB
I	<i>Ophiogomphus howei</i>	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2	2 May Be At Risk	27	48.0 ± 0.0	NB
I	<i>Alasmidonta varicosa</i>	Brook Floater	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	12	48.0 ± 0.0	NB
I	<i>Lampsilis cariosa</i>	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S2	3 Sensitive	104	4.6 ± 0.0	NB
I	<i>Bombus terricola</i>	Yellow-banded Bumblebee	Special Concern	Special Concern		S3?	3 Sensitive	39	22.3 ± 0.0	NB
I	<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle		Special Concern		SH	2 May Be At Risk	2	69.5 ± 0.0	NB
I	<i>Appalachina sayana</i>	Spike-lip Crater	Not At Risk			S3?		2	64.1 ± 1.0	NB
I	<i>Haematopota rara</i>	Shy Cleg				S1	5 Undetermined	1	8.3 ± 1.0	NB
I	<i>Lycaena dorcas</i>	Dorcas Copper				S1	2 May Be At Risk	20	57.3 ± 0.0	NB
I	<i>Erora laeta</i>	Early Hairstreak				S1	2 May Be At Risk	10	22.7 ± 7.0	NB
I	<i>Somatochlora septentrionalis</i>	Muskeg Emerald				S1	2 May Be At Risk	1	40.9 ± 1.0	NB
I	<i>Arigomphus furcifer</i>	Lilypad Clubtail				S1	5 Undetermined	9	14.0 ± 0.0	NB
I	<i>Polites origenes</i>	Crossline Skipper				S1?	5 Undetermined	8	18.0 ± 0.0	NB
I	<i>Plebejus saepiolus</i>	Greenish Blue				S1S2	4 Secure	3	3.1 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
	<i>Ophiogomphus colubrinus</i>	Boreal Snaketail				S1S2	2 May Be At Risk	36	5.6 ± 1.0	NB
	<i>Cicindela ancocisconensis</i>	Appalachian Tiger Beetle				S2	5 Undetermined	2	87.2 ± 0.0	NB
	<i>Encyclops caerulea</i>	a Longhorned Beetle				S2		3	9.3 ± 0.0	NB
	<i>Brachyleptura circumdata</i>	a Longhorned Beetle				S2		6	13.7 ± 0.0	NB
	<i>Satyrrium calanus</i>	Banded Hairstreak				S2	3 Sensitive	29	4.6 ± 0.0	NB
	<i>Satyrrium calanus falacer</i>	Banded Hairstreak				S2	4 Secure	1	7.5 ± 1.0	NB
	<i>Strymon melinus</i>	Grey Hairstreak				S2	4 Secure	4	24.8 ± 2.0	NB
	<i>Aeshna clepsydra</i>	Mottled Darner				S2	3 Sensitive	12	51.9 ± 0.0	NB
	<i>Somatochlora tenebrosa</i>	Clamp-Tipped Emerald				S2	5 Undetermined	5	6.3 ± 1.0	NB
	<i>Ladona exusta</i>	White Corporal				S2	5 Undetermined	9	51.7 ± 0.0	NB
	<i>Hetaerina americana</i>	American Rubyspot				S2	3 Sensitive	15	46.6 ± 0.0	NB
	<i>Coenagrion interrogatum</i>	Subarctic Bluet				S2	3 Sensitive	1	79.5 ± 0.0	NB
	<i>Ischnura posita</i>	Fragile Forktail				S2	2 May Be At Risk	9	6.4 ± 0.0	NB
	<i>Callophrys henrici</i>	Henry's Elfin				S2S3	4 Secure	13	1.5 ± 7.0	NB
	<i>Celithemis martha</i>	Martha's Pennant				S2S3	5 Undetermined	3	72.2 ± 0.0	NB
	<i>Sphaeroderus nitidicollis</i>	a Ground Beetle				S3	4 Secure	1	25.7 ± 0.0	NB
	<i>Lepturoopsis biforis</i>	a Longhorned Beetle				S3		1	82.2 ± 1.0	NB
	<i>Orthosoma brunneum</i>	a Longhorned Beetle				S3		1	35.3 ± 5.0	NB
	<i>Elaphrus americanus</i>	a Ground Beetle				S3	4 Secure	1	14.0 ± 0.0	NB
	<i>Desmocerus palliatus</i>	Elderberry Borer				S3		4	82.2 ± 1.0	NB
	<i>Agonum excavatum</i>	a Ground Beetle				S3	4 Secure	1	14.0 ± 0.0	NB
	<i>Clivina americana</i>	a Ground Beetle				S3	4 Secure	1	14.0 ± 0.0	NB
	<i>Olisthopus parmatus</i>	a Ground Beetle				S3	4 Secure	1	25.7 ± 0.0	NB
	<i>Paratachys scitulus</i>	a Ground Beetle				S3	5 Undetermined	1	14.0 ± 0.0	NB
	<i>Coccinella hieroglyphica kirbyi</i>	a Ladybird Beetle				S3	4 Secure	1	82.2 ± 1.0	NB
	<i>Hippodamia parenthesis</i>	Parenthesis Lady Beetle				S3	4 Secure	2	82.2 ± 1.0	NB
	<i>Stenocorus vittiger</i>	a Longhorned Beetle				S3		1	14.1 ± 0.0	NB
	<i>Gnathacmaeops pratensis</i>	a Longhorned Beetle				S3		5	82.2 ± 1.0	NB
	<i>Pogonocherus mixtus</i>	a Longhorned Beetle				S3		1	82.2 ± 1.0	NB
	<i>Badister neopulchellus</i>	a Ground Beetle				S3	4 Secure	1	14.0 ± 0.0	NB
	<i>Saperda lateralis</i>	a Longhorned Beetle				S3		2	66.2 ± 0.0	NB
	<i>Hesperia sassacus</i>	Indian Skipper				S3	4 Secure	22	1.5 ± 7.0	NB
	<i>Euphyes bimacula</i>	Two-spotted Skipper				S3	4 Secure	27	1.5 ± 7.0	NB
	<i>Lycaena hyllus</i>	Bronze Copper				S3	3 Sensitive	26	8.8 ± 0.0	NB
	<i>Satyrrium acadica</i>	Acadian Hairstreak				S3	4 Secure	22	4.6 ± 0.0	NB
	<i>Callophrys polios</i>	Hoary Elfin				S3	4 Secure	21	1.5 ± 7.0	NB
	<i>Callophrys eryphon</i>	Western Pine Elfin				S3	4 Secure	1	81.7 ± 7.0	NB
	<i>Plebejus idas empetri</i>	Crowberry Blue				S3	4 Secure	23	77.5 ± 0.0	NB
	<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3	4 Secure	25	1.5 ± 7.0	NB
	<i>Boloria eunomia</i>	Bog Fritillary				S3	5 Undetermined	6	46.6 ± 0.0	NB
	<i>Boloria bellona</i>	Meadow Fritillary				S3	4 Secure	81	1.5 ± 7.0	NB
	<i>Boloria chariclea</i>	Arctic Fritillary				S3	4 Secure	2	84.6 ± 2.0	NB
	<i>Polygonia satyrus</i>	Satyr Comma				S3	4 Secure	23	1.5 ± 7.0	NB
	<i>Polygonia gracilis</i>	Hoary Comma				S3	4 Secure	14	10.0 ± 10.0	NB
	<i>Nymphalis l-album</i>	Compton Tortoiseshell				S3	4 Secure	18	1.5 ± 7.0	NB
	<i>Gomphus vastus</i>	Cobra Clubtail				S3	3 Sensitive	60	4.1 ± 1.0	NB
	<i>Gomphus abbreviatus</i>	Spine-crowned Clubtail				S3	4 Secure	51	6.8 ± 0.0	NB
	<i>Gomphaeschna furcillata</i>	Harlequin Darner				S3	5 Undetermined	11	6.3 ± 1.0	NB
	<i>Dorocordulia lepida</i>	Petite Emerald				S3	4 Secure	29	5.3 ± 1.0	NB
	<i>Somatochlora albicincta</i>	Ringed Emerald				S3	4 Secure	1	86.0 ± 1.0	NB
	<i>Somatochlora cingulata</i>	Lake Emerald				S3	4 Secure	11	30.4 ± 1.0	NB
	<i>Somatochlora forcipata</i>	Forcinate Emerald				S3	4 Secure	21	9.3 ± 1.0	NB
	<i>Williamsonia fletcheri</i>	Ebony Boghaunter				S3	4 Secure	22	9.0 ± 1.0	NB
	<i>Lestes eurinus</i>	Amber-Winged Spreadwing				S3	4 Secure	10	34.7 ± 1.0	NB
	<i>Lestes vigilax</i>	Swamp Spreadwing				S3	3 Sensitive	38	24.1 ± 0.0	NB
	<i>Enallagma geminatum</i>	Skimming Bluet				S3	5 Undetermined	22	24.5 ± 0.0	NB
	<i>Enallagma signatum</i>	Orange Bluet				S3	4 Secure	26	26.9 ± 0.0	NB



Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
I	<i>Stylurus scudderii</i>	Zebra Clubtail				S3	4 Secure	74	6.7 ± 0.0	NB
I	<i>Alasmidonta undulata</i>	Triangle Floater				S3	3 Sensitive	51	14.3 ± 0.0	NB
I	<i>Leptodea ochracea</i>	Tidewater Mucket				S3	4 Secure	67	4.6 ± 0.0	NB
I	<i>Striatura ferrea</i>	Black Striate				S3		1	7.4 ± 1.0	NB
I	<i>Neohelix albolabris</i>	Whitelip				S3		2	7.4 ± 1.0	NB
I	<i>Spurwinkia salsa</i>	Saltmarsh Hydrobe				S3		34	56.4 ± 0.0	NB
I	<i>Pantala hymenaea</i>	Spot-Winged Glider				S3B,S3M	4 Secure	6	78.5 ± 0.0	NB
I	<i>Satyrium liparops</i>	Striped Hairstreak				S3S4	4 Secure	21	1.5 ± 7.0	NB
I	<i>Cupido comyntas</i>	Eastern Tailed Blue				S3S4	4 Secure	58	1.7 ± 0.0	NB
N	<i>Pannaria lurida</i>	Wrinkled Shingle Lichen	Threatened	Threatened		S1?	2 May Be At Risk	4	90.4 ± 0.0	NB
N	<i>Anzia colpodes</i>	Black-foam Lichen	Threatened	Threatened		S1S2	5 Undetermined	4	17.4 ± 0.0	NB
N	<i>Fuscopannaria leucosticta</i>	Rimmed Shingles Lichen	Threatened			S2	2 May Be At Risk	78	17.4 ± 0.0	NB
N	<i>Pseudevernia cladonia</i>	Ghost Antler Lichen	Not At Risk			S2S3	5 Undetermined	12	50.4 ± 0.0	NB
N	<i>Bryum muehlenbeckii</i>	Muehlenbeck's Bryum Moss				S1	2 May Be At Risk	1	70.0 ± 1.0	NB
N	<i>Sphagnum macrophyllum</i>	Sphagnum				S1	2 May Be At Risk	4	53.6 ± 0.0	NB
N	<i>Syntrichia ruralis</i>	a Moss				S1	2 May Be At Risk	1	90.9 ± 0.0	NB
N	<i>Coscinodon cribrus</i>	Sieve-Toothed Moss				S1	2 May Be At Risk	1	81.4 ± 0.0	NB
N	<i>Atrichum angustatum</i>	Lesser Smoothcap Moss				S1?	2 May Be At Risk	1	81.5 ± 2.0	NB
N	<i>Calliergon trifarium</i>	Three-ranked Moss				S1?	2 May Be At Risk	1	75.9 ± 0.0	NB
N	<i>Dichelyma falcatum</i>	a Moss				S1?	2 May Be At Risk	2	11.7 ± 10.0	NB
N	<i>Dicranum bonjeanii</i>	Bonjean's Broom Moss				S1?	2 May Be At Risk	1	8.2 ± 1.0	NB
N	<i>Entodon brevisetus</i>	a Moss				S1?	2 May Be At Risk	1	83.9 ± 10.0	NB
N	<i>Eurhynchium hians</i>	Light Beaked Moss				S1?	2 May Be At Risk	3	9.9 ± 1.0	NB
N	<i>Homomallium adnatum</i>	Adnate Hairy-gray Moss				S1?	2 May Be At Risk	2	83.9 ± 10.0	NB
N	<i>Plagiothecium latebricola</i>	Alder Silk Moss				S1?	2 May Be At Risk	1	84.3 ± 0.0	NB
N	<i>Racomitrium ericoides</i>	a Moss				S1?	2 May Be At Risk	1	39.6 ± 3.0	NB
N	<i>Rhytidium rugosum</i>	Wrinkle-leaved Moss				S1?	2 May Be At Risk	1	97.5 ± 0.0	NB
N	<i>Splachnum pennsylvanicum</i>	Southern Dung Moss				S1?	2 May Be At Risk	2	26.9 ± 1.0	NB
N	<i>Platylomella lescurii</i>	a Moss				S1?	5 Undetermined	1	76.5 ± 1.0	NB
N	<i>Cephaloziella spinigera</i>	Spiny Threadwort				S1S2	6 Not Assessed	2	96.1 ± 0.0	NB
N	<i>Jungermannia obovata</i>	Egg Flapwort				S1S2	6 Not Assessed	1	70.2 ± 0.0	NB
N	<i>Pallavicinia lyellii</i>	Lyell's Ribbonwort				S1S2	6 Not Assessed	4	34.3 ± 0.0	NB
N	<i>Reboulia hemisphaerica</i>	Purple-margined Liverwort				S1S2	6 Not Assessed	1	93.1 ± 1.0	NB
N	<i>Brachythecium acuminatum</i>	Acuminate Ragged Moss				S1S2	5 Undetermined	3	9.9 ± 10.0	NB
N	<i>Bryum salinum</i>	a Moss				S1S2	2 May Be At Risk	1	84.9 ± 1.0	NB
N	<i>Campyllum radicale</i>	Long-stalked Fine Wet Moss				S1S2	5 Undetermined	1	9.9 ± 1.0	NB
N	<i>Ditrichum pallidum</i>	Pale Cow-hair Moss				S1S2	2 May Be At Risk	4	33.5 ± 1.0	NB
N	<i>Drummondia prorepens</i>	a Moss				S1S2	2 May Be At Risk	1	92.6 ± 1.0	NB
N	<i>Fissidens taxifolius</i>	Yew-leaved Pocket Moss				S1S2	2 May Be At Risk	4	79.4 ± 0.0	NB
N	<i>Seligeria brevifolia</i>	a Moss				S1S2	3 Sensitive	1	84.5 ± 1.0	NB
N	<i>Sphagnum platyphyllum</i>	Flat-leaved Peat Moss				S1S2	5 Undetermined	3	33.5 ± 1.0	NB
N	<i>Timmia norvegica</i>	a moss				S1S2	2 May Be At Risk	1	84.7 ± 0.0	NB
N	<i>Tomentypnum falcifolium</i>	Sickle-leaved Golden Moss				S1S2	2 May Be At Risk	1	84.9 ± 1.0	NB
N	<i>Pseudotaxiphyllum distichaceum</i>	a Moss				S1S2	2 May Be At Risk	2	9.5 ± 1.0	NB
N	<i>Hamatocaulis vernicosus</i>	a Moss				S1S2	2 May Be At Risk	1	89.0 ± 100.0	NB
N	<i>Cystocoleus ebeneus</i>	Rockgossamer Lichen				S1S2		1	97.2 ± 0.0	NB
N	<i>Calypogeia neesiana</i>	Nees' Pouchwort				S1S3	6 Not Assessed	1	74.0 ± 1.0	NB
N	<i>Cephaloziella elachista</i>	Spurred Threadwort				S1S3	6 Not Assessed	1	76.3 ± 5.0	NB
N	<i>Porella pinnata</i>	Pinnate Scalewort				S1S3	6 Not Assessed	2	70.5 ± 1.0	NB
N	<i>Amphidium mougeotii</i>	a Moss				S2	3 Sensitive	1	88.9 ± 8.0	NB
N	<i>Anomodon viticulosus</i>	a Moss				S2	2 May Be At Risk	5	74.2 ± 0.0	NB
N	<i>Cirriphyllum piliferum</i>	Hair-pointed Moss				S2	3 Sensitive	2	83.9 ± 1.0	NB
N	<i>Cynodontium strumiferum</i>	Strumose Dogtooth Moss				S2	3 Sensitive	1	88.9 ± 8.0	NB
N	<i>Dicranella palustris</i>	Drooping-Leaved Fork Moss				S2	3 Sensitive	2	50.9 ± 100.0	NB
N	<i>Didymodon ferrugineus</i>	a moss				S2	3 Sensitive	3	75.3 ± 1.0	NB
N	<i>Anomodon tristis</i>	a Moss				S2	2 May Be At Risk	1	42.4 ± 1.0	NB
N	<i>Hypnum pratense</i>	Meadow Plait Moss				S2	3 Sensitive	3	76.6 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	<i>Isopterygiopsis pulchella</i>	Neat Silk Moss				S2	3 Sensitive	1	91.9 ± 1.0	NB
N	<i>Meesia triquetra</i>	Three-ranked Cold Moss				S2	2 May Be At Risk	2	50.9 ± 100.0	NB
N	<i>Physcomitrium immersum</i>	a Moss				S2	3 Sensitive	7	9.9 ± 1.0	NB
N	<i>Sphagnum centrale</i>	Central Peat Moss				S2	3 Sensitive	1	87.2 ± 0.0	NB
N	<i>Sphagnum lindbergii</i>	Lindberg's Peat Moss				S2	3 Sensitive	8	75.7 ± 1.0	NB
N	<i>Sphagnum flexuosum</i>	Flexuous Peatmoss				S2	3 Sensitive	1	99.8 ± 0.0	NB
N	<i>Tayloria serrata</i>	Serrate Trumpet Moss				S2	3 Sensitive	2	97.3 ± 1.0	NB
N	<i>Tetraplodon mnioides</i>	Entire-leaved Nitrogen Moss				S2	3 Sensitive	3	80.1 ± 0.0	NB
N	<i>Thamnobryum alleghaniense</i>	a Moss				S2	3 Sensitive	2	84.9 ± 0.0	NB
N	<i>Tortula mucronifolia</i>	Mucronate Screw Moss				S2	3 Sensitive	1	80.3 ± 0.0	NB
N	<i>Ulota phyllantha</i>	a Moss				S2	3 Sensitive	1	84.9 ± 1.0	NB
N	<i>Anomobryum filiforme</i>	a moss				S2	5 Undetermined	1	9.9 ± 1.0	NB
N	<i>Leptogium corticola</i>	Blistered Jellyskin Lichen				S2	2 May Be At Risk	1	29.6 ± 0.0	NB
N	<i>Leptogium milligranum</i>	Stretched Jellyskin Lichen				S2	5 Undetermined	1	96.9 ± 0.0	NB
N	<i>Nephroma laevigatum</i>	Mustard Kidney Lichen				S2	2 May Be At Risk	1	96.5 ± 0.0	NB
N	<i>Andreaea rothii</i>	a Moss				S2?	3 Sensitive	1	92.1 ± 0.0	NB
N	<i>Anomodon minor</i>	Blunt-leaved Anomodon Moss				S2?	2 May Be At Risk	1	93.8 ± 1.0	NB
N	<i>Brachythecium digastrum</i>	a Moss				S2?	3 Sensitive	2	9.9 ± 1.0	NB
N	<i>Bryum pallescens</i>	Pale Bryum Moss				S2?	5 Undetermined	2	42.6 ± 1.0	NB
N	<i>Dichelyma capillaceum</i>	Hairlike Dichelyma Moss				S2?	3 Sensitive	2	48.2 ± 4.0	NB
N	<i>Dicranum spurium</i>	Spurred Broom Moss				S2?	3 Sensitive	2	83.9 ± 0.0	NB
N	<i>Schistostega pennata</i>	Luminous Moss				S2?	3 Sensitive	3	9.9 ± 1.0	NB
N	<i>Seligeria campylopoda</i>	a Moss				S2?	3 Sensitive	2	83.8 ± 0.0	NB
N	<i>Seligeria diversifolia</i>	a Moss				S2?	3 Sensitive	1	39.6 ± 0.0	NB
N	<i>Sphagnum angermanicum</i>	a Peatmoss				S2?	3 Sensitive	3	55.6 ± 1.0	NB
N	<i>Plagiomnium rostratum</i>	Long-beaked Leafy Moss				S2?	3 Sensitive	1	85.0 ± 0.0	NB
N	<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen				S2?	5 Undetermined	5	24.8 ± 0.0	NB
N	<i>Physcia subtilis</i>	Slender Rosette Lichen				S2?	5 Undetermined	1	73.7 ± 0.0	NB
N	<i>Bryum uliginosum</i>	a Moss				S2S3	3 Sensitive	1	90.2 ± 4.0	NB
N	<i>Buxbaumia aphylla</i>	Brown Shield Moss				S2S3	3 Sensitive	2	80.8 ± 15.0	NB
N	<i>Calliergonella cuspidata</i>	Common Large Wetland Moss				S2S3	3 Sensitive	4	75.8 ± 0.0	NB
N	<i>Campylium polygamum</i>	a Moss				S2S3	3 Sensitive	1	69.8 ± 1.0	NB
N	<i>Didymodon rigidulus</i>	Rigid Screw Moss				S2S3	3 Sensitive	1	31.7 ± 8.0	NB
N	<i>Ephemerum serratum</i>	a Moss				S2S3	3 Sensitive	3	22.9 ± 0.0	NB
N	<i>Fissidens bushii</i>	Bush's Pocket Moss				S2S3	3 Sensitive	3	84.5 ± 1.0	NB
N	<i>Orthotrichum speciosum</i>	Showy Bristle Moss				S2S3	5 Undetermined	3	34.7 ± 3.0	NB
N	<i>Racomitrium fasciculare</i>	a Moss				S2S3	3 Sensitive	1	86.5 ± 0.0	NB
N	<i>Scorpidium scorpioides</i>	Hooked Scorpion Moss				S2S3	3 Sensitive	5	75.8 ± 0.0	NB
N	<i>Sphagnum subfulvum</i>	a Peatmoss				S2S3	2 May Be At Risk	4	84.9 ± 1.0	NB
N	<i>Taxiphyllum deplanatum</i>	Imbricate Yew-leaved Moss				S2S3	3 Sensitive	2	83.7 ± 0.0	NB
N	<i>Zygodon viridissimus</i>	a Moss				S2S3	2 May Be At Risk	2	81.8 ± 5.0	NB
N	<i>Schistidium agassizii</i>	Elf Bloom Moss				S2S3	3 Sensitive	2	78.8 ± 2.0	NB
N	<i>Punctelia caseana</i>					S2S3		3	94.8 ± 0.0	NB
N	<i>Cynodontium tenellum</i>	Delicate Dogtooth Moss				S3	3 Sensitive	1	84.9 ± 1.0	NB
N	<i>Hypnum curvifolium</i>	Curved-leaved Plait Moss				S3	3 Sensitive	2	81.8 ± 5.0	NB
N	<i>Tortella fragilis</i>	Fragile Twisted Moss				S3	3 Sensitive	1	39.8 ± 0.0	NB
N	<i>Schistidium maritimum</i>	a Moss				S3	4 Secure	1	84.9 ± 1.0	NB
N	<i>Collema nigrescens</i>	Blistered Tarpaper Lichen				S3	3 Sensitive	6	96.6 ± 0.0	NB
N	<i>Cladonia strepsilis</i>	Olive Cladonia Lichen				S3	4 Secure	1	68.9 ± 0.0	NB
N	<i>Nephroma resupinatum</i>	a lichen				S3	3 Sensitive	3	95.8 ± 0.0	NB
N	<i>Usnea strigosa</i>	Bushy Beard Lichen				S3	5 Undetermined	1	96.6 ± 0.0	NB
N	<i>Leptogium laceroides</i>	Short-bearded Jellyskin Lichen				S3	3 Sensitive	2	96.6 ± 0.0	NB
N	<i>Peltigera membranacea</i>	Membranous Pelt Lichen				S3	5 Undetermined	2	97.1 ± 0.0	NB
N	<i>Aulacomnium androgynum</i>	Little Groove Moss				S3?	4 Secure	2	80.6 ± 1.0	NB
N	<i>Dicranella rufescens</i>	Red Forklet Moss				S3?	5 Undetermined	2	9.1 ± 4.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
N	<i>Sphagnum lescurii</i>	a Peatmoss				S3?	5 Undetermined	2	74.3 ± 0.0	NB
N	<i>Sphagnum inundatum</i>	a Sphagnum				S3?	5 Undetermined	1	26.2 ± 0.0	NB
N	<i>Leptogium subtile</i>	Appressed Jellyskin Lichen				S3?	5 Undetermined	3	24.1 ± 0.0	NB
N	<i>Collema occultatum</i>	Crusted Tarpaper Lichen				S3?	5 Undetermined	1	24.8 ± 0.0	NB
N	<i>Anomodon rugelii</i>	Rugel's Anomodon Moss				S3S4	3 Sensitive	2	94.0 ± 0.0	NB
N	<i>Barbula convoluta</i>	Lesser Bird's-claw Beard Moss				S3S4	4 Secure	1	31.7 ± 8.0	NB
N	<i>Brachythecium velutinum</i>	Velvet Ragged Moss				S3S4	4 Secure	5	37.3 ± 4.0	NB
N	<i>Dicranella cerviculata</i>	a Moss				S3S4	3 Sensitive	3	84.9 ± 1.0	NB
N	<i>Dicranum majus</i>	Greater Broom Moss				S3S4	4 Secure	3	80.1 ± 0.0	NB
N	<i>Fissidens bryoides</i>	Lesser Pocket Moss				S3S4	4 Secure	4	22.7 ± 0.0	NB
N	<i>Helodium blandowii</i>	Wetland-plume Moss				S3S4	4 Secure	2	91.9 ± 1.0	NB
N	<i>Heterocladium dimorphum</i>	Dimorphous Tangle Moss				S3S4	4 Secure	1	78.8 ± 2.0	NB
N	<i>Isopterygiopsis muelleriana</i>	a Moss				S3S4	4 Secure	6	37.3 ± 4.0	NB
N	<i>Myurella julacea</i>	Small Mouse-tail Moss				S3S4	4 Secure	1	88.9 ± 8.0	NB
N	<i>Physcomitrium pyriforme</i>	Pear-shaped Urn Moss				S3S4	3 Sensitive	6	9.9 ± 10.0	NB
N	<i>Pogonatum dentatum</i>	Mountain Hair Moss				S3S4	4 Secure	1	84.9 ± 1.0	NB
N	<i>Sphagnum torreyanum</i>	a Peatmoss				S3S4	4 Secure	4	82.5 ± 0.0	NB
N	<i>Sphagnum austinii</i>	Austin's Peat Moss				S3S4	4 Secure	1	81.1 ± 1.0	NB
N	<i>Sphagnum contortum</i>	Twisted Peat Moss				S3S4	4 Secure	1	75.3 ± 0.0	NB
N	<i>Splachnum rubrum</i>	Red Collar Moss				S3S4	4 Secure	1	97.3 ± 1.0	NB
N	<i>Tetraphis geniculata</i>	Geniculate Four-tooth Moss				S3S4	4 Secure	4	74.9 ± 0.0	NB
N	<i>Tetraplodon angustatus</i>	Toothed-leaved Nitrogen Moss				S3S4	4 Secure	2	84.9 ± 1.0	NB
N	<i>Tomentypnum nitens</i>	Golden Fuzzy Fen Moss				S3S4	4 Secure	1	78.5 ± 3.0	NB
N	<i>Weissia controversa</i>	Green-Cushioned Weissia				S3S4	4 Secure	1	22.9 ± 0.0	NB
N	<i>Trichostomum tenuirostre</i>	Acid-Soil Moss				S3S4	4 Secure	3	81.8 ± 5.0	NB
N	<i>Limprichtia revolvens</i>	a Moss				S3S4	4 Secure	2	82.9 ± 0.0	NB
N	<i>Rauvella scita</i>	Smaller Fern Moss				S3S4	3 Sensitive	2	87.2 ± 3.0	NB
N	<i>Pannaria rubiginosa</i>	Brown-eyed Shingle Lichen				S3S4	3 Sensitive	8	84.4 ± 0.0	NB
N	<i>Cladonia terrae-novae</i>	Newfoundland Reindeer Lichen				S3S4	4 Secure	1	83.7 ± 0.0	NB
N	<i>Cladonia floerkeana</i>	Gritty British Soldiers Lichen				S3S4	4 Secure	1	68.9 ± 0.0	NB
N	<i>Vahlia leucophaea</i>	Shelter Shingle Lichen				S3S4	5 Undetermined	4	17.0 ± 0.0	NB
N	<i>Montanella panniformis</i>	Shingled Camouflage Lichen				S3S4	5 Undetermined	1	97.2 ± 0.0	NB
N	<i>Nephroma parile</i>	Powdery Kidney Lichen				S3S4	4 Secure	4	24.5 ± 0.0	NB
N	<i>Protopannaria pezizoides</i>	Brown-gray Moss-shingle Lichen				S3S4	4 Secure	6	85.2 ± 0.0	NB
N	<i>Pseudocyphellaria holarctica</i>	Yellow Specklebelly Lichen				S3S4	3 Sensitive	38	23.4 ± 0.0	NB
N	<i>Pannaria conoplea</i>	Mealy-rimmed Shingle Lichen				S3S4	3 Sensitive	15	29.6 ± 0.0	NB
N	<i>Anaptychia palmulata</i>	Shaggy Fringed Lichen				S3S4	3 Sensitive	1	97.1 ± 0.0	NB
N	<i>Dermatocarpon luridum</i>	Brookside Stippleback Lichen				S3S4	4 Secure	10	35.9 ± 0.0	NB
N	<i>Grimmia anodon</i>	Toothless Grimmiid Moss				SH	5 Undetermined	2	79.6 ± 10.0	NB
N	<i>Leucodon brachypus</i>	a Moss				SH	2 May Be At Risk	3	40.1 ± 10.0	NB
N	<i>Orthotrichum gymnostomum</i>	a Moss				SH	2 May Be At Risk	1	41.8 ± 10.0	NB
N	<i>Thelia hirtella</i>	a Moss				SH	2 May Be At Risk	1	50.9 ± 100.0	NB
N	<i>Cyrto-hypnum minutulum</i>	Tiny Cedar Moss				SH	2 May Be At Risk	3	78.4 ± 10.0	NB
P	<i>Juglans cinerea</i>	Butternut	Endangered	Endangered	Endangered	S1	1 At Risk	512	5.2 ± 0.0	NB
P	<i>Polemonium vanbruntiae</i>	Van Brunt's Jacob's-ladder	Threatened	Threatened	Threatened	S1	1 At Risk	74	78.7 ± 1.0	NB
P	<i>Fraxinus nigra</i>	Black Ash	Threatened			S4S5	4 Secure	729	1.9 ± 0.0	NB
P	<i>Symphotrichum praealtum</i>	Willow-leaved Aster	Threatened	Threatened		SNA	7 Exotic	1	93.3 ± 1.0	NB
P	<i>Isoetes prototypus</i>	Prototype Quillwort	Special Concern	Special Concern	Endangered	S2	1 At Risk	23	9.6 ± 0.0	NB
P	<i>Symphotrichum anticostense</i>	Anticosti Aster	Special Concern	Special Concern	Endangered	S2S3	1 At Risk	28	21.2 ± 0.0	NB
P	<i>Pteropora andromedea</i>	Woodland Pinedrops			Endangered	S1	1 At Risk	25	16.2 ± 0.0	NB
P	<i>Cryptotaenia canadensis</i>	Canada Honewort				S1	2 May Be At Risk	5	78.0 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Sanicula trifoliata</i>	Large-Fruited Sanicle				S1	2 May Be At Risk	23	70.6 ± 0.0	NB
P	<i>Antennaria parlinii</i>	a Pussytoes				S1	2 May Be At Risk	7	47.8 ± 1.0	NB
P	<i>Antennaria howellii</i> ssp. <i>petaloidea</i>	Pussy-Toes				S1	2 May Be At Risk	2	68.8 ± 1.0	NB
P	<i>Bidens discoidea</i>	Swamp Beggarticks				S1	2 May Be At Risk	4	24.7 ± 0.0	NB
P	<i>Pseudognaphalium obtusifolium</i>	Eastern Cudweed				S1	2 May Be At Risk	2	50.2 ± 0.0	NB
P	<i>Helianthus decapetalus</i>	Ten-rayed Sunflower				S1	2 May Be At Risk	20	19.2 ± 0.0	NB
P	<i>Hieracium paniculatum</i>	Panicled Hawkweed				S1	2 May Be At Risk	4	21.8 ± 0.0	NB
P	<i>Hieracium robinsonii</i>	Robinson's Hawkweed				S1	3 Sensitive	1	78.0 ± 0.0	NB
P	<i>Symphyotrichum laeve</i>	Smooth Aster				S1	5 Undetermined	6	68.1 ± 1.0	NB
P	<i>Canadanthus modestus</i>	Great Northern Aster				S1	2 May Be At Risk	12	96.4 ± 0.0	NB
P	<i>Andersonglossum boreale</i>	Northern Wild Comfrey				S1	2 May Be At Risk	14	86.8 ± 0.0	NB
P	<i>Cardamine parviflora</i>	Small-flowered Bittercress				S1	2 May Be At Risk	3	60.4 ± 0.0	NB
P	<i>Cardamine concatenata</i>	Cut-leaved Toothwort				S1	2 May Be At Risk	14	1.8 ± 0.0	NB
P	<i>Draba arabisans</i>	Rock Whitlow-Grass				S1	2 May Be At Risk	3	69.7 ± 1.0	NB
P	<i>Draba cana</i>	Lance-leaved Draba				S1	2 May Be At Risk	10	16.8 ± 0.0	NB
P	<i>Draba glabella</i>	Rock Whitlow-Grass				S1	2 May Be At Risk	7	35.7 ± 1.0	NB
P	<i>Mononeuria groenlandica</i>	Greenland Stitchwort				S1	2 May Be At Risk	1	63.9 ± 0.0	NB
P	<i>Chenopodium simplex</i>	Maple-leaved Goosefoot				S1	2 May Be At Risk	8	9.2 ± 5.0	NB
P	<i>Blitum capitatum</i>	strawberry-blite				S1	2 May Be At Risk	5	8.0 ± 6.0	NB
P	<i>Callitriche terrestris</i>	Terrestrial Water-Starwort				S1	5 Undetermined	1	90.9 ± 0.0	NB
P	<i>Hypericum virginicum</i>	Virginia St. John's-wort				S1	2 May Be At Risk	7	54.6 ± 0.0	NB
P	<i>Drosera anglica</i>	English Sundew				S1	2 May Be At Risk	1	77.4 ± 0.0	NB
P	<i>Drosera linearis</i>	Slender-Leaved Sundew				S1	2 May Be At Risk	1	77.4 ± 0.0	NB
P	<i>Corema conradii</i>	Broom Crowberry				S1	2 May Be At Risk	1	81.4 ± 10.0	NB
P	<i>Vaccinium boreale</i>	Northern Blueberry				S1	2 May Be At Risk	1	70.1 ± 0.0	NB
P	<i>Vaccinium corymbosum</i>	Highbush Blueberry				S1	3 Sensitive	9	76.2 ± 0.0	NB
P	<i>Hylodesmum glutinosum</i>	Large Tick-trefoil				S1	2 May Be At Risk	8	75.1 ± 0.0	NB
P	<i>Lespedeza capitata</i>	Round-headed Bush-clover				S1	2 May Be At Risk	10	37.4 ± 0.0	NB
P	<i>Gentiana rubricaulis</i>	Purple-stemmed Gentian				S1	2 May Be At Risk	14	58.4 ± 0.0	NB
P	<i>Ribes cynosbati</i>	Prickly Gooseberry				S1	2 May Be At Risk	1	83.4 ± 0.0	NB
P	<i>Proserpinaca pectinata</i>	Comb-leaved Mermaidweed				S1	2 May Be At Risk	1	73.4 ± 0.0	NB
P	<i>Pycnanthemum virginianum</i>	Virginia Mountain Mint				S1	2 May Be At Risk	4	60.0 ± 0.0	NB
P	<i>Decodon verticillatus</i>	Swamp Loosestrife				S1	2 May Be At Risk	3	56.5 ± 0.0	NB
P	<i>Polygala verticillata</i>	Whorled Milkwort				S1	5 Undetermined	2	85.6 ± 0.0	NB
P	<i>Polygonum douglasii</i>	Douglas Knotweed				S1		1	92.9 ± 0.0	NB
P	<i>Lysimachia hybrida</i>	Lowland Yellow Loosestrife				S1	2 May Be At Risk	14	87.9 ± 0.0	NB
P	<i>Lysimachia quadrifolia</i>	Whorled Yellow Loosestrife				S1	2 May Be At Risk	14	58.0 ± 0.0	NB
P	<i>Hepatica acutiloba</i>	Sharp-lobed Hepatica				S1	2 May Be At Risk	11	97.7 ± 0.0	NB
P	<i>Coptidium lapponicum</i>	Lapland Buttercup				S1	2 May Be At Risk	1	99.3 ± 1.0	NB
P	<i>Ranunculus sceleratus</i>	Cursed Buttercup				S1	2 May Be At Risk	6	8.4 ± 0.0	NB
P	<i>Crataegus jonesiae</i>	Jones' Hawthorn				S1	2 May Be At Risk	6	7.2 ± 1.0	NB
P	<i>Potentilla canadensis</i>	Canada Cinquefoil				S1	5 Undetermined	1	64.0 ± 0.0	NB
P	<i>Geum fragarioides</i>	Barren Strawberry				S1	2 May Be At Risk	27	70.5 ± 0.0	NB
P	<i>Galium brevipes</i>	Limestone Swamp Bedstraw				S1	2 May Be At Risk	3	51.4 ± 5.0	NB
P	<i>Saxifraga paniculata</i> ssp. <i>laestadii</i>	Laestadius' Saxifrage				S1	2 May Be At Risk	23	70.5 ± 10.0	NB
P	<i>Agalinis tenuifolia</i>	Slender Agalinis				S1	2 May Be At Risk	6	4.8 ± 0.0	NB
P	<i>Agalinis purpurea</i> var. <i>parviflora</i>	Small-flowered Purple False Foxglove				S1	2 May Be At Risk	8	8.7 ± 10.0	NB
P	<i>Gratiola lutea</i>	Golden Hedge-hyssop				S1	3 Sensitive	2	68.6 ± 0.0	NB
P	<i>Pedicularis canadensis</i>	Canada Lousewort				S1	2 May Be At Risk	3	16.2 ± 0.0	NB
P	<i>Viola canadensis</i>	Canada Violet				S1	2 May Be At Risk	85	84.1 ± 0.0	NB
P	<i>Viola sagittata</i> var. <i>ovata</i>	Arrow-Leaved Violet				S1	2 May Be At Risk	12	12.4 ± 0.0	NB
P	<i>Alisma subcordatum</i>	Southern Water Plantain				S1	5 Undetermined	8	7.4 ± 0.0	NB
P	<i>Carex annectens</i>	Yellow-Fruited Sedge				S1	2 May Be At Risk	1	84.4 ± 0.0	NB
P	<i>Carex backii</i>	Rocky Mountain Sedge				S1	2 May Be At Risk	6	16.4 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Carex blanda</i>	Eastern Woodland Sedge				S1	2 May Be At Risk	1	84.1 ± 0.0	NB
P	<i>Carex cephaloidea</i>	Thin-leaved Sedge				S1	2 May Be At Risk	22	33.0 ± 0.0	NB
P	<i>Carex merritt-feraldii</i>	Merritt Fernald's Sedge				S1	2 May Be At Risk	2	92.3 ± 0.0	NB
P	<i>Carex scirpoidea</i>	Scirpuslike Sedge				S1	2 May Be At Risk	6	95.1 ± 0.0	NB
P	<i>Carex sterilis</i>	Sterile Sedge				S1	2 May Be At Risk	12	23.9 ± 0.0	NB
P	<i>Carex grisea</i>	Inflated Narrow-leaved Sedge				S1	2 May Be At Risk	15	14.8 ± 1.0	NB
P	<i>Carex saxatilis</i>	Russet Sedge				S1	2 May Be At Risk	14	69.0 ± 0.0	NB
P	<i>Cyperus diandrus</i>	Low Flatsedge				S1	2 May Be At Risk	7	4.6 ± 1.0	NB
P	<i>Cyperus lupulinus</i>	Hop Flatsedge				S1	2 May Be At Risk	18	26.1 ± 0.0	NB
P	<i>Cyperus lupulinus ssp. macilentus</i>	Hop Flatsedge				S1	2 May Be At Risk	16	32.9 ± 1.0	NB
P	<i>Eleocharis flavescens var. olivacea</i>	Bright-green Spikerush				S1	2 May Be At Risk	3	89.7 ± 1.0	NB
P	<i>Rhynchospora capillacea</i>	Slender Beakrush				S1	2 May Be At Risk	3	20.5 ± 0.0	NB
P	<i>Scirpus pendulus</i>	Hanging Bulrush				S1	2 May Be At Risk	1	64.0 ± 0.0	NB
P	<i>Sisyrinchium angustifolium</i>	Narrow-leaved Blue-eyed-grass				S1	2 May Be At Risk	5	34.1 ± 0.0	NB
P	<i>Juncus greenii</i>	Greene's Rush				S1	2 May Be At Risk	1	84.9 ± 0.0	NB
P	<i>Juncus subtilis</i>	Creeping Rush				S1	2 May Be At Risk	1	44.1 ± 5.0	NB
P	<i>Allium canadense</i>	Canada Garlic				S1	2 May Be At Risk	11	19.3 ± 1.0	NB
P	<i>Goodyera pubescens</i>	Downy Rattlesnake-Plantain				S1	2 May Be At Risk	9	9.5 ± 0.0	NB
P	<i>Malaxis monophyllos var. brachypoda</i>	North American White Adder's-mouth				S1	2 May Be At Risk	12	44.4 ± 0.0	NB
P	<i>Platanthera flava var. herbiola</i>	Pale Green Orchid				S1	2 May Be At Risk	13	7.8 ± 10.0	NB
P	<i>Platanthera macrophylla</i>	Large Round-Leaved Orchid				S1	2 May Be At Risk	9	9.3 ± 1.0	NB
P	<i>Spiranthes casei</i>	Case's Ladies'-Tresses				S1	2 May Be At Risk	6	16.3 ± 0.0	NB
P	<i>Bromus pubescens</i>	Hairy Wood Brome Grass				S1	5 Undetermined	6	32.4 ± 0.0	NB
P	<i>Cinna arundinacea</i>	Sweet Wood Reed Grass				S1	2 May Be At Risk	22	31.3 ± 0.0	NB
P	<i>Danthonia compressa</i>	Flattened Oat Grass				S1	2 May Be At Risk	3	54.3 ± 0.0	NB
P	<i>Dichanthelium xanthophyllum</i>	Slender Panic Grass				S1	2 May Be At Risk	6	78.6 ± 0.0	NB
P	<i>Dichanthelium dichotomum</i>	Forked Panic Grass				S1	2 May Be At Risk	5	64.6 ± 1.0	NB
P	<i>Elymus hystrix</i>	Spreading Wild Rye				S1	2 May Be At Risk	29	70.6 ± 0.0	NB
P	<i>Festuca subverticillata</i>	Nodding Fescue				S1	2 May Be At Risk	12	94.0 ± 0.0	NB
P	<i>Glyceria obtusa</i>	Atlantic Manna Grass				S1	2 May Be At Risk	6	59.0 ± 0.0	NB
P	<i>Sporobolus compositus</i>	Rough Dropseed				S1	2 May Be At Risk	17	19.0 ± 0.0	NB
P	<i>Potamogeton friesii</i>	Fries' Pondweed				S1	2 May Be At Risk	6	9.8 ± 5.0	NB
P	<i>Potamogeton nodosus</i>	Long-leaved Pondweed				S1	2 May Be At Risk	14	3.7 ± 1.0	NB
P	<i>Potamogeton strictifolius</i>	Straight-leaved Pondweed				S1	2 May Be At Risk	2	69.0 ± 0.0	NB
P	<i>Xyris difformis</i>	Bog Yellow-eyed-grass				S1	5 Undetermined	3	63.4 ± 0.0	NB
P	<i>Asplenium ruta-muraria var. cryptolepis</i>	Wallrue Spleenwort				S1	2 May Be At Risk	3	70.5 ± 0.0	NB
P	<i>Cystopteris laurentiana</i>	Laurentian Bladder Fern				S1	2 May Be At Risk	1	97.5 ± 1.0	NB
P	<i>Dryopteris clintoniana</i>	Clinton's Wood Fern				S1	2 May Be At Risk	1	84.1 ± 0.0	NB
P	<i>Sceptridium oneidense</i>	Blunt-lobed Moonwort				S1	2 May Be At Risk	8	10.1 ± 0.0	NB
P	<i>Sceptridium rugulosum</i>	Rugulose Grapefern				S1	2 May Be At Risk	5	61.7 ± 1.0	NB
P	<i>Schizaea pusilla</i>	Little Curlygrass Fern				S1	2 May Be At Risk	19	81.3 ± 0.0	NB
P	<i>Cuscuta campestris</i>	Field Dodder				S1?	2 May Be At Risk	3	41.0 ± 10.0	NB
P	<i>Polygonum aviculare ssp. neglectum</i>	Narrow-leaved Knotweed				S1?	5 Undetermined	7	7.7 ± 0.0	NB
P	<i>Galium trifidum ssp. subbiflorum</i>	Three-petaled Bedstraw				S1?	5 Undetermined	1	90.6 ± 1.0	NB
P	<i>Carex laxiflora</i>	Loose-Flowered Sedge				S1?	5 Undetermined	2	91.5 ± 0.0	NB
P	<i>Carex appalachica</i>	Appalachian Sedge				S1?	5 Undetermined	1	90.2 ± 0.0	NB
P	<i>Sisyrinchium mucronatum</i>	Michaux's Blue-eyed-grass				S1?	5 Undetermined	3	87.5 ± 0.0	NB
P	<i>Wolffia columbiana</i>	Columbian Watermeal				S1?	2 May Be At Risk	5	5.0 ± 0.0	NB

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P	<i>Micranthes virginensis</i>	Early Saxifrage				S1S2	2 May Be At Risk	14	16.2 ± 0.0	NB
P	<i>Potamogeton bicupulatus</i>	Snailseed Pondweed				S1S2	2 May Be At Risk	5	49.3 ± 0.0	NB
P	<i>Selaginella rupestris</i>	Rock Spikemoss				S1S2	2 May Be At Risk	14	20.7 ± 1.0	NB
P	<i>Coryphopteris simulata</i>	Bog Fern				S1S2	2 May Be At Risk	20	24.3 ± 0.0	NB
P	<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S1S3	2 May Be At Risk	2	69.2 ± 0.0	NB
P	<i>Spiranthes arcisepala</i>	Appalachian Ladies'-tresses				S1S3		2	35.5 ± 0.0	NB
P	<i>Neottia bifolia</i>	Southern Twayblade			Endangered	S2	1 At Risk	16	28.8 ± 0.0	NB
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	3 Sensitive	9	25.5 ± 5.0	NB
P	<i>Sanicula odorata</i>	Clustered Sanicle				S2	2 May Be At Risk	22	25.5 ± 0.0	NB
P	<i>Solidago racemosa</i>	Racemose Goldenrod				S2	2 May Be At Risk	21	18.1 ± 0.0	NB
P	<i>Ionactis linariifolia</i>	Flax-leaved Aster				S2	3 Sensitive	25	14.0 ± 0.0	NB
P	<i>Symphotrichum racemosum</i>	Small White Aster				S2	3 Sensitive	13	13.2 ± 0.0	NB
P	<i>Pseudognaphalium macounii</i>	Macoun's Cudweed				S2	3 Sensitive	12	16.2 ± 0.0	NB
P	<i>Impatiens pallida</i>	Pale Jewelweed				S2	2 May Be At Risk	6	81.7 ± 0.0	NB
P	<i>Alnus serrulata</i>	Smooth Alder				S2	3 Sensitive	38	33.4 ± 0.0	NB
P	<i>Boechea stricta</i>	Drummond's Rockcress				S2	3 Sensitive	18	16.8 ± 0.0	NB
P	<i>Sagina nodosa</i>	Knotted Pearlwort				S2	3 Sensitive	4	84.0 ± 1.0	NB
P	<i>Sagina nodosa ssp. borealis</i>	Knotted Pearlwort				S2	3 Sensitive	1	86.5 ± 0.0	NB
P	<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	3 Sensitive	12	8.9 ± 10.0	NB
P	<i>Atriplex glabriuscula var. franktonii</i>	Frankton's Saltbush				S2	4 Secure	1	93.3 ± 1.0	NB
P	<i>Oxybasis rubra</i>	Red Goosefoot				S2	3 Sensitive	4	71.2 ± 1.0	NB
P	<i>Hypericum x dissimulatum</i>	Disguised St. John's-wort				S2	3 Sensitive	3	13.3 ± 0.0	NB
P	<i>Triosteum aurantiacum</i>	Orange-fruited Tinker's Weed				S2	3 Sensitive	180	20.8 ± 1.0	NB
P	<i>Viburnum lentago</i>	Nannyberry				S2	4 Secure	62	48.6 ± 0.0	NB
P	<i>Viburnum recognitum</i>	Northern Arrow-Wood				S2	4 Secure	123	60.2 ± 0.0	NB
P	<i>Astragalus eucosmus</i>	Elegant Milk-vetch				S2	2 May Be At Risk	11	20.3 ± 1.0	NB
P	<i>Oxytropis campestris var. johannensis</i>	Field Locoweed				S2	3 Sensitive	11	19.2 ± 0.0	NB
P	<i>Quercus macrocarpa</i>	Bur Oak				S2	2 May Be At Risk	67	7.4 ± 0.0	NB
P	<i>Gentiana linearis</i>	Narrow-Leaved Gentian				S2	3 Sensitive	17	9.6 ± 5.0	NB
P	<i>Myriophyllum humile</i>	Low Water Milfoil				S2	3 Sensitive	10	13.3 ± 1.0	NB
P	<i>Proserpinaca palustris</i>	Marsh Mermaidweed				S2	3 Sensitive	23	50.9 ± 0.0	NB
P	<i>Hedeoma pulegioides</i>	American False Pennyroyal				S2	4 Secure	15	29.4 ± 0.0	NB
P	<i>Nuphar x rubrodisca</i>	Red-disk Yellow Pond-lily				S2	3 Sensitive	15	9.7 ± 10.0	NB
P	<i>Aphyllon uniflorum</i>	One-flowered Broomrape				S2	3 Sensitive	15	35.2 ± 1.0	NB
P	<i>Polygaloides paucifolia</i>	Fringed Milkwort				S2	3 Sensitive	20	7.3 ± 1.0	NB
P	<i>Polygala senega</i>	Seneca Snakeroot				S2	3 Sensitive	34	32.6 ± 1.0	NB
P	<i>Persicaria amphibia var. emersa</i>	Long-root Smartweed				S2	3 Sensitive	42	6.8 ± 1.0	NB
P	<i>Persicaria careyi</i>	Carey's Smartweed				S2	3 Sensitive	17	8.8 ± 1.0	NB
P	<i>Podostemum ceratophyllum</i>	Horn-leaved Riverweed				S2	3 Sensitive	37	23.8 ± 0.0	NB
P	<i>Anemone multifida</i>	Cut-leaved Anemone				S2	3 Sensitive	5	21.7 ± 0.0	NB
P	<i>Hepatica americana</i>	Round-lobed Hepatica				S2	3 Sensitive	59	12.7 ± 0.0	NB
P	<i>Ranunculus flabellaris</i>	Yellow Water Buttercup				S2	4 Secure	20	7.5 ± 0.0	NB
P	<i>Crataegus scabrada</i>	Rough Hawthorn				S2	3 Sensitive	9	43.2 ± 1.0	NB
P	<i>Crataegus succulenta</i>	Fleshy Hawthorn				S2	3 Sensitive	1	9.9 ± 5.0	NB
P	<i>Rosa acicularis ssp. sayi</i>	Prickly Rose				S2	2 May Be At Risk	35	74.9 ± 0.0	NB
P	<i>Cephalanthus occidentalis</i>	Common Buttonbush				S2	3 Sensitive	57	28.4 ± 0.0	NB
P	<i>Galium kamschaticum</i>	Northern Wild Licorice				S2	3 Sensitive	2	70.6 ± 0.0	NB
P	<i>Salix candida</i>	Sage Willow				S2	3 Sensitive	12	32.2 ± 1.0	NB
P	<i>Castilleja septentrionalis</i>	Northeastern Paintbrush				S2	3 Sensitive	9	77.9 ± 0.0	NB
P	<i>Euphrasia randii</i>	Rand's Eyebright				S2	2 May Be At Risk	4	84.5 ± 0.0	NB
P	<i>Scrophularia lanceolata</i>	Lance-leaved Figwort				S2	3 Sensitive	12	17.2 ± 100.0	NB
P	<i>Dirca palustris</i>	Eastern Leatherwood				S2	2 May Be At Risk	51	16.3 ± 0.0	NB
P	<i>Phryma leptostachya</i>	American Lopseed				S2	3 Sensitive	77	22.0 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Verbena urticifolia</i>	White Vervain				S2	2 May Be At Risk	26	16.6 ± 1.0	NB
P	<i>Viola novae-angliae</i>	New England Violet				S2	3 Sensitive	7	60.1 ± 0.0	NB
P	<i>Symplocarpus foetidus</i>	Eastern Skunk Cabbage				S2	3 Sensitive	72	45.9 ± 0.0	NB
P	<i>Carex comosa</i>	Bearded Sedge				S2	2 May Be At Risk	6	94.5 ± 0.0	NB
P	<i>Carex granularis</i>	Limestone Meadow Sedge				S2	3 Sensitive	9	7.4 ± 0.0	NB
P	<i>Carex gynocrates</i>	Northern Bog Sedge				S2	3 Sensitive	40	74.5 ± 0.0	NB
P	<i>Carex hirtifolia</i>	Pubescent Sedge				S2	3 Sensitive	73	22.7 ± 0.0	NB
P	<i>Carex livida</i>	Livid Sedge				S2	3 Sensitive	7	75.3 ± 0.0	NB
P	<i>Carex plantaginea</i>	Plantain-Leaved Sedge				S2	3 Sensitive	136	21.2 ± 0.0	NB
P	<i>Carex prairea</i>	Prairie Sedge				S2	3 Sensitive	26	91.3 ± 0.0	NB
P	<i>Carex rostrata</i>	Narrow-leaved Beaked Sedge				S2	3 Sensitive	5	90.3 ± 0.0	NB
P	<i>Carex salina</i>	Saltmarsh Sedge				S2	3 Sensitive	2	80.7 ± 1.0	NB
P	<i>Carex sprengelii</i>	Longbeak Sedge				S2	3 Sensitive	51	16.6 ± 0.0	NB
P	<i>Carex tenuiflora</i>	Sparse-Flowered Sedge				S2	2 May Be At Risk	32	56.8 ± 0.0	NB
P	<i>Carex albicans</i>	White-tinged Sedge				S2	3 Sensitive	1	59.6 ± 1.0	NB
P	<i>Carex albicans</i> var. <i>emmonsii</i>	White-tinged Sedge				S2	3 Sensitive	6	39.1 ± 0.0	NB
P	<i>Cyperus squarrosus</i>	Awned Flatsedge				S2	3 Sensitive	36	5.1 ± 10.0	NB
P	<i>Eriophorum gracile</i>	Slender Cottongrass				S2	2 May Be At Risk	13	28.7 ± 0.0	NB
P	<i>Elodea nuttallii</i>	Nuttall's Waterweed				S2	3 Sensitive	7	4.2 ± 0.0	NB
P	<i>Juncus vaseyi</i>	Vasey Rush				S2	3 Sensitive	10	77.0 ± 0.0	NB
P	<i>Allium tricoccum</i>	Wild Leek				S2	2 May Be At Risk	26	21.6 ± 0.0	NB
P	<i>Najas gracillima</i>	Thread-Like Naiad				S2	3 Sensitive	11	25.1 ± 0.0	NB
P	<i>Galearis rotundifolia</i>	Small Round-leaved Orchid				S2	2 May Be At Risk	3	95.6 ± 0.0	NB
P	<i>Calypso bulbosa</i>	Calypso				S2	2 May Be At Risk	2	49.4 ± 0.0	NB
P	<i>Calypso bulbosa</i> var. <i>americana</i>	Calypso				S2	2 May Be At Risk	39	9.3 ± 1.0	NB
P	<i>Coeloglossum viride</i>	Long-bracted Frog Orchid				S2	2 May Be At Risk	8	7.9 ± 5.0	NB
P	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper				S2	2 May Be At Risk	11	14.6 ± 1.0	NB
P	<i>Galearis spectabilis</i>	Showy Orchis				S2	2 May Be At Risk	54	70.7 ± 0.0	NB
P	<i>Goodyera oblongifolia</i>	Menzies' Rattlesnake-plantain				S2	3 Sensitive	1	51.4 ± 0.0	NB
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses				S2	3 Sensitive	26	8.7 ± 50.0	NB
P	<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses				S2	2 May Be At Risk	3	35.6 ± 0.0	NB
P	<i>Agrostis mertensii</i>	Northern Bent Grass				S2	2 May Be At Risk	1	78.1 ± 0.0	NB
P	<i>Dichanthelium linearifolium</i>	Narrow-leaved Panic Grass				S2	3 Sensitive	14	22.8 ± 0.0	NB
P	<i>Elymus canadensis</i>	Canada Wild Rye				S2	2 May Be At Risk	19	7.5 ± 5.0	NB
P	<i>Leersia virginica</i>	White Cut Grass				S2	2 May Be At Risk	42	5.1 ± 1.0	NB
P	<i>Piptatheropsis canadensis</i>	Canada Ricegrass				S2	3 Sensitive	5	26.3 ± 0.0	NB
P	<i>Poa glauca</i>	Glaucous Blue Grass				S2	4 Secure	1	81.3 ± 2.0	NB
P	<i>Puccinellia phryganodes</i> ssp. <i>neoarctica</i>	Creeping Alkali Grass				S2	3 Sensitive	8	83.1 ± 0.0	NB
P	<i>Puccinellia nutkaensis</i>	Alaska Alkaligrass				S2	3 Sensitive	1	82.8 ± 1.0	NB
P	<i>Schizachyrium scoparium</i>	Little Bluestem				S2	3 Sensitive	56	9.3 ± 0.0	NB
P	<i>Zizania aquatica</i> var. <i>aquatica</i>	Eastern Wild Rice				S2	5 Undetermined	6	9.9 ± 5.0	NB
P	<i>Piptatheropsis pungens</i>	Slender Ricegrass				S2	2 May Be At Risk	5	78.0 ± 0.0	NB
P	<i>Potamogeton vaseyi</i>	Vasey's Pondweed				S2	3 Sensitive	11	32.2 ± 0.0	NB
P	<i>Asplenium trichomanes</i>	Maidenhair Spleenwort				S2	3 Sensitive	10	27.7 ± 0.0	NB
P	<i>Anchistea virginica</i>	Virginia chain fern				S2	3 Sensitive	19	9.9 ± 0.0	NB
P	<i>Woodsia alpina</i>	Alpine Cliff Fern				S2	3 Sensitive	5	70.6 ± 0.0	NB
P	<i>Selaginella selaginoides</i>	Low Spikemoss				S2	3 Sensitive	4	74.5 ± 6.0	NB
P	<i>Toxicodendron radicans</i> var. <i>radicans</i>	Eastern Poison Ivy				S2?	3 Sensitive	14	11.4 ± 1.0	NB
P	<i>Symphyotrichum novi-belgii</i> var. <i>crenifolium</i>	New York Aster				S2?	5 Undetermined	3	8.7 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Humulus lupulus</i> var. <i>lupuloides</i>	Common Hop				S2?	3 Sensitive	5	5.5 ± 0.0	NB
P	<i>Rubus x recurvicaulis</i>	arching dewberry				S2?	4 Secure	5	35.2 ± 1.0	NB
P	<i>Galium obtusum</i>	Blunt-leaved Bedstraw				S2?	4 Secure	6	20.1 ± 0.0	NB
P	<i>Salix myricoides</i>	Bayberry Willow				S2?	3 Sensitive	14	19.1 ± 0.0	NB
P	<i>Carex vacillans</i>	Estuarine Sedge				S2?	3 Sensitive	2	87.0 ± 1.0	NB
P	<i>Platanthera huronensis</i>	Fragrant Green Orchid				S2?	5 Undetermined	3	42.7 ± 0.0	NB
P	<i>Solidago altissima</i>	Tall Goldenrod				S2S3	4 Secure	46	10.4 ± 1.0	NB
P	<i>Callitriche hermaphroditica</i>	Northern Water-starwort				S2S3	4 Secure	7	42.1 ± 0.0	NB
P	<i>Lonicera oblongifolia</i>	Swamp Fly Honeysuckle				S2S3	3 Sensitive	131	65.6 ± 0.0	NB
P	<i>Elatine americana</i>	American Waterwort				S2S3	3 Sensitive	8	25.7 ± 0.0	NB
P	<i>Bartonia paniculata</i> ssp. <i>iodandra</i>	Branched Bartonia				S2S3	3 Sensitive	16	54.6 ± 0.0	NB
P	<i>Geranium robertianum</i>	Herb Robert				S2S3	4 Secure	20	67.3 ± 1.0	NB
P	<i>Myriophyllum quitense</i>	Andean Water Milfoil				S2S3	4 Secure	71	58.4 ± 0.0	NB
P	<i>Epilobium coloratum</i>	Purple-veined Willowherb				S2S3	3 Sensitive	10	8.8 ± 1.0	NB
P	<i>Rumex pallidus</i>	Seabeach Dock				S2S3	3 Sensitive	4	38.3 ± 1.0	NB
P	<i>Rumex occidentalis</i>	Western Dock				S2S3	2 May Be At Risk	1	6.1 ± 1.0	NB
P	<i>Amelanchier gaspensis</i>	Gasp Serviceberry				S2S3	5 Undetermined	1	84.0 ± 0.0	NB
P	<i>Rubus pensilvanicus</i>	Pennsylvania Blackberry				S2S3	4 Secure	13	7.0 ± 0.0	NB
P	<i>Galium labradoricum</i>	Labrador Bedstraw				S2S3	3 Sensitive	92	33.8 ± 0.0	NB
P	<i>Valeriana uliginosa</i>	Swamp Valerian				S2S3	3 Sensitive	45	65.5 ± 0.0	NB
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	4 Secure	6	26.1 ± 6.0	NB
P	<i>Juncus brachycephalus</i>	Small-Head Rush				S2S3	3 Sensitive	6	71.8 ± 0.0	NB
P	<i>Corallorhiza maculata</i> var. <i>occidentalis</i>	Spotted Coralroot				S2S3	3 Sensitive	11	9.3 ± 1.0	NB
P	<i>Corallorhiza maculata</i> var. <i>maculata</i>	Spotted Coralroot				S2S3	3 Sensitive	4	7.2 ± 1.0	NB
P	<i>Neottia auriculata</i>	Auricled Twayblade				S2S3	3 Sensitive	9	20.0 ± 0.0	NB
P	<i>Spiranthes cernua</i>	Nodding Ladies'-Tresses				S2S3	3 Sensitive	16	7.0 ± 0.0	NB
P	<i>Eragrostis pectinacea</i>	Tufted Love Grass				S2S3	4 Secure	14	6.8 ± 0.0	NB
P	<i>Stuckenia filiformis</i>	Thread-leaved Pondweed				S2S3	3 Sensitive	9	75.5 ± 0.0	NB
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S2S3	4 Secure	20	59.7 ± 0.0	NB
P	<i>Isoetes tuckermanii</i> ssp. <i>acadiensis</i>	Acadian Quillwort				S2S3	3 Sensitive	10	22.1 ± 1.0	NB
P	<i>Botrychium tenebrosum</i>	Swamp Moonwort				S2S3	3 Sensitive	1	82.3 ± 0.0	NB
P	<i>Ophioglossum pusillum</i>	Northern Adder's-tongue				S2S3	3 Sensitive	11	31.7 ± 1.0	NB
P	<i>Panax trifolius</i>	Dwarf Ginseng				S3	3 Sensitive	15	11.4 ± 1.0	NB
P	<i>Arnica lanceolata</i>	Lance-leaved Arnica				S3	4 Secure	27	38.5 ± 0.0	NB
P	<i>Artemisia campestris</i> ssp. <i>caudata</i>	Tall Wormwood				S3	4 Secure	102	16.6 ± 1.0	NB
P	<i>Artemisia campestris</i>	Field Wormwood				S3	4 Secure	9	32.7 ± 0.0	NB
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane				S3	4 Secure	25	39.0 ± 0.0	NB
P	<i>Nabalus racemosus</i>	Glaucous Rattlesnakeroot				S3	4 Secure	71	9.0 ± 100.0	NB
P	<i>Tanacetum bipinnatum</i> ssp. <i>huronense</i>	Lake Huron Tansy				S3	4 Secure	35	16.3 ± 5.0	NB
P	<i>Symphyotrichum boreale</i>	Boreal Aster				S3	3 Sensitive	148	21.5 ± 10.0	NB
P	<i>Betula pumila</i>	Bog Birch				S3	4 Secure	36	12.3 ± 0.0	NB
P	<i>Turritis glabra</i>	Tower Mustard				S3	5 Undetermined	13	65.4 ± 0.0	NB
P	<i>Arabis pycnocarpa</i>	Cream-flowered Rockcress				S3	4 Secure	23	16.6 ± 0.0	NB
P	<i>Cardamine maxima</i>	Large Toothwort				S3	4 Secure	126	9.3 ± 0.0	NB
P	<i>Subularia aquatica</i> ssp. <i>americana</i>	American Water Awlwort				S3	4 Secure	18	36.7 ± 0.0	NB
P	<i>Lobelia cardinalis</i>	Cardinal Flower				S3	4 Secure	337	23.8 ± 0.0	NB
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort				S3	4 Secure	6	82.0 ± 0.0	NB
P	<i>Ceratophyllum echinatum</i>	Prickly Hornwort				S3	3 Sensitive	18	10.1 ± 0.0	NB
P	<i>Hudsonia tomentosa</i>	Woolly Beach-heath				S3	4 Secure	3	65.4 ± 0.0	NB
P	<i>Cornus obliqua</i>	Silky Dogwood				S3	3 Sensitive	188	33.5 ± 0.0	NB



Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Crassula aquatica</i>	Water Pygmyweed			S3	4 Secure	4 Secure	3	25.9 ± 1.0	NB
P	<i>Rhodiola rosea</i>	Roseroot			S3	4 Secure	4 Secure	26	68.0 ± 5.0	NB
P	<i>Penthorum sedoides</i>	Ditch Stonecrop			S3	4 Secure	4 Secure	71	4.7 ± 0.0	NB
P	<i>Elatine minima</i>	Small Waterwort			S3	4 Secure	4 Secure	56	36.9 ± 0.0	NB
P	<i>Astragalus alpinus var. brunetianus</i>	Alpine Milk-Vetch			S3	4 Secure	4 Secure	13	18.3 ± 0.0	NB
P	<i>Hedysarum americanum</i>	Alpine Hedysarum			S3	4 Secure	4 Secure	35	76.0 ± 0.0	NB
P	<i>Gentianella amarella ssp. acuta</i>	Northern Gentian			S3	4 Secure	4 Secure	12	51.8 ± 0.0	NB
P	<i>Geranium bicknellii</i>	Bicknell's Crane's-bill			S3	4 Secure	4 Secure	18	24.3 ± 5.0	NB
P	<i>Myriophyllum farwellii</i>	Farwell's Water Milfoil			S3	4 Secure	4 Secure	22	26.5 ± 5.0	NB
P	<i>Myriophyllum heterophyllum</i>	Variable-leaved Water Milfoil			S3	4 Secure	4 Secure	51	22.2 ± 0.0	NB
P	<i>Myriophyllum verticillatum</i>	Whorled Water Milfoil			S3	4 Secure	4 Secure	23	8.0 ± 1.0	NB
P	<i>Stachys hispida</i>	Smooth Hedge-Nettle			S3	3 Sensitive	3 Sensitive	14	15.9 ± 0.0	NB
P	<i>Utricularia radiata</i>	Little Floating Bladderwort			S3	4 Secure	4 Secure	54	48.0 ± 0.0	NB
P	<i>Nuphar microphylla</i>	Small Yellow Pond-lily			S3	4 Secure	4 Secure	23	10.6 ± 0.0	NB
P	<i>Epilobium hornemannii</i>	Hornemann's Willowherb			S3	4 Secure	4 Secure	4	76.2 ± 1.0	NB
P	<i>Epilobium strictum</i>	Downy Willowherb			S3	4 Secure	4 Secure	54	24.5 ± 1.0	NB
P	<i>Polygala sanguinea</i>	Blood Milkwort			S3	3 Sensitive	3 Sensitive	49	7.3 ± 0.0	NB
P	<i>Persicaria arifolia</i>	Halberd-leaved Tearthumb			S3	4 Secure	4 Secure	28	27.4 ± 0.0	NB
P	<i>Persicaria punctata</i>	Dotted Smartweed			S3	4 Secure	4 Secure	13	9.9 ± 5.0	NB
P	<i>Fallopia scandens</i>	Climbing False Buckwheat			S3	4 Secure	4 Secure	42	5.9 ± 1.0	NB
P	<i>Littorella americana</i>	American Shoreweed			S3	4 Secure	4 Secure	30	26.9 ± 0.0	NB
P	<i>Primula mistassinica</i>	Mistassini Primrose			S3	4 Secure	4 Secure	21	22.1 ± 1.0	NB
P	<i>Pyrola minor</i>	Lesser Pyrola			S3	4 Secure	4 Secure	2	75.4 ± 0.0	NB
P	<i>Clematis occidentalis</i>	Purple Clematis			S3	4 Secure	4 Secure	32	11.6 ± 0.0	NB
P	<i>Ranunculus gmelinii</i>	Gmelin's Water Buttercup			S3	4 Secure	4 Secure	31	7.2 ± 0.0	NB
P	<i>Thalictrum confine</i>	Northern Meadow-rue			S3	4 Secure	4 Secure	97	4.8 ± 0.0	NB
P	<i>Amelanchier canadensis</i>	Canada Serviceberry			S3	4 Secure	4 Secure	17	7.1 ± 1.0	NB
P	<i>Rosa palustris</i>	Swamp Rose			S3	4 Secure	4 Secure	49	33.0 ± 0.0	NB
P	<i>Rubus occidentalis</i>	Black Raspberry			S3	4 Secure	4 Secure	138	19.7 ± 0.0	NB
P	<i>Galium boreale</i>	Northern Bedstraw			S3	4 Secure	4 Secure	9	16.7 ± 0.0	NB
P	<i>Salix nigra</i>	Black Willow			S3	3 Sensitive	3 Sensitive	126	7.4 ± 5.0	NB
P	<i>Salix pedicellaris</i>	Bog Willow			S3	4 Secure	4 Secure	68	13.1 ± 1.0	NB
P	<i>Salix interior</i>	Sandbar Willow			S3	4 Secure	4 Secure	35	6.7 ± 0.0	NB
P	<i>Comandra umbellata</i>	Bastard's Toadflax			S3	4 Secure	4 Secure	1	41.9 ± 10.0	NB
P	<i>Parnassia glauca</i>	Fen Grass-of-Parnassus			S3	4 Secure	4 Secure	12	25.3 ± 10.0	NB
P	<i>Limosella australis</i>	Southern Mudwort			S3	4 Secure	4 Secure	1	93.6 ± 5.0	NB
P	<i>Boehmeria cylindrica</i>	Small-spike False-nettle			S3	3 Sensitive	3 Sensitive	123	18.0 ± 0.0	NB
P	<i>Pilea pumila</i>	Dwarf Clearweed			S3	4 Secure	4 Secure	63	8.9 ± 1.0	NB
P	<i>Viola adunca</i>	Hooked Violet			S3	4 Secure	4 Secure	14	50.4 ± 1.0	NB
P	<i>Viola nephrophylla</i>	Northern Bog Violet			S3	4 Secure	4 Secure	74	19.9 ± 0.0	NB
P	<i>Carex arcta</i>	Northern Clustered Sedge			S3	4 Secure	4 Secure	57	7.8 ± 0.0	NB
P	<i>Carex capillaris</i>	Hairlike Sedge			S3	4 Secure	4 Secure	12	75.4 ± 0.0	NB
P	<i>Carex chordorrhiza</i>	Creeping Sedge			S3	4 Secure	4 Secure	83	14.5 ± 0.0	NB
P	<i>Carex conoidea</i>	Field Sedge			S3	4 Secure	4 Secure	24	24.5 ± 1.0	NB
P	<i>Carex eburnea</i>	Bristle-leaved Sedge			S3	4 Secure	4 Secure	9	59.6 ± 1.0	NB
P	<i>Carex exilis</i>	Coastal Sedge			S3	4 Secure	4 Secure	128	41.7 ± 0.0	NB
P	<i>Carex garberi</i>	Garber's Sedge			S3	3 Sensitive	3 Sensitive	14	35.2 ± 1.0	NB
P	<i>Carex haydenii</i>	Hayden's Sedge			S3	4 Secure	4 Secure	51	10.2 ± 1.0	NB
P	<i>Carex lupulina</i>	Hop Sedge			S3	4 Secure	4 Secure	111	8.2 ± 1.0	NB
P	<i>Carex michauxiana</i>	Michaux's Sedge			S3	4 Secure	4 Secure	61	51.9 ± 0.0	NB
P	<i>Carex ormostachya</i>	Necklace Spike Sedge			S3	4 Secure	4 Secure	26	16.8 ± 0.0	NB
P	<i>Carex rosea</i>	Rosy Sedge			S3	4 Secure	4 Secure	256	16.4 ± 0.0	NB
P	<i>Carex tenera</i>	Tender Sedge			S3	4 Secure	4 Secure	55	7.4 ± 0.0	NB
P	<i>Carex tuckermanii</i>	Tuckerman's Sedge			S3	4 Secure	4 Secure	85	7.4 ± 0.0	NB
P	<i>Carex vaginata</i>	Sheathed Sedge			S3	3 Sensitive	3 Sensitive	17	64.2 ± 0.0	NB
P	<i>Carex wiegandii</i>	Wiegand's Sedge			S3	4 Secure	4 Secure	66	16.8 ± 0.0	NB

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P	<i>Carex recta</i>	Estuary Sedge				S3	4 Secure	5	36.3 ± 0.0	NB
P	<i>Carex atratiformis</i>	Scabrous Black Sedge				S3	4 Secure	4	79.4 ± 0.0	NB
P	<i>Cyperus dentatus</i>	Toothed Flatsedge				S3	4 Secure	191	13.2 ± 1.0	NB
P	<i>Cyperus esculentus</i>	Perennial Yellow Nutsedge				S3	4 Secure	11	27.3 ± 0.0	NB
P	<i>Cyperus esculentus var. leptostachyus</i>	Perennial Yellow Nutsedge				S3	4 Secure	48	9.3 ± 5.0	NB
P	<i>Eleocharis intermedia</i>	Matted Spikerush				S3	4 Secure	7	19.3 ± 0.0	NB
P	<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush				S3	4 Secure	31	18.1 ± 0.0	NB
P	<i>Rhynchospora capitellata</i>	Small-headed Beakrush				S3	4 Secure	53	23.8 ± 0.0	NB
P	<i>Rhynchospora fusca</i>	Brown Beakrush				S3	4 Secure	42	30.9 ± 1.0	NB
P	<i>Trichophorum clintonii</i>	Clinton's Clubrush				S3	4 Secure	95	48.9 ± 1.0	NB
P	<i>Bolboschoenus fluviatilis</i>	River Bulrush				S3	3 Sensitive	58	14.1 ± 0.0	NB
P	<i>Schoenoplectus torreyi</i>	Torrey's Bulrush				S3	4 Secure	34	20.8 ± 0.0	NB
P	<i>Lemna trisulca</i>	Star Duckweed				S3	4 Secure	22	44.1 ± 0.0	NB
P	<i>Triantha glutinosa</i>	Sticky False-Asphodel				S3	4 Secure	88	19.7 ± 0.0	NB
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S3	3 Sensitive	111	65.5 ± 0.0	NB
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3	4 Secure	24	1.9 ± 0.0	NB
P	<i>Platanthera blephariglottis</i>	White Fringed Orchid				S3	4 Secure	66	6.9 ± 1.0	NB
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	3 Sensitive	54	25.1 ± 1.0	NB
P	<i>Bromus latiglumis</i>	Broad-Grummed Brome				S3	3 Sensitive	17	21.5 ± 0.0	NB
P	<i>Calamagrostis pickeringii</i>	Pickering's Reed Grass				S3	4 Secure	106	54.4 ± 0.0	NB
P	<i>Dichanthelium depauperatum</i>	Starved Panic Grass				S3	4 Secure	27	31.6 ± 0.0	NB
P	<i>Dichanthelium depauperatum var. 1</i>	Starved Panic Grass				S3	4 Secure	1	49.2 ± 0.0	NB
P	<i>Muhlenbergia richardsonis</i>	Mat Muhly				S3	4 Secure	27	19.2 ± 0.0	NB
P	<i>Heteranthera dubia</i>	Water Stargrass				S3	4 Secure	62	8.1 ± 0.0	NB
P	<i>Potamogeton obtusifolius</i>	Blunt-leaved Pondweed				S3	4 Secure	35	40.6 ± 1.0	NB
P	<i>Potamogeton richardsonii</i>	Richardson's Pondweed				S3	3 Sensitive	17	9.6 ± 5.0	NB
P	<i>Xyris montana</i>	Northern Yellow-Eyed-Grass				S3	4 Secure	26	52.4 ± 0.0	NB
P	<i>Zannichellia palustris</i>	Horned Pondweed				S3	4 Secure	5	69.0 ± 0.0	NB
P	<i>Adiantum pedatum</i>	Northern Maidenhair Fern				S3	4 Secure	336	15.5 ± 0.0	NB
P	<i>Cryptogramma stelleri</i>	Steller's Rockbrake				S3	4 Secure	1	81.0 ± 1.0	NB
P	<i>Asplenium viride</i>	Green Spleenwort				S3	4 Secure	15	59.1 ± 0.0	NB
P	<i>Dryopteris fragrans</i>	Fragrant Wood Fern				S3	4 Secure	19	34.8 ± 0.0	NB
P	<i>Dryopteris goldiana</i>	Goldie's Woodfern				S3	3 Sensitive	210	21.4 ± 5.0	NB
P	<i>Woodsia glabella</i>	Smooth Cliff Fern				S3	4 Secure	1	95.1 ± 1.0	NB
P	<i>Equisetum palustre</i>	Marsh Horsetail				S3	4 Secure	9	5.6 ± 10.0	NB
P	<i>Isoetes tuckermanii ssp. tuckermanii</i>	Tuckerman's Quillwort				S3	4 Secure	20	33.0 ± 0.0	NB
P	<i>Diphasiastrum x sabinifolium</i>	Savin-leaved Ground-cedar				S3	4 Secure	12	24.3 ± 10.0	NB
P	<i>Huperzia appressa</i>	Mountain Firmoss				S3	3 Sensitive	2	78.3 ± 1.0	NB
P	<i>Sceptridium dissectum</i>	Dissected Moonwort				S3	4 Secure	50	7.9 ± 0.0	NB
P	<i>Botrychium lanceolatum</i>	Triangle Moonwort				S3	3 Sensitive	1	80.5 ± 0.0	NB
P	<i>Botrychium lanceolatum ssp. angustisegmentum</i>	Narrow Triangle Moonwort				S3	3 Sensitive	22	9.9 ± 5.0	NB
P	<i>Botrychium simplex</i>	Least Moonwort				S3	4 Secure	14	12.8 ± 0.0	NB
P	<i>Polypodium appalachianum</i>	Appalachian Polypody				S3	4 Secure	46	7.2 ± 10.0	NB
P	<i>Utricularia resupinata</i>	Inverted Bladderwort				S3?	4 Secure	16	41.7 ± 0.0	NB
P	<i>Crataegus submollis</i>	Quebec Hawthorn				S3?	3 Sensitive	19	10.2 ± 1.0	NB
P	<i>Mertensia maritima</i>	Sea Lungwort				S3S4	4 Secure	16	80.6 ± 1.0	NB
P	<i>Lobelia kalmii</i>	Brook Lobelia				S3S4	4 Secure	49	9.9 ± 1.0	NB
P	<i>Suaeda calceoliformis</i>	Horned Sea-blite				S3S4	4 Secure	3	8.5 ± 0.0	NB
P	<i>Myriophyllum sibiricum</i>	Siberian Water Milfoil				S3S4	4 Secure	32	33.6 ± 0.0	NB
P	<i>Stachys pilosa</i>	Hairy Hedge-Nettle				S3S4	5 Undetermined	6	19.1 ± 0.0	NB
P	<i>Utricularia gibba</i>	Humped Bladderwort				S3S4	4 Secure	41	23.2 ± 0.0	NB
P	<i>Drymocallis arguta</i>	Tall Wood Beauty				S3S4	4 Secure	51	9.3 ± 1.0	NB
P	<i>Rubus chamaemorus</i>	Cloudberry				S3S4	4 Secure	79	73.9 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	<i>Geocaulon lividum</i>	Northern Comandra				S3S4	4 Secure	12	78.6 ± 0.0	NB
P	<i>Juniperus horizontalis</i>	Creeping Juniper				S3S4	4 Secure	2	82.8 ± 1.0	NB
P	<i>Cladium mariscoides</i>	Smooth Twigrush				S3S4	4 Secure	88	31.2 ± 0.0	NB
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	4 Secure	12	29.7 ± 2.0	NB
P	<i>Triglochin gaspensis</i>	Gasp  ← Arrowgrass				S3S4	4 Secure	11	82.0 ± 0.0	NB
P	<i>Spirodela polyrhiza</i>	great duckweed				S3S4	4 Secure	40	2.7 ± 1.0	NB
P	<i>Corallorhiza maculata</i>	Spotted Coralroot				S3S4	3 Sensitive	17	27.7 ± 0.0	NB
P	<i>Calamagrostis stricta</i>	Slim-stemmed Reed Grass				S3S4	4 Secure	3	61.0 ± 0.0	NB
P	<i>Distichlis spicata</i>	Salt Grass				S3S4	4 Secure	3	91.6 ± 1.0	NB
P	<i>Potamogeton oakesianus</i>	Oakes' Pondweed				S3S4	4 Secure	35	7.4 ± 0.0	NB
P	<i>Solidago caesia</i>	Blue-stemmed Goldenrod				SX	0.1 Extirpated	2	81.1 ± 1.0	NB
P	<i>Solidago ptarmicoides</i>	Upland White Goldenrod				SX	0.1 Extirpated	3	81.0 ± 1.0	NB
P	<i>Celastrus scandens</i>	Climbing Bittersweet				SX	0.1 Extirpated	4	22.3 ± 1.0	NB

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The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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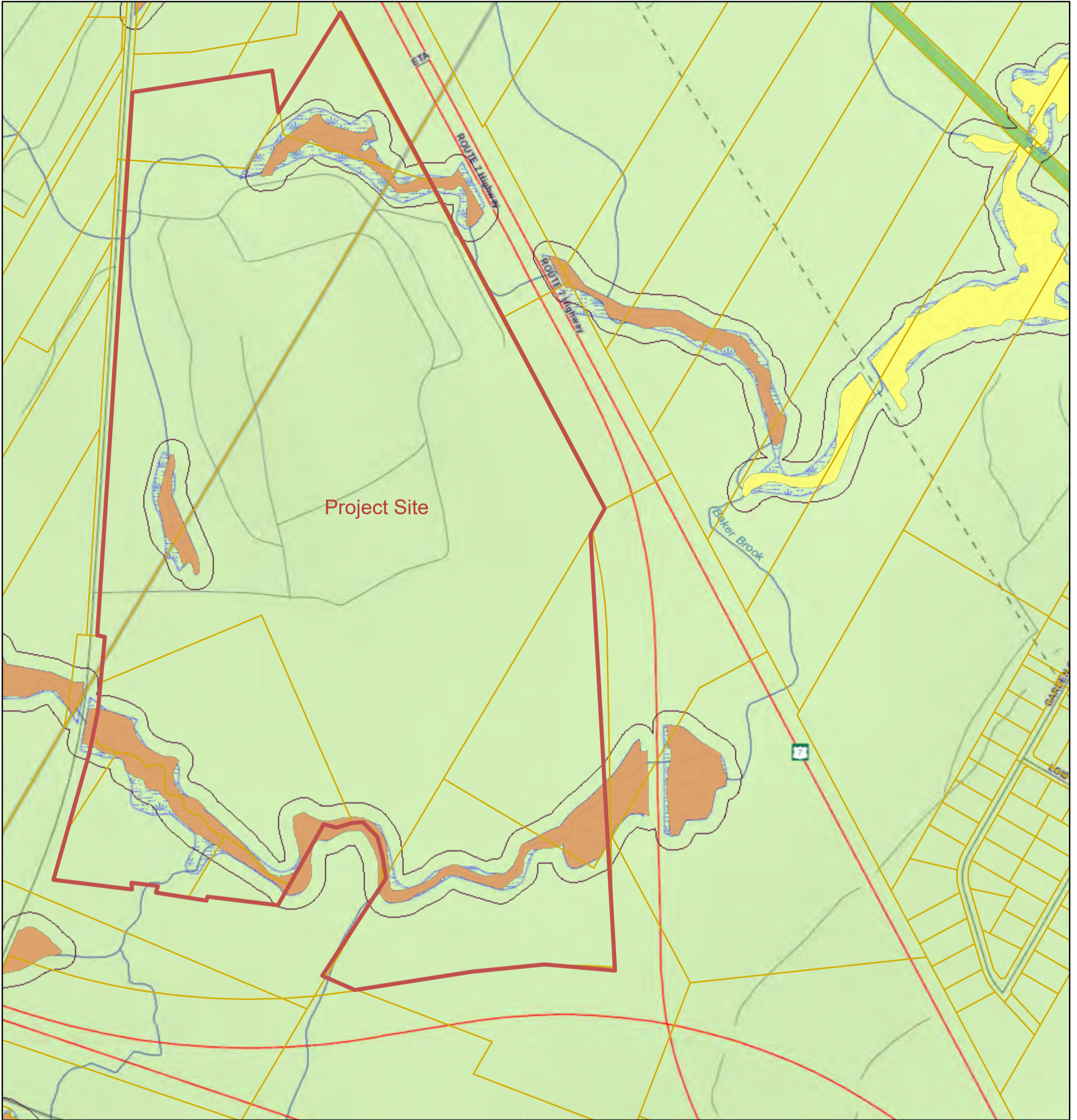
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# ArcGIS Web Map



9/17/2020, 10:31:46 AM

- Override 1
- Property
- 2
- 1
- 30 meters
- Water Bodies
- Water Courses

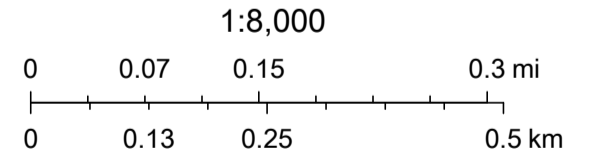




TABLE E2: SPECIES HABITAT COMPARISON			
Common Name	Scientific Name	Preferred Habitat	Habitat Present
<b>Fauna</b>			
Acadian Hairstreak	<i>Satyrium acadica</i>	Willow-lined streams, marshes, moist woodlands (1).	
American Golden-Plover	<i>Pluvialis dominica</i>	Breeds on Arctic tundra, especially in low vegetation on rocky slopes. On migration found in prairie, pastures, tilled farmland, golf courses, airports, mudflats, shorelines, and beaches (2).	
Aphrodite Fritillary	<i>Speyeria aphrodite</i>	Moist prairies, high mountain meadows, openings in barrens, brushland, dry fields, open oak woods, bogs (1).	
Baltimore Oriole	<i>Icterus galbula</i>	Breeding ground often high in leafy deciduous trees, but not in deep forests; they prefer open woodland, forest edge, river banks, and small groves of trees. Well adapted to human settlements of parks, orchards, and backyards (2).	
Banded Hairstreak	<i>Satyrium calanus</i>	Forest areas and neighboring open edges and fields, perched on low shrubs and tree branches (1).	
Bank Swallow	<i>Riparia riparia</i>	The Bank Swallow breeds in a wide variety of natural and artificial sites with vertical banks, including riverbanks, lake and ocean bluffs, aggregate pits, road cuts, and stock piles of soil. Sand-silt substrates are preferred for excavating nest burrows. Breeding sites tend to be somewhat ephemeral due to the dynamic nature of bank erosion. Breeding sites are often situated near open terrestrial habitat used for aerial foraging (e.g., grasslands, meadows, pastures, and agricultural cropland). Large wetlands are used as communal nocturnal roost sites during post-breeding, migration, and wintering periods (3).	
Barn Swallow	<i>Hirundo rustica</i>	Before European colonization, Barn Swallows nested mostly in caves, holes, crevices and ledges in cliff faces. Following European settlement, they shifted largely to nesting in and on artificial structures, including barns and other outbuildings, garages, houses, bridges, and road culverts. Barn Swallows prefer various types of open habitats for foraging, including grassy fields, pastures, various kinds of agricultural crops, lake and river shorelines, cleared rights-of-way, cottage areas and farmyards, islands, wetlands, and subarctic tundra (3).	
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	Found in woodlands and thickets that contain aspen, poplar, birch, sugar maple, hickory, hawthorn, and willow. More likely to be seen in deciduous stands opposed to coniferous (2).	
Bobolink	<i>Dolichonyx oryzivorus</i>	Prefer to nest in tall grass, but also tend to nest in forage crops such as hayfields and pastures. Also found in small grain fields, restored surface mining sites and irrigated fields (3).	
Brown-headed Cowbird	<i>Molothrus ater</i>	This species can be found in grasslands with lowland and scattered trees and woodland edges, brushy thickets, fields, pastures, orchards, and residential areas. These birds avoid forests (2).	
Canada Warbler	<i>Wilsonia canadensis</i>	The Canada Warbler is found in a variety of forest types, but it is most abundant in wet, mixed deciduous-coniferous forest with a well-developed shrub layer. It is also found in riparian shrub forests on slopes and in ravines and in old-growth forests with canopy openings and a high density of shrubs, as well as in stands regenerating after natural disturbances, such as forest fires, or anthropogenic disturbances, such as logging (3).	
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	They nest on buildings, bridges and other man-made structures. Live in grasslands, towns, broken forest and river edges. Forage near a water source and open fields or pastures (2).	
Cobra Clubtail	<i>Gomphus vastus</i>	Common throughout eastern United States and southeastern Canada, cobra clubtails can be found at large rivers with average to fast currents, and lake shores where there are alternating stretches of sand and gravel, and sometimes large streams (4).	
Common Nighthawk	<i>Chordeiles minor</i>	The Common Nighthawk nests in a wide range of open, vegetation-free habitats, including dunes, beaches, recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, pastures, peat bogs, marshes, lakeshores, and river banks. This species also inhabits mixed and coniferous forests (3).	
Compton Tortoiseshell	<i>Nymphalis l-album</i>	Upland deciduous or coniferous forests (1).	
Eastern Kingbird	<i>Tyrannus tyrannus</i>	The Eastern Kingbird usually breeds in fields with scattered shrubs and trees, in orchards, and along forest edges. It may also breed in desert riparian habitats, quaking aspen groves, parks, newly burned forest, beaver ponds, golf courses, and urban environments with tall trees and scattered open spaces (2).	
Eastern Tailed Blue	<i>Cupido comyntas</i>	Many open, sunny places including weedy areas and disturbed habitats (1).	
Eastern Whip-Poor-Will	<i>Antrostomus vociferus</i>	Found in both purely deciduous and mixed deciduous-pine forests with open understories, often in areas with sandy soil (2).	
Eastern Wood-Pewee	<i>Contopus virens</i>	Usually found in clearings and forest edges—including mature woodlands, urban shade trees, roadsides, woodlots, and orchards. They prefer deciduous forest but also live in open pine woodlands (2).	
Glaucous Gull	<i>Larus hyperboreus</i>	Glaucous Gulls nest on sea cliffs and coastlines, often near colonies of other birds such as Northern Fulmars, auks, waterfowl, or other gulls. During the nesting season, they forage along coastlines, in open water, and around sea ice and icebergs (2).	
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	Great Crested Flycatchers prefer breeding territories in open broadleaf or mixed woodlands and at the edges of clearings rather than in dense forests. They favor edge habitats in second-growth forests, wooded hedgerows, isolated woody patches, and selectively cut forests over continuous, closed-canopy forests. Dead snags and dying trees are important sources of the cavities they need for nesting (2).	
Green Heron	<i>Butorides virescens</i>	Green Herons are common breeders in coastal and inland wetlands. They nest along swamps, marshes, lakes, ponds, impoundments, and other wet habitats with trees and shrubs to provide secluded nest sites (2).	
Greenish Blue	<i>Plebejus saepiolus</i>	Bogs, roadsides, stream edges, open fields, meadows, open forests (1).	
Henry's Elfyn	<i>Callophrys henrici</i>	Edges and openings in barrens and near pine or pine-oak woodland (1).	
Hoary Elfyn	<i>Callophrys polios</i>	Open sunny glades in barrens, rocky ridges, dunes, forest edges, adjacent to bogs (1).	
Horned Lark	<i>Eremophila alpestris</i>	Common habitats include prairies, deserts, tundra, beaches, dunes, and heavily grazed pastures. Horned Larks frequent areas cleared by humans, such as plowed fields and mowed expanses around airstrips, preferring bare, dry ground with short, sparse vegetation (2).	
Indian Skipper	<i>Hesperia sassacus</i>	Old brushy fields, pastures, clearings, headlands (1).	
Indigo Bunting	<i>Passerina cyanea</i>	Indigo Buntings breed in brushy and weedy areas. They're common on the edges of woods and fields; along roads, streams, rivers, and powerline cuts; in logged forest plots, brushy canyons, and abandoned fields where shrubby growth is returning (2).	

TABLE E2: SPECIES HABITAT COMPARISON			
Common Name	Scientific Name	Preferred Habitat	Habitat Present
Killdeer	<i>Charadrius vociferus</i>	Prefer open areas like sandbars, mudflats, and grazed fields. They live in lawns, driveways, sports fields and golf courses (2).	
Lapland Longspur	<i>Calcarius lapponicus</i>	Lapland Longspurs occur exclusively in open, treeless habitats. On their breeding grounds they are found in arctic tundra as well as in high-elevation alpine tundra in the mountain ranges of Alaska. The rest of the year they can be found in any open habitat with short grass or bare ground (2).	
Meadow Frillary	<i>Boloria bellona</i>	Usually wet places marshes, wet aspen groves (1).	
Monarch	<i>Danaus plexippus</i>	Prefer open habitats such as fields, meadows, weedy areas, marshes and roadsides (1).	
Northern Mockingbird	<i>Mimus polyglottos</i>	Can be found in areas with open ground as well as with shrubby vegetation such as hedges, fruiting bushes and thickets. While foraging, they prefer grassy areas (2).	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallows forage in open areas often near water (2).	
Northern Shoveler	<i>Anas clypeata</i>	They breed in shallow, open wetlands and winter in both freshwater and saline marshes (2).	
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Olive-sided Flycatchers breed mostly in the boreal forest and in western coniferous forests. They use openings or edges in the forest and are rarely found in deep, closed forest. Prefer meadows, rivers and streams, partially logged areas, recent burns, beaver ponds, bogs, and muskegs with dead or dying trees (2).	
Purple Martin	<i>Progne subis</i>	Purple Martins forage over towns, cities, parks, open fields, dunes, streams, wet meadows, beaver ponds, and other open areas. In eastern North America they used to breed along forest edges and rivers, where dead snags offered woodpecker holes to nest in. But since humans began supplying nest boxes for them, Eastern Martins have become urbanites, living almost exclusively near cities and towns (2).	
Satyr Comma	<i>Polygonia satyrus</i>	Valley bottoms, along streams, wooded prairie ravines, marshes, openings in riparian woods, fields and edges near moist woods (1).	
Solitary Sandpiper	<i>Tringa solitaria</i>	Solitary Sandpipers nest by freshwater lakes, ponds, and creeks in areas of muskeg bogs and spruce trees. They also appear in ditches, stagnant pools, cow pastures, rain pools, freshwater swamps, flooded sod farms or sports fields, bogs, rice fields, and even in wooded wetlands at higher elevations (2).	
Spotted Sandpiper	<i>Actitis macularius</i>	Pebbly lake shores, ponds, streambanks; in winter, also seashores. Breeds near the edge of fresh water in a wide variety of settings, including lakes, ponds, rivers, streams, in either open or wooded country. In migration and winter also found along coast on mudflats, beaches, breakwaters; also on such inland habitats as sewage ponds, irrigation ditches (5).	
Striped Hairstreak	<i>Satyrium liparops</i>	Deciduous forest openings and edges, prairie streambanks, shaded swamps, acid barrens, prairie copses (1).	
Tidewater Mucket	<i>Leptodea ochracea</i>	Found in New Brunswick waterbodies including the St. John River, Canaan River, Jemseg River, Aulac River, and Grand Lake (6).	
Two-spotted Skipper	<i>Euphyes bimaculata</i>	Marshes, bogs, wet streambanks, and wet sedge meadows (1).	
Virginia Rail	<i>Rallus limicola</i>	Virginia Rails occupy shallow freshwater wetlands with tall stands of cattails and rushes. They need areas with standing water typically less than 6 inches deep with a muddy bottom (2).	
Warbling Vireo	<i>Vireo gilvus</i>	During breeding season, Warbling Vireos occur in mature deciduous woodlands from sea level to an elevation of about 10,500 feet—especially along streams, ponds, marshes, and lakes, but sometimes in upland areas away from water (2).	
Willow Flycatcher	<i>Empidonax traillii</i>	Occupy areas with willows or other shrubs near standing or running water. They may also breed in drier scrubby areas. They winter in shrubby clearings, pastures and woodland edges near water (2).	
Wilson's Phalarope	<i>Phalaropus tricolor</i>	Breed in wetlands, upland shrubby areas, marshes and roadside ditches. During migration, they may stop at saline lakes in western North America, and coastal marshes and sewage ponds. They winter in high Andean salt lakes and wetlands in South America (2).	
Wilson's Snipe	<i>Gallinago delicata</i>	Wilson's Snipes can be found in all types of wet, marshy settings, including bogs, fens, alder and willow swamps, wet meadows, and along rivers and ponds. They avoid areas with tall, dense vegetation, but need patches of cover to hide in and to provide a safe lookout for predators (2).	
Wood Thrush	<i>Hylocichla mustelina</i>	Wood Thrushes breed throughout mature deciduous and mixed forests in eastern North America, most commonly those with American beech, sweet gum, red maple, black gum, eastern hemlock, flowering dogwood, American hornbeam, oaks, or pines. They nest somewhat less successfully in fragmented forests and even suburban parks where there are enough large trees for a territory (2).	
Yellow Lampmussel	<i>Lampsilis cariosa</i>	This species is typically found in faster flowing sections of larger rivers, especially on sand and gravel bottoms in riffles (3).	
<b>Location Sensitive Species</b>			
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Nest in forests located next to large water bodies and avoid heavily developed areas when possible. May forage around fish processing plants, landfills, and below dams. Perch in tall deciduous or coniferous trees that allow them to view their surroundings (2).	
-	<i>Bat Hibernaculum</i>	A bat hibernaculum is a site where bats hibernate over winter. Most often caves or abandoned mines and may contain both rare and non-rare species (7).	
Wood Turtle	<i>Glyptemys insculpta</i>	Road networks and agricultural practices are the largest threat to the population. They prefer clear, hard-bottomed streams and rivers as well as the adjoining forest, woodland and some fields. Deep pools with permanent flow are critical for hibernation (8).	

TABLE E2: SPECIES HABITAT COMPARISON			
Common Name	Scientific Name	Preferred Habitat	Habitat Present
<b>Flora</b>			
Black Ash	<i>Fraxinus nigra</i>	Swampy woodlands (9).	
Cut-Leaved Toothwort	<i>Cardamine concatenata</i>	Floodplain (river or stream floodplains), forests, talus and rocky slopes (10).	
Slender Agalinis	<i>Agalinis tenuifolia</i>	Anthropogenic (man-made or disturbed habitats), brackish or salt marshes and flats, fresh tidal marshes or flats, meadows and fields, woodlands (10).	
Low Flatsedge	<i>Cyperus diandrus</i>	Shores of rivers or lakes, wetland margins (10).	
Long-Leaved Pondweed	<i>Potamogeton nodosus</i>	Lacustrine or riverine (10).	
Columbian Watermeal	<i>Wolffia columbiana</i>	Lacustrine or riverine (10).	
Nuttall's Waterweed	<i>Elodea nuttallii</i>	Lacustrine or riverine (10).	
Ditch Stonecrop	<i>Penthorum sedoides</i>	Anthropogenic (man-made or disturbed habitats), floodplain (river or stream floodplains), lacustrine, marshes, shores of rivers or lakes, swamps, wetland margins (10).	
Northern Meadow-Rue	<i>Thalictrum confine</i>	Alluvial meadows and calcareous shores (11).	
Loesel's Twayblade	<i>Liparis loeselii</i>	Fens and bogs (12).	
Great Duckweed	<i>Spirodela polyrhiza</i>	Lacustrine or riverine (10).	

(1) Butterflies and Moths of North America. Accessed online July, 2020: <https://www.butterfliesandmoths.org/>

(2) The Cornell Lab of Ornithology: All About Birds. Accessed online July, 2020: <https://www.allaboutbirds.org/>

(3) Species at Risk Public Registry. Accessed online in November 2018 from: <https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry.html>

(4) Wisconsin Department of Natural Resources: Wisconsin Odonata Survey. Accessed online July, 2020: <http://wiatri.net/inventory/odonata/SpeciesAccounts/SpeciesDetail.cfm?TaxalD=85>

(5) Audubon Society. Accessed online in November 2018 from: <http://www.audubon.org/bird-guide>

(6) NatureServe Explorer. Accessed online in November 2018 from: <http://explorer.natureserve.org/>

(7) Wisconsin Department of Natural Resources. Accessed online in November 2018 from: <https://dnr.wi.gov/>

(8) The IUCN Red List of Threatened Species. Accessed online in November 2018 from: <https://www.iucnredlist.org/>

(9) Tree Canada. Accessed online July, 2020: <https://treecanada.ca/resources/trees-of-canada/black-ash-fraxinus-nigra/>

(10) GoBotany. Accessed online July, 2020: <https://gobotany.nativeplanttrust.org/>

(11) Flora of New Brunswick. 2000. Hinds., H.R.,

(12) Ontario Wildflowers. Accessed online July, 2020: <http://ontariowildflowers.com/main/species.php?id=214>

<b>Table E3: Surrounding Land Use</b>		
<b>PID Number</b>	<b>Land Use</b>	<b>Location in Relation to Site</b>
75289298	Highways	North
75289280	Highways	North
75386581	Highways	Northeast
60147212	Highways	East
60147220	Highways	East
60001906	Highways	East
60001930	Highways	Southeast
60001898	Highways	Southeast
60164829	Highways	South
60164811	Highways	South
75353623	Highways	Southwest
75227975	Woodland	Southwest
01475433	Woodland	West
75027573	Residential Lots - Unserviced	West
75300277	Office Complex	West
01475094	Woodland	West
75400598	Residential Lots - Unserviced	Northwest
75009720	Salvage Dealers (All Types Including Redemption Centres)	Northwest

# Treasury Board of Canada Secretariat

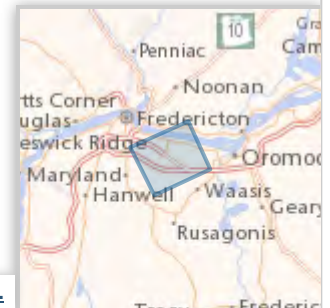
[Home](#) > [OCG](#) > [Real Property Management](#) > [FCSI](#) > DFRP/FCSI - Map Navigator

## DFRP/FCSI - Map Navigator

**Area:** Sunbury, York **Content:** 0 Federal Property, 0 Federal Building, 3 Federal Contaminated Sites









**Scale:** 1 : 54,274  
**Latitude:** 45.86497  
**Longitude:** -66.54634



### Layers

- ● ● Contaminated Sites from active query
- ★  Federal Properties
- ★  Federal Buildings
- ● ● Federal Contaminated Sites

-  Economic Region
-  Census Divisions
-  Census Subdivisions
-  Metropolitan Areas
-  Federal Electoral Districts
-  Treaty Areas

<sup>1</sup> This layer is visible only when the map scale is smaller than 1:3,000,000.

<sup>2</sup>  Suspected  Active  Closed

<sup>3</sup> Google base maps are only available when the map scale is smaller than 1:60,000.

IMPORTANT NOTE: The tables below are currently not synchronized with the map content.  
Please click on the following button if you want to update the tables content: [UPDATE TABLES](#)

**Federal Properties (0) / Parcels (0)**

**Federal Buildings (0)**

**Federal Contaminated Sites (0)**

No record found.



## **APPENDIX F**

### Site Photos



Photo 1: View of capped landfill disposal cells in Area B (July 2, 2020).



Photo 2: View of active landfill disposal cells in Area E (July 2, 2020).





Photo 3: View of the construction of landfill disposal cells in Area E (July 2, 2020).



Photo 4: View of the construction of landfill disposal cells in Area E (July 2, 2020).



Photo 5: View of vegetated area adjoining Area C (July 2, 2020).

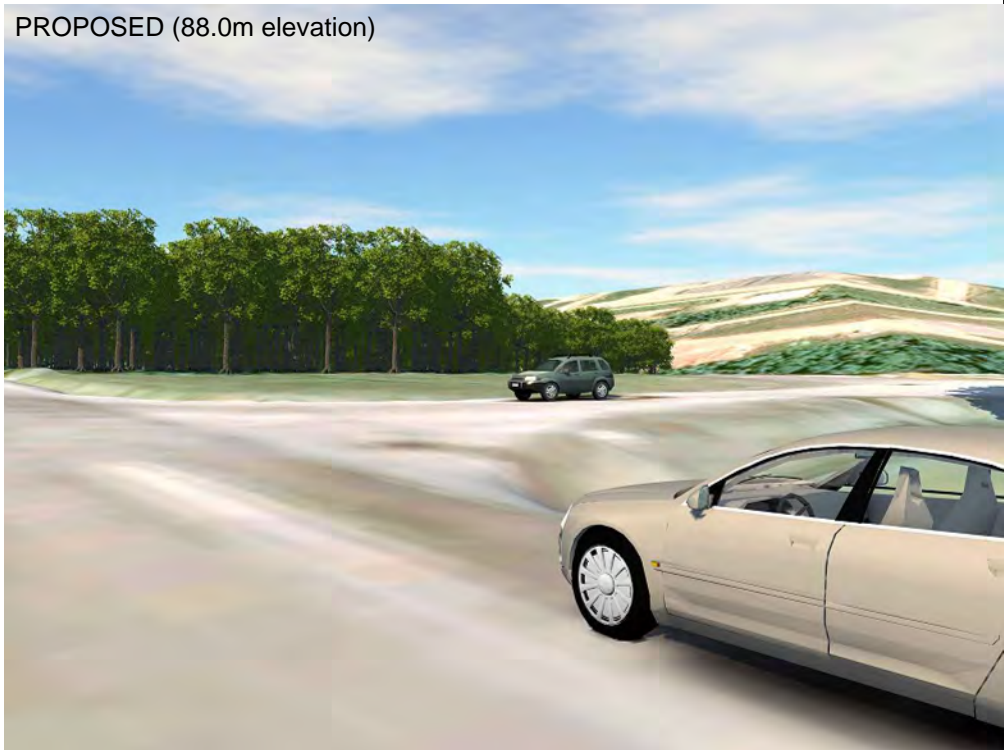


Photo 6: View of vegetated area adjoining Area C (July 2, 2020).



## **APPENDIX G**

### Viewscape Modelling



Plotted: Sep 22, 2020 02:38 PM - by: ANDREW DEMERCHANT - File: n:\drawings\101000101156902-dtm-dsm-comparison.dwg

Project  
 ENVIRONMENTAL IMPACT ASSESSMENT  
 FREDERICTON LANDFILL  
 MAXIMUM HEIGHT INCREASE

Drawing  
 ALISON BOULEVARD  
 CHANGE IN VIEWSCAPE

Drawn By  
 AGSD

Date  
 SEPT, 2020

File No.  
 101156902

Drawing No.  
 FIGURE G-1

Revision No.  
 0





Plotted: Sep 22, 2020 02:38 PM - by: ANDREW DEMERCHANT - File: n:\drawings\10\100\1011569\101156902-dtm-dsm-comparison.dwg

Project  
 ENVIRONMENTAL IMPACT ASSESSMENT  
 FREDERICTON LANDFILL  
 MAXIMUM HEIGHT INCREASE

Drawing  
 TRANS-CANADA  
 CHANGE IN VIEWSCAPE



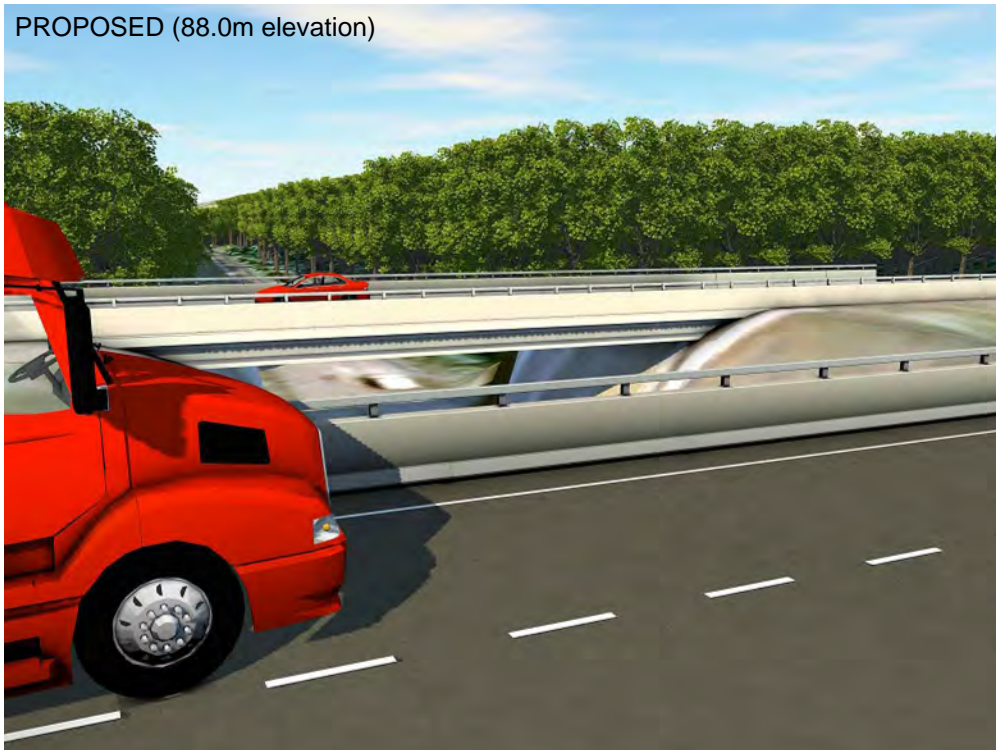
Drawn By  
 AGSD

Date  
 SEPT, 2020

File No.  
 101156902

Drawing No.  
 FIGURE G-2

Revision No.  
 0



Plotted: Sep 22, 2020 02:38 PM - by: ANDREW DEMERCHANT - File: n:\drawings\101000\101156902-dtm-dsm-comparison.dwg

Project  
 ENVIRONMENTAL IMPACT ASSESSMENT  
 FREDERICTON LANDFILL  
 MAXIMUM HEIGHT INCREASE

Drawing  
 TRANS-CANADA / ALISON BOULEVARD  
 OVERPASS  
 CHANGE IN VIEWSCAPE



Drawn By  
 AGSD

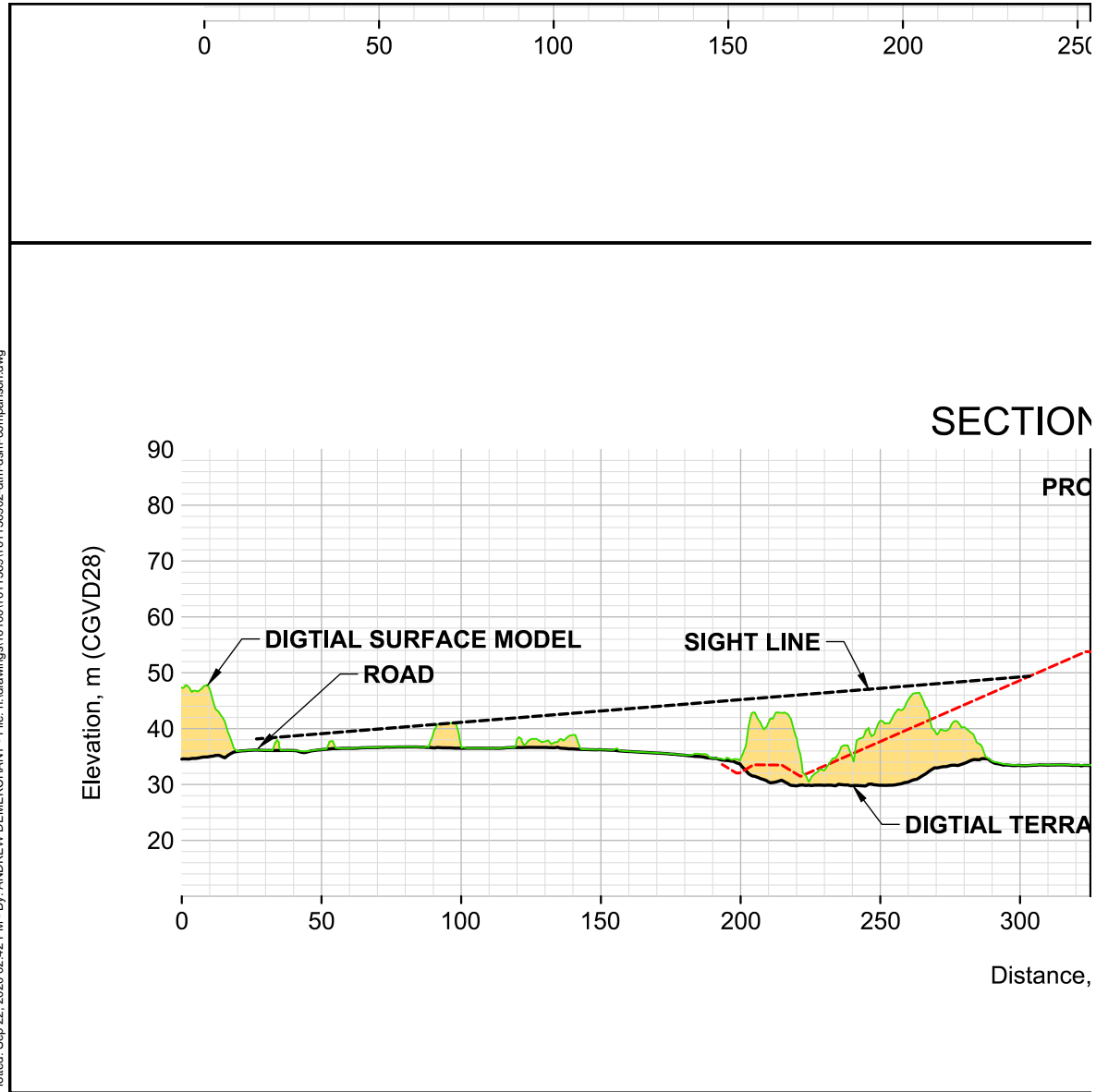
Date  
 SEPT, 2020

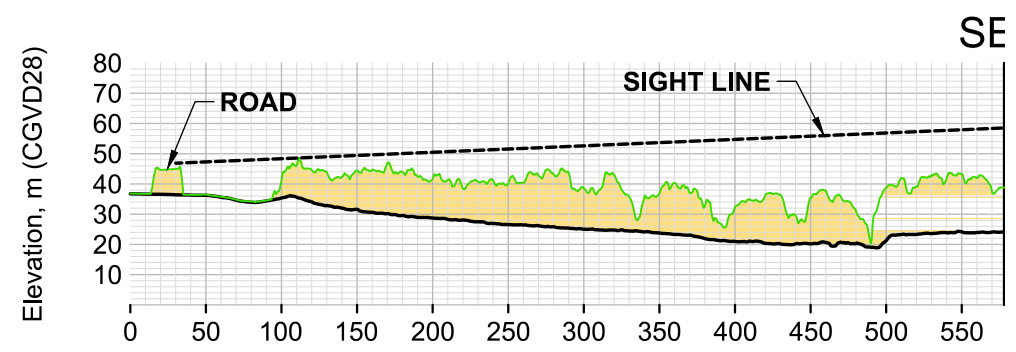
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Drawing No.  
 FIGURE G-3

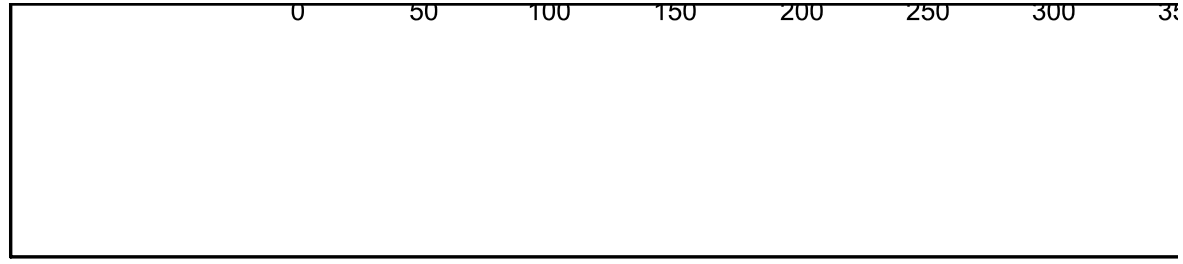
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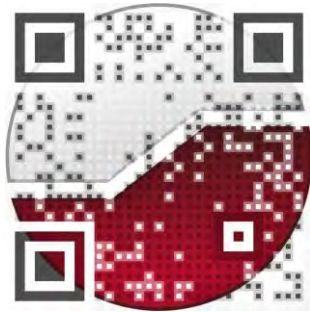








experience • knowledge • integrity



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geotechnical  
environmental  
field services  
materials testing

civil  
géotechnique  
environnementale  
surveillance de chantier  
service de laboratoire des matériaux

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