

DILLON
CONSULTING

TOWN OF ROTHESAY

Environmental Impact Assessment (EIA) Registration

Turnbull Court Sanitary Sewer Line Upgrade
Town of Rothesay, New Brunswick



January 2023 – 19-9889



January 24, 2023

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

Attention: Ms. Crystale Harty
Director, Environmental Impact Assessment Branch

Re: Environmental Impact Assessment (EIA) Registration: Turnbull Court Sanitary Sewer Line Upgrade Project, Rothesay, New Brunswick

On behalf of the Town of Rothesay, Dillon Consulting Limited (Dillon) is pleased to submit this Environmental Impact Assessment (EIA) Registration document for the proposed Turnbull Court Sanitary Sewer Line Upgrade Project in Rothesay, New Brunswick, for your review and consideration.

Dillon looks forward to the timely review of the documentation. Please contact the undersigned if you have any questions or require additional information.

Sincerely,

DILLON CONSULTING LIMITED

Denis L. Marquis, M.Sc.E., P.Eng.
Associate

BJG:vrt

Enclosure: EIA Registration

cc: Brett McLean – Town of Rothesay

Our file: 19-9889

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1.0 Introduction

This Environmental Impact Assessment (EIA) Registration document has been developed to initiate the regulatory process for the upgrading of a section of sanitary sewer line and connection to the new (already constructed) pumping station (the Project).

The Project is an “undertaking” under item (v) of Schedule A of the New Brunswick *Environmental Impact Assessment Regulation – Clean Environment Act* (EIA Regulation) [“(v) all enterprises, activities, projects, structures, works, or programs affecting two hectares or more of bog, marsh, swamp, or other wetland.”]. As such, the Project must be registered under Section 5(1) of the EIA Regulation.

This EIA Registration document is submitted to the New Brunswick Department of Environment and Local Government (NBDELG) under Section 5(2) of the New Brunswick *Environmental Impact Assessment Regulation 87-83 of the Clean Environment Act*. It has been prepared by Dillon Consulting Limited (Dillon) on behalf of the Town of Rothesay (the Proponent).

1.1 Proponent Information

The Project may be referred to as the “Turnbull Court Sanitary Sewer Line Upgrade Project”. The proponent of the Project is the Town of Rothesay. The Proponent’s contact information is provided in **Table 1.1.1** below.

Table 1.1.1: Proponent Information

Name of Project:	Turnbull Court Sanitary Sewer Line Upgrade Project
Name of Proponent:	Town of Rothesay
Mailing Address of Proponent:	70 Hampton Road Rothesay, NB E2E 5L5
Principal Proponent Contact for the purposes of this EIA Registration:	Brett McLean, P.Eng. Director of Operations Telephone: 506.848.6600 Fax: 506.848.6677 E-mail: brettmclean@rothesay.ca
Environmental Consultant that led the preparation of this EIA Registration:	Denis L. Marquis, M.Sc.E., P.Eng. Associate, Project Manager Dillon Consulting Limited 1149 Smythe Street, Suite 200 Fredericton, NB E3B 3H4 Mobile: 506.454.8846 Email: dmarquis@dillon.ca

1.2 Project Overview (Nature of the Undertaking)

The sanitary wastewater collection infrastructure in the Turnbull Court, Domville Lane, and Tennis Court Road area of the Town of Rothesay (**Figure 2.1.1**) is at the end of its service life and is at risk of recurrent flooding. The existing underground sanitary sewer line is located adjacent to and within the flood zone of the Kennebecasis River, between Tennis Court Road and Turnbull Court.

In 2021, the Town of Rothesay (the Town) upgraded the sewer line infrastructure north of Taylors Brook (**Figure 2.1.1**) for customers on Tennis Court Road. In addition, a new lift (pumping) station south of Taylors Brook was constructed in order to be able to pump sewage from Domville Lane and Turnbull Court across the current traffic bridge on Rothesay Road/Route 100 to the Fairvale wastewater treatment facility. This upgrade was conducted under the authority of a watercourse and wetland alteration (WAWA) permit that the NBDELG determined at the time did not require an EIA Registration.

In December 2021, a new watercourse and wetland alteration (WAWA) permit application was submitted to the NBDELG, in order to upgrade the remaining infrastructure along Domville Lane and Turnbull Court, and connect them to the new lift station (i.e., this Project). On April 1, 2022, the Town received a letter from NBDELG, notifying them that the remaining work associated with Project (as described in this EIA Registration) needed to be registered under the New Brunswick *Environmental Impact Assessment Regulation – Clean Environment Act* due to Paragraph (v) of Schedule A of the Regulation:

“all enterprises, activities, projects, structures, works or programs affecting two hectares or more of bog, marsh, swamp, or other wetland”.

The proposed sanitary upgrade for this Project includes the removal of approximately 650 m of existing degraded underground gravity sewer line, and its replacement through the installation of a new underground sanitary sewer line with raised manholes which has been designed to mitigate and alleviate impacts of flooding during the spring freshet. The new sanitary sewer line will connect to a recently (2021) constructed section of new sanitary sewer line and new pumping station. The proposed upgrade will be carried out within a provincially significant wetland (PSW), for which alteration is prohibited under the New Brunswick *Wetlands Conservation Policy* unless the alteration provides a necessary public function. The Town of Rothesay respectfully submits that the construction and operation of safe and reliable sanitary sewage collection infrastructure for the residents of the Turnbull Court area is essential for the greater public good, in addition to being protective of the environment by replacing degraded infrastructure that frequently leaks and is prone to seasonal flooding on occasion. It is with these goals in mind that the proponent has proposed this Project, intended for the public interest and providing a necessary public function.

Specifically, the Project will consist of the following components:

- The removal of approximately 650 linear metres of existing degraded 200 mm diameter sanitary gravity sewer infrastructure that was installed in the 1970s, and its replacement through the installation of a new underground sanitary sewer line of roughly the same length.

- The new sanitary sewer line will consist of a new 250 mm diameter DR35 polyvinyl chloride (PVC) sewer main which will direct flows from the Turnbull Court area to the newly constructed lift station at Taylors Brook.
- Approximately 12 new 1,050 mm diameter reinforced concrete manhole structures will be installed in conjunction with the new sanitary sewer main to allow for flushing and general maintenance.

The existing sewer laterals at the sewer main will be replaced with new 100 mm diameter DR35 PVC pipe. Exact replacement length of the laterals will vary based on the change in slope and grades from the existing sewer pipe.

The total footprint of the Project (i.e., Project development area) is approximately 0.41 hectares (ha).

1.3 Purpose/Rationale/Need for the Undertaking

There are currently 17 households reliant on this 650-metre section of sanitary sewer line along Turnbull Court and Domville Lane. The existing 200 mm diameter asbestos concrete sewer system is in poor condition and is in need of replacement. Upgrading of the infrastructure through the implementation of this Project will allow for the continuation of an essential service to residents of the Town of Rothesay, while improving water quality in the adjacent watercourses and wetland.

1.4 Purpose/Organization of this Document

The purpose of this EIA Registration document is to provide information to the NBDELG and its Technical Review Committee (TRC) as part of its review of the environmental effects of the Project in accordance with the EIA Regulation. As the Project triggered an EIA Registration solely due to its location adjacent to a provincially significant wetland (PSW), the main focus of this document is the wetland (herein referred to as “the Turnbull Court wetland”) and its related disturbance. This includes information on wetland delineation, the functional assessment, and mitigation measures. The rest of the document includes the required information for an EIA Registration, as outlined in *A Guide to Environmental Impact Assessment in New Brunswick* (NBDELG 2018a).

This EIA Registration document provides a brief description of the Project; existing environmental conditions, and identified mitigation measures to be employed to minimize the effects of the Project; accidents, malfunctions, and unplanned events; and public and First Nations involvement.

2.0 Project Description

Section 2.0 provides a brief description of the proposed Project components as it is currently conceived, including:

- A brief description of the Project and its components as well as the general site of the Project; and
- The activities that will be carried out during construction of the sanitary gravity pipe renewal.

2.1 Project Location

The Project is located within the municipal boundary of the Town of Rothesay, Kings County, New Brunswick (NB). The town is located along the east bank of the Kennebecasis River, northeast of the city of Saint John (**Figure 2.1.1**). Specifically, the renewal of the existing sanitary sewer line is located beginning at the end of Turnbull Court then flowing northeast towards Domville Lane/Taylor's Brook where it is then captured by a recently constructed sewage lift station and carried to an existing sewer force main that discharges at the Fairville wastewater treatment facility (WWTF). The exact Project location and routing can be seen in **Figure 2.1.1**. The existing pipe infrastructure spans multiple Parcel Identifiers (PIDs). Agreements from landowners to complete construction have been obtained by the Town and are attached to this report in **Appendix A**. This Project is located entirely on privately owned land. Because the Project is linear in nature, there are 11 affected properties, with PIDs affected as follows:

- 00255463
- 30054381
- 30176630
- 30274104
- 30323190
- 30191407
- 30326813
- 30311211
- 30313597
- 00258582
- 30192629



TURNBULL COURT EIA

TOWN OF ROTHESAY

PROJECT LOCATION AND EXISTING AND PROPOSED INFRASTRUCTURE

FIGURE 2.1.1

- | | | |
|---------------------------|---------------------------|----------------------------------|
| Proposed Sanitary Manhole | Highway | Existing Sanitary Pipe Alignment |
| Proposed Wet Well | Existing Sanitary Sewer | Existing Lift Station |
| Existing Sanitary Manhole | Proposed Pipe Alignment | Proposed Lift Station |
| Street | Proposed Pipe Impact Area | |



SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

MAP CREATED BY: RP
 MAP CHECKED BY: BG
 MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

SCALE 1:3,500
 Meters
 0 25 50

PROJECT: 19-9889
 STATUS: DRAFT
 DATE: 2023-01-18

2.2 Overview of Existing Infrastructure to be Replaced

The existing infrastructure proposed to be replaced comprises approximately 650 linear metres of 200 mm diameter asbestos concrete sanitary sewer gravity main coupled with existing concrete manhole structures. The existing piping network was installed and constructed in the late 1960s and is at the end of its useful life. Specifically, due to the short pipe sections, reduced pipe slope, and minimal cover for frost protection, multiple pipe joints in the system are separated and have been contributing to sewer backups (causing operational issues) as well as leaching of wastewater into the existing soils and presumably groundwater. The existing infrastructure is also located in an area subject to flooding during freshet conditions in the Kennebecasis River, and multiple existing manhole structures are located below the historic flood elevation. An overview of the existing piping network can be seen in **Figure 2.1.1** as well as in **Appendix B**.

2.3 Previous Upgrades

In 2019, the Town of Rothesay retained Dillon Consulting Limited to assist in upgrading the sanitary sewer infrastructure along Turnbull Court, Domville Lane, and Tennis Court Road. It was identified that work would have to occur within and adjacent to a GeoNB mapped provincially-significant wetland (PSW; refer to **Figure 3.2.1** to see extents of GeoNB mapped wetland). Due to funding constraints of the Town, it was decided that the upgrades would be completed in phases as funding became available. Prior to beginning construction activities in 2020, a wetland delineation was performed by Dillon biologists on the northern section of wetland that would be potentially impacted during Phase 1 of construction (2020/2021) and a watercourse and wetland alteration (WAWA) permit application was submitted. At this time it was deemed by NBDELG that the impacts to the wetland would be minimal, and therefore an EIA Registration was not required.

Following the receipt of the WAWA permit, in 2020/2021, approximately 220 linear metres of 200 mm diameter asbestos concrete sanitary sewer gravity main and manhole structures were replaced between Taylors Brook and Tennis Court Road (Phase 1; shown on **Figure 2.1.1**). The replaced infrastructure, in 2020/2021, was comprised of the downstream section of infrastructure that was part of the sanitary system constructed in the 1960s between Turnbull Court and Tennis Court Road. A lift station was also constructed in 2020/2021 on the southern side of Taylors Brook as part of the 2020/2021 project. The construction of the new lift station was completed in order to re-route wastewater flows away from the existing gravity pipe bridge that conveyed flows across Taylors Brook up to an existing sanitary force-main located at Rothesay Road (Highway 100). During previous spring freshet events, the former pipe bridge was susceptible to ice build-up, and due to its vintage (1960s) there was great concern with the risk of this infrastructure failing in an ice jam and causing wastewater discharge to Taylors Brook.

In September 2021, Boreal Environmental biologists revisited the site to perform another wetland delineation on the full extent of the wetland, prior to Dillon applying for a WAWA permit for Phase 2 (originally scheduled for 2022). In December 2021, Dillon applied for a WAWA permit for Phase 2 and was informed on Friday, April 1, 2022 that the Project would have to undergo an EIA Registration under

the *Environmental Impact Assessment Regulation – Clean Environment Act* as the PSW in question is larger than two hectares.

2.4 Siting Considerations

Prior to finalizing the design for the proposed infrastructure, alternate routing was explored outside of the current proposed Project area; however, due to a multitude of constraints (i.e., topography, available land, pipe grades and orientation), the proposed alignment as seen in **Appendix B** was chosen. The proposed routing shown in **Appendix B** was chosen based on the following parameters:

- Minimize impacts to the existing wetland area; to achieve this as much as possible, the alignment of the proposed sewer was shifted to the south/southeast as much as possible without impacting existing dwellings and associated private infrastructure;
- Maximize soil cover to help protect against freezing; the existing piping network is very shallow and is prone to freezing as well as movement due to freeze/thaw conditions;
- Set manhole covers at an elevation of 6.5 m geodetic or higher to protect the new sewer system from infiltration during spring freshet and periods of high-water events; and
- Create a corridor to allow for maintenance activities (e.g., pipe inspection, flushing).

2.5 Components and Dimensions of the Project

The Turnbull Court Sanitary Sewer Line Upgrade Project consists of the removal and replacement of approximately 650 linear metres of existing sanitary gravity sewer infrastructure that was installed in the 1970s. The existing 200 mm diameter asbestos concrete sewer system is in poor condition and needs replacement. Examples of current conditions include but are not limited to pipe joint separations, collapsed pipe sections and settled sections of pipe resulting in unwanted low points in the sanitary system. These conditions result in various consequences including but not limited to groundwater infiltration into the system, tree root infiltration into the pipe causing blockage and inconsistent pipe grades due to joint separations causing blockages in the pipe system.

The proposed infrastructure will consist of a new 250 mm diameter DR35 PVC sewer main which will direct flows from the Turnbull Court area to the newly constructed lift station on the southern side of Taylors Brook. The replacement of the asbestos concrete pipe with PVC pipe will remedy the existing separated pipe joints as well as mitigate infiltration and provide better flow handling resulting from smoother pipe materials and longer pipe sections. Approximately 12 new 1,050 mm diameter reinforced concrete manhole structures will be installed in conjunction with the new sanitary sewer main to allow for flushing and general maintenance (**Figure 2.1.1**). New manhole structures will be installed at an elevation of 6.5 m (CVGD1928, HT2 Datum) to protect the sewer system from infiltration during spring freshet events. The existing sewer laterals at the sewer main will be replaced with new 100 mm diameter DR35 PVC pipe; the exact replacement length of the laterals will vary based on the change in slope and grades from the existing sewer pipe. All work will be completed based on industry best

practices. Quality assurance and quality control will be completed on all construction work associated with the Project.

The total footprint of the Project (i.e., Project development area) is approximately 0.41 hectares (ha).

2.6 Project Phases and Activities

The proposed Project will be completed in one stage as a previous stage of the Project has already been completed under separate approvals, as discussed previously. The following section provides an overview of the proposed construction activities.

2.6.1 Construction Phase

2.6.1.1 Site Access

Access to the site will be established at two locations along the proposed upgrades. One access point will be at civic number 17 Turnbull Court via the existing Municipal Services Easement. Alternate access will be established at 11 Domville Lane via the common right-of-way. Additional written permission has been established with individual homeowners to access the site to complete the proposed infrastructure upgrades on their respective properties.

2.6.1.2 Environmental Protection Measures

Prior to construction beginning on-site, sediment control structures and silt fence will be placed along the Project corridor to prevent erosion during the construction works. All equipment will be inspected to ensure that it is in good working order and that no leaks are present and that equipment is free of invasive species that might be carried to the site from previous work elsewhere. Upon approval of this application, permit conditions will be reviewed by all parties involved.

2.6.1.3 Clearing and Grubbing

Upon installation of environmental protection measures, clearing and grubbing activities will begin to prepare the corridor for installation of the new pipe and associated infrastructure. Clearing will be completed using a tracked excavator and a mulcher attachment ranging between 8 m – 15 m in width depending on the existing topography. Once clearing activities are completed, grubbing activities will begin. Grubbing activities include but are not limited to stripping of existing tree stumps, roots, and vegetation over the pipe renewal area in order to prepare for the installation of the new pipe and associated appurtenances.

2.6.1.4 Excavation and Pipe Removal

Excavation to facilitate the removal of the existing pipe will be completed by digging a 2.5 m deep trench using a tracked excavator, rubber tire loader, and tandem dump trucks, within which the new sanitary sewer pipe will be installed. Excavated material will be removed in accordance with local regulations and

disposed of off-site appropriately if required, or stockpiled in place to be used for backfilling the trench following the new pipe installation should the material be suitable. If existing material is not suitable to be reused for backfill, gravel will be imported to backfill the trench. During excavation activities, no equipment will work outside of the approved work zone outlined on the design drawings in **Appendix B** and stay within the implemented environmental protection measures.

During excavation in preparation for the new sanitary sewer pipe, the existing asbestos concrete pipe will be removed in all areas where the existing pipe alignment and the new pipe alignment intersect or run parallel within the same pipe trench. This scenario accounts for the majority of the existing pipe infrastructure with the exception of one section. One section of existing pipe network, approximately 117 m in length, will be abandoned in place as it does not follow the same alignment as the proposed pipe (**Figure 2.1.1**). The proposed pipe does not follow the existing alignment in this section as the new alignment was shifted to the south to minimize wetland impacts. The existing pipe to be left in place will be capped on either end prior to backfilling.

2.6.1.5 New Pipe Installation and Backfill

The new pipe will consist of PVC DR35 and will be installed per industry best practices. After trench excavation has been completed, clear stone will be placed in the bottom of the trench as pipe bedding material. This material will allow the pipe to be installed to the proposed design slope as well as provide proper drainage around the pipe to help with longevity. After bedding material has been placed, the new pipe will be installed in sections and the sections fused together. The trench will then be backfilled and compacted with either existing material should it be suitable for re-use or imported bank run gravel brought to the site. This will create a solid surface for proper protection of the pipe and allow for maintenance activities to occur as needed upon commissioning of the new sanitary line.

Following installation of the new pipe sections, they will be connected to the sanitary pumping station south of Taylors Brook that was construction in 2021 as part of Phase 1 of the Project. This pumping station will transport the sewage across the Route 100 traffic bridge toward the Fairvale wastewater treatment plant. The existing pipe bridge that transports sewage across Taylors Brook will be abandoned-in-place and plugged.

2.6.1.6 Revegetation

Upon completion of the pipe installation the site will be revegetated. Revegetation will consist of the placement of 100 mm thickness of topsoil and hydroseed. All environmental protection measures will remain in place until vegetation has been re-established within the work area.

2.6.2 Operation and Maintenance Phase

In order to be able to perform maintenance and/or address any issues within the sanitary sewer line following installation, there will be manhole structures installed along the length of the pipe. Manholes will be installed within the right-of-way with the purpose of serving as inspection and maintenance points for the newly installed sanitary pipe. The right-of-way of the Project will be wide enough to

enable a truck to drive along the pipe alignment for general maintenance, as needed. Besides this, regular operation of the sanitary sewer line will be relatively hands-off once construction is complete and the new pipes are connected to the existing pumping station. Modern construction materials, when being compared to the existing pipe material, require significantly less maintenance. Access along the alignment will only be completed on an as needed basis.

2.6.3 Future Modifications, Extensions, or Abandonment

Completion of this Project will conclude the upgrades to the system in this area. Future modifications and/or expansion are not planned at this time. Decommissioning of the Project will be carried out at the end of its useful service life, in accordance with the regulations and requirements in place at that time.

2.6.4 Project Schedule

Construction is scheduled to begin in late winter/early spring 2023 and will last for a duration of approximately six weeks, depending on weather conditions. All construction activities will be completed outside of the spring freshet time period, pending approval of this Project. The operational life of the new sanitary sewer piping infrastructure is expected to be approximately 70 years.

3.0

Environmental Interactions and Mitigation

Environmental features deemed to have specific value to the ecosystem, societal well-being, heritage and/or culture, or are afforded protection by legislation, are defined as valued components (VC).

An assessment of potential environmental effects of the Project, as well as potential accidental events and malfunctions, on the identified VCs has been undertaken below as there is a potential for the local environment within the vicinity of the Project to be impacted by the Project. Potential environmental interactions of the Project with VCs as planned during the applicable Construction and Operation and Maintenance activities are initially reviewed (**Section 3.1**). Following this, potential environmental interactions of the Project during accidents, malfunctions, and unplanned events were assessed (**Section 3.3**).

Mitigation is identified for each interaction and/or effect in an attempt to prevent the interaction from occurring if possible, or to reduce the severity, magnitude, or duration of the interaction. Best management practices (based on industry guidelines and regulatory guidance documents) have been identified as appropriate mitigation measures. In addition, several provincial and federal Acts, codes, regulations, and guidelines may require appropriate actions be conducted as mitigation measures prior to or during the Project and have been considered in the development of the mitigation measures.

3.1

Identification of Impacts of the Project on the Environment

The assessment involves identifying the potential for the Project to interact with the VCs. The following environmental features in **Table 3.1.1** have been identified as VCs in relation to the Project activities associated with the Turnbull Court Sewage Infrastructure Upgrade Project.

As each phase of the Project involves different activities, and potentially different interactions with the VCs, the assessment was completed in consideration of each of the Project phases (Construction, and Operation and Maintenance) as well as for Accidents, Malfunctions, and Unplanned Events. The potential interactions between the Project and the VCs are presented in **Table 3.1.1** below.

Table 3.1.1: Potential Project Interactions with Valued Components

Valued Component	Rationale for Selection of the VC	Project Phases		
		Construction	Operation and Maintenance	Accidents, Malfunctions, and Unplanned Events
Atmospheric Environment	Emissions of particulate matter (e.g., dust) related to Project activities may interact with the atmospheric environment and adjacent receptors through excavation and installation of new infrastructure.	X		X

Valued Component	Rationale for Selection of the VC	Project Phases		
		Construction	Operation and Maintenance	Accidents, Malfunctions, and Unplanned Events
Acoustic Environment	Sound and vibration related to Project activities may interact with adjacent receptors through the installation of new infrastructure.	X		X
Potable Water Resources (Surface Water and Groundwater)	The Project may interact with surface water and groundwater from physical alterations of the Project areas near the Kennebecasis River and Taylors Brook by excavation and installation of new infrastructure (i.e., piping).	X		X
Fish and Fish Habitat	The Project may have limited interactions with fish and fish habitat due to the proximity of the activities to the Kennebecasis River and Taylors Brook.	X		X
Vegetation and Wetlands	The Project may interact with some vegetation including some wetland and riparian vegetation due to physical alteration of the Project areas. The Project is located within/adjacent to a wetland.	X		
Wildlife and Wildlife Habitat	Physical alteration of the Project site during decommissioning may result in limited loss of wildlife habitat and Project activities may interact with wildlife (i.e., sensory disturbance due to Project activities).	X		
Socioeconomic Environment	The Project will interact with labour and economy through the generation of employment opportunities and will impact those landowners who live on the properties where the Project activities will be taking place.	X		
Heritage and Cultural Resources	The Project may interact with palaeontological and/or archaeological resources (including pre-contact sites, protected under the New Brunswick <i>Heritage Conservation Act</i>) due to the proximity of the Project to the Kennebecasis River and Taylors Brook.	X		X

Note:

X = potential interaction to be evaluated further.

As described in **Section 2.4.2**, the Operation and Maintenance phase of the Project entails routine maintenance and monitoring of wastewater infrastructure. The new pipes have a lifetime of approximately 70 years. It is anticipated that all environmental disturbance associated with the Project will occur as part of the Construction phase, and once these activities are complete, there will be no further planned interaction between the environment and the Project elements as these components

will remain passive. As such, the VCs selected above are not anticipated to interact with the Operation and Maintenance phases of the Project as there are no physical alterations directly interacting with surface water, groundwater, fish and fish habitat, wildlife or wildlife habitat, vegetation or wetlands, heritage resources, or ongoing activities interacting with emissions related to the atmospheric and acoustic environments. Given the lack of interactions with all VCs, the Operation and Maintenance phase of the Project is not discussed further in this document.

In light of the above, all entries in **Table 3.1.1** above where no interaction was identified (i.e., all activities not marked with an X) are not expected to result in substantive or measureable environmental effects and they are not discussed further in this document.

3.1.1 Spatial Boundaries

Study boundaries set the limits of the area examined within the assessment. Boundaries for the EIA were defined by good practice and professional judgment. The spatial boundaries defined for the EIA will include the **Project Development Area (PDA; Figure 3.1.1)**. The PDA is defined as the area of physical disturbance associated with construction and operation of the Project. Specifically, the PDA consists of an area of approximately 0.41 ha that includes the linear piping feature to be replaced as well as the right-of-way where work will be completed.



TURNBULL COURT EIA
TOWN OF ROTHESAY

PROJECT DEVELOPMENT AREA

FIGURE 3.1.1

- | | | |
|---|-------------------------|--|
| ● Proposed Sanitary Manhole | — Watercourse | ■ Delineated Wetland (7.04 ha) |
| ● Proposed Wet Well | — Street | ▨ Provincially Significant Wetland (NBDELG 2022) |
| ● Existing Sanitary Manhole | — Highway | |
| - - - Proposed Pipe Impact Area (0.41 ha) | ▭ Existing Lift Station | |
| — Existing Sanitary Pipe Alignment | ▭ Proposed Lift Station | |



SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

MAP CREATED BY: GAM
MAP CHECKED BY: BG
MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

SCALE 1:3,500
0 25 50 Meters

PROJECT: 19-9889
STATUS: DRAFT
DATE: 2023-01-18

3.2 Assessment of Environmental Interactions and Mitigation

Potential effects and mitigation measures specific to each VC is discussed within the following sub-sections. Residual effects remaining after mitigation has been applied are also discussed.

3.2.1 Atmospheric Environment

The atmospheric environment is defined as the layer of air above the earth's surface to a height of approximately 10 km. The atmospheric environment has been selected as a valued component (VC) because the atmosphere helps maintain the health and well-being of humans, wildlife, vegetation, and other biota.

3.2.1.1 Existing Conditions

Climate

The nearest Environment and Climate Change (ECCC) weather station to the PDA is located at the Saint John Airport (N 45° 19.055', W 65° 52.981'), approximately 11.6 km southeast of the Project. According to this station, the annual daily mean temperature for the most recent 30-year period (1981-2010) was 5.2 degrees Celsius (°C), with extremes ranging from -36.7°C to 34.4°C (ECCC 2022). On average, the warmest periods annually were between June and September, with July being the warmest month having a daily average temperature of 17.1°C (ECCC 2022). On average, the coolest periods annually were between December and March, with January being the coldest month with a daily average temperature of -7.9°C.

The historical precipitation data from the Saint John Airport station recorded an average of 1,295.5 mm of precipitation per year, with 1,076.0 mm as rain and 239.9 cm as snowfall (ECCC 2022).

Ambient Air Quality

Due to the generally industrialized nature of the area, the Saint John region (within which the town of Rothesay is located) has numerous ambient air quality monitoring stations. NBDELG, in collaboration with local heavy industries operate an extensive ambient air quality monitoring network in the city of Saint John. NBDELG directly operates four of these monitoring stations in the city of Saint John, in addition to one in Saint Andrews, which acts as a background reference site.

The maximum measured concentrations from the four NBDELG monitoring stations in Saint John for the respective averaging periods of each contaminant during 2021, as reported in NBDELG's most recent ambient air quality monitoring report, *2021 Air Quality Monitoring Results* (NBDELG 2022a), and its supplementary data report (NBDELG 2022b), are presented in **Table 3.2.1**. It is noted that since the data presented in the air quality monitoring reports is in graphical form (i.e., raw numerical values are not presented in the reports), the values in the table below are interpolated from the graphs and should be considered approximate.

In consideration of the data presented in **Table 3.2.1**, the ambient air quality in the Saint John region (and by extension, the Rothesay area) is fair to moderate on occasion considering the number of industrial emission sources in the area, but otherwise generally good.

Table 3.2.1: Ambient Monitoring Data- 2021 Maximums (Approximate) – Saint John Area Air Quality Monitoring Stations Operated by NBDELG (NBDELG 2022b)

Air Contaminant	Averaging Period	Maximum Ground-Level Concentration Recorded in 2021
Forest Hills		
Nitrogen dioxide (NO ₂)	1 h	58 µg/m ³ (31 ppb)
Ozone (O ₃)	1 h	130 µg/m ³ (66 ppb)
Particulate matter less than 2.5 microns (PM _{2.5})	24 h	24 µg/m ³
Castle Street		
Carbon monoxide (CO)	1 h	573 µg/m ³ (500 ppb)
Nitrogen dioxide (NO ₂)	1 h	96 µg/m ³ (51 ppb)
Sulphur dioxide (SO ₂)	1 h	118 µg/m ³ (45 ppb)
Ozone (O ₃)	1 h	137 µg/m ³ (70 ppb)
Particulate matter less than 2.5 microns (PM _{2.5})	24 h	35 µg/m ³
West Side		
Nitrogen dioxide (NO ₂)	1 h	27 ppb
Ozone (O ₃)	1 h	61 ppb
Particulate matter less than 2.5 microns (PM _{2.5})	24 h	21 µg/m ³
Sulphur dioxide (SO ₂)	1 h	170 µg/m ³ (65 ppb)

3.2.1.2

Environmental Interactions Assessment

Potential Interactions

Temporary interactions with the atmospheric environment are anticipated during the Construction phase, through the excavation of existing infrastructure and installation of new wastewater infrastructure. These activities require excavation/digging and the use of heavy machinery and equipment (e.g., excavator, back-hoe, crane trucks, etc.), all of which may increase emissions of nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds (VOCs), and sulphur dioxide (SO₂) associated with the burning of fossil fuels in such equipment. In addition, these earth moving activities and related transportation may result in the release of fugitive dust. Because the Project involves replacing sanitary sewage infrastructure, there may temporarily be an unpleasant smell during the Construction phase as old piping and infrastructure is removed; however, once the new pipes are in place, smell is expected to improve due to reduced leakage of sewage.

Mitigation

During the Construction phase, the following mitigation measures for atmospheric environment will be employed:

- Construction activities will be conducted exclusively during daylight hours, Monday to Friday, excluding statutory holidays;
- Contractors are to ensure that vehicles, tools, and equipment will be properly maintained according to emission and noise suppression standards;
- A plan for handling soil and construction materials for the site will be developed (i.e., excavated soil and rock will be stockpiled away from any watercourse or wetland in predefined areas or removed from site to a predetermined location) with an intent to minimize soil stockpiled and duration soil is stockpiled at the site;
- All construction/maintenance equipment will be turned off when not in active use to minimize idling;
- Monitoring of weather (wind conditions) and stabilization of soil stockpiles and bare slopes to minimize a potential increase in fine particulate matter;
- Stockpiled materials will be limited to the extent possible in volume and duration;
- Exposed soils will be stabilized as soon as practical; and
- Water will be used to reduce dust, where necessary.

3.2.1.3

Summary

Construction activities have the potential to result in temporary changes to the local air quality, primarily due to dust and combustion gas emissions, as well as temporary unpleasant smells due to the removal of sanitary sewer lines. The emission of air contaminants from construction activities will be limited to the periods when activities are taking place, and effects are anticipated to be localized to the PDA (**Figure 3.1.1**) and perhaps areas immediately adjacent to them; however, once the Project is complete and the wastewater infrastructure is operating as in its pre-construction state, there are no residual effects anticipated, and smell is expected to improve overall quickly following construction due to reduced leakage of sewage that occurs currently on occasion. As described above, no interactions will occur during the Operation and Maintenance phase.

With the implementation of the planned mitigation indicated above, interactions between the Project and the atmospheric environment are not anticipated to be substantive and are limited to the local environment temporarily during the Construction phase.

3.2.2

Acoustic Environment

The acoustic environment focuses on ambient noise, both natural and human-made. It is identified as a valued component (VC) because noise is defined as a contaminant in the *New Brunswick Air Quality Regulation – Clean Air Act*, and noise levels may be of concern in relation to human health, socioeconomic values, and potential disturbance of ecological functions.

Potential changes to the acoustic environment may affect humans and wildlife. Components considered under this VC are sound pressure levels that could affect nearby receptors.

3.2.2.1 Existing Conditions

Existing sound quality conditions in the vicinity of the Project were not measured for this assessment. Given the largely residential setting of this Project and the current operation of the infrastructure, existing ambient sound pressure levels are predicted to be minimal and typical of a suburban residential area. Noise emissions are expected periodically for the duration of the construction activities; however, this is expected to be infrequent and of temporary nature only.

3.2.2.2 Environmental Interactions Assessment

Potential Interactions

Temporary interactions with the acoustic environment are anticipated during the Construction phase of the Project only, primarily as a result of heavy equipment used to carry out excavation and installation of new infrastructure (i.e., piping), thereby increasing the potential for elevated noise levels.

Mitigation

During the Construction phase of the Project, the following mitigation measures for the acoustic environment will be employed:

- Noise-intrusive activities will be conducted exclusively during daylight hours, Monday to Friday, excluding statutory holidays;
- A noise reduction plan will be established and communicated to the contractors prior to construction;
- During Construction, nearby residents will be notified of the schedule for construction activities and the likely duration;
- Contractors are to ensure that vehicles, tools, and equipment will be properly maintained according to emission and noise suppression standards;
- All construction/maintenance equipment will be turned off when not in active use to minimize idling; and
- Complaints related to noise from the construction activities will be recorded and addressed by the contractor.

3.2.2.3 Summary

Construction activities have the potential to result in temporary changes to the local acoustic environment due to noise emissions from the operation of heavy equipment associated with construction activities. Noise emissions from construction activities are expected to be limited to the periods when such activities are taking place, and effects are anticipated to be localized to the Project footprint and perhaps areas immediately adjacent to them. Frequent release of noise levels associated

with Project activities that could cause nuisance or substantial loss of enjoyment of nearby properties is not expected; however, once the Project is complete, elevated noise levels are not anticipated from the Project. As described above, no interactions will occur during the Operation and Maintenance phase, given the passive nature of Project components during this phase.

With the implementation of the planned mitigation indicated above, interactions between the Project and the acoustic environment are not anticipated to be substantive and are limited to the local environment temporarily during the Construction phase.

3.2.3 Potable Water Resources (Surface Water and Groundwater)

Water is essential for life on Earth. As humans, we need water for drinking, bathing, sanitation, recreation, and for the production of food and goods. Fish, wildlife, and vegetation also rely on the availability of water to live and flourish. Changes in the availability of water or the quality of the water may affect the lives of people and other living things.

Potable water resources, including surface water and groundwater, are considered a valued component (VC) because it is an important part of the hydrologic cycle through infiltration of precipitation or runoff, and it is important to local ecosystems and for potable water supplies.

3.2.3.1 Existing Conditions

Surface Water

The Project is located along the eastern bank of the Kennebecasis River situated within the Saint John River basin. In addition, Taylors Brook runs north of the Project, and through the Turnbull Court wetland, before flowing into the Kennebecasis River (refer to **Figure 3.2.1**). The Kennebecasis River watershed drains an area of 2,056 km² (NBDELG 2007), with the drainage area consisting of predominantly undeveloped wooded terrain and agricultural land.

A 7.04 hectare (ha) wetland that is considered a provincially significant wetland (PSW) is located north of Turnbull Court, east of Domville Lane. To the west of the wetland, the Kennebecasis River flows. Taylors Brook is located to the north of the wetland and Domville Lane and flows westerly through the wetland (**Figure 3.2.1**). There are train tracks between the wetland and the Kennebecasis River; however, they are hydrologically connected as there is a train bridge where Taylors Brook meets the Kennebecasis River.

As the areas of disturbance are within 30 m of watercourses and a wetland, a permit under the New Brunswick *Wetland and Watercourse Alteration (WAWA) Regulation* under the *Clean Water Act* is required for carrying out the Project (with potential for associated wetland compensation to be required, at the discretion of NBDELG). The area of the wetland and Taylors Brook are prone to flooding during the spring freshet, as confirmed by the NBDELG WAWA Reference Map (NBDELG 2022c).

Groundwater

Potable water is supplied to the residents in the vicinity of the Project by a municipal water supply system for which the municipal wells are located approximately 1.7 km east of the PDA. The PDA is not located in a wellfield protected area under the New Brunswick Wellfield Protection Program or in a designated watershed under the New Brunswick Watershed Protection Program. There are nine wells (eight drinking water) within 500 metres of the general Project area, with the closest being 125 metres to the PDA (see **Figure 3.2.2**; NBDELG 2022d).



TURNBULL COURT EIA
TOWN OF ROTHESAY

WETLANDS AND WATERCOURSES

FIGURE 3.2.1

- | | | |
|---------------------------------|------------------------------------|--|
| ● Proposed Sanitary Manhole | — Existing Sanitary Pipe Alignment | □ Existing Lift Station |
| ● Proposed Wet Well | — Street | □ Proposed Lift Station |
| ● Existing Sanitary Manhole | — Highway | ▨ Indirect Impact Wetland |
| — Proposed Pipe Alignment | — Existing Sanitary Sewer | ■ Delineated Wetland (7.04 ha) |
| - - - Proposed Pipe Impact Area | — Watercourse | ▨ Provincially Significant Wetland (NBDELG 2022) |



SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

MAP CREATED BY: GAM
MAP CHECKED BY: BG
MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

SCALE 1:3,500
0 25 50 Meters

PROJECT: 19-9889
STATUS: DRAFT
DATE: 2023-01-18



TURNBULL COURT EIA

TOWN OF ROTHESAY

WELLS WITHIN 500M OF THE PDA

FIGURE 3.2.2

- | | | |
|---------------------------|----------------------------------|--|
| Well Locations | Proposed Pipe Impact Area | Watercourse |
| Proposed Sanitary Manhole | Existing Sanitary Pipe Alignment | Existing Lift Station |
| Proposed Wet Well | Street | Proposed Lift Station |
| Existing Sanitary Manhole | Highway | Delineated Wetland (7.04 ha) |
| Proposed Pipe Alignment | Existing Sanitary Sewer | Provincially Significant Wetland (NBDELG 2022) |



SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

MAP CREATED BY: GAM
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 MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

SCALE 1:6,500
 Meters
 0 50 100

PROJECT: 19-9889
 STATUS: DRAFT
 DATE: 2023-01-18

3.2.3.2

Environmental Interactions Assessment**Potential Interactions**

During the Construction phase of the Project, there is potential for temporary interactions between surface water and construction activities within the PDA. These potential interactions include the physical alteration of soil within the Turnbull Court wetland. Potential environmental effects to surface water include sedimentation of the surface water within the Turnbull Court wetland from excavation of the existing pipe to replace it, as well as runoff from stockpiling of fill or excavated materials and erosion from vegetation removal for machine access.

Given the limited scope of the Project, interactions with groundwater are not expected.

Mitigation

During the Construction phase, the following mitigation measures for surface water and groundwater will be employed:

- Proper erosion and sediment control (ESC) measures will be installed and checked regularly during the Construction phase and prior to and after storm events to ensure they are continuing to operate properly to minimize potential effects to adjacent habitat;
- Minimize stockpiled soils or excavated material;
- Avoid stockpiling soils or excavated material within 30 m of watercourses and wetlands;
- Exposed soils will be stabilized as soon as practical to minimize emissions of fine particulate matter and soil erosion;
- Proper labelling of chemical storage containers will be completed and appropriate material safety data sheets (MSDS) for stored chemicals will be stored on-site to reduce the likelihood of accidents or spills and to ensure the safety of workers on-site;
- Where appropriate, secondary containment containers and spill prevention measures will be employed;
- A watercourse and wetland alteration (WAWA) permit under the *Clean Water Act* will be obtained prior to any work within 30 m of a watercourse or wetland. Additional mitigation measures as outlined in the conditions of approval of the WAWA will be adhered to and a copy of the site-specific WAWA permit will be kept on-site;
- Fill and excavated materials will not be stockpiled for long periods of time to reduce the likelihood of sedimentation. Fill/excavation material piles will be covered with tarps if left standing for more than 24 hours;
- No refueling or maintenance of equipment or machinery will occur within 30 m of a watercourse or wetland and, where possible, will be completed over an impermeable surface;
- Weather will be monitored and additional erosion and sediment control (ESC) measures such as the installment of hay bales and check dams or silt fences will be employed, as appropriate, should stockpiled fill be present in unexpected heavy rain events; and

- ESC structures will follow specifications as outlined in the WAWA technical guidelines and will be inspected weekly, as well as prior to any heavy rainfall (> 25 mm over 24 hours) events to ensure they are continuing to operate properly.

3.2.3.3 Summary

Construction activities have the potential to result in changes to surface water and groundwater without the proper mitigation employed. No interactions will occur during the Operation and Maintenance phase due to the passive nature of that phase. Although the Project areas are within 30 m of a watercourse (i.e., Kennebecasis River and Taylors Brook), with the implementation of the planned mitigation indicated above, including obtaining a WAWA permit for any activity carried out within 30 m of a watercourse, interactions between the Project and surface water and groundwater are not anticipated to be substantive and are limited to the local PDA.

3.2.4 Fish and Fish Habitat

The fish and fish habitat valued component (VC) includes aquatic life such as freshwater fish, benthic invertebrate species, and the habitat that supports them, as well as aquatic species at risk (SAR). Fish and fish habitat are considered a VC: because of their importance in supporting aquatic life; as a fisheries resource; as food source for humans, other fish, and wildlife; for providing recreational opportunities; and because they are of importance to the public, stakeholders, and Indigenous communities.

Fish and fish habitat are protected through the federal *Fisheries Act* as well as the New Brunswick *Fish and Wildlife Act* and the New Brunswick *Watercourse and Wetland Alteration Regulation – Clean Water Act*.

For the purposes of this assessment, SAR and SOCC are defined as:

- **Species at Risk (SAR):** any species listed as “Extirpated”, “Endangered”, “Threatened”, and “Special Concern” on Schedule 1 of the federal *Species at Risk Act* (SARA) or listed under the New Brunswick *Species at Risk Act* (NB SARA); and
- **Species of Conservation Concern (SOCC):** species that are not SAR, but are listed in other sections of SARA, listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or identified as “extremely rare” (S1), “rare” (S2), or “uncommon” (S3) by the Atlantic Canada Conservation Data Centre (AC CDC).

3.2.4.1 Existing Conditions

The Project is located along the eastern bank of the Kennebecasis River situated within the Saint John River basin. In addition, Taylors Brook runs north of the Project, and through the wetland at Turnbull Court, before flowing into the Kennebecasis River (refer to **Figure 3.2.1**). The Kennebecasis River watershed drains an area of 2,056 km² (NBDELG 2007), with the drainage area consisting of predominantly undeveloped wooded terrain and agricultural land. The Kennebecasis River is home to

31 fish species, including 5 marine species that occur in the Kennebecasis Bay and 11 diadromous fish species (CRI 2011).

There are 53 fish species identified within the Saint John River basin, the greatest natural diversity of freshwater fish in Maine and Atlantic Canada (CRI 2011). The Canadian Rivers Institute (CRI 2011) indicates that many stable and healthy populations and communities exist throughout the basin; however, some populations demonstrate signs of stress. Key stressors to the fish populations within the basin include poor management of wastewater, river flow, and fish passage (i.e., dams; CRI 2011).

A custom Atlantic Canada Conservation Data Centre (AC CDC) report (**Appendix C**) was obtained for a five km radius around the PDA. According to the AC CDC records review (AC CDC 2021), there are historical observations of two aquatic species at risk (SAR) or species of conservation concern (SOCC) within five km of the PDA, Atlantic salmon (*Salmo salar*) – outer Bay of Fundy population, and shortnose sturgeon (*Acipenser brevirostrum*). In addition, the Department of Fisheries and Oceans (DFO) aquatic species at risk map reported shortnose sturgeon in the vicinity of the Project in the Kennebecasis River (DFO 2021). American eel (*Anguilla rostrata*) was reported to have been historically observed within 100 km of the PDA (AC CDC 2021).

3.2.4.2 Environmental Interactions Assessment

Potential Interactions

Temporary measures to protect fish and fish habitat during the Construction phase of the Project will be implemented as some activities will occur in, and within the buffer of, a wetland which is hydrologically connected to Taylors Brook and the Kennebecasis River. As such, there is potential for impacts from the PDA to reach the Kennebecasis River if appropriate mitigation measures are not put in place. There are no direct anticipated interactions to Taylors Brook (i.e., in-water works) planned for the Project as the new infrastructure will direct the sewage to the pumping station south of Taylors Brook where it will be pumped across the Route 100 traffic bridge. The existing pipe bridge that crosses Taylors Brook will be plugged.

At its closest points, the area of disturbance associated with the Project is within 27 m of the Kennebecasis River to the west, and less than 10 m from Taylors Brook to the north. In addition, by upgrading the current wastewater infrastructure in this area, untreated sewage will no longer leach into the wetland or adjacent Kennebecasis River, thereby reducing interactions between untreated wastewater and the Kennebecasis River, fish, and fish habitat. As the areas of disturbance are within 30 m of a watercourse, a WAWA permit under the *Clean Water Act* is required to carry out the Project.

Mitigation

During the Construction phase, the following general mitigation measure for the aquatic environment will be applied:

- No work is to be conducted within 30 m of the Kennebecasis River or Taylors Brook or any wetland without obtaining and complying with a WAWA permit;

- Soil will not be stockpiled within 30 m of any watercourse or wetland;
- All chemicals and petroleum products will be managed in accordance with manufacturer specifications and stored more than 30 m from any watercourse or wetland;
- Refuelling equipment and vehicles will be conducted more than 30 m from any watercourse or wetland and where possible, over an impermeable surface;
- All waste materials will be secured and/or stabilized until they can be transported offsite for disposal to prevent them from entering any aquatic habitat;
- Ground disturbance work will not be completed during significant storm events;
- ESC structures will follow specifications as outlined in the WAWA technical guidelines and will be inspected weekly, as well as prior to any heavy rainfall (> 25 mm over 24 hours) events to ensure they are continuing to operate properly;
- Routine maintenance of ESC measures will be performed to address concerns identified during the inspections to ensure they are continuing to operate properly;
- In the event of a significant ESC failure that results in non-compliance with permit/approval, all work will be immediately stopped, and all available resources will immediately focus on mitigating the failure(s) in an effort to minimize negative impacts; and
- Where appropriate, siltation prevention measures (i.e., silt fences) shall be installed. Sediment control structure shall be monitored and maintained on a daily basis.

3.2.4.3 Summary

Due to the location of existing infrastructure and siting considerations within the town of Rothesay, Project activities will occur within the 30 m buffer of the Kennebecasis River and Taylors Brook, although no in-water work is planned. There is a potential for sediment-laden runoff to reach the Kennebecasis River; however, by avoiding high precipitation events and installing sediment control measures, these interactions will be limited and controlled. Substantive interactions with fish and fish habitat are not expected during Construction. No interactions will occur during the Operation and Maintenance phase.

3.2.5 Vegetation and Wetlands

Wetlands are defined as land where the water table is at, near, or above the land's surface, or land 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 (NBDNRE-NBDELG 2002; NTNB 2018). Vegetation is included in this section due to the potential for interactions with rare plants and Project activities, particularly SAR or SOCC that may occur in wetlands.

For the purposes of this assessment, SAR and SOCC are defined as:

- **Species at Risk (SAR):** any species listed as "Extirpated", "Endangered", "Threatened", or "Special Concern" on Schedule 1 of the federal *Species at Risk Act* (SARA) or listed under the New Brunswick *Species at Risk Act* (NB SARA); and

- **Species of Conservation Concern (SOCC):** species that are not SAR, but are listed in other sections of SARA, listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or identified as “extremely rare” (S1), “rare” (S2), or “uncommon” (S3) by the Atlantic Canada Conservation Data Centre (AC CDC).

Wetlands often support rare or uncommon species assemblages and the New Brunswick *Wetlands Conservation Policy* and other regulatory processes are guided towards the goal of achieving no net loss of wetland function (NBDNRE-NBDELG 2002).

Vegetation and wetlands were selected as a VC because of their relationship with water resources, wildlife and wildlife habitat, and other biological and physical components addressed as VCs in this EIA Registration. In addition, wetlands are widely recognized as providing a host of ecosystem functions and benefits including, but not limited to:

- Filtering pollutants and heavy metals;
- Mitigating flood events; and
- Providing habitat to many SAR in New Brunswick such as the wood turtle (*Glyptemys insculpta*), least bittern (*Ixobrychus exilis*), and yellow rail (*Coturnicops noveboracensis*; NTN 2018).

Project activities have the potential to cause adverse environmental effects through the proposed physical destruction and alteration of wetland habitat, as well as terrestrial and aquatic vegetation. New Brunswick’s wetlands have been given specific protection pursuant to the New Brunswick *Clean Environment Act* and the *Clean Water Act*. The NBDELG requires a permit for any alteration within 30 m of the banks of a watercourse or regulated wetland (i.e., Watercourse and Wetland Alteration [WAWA] permit).

3.2.5.1

Existing Conditions

Regional Setting

The information regarding the presence and characterization of wetlands and the characterization of vegetation communities within the PDA was derived from several sources including existing databases and secondary information sources (i.e., desktop analysis) as well as field surveys. The methods conducted during the desktop analysis and field surveys are presented below.

The PDA is located within the Valley Lowlands Ecoregion and, more specifically, within the Kingston Ecodistrict, which straddles the Kingston Peninsula and the valleys of the Kennebecasis Bay and River, and the Belleisle Bay and Long Reach (Zelazny 2007). The ecodistrict is characterized by the Kennebecasis River and the Belleisle Bay, which define the Kingston Peninsula. The ecodistrict has a maximum elevation of 220 metres above mean sea level (m amsl).

Based on the New Brunswick Department of Natural Resources and Energy Development’s (NBDNRED) Mineral Resource Division’s Bedrock Geology of the Saint John Area (NTS 21 G/08) map, the bedrock underlying the Project location consists of Late Neoproterozoic to Early Cambrian granodiorite of the Golden Grove Plutonic Suite (Renforth Granodiorite). Soils in the area surrounding the Turnbull Court

wetland are from the Lomond Association, a well-developed podzol consisting of sandy loam and having good capacity for moisture retention (Aalund & Wicklund 1950). Soils within the wetland (i.e., where the majority of the PDA is located) were assessed in the field during the field wetland delineation.

Precambrian igneous and sedimentary rocks occur in the Rothesay area. This includes limestone belonging to the Green Head Group which are the oldest rocks in the province (about 1 billion years old; Zelazny 2007). Shallow, medium-textured soils cover much of the area, as they are derived from the igneous and sedimentary rocks. Within this ecoregion, southern vegetation species such as intolerant hardwoods and red spruce (*Picea rubens*) have a higher composition than the more northerly species. In total, about 30 of the province's tree species are found in the ecoregion, including those with an affinity for a warmer climate such as butternut (*Juglans cinerea*), basswood (*Tilia americana*), ironwood (*Ostrya virginiana*), silver maple (*Acer saccharinum*), green ash (*Fraxinus pennsylvanica*), and white ash (*Fraxinus americana*; Zelazny 2007). In addition to the forest species, understory species characteristic to the region include dogtooth violet (*Erythronium americanum*), hay-scented fern (*Dennstaedtia punctilobula*), and Christmas fern (*Polystichum acrostichoides*), along with alternate-leaved dogwood (*Cornus alternifolia*) and riverbank grape (*Vitis riparia*) in the lowest elevations (Zelazny 2007).

Desktop Analysis

Prior to completing the field surveys, Dillon reviewed readily-available information from reputable sources. The information was reviewed to evaluate the potential for vegetation SOCC and/or SAR within the general area of the Project and to assist in scoping/focussing efforts for the field surveys. Dillon completed a review of the following sources and data lists:

- A custom AC CDC report (AC CDC 2021);
- Various NBDELG and New Brunswick Department of Natural Resources and Energy Development (NBDNRED) publications;
- The federal SARA registry;
- The provincial SARA registry;
- Publicly-available Geographic Information Systems (GIS) map layers and databases;
- High-resolution aerial photography; and
- GeoNB wetland and watercourse mapping.

A custom AC CDC report was obtained in December 2021 for the Rothesay area to cover the extents of various infrastructure upgrades within the town (AC CDC 2021). The report lists historical observations of species of flora and fauna, including rare species, SOCC, and SAR within and around the Project sites (refer to **Appendix C**; shown on **Figure 3.2.3**). It should be noted that a historical observation of a SAR or SOCC documented in the AC CDC report does not necessarily imply that these species are or will be present in the Project area, but rather that they were observed at some time in the past as having been present. The AC CDC report nonetheless provides useful information as to the types of species that might potentially be present in the PDA, which informs the field surveys for potential target species of interest.



TURNBULL COURT EIA

TOWN OF ROTHESAY

VEGETATION & WILDLIFE

FIGURE 3.2.3

- Species of Conservation Concern, Bird
- ⬠ Species of Conservation Concern, Invertebrate
- ▲ Species of Conservation Concern, Plant
- Street
- Highway
- Existing Sanitary Sewer
- Existing Sanitary Pipe Alignment
- Proposed Pipe Alignment
- - - Proposed Pipe Impact Area
- Delineated Wetland



SERVICE LAYER CREDITS: SOURCE: ESRI, MAXAR, EARTHSTAR GEOGRAPHICS, AND THE GIS USER COMMUNITY

MAP CREATED BY: GAM
 MAP CHECKED BY: BG
 MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

SCALE 1:20,000
 0 150 300 Meters
 PROJECT: 19-9889
 STATUS: DRAFT
 DATE: 2023-01-18

Wetland Determination, Delineation, and Functional Assessment

Field Wetland Delineation

The field wetland determination and delineation methods described herein are based upon established protocols for wetland delineation, as outlined by the *US Army Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region* (USACE 2012). Wetland determination and delineation is focussed on establishing the wetland-upland edge, and is based on the presence of positive indicators for three parameters:

- Hydric soils;
- Hydrophytic vegetation; and
- Wetland hydrology.

A positive indicator must typically be present for all three parameters in order to definitely identify the boundary (edge) of a wetland. Sample points for these three parameters were established at representative locations within the wetlands.

Upon positive wetland determination (i.e., positive indicators identified for soils, hydrology and vegetation), a wetland edge condition was established based on the indicators identified at the three-parameter sample points. This edge condition was used to navigate around the perimeter of the wetland, which was in turn georeferenced with a handheld Geographical Positioning System (GPS) unit (3 to 5 m accuracy).

Hydric Soils

Hydric soil conditions are formed when an area is exposed to flooding or saturation for a sufficient length of time during the growing season such that an anaerobic (oxygen free) environment is formed in the soil. These anaerobic conditions may manifest themselves in a variety of ways, such as through the formation of redox features (reduction-oxidation), organic soils (i.e., peat), or formation of hydrogen sulphide (rotten egg odour), among many other indicators. Interpretation of soil profiles, their associated colour, texture and presence/absence of any hydric soil indicators provides the basis for judgment of whether or not any given soil is a hydric soil (USDA 2010).

Soil sampling was performed to a depth of approximately 50 cm (or to point of refusal) to identify conditions in both wetland and upland soils. Soil horizons were documented in terms of their texture, thickness, color (Munsell value/chroma/hue) and presence of hydric soil indicators (where applicable).

Hydric soil indicators were determined as per the document titled *Field Indicators of Hydric Soils in the United States* (USDA 2010). *Wetland Delineation Data Sheets* were used to record data collected in the field. The data sheets provide the detailed soil information for each sample point, as well as list the various possible hydric soil indicators.

Hydrophytic Vegetation

Hydrophytic vegetation arises in areas where saturation or inundation by water is of duration sufficient to exert a controlling influence on the plant community assemblage. In such areas, plant species which

are adapted to high-moisture environments tend to dominate. In order for a given area to classify as a wetland, hydrophytic vegetation should account for the majority (> 50%) of the sample sites' total vegetation (Environmental Laboratory 1987).

For every plant species, there is a wetland indicator status, which may be interpreted as that species' estimated probability of occurring within a wetland (Environmental Laboratory 1987). If the majority of plant cover in the sample area is comprised of species with facultative (FAC), facultative wetland (FACW), or obligate (OBL) statuses, then the positive indicator for hydrophytic vegetation is met. Wetland indicator statuses for plant species were determined as per USDA Region 1 (Nova Scotia and New Brunswick) listings for interpreting USDA Wetland Indicator Statuses).

Species encountered at each of the sample locations were analysed at three strata (tree, shrub, and herbaceous) and were documented in terms of their percent (%) cover within a given plot size (10 m, 5 m, and 2 m radius, respectively) and their wetland indicator status (i.e., FAC, FACW, and OBL).

Wetland Hydrology

Both in the soil pits prepared and over the greater area of the wetland, observations were made concerning the presence of a hydrological regime, which would sustain wetland processes. Taken into consideration were: the site context, site location, and the microtopography of the wetland area.

Primary hydrology indicators (of which at least one must be present) include surface water, high water table, saturation, sediment deposits, among many other others (Environmental Laboratory 1987).

Secondary indicators (of which two are required, in the absence of a primary indicator) include surface soil cracks, drainage patterns and moss trim lines among others.

Wetland Delineation Results

Boreal Environmental biologists certified in wetland identification, delineation, and ecology visited the wetland on October 5, 2021 to complete a wetland delineation as per the *New Brunswick Protocol for Wetland Delineation in New Brunswick* (NBDELG 2021).

The wetland located within and adjacent to the Project is classified as a 7.04 hectare (ha) riverine floodplain and is located adjacent to the Kennebecasis River (**Figure 3.2.1**). It has been identified as a provincially significant wetland (PSW) by the NBDELG. There is a train track running parallel to the river, separating the river and the wetland, but the river and wetland are still hydrologically connected as there is a bridge spanning the outlet. The wetland's inlet is Taylors Brook and the wetland outlets directly into the Kennebecasis River, approximately 40 m from the northernmost point of the PDA. The soil conditions in the wetland were saturated and identified as a depleted matrix, with the water table being approximately 20 cm below the surface at the time of the October 2021 field survey. Field staff also noted disturbed soil conditions from infilling. Other indicators of wetland hydrology included a high water table, saturation, drift deposits, and water-stained leaves.

Photos 3.2.1 and **3.2.2** below show the typical vegetation present in the wetland. For more photos of the wetland and the wetland data sheets, refer to the wetland delineation report in **Appendix D**.



Photo 3.2.1: Representative Photo of Shrub and Herb Strata in the Turnbull Court Wetland (October 5, 2021)



Photo 3.2.2: Representative Photo of Tree Stratum in the Turnbull Court Wetland (October 5, 2021)

Table 3.2.2 describes the vegetation profile of the wetland and **Table 3.2.3** describes the soil profile.

Table 3.2.2: Vegetation Profile of the Wetland

Stratum	Vegetation Species
Tree Stratum	Red ash (FACW; <i>Fraxinus pennsylvanica</i>)
Shrub Stratum	Red ash (FACW), grey alder (FACW; <i>Alnus incana</i>)
Herb Stratum	Bluejoint reed grass (FAC; <i>Calamagrostis canadensis</i>), sensitive fern (FACW; <i>Onoclea sensibilis</i>), royal fern (OBL; <i>Osmunda regalis</i>), swamp yellow loosestrife (FACW; <i>Lysimachia terrestris</i>), alternate-leaved dogwood (FAC; <i>Cornus alterniflora</i>), field horsetail (FAC; <i>Equisetum arvense</i>), reed canary grass (FACW; <i>Phalaris arundinacea</i>), northern bugleweed (FACW; <i>Lycopus uniflorus</i>), and white meadowsweet (FAC; <i>Spiraea alba</i>).

Notes:

- OBL = obligate wet
- FACW = facultative wet
- FAC = facultative

Table 3.2.3: Soil Profile of the Wetland

Depth (cm)	Matrix	Redox Features	Texture
0-1	n/a	n/a	Organic
1-29	7.5 YR 3/1	None	Silt
29-37	10 YR 4/3	None	Sand
37-50	7.5 YR 3/1	None	Mucky Silt

Functional Assessment Methods and Results: WESP-AC

The Wetland Ecosystem Services Protocol of Atlantic Canada (WESP-AC) represents a standardized approach to the way data is collected and interpreted to indirectly yield relative estimates of a wide variety of important wetland functions and their associated benefits. WESP-AC generates scores (0 to 10 scale) and ratings (“Lower”, “Moderate”, or “Higher”) for a variety of wetland functions using visual assessments of weighted ecological indicators. The number of indicators that is applied to estimate a particular wetland function depends on which function is being assessed.

The indicators are then combined in a spreadsheet using logic-based, mathematical models to generate the score and rating for each wetland function and benefit (NBDELG 2018b). Together, they provide a profile of “what a wetland does.”

For each function, the scores and ratings represent a particular wetland’s standing relative to those in a statistical sample of non-tidal wetlands previously assessed in the province (98 for New Brunswick; NBDELG 2018b). **Table 3.2.4** provides a list of various functions, their definitions, and potential benefits.

Table 3.2.4: Benefits of Wetland Functions Scored by WESP-AC (NBDELG 2018b)

Function	Definition	Potential Benefits
Hydrologic Functions:		
Water Storage and Delay	The effectiveness for storing runoff or delaying the downslope movement of surface water for long or short periods.	Flood control, maintain ecological systems
Stream Flow Support	The effectiveness for contributing water to streams especially during the driest part of a growing season.	Support fish and other aquatic life
Water Quality Maintenance Functions:		
Water Cooling	The effectiveness for maintaining or reducing temperature of downslope waters.	Support cold water fish and other aquatic life
Sediment and Retention Stabilization	The effectiveness for intercepting and filtering suspended inorganic sediments thus allowing their deposition, as well as reducing energy of waves and currents, resisting excessive erosion, and stabilizing underlying sediments or soil	Maintain quality of receiving waters. Protect shoreline structures from erosion
Phosphorous Retention	The effectiveness for retaining phosphorus for long periods (> 1 growing season)	Maintain quality of receiving waters
Nitrate Removal and Retention	The effectiveness for retaining particulate nitrate and converting soluble nitrate and ammonium to nitrogen gas while generating little or no nitrous oxide (a potent greenhouse gas).	Maintain quality of receiving waters
Organic Nutrient Transport	The effectiveness for producing and subsequently exporting organic nutrients (mainly carbon), either particulate or dissolved.	Support food chains in receiving waters
Ecological (Habitat) Functions:		
Fish Habitat	The capacity to support an abundance and diversity of native fish (both anadromous and resident species)	Support recreational and ecological values

Function	Definition	Potential Benefits
Aquatic Invertebrate Habitat	The capacity to support or contribute to an abundance or diversity of invertebrate animals which spend all or part of their life cycle underwater or in moist soil. Includes dragonflies, midges, clams, snails, water beetles, shrimp, aquatic worms, and others.	Support salmon and other aquatic life Maintain regional biodiversity
Amphibian and Reptile Habitat	The capacity to support or contribute to an abundance or diversity of native frogs, toads, salamanders, and turtles.	Maintain regional biodiversity
Waterbird Feeding Habitat	The capacity to support or contribute to an abundance or diversity of waterbirds that migrate or winter but do not breed in the region.	Support hunting and ecological values Maintain regional biodiversity
Waterbird Nesting Habitat	The capacity to support or contribute to an abundance or diversity of waterbirds that nest in the region.	Maintain regional biodiversity
Songbird, Raptor, and Mammal Habitat	The capacity to support or contribute to an abundance or diversity of native songbird, raptor, and mammal species and functional groups, especially those that are most dependent on wetlands or water	Maintain regional biodiversity
Native Plant Habitat and Pollinator Habitat	The capacity to support or contribute to a diversity of native, hydrophytic, vascular plant species, communities, and/or functional groups, as well as the pollinating insects linked to them	Maintain regional biodiversity and food chains
Public Use and Recognition*	Prior designation of the wetland, by a natural resource or environmental agency, as some type of special protected area. Also, the potential and actual use of a wetland for low-intensity outdoor recreation, education, or research.	Commercial and social benefits of recreation. Protection of public investments

A WESP-AC functional assessment was performed on the Turnbull Court wetland by Boreal Environmental biologists on June 23, 2022, the results of which are presented below in **Table 3.2.5**. The results of the functional assessment were typically rated as “Higher”, with only a few function and benefits rated as “Moderate”, and only two “Lower” benefits ratings. Compared to the normalized function score, the normalized benefits score is calculated independently of the function score and describes the context in which the certain function is being performed and it is currently associated with current land uses.

Table 3.2.5: Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC) Results for the Turnbull Court Wetland

Wetland Functions or Other Attributes:	Function Score (Normalized)	Function Rating	Benefits Score (Normalised)	Benefits Rating
Water Storage and Delay (WS)	3.65	Moderate	10.00	Higher
Stream Flow Support (SFS)	8.75	Higher	4.77	Moderate
Water Cooling (WC)	3.58	Moderate	8.04	Higher
Sediment Retention and Stabilization (SR)	5.27	Higher	8.08	Higher
Phosphorus Retention (PR)	4.77	Higher	7.08	Higher
Nitrate Removal and Retention (NR)	2.40	Moderate	10.00	Higher

Wetland Functions or Other Attributes:	Function Score (Normalized)	Function Rating	Benefits Score (Normalised)	Benefits Rating
Carbon Sequestration (CS)	6.64	Higher		
Organic Nutrient Export (OE)	7.67	Higher		
Anadromous Fish Habitat (FA)	8.84	Higher	9.92	Higher
Resident Fish Habitat (FR)	7.42	Higher	10.00	Higher
Aquatic Invertebrate Habitat (INV)	7.60	Higher	8.28	Higher
Amphibian and Turtle Habitat (AM)	4.87	Moderate	9.21	Higher
Waterbird Feeding Habitat (WBF)	7.55	Higher	10.00	Higher
Waterbird Nesting Habitat (WBN)	6.46	Higher	10.00	Higher
Songbird, Raptor, and Mammal Habitat (SBM)	8.48	Higher	10.00	Higher
Pollinator Habitat (POL)	8.23	Higher	6.67	Moderate
Native Plant Habitat (PH)	6.02	Higher	7.81	Higher
Public Use and Recognition (PU)			3.27	Moderate
Wetland Sensitivity (Sens)			8.74	Higher
Wetland Ecological Condition (EC)			2.89	Lower
Wetland Stressors (STR) (higher score means more stress)			8.87	Higher
Summary Ratings for Grouped Functions:				
HYDROLOGIC Group (WS)	3.65	Moderate	10.00	Higher
WATER QUALITY SUPPORT Group (max+avg/2 of SR, PR, NR, CS)	5.71	Higher	9.19	Higher
AQUATIC SUPPORT Group (max+avg/2 of SFS, INV, OE, WC)	7.83	Higher	7.66	Higher
AQUATIC HABITAT Group (max+avg/2 of FA, FR, AM, WBF, WBN)	7.93	Higher	9.91	Higher
TRANSITION HABITAT Group (max+avg/2 of SBM, PH, POL)	8.03	Higher	9.08	Higher
WETLAND CONDITION (EC)			2.89	Lower
WETLAND RISK (average of Sensitivity and Stressors)			8.81	Higher

As defined by NBDELG (2018) in the manual for Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC): Non-tidal Wetlands, wetland ecosystem condition is the health and integrity of the wetland. For the purposes of WESP-AC, this is measured primarily by the wetlands vegetation, as that is the only meaningful indicator of wetland ecosystem health that can be assessed rapidly.

Wetland and Upland Vegetation Communities

Vegetation in the PDA was surveyed by Boreal Environmental biologists experienced in vegetation identification in New Brunswick in June 2022. Following a desktop analysis for the PDA, vegetation

(including both wetland and upland vegetation communities, with a primary focus on vegetation SOCC and SAR) was assessed within the PDA, the methods of which are described below.

In addition to the wetland delineation and functional assessment, vegetation communities within the PDA were inventoried by Boreal Environmental biologists skilled in the identification of common and rare plant species of New Brunswick. The vascular plant inventory for the PDA was completed June 2022. A master plant list is provided in **Appendix E**.

Although there were no vegetation SAR or SOCC identified within the PDA in the AC CDC records review, two SOCC were encountered in the PDA during vegetation surveys: white ash (*Fraxinus americana*) and red ash (*Fraxinus pennsylvanica*; **Figure 3.2.3**). White ash is listed as S3S4 (vulnerable to apparently secure) by AC CDC, and red ash is listed as S3 (uncommon) by AC CDC. No SAR were identified during the surveys.

3.2.5.2 Environmental Interactions Assessment

Potential Interactions

As currently proposed, the Project has the potential to affect wetland ecosystems through direct (though temporary) loss of wetland area or function as well as indirect loss or change in function. Clearing of vegetation and grubbing and excavating the existing pipe to replace it will result in the physical loss of wetland area and an associated loss in wetland function; these losses will be regained over time after construction is complete and as vegetation re-establishes. In addition, wetland function has the potential to be affected by other construction activities, including sedimentation from excavation activities and/or stockpiling of excavated materials which will affect the aquatic fauna within the wetland as well as surface water quality within the wetland. Sedimentation could also result in changes to pH and nutrient concentrations within the wetland, impacting plant growth within the wetland.

Invasive species could be introduced into the Turnbull Court wetland from machinery or vehicles using the PDA. Vegetation removal in the wetland or areas adjacent to the wetland may also alter habitat for wetland wildlife and herbaceous plant species.

Specifically, approximately 0.0993 ha (993 m²) of the field delineated Turnbull Court wetland is anticipated to be permanently altered as a direct result of the replacement of the sanitary sewer line. In addition, approximately 0.26 ha of the field delineated Turnbull Court wetland is anticipated to be temporarily altered as a result of being disconnected from the main body of the wetland during the installation of the new sanitary sewer line (**Figure 3.2.1**). Overall, a total of approximately 0.36 ha of wetland will be affected, out of the 0.41 ha PDA. Further extents of the wetland will be indirectly impacted by sedimentation, but it is impossible to estimate the extents of the disturbance at this time.

Mitigation

Vegetation

In general, vegetation removal and ground disturbance will be minimized where possible, and areas with trees and shrubs will be cleared outside the months of April-September, if clearing is necessary for construction. General mitigation measures for the terrestrial vegetation include the following:

- Where possible, vegetation will be preserved to maintain wildlife habitat and wetland function;
- The Project footprint will be limited to that which is absolutely necessary to allow the Project to be carried out;
- Proper labelling of chemical storage containers will be completed, and appropriate MSDS for stored chemicals will be stored on-site to reduce the likelihood of accidents or spills and to ensure the safety of workers on-site;
- Where appropriate, secondary containment containers and spill prevention measures will be employed;
- A plan for handling fill and construction materials for the site will be communicated to the contractor (i.e., if stockpiling is required, materials will be stored away from any watercourse or wetland or removed from site to a predetermined location) with an intent to minimize soil stockpiled, and the duration that soil is stockpiled at the site;
- Any necessary tree or vegetation removal will occur outside the period of April-September, so as to not disturb nesting birds, and relevant SAR permits will be obtained, if necessary;
- The source of any new fill materials will be approved and the material will be inspected prior to construction; and
- Existing roads and trails will be used, where possible, to limit disturbance of the Project footprint.

Wetlands

The following mitigation measures will be implemented to avoid or reduce the adverse impacts of the Project on the Turnbull Court wetland:

- No work is to be conducted within 30 m of the Kennebecasis River or Taylors Brook or any wetland without obtaining and complying with a WAWA permit;
- Any work within the riverine floodplain wetland boundary will be compensated for at a ratio approved by the NBDELG;
 - A Wetland Compensation Plan that meets the applicable NBDELG requirements will be developed and submitted to NBDELG for review and approval.
- Soil will not be stockpiled within 30 m of any watercourse or wetland;
- All chemicals and petroleum products will be managed in accordance with manufacturer specifications and stored more than 30 m from any watercourse or wetland;
- Refuelling equipment and vehicles will be conducted more than 30 m from any watercourse or wetland and where possible, over an impermeable surface;
- All waste materials will be secured and/or stabilized until they can be transported offsite for disposal to prevent them from entering any aquatic habitat;

- Ground disturbance work will not be completed during significant storm events;
- ESC structures will follow specifications as outlined in the WAWA technical guidelines and will be inspected weekly, as well as prior to any heavy rainfall (> 25 mm over 24 hours) events to ensure they are continuing to operate properly;
- Routine maintenance of ESC measures will be performed to address concerns identified during the inspections to ensure they are continuing to operate properly;
- In the event of a significant ESC failure that results in non-compliance with permit/approval, all work will be immediately stopped, and all available resources will immediately focus on mitigating the failure(s) in an effort to minimize negative impacts; and
- Where appropriate, siltation prevention measures (i.e., silt fences) shall be installed. Sediment control structure shall be monitored and maintained on a daily basis.

3.2.5.3 Characterization of Potential Interactions

The Turnbull Court wetland is identified by NBDELG as a provincially significant wetland (PSW). According to the New Brunswick *Wetlands Conservation Policy* (2002), a PSW is a wetland that has provincial, national, or international significance for one of seven reasons listed in the policy. The Turnbull Court wetland is classified as a PSW because of the following reason of the Policy:

“Wetlands that have a significant hydrologic value including flood control, water quality protection, recharge or discharge of groundwater.” (NBDNRE-NBDELG 2002)

All wetlands in the Lower Saint John River Floodplain that fall below the 2018 flood line have been designated as PSWs due to their importance in mitigating flood impacts. This designation is of particular importance to this Project, as the New Brunswick *Wetlands Conservation Policy* states that the government will not support any activities in a PSW or within the 30 m buffer of a PSW unless the activity is deemed to provide necessary public function, after completing an EIA with public review (NBDNRE-NBDELG 2002).

The New Brunswick *Wetlands Conservation Policy* defines necessary public function as:

“Activities that provide public function on a provincial scale such as public transportation projects, public infrastructure, linear pipeline or transmission corridors, and projects necessary for public safety.” (NBDNRE-NBDELG 2002)

The Turnbull Court sanitary sewer line Project is a necessary upgrade serving the public good and providing a necessary public function due to the following reasons:

- The sanitary sewer line serves 17 residences within the town of Rothesay, and is necessary for the safe and healthy conveyance of sewage to be directed to wastewater treatment facilities;
- The current sanitary sewer line is past its reasonable lifetime and is breaching in certain places, leaking raw sewage into the Turnbull Court PSW; and
- The new sanitary sewer line will be moved above the flood line, where possible, to prevent sewage leakage into the Kennebecasis River during major floods.

Based on this, despite the unavoidable temporary impacts to the PSW during Construction that will eventually lead to natural revegetation growth and re-establishment of wetland function in the PDA over time, the Town of Rothesay respectfully submits that the Project will serve a necessary public function, in the public interest, and is justifiable under the circumstances, as long as a WAWA permit, defined and proven mitigation, and wetland compensation (if deemed necessary by NBDELG) are in place to avoid or reduce unnecessary impacts to the PSW.

3.2.5.4 Summary

During the Construction phase of the Project, vegetation removal and alteration work within the wetland is required to complete the Project. Activities within the wetland will result in temporary impacts to the PSW. With the above proposed mitigation measures, impacts to the wetland will be concentrated to the smallest area possible. Though the wetland is a PSW, this Project is for the necessary public good of the residents of the town of Rothesay, making it a necessary infrastructure upgrade Project that provides a necessary public function that is in the public interest. With permitting and compensation in place to offset the loss of wetland function, the Project is not expected to result in substantive interactions with vegetation and wetlands.

3.2.6 Wildlife and Wildlife Habitat

Wildlife and wildlife habitat includes wildlife (fauna) and the habitats that support wildlife species. This VC is focussed on birds, mammals, invertebrates, and herptiles within terrestrial components of their lifecycle, as well as the habitats that support them. Wildlife and wildlife habitat is selected as a VC because of potential interactions between wildlife, its habitat, and proposed Project activities. SAR and SOCC are of particular focus in this assessment because they are often susceptible to changes in the environment and are therefore useful indicators of ecosystem health and regional biodiversity.

For the purposes of this assessment, SAR and SOCC are defined as:

- **Species at Risk (SAR):** any species listed as “Extirpated”, “Endangered”, “Threatened”, and “Special Concern” on Schedule 1 of the federal *Species at Risk Act* (SARA) or listed under the New Brunswick *Species at Risk Act* (NB SARA); and
- **Species of Conservation Concern (SOCC):** species that are not SAR, but are listed in other sections of SARA, listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or identified as “extremely rare” (S1), “rare” (S2), or “uncommon” (S3) by the Atlantic Canada Conservation Data Centre (AC CDC).

Wildlife and wildlife habitat were selected as a VC because of their relationship with vegetation and wetlands, and other biological and physical components addressed as VCs in the EIA Registration. Also, wildlife are recognized as contributing to biodiversity and are valued by people. Project activities have the potential to cause adverse environmental effects through the proposed physical destruction of wildlife habitat, in particular the Turnbull Court wetland and its associated vegetation. The wildlife and wildlife habitat VC has strong connections to the vegetation and wetlands VC (**Section 4.2.5**). Fish and fish habitat are discussed in **Section 4.2.4**.

3.2.6.1

Existing Conditions

Information regarding the use of the PDA by wildlife and the presence of wildlife habitat was derived from several sources, including existing databases, secondary information sources, as well as a limited bird survey on-site.

Resident and Migratory Birds

The vast majority of bird species found in New Brunswick are migratory and either breed in the province during the summer months, or pass through it during the spring and fall migratory periods; therefore, jurisdiction for many migratory birds is federal, since migratory birds cross both provincial and international boundaries. The *Migratory Birds Convention Act* (MBCA) is the federal law which protects migratory birds in Canada, with similar legislation in the United States. The Act prohibits killing, injuring, or harassing migratory birds, their nests, or their young without a permit. Furthermore, species listed pursuant to the federal SARA or NB SARA are afforded further protection as harm, the destruction of their nest, eggs, or young is prohibited. Migratory birds that are protected under the MCBA in Canada, and that are relevant to the Project include:

- Waterfowl (e.g., ducks and geese);
- Rails (e.g., coots, gallinules, sora, and other rails);
- Shorebirds (e.g., plovers and sandpipers); and
- Songbirds (e.g., thrushes and warblers).

Birds not addressed under federal jurisdiction include: grouse, quail, pheasants, ptarmigan, hawks, owls, eagles, falcons, cormorants, pelicans, crows, jays, and kingfishers. Most birds not included in this list are protected under provincial laws, most notably the New Brunswick *Fish and Wildlife Act*. The New Brunswick *Fish and Wildlife Act* protects all fish and wildlife species (including all vertebrate animals or birds) from angling, hunting, trapping, and other forms of intentional take, except under the authority of permits or licenses. The Act also prohibits the disturbance, gathering, or collection of nests or eggs of any bird species, except under the authority of a permit. Under Section 4 of the *Act*, some wildlife and bird species (including American Crow (*Corvus brachyrhynchos*), Double-crested Cormorant (*Phalacrocorax auritus*), and European Starling (*Sturnus vulgaris*) may be taken if they present a risk of injury to landowners or a risk of property damage, but this requires a nuisance permit.

Species at Risk Database Review

A custom AC CDC report was obtained in December 2021 for the Rothesay area to cover the extents of various infrastructure upgrades within the town (AC CDC 2021). The report lists historical observations of species of flora and fauna, including rare species, SOCC, and SAR within and around the Project sites (refer to **Appendix C; Figure 3.2.3**). It should be noted that a historical observation of a SAR or SOCC documented in the AC CDC report does not necessarily imply that these species are or will be present in the Project area, but rather that they were observed at some time in the past as having been present. The AC CDC report nonetheless provides useful information as to the types of species that might potentially be present in the PDA, which informs the field surveys for potential target species of interest.

A review of the AC CDC database indicated that there were 50 records of 19 vertebrate SAR or SOCC historically observed within 5 km of the PDA, and 17 of those were avian species. Of the avian species, six are considered SAR (see **Table 3.2.6**), and the remainder SOCC. There are also two “location sensitive” listed bird species that were historically observed within five km of the Project: Bald Eagle (*Haliaeetus leucocephalus*) and Peregrine Falcon (*Falco peregrinus*; AC CDC 2021), for a total of eight avian SAR within five km of the PDA.

Table 3.2.6: Historical Species at Risk Observations within 5 km of the PDA, According to AC CDC (2021)

Common Name	Scientific Name	Number of Observations	Conservation Status	Year	Distance from Centre of PDA	Comments
Bank Swallow	<i>Riparia riparia</i>	1	SARA: Threatened S-Rank: S2B	1989	4.5 ± 7.0	Confirmed breeding; adult occupying nest.
Barn Swallow	<i>Hirundo rustica</i>	4	SARA: Special Concern NB SARA: Threatened S-Rank: S2B	1988	4.5 ± 7.0	Probably breeding; adult visiting nest site.
				1989	4.5 ± 7.0	Confirmed breeding; adult occupying nest.
				2009	4.2 ± 5.0	Confirmed breeding; recently fledged and/or dependent young.
				2009	4.1 ± 5.0	Possible breeding: adult in suitable nesting habitat and season
Olive-sided Flycatcher	<i>Contopus cooperi</i>	1	SARA: Special Concern NB SARA: Threatened S-Rank: S3B	2006	4.2 ± 5.0	Possible breeding: adult in suitable nesting habitat and season
Common Nighthawk	<i>Chordeiles minor</i>	3	SARA: Special Concern NB SARA: Threatened S-Rank: S3B, S4M	2007	4.1 ± 5.0	Possible breeding: adult in suitable nesting habitat and season
				2010	4.1 ± 5.0	Possible breeding: adult in suitable nesting habitat and season
				2012	4.4 ± 0.0	N/A

Common Name	Scientific Name	Number of Observations	Conservation Status	Year	Distance from Centre of PDA	Comments
Eastern Wood-pewee	<i>Contopus virens</i>	3	SARA: Special Concern NB SARA: Special Concern S-Rank: S3B	2006	4.2 ± 5.0	Possible breeding: singing male in suitable nesting habitat and season.
				2009	4.2 ± 5.0	Possible breeding: singing male in suitable nesting habitat and season.
				2012	4.4 ± 0.0	Confirmed breeding: adult attending young.
Canada Warbler	<i>Cardellina canadensis</i>	8	SARA: Special Concern NB SARA: Threatened S-Rank: S3S4B	1989	4.2 ± 7.0	Possible breeding: singing male in suitable nesting habitat and season.
				2007	4.1 ± 5.0	Confirmed breeding: adult carrying food.
				2007	4.1 ± 5.0	Probable breeding: pair in suitable nesting habitat and season.
				2009	4.2 ± 5.0	Confirmed breeding: adult carrying food.
				2008	4.1 ± 5.0	Probable breeding: adult in suitable nesting habitat and season.
				2009	4.1 ± 5.0	Confirmed breeding: adult carrying food.
				2010	4.1 ± 5.0	Probable breeding: pair in suitable nesting habitat and season.
2009	4.7 ± 0.0	Probable breeding: pair in suitable nesting habitat and season.				

Notes:

S1: critically imperiled S4: apparently secure
S2: imperiled S5: secure
S3: vulnerable M: migratory
B: breeding

Environment and Climate Change Canada (ECCC) provides general avoidance information for migratory birds, including regional nesting periods during which most migratory bird species covered under the MBCA breed. The PDA is located in Breeding Zone C3, where most migratory birds breed from mid-April until late August each year (specifically April 12-August 28; ECCC 2018); however, it is noted that some avian species breed outside of this period, including corvids, crossbills, owls, and waxwings.

Field Survey

Birds in the PDA were surveyed by Boreal Environmental biologists certified in bird visual and auditory identification on June 23, 2022. Following a desktop analysis for the PDA, breeding birds were assessed. One point count was conducted. A total of 56 individual birds of 22 different species were detected. A summary of species found within the PDA and surrounding area is shown in **Table 3.2.7**. None of these species are listed under SARA or NB SARA.

Table 3.2.7: Species Summary of Breeding Bird Survey in Turnbull Court Wetland (June 23, 2022)

Common Name	Scientific Name	AC CDC S-Rank	Number of Individuals Observed
Alder Flycatcher	<i>Empidonax alnorum</i>	S5B	3
American Crow	<i>Corvus brachyrhynchos</i>	S5	1
American Goldfinch	<i>Spinus tristis</i>	S5	2
American Redstart	<i>Setophaga ruticilla</i>	S5B	4
American Robin	<i>Turdus migratorius</i>	S5B	7
Black-and-White Warbler	<i>Mniotilta varia</i>	S5B	2
Black-capped Chickadee	<i>Poecile atricapillus</i>	S5	1
Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	S1S2B	1
Black-throated Green Warbler	<i>Setophaga virens</i>	S5B	1
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	S5B	2
Common Grackle	<i>Quiscalus quiscula</i>	S5B	6
Common Yellowthroat	<i>Geothlypis trichas</i>	S5B	2
Downy Woodpecker	<i>Dryobates pubescens</i>	S5	1
Grey Catbird	<i>Dumetella carolinensis</i>	S4B	1
Mallard	<i>Anas platyrhynchos</i>	S5B,S4N	1
Mourning Dove	<i>Zenaida macroura</i>	S5B,S4N	1
Northern Cardinal	<i>Cardinalis cardinalis</i>	S4	2
Northern Parula	<i>Setophaga americana</i>	S5B	6
Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B	3
Song Sparrow	<i>Melospiza melodia</i>	S5B	7
Tree Swallow	<i>Tachycineta bicolor</i>	S4B	1
Veery	<i>Catharus fuscescens</i>	S4B	1

Table 3.2.8 below shows the breeding statuses of birds surveyed. 22 bird species were counted in total, though some were detected more than once. During breeding bird surveys, any evidence of breeding activities is recorded for each bird (e.g., singing, calling, carrying food) and matched to a breeding code (e.g., possible, observed, probable).

Table 3.2.8: Birds Detected during June 23, 2022 Breeding Bird Survey and their Breeding Evidence and Breeding Code

Common Name	Scientific Name	Number of Individuals Observed	Breeding Evidence	Breeding Code	Comments
Grey Catbird	<i>Dumetella carolinensis</i>	1	Singing	Possible	
Song Sparrow	<i>Melospiza melodia</i>	1	Singing	Possible	
Red-eyed Vireo	<i>Vireo olivaceus</i>	1	Singing	Possible	
Alder Flycatcher	<i>Empidonax alnorum</i>	1	Singing	Possible	
Black-and-White Warbler	<i>Mniotilta varia</i>	1	Singing	Possible	
Northern Parula	<i>Setophaga americana</i>	1	Singing	Possible	
American Robin	<i>Turdus migratorius</i>	1	Singing	Possible	
American Redstart	<i>Setophaga ruticilla</i>	1	Singing	Possible	
Northern Parula	<i>Setophaga americana</i>	1	Singing	Possible	
Red-eyed Vireo	<i>Vireo olivaceus</i>	1	Singing	Possible	
Northern Cardinal	<i>Cardinalis cardinalis</i>	1	Singing	Possible	
Northern Parula	<i>Setophaga americana</i>	1	Singing	Possible	
American Robin	<i>Turdus migratorius</i>	1	Singing	Possible	
Mourning Dove	<i>Zenaid macroura</i>	1	Singing	Possible	
Veery	<i>Catharus fuscescens</i>	1	Singing	Possible	
Common Yellowthroat	<i>Geothlypis trichas</i>	1	Singing	Possible	
American Redstart	<i>Setophaga ruticilla</i>	1	Singing	Possible	
Alder Flycatcher	<i>Empidonax alnorum</i>	1	Singing	Possible	
Northern Parula	<i>Setophaga americana</i>	1	Singing	Possible	
American Robin	<i>Turdus migratorius</i>	1	Singing	Possible	
American Robin	<i>Turdus migratorius</i>	1	Singing	Possible	
American Robin	<i>Turdus migratorius</i>	1	Fledgling calling	Confirmed	Fledgling
American Goldfinch	<i>Spinus tristis</i>	1	Calling during flyover	Observed	
Song Sparrow	<i>Melospiza melodia</i>	1	Observed	Observed	
Black-throated Green Warbler	<i>Setophaga virens</i>	1	Singing	Possible	
Alder Flycatcher	<i>Empidonax alnorum</i>	1	Singing	Possible	
Song Sparrow	<i>Melospiza melodia</i>	1	Singing	Possible	
Northern Parula	<i>Setophaga americana</i>	1	Singing	Possible	
American Robin	<i>Turdus migratorius</i>	1	Singing	Possible	
Common Yellowthroat	<i>Geothlypis trichas</i>	1	Singing	Possible	
Northern Parula	<i>Setophaga americana</i>	1	Singing	Possible	
Song Sparrow	<i>Melospiza melodia</i>	1	Singing	Possible	

Common Name	Scientific Name	Number of Individuals Observed	Breeding Evidence	Breeding Code	Comments
American Redstart	<i>Setophaga ruticilla</i>	1	Singing	Possible	
American Robin	<i>Turdus migratorius</i>	1	Observed	Observed	
Red-eyed Vireo	<i>Vireo olivaceus</i>	1	Singing	Possible	
Black-and-White Warbler	<i>Mniotilta varia</i>	1	Singing	Possible	
Song Sparrow	<i>Melospiza melodia</i>	1	Singing	Possible	
Mallard	<i>Anas platyrhynchos</i>	1	Calling	Possible	
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	1	Singing	Possible	
Northern Cardinal	<i>Cardinalis cardinalis</i>	1	Singing	Possible	
American Redstart	<i>Setophaga ruticilla</i>	1	Singing	Possible	
Song Sparrow	<i>Melospiza melodia</i>	1	Singing	Possible	
Song Sparrow	<i>Melospiza melodia</i>	1	Singing	Possible	
Downy Woodpecker	<i>Dryobates pubescens</i>	1	Singing	Possible	
Black-capped Chickadee	<i>Poecile atricapillus</i>	1	Singing	Possible	
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	1	Singing	Possible	
American Goldfinch	<i>Spinus tristis</i>	1	Singing	Possible	
Common Grackle	<i>Quiscalus quiscula</i>	3	Calling	Possible	3
Tree Swallow	<i>Tachycineta bicolor</i>	1	Observed	Observed	Foraging over water
Common Grackle	<i>Quiscalus quiscula</i>	3	Food carry	Confirmed	At least 3 observed food carry
Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	1	Observed	Observed	Adult black crown night heron
American Crow	<i>Corvus brachyrhynchos</i>	1	Calling	Possible	

Mammals (Including Bats)

The *Wild Species: General Status of Species in Canada* reports that there are 53 extant species of mammals known to occur within New Brunswick, and an additional four species which are extinct, extirpated, or unverified (CESCC 2022). Of these 53 species, Canada lynx (*Lynx canadensis*) is listed as Endangered under NB SARA, and three bat species are listed as Endangered under SARA and NB SARA including the little brown bat (little myotis; *Myotis lucifugus*), northern long-eared bat (northern myotis; *Myotis septentrionalis*), and eastern pipistrelle (tri-coloured bat; *Perimyotis subflavus*). There are no known bat hibernacula within 5 km of the PDA.

Invertebrates

Lists of lepidopterans (butterfly and moth) and odonate (dragonfly and damselfly) species in New Brunswick are also maintained in the *Wild Species: General Status of Species in Canada* database (CESCC 2022). The database currently lists 1,713 lepidopterans species and 141 odonate species known to occur in the province. Of these species, one (Maritime ringlet, *Coenonympha nipisiquit*, a butterfly) is a SAR listed as Endangered under SARA and NB SARA, 15 (four butterflies and 11 odonates) are considered May be At Risk SOCCs, and 13 (one butterfly and 12 odonates) are considered Sensitive (neither SAR nor SOCC). The cobblestone tiger beetle (*Cicindela marginipennis*), Maritime ringlet, and skillet clubtail (*Gomphus ventricosus*, an odonate) are SAR that are listed as Endangered under SARA, while the monarch butterfly (*Danaus plexippus*) and pygmy snaketail (*Ophiogomphus howei*, an odonate) are considered to be SAR as they are listed as Special Concern under Schedule 1 of SARA. The skillet clubtail, cobblestone tiger beetle, and the Maritime ringlet have very limited populations in New Brunswick that are not located in the immediate vicinity of the Kennebecasis River.

A review of the AC CDC (2021) data report indicated that there were three records of monarch butterflies historically observed within 5 km of the PDA, though none have historically been observed within the PDA or within 1 km of it. Refer to **Appendix C** for the full report from AC CDC.

Herptiles

The *Wild Species: General Status of Species in Canada* database (CESCC 2022) reports that there are seven reptile and 16 amphibian species known to occur in New Brunswick. Of these species, one (wood turtle [*Glyptemys insculpta*]) is considered to be At Risk, and one (dusky salamander [*Desmognathus fuscus*]) is considered to be Sensitive. Both SARA and NB SARA list the wood turtle as Threatened and the snapping turtle (*Chelydra serpentina*) as Special Concern; both are considered SAR.

A review of the AC CDC (2021) report indicated that there were no records of historical observations of wood turtle or snapping turtle within 5 km of the Project footprint.

Environmentally Sensitive Areas

The AC CDC (2021) report indicates that there are two biologically significant sites and one managed area within 5 km of the PDA (**Table 3.2.9**).

Table 3.2.9: Biologically Significant Sites and Managed Areas within Five km of the PDA (AC CDC 2021)

Name	Type	Distance from Turnbull Court PDA
Minister's Face, Long Island ESA	Biologically Significant Site	2.7 km
Renforth Bog ESA	Biologically Significant Site	2.6 km
Minister's Face Nature Preserve	Managed Area (Nature Preserve)	2.5 km

Minister's Face Nature Preserve and environmentally sensitive area (ESA) are located on Long Island in the Kennebecasis River. The cliffs of Minister's Face are considered an ESA due to the presence of rare arctic flora habitat and they are often visited by Peregrine Falcons, which are a SAR historically observed

in the area (NTNB 2022). Rare plants located in the preserve include livelong saxifrage (*Saxifraga paniculata*), alpine woodsia (*Woodsia alpina*), smooth draba (*Draba glabella*), and wall-rue fern (*Asplenium ruta-muraria*; NTNB 2022).

There are no provincially-identified deer wintering areas (DWAs) or Protected Natural Areas (PNAs) within 5 km of the Project footprint.

3.2.6.2 Environmental Interactions Assessment

Potential Interactions

Due to the urban/developed nature of the PDA and its surrounding area (the town of Rothesay) and the limited presence of wildlife, there is low potential for wildlife to be affected during the Project. Potential temporary interactions with wildlife and wildlife habitat during the Construction phase include loss of wildlife habitat (e.g., vegetation removal and wetland alteration) and construction activities interacting with wildlife (e.g., sensory disturbance). Without proper mitigation, the potential environmental effects to priority wildlife could include temporary disturbance of foraging fauna during Project activities, harm to wildlife from construction equipment, or permanent destruction of habitat or nests. If any turtles are observed during any of the Project phases and activities, a mitigation plan will be developed specifically for turtles.

Mitigation

During Project activities, the following mitigation measures for wildlife and wildlife habitat will be applied:

- Vegetation will be retained where possible to maintain wildlife habitat;
- The footprint of the Project will be limited to that which is absolutely necessary to enable the Project to be carried out;
- Construction activities will be outside the breeding bird season;
- Existing roads, trails, or disturbed areas will be utilized, if possible, to limit disturbance of the Project footprint and to minimize interactions with wildlife and wildlife habitat;
- To minimize wildlife encounters, the site and working areas shall be kept clean of food scraps and garbage and will be removed from the site daily;
- In the case of wildlife encounters, the following shall be implemented:
 - No attempt will be made by any worker at the Project site to chase, catch, divert, follow or otherwise harass wildlife by vehicle or on foot,
 - Equipment and vehicles will yield the right-of-way to wildlife, and
 - If a SAR or a nest of any bird is encountered during activities, work around the nest shall cease until the Town dispatches a qualified biologist to assess the situation and appropriate mitigation is applied.
- If Project work extends outside the winter season, the Project areas will be visually checked on a daily basis for nesting migratory birds. Should a nesting migratory bird be identified within the work

area, ECCC/Canadian Wildlife Service (CWS) will be notified and an appropriate no-work buffer zone (in consultation with ECCC/CWS) will be applied around the nest until the nest has been fledged. No flagging of the nest will occur to minimize chances of predation;

- Fill and excavated materials will not be stockpiled for long periods of time to deter the potential for nesting by Bank Swallows or other ground nesting species (e.g., Common Nighthawk). Fill/excavation material piles will be covered with tarps if left standing for more than 24 hours;
- To minimize disruptions with wildlife activity at night, the Project construction activities will be limited to daylight hours. If night work is required, approval from the Town will be required. Lighting requirements will meet ECCC standards to minimize the potential impacts to migratory birds and bat;
- All workers will adhere to the provincial and federal *Species at Risk Act*;
- All workers will adhere to the *Migratory Birds Convention Act* and the *Migratory Birds Regulations*; and
- Any nuisance wildlife as identified under the *Nuisance Wildlife Regulation (97-141)* of the *Fish and Wildlife Act* identified as disrupting Project-related activities may only be removed by a licensed Nuisance Wildlife Control Officer or a licensed trapper.

3.2.6.3

Summary

The Construction phase of the Project will result in the loss of wildlife habitat through vegetation removal and loss of wetland function in a provincially significant wetland (PSW). In order to mitigate these losses, any wetland area loss will be compensated for through wetland compensation/enhancement programs. As per New Brunswick's *Wetland Compensation Policy*, the government will not support any activities within, or within the 30 m buffer of, a PSW, with the exception of: "*activities deemed to provide necessary public function, after completing an Environmental Impact Assessment with public review*" (NBDNRE-NBDELG 2002). In addition, any area where vegetation is removed will be re-vegetated with native vegetation species following construction activities. Therefore, with proposed mitigation, the residual interactions of the Project with wildlife and wildlife habitat are not anticipated to be substantive.

3.2.7

Socioeconomic Environment

The Project has the potential to interact with the socioeconomic environment, which includes land and resource use, employment, and the local economy. These potential interactions concern regulatory agencies, non-governmental organizations, and the general public because they can have a direct influence on the lives of those living and working in the vicinity of a project. The socioeconomic environment has therefore been selected as a valued component (VC) in recognition of these concerns and values of New Brunswickers.

3.2.7.1

Existing Conditions**Demographic and Economic Overview**

Based on the 2021 census (Statistics Canada 2022), the population in the town of Rothesay in 2021 was 11,977, up 2.7% from 11,659 in 2016 (Statistics Canada 2017). The population density of the town is 346.2 persons per square kilometre, compared to 10.9 persons per square kilometre for the province. The age distribution of people living in Rothesay for the 2021 census indicates that the largest portion of the population is in the 15-64 age range, followed by the 65 and over age range. The 0-14 and 15-64 age ranges have decreased since 2016, with the 65+ age range increasing.

Land Use

The Project is located in the town of Rothesay (the town), in Kings County, New Brunswick. In 1998, five former communities (i.e., East Riverside-Kinghurst, Fairvale, Renforth, Rothesay, and Wells) amalgamated to form the town of Rothesay (Town of Rothesay 2022). The town is an evolving commuter suburban community with a land use pattern made up a broad range of residential, commercial, industrial, recreation, and institutional uses at various intensities, with residential land being the predominant land use.

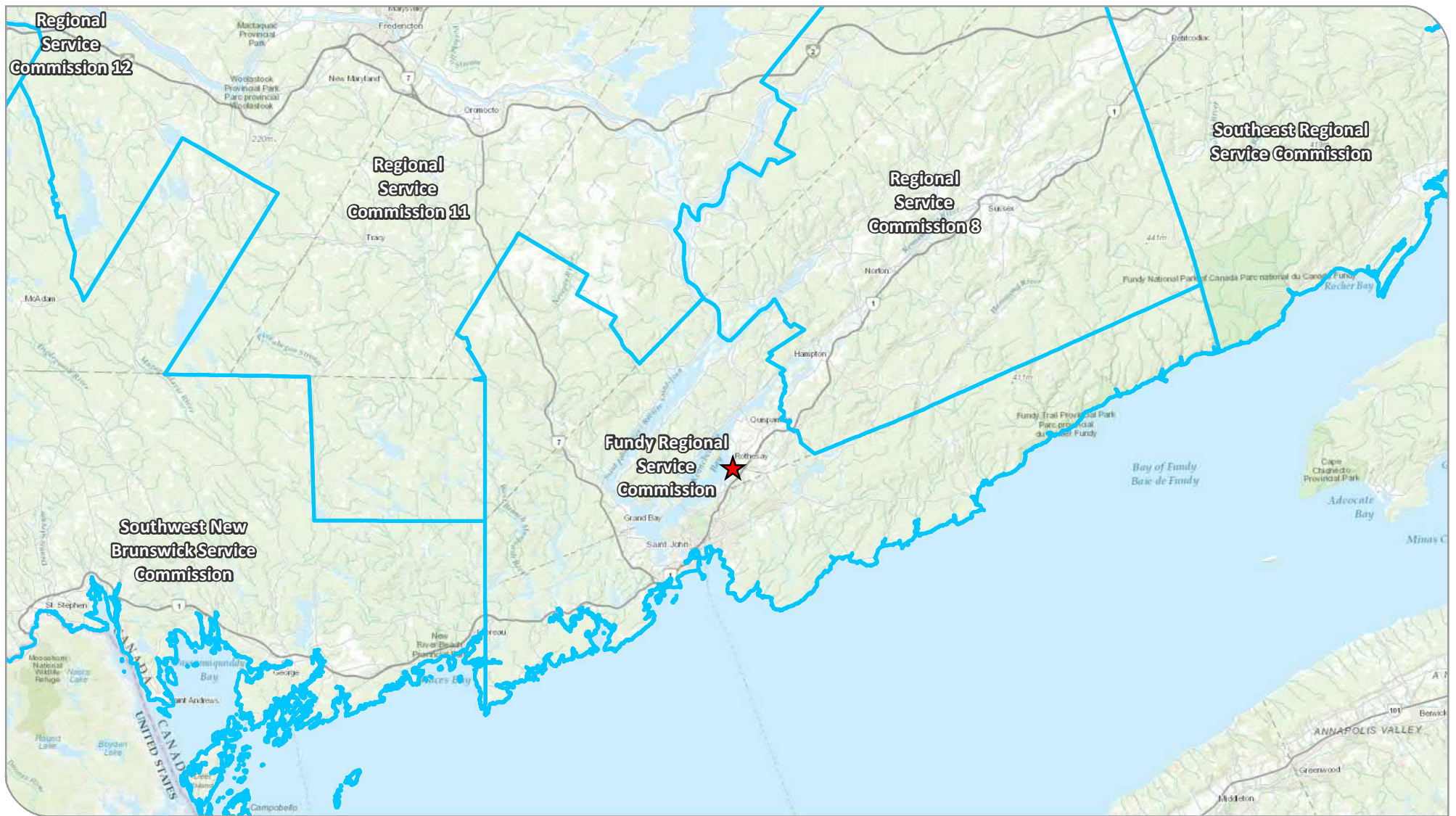
It is also worth noting that, although the town is located within the Fundy Regional Service Commission (RSC), the municipality administers its own planning regulations, as per the *Community Planning Act, 2017*. Planning in the unincorporated areas outside of municipal boundaries are administered by the RSC. Existing land use designations are shown on **Figure 3.2.3**.

Infrastructure and Services

Residential land use is the most dominant land use designation within the town. Statistics Canada's 2021 census for the town indicates that there are 4,870 occupied private dwellings within the town (Statistics Canada 2021), up from 4,365 in 2016 (Statistics Canada 2017). The majority of the population of Rothesay commutes to Saint John for employment and the city of Saint John is recognized as the regional service centre (Town of Rothesay 2021).

Institutional facilities to note within Rothesay include Rothesay Netherwood School (RNS). RNS is a private boarding and day school situated on 200 acres, providing university-preparatory education for grades 6-12 (Town of Rothesay 2021). In addition to RNS, Touchstone Academy provides private education to students from Kindergarten to Grade 5. There are also three public elementary schools, two public middle schools, and a public high school located within the town.

The town of Rothesay, along with the town of Quispamsis, are serviced by the Kennebecasis Valley Fire Department (KVFD) and the Kennebecasis Regional Police Force. The KVFD operates out of two stations, one in Quispamsis, and one at 7 Campbell Drive in Rothesay. Emergency medical services in the town are provided by Ambulance New Brunswick (ANB), and health services are provided by Horizon Health Network.





TURNBULL COURT EIA

TOWN OF ROTHESAY

FUNDY REGIONAL SERVICE COMMISSION

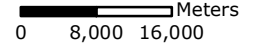
FIGURE 3.2.4

-  Project Location
-  Regional Service Boundaries



SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, INTERMAP, INCREMENT P CORP., GEBCO, USGS, FAO, NPS, NRCAN,

MAP CREATED BY: GAM
 MAP CHECKED BY: BG
 MAP PROJECTION: NAD 1983 CSRS New Brunswick Stereographic

SCALE 1:800,000


PROJECT: 19-9889
 STATUS: DRAFT
 DATE: 2023-01-18

Environmental Interactions Assessment

Potential Interactions

The Project has the potential to interact with the socioeconomic environment, which includes land use, employment, and the local economy, as well as the ongoing presence of the Project. Without mitigation, the Project may result in environmental effects to the socioeconomic environment such as temporary noise disruption from construction equipment or incompatible land uses. There are no anticipated zoning or land use changes within the town of Rothesay as a result of the Project.

Interactions of the Project with traffic patterns, especially on residential roads, are not anticipated to cause any safety problems to the residents of Rothesay with the appropriate mitigation measures applied, such as following speed limits. In addition, much of the construction will take place during the day.

The Project also has the potential to interact positively with the socioeconomic environment. During the Construction phase, there is a possibility of a temporary infusion of job creation (short-term); however, following the Construction phase, the Project will be job neutral. There will also be a temporary influx of economic activity to the town association with the Project, which may include: local sourcing of materials, hotel room stays, and the usage of local restaurants, gas stations, and grocery stores.

The Project has the potential to interact with nearby residences as a result of light and noise disruption and modest emission of particulate matter and air contaminants generated by construction equipment during construction and decommissioning activities. There is also potential for odour interactions during the decommissioning and removal of the existing pipe. These interactions are expected to be limited.

Mitigation

Mitigation measures or best management practices (BMPs) to reduce potential environmental effects as a result of the interaction between the Project and the socioeconomic environment are identified below:

- The Town of Rothesay will continue to engage with its residents prior to and throughout the duration of the Project to identify and address potential concerns;
- Vehicles and equipment will be equipped with mufflers and maintained, and dust suppression will be applied to stockpiled soil during dry periods;
- Working hours will conform to local by-laws, which state that no person shall operate construction equipment between the hours of 9:00 p.m. and 7:00 a.m.;
- Noise-intrusive activities will be conducted exclusively during daylight hours, Monday to Saturday, excluding statutory holidays;
- Truck drivers will adhere to posted speed limits and warning signage and adjust driving to meet weather and road conditions (especially in residential and school areas);
- It is possible that oversized loads will be required for equipment used during construction. Transportation of these loads on public roads may require permits from the New Brunswick

Department of Transportation and Infrastructure (NBDTI) and may require special markings, lead-and-follow vehicles, and temporary traffic interruptions. In this case, all necessary permits will be obtained and best practices will be followed; and

- Workers will use appropriate personal protective equipment (PPE) and follow industry safety procedures.

3.2.7.3 Summary

In summary, the Project is not expected to have any permanent negative interactions with the socioeconomic environment. Any impacts to the residents of Rothesay are temporary in nature, and air quality in the vicinity of the Project footprint will improve following completion of the Construction phase. No significant land use changes are anticipated within the town. A temporary infusion to the local economy is possible during construction activities, but the Project has a generally neutral effect on jobs. In consideration of the planned mitigation and best practices, the potential interactions between the Project and the socioeconomic environment are not anticipated to be substantive, and no specific follow-up is proposed for the socioeconomic environment. During the Operation and Maintenance phase, impacts to the socioeconomic environment are anticipated to be positive, through continued septic service to the residents of the town.

3.2.8 Heritage and Cultural Resources

Heritage resources, both naturally occurring and human-made, are those resources related to the past that remain to inform present and future societies of that past. Heritage resources includes archaeological resources (e.g., artifacts, features, structures), palaeontological resources (e.g., fossils), and built heritage resources (e.g., historic buildings, complexes). Heritage resources are highly delicate features of the environment and their integrity is susceptible to ground-disturbing activities. A Project activity related to surface or sub-surface ground disturbance has the potential for interaction with heritage resources, where they are present.

Heritage resources has been selected as a valued component (VC) because of its importance to the people of New Brunswick and because these resources are recognized and managed by provincial and federal regulatory agencies. In addition, Indigenous peoples are very interested in the preservation and management of heritage resources, particularly those resources that relate to their individual identities as well as their community history, culture, or traditions — these are sometimes referred to as cultural resources.

3.2.8.1 Existing Conditions

Based on the proximity to the Kennebecasis River, there is potential for Indigenous cultural heritage resources (both pre-contact and historic) or Euro-Canadian resources to exist within the PDA, despite its disturbed nature. Areas with high potential for archaeological and cultural resources may be found along the shoreline of waterbodies such as the Kennebecasis River or Taylors Brook. Dillon retained

Colbr Consulting Ltd. to perform an archaeological impact assessment (AIA, consisting of a pedestrian walkover) for the area, which was completed in fall 2022. It was recommended that no further archaeological work is required, and it was recommended to avoid a small stone wall on the property line between 9 and 13 Domville Lane. Colbr provided the results of the walkover to the New Brunswick Department of Tourism, Heritage, and Culture (NBDTHC), and a final report will be generated during winter 2023.

3.2.8.2 Environmental Interactions Assessment

Potential Interactions

The Project has the potential to interact with heritage and cultural resources via accidental discovery of archaeological resources during construction activities; however, it is unlikely that heritage resources will be encountered in the PDA as the area has all been previously disturbed post-colonization; however, any ground-moving activity has the potential to uncover heritage resources, with heightened probability at this site due to its location adjacent to Taylors Brook and the Kennebecasis River. Without mitigation, environmental effects include the potential permanent destruction of any previously undiscovered archaeological or paleontological resources that might be present within the Project footprint.

Mitigation

Based on the findings of the AIA, the PDA has a generally low potential to harbour archaeological resources. Nonetheless, if any heritage or cultural resources are identified at any point over the course of the Project, the following mitigation measures for archaeological resources will be applied:

- Ground intrusive work activities will not exceed the pre-defined work areas;
- Work in the area must cease immediately and the Archaeology and Heritage Branch of the New Brunswick Department of Tourism, Heritage and Culture will be contacted at (506) 453-2738 for further mitigation;
- Until a qualified archaeologist arrives at the scene, no one shall disturb, move, or re-bury any uncovered artifact;
- Activities at the site may resume only when authorized by Archaeological Services and once mitigation measures have been completed;
- If bones or human remains are found, work in the area must cease, and the RCMP shall be immediately notified;
- No one shall disturb, move or rebury any uncovered human remains;
- If the discovered resources are related to Indigenous culture, the New Brunswick Department of Aboriginal Affairs will be contacted to determine how best to proceed with respect to repatriation of the resources; and
- The New Brunswick Museum of the New Brunswick Department of Tourism, Heritage and Culture will be notified at 506-643-2300, should fossils be encountered during the ground intrusive work.

3.2.8.3

Summary

Given the history of the PDA and the results of the archaeological walkover, the potential to encounter previously undiscovered heritage and cultural resources during the Construction phase is believed to be very low, despite the proximity to Taylors Brook and the Kennebecasis River (note: all areas within 80 metres of a watercourse are considered to have heightened archaeological potential until an AIA determines those areas to be of low potential). As described above, no interactions will occur during the Operation and Maintenance phase. In consideration of the planned mitigation and best practices, the potential interactions between the Project and heritage and cultural resources are not anticipated to be substantive.

3.3

Assessment of Potential Project Interactions with the Environment as a Result of Accidents, Malfunctions, and Unplanned Events

Potential Interactions

There is a potential for accidents, malfunctions, or unplanned events related to any construction project. Without mitigation, the Project could interact with the following VCs as a result of accidents, malfunctions, or unplanned events associated with the Project activities.

- In the event of the failure of ESC measures, the discharge of runoff containing sediment to watercourses (i.e., surface water) and fish and fish habitat during storm events or spring runoff may result in the degradation of those VCs on a temporary basis.
- The accidental release of a hazardous materials through spills could affect groundwater, surface water, and fish and fish habitat through runoff or direct interactions at those VCs from a localized spill meandering into the receiving potable water supply, watercourses, potentially resulting in degradation of water quality or even mortality of fish.
- Several factors including but not limited to the accumulation of waste on-site, accumulation of fill and materials for long periods of time, and minimizing disruptions at night (i.e., lights pointed up) can all increase the potential for interactions with wildlife (i.e., birds), potentially causing avoidance, sensory disturbance, or even mortality.
- Although an AIA was conducted prior to Construction, there is always the possibility to uncover previously undiscovered heritage resources through ground breaking or earth moving activities.

Mitigation

To limit these accidents, malfunctions, and unplanned events during the Project, the following mitigation measures (in addition to those listed in **Section 4.2**) will be followed:

- Construction of the ESC measures using quality materials and sound and proven construction practices in accordance with industry best practices;
- Periodic inspection and maintenance (as required) of the ESC measures, particularly following each precipitation event;

- Storage of chemicals and fuels shall be in an area away from the surrounding terrestrial environment, or direct pathways (i.e., ditches) to the surrounding environment;
- The volume of chemicals and fuels stored on site will be minimized to the extent possible;
- Where appropriate secondary containment containers and spill prevention measures will be employed;
- To avoid/minimize potential hazardous materials spills, spill response kits will be available within the proposed Project areas during all phases of the Project;
- Any spills or leaks that occur will be reported to the appropriate regulatory authorities, if applicable, as soon as possible;
- Remedial action, or engineered controls, for any spills or leaks that occur will be completed;
- If contaminated soil is encountered, it will be reported to NBDELG and managed utilizing the Atlantic Risk Based Corrective Action (RBCA) Framework;
- Refueling, oiling, and maintenance of equipment will be completed in specifically designated areas located at least 30 m away from any watercourse, wetland, or well to minimize potential effects that could arise in the event of a spill;
- Servicing of equipment will be completed off-site by a licensed mechanic; however if required to be completed on-site, the work will be completed over an impervious surface or trap;
- Rubbish and waste materials will be kept at minimum quantities and burning of this material will be prohibited;
- Waste materials will be collected on a regular basis and disposed of at an appropriate approved facility;
- No materials will be burned on site;
- If work is required at night, the area will be appropriately lit with shielded lights pointing downwards;
- Oily rags will be stored in approved receptacles and disposed of at approved waste facilities;
- Chemical and petroleum hydrocarbons will be stored in appropriate containers and in specifically designated areas to reduce potential for leaks. Where applicable, secondary containment of chemicals or petroleum hydrocarbons will be employed;
- Work entailing use of toxic or hazardous materials, chemicals, or otherwise creating hazard to life, safety of health, will be conducted in accordance with National Fire Code of Canada to minimize the potential for spills or fires; and
- If fuel storage is required on-site, double walled fuel storage tanks will be required.

Summary

With the implementation of the planned mitigation, and with the careful development and implementation of contingency and emergency response plans to be applied in the unlikely occurrence of an accident, malfunction, or unplanned event, interactions between the Project and the environment arising from an accident, malfunction, or unplanned event are not anticipated to be substantive.

4.0 Public Involvement

In accordance with the EIA Regulation, direct communication with stakeholders (local residents, elected officials, businesses, etc.) is required. The planned approach to public involvement in respect of the EIA review of the Project is described in this section. Evidence of notification and a summary report detailing engagement efforts and comments received will be provided to the NBDELG within 60 days following registration of the Project.

4.1 Notification of Elected Officials

Following registration of the Project with NBDELG, relevant elected officials will be notified of the project through direct communication (i.e., letter), as outlined in the *Guide to Environmental Impact Assessment in New Brunswick* (NBDELG 2018a). In addition, interested residents will be given the opportunity to review the EIA registration document available to download on the NBDELG website.

Direct written communication will include the following:

- Brief description of the proposed Project;
- Description of the Project location;
- Map showing the location of the Project components;
- Status of the provincial regulatory approval process; and
- Contact information from a Town or Dillon representative who can be contacted for further information.

4.2 Communications to Area Residents

This Project is located entirely on private land, as discussed in **Section 2.1**. Because the Project is linear in nature, there are 11 affected properties:

- 00255463
- 30054381
- 30176630
- 30274104
- 30323190
- 30191407
- 30326813
- 30311211
- 30313597
- 00258582
- 30192629

All affected landowners have been notified of the Project and have provided consent to complete the work (see **Appendix A**).

Following communications to elected officials as well as the comment period following the registration of the Project on the NBDELG website, a communication log and summary report will be submitted to NBDELG, outlining engagement efforts.

5.0 Other Information

5.1 Project-Related Documents

The following documents are related to the undertaking:

- This EIA Registration;
- Wetland Assessment and Delineation and Watercourse and Wetland Alteration Permit Application (December 2021; **Appendix D**); and
- AC CDC Data Report 7136: Rothesay, NB (**Appendix C**).

5.2 Approval of the Undertaking

The following permits and approvals will be obtained once the Certificate of Determination is received and prior to proceeding with the physical components of the Project:

- Approval to Construct from NBDELG; and
- Watercourse and Wetland Alteration Permit from NBDELG.

5.3 Funding

Funding for this Project is provided by the Town of Rothesay.

5.4 Signature

This document is submitted on behalf of the Town of Rothesay.

Oh behalf of the Town of Rothesay

Date of Signature

6.0

Closing

This report was prepared by Dillon Consulting Limited (Dillon) on behalf of the Town of Rothesay. Dillon has used the degree of care and skill ordinarily exercised under similar circumstances at the time the work was performed by reputable members of the environmental consulting profession practicing in Canada. Dillon assumes no responsibility for conditions which were beyond its scope of work. There is no warranty expressed or implied by Dillon.

The material in the report reflects Dillon's best judgment in light of the information available to Dillon at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This report has been prepared by a team of Dillon professionals on behalf of the Town of Rothesay.

7.0

References

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Appendix A

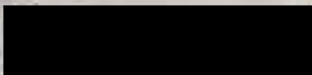
Signed Landowner Agreements



ROTHESAY



January 25, 2021



Rothesay, NB

70 Hampton Road
Rothesay, NB
Canada G8E 2J2

T: 506-848-6600
F: 506-848-6677

Rothesay@rothesay.ca
www.rothesay.ca

Subject: Property Owner Signoff - Wetland and Watercourse (WAWA) Permit

As part of our recent conversation, Rothesay will be proceeding with the 'Turnbull Court Sewer Design - Phase II' construction project (Contract #S-2021-010). This new construction will cross your property on Turnbull Court in Rothesay NB. We are hereby confirming that you have granted us permission to obtain a WAWA permit for your property identified by PID 30191407.

As discussed, since the location of the proposed sewer line is within 30m of a wetland watercourse and located on your property, property owner signoff is required by the New Brunswick Department of Environment and Local Government (NBDELG) to obtain permit to complete the work.

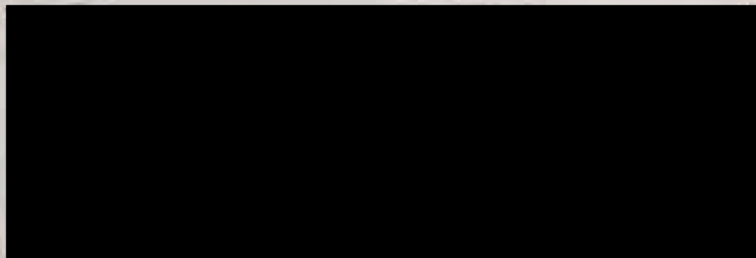
Thank you for your cooperation as we work towards the completion of this project. Please do not hesitate to contact me at 506-848-6600 should you have any questions or concerns.

Sincerely,

Brent McLean, P. Eng.
Director of Operations
Rothesay

c.c. Ryan Briggs (Dillon Consulting)

Signature:



Date:

Rothesay Town Hall

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Grand Bay Westfield - Quisperton - Rothesay - St. Martins - Saint-James



ROTHESAY



January 25, 2022



Rothesay, NB

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F: 506-848-6677

Rothesay@rothesay.ca
www.rothesay.ca

Subject: Property Owner Signoff – Wetland and Watercourse (WAWA) Permit

As part of our recent conversation, Rothesay will be proceeding with the 'Turnbull Court Sewer Design – Phase II' construction project (Contract #S-2021-010). This new construction will cross your property on Turnbull Court in Rothesay NB. We are hereby confirming that you have granted us permission to obtain a WAWA permit for your property identified by PID 30313597.

As discussed, since the location of the proposed sewer line is within 30m of a wetland/watercourse and located on your property, property owner signoff is required by the New Brunswick Department of Environment and Local Government (NBDELG) to obtain permit to complete the work.

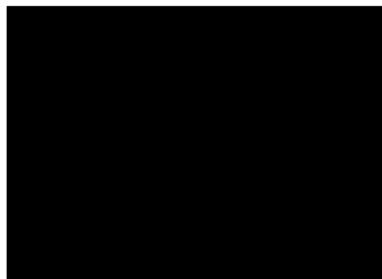
Thank you for your cooperation as we work towards the completion of this project. Please do not hesitate to contact me at 506.848.6600 should you have any questions or concerns.

Sincerely,

Brett McLean, P.Eng.
Director of Operations
Rothesay

c.c. Ryan Briggs (Dillon Consulting)

Signature :



Date:

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Rothesay@rothesay.ca
www.rothesay.ca

Subject: Property Owner Signoff – Wetland and Watercourse (WAWA) Permit

As part of our recent conversation, Rothesay will be proceeding with the 'Turnbull Court Sewer Design – Phase II' construction project (Contract #S-2021-010). This new construction will cross your property on Turnbull Court in Rothesay NB. We are hereby confirming that you have granted us permission to obtain a WAWA permit for your property identified by PID 30192629.

As discussed, since the location of the proposed sewer line is within 30m of a wetland/watercourse and located on your property, property owner signoff is required by the New Brunswick Department of Environment and Local Government (NBDELG) to obtain permit to complete the work.

Thank you for your cooperation as we work towards the completion of this project. Please do not hesitate to contact me at 506.848.6600 should you have any questions or concerns.

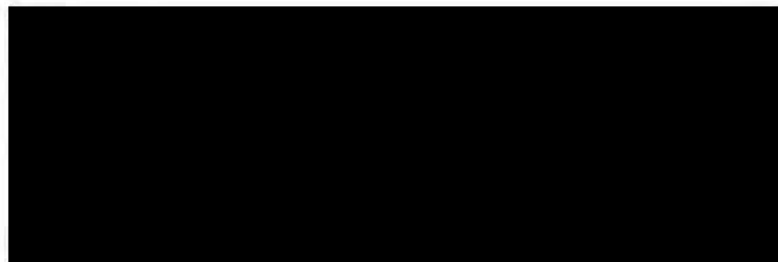
Sincerely,

Brett McLean, P.Eng.
Director of Operations
Rothesay

c.c. Ryan Briggs (Dillon Consulting)

Signature :

Date:



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ROTHESAY



January 25, 2022



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www.rothesay.ca

Subject: Property Owner Signoff – Wetland and Watercourse (WAWA) Permit

As part of our recent conversation, Rothesay will be proceeding with the 'Turnbull Court Sewer Design – Phase II' construction project (Contract #S-2021-010). This new construction will cross your property on Domville Lane in Rothesay NB. We are hereby confirming that you have granted us permission to obtain a WAWA permit for your property identified by PID 30054381 and PID 30342745.

As discussed, since the location of the proposed sewer line is within 30m of a wetland/watercourse and located on your property, property owner signoff is required by the New Brunswick Department of Environment and Local Government (NBDELG) to obtain permit to complete the work.

Thank you for your cooperation as we work towards the completion of this project. Please do not hesitate to contact me at 506.848.6600 should you have any questions or concerns.

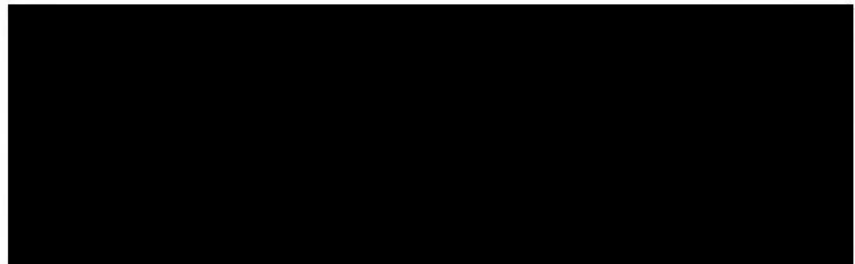
Sincerely,

Brett McLean, P.Eng.
Director of Operations
Rothesay

c.c. Ryan Briggs (Dillon Consulting)

Signature :

Date:



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January 25, 2022



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Rothesay@rothesay.ca
www.rothesay.ca

Subject: Property Owner Signoff – Wetland and Watercourse (WAWA) Permit

As part of our recent conversation, Rothesay will be proceeding with the 'Turnbull Court Sewer Design – Phase II' construction project (Contract #S-2021-010). This new construction will cross your property on Turnbull Court in Rothesay NB. We are hereby confirming that you have granted us permission to obtain a WAWA permit for your property identified by PID 30311211.

As discussed, since the location of the proposed sewer line is within 30m of a wetland/watercourse and located on your property, property owner signoff is required by the New Brunswick Department of Environment and Local Government (NBDELG) to obtain permit to complete the work.

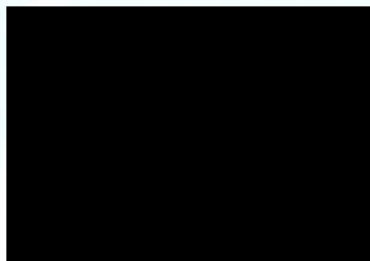
Thank you for your cooperation as we work towards the completion of this project. Please do not hesitate to contact me at 506.848.6600 should you have any questions or concerns.

Sincerely,

Brett McLean, P.Eng.
Director of Operations
Rothesay

c.c. Ryan Briggs (Dillon Consulting)

Signature :



Date:

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January 25, 2022



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Subject: Property Owner Signoff – Wetland and Watercourse (WAWA) Permit

As part of our recent conversation, Rothesay will be proceeding with the 'Turnbull Court Sewer Design – Phase II' construction project (Contract #S-2021-010). This new construction will cross your property on Turnbull Court in Rothesay NB. We are hereby confirming that you have granted us permission to obtain a WAWA permit for your property identified by PID 00258582.

As discussed, since the location of the proposed sewer line is within 30m of a wetland/watercourse and located on your property, property owner signoff is required by the New Brunswick Department of Environment and Local Government (NBDELG) to obtain permit to complete the work.

Thank you for your cooperation as we work towards the completion of this project. Please do not hesitate to contact me at 506.848.6600 should you have any questions or concerns.

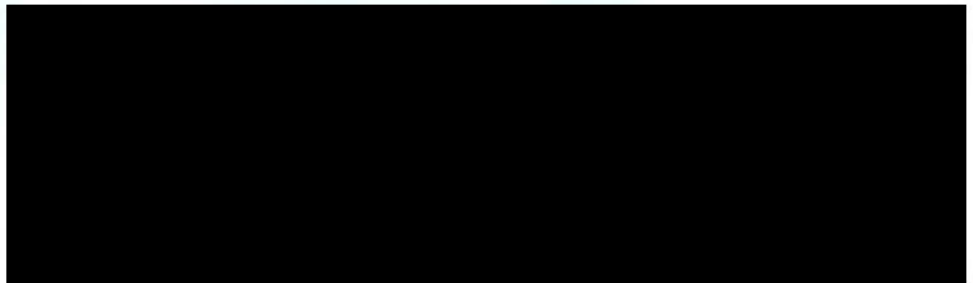
Sincerely,

Brett McLean, P.Eng.
Director of Operations
Rothesay

c.c. Ryan Briggs (Dillon Consulting)

Signature :

Date:



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TEMPORARY CONSTRUCTION EASEMENT
AND HOLD HARMLESS AGREEMENT

THIS TEMPORARY CONSTRUCTION EASEMENT made and entered into this 2nd day of February 2022, between [redacted] party of the first and Rothestay, Kings County, New Brunswick, party of the second part.

WITNESSETH, that the said party of the first part, for and in consideration of the sum of One Dollar and No/100 (\$1.00) paid by the said party of the second part, and other consideration, the receipt and sufficiency of which are hereby acknowledged, does by these presents, grant unto the party of the second part, its agents, contractors, subcontractors and assigns, TO HAVE AND TO HOLD, a temporary easement to engage in construction activity in and upon the premises at 15 Turnbull Court, Rothestay, PID 00258582 , situated in County of Kings, New Brunswick.

This Temporary Construction Easement is granted for the purpose of allowing the Town and its contractor Galbraith Construction Ltd. access to private property along the rear of civic #15 Turnbull Court to replace and existing sanitary sewer line, regrade the disturbed area as per the attached sketch and re-sod the newly graded area within the disturbed zone. There is no cost to the homeowner for this work.

Upon such project completion, this temporary construction zone easement shall terminate and be replaced by a permanent easement to cover the extent of the installed sewer line. It should be noted that re-grading of the disturbed area and associated sod work is expected to commence in early February and be completed in late June 2022. During construction, every effort will be made to avoid damage to, or removal of, any other large trees or shrubs near the work site.

The parties agree that Rothestay's responsibility is limited to:

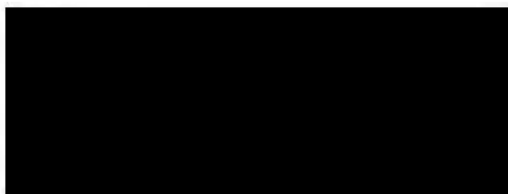
- Excavating and removing the existing sewer line;
- Installing the new sanitary sewer line;
- Re- grading the disturbed area (to provide long term access to the sewer line for maintenance purposes), per that attached sketch;
- Sodding the newly graded area;
- Installing private property signage and gating the entry points near #17 Turnbull and #9 Domville;
- Installing a backflow prevention device (including inspection chamber) along the existing sanitary sewer lateral to civic #15 Turnbull ; and
- Clean up as required

The Party of the first part does hereby covenant to Rothestay that he is lawfully seized and possessed of the real estate above described and has full authority to grant this easement.

IN WITNESS WHEREOF, the said party of the first part has executed these presents the day and year first above written.

Town OF Rothestay _____)

COUNTY OF Kings _____)



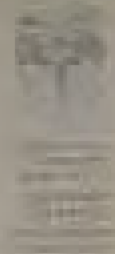
Homeowner Signature

On this 06 day of February, 20 22,

Witness name _____



Witness signature



[Redacted]

Dear [Redacted],

We are pleased to inform you that your application for the position of [Redacted] has been successful. We have received your resume and cover letter, and we were impressed with your qualifications and experience.

We would like to offer you a position of [Redacted] at our [Redacted] location. The position is a full-time, permanent position with a starting salary of [Redacted].

The position involves [Redacted] and will report to [Redacted]. You will be responsible for [Redacted].

We would like to schedule an interview with you on [Redacted] at [Redacted]. Please let us know if you are available and if you need any further information.

Thank you for your interest in Hollister. We look forward to hearing from you.

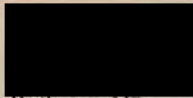
Sincerely,
[Redacted]
[Redacted]
[Redacted]



ROTHESAY



January 25, 2022



Rothesay, NB

70 Hampton Road
Rothesay, NB
Canada E2E 5L5

T: 506-848-6600
F: 506-848-6677

Rothesay@rothesay.ca
www.rothesay.ca

Subject: Property Owner Signoff – Wetland and Watercourse (WAWA) Permit

As part of our recent conversation, Rothesay will be proceeding with the 'Turnbull Court Sewer Design – Phase II' construction project (Contract #S-2021-010). This new construction will cross your property on Domville Lane in Rothesay NB. We are hereby confirming that you have granted us permission to obtain a WAWA permit for your property identified by PID 30342752.

As discussed, since the location of the proposed sewer line is within 30m of a wetland/watercourse and located on your property, property owner signoff is required by the New Brunswick Department of Environment and Local Government (NBDELG) to obtain permit to complete the work.

Thank you for your cooperation as we work towards the completion of this project. Please do not hesitate to contact me at 506.848.6600 should you have any questions or concerns.

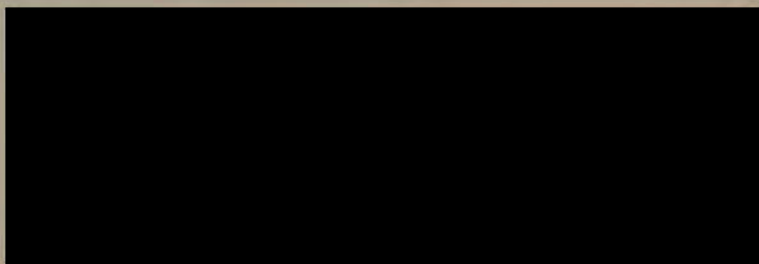
Sincerely,

Brett McLean, P.Eng.
Director of Operations
Rothesay

c.c. Ryan Briggs (Dillon Consulting)

Signature :

Date:



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Appendix B

Project Drawings



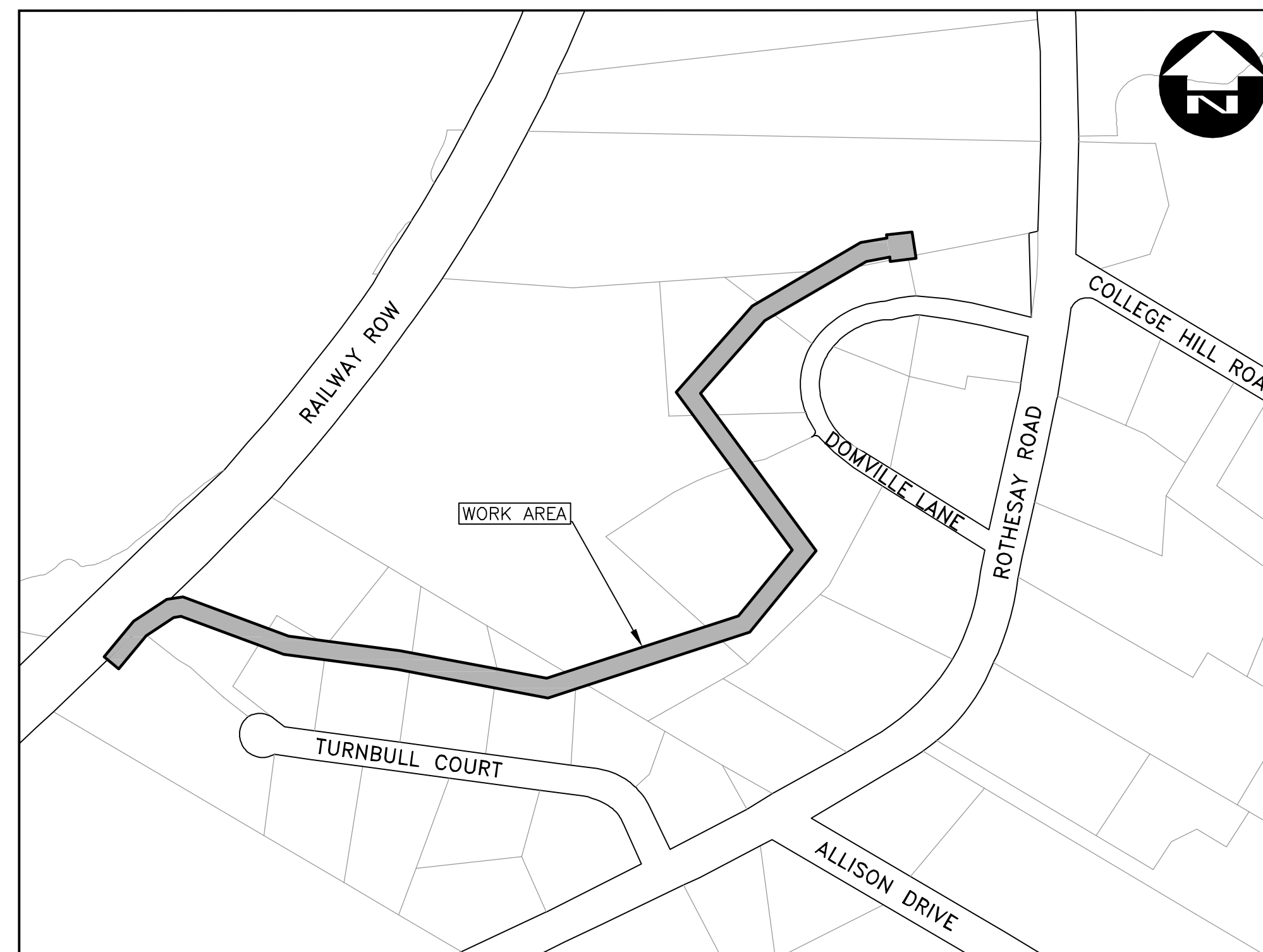
TURNBULL COURT SEWER DESIGN - PHASE II

TOWN OF ROTHESAY

EXISTING	LEGEND	PROPOSED
	PROPERTY LINE	
	RIGHT OF WAY	
	EDGE OF ASPHALT	
	CURB & GUTTER	
	CURB	
	SANITARY SEWER	
	STORM SEWER	
	INLET/OUTLET/CULVERT	
	WATER MAIN	
	DITCH CENTERLINE	
	GUTTERAL VALVE	
	STORM/SANITARY MANHOLE	
	CATCH BASIN/SLUICE BOX	
	FIRE HYDRANT	
	LIGHT STANDARD	
	UTILITY POLE	
	GUY WIRE ANCHOR	
	TREE LINE/BUSH/HEDGE	
	RETAINING WALL	
	BUILDING	
	TREE	

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES, ELEVATIONS IN GEODETIC METRES AND CHAINAGES IN METRES. ELEVATIONS ON THIS PLAN ARE BASED ON THE CANADIAN GEODETIC VERTICAL DATUM OF 1928
2. LOCATION OF EXISTING SERVICES, STRUCTURES AND BUILDINGS ARE APPROXIMATE ONLY.
3. ALL PROPERTY LINE INFORMATION OBTAINED FROM S.N.B. AND IS APPROXIMATE ONLY.
4. CONTRACTOR RESPONSIBLE FOR COORDINATING FIELD LOCATES AND CLEARANCE CERTIFICATES FROM NB POWER, ALANT, ROGERS, ENBRIDGE AND ANY OTHER UTILITIES PRIOR TO COMMENCING CONSTRUCTION.
5. WHERE TRENCHING IS ADJACENT TO NB POWER UTILITY POLES, POLES MUST BE SUPPORTED TO THE SATISFACTION OF NB POWER DURING THE WORK.
6. LAWN RESTORATION TO CONSIST OF TOPSOIL AND SOD OVER ALL DISTURBED VEGETATED AREAS.

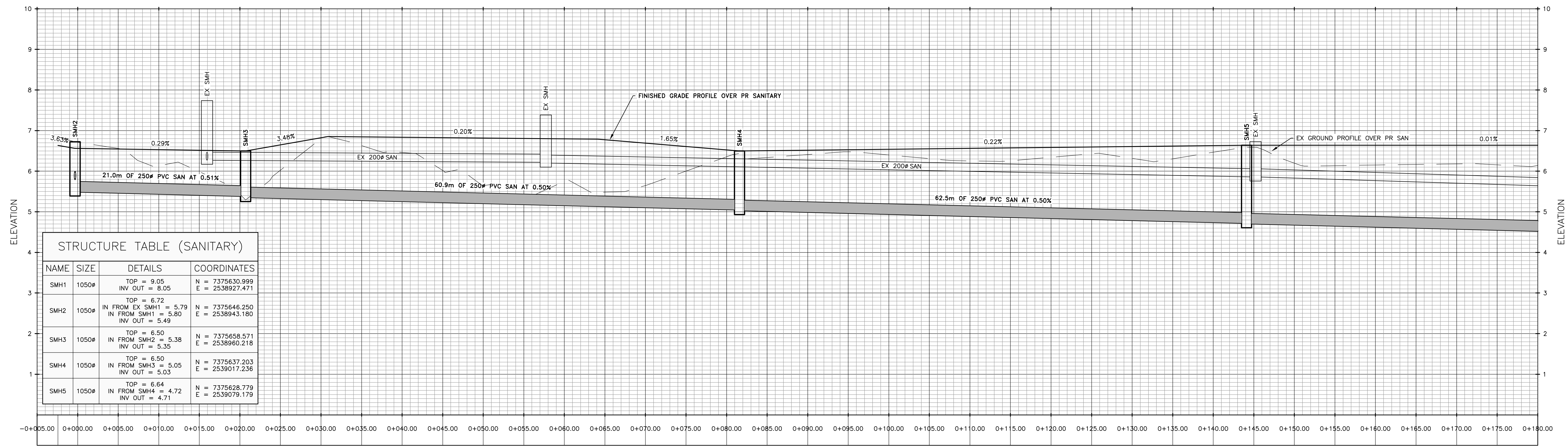
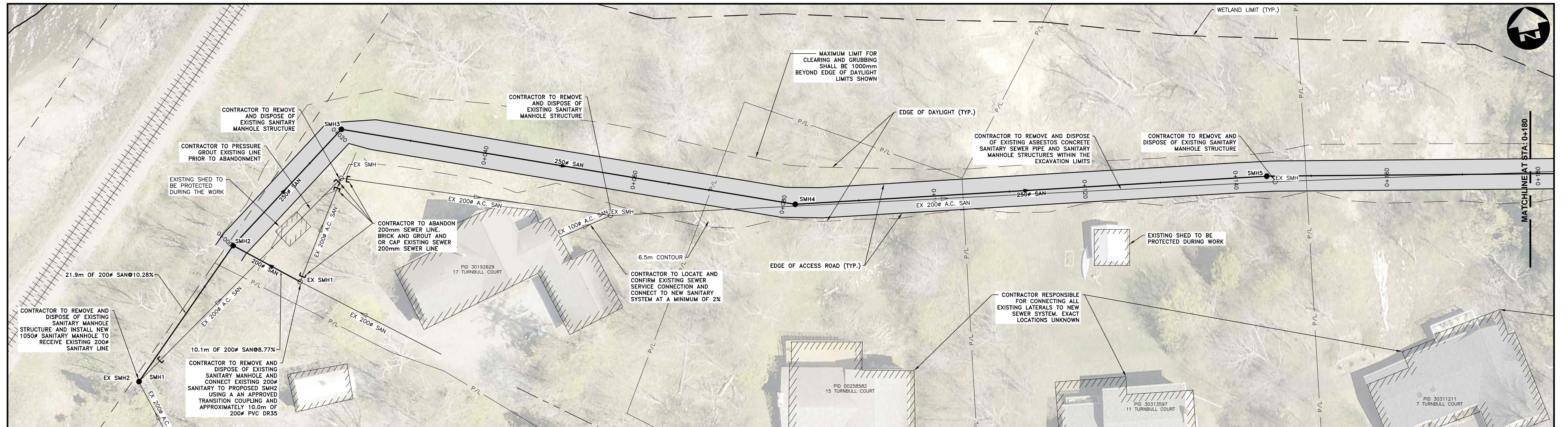


KEY PLAN
1:2500

DRAWING INDEX	
DWG.	DESCRIPTION
01	SANITARY PLAN & PROFILE STA. 0+000 TO STA. 0+180
02	SANITARY PLAN & PROFILE STA. 0+180 TO STA. 0+370
03	SANITARY PLAN & PROFILE STA. 0+370 TO STA. 0+505
04	SANITARY PLAN & PROFILE STA. 0+505 TO STA. 0+675
05	SECTION SHEET 1 STA. 0+000 TO STA. 0+300
06	SECTION SHEET 2 STA. 0+300 TO STA. 0+660

DILLON PROJECT: 19-9889
 CONTRACT #: S-2021-010
 DATE: NOVEMBER 2021





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 DILLON CONSULTING

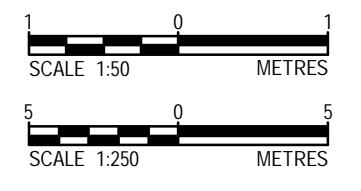
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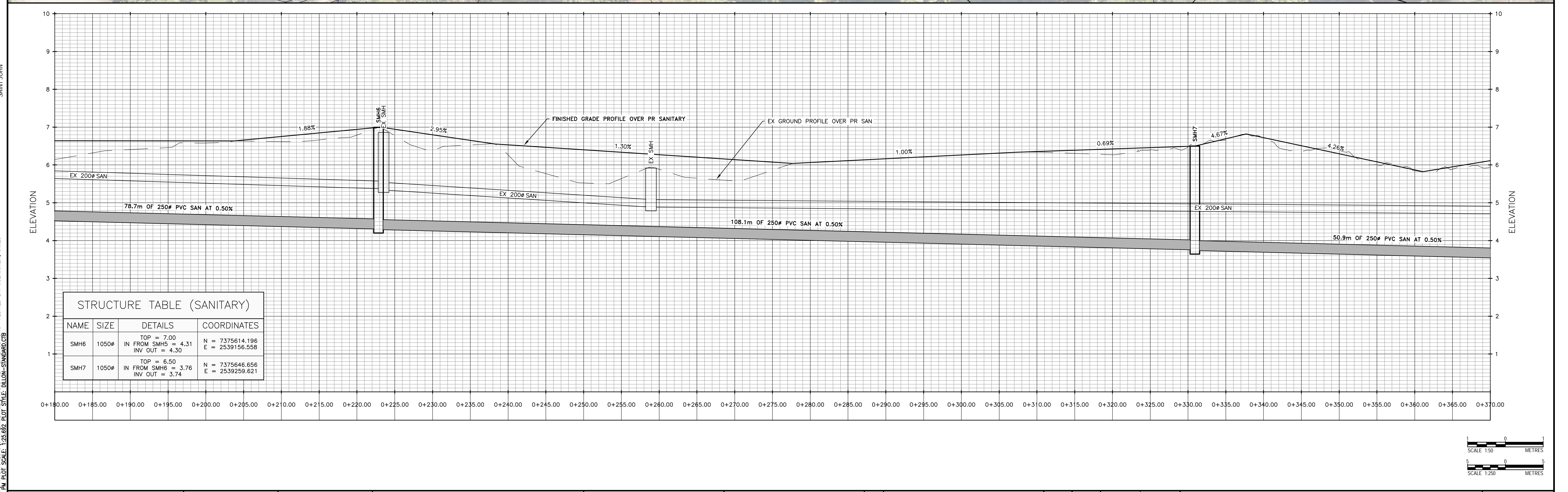
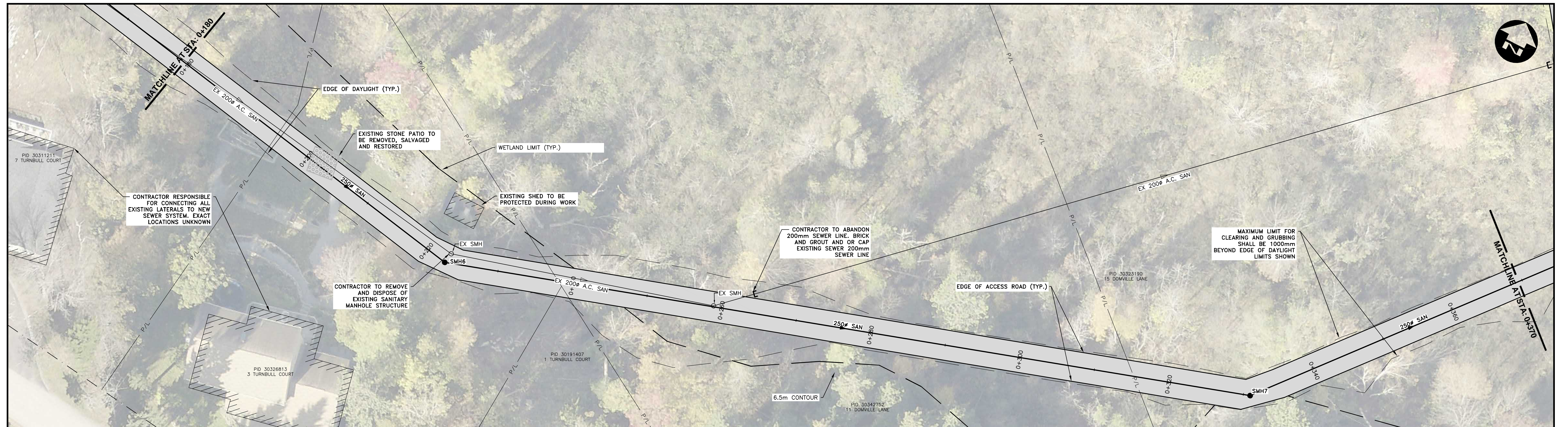
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 CONTRACT #: S-2021-010



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TURNBULL COURT SEWER DESIGN TOWN OF ROTHESAY		PROJECT NO. 19-9889B
SANITARY PLAN & PROFILE STA. 0+000 TO STA. 0+180		SHEET NO. 01





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 DILLON CONSULTING

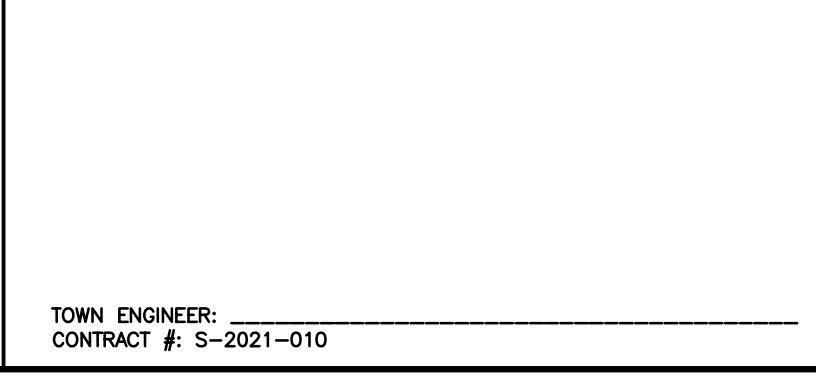
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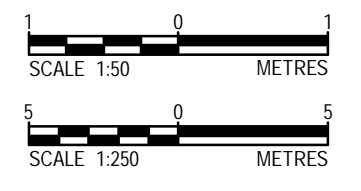
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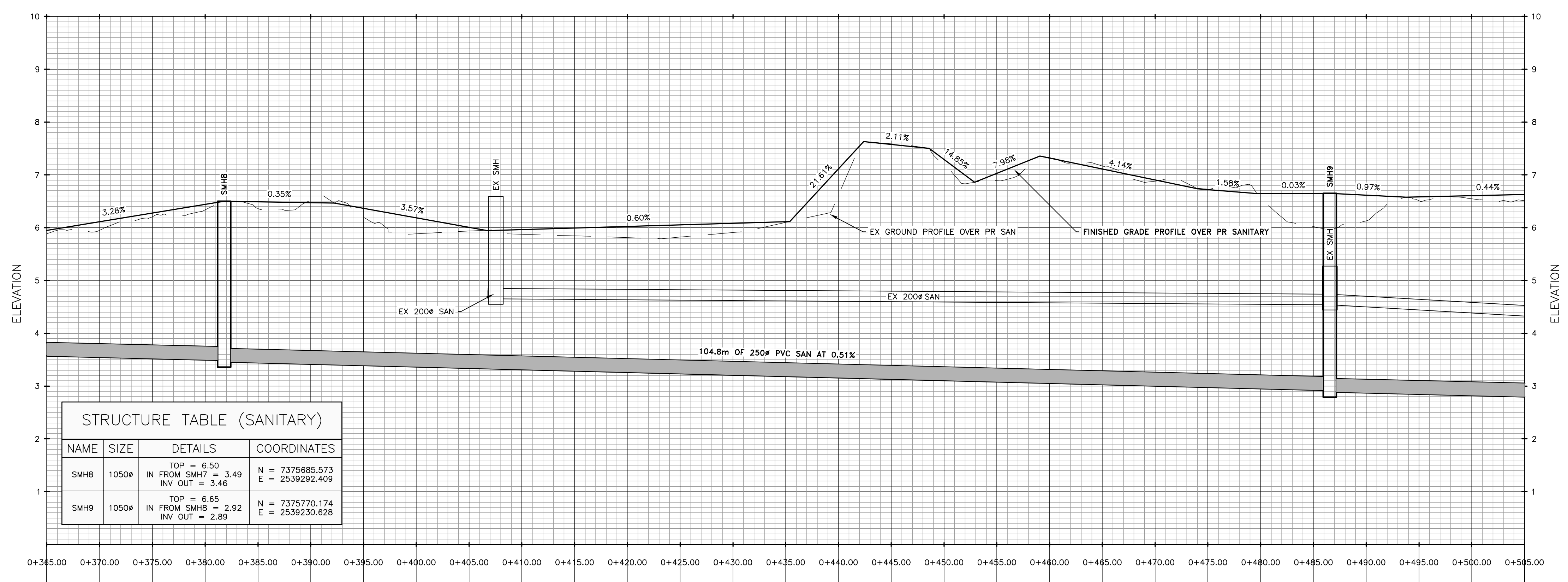
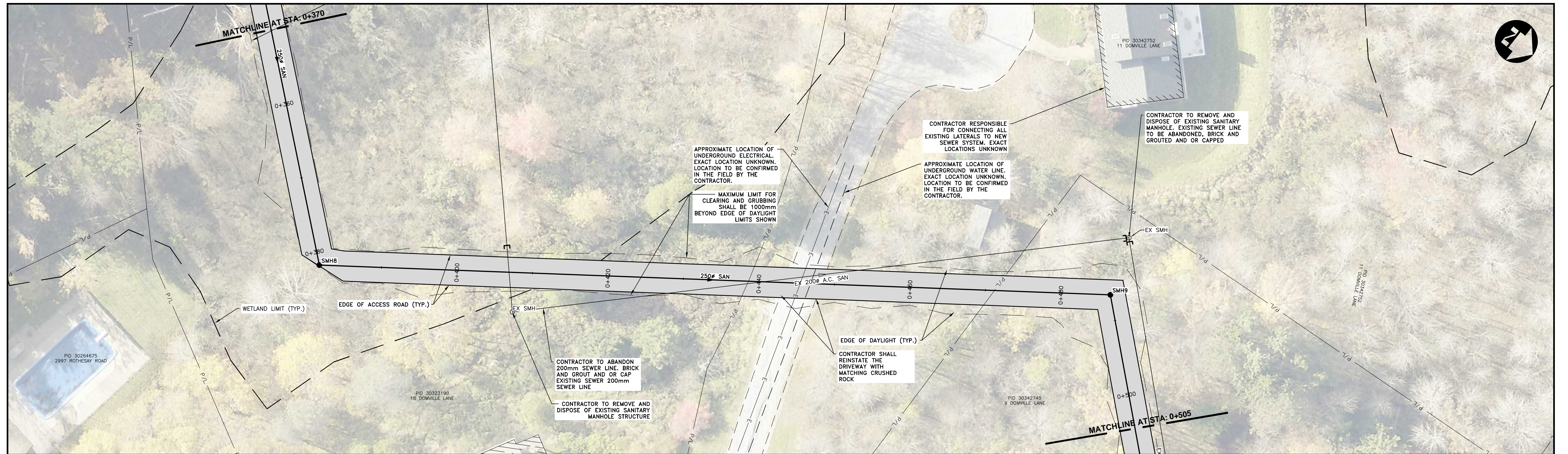
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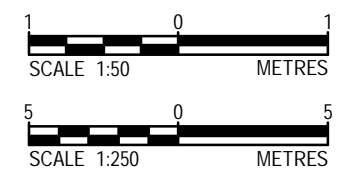
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SANITARY PLAN & PROFILE STA. 0+180 TO STA. 0+370		SHEET NO. 02





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SMH9	1050ø	TOP = 6.65 IN FROM SMH8 = 2.92 INV OUT = 2.89	N = 7375770.174 E = 2539230.628



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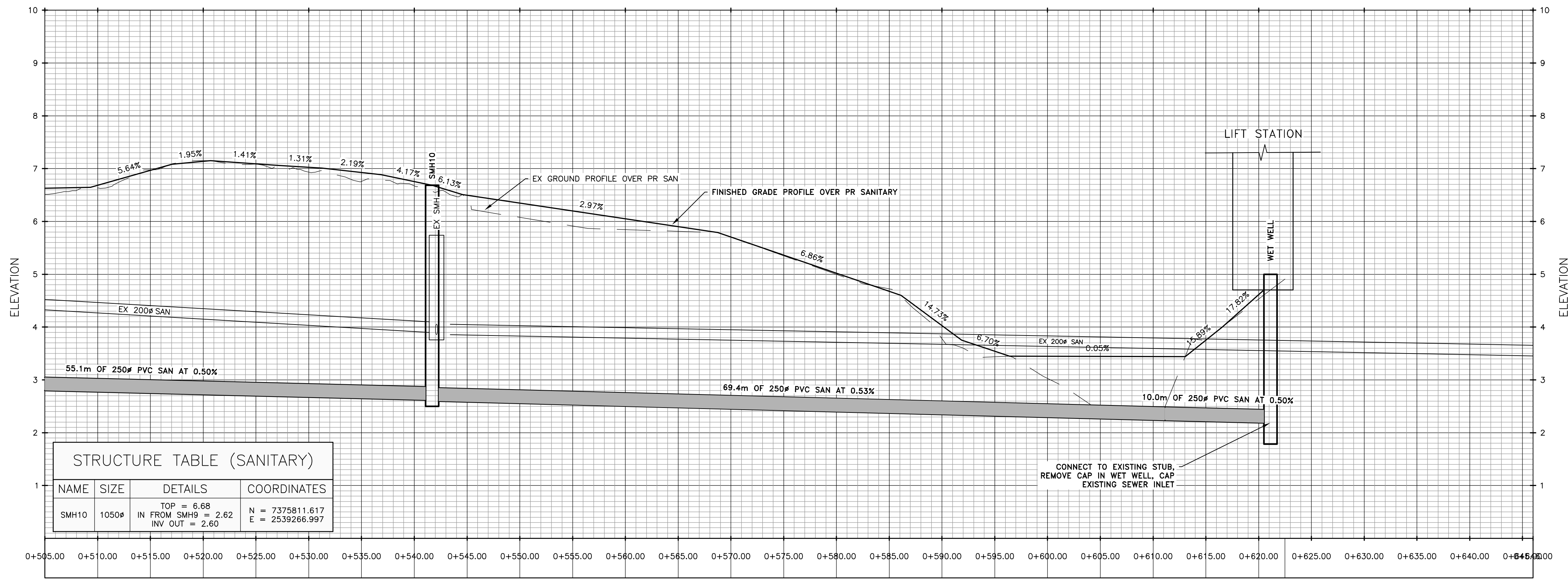
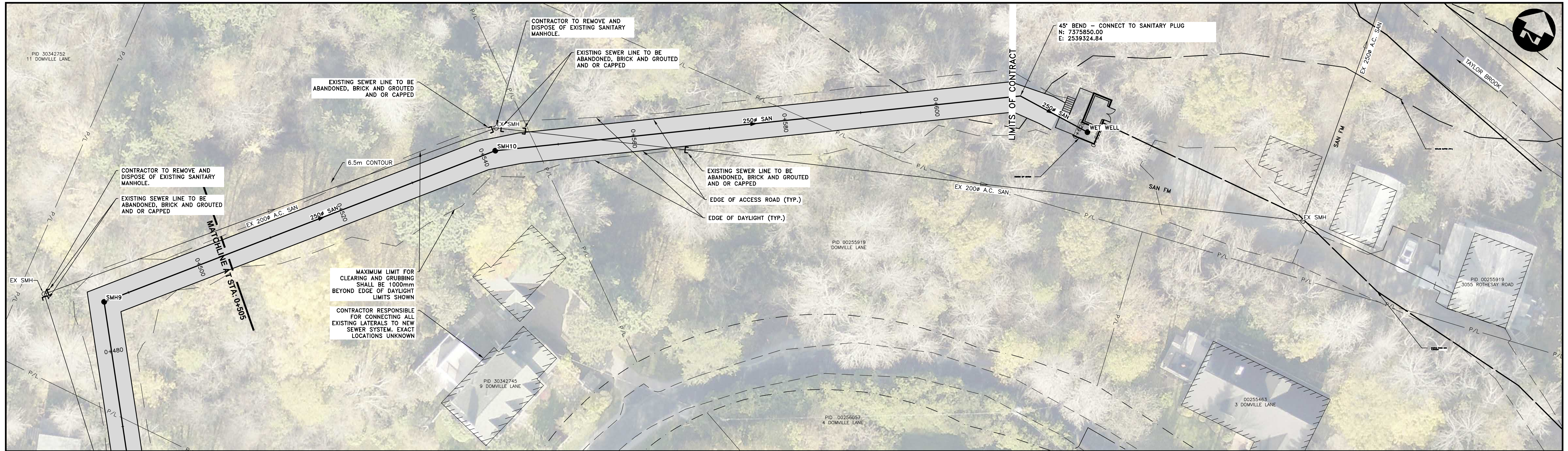
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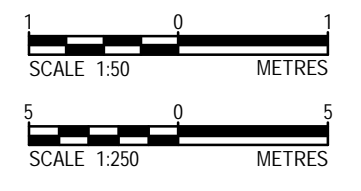


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TURNBULL COURT SEWER DESIGN TOWN OF ROTHESAY		PROJECT NO. 19-9889B
SANITARY PLAN & PROFILE STA. 0+370 TO STA. 0+505		SHEET NO. 03



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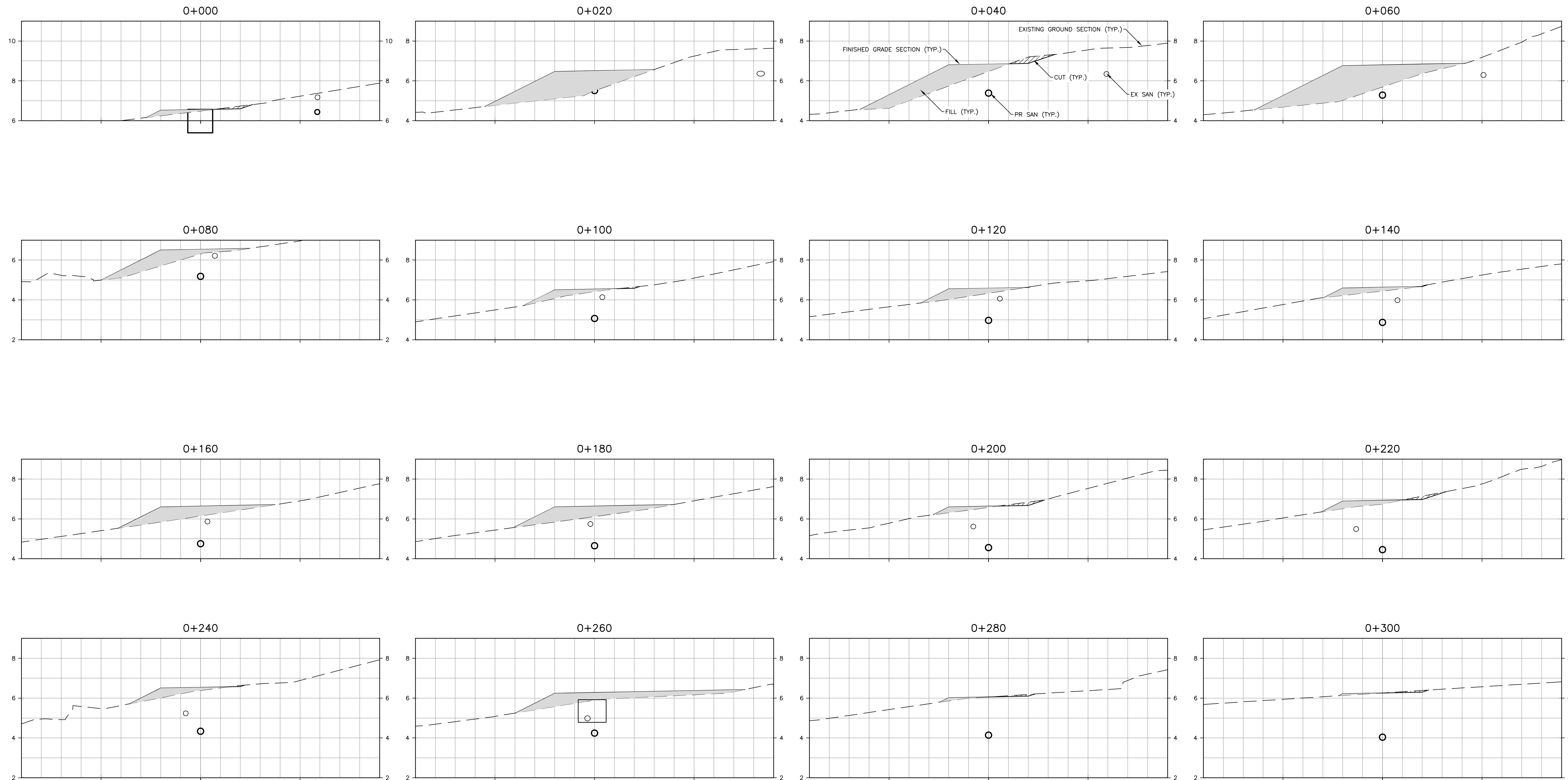
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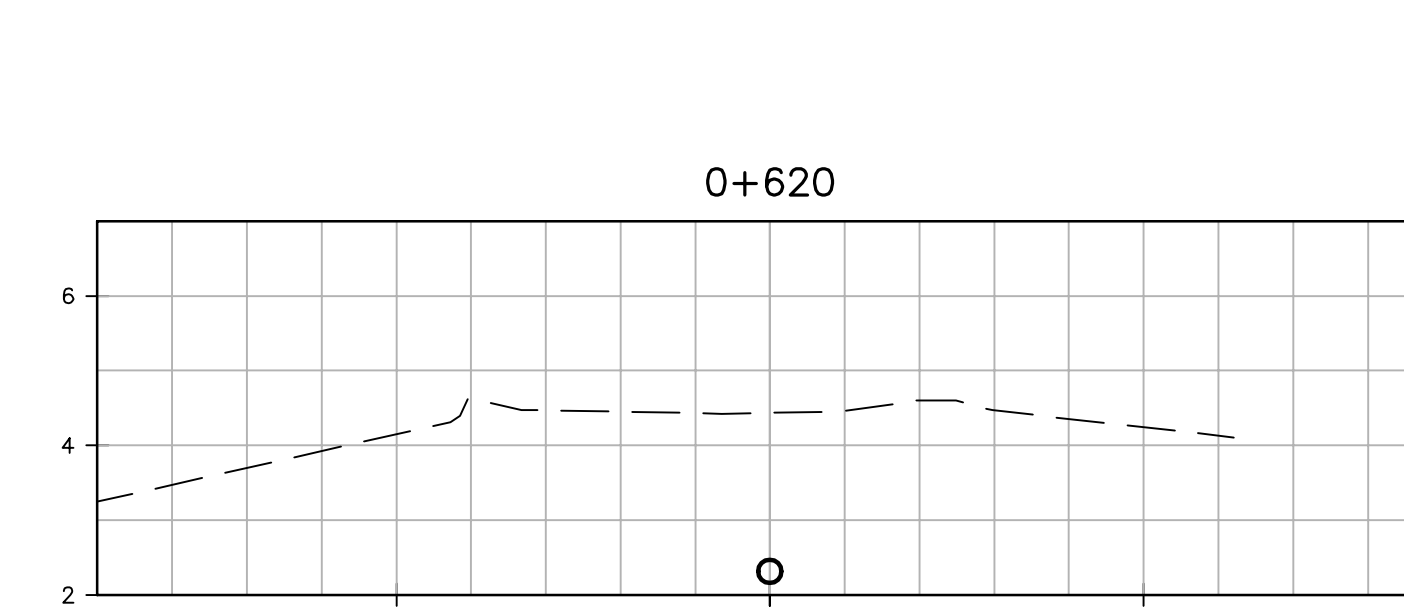
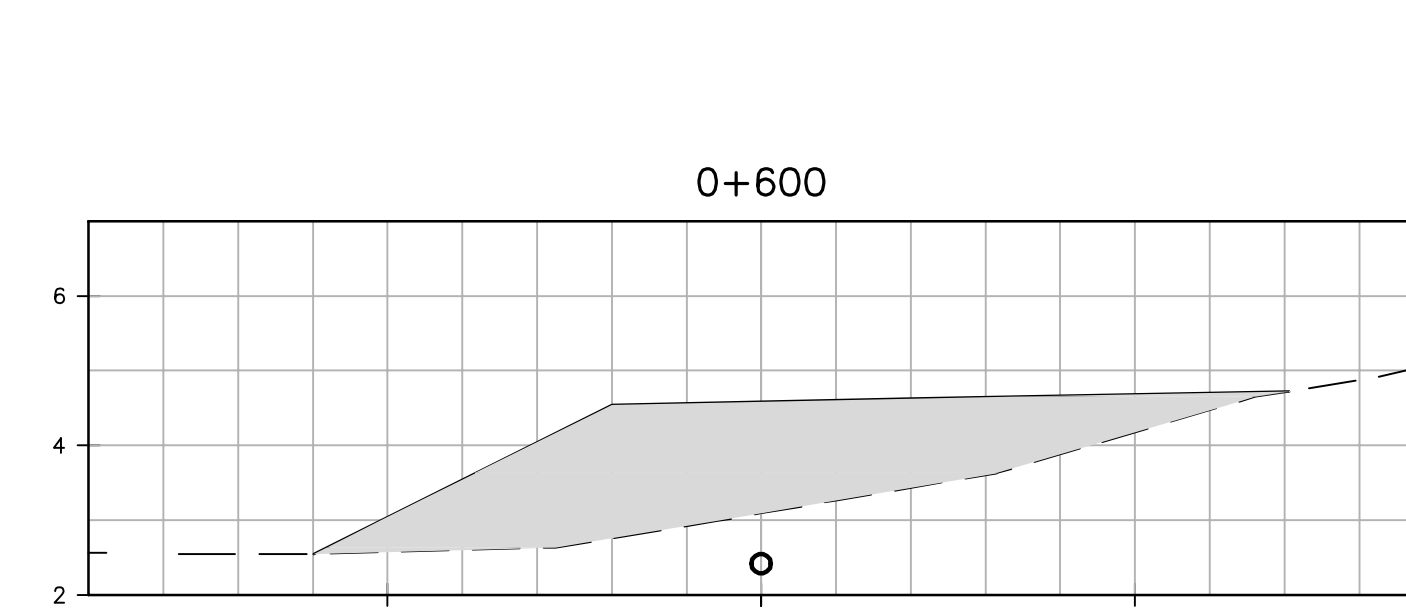
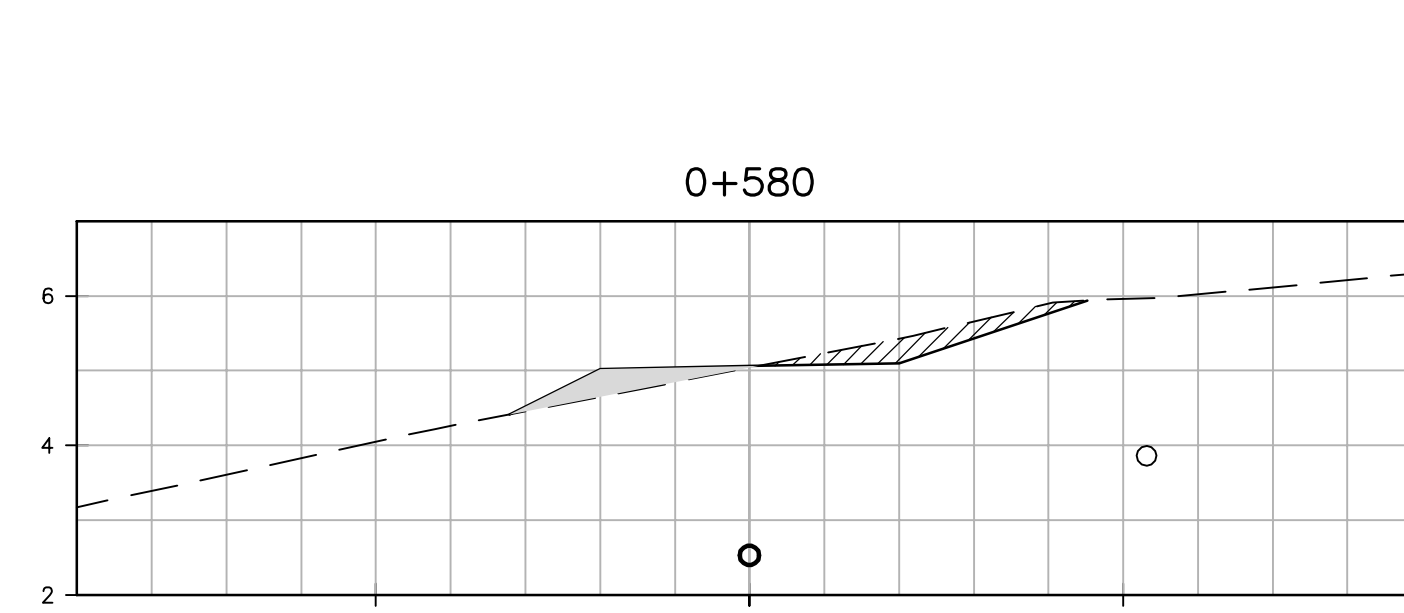
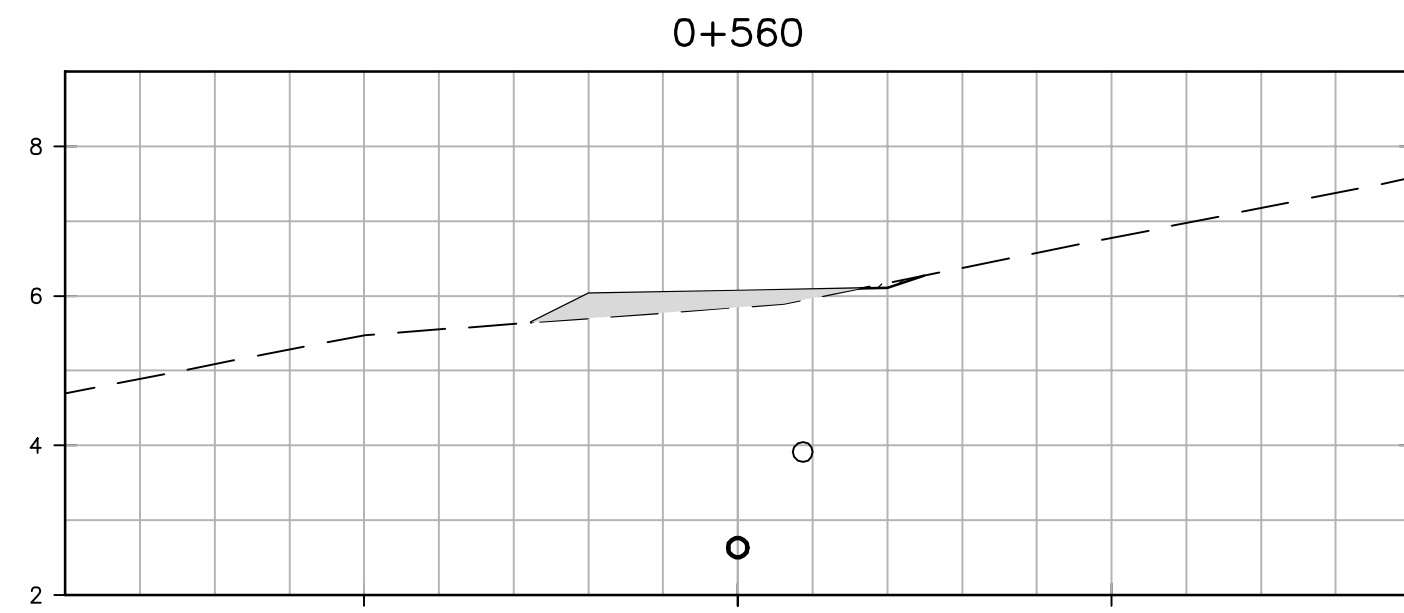
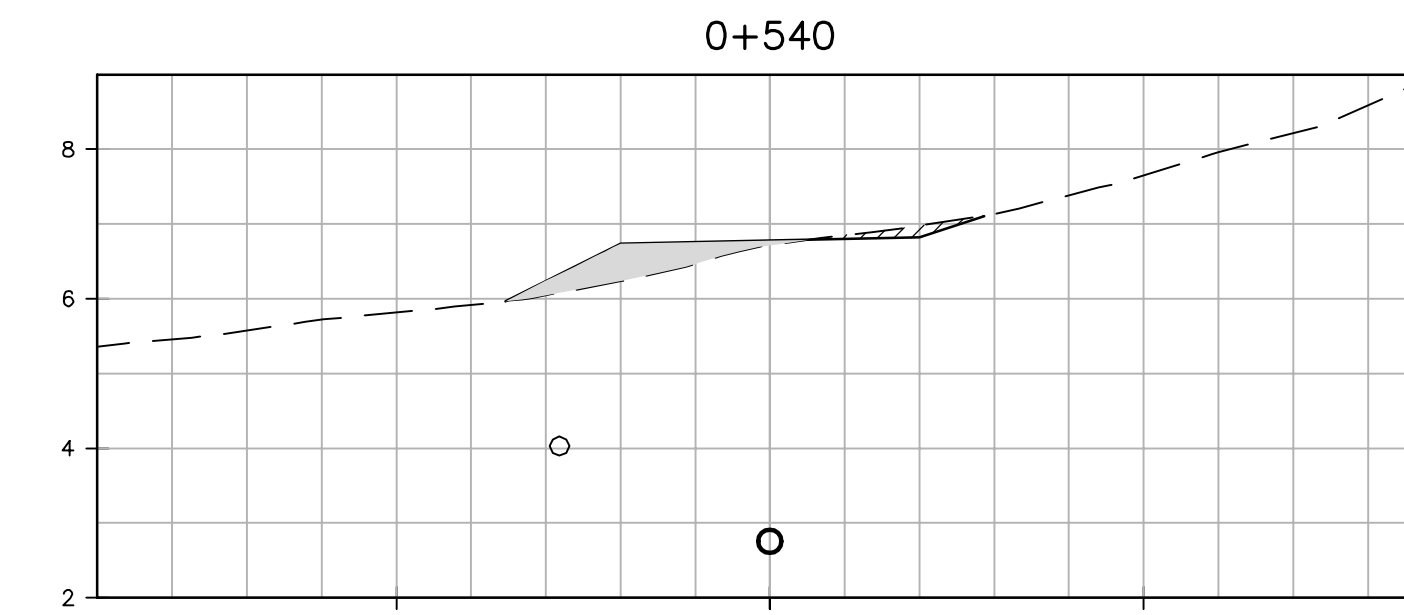
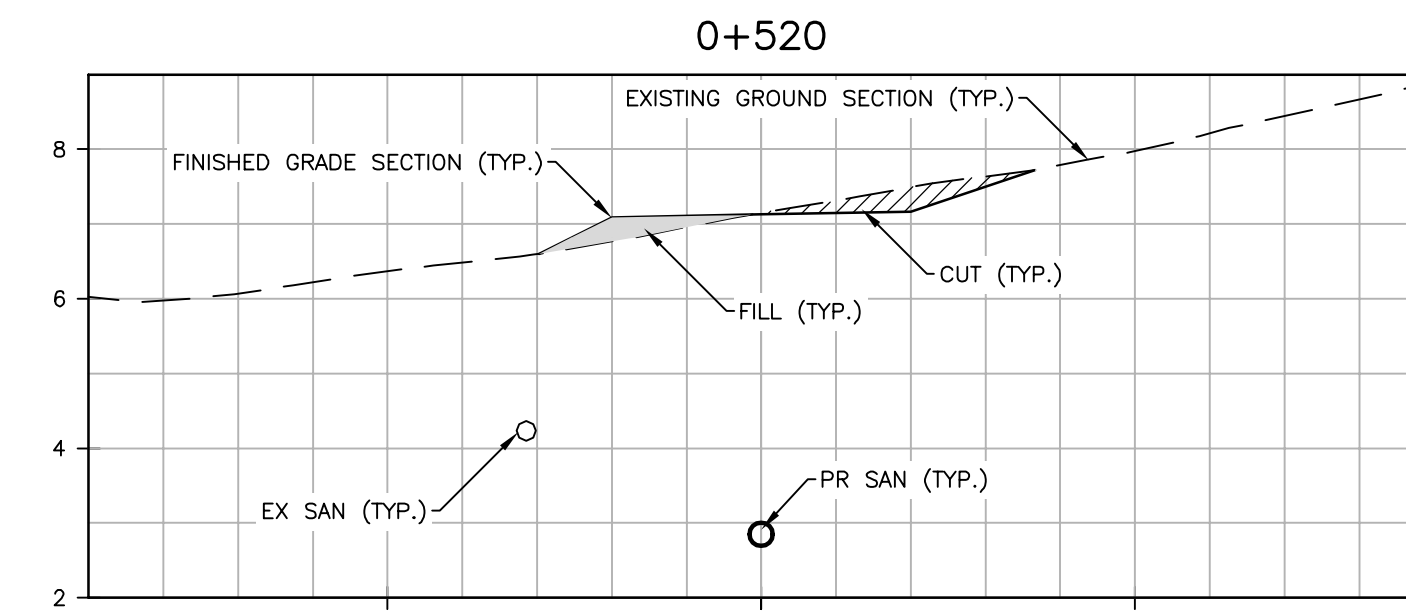
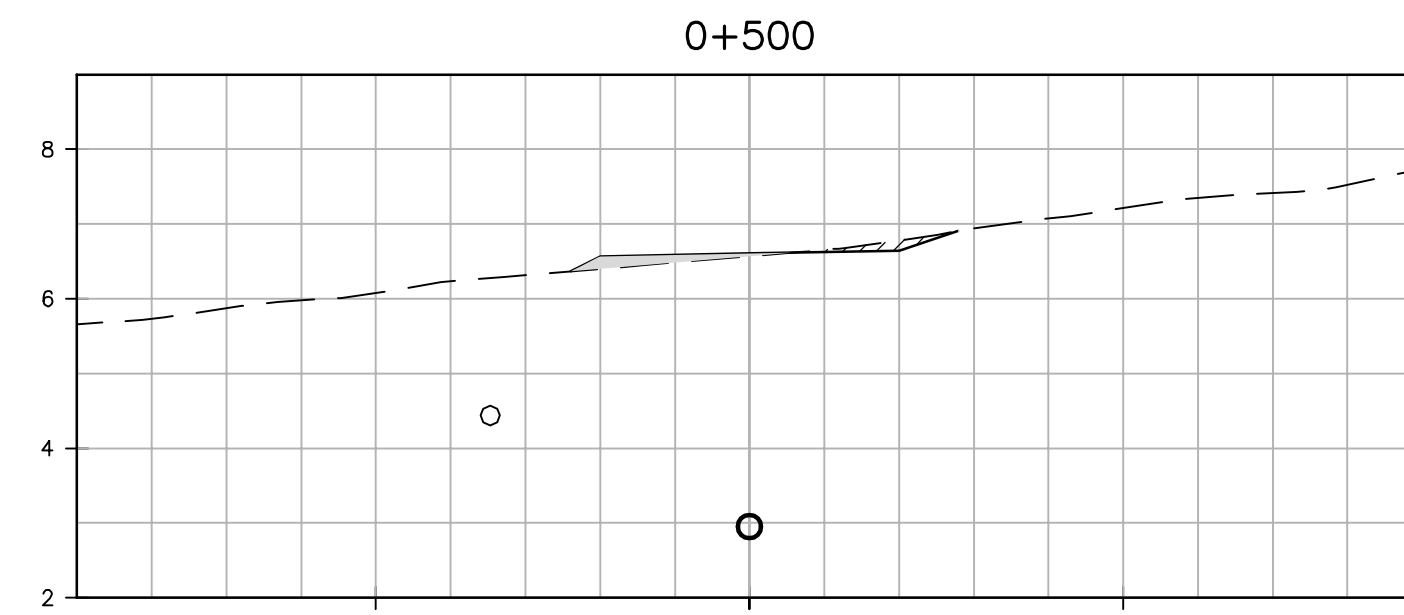
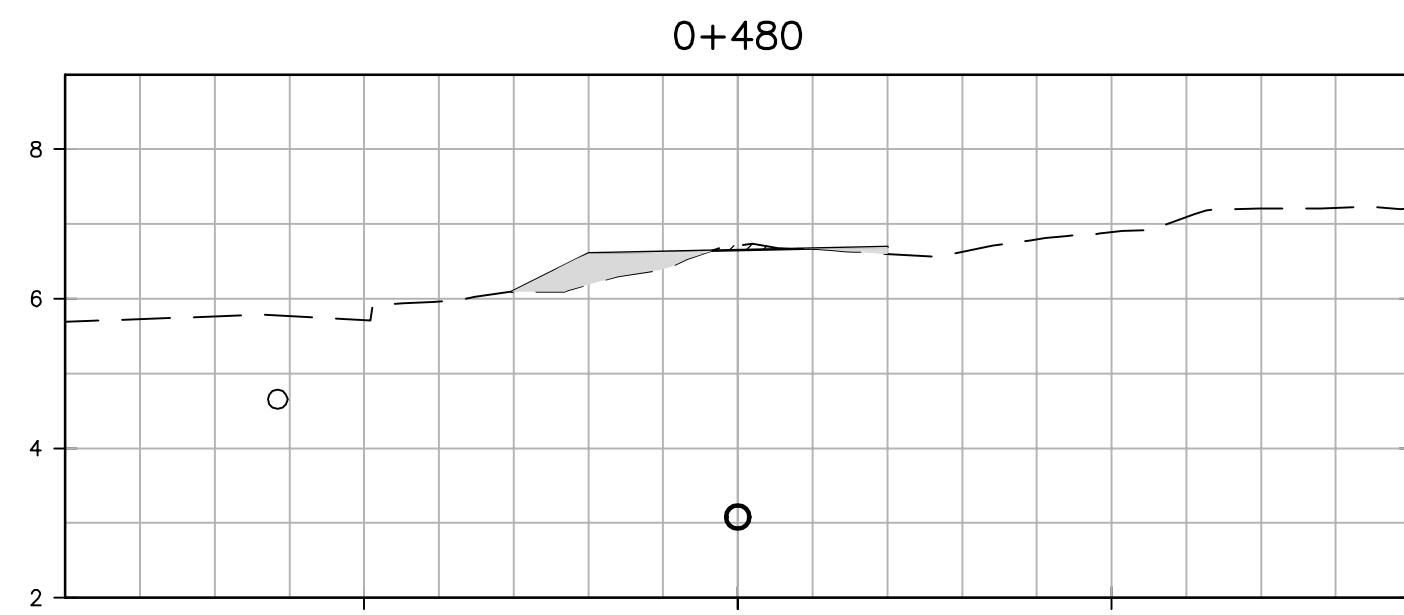
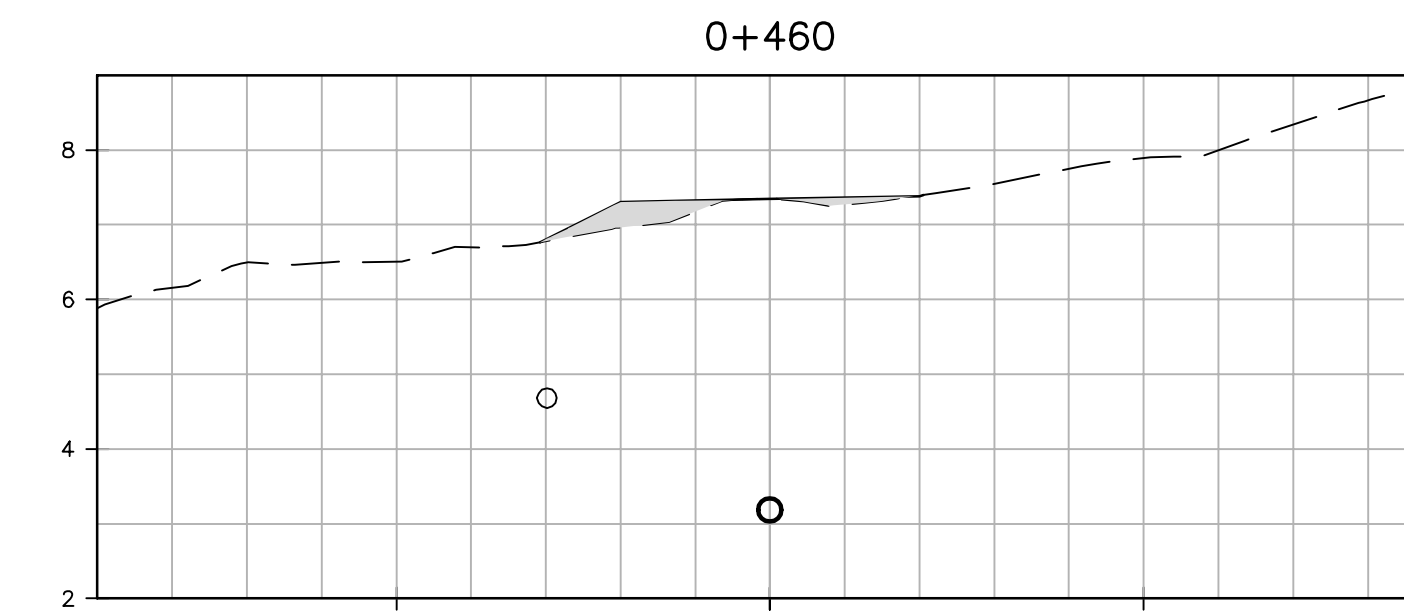
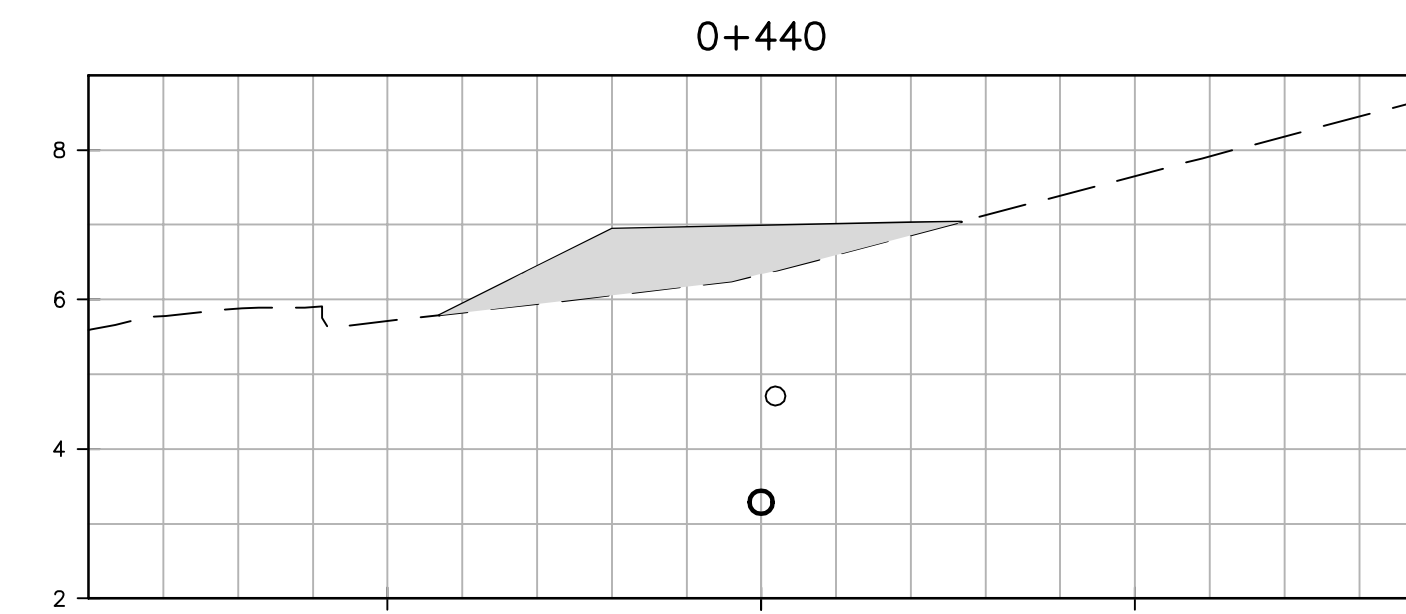
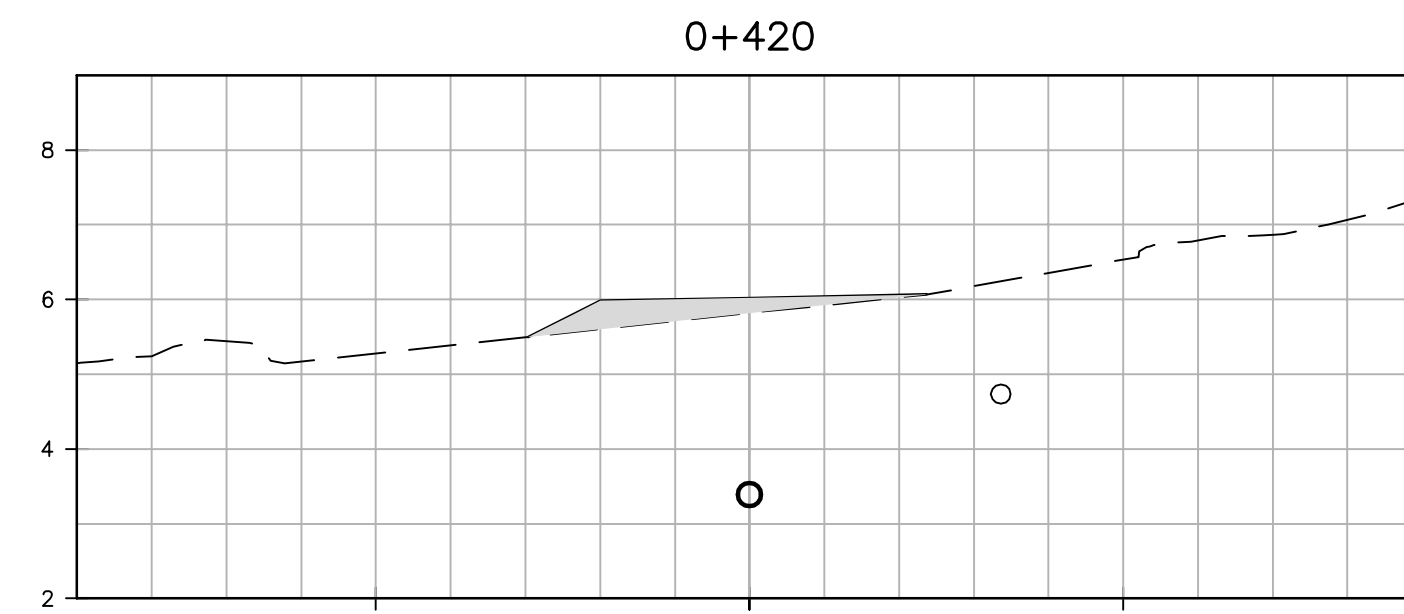
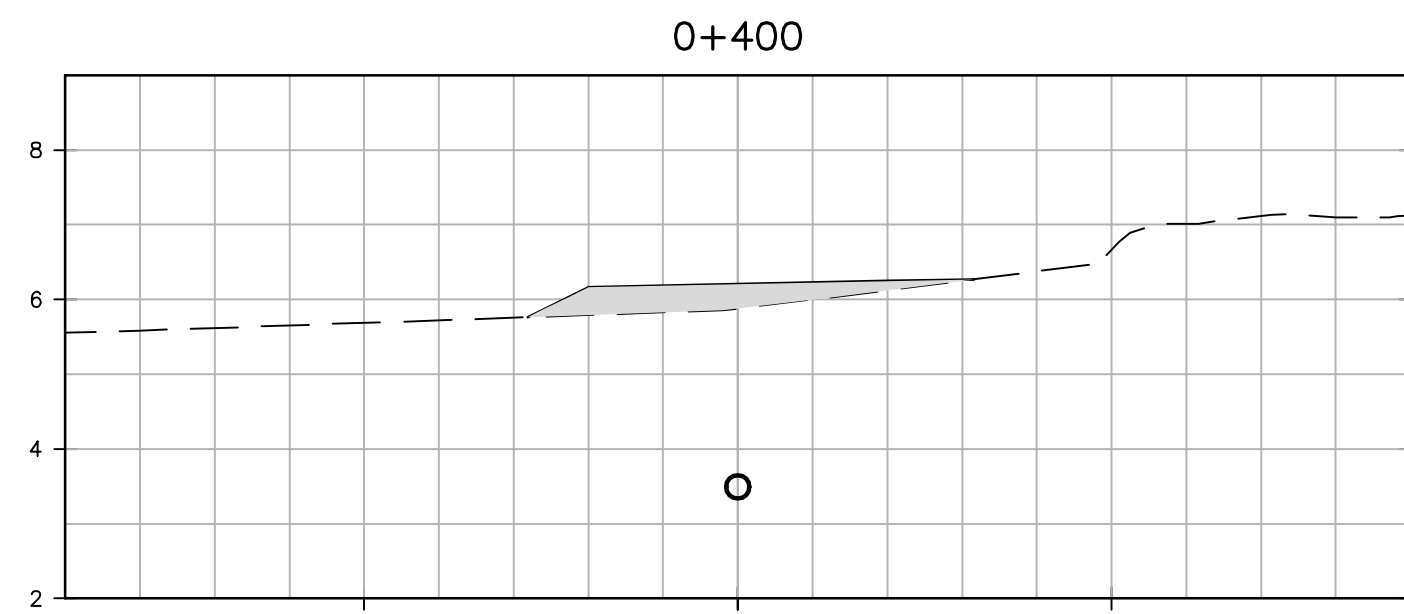
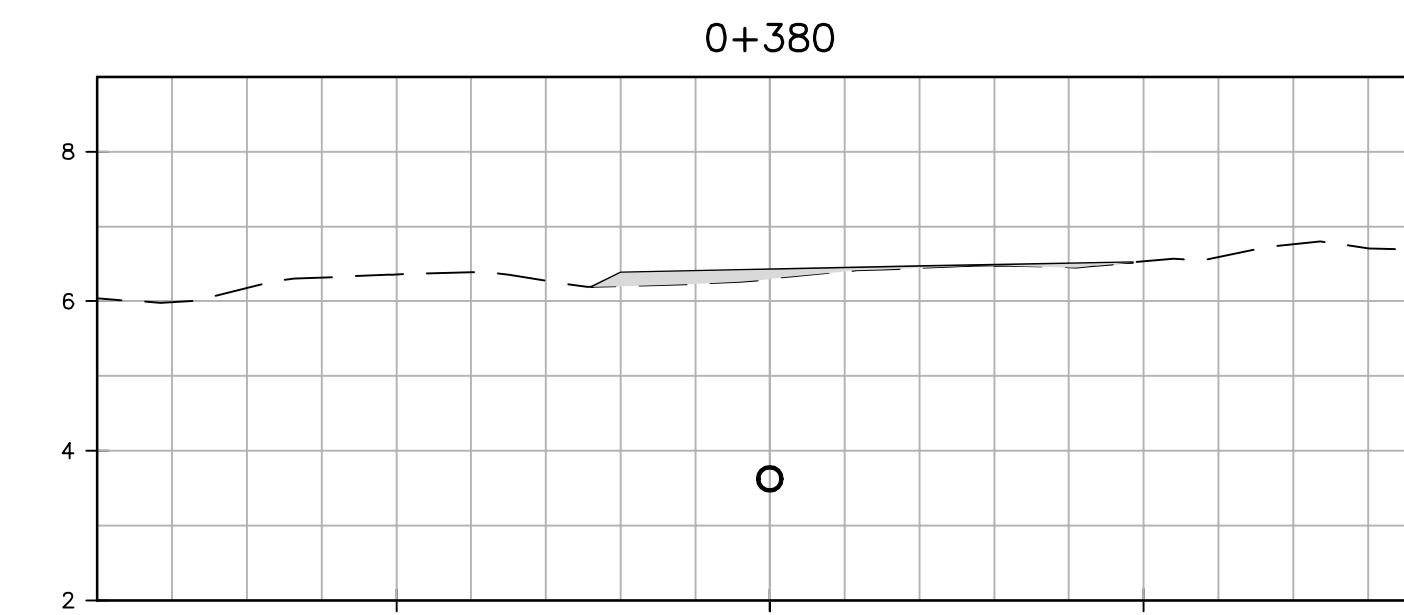
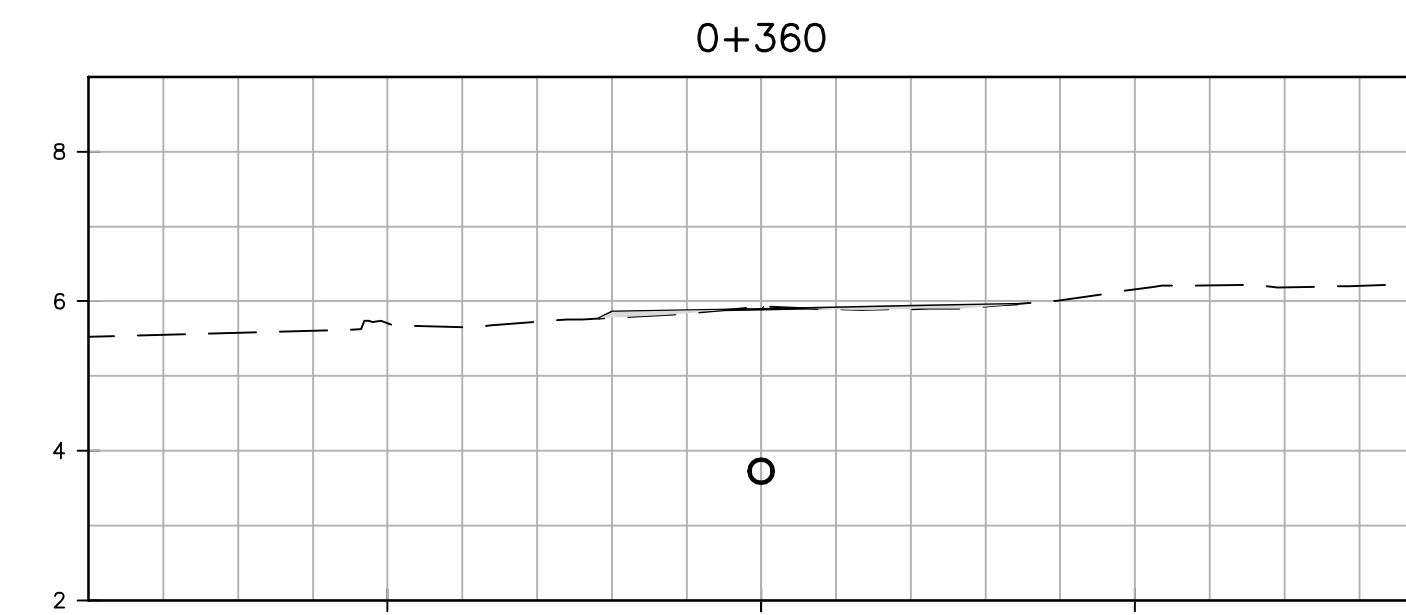
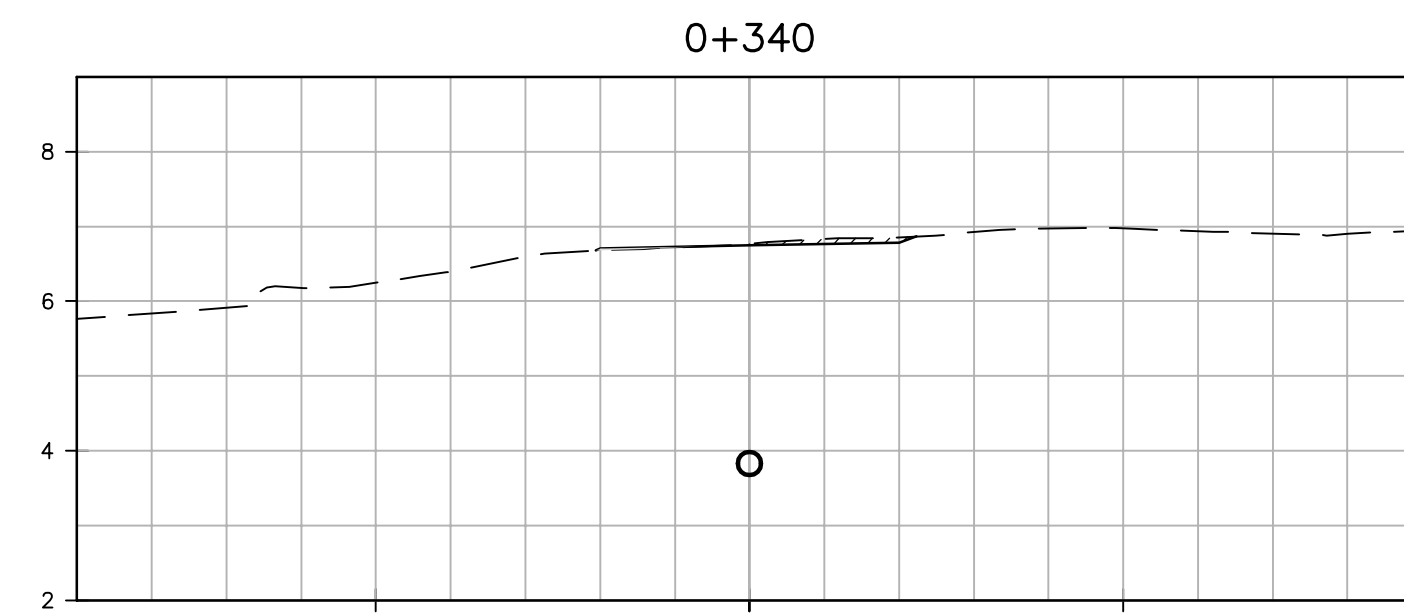
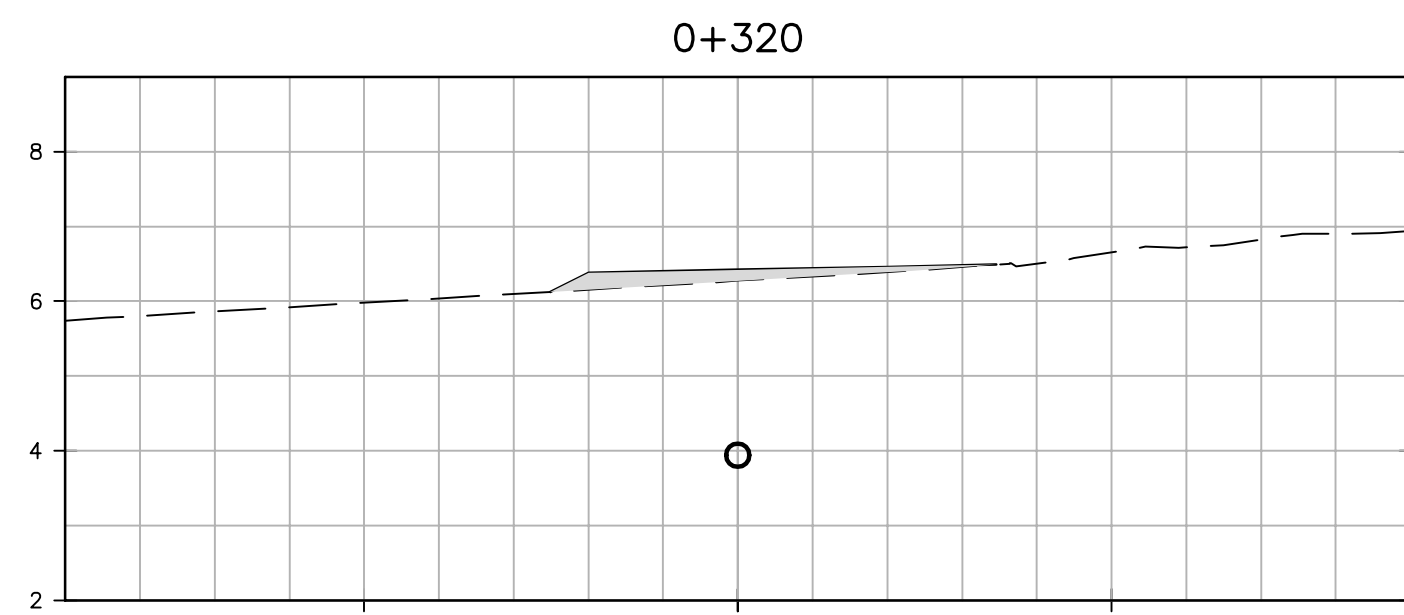
TURNBULL COURT SEWER DESIGN
TOWN OF ROTHESAY

PROJECT NO.
19-9889B

SECTION SHEET 1
STA. 0+000 TO STA. 0+300

SHEET NO.
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TURNBULL COURT SEWER DESIGN
 TOWN OF ROTHESAY
 SECTION SHEET 2
 STA. 0+300 TO STA. 0+660

PROJECT NO.
 19-9889B
 SHEET NO.
06

Appendix C

Atlantic Canada Conservation Data Centre (AC CDC) Report

DATA REPORT 7136: Rothesay, NB

Prepared 21 December 2021
by J. Churchill, Data Manager

CONTENTS OF REPORT

1.0 Preface

- 1.1 Data List
- 1.2 Restrictions
- 1.3 Additional Information
- Map 1: Buffered Study Area

2.0 Rare and Endangered Species

- 2.1 Flora
- 2.2 Fauna
- Map 2: Flora and Fauna

3.0 Special Areas

- 3.1 Managed Areas
- 3.2 Significant Areas
- Map 3: Special Areas

4.0 Rare Species Lists

- 4.1 Fauna
- 4.2 Flora
- 4.3 Location Sensitive Species
- 4.4 Source Bibliography

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) 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>
RothesayNB_7136ob.xls	Rare or legally-protected Flora and Fauna in your study area
RothesayNB_7136ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
RothesayNB_7136msa.xls	Managed and Biologically Significant Areas in your study area
RothesayNB_7136ff_py.xls	Rare 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
(506) 364-2658
sean.blaney@accdc.ca

Animals (Fauna)

John Klymko
Zoologist
(506) 364-2660
john.klymko@accdc.ca

Plant Communities

Caitlin Porter
Botanist / Community Ecologist
(902) 719-4815
caitlin.porter@accdc.ca

Data Management, GIS

James Churchill
Conservation Data Analyst / Field Biologist
(902) 679-6146
james.churchill@accdc.ca

Billing

Jean Breau
Financial Manager / Executive Assistant
(506) 364-2657
jean.breau@accdc.ca

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

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

Western: Sarah Spencer
(902) 541-0081
Sarah.Spencer@novascotia.ca

Central: Shavonne Meyer
(902) 893-0816
Shavonne.Meyer@novascotia.ca

Central: Kimberly George
(902) 890-1046
Kimberly.George@novascotia.ca

Eastern: Harrison Moore
(902) 497-4119
Harrison.Moore@novascotia.ca

Eastern: Maureen Cameron-MacMillan
(902) 295-2554
Maureen.Cameron-MacMillan@novascotia.ca

Eastern: Elizabeth Walsh
(902) 563-3370
Elizabeth.Walsh@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.

3.0 SPECIAL AREAS

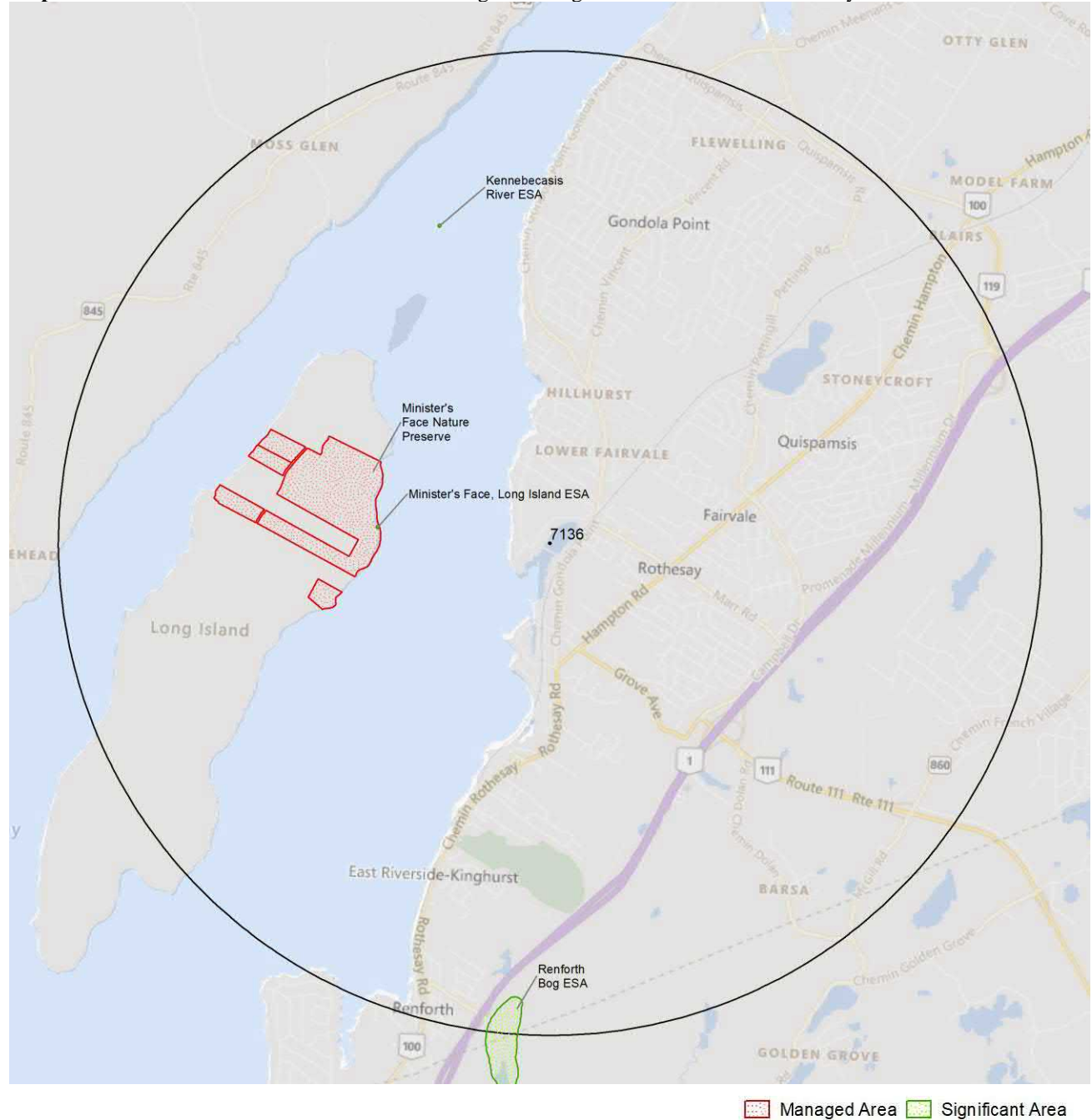
3.1 MANAGED AREAS

The GIS scan identified 2 managed areas in the vicinity of the study area (Map 3 and attached file: *msa.xls).

3.2 SIGNIFICANT AREAS

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

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



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding “location-sensitive” species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (\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	# recs	Distance (km)
N	<i>Jungermannia obovata</i>	Egg Flapwort				S1S2	1	1.8 \pm 0.0
N	<i>Fuscocephaloziopsis connivens</i>	Forcipated Pincerwort				S1S3	1	2.4 \pm 0.0
N	<i>Amphidium mougeotii</i>	a Moss				S2	1	2.5 \pm 1.0
N	<i>Ditrichum flexicaule</i>	Flexible Cow-hair Moss				S2	1	2.5 \pm 1.0
N	<i>Isoetecium myosuroides</i>	Slender Mouse-tail Moss				S2	1	2.5 \pm 1.0
N	<i>Seligeria calcarea</i>	Chalk Brittle Moss				S2	1	2.5 \pm 1.0
N	<i>Palustriella falcata</i>	a Moss				S2S3	1	2.5 \pm 1.0
N	<i>Neckera complanata</i>	a Moss				S2S3	1	2.5 \pm 1.0
N	<i>Loeskeobryum brevirostre</i>	a Moss				S2S3	1	2.5 \pm 1.0
N	<i>Usnea strigosa</i>	Bushy Beard Lichen				S3	1	2.8 \pm 0.0
N	<i>Aulacomnium androgynum</i>	Little Groove Moss				S3?	1	2.5 \pm 1.0
N	<i>Sphagnum lescurii</i>	a Peatmoss				S3?	1	2.7 \pm 0.0
N	<i>Isopterygiopsis muelleriana</i>	a Moss				S3S4	1	2.5 \pm 1.0
N	<i>Myurella julacea</i>	Small Mouse-tail Moss				S3S4	1	2.5 \pm 1.0
N	<i>Sphagnum quinquefarium</i>	Five-ranked Peat Moss				S3S4	1	2.5 \pm 1.0
N	<i>Weissia controversa</i>	Green-Cushioned Weissia				S3S4	1	2.0 \pm 1.0
P	<i>Draba arabisans</i>	Rock Whitlow-Grass				S1	2	1.7 \pm 0.0
P	<i>Draba glabella</i>	Rock Whitlow-Grass				S1	5	2.1 \pm 0.0
P	<i>Saxifraga paniculata</i> ssp. <i>laestadii</i>	Laestadius' Saxifrage				S1	8	1.7 \pm 0.0
P	<i>Carex saxatilis</i>	Russet Sedge				S1	5	1.1 \pm 5.0
P	<i>Asplenium ruta-muraria</i> var. <i>cryptolepis</i>	Wallrue Spleenwort				S1	4	1.7 \pm 0.0
P	<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S1S3	1	3.4 \pm 0.0
P	<i>Oxytropis campestris</i> var. <i>johannensis</i>	Field Locoweed				S2	1	2.5 \pm 50.0
P	<i>Hedeoma pulegioides</i>	American False Pennyroyal				S2	1	4.7 \pm 1.0
P	<i>Aphyllon uniflorum</i>	One-flowered Broomrape				S2	2	1.6 \pm 1.0
P	<i>Crataegus scabrida</i>	Rough Hawthorn				S2	2	2.2 \pm 0.0
P	<i>Symplocarpus foetidus</i>	Eastern Skunk Cabbage				S2	3	2.0 \pm 1.0
P	<i>Carex livida</i>	Livid Sedge				S2	1	3.9 \pm 0.0
P	<i>Woodsia alpina</i>	Alpine Cliff Fern				S2	6	1.7 \pm 0.0
P	<i>Rubus x recurvicaulis</i>	arching dewberry				S2?	1	3.5 \pm 5.0
P	<i>Geranium robertianum</i>	Herb Robert				S2S3	6	1.7 \pm 0.0
P	<i>Myriophyllum quitense</i>	Andean Water Milfoil				S2S3	7	0.9 \pm 0.0
P	<i>Nabalus racemosus</i>	Glaucous Rattlesnakeroot				S3	1	3.0 \pm 1.0
P	<i>Symphotrichum boreale</i>	Boreal Aster				S3	4	2.0 \pm 1.0
P	<i>Rhodiola rosea</i>	Roseroot				S3	2	1.8 \pm 0.0
P	<i>Myriophyllum verticillatum</i>	Whorled Water Milfoil				S3	1	4.3 \pm 5.0
P	<i>Primula mistassinica</i>	Mistassini Primrose				S3	1	1.7 \pm 0.0
P	<i>Thalictrum confine</i>	Northern Meadow-rue				S3	1	4.9 \pm 5.0
P	<i>Amelanchier canadensis</i>	Canada Serviceberry				S3	1	1.7 \pm 1.0
P	<i>Rosa palustris</i>	Swamp Rose				S3	1	3.5 \pm 5.0
P	<i>Salix nigra</i>	Black Willow				S3	1	1.2 \pm 1.0
P	<i>Carex exilis</i>	Coastal Sedge				S3	5	3.5 \pm 0.0
P	<i>Carex michauxiana</i>	Michaux's Sedge				S3	2	4.4 \pm 0.0
P	<i>Cyperus dentatus</i>	Toothed Flatsedge				S3	1	4.7 \pm 5.0
P	<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush				S3	3	3.9 \pm 0.0

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
P	<i>Rhynchospora fusca</i>	Brown Beakrush				S3	1	3.9 ± 0.0
P	<i>Lemna trisulca</i>	Star Duckweed				S3	1	2.5 ± 1.0
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3	1	1.7 ± 0.0
P	<i>Calamagrostis pickeringii</i>	Pickering's Reed Grass				S3	1	3.9 ± 0.0
P	<i>Asplenium viride</i>	Green Spleenwort				S3	2	1.8 ± 0.0
P	<i>Myriophyllum sibiricum</i>	Siberian Water Milfoil				S3S4	1	3.4 ± 0.0
P	<i>Rubus chamaemorus</i>	Cloudberry				S3S4	1	4.4 ± 1.0

4.2 FAUNA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	1	4.5 ± 7.0
A	<i>Hirundo rustica</i>	Barn Swallow	Special Concern	Threatened	Threatened	S2B,S2M	4	4.1 ± 5.0
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B,S3M	1	4.2 ± 5.0
A	<i>Cardellina canadensis</i>	Canada Warbler	Special Concern	Threatened	Threatened	S3B,S3M	8	4.1 ± 5.0
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	3	4.1 ± 5.0
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	3	4.2 ± 5.0
A	<i>Puma concolor pop. 1</i>	Eastern Cougar	Data Deficient		Endangered	SNA	1	4.0 ± 1.0
A	<i>Progne subis</i>	Purple Martin				S1B,S1M	1	0.4 ± 7.0
A	<i>Larus hyperboreus</i>	Glaucous Gull				S2N,S2M	2	4.0 ± 14.0
A	<i>Spatula clypeata</i>	Northern Shoveler				S2S3B,S2S3M	1	2.0 ± 0.0
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B,S2S3M	1	4.5 ± 7.0
A	<i>Spinus pinus</i>	Pine Siskin				S3	2	4.1 ± 5.0
A	<i>Cathartes aura</i>	Turkey Vulture				S3B,S3M	4	2.7 ± 1.0
A	<i>Rallus limicola</i>	Virginia Rail				S3B,S3M	4	4.1 ± 5.0
A	<i>Charadrius vociferus</i>	Killdeer				S3B,S3M	4	4.1 ± 5.0
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S3B,S3M	3	1.3 ± 0.0
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B,S3S4M	1	4.1 ± 5.0
A	<i>Actitis macularia</i>	Spotted Sandpiper				S3S4B,S5M	5	4.1 ± 5.0
A	<i>Larus delawarensis</i>	Ring-billed Gull				S3S4B,S5M	1	2.7 ± 1.0
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	3	2.1 ± 0.0
I	<i>Alasmidonta undulata</i>	Triangle Floater				S3	1	3.2 ± 0.0
I	<i>Spurwinkia salsa</i>	Saltmarsh Hydrobe				S3	5	1.1 ± 0.0
I	<i>Satyrrium liparops</i>	Striped Hairstreak				S3S4	3	1.7 ± 1.0
I	<i>Cupido comyntas</i>	Eastern Tailed Blue				S3S4	1	3.1 ± 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	Special Concern		No
<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	No
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	YES
<i>Haliaeetus leucocephalus</i>	Bald Eagle		Endangered	YES
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Endangered	YES
<i>Cicindela marginipennis</i>	Cobblestone Tiger Beetle	Endangered	Endangered	No
<i>Coenonympha nipisiquit</i>	Maritime Ringlet	Endangered	Endangered	No
Bat hibernaculum or bat species occurrence		[Endangered]!	[Endangered]!	YES

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

4.4 SOURCE BIBLIOGRAPHY

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

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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 39604 records of 150 vertebrate and 2227 records of 88 invertebrate fauna; 8538 records of 370 vascular, 2543 records of 232 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	# recs	Distance (km)	Prov
A	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	191	3.5 \pm 1.0	NB
A	<i>Myotis septentrionalis</i>	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	34	11.0 \pm 1.0	NB
A	<i>Perimyotis subflavus</i>	Eastern Pipistrelle	Endangered	Endangered	Endangered	S1	41	16.8 \pm 0.0	NB
A	<i>Eubalaena glacialis</i>	North Atlantic Right Whale	Endangered	Endangered	Endangered	S1	5	76.9 \pm 0.0	NB
A	<i>Osmerus mordax</i> pop. 2	Lake Utopia Smelt large-bodied pop.	Endangered	Threatened	Threatened	S1	2	66.4 \pm 10.0	NB
A	<i>Sterna dougallii</i>	Roseate Tern	Endangered	Endangered	Endangered	S1?B,S1?M	4	70.9 \pm 0.0	NB
A	<i>Charadrius melodus melodus</i>	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	30	14.0 \pm 0.0	NB
A	<i>Dermochelys coriacea</i> (Atlantic pop.)	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	4	16.1 \pm 50.0	NB
A	<i>Salmo salar</i> pop. 1	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered	Endangered	S2	582	17.4 \pm 0.0	NB
A	<i>Salmo salar</i> pop. 7	Atlantic Salmon - Outer Bay of Fundy pop.	Endangered		Endangered	SNR	734	19.6 \pm 0.0	NB
A	<i>Rangifer tarandus</i> pop. 2	Woodland Caribou (Atlantic-Gasp /rsie pop.)	Endangered	Endangered	Extirpated	SX	4	6.2 \pm 5.0	NB
A	<i>Sturnella magna</i>	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B,S1M	43	11.4 \pm 7.0	NB
A	<i>Ixobrychus exilis</i>	Least Bittern	Threatened	Threatened	Threatened	S1S2B,S1S2M	34	12.9 \pm 7.0	NB
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened	Threatened	Threatened	S1S2B,S1S2M	159	5.9 \pm 7.0	NB
A	<i>Asio flammeus</i>	Short-eared Owl	Threatened	Special Concern	Special Concern	S2B,S2M	19	37.5 \pm 0.0	NB
A	<i>Antrostomus vociferus</i>	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	81	5.9 \pm 7.0	NB
A	<i>Catharus bicknelli</i>	Bicknell's Thrush	Threatened	Threatened	Threatened	S2B,S2M	20	23.3 \pm 1.0	NB
A	<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel	Threatened			S2B,SUM	40	45.5 \pm 0.0	NB
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2S3	1305	4.6 \pm 0.0	NB
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	562	10.3 \pm 7.0	NB
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	1043	4.5 \pm 7.0	NB
A	<i>Acipenser oxyrinchus</i>	Atlantic Sturgeon	Threatened		Threatened	S3	2	13.7 \pm 0.0	NB
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	1798	6.9 \pm 7.0	NB
A	<i>Limosa haemastica</i>	Hudsonian Godwit	Threatened			S3S4M	79	21.6 \pm 0.0	NB
A	<i>Anguilla rostrata</i>	American Eel	Threatened		Threatened	S4	2475	13.7 \pm 0.0	NB
A	<i>Tringa flavipes</i>	Lesser Yellowlegs	Threatened			S4M	621	13.4 \pm 0.0	NB
A	<i>Coturnicops noveboracensis</i>	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B,SUM	3	44.5 \pm 7.0	NB
A	<i>Histrionicus histrionicus</i> pop. 1	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	132	45.1 \pm 17.0	NB
A	<i>Hirundo rustica</i>	Barn Swallow	Special Concern	Threatened	Threatened	S2B,S2M	1484	4.1 \pm 5.0	NB
A	<i>Bucephala islandica</i> (Eastern pop.)	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	59	5.8 \pm 0.0	NB
A	<i>Balaenoptera physalus</i>	Fin Whale	Special Concern	Special Concern		S2S3	18	23.3 \pm 0.0	NB
A	<i>Acipenser brevirostrum</i>	Shortnose Sturgeon	Special Concern	Special Concern	Special Concern	S3	11	8.1 \pm 0.0	NB
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	93	11.6 \pm 0.0	NB
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	151	8.4 \pm 0.0	NB
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B,S3M	460	4.2 \pm 5.0	NB
A	<i>Cardellina canadensis</i>	Canada Warbler	Special Concern	Threatened	Threatened	S3B,S3M	965	4.1 \pm 5.0	NB
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	369	10.3 \pm 7.0	NB
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	402	4.1 \pm 5.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Special Concern	Special Concern		S3M	155	10.3 ± 0.0	NB
A	<i>Phocoena phocoena</i>	Harbour Porpoise	Special Concern		Spec.Concern	S4	210	15.2 ± 0.0	NB
A	<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern			S4	102	13.0 ± 1.0	NB
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	1003	4.2 ± 5.0	NB
A	<i>Podiceps auritus</i>	Horned Grebe	Special Concern	Special Concern	Special Concern	S4N,S4M	169	14.1 ± 1.0	NB
A	<i>Anarhichas lupus</i>	Atlantic Wolffish	Special Concern	Special Concern	Special Concern	SNR	1	93.7 ± 0.0	NB
A	<i>Hemidactylium scutatum</i>	Four-toed Salamander	Not At Risk			S1?	12	73.2 ± 0.0	NB
A	<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius	Not At Risk	Special Concern	Endangered	S1B,S3M	523	1.7 ± 0.0	NB
A	<i>Bubo scandiacus</i>	Snowy Owl	Not At Risk			S1N,S2S3M	19	11.1 ± 0.0	NB
A	<i>Accipiter cooperii</i>	Cooper's Hawk	Not At Risk			S1S2B,S1S2M	19	25.4 ± 7.0	NB
A	<i>Fulica americana</i>	American Coot	Not At Risk			S1S2B,S1S2M	15	14.2 ± 0.0	NB
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk			S1S2B,SUM	3	25.4 ± 0.0	NB
A	<i>Sorex dispar</i>	Long-tailed Shrew	Not At Risk			S2	2	21.2 ± 1.0	NB
A	<i>Buteo lineatus</i>	Red-shouldered Hawk	Not At Risk			S2B,S2M	51	8.0 ± 0.0	NB
A	<i>Chlidonias niger</i>	Black Tern	Not At Risk			S2B,S2M	343	13.4 ± 7.0	NB
A	<i>Globicephala melas</i>	Long-finned Pilot Whale	Not At Risk			S2S3	3	16.6 ± 1.0	NB
A	<i>Lynx canadensis</i>	Canadian Lynx	Not At Risk		Endangered	S3	17	11.6 ± 1.0	NB
A	<i>Desmognathus fuscus - Quebec / New Brunswick population</i>	Northern Dusky Salamander - Quebec / New Brunswick population	Not At Risk			S3	55	13.0 ± 1.0	NB
A	<i>Megaptera novaeangliae</i>	Humpback Whale (NW Atlantic pop.)	Not At Risk			S3	26	75.2 ± 0.0	NB
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B,SUM	237	6.9 ± 7.0	NB
A	<i>Podiceps grisegena</i>	Red-necked Grebe	Not At Risk			S3M,S2N	320	18.3 ± 9.0	NB
A	<i>Lagenorhynchus acutus</i>	Atlantic White-sided Dolphin	Not At Risk			S3S4	2	16.6 ± 1.0	NB
A	<i>Haliaeetus leucocephalus</i>	Bald Eagle	Not At Risk		Endangered	S4	1377	2.7 ± 1.0	NB
A	<i>Canis lupus</i>	Gray Wolf	Not At Risk		Extirpated	SX	4	15.2 ± 1.0	NB
A	<i>Puma concolor pop. 1</i>	Eastern Cougar	Data Deficient		Endangered	SNA	108	4.0 ± 1.0	NB
A	<i>Calidris canutus rufa</i>	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	271	13.6 ± 0.0	NB
A	<i>Morone saxatilis</i>	Striped Bass	E,SC			S3	13	15.9 ± 10.0	NB
A	<i>Odobenus rosmarus pop. 5</i>	Atlantic Walrus - Nova Scotia-Newfoundland-Gulf of St. Lawrence population (DU3)	X			SX	1	80.8 ± 5.0	NS
A	<i>Thryothorus ludovicianus</i>	Carolina Wren				S1	37	6.7 ± 0.0	NB
A	<i>Salvelinus alpinus</i>	Arctic Char				S1	3	57.8 ± 0.0	NB
A	<i>Vireo flavifrons</i>	Yellow-throated Vireo				S1?B,S1?M	16	15.0 ± 1.0	NB
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S1?B,S5M	1083	10.3 ± 0.0	NB
A	<i>Aythya americana</i>	Redhead				S1B,S1M	8	12.7 ± 0.0	NB
A	<i>Gallinula galeata</i>	Common Gallinule				S1B,S1M	34	14.7 ± 1.0	NB
A	<i>Antigone canadensis</i>	Sandhill Crane				S1B,S1M	11	16.1 ± 0.0	NB
A	<i>Bartramia longicauda</i>	Upland Sandpiper				S1B,S1M	46	40.4 ± 0.0	NB
A	<i>Phalaropus tricolor</i>	Wilson's Phalarope				S1B,S1M	57	14.2 ± 0.0	NB
A	<i>Leucophaeus atricilla</i>	Laughing Gull				S1B,S1M	57	12.7 ± 0.0	NB
A	<i>Progne subis</i>	Purple Martin				S1B,S1M	252	0.4 ± 7.0	NB
A	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B,S2S3M	48	12.1 ± 1.0	NB
A	<i>Uria aalge</i>	Common Murre				S1B,S3N,S3M	98	33.0 ± 15.0	NB
A	<i>Aythya affinis</i>	Lesser Scaup				S1B,S4M	200	5.8 ± 0.0	NB
A	<i>Aythya marila</i>	Greater Scaup				S1B,S4M,S2N	42	10.3 ± 0.0	NB
A	<i>Eremophila alpestris</i>	Horned Lark				S1B,S4N,S5M	36	18.3 ± 5.0	NB
A	<i>Sterna paradisaea</i>	Arctic Tern				S1B,SUM	74	29.0 ± 0.0	NB
A	<i>Fratercula arctica</i>	Atlantic Puffin				S1B,SUN,SUM	123	33.0 ± 15.0	NB
A	<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S1N,S2M	37	13.6 ± 0.0	NB
A	<i>Branta bernicla</i>	Brant				S1N,S2S3M	151	19.8 ± 0.0	NB
A	<i>Butorides virescens</i>	Green Heron				S1S2B,S1S2M	30	12.9 ± 7.0	NB
A	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron				S1S2B,S1S2M	39	14.7 ± 1.0	NB
A	<i>Empidonax traillii</i>	Willow Flycatcher				S1S2B,S1S2M	140	7.0 ± 5.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow				S1S2B,S1S2M	22	27.3 ± 7.0	NB
A	<i>Troglodytes aedon</i>	House Wren				S1S2B,S1S2M	31	11.1 ± 0.0	NB
A	<i>Rissa tridactyla</i>	Black-legged Kittiwake				S1S2B,S4N,S5M	57	51.7 ± 0.0	NB
A	<i>Calidris bairdii</i>	Baird's Sandpiper				S1S2M	86	13.4 ± 0.0	NB
A	<i>Cistothorus palustris</i>	Marsh Wren				S2B,S2M	397	11.6 ± 0.0	NB
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S2B,S2M	136	11.4 ± 7.0	NB
A	<i>Toxostoma rufum</i>	Brown Thrasher				S2B,S2M	101	19.3 ± 7.0	NB
A	<i>Poocetes gramineus</i>	Vesper Sparrow				S2B,S2M	98	24.4 ± 7.0	NB
A	<i>Mareca strepera</i>	Gadwall				S2B,S3M	164	11.5 ± 0.0	NB
A	<i>Alca torda</i>	Razorbill				S2B,S3N,S3M	74	21.8 ± 0.0	NB
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S2B,S4S5N,S4S5M	47	20.1 ± 0.0	NB
A	<i>Tringa solitaria</i>	Solitary Sandpiper				S2B,S5M	193	12.2 ± 4.0	NB
A	<i>Anser caerulescens</i>	Snow Goose				S2M	6	21.1 ± 1.0	NB
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2N,S2M	171	15.6 ± 3.0	NB
A	<i>Somateria spectabilis</i>	King Eider				S2N,S2M	16	37.2 ± 0.0	NB
A	<i>Larus hyperboreus</i>	Glaucous Gull				S2N,S2M	145	4.0 ± 9.0	NB
A	<i>Asio otus</i>	Long-eared Owl				S2S3	22	19.3 ± 7.0	NB
A	<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S2S3	11	60.3 ± 7.0	NB
A	<i>Spatula clypeata</i>	Northern Shoveler				S2S3B,S2S3M	162	2.0 ± 0.0	NB
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S2S3B,S2S3M	373	11.3 ± 0.0	NB
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B,S2S3M	597	4.5 ± 7.0	NB
A	<i>Pluvialis dominica</i>	American Golden-Plover				S2S3M	229	13.4 ± 0.0	NB
A	<i>Calcarius lapponicus</i>	Lapland Longspur				S2S3N,SUM	30	14.8 ± 0.0	NB
A	<i>Cephus grylle</i>	Black Guillemot				S3	488	18.3 ± 20.0	NB
A	<i>Loxia curvirostra</i>	Red Crossbill				S3	166	14.1 ± 0.0	NB
A	<i>Spinus pinus</i>	Pine Siskin				S3	427	4.1 ± 5.0	NB
A	<i>Prosopium cylindraceum</i>	Round Whitefish				S3	1	64.0 ± 0.0	NB
A	<i>Salvelinus namaycush</i>	Lake Trout				S3	4	27.8 ± 0.0	NB
A	<i>Sorex maritimensis</i>	Maritime Shrew				S3	2	82.2 ± 0.0	NS
A	<i>Eptesicus fuscus</i>	Big Brown Bat				S3	51	13.0 ± 1.0	NB
A	<i>Cathartes aura</i>	Turkey Vulture				S3B,S3M	373	2.7 ± 1.0	NB
A	<i>Rallus limicola</i>	Virginia Rail				S3B,S3M	289	4.1 ± 5.0	NB
A	<i>Charadrius vociferus</i>	Killdeer				S3B,S3M	874	4.1 ± 5.0	NB
A	<i>Tringa semipalmata</i>	Willet				S3B,S3M	143	16.9 ± 8.0	NB
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B,S3M	207	6.9 ± 7.0	NB
A	<i>Vireo gilvus</i>	Warbling Vireo				S3B,S3M	269	6.9 ± 7.0	NB
A	<i>Piranga olivacea</i>	Scarlet Tanager				S3B,S3M	131	10.5 ± 7.0	NB
A	<i>Passerina cyanea</i>	Indigo Bunting				S3B,S3M	129	5.4 ± 0.0	NB
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S3B,S3M	328	1.3 ± 0.0	NB
A	<i>Icterus galbula</i>	Baltimore Oriole				S3B,S3M	239	10.3 ± 7.0	NB
A	<i>Somateria mollissima</i>	Common Eider				S3B,S4M,S3N	1196	7.0 ± 5.0	NB
A	<i>Setophaga tigrina</i>	Cape May Warbler				S3B,S4S5M	176	10.5 ± 7.0	NB
A	<i>Anas acuta</i>	Northern Pintail				S3B,S5M	59	15.9 ± 7.0	NB
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3B,S5M,S4S5N	320	12.9 ± 0.0	NB
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	498	13.4 ± 0.0	NB
A	<i>Phalaropus fulicarius</i>	Red Phalarope				S3M	71	45.5 ± 0.0	NB
A	<i>Melanitta americana</i>	Black Scoter				S3M,S1S2N	337	13.5 ± 0.0	NB
A	<i>Bucephala albeola</i>	Bufflehead				S3M,S2N	787	5.8 ± 0.0	NB
A	<i>Calidris maritima</i>	Purple Sandpiper				S3M,S3N	216	20.6 ± 15.0	NB
A	<i>Uria lomvia</i>	Thick-billed Murre				S3N,S3M	46	31.1 ± 8.0	NB
A	<i>Synaptomys cooperi</i>	Southern Bog Lemming				S3S4	87	19.8 ± 1.0	NB
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B,S3S4M	676	4.1 ± 5.0	NB
A	<i>Actitis macularia</i>	Spotted Sandpiper				S3S4B,S5M	966	4.1 ± 5.0	NB
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3S4B,S5M	1032	10.3 ± 7.0	NB
A	<i>Larus delawarensis</i>	Ring-billed Gull				S3S4B,S5M	355	2.7 ± 1.0	NB

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A	<i>Setophaga striata</i>	Blackpoll Warbler				S3S4B,S5M	81	22.4 ± 0.0	NB
A	<i>Pluvialis squatarola</i>	Black-bellied Plover				S3S4M	846	13.4 ± 0.0	NB
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3S4M	1427	13.4 ± 0.0	NB
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S3S4M	303	13.4 ± 0.0	NB
A	<i>Calidris alba</i>	Sanderling				S3S4M,S1N	501	13.6 ± 0.0	NB
A	<i>Morus bassanus</i>	Northern Gannet				SHB,S5M	593	17.9 ± 0.0	NB
	<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	55.2 ± 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	54.9 ± 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	11.4 ± 0.0	NB
I	<i>Bombus (Psithyrus) bohemicus</i>	Gypsy Cuckoo Bumble Bee	Endangered	Endangered		S1	15	9.2 ± 5.0	NB
I	<i>Gomphus ventricosus</i>	Skillet Clubtail	Endangered	Endangered	Endangered	S1S2	59	42.5 ± 0.0	NB
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	400	2.1 ± 0.0	NB
I	<i>Bombus affinis</i>	Rusty-patched Bumble Bee	Endangered	Endangered		SH	1	80.4 ± 5.0	NB
I	<i>Bombus suckleyi</i>	Suckley's Cuckoo Bumble Bee	Threatened			SNR	1	19.3 ± 5.0	NB
I	<i>Cicindela marginipennis</i>	Cobblestone Tiger Beetle	Special Concern	Endangered	Endangered	S1	185	51.8 ± 0.0	NB
I	<i>Ophiogomphus howei</i>	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2	15	64.7 ± 0.0	NB
I	<i>Alasmidonta varicosa</i>	Brook Floater	Special Concern	Special Concern	Special Concern	S2	4	88.9 ± 1.0	NB
I	<i>Lampsilis cariosa</i>	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S2	104	16.4 ± 0.0	NB
I	<i>Bombus terricola</i>	Yellow-banded Bumblebee	Special Concern	Special Concern		S3?	180	14.4 ± 5.0	NB
I	<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle	Special Concern			SH	18	15.8 ± 1.0	NB
I	<i>Appalachina sayana</i>	Spike-lip Crater	Not At Risk			S3?	2	7.4 ± 1.0	NB
I	<i>Conotrachelus juglandis</i>	a Weevil				S1	3	76.0 ± 0.0	NB
I	<i>Haematopota rara</i>	Shy Cleg				S1	1	79.9 ± 1.0	NB
I	<i>Lycaena dorcas</i>	Dorcas Copper				S1	1	80.7 ± 0.0	NB
I	<i>Erora laeta</i>	Early Hairstreak				S1	5	82.3 ± 7.0	NB
I	<i>Arigomphus furcifer</i>	Lilypad Clubtail				S1	20	48.2 ± 0.0	NB
I	<i>Polites origenes</i>	Crossline Skipper				S1?	8	36.2 ± 0.0	NB
I	<i>Plebejus saepiolus</i>	Greenish Blue				S1S2	7	62.5 ± 0.0	NB
I	<i>Ophiogomphus colubrinus</i>	Boreal Snaketail				S1S2	37	46.0 ± 1.0	NB
I	<i>Encyclops caerulea</i>	a Longhorned Beetle				S2	1	80.8 ± 0.0	NB
I	<i>Scaphinotus viduus</i>	a Ground Beetle				S2	2	23.6 ± 0.0	NB
I	<i>Brachyleptura circumdata</i>	a Longhorned Beetle				S2	6	59.2 ± 0.0	NB
I	<i>Satyrium calanus</i>	Banded Hairstreak				S2	27	22.5 ± 0.0	NB
I	<i>Satyrium calanus falacer</i>	Banded Hairstreak				S2	1	77.7 ± 1.0	NB
I	<i>Strymon melinus</i>	Grey Hairstreak				S2	7	34.1 ± 0.0	NB
I	<i>Aeshna clepsydra</i>	Mottled Darner				S2	14	7.9 ± 0.0	NB
I	<i>Somatochlora tenebrosa</i>	Clamp-Tipped Emerald				S2	10	74.9 ± 0.0	NB
I	<i>Ladona exusta</i>	White Corporal				S2	6	48.6 ± 0.0	NB
I	<i>Hetaerina americana</i>	American Rubyspot				S2	13	26.4 ± 0.0	NB
I	<i>Ischnura posita</i>	Fragile Forktail				S2	20	52.7 ± 0.0	NB
I	<i>Callophrys henrici</i>	Henry's Elfin				S2S3	19	73.1 ± 7.0	NB
I	<i>Celithemis martha</i>	Martha's Pennant				S2S3	9	12.8 ± 0.0	NB
I	<i>Sphaeroderus nitidicollis</i>	a Ground Beetle				S3	1	59.3 ± 0.0	NB
I	<i>Lepturopsis biforis</i>	a Longhorned Beetle				S3	1	15.8 ± 1.0	NB
I	<i>Orthosoma brunneum</i>	a Longhorned Beetle				S3	3	57.0 ± 5.0	NB
I	<i>Elaphrus americanus</i>	a Ground Beetle				S3	1	64.8 ± 0.0	NB
I	<i>Semanotus terminatus</i>	A Long-horned Beetle				S3	1	74.2 ± 0.0	NB
I	<i>Desmocerus palliatus</i>	Elderberry Borer				S3	9	15.8 ± 1.0	NB
I	<i>Agonum excavatum</i>	a Ground Beetle				S3	1	64.8 ± 0.0	NB

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	<i>Clivina americana</i>	a Ground Beetle				S3	1	64.8 ± 0.0	NB
	<i>Olisthopus parmatus</i>	a Ground Beetle				S3	1	59.3 ± 0.0	NB
	<i>Paratachys scitulus</i>	a Ground Beetle				S3	1	64.8 ± 0.0	NB
	<i>Carabus serratus</i>	a Ground Beetle				S3	1	72.2 ± 0.0	NB
	<i>Coccinella hieroglyphica kirbyi</i>	a Ladybird Beetle				S3	1	15.8 ± 1.0	NB
	<i>Hippodamia parenthesis</i>	Parenthesis Lady Beetle				S3	6	15.8 ± 1.0	NB
	<i>Stenocorus vittiger</i>	a Longhorned Beetle				S3	1	64.8 ± 0.0	NB
	<i>Gnathacmaeops pratensis</i>	a Longhorned Beetle				S3	5	15.8 ± 1.0	NB
	<i>Pogonocherus mixtus</i>	a Longhorned Beetle				S3	1	15.8 ± 1.0	NB
	<i>Badister neopulchellus</i>	a Ground Beetle				S3	1	64.8 ± 0.0	NB
	<i>Calathus gregarius</i>	a Ground Beetle				S3	1	78.5 ± 1.0	NB
	<i>Gonotropis dorsalis</i>	A Fungus Weevil				S3	1	74.2 ± 0.0	NB
	<i>Naemia seriata</i>	a Ladybird beetle				S3	8	32.5 ± 0.0	NB
	<i>Beckerus appressus</i>	A Click Beetle				S3	1	73.6 ± 0.0	NB
	<i>Saperda lateralis</i>	a Longhorned Beetle				S3	2	21.0 ± 0.0	NB
	<i>Trachysida aspera</i>	a Longhorned Beetle				S3	1	97.5 ± 0.0	NB
	<i>Hesperia sassacus</i>	Indian Skipper				S3	18	36.2 ± 1.0	NB
	<i>Euphyes bimacula</i>	Two-spotted Skipper				S3	13	31.5 ± 0.0	NB
	<i>Lycaena hyllus</i>	Bronze Copper				S3	34	18.3 ± 0.0	NB
	<i>Satyrium acadica</i>	Acadian Hairstreak				S3	14	15.7 ± 5.0	NB
	<i>Callophrys polios</i>	Hoary Elfin				S3	22	15.7 ± 5.0	NB
	<i>Plebejus idas</i>	Northern Blue				S3	8	48.7 ± 0.0	NB
	<i>Plebejus idas empetri</i>	Crowberry Blue				S3	35	25.8 ± 2.0	NB
	<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3	28	15.7 ± 5.0	NB
	<i>Boloria bellona</i>	Meadow Fritillary				S3	58	28.8 ± 0.0	NB
	<i>Polygonia satyrus</i>	Satyr Comma				S3	19	23.1 ± 2.0	NB
	<i>Polygonia gracilis</i>	Hoary Comma				S3	6	28.4 ± 7.0	NB
	<i>Nymphalis l-album</i>	Compton Tortoiseshell				S3	33	15.7 ± 5.0	NB
	<i>Gomphus vastus</i>	Cobra Clubtail				S3	86	21.6 ± 0.0	NB
	<i>Gomphus abbreviatus</i>	Spine-crowned Clubtail				S3	32	19.4 ± 0.0	NB
	<i>Gomphaeschna furcillata</i>	Harlequin Darner				S3	10	61.0 ± 0.0	NB
	<i>Dorocordulia lepida</i>	Petite Emerald				S3	28	10.3 ± 0.0	NB
	<i>Somatochlora cingulata</i>	Lake Emerald				S3	12	11.4 ± 0.0	NB
	<i>Somatochlora forcipata</i>	Forcinate Emerald				S3	18	74.1 ± 0.0	NB
	<i>Williamsonia fletcheri</i>	Ebony Boghaunter				S3	4	51.5 ± 0.0	NB
	<i>Lestes eurinus</i>	Amber-Winged Spreadwing				S3	20	29.1 ± 1.0	NB
	<i>Lestes vigilax</i>	Swamp Spreadwing				S3	30	10.3 ± 0.0	NB
	<i>Enallagma geminatum</i>	Skimming Bluet				S3	23	19.4 ± 0.0	NB
	<i>Enallagma signatum</i>	Orange Bluet				S3	24	46.8 ± 0.0	NB
	<i>Stylurus scudderi</i>	Zebra Clubtail				S3	77	21.6 ± 0.0	NB
	<i>Alasmidonta undulata</i>	Triangle Floater				S3	49	3.2 ± 0.0	NB
	<i>Leptodea ochracea</i>	Tidewater Mucket				S3	155	12.2 ± 0.0	NB
	<i>Striatura ferrea</i>	Black Striate				S3	1	79.1 ± 1.0	NB
	<i>Neohelix albolabris</i>	Whitelip				S3	2	40.9 ± 0.0	NB
	<i>Spurwinkia salsa</i>	Saltmarsh Hydrobe				S3	34	1.1 ± 0.0	NB
	<i>Pantala hymenaea</i>	Spot-Winged Glider				S3B,S3M	8	27.4 ± 1.0	NB
	<i>Satyrium liparops</i>	Striped Hairstreak				S3S4	18	1.7 ± 1.0	NB
	<i>Cupido comyntas</i>	Eastern Tailed Blue				S3S4	57	3.1 ± 0.0	NB
N	<i>Erioderma mollissimum</i>	Graceful Felt Lichen	Endangered	Endangered	Endangered	SH	2	75.7 ± 1.0	NB
N	<i>Erioderma pedicellatum</i> (Atlantic pop.)	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	SH	3	84.8 ± 0.0	NS
N	<i>Peltigera hydrothyria</i>	Eastern Waterfan	Threatened	Threatened		S1	707	70.8 ± 0.0	NB
N	<i>Pannaria lurida</i>	Wrinkled Shingle Lichen	Threatened	Threatened		S1?	12	77.6 ± 0.0	NS
N	<i>Anzia colpodes</i>	Black-foam Lichen	Threatened	Threatened		S1S2	12	57.7 ± 0.0	NB
N	<i>Fuscopannaria leucosticta</i>	White-rimmed Shingle Lichen	Threatened			S2	15	27.4 ± 0.0	NB
N	<i>Pectenium plumbea</i>	Blue Felt Lichen	Special Concern	Special Concern	Special Concern	S1	412	26.9 ± 0.0	NB

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N	<i>Pseudevernia cladonia</i>	Ghost Antler Lichen	Not At Risk			S2S3	32	8.5 ± 0.0	NB
N	<i>Imbricaria muehlenbeckii</i>	Muehlenbeck's Bryum Moss				S1	1	15.0 ± 1.0	NB
N	<i>Dicranoweisia crispula</i>	Mountain Thatch Moss				S1	1	83.0 ± 0.0	NB
N	<i>Didymodon rigidulus</i> var. <i>gracilis</i>	a moss				S1	1	78.6 ± 1.0	NB
N	<i>Sphagnum macrophyllum</i>	Sphagnum				S1	4	23.7 ± 0.0	NB
N	<i>Syntrichia ruralis</i>	a Moss				S1	1	54.8 ± 0.0	NB
N	<i>Coscinodon cribrus</i>	Sieve-Toothed Moss				S1	1	17.4 ± 0.0	NB
N	<i>Enchylium tenax</i>	Soil Tarpaper Lichen				S1	1	79.6 ± 0.0	NS
N	<i>Sticta fuliginosa</i>	Peppered Moon Lichen				S1	13	79.2 ± 0.0	NS
N	<i>Cladonia straminea</i>	Reptilian Pixie-cup Lichen				S1	5	71.9 ± 1.0	NB
N	<i>Ephebe hispidula</i>	Dryside Rockshag Lichen				S1	1	81.9 ± 0.0	NS
N	<i>Ephebe perspinulosa</i>	Thread Lichen				S1	1	84.1 ± 0.0	NS
N	<i>Coccocarpia palmicola</i>	Salted Shell Lichen				S1	6	85.9 ± 1.0	NB
N	<i>Peltigera collina</i>	Tree Pelt Lichen				S1	2	97.6 ± 0.0	NS
N	<i>Peltigera malacea</i>	Veinless Pelt Lichen				S1	1	74.5 ± 1.0	NB
N	<i>Bryoria bicolor</i>	Electrified Horsehair Lichen				S1	1	74.5 ± 1.0	NB
N	<i>Hygrobiella laxifolia</i>	Lax Notchwort				S1?	1	72.0 ± 1.0	NB
N	<i>Atrichum angustatum</i>	Lesser Smoothcap Moss				S1?	1	99.9 ± 3.0	NS
N	<i>Bartramia ithyphylla</i>	Straight-leaved Apple Moss				S1?	2	72.0 ± 0.0	NB
N	<i>Pseudocalliergon trifarium</i>	Three-ranked Spear Moss				S1?	1	22.5 ± 0.0	NB
N	<i>Dichelyma falcatum</i>	a Moss				S1?	2	25.5 ± 1.0	NB
N	<i>Dicranum bonjeanii</i>	Bonjean's Broom Moss				S1?	1	79.6 ± 1.0	NB
N	<i>Dicranum condensatum</i>	Condensed Broom Moss				S1?	1	82.8 ± 0.0	NB
N	<i>Entodon brevisetus</i>	a Moss				S1?	1	80.4 ± 10.0	NB
N	<i>Oxyrrhynchium hians</i>	Light Beaked Moss				S1?	4	52.3 ± 0.0	NB
N	<i>Homomallium adnatum</i>	Adnate Hairy-gray Moss				S1?	3	80.4 ± 10.0	NB
N	<i>Plagiothecium latebricola</i>	Alder Silk Moss				S1?	2	22.8 ± 0.0	NB
N	<i>Niphotrichum ericoides</i>	Dense Rock Moss				S1?	1	84.8 ± 3.0	NB
N	<i>Rhytidium rugosum</i>	Wrinkle-leaved Moss				S1?	2	54.5 ± 0.0	NB
N	<i>Seligeria recurvata</i>	a Moss				S1?	2	94.4 ± 1.0	NB
N	<i>Splachnum pennsylvanicum</i>	Southern Dung Moss				S1?	1	75.2 ± 1.0	NB
N	<i>Platylomella lescurii</i>	a Moss				S1?	1	86.0 ± 1.0	NB
N	<i>Euopsis granatina</i>	Lesser Rockbud Lichen				S1?	1	78.8 ± 1.0	NS
N	<i>Heterodermia squamulosa</i>	Scaly Fringe Lichen				S1?	14	23.1 ± 0.0	NB
N	<i>Pilophorus fibula</i>	New England Matchstick Lichen				S1?	1	54.4 ± 0.0	NB
N	<i>Spilonema revertens</i>	Rock Hairball Lichen				S1?	4	80.3 ± 0.0	NS
N	<i>Peltigera venosa</i>	Fan Pelt Lichen				S1?	1	50.2 ± 0.0	NB
N	<i>Cladonia oricola</i>	Cladonia Lichen				S1?	2	37.1 ± 0.0	NB
N	<i>Odontoschisma francisci</i>	Holt's Notchwort				S1S2	4	78.6 ± 1.0	NB
N	<i>Harpanthus flotovianus</i>	Great Mountain Flapwort				S1S2	2	73.1 ± 1.0	NB
N	<i>Jungermannia obovata</i>	Egg Flapwort				S1S2	2	1.8 ± 0.0	NB
N	<i>Pallavicinia lyellii</i>	Lyell's Ribbonwort				S1S2	4	21.7 ± 1.0	NB
N	<i>Radula tenax</i>	Tenacious Scalewort				S1S2	1	83.3 ± 0.0	NB
N	<i>Reboulia hemisphaerica</i>	Purple-margined Liverwort				S1S2	2	78.5 ± 0.0	NB
N	<i>Brachythecium acuminatum</i>	Acuminate Ragged Moss				S1S2	6	47.9 ± 100.0	NB
N	<i>Ptychostomum salinum</i>	Saltmarsh Bryum				S1S2	2	51.2 ± 1.0	NB
N	<i>Pseudocampylium radicale</i>	Long-stalked Fine Wet Moss				S1S2	1	81.0 ± 1.0	NB
N	<i>Tortula obtusifolia</i>	a Moss				S1S2	1	37.5 ± 0.0	NB
N	<i>Distichium inclinatum</i>	Inclined Iris Moss				S1S2	5	78.4 ± 0.0	NB
N	<i>Ditrichum pallidum</i>	Pale Cow-hair Moss				S1S2	3	67.7 ± 1.0	NB
N	<i>Drummondia prorepens</i>	a Moss				S1S2	1	92.6 ± 0.0	NS
N	<i>Hygrohypnum bestii</i>	Best's Brook Moss				S1S2	6	62.0 ± 0.0	NB
N	<i>Sphagnum platyphyllum</i>	Flat-leaved Peat Moss				S1S2	2	84.9 ± 0.0	NS
N	<i>Timmia norvegica</i>	a moss				S1S2	3	40.2 ± 0.0	NB
N	<i>Timmia norvegica</i> var. <i>excurrans</i>	a moss				S1S2	1	78.4 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Tomentypnum falcifolium</i>	Sickle-leaved Golden Moss				S1S2	1	43.1 ± 1.0	NB
N	<i>Tortella humilis</i>	Small Crisp Moss				S1S2	7	72.3 ± 0.0	NB
N	<i>Pseudotaxiphyllum distichaceum</i>	a Moss				S1S2	3	51.2 ± 1.0	NB
N	<i>Hamatocaulis vernicosus</i>	a Moss				S1S2	3	19.1 ± 100.0	NB
N	<i>Haplocladium microphyllum</i>	Tiny-leaved Haplocladium Moss				S1S2	1	73.8 ± 3.0	NS
N	<i>Umbilicaria vellea</i>	Grizzled Rocktripe Lichen				S1S2	1	78.6 ± 1.0	NB
N	<i>Cystocoleus ebeneus</i>	Rockgossamer Lichen				S1S2	1	78.7 ± 0.0	NS
N	<i>Pilophorus cereolus</i>	Powdered Matchstick Lichen				S1S2	2	54.4 ± 0.0	NB
N	<i>Peltigera scabrosa</i>	Greater Toad Pelt Lichen				S1S2	4	82.9 ± 1.0	NB
N	<i>Calypogeia neesiana</i>	Nees' Pouchwort				S1S3	1	10.7 ± 1.0	NB
N	<i>Fuscocephaloziopsis connivens</i>	Forcipated Pincerwort				S1S3	1	2.4 ± 0.0	NB
N	<i>Cephaloziella elachista</i>	Spurred Threadwort				S1S3	1	22.7 ± 5.0	NB
N	<i>Porella pinnata</i>	Pinnate Scalewort				S1S3	1	16.8 ± 1.0	NB
N	<i>Tritomaria scitula</i>	Mountain Notchwort				S1S3	1	85.5 ± 1.0	NB
N	<i>Amphidium mougeotii</i>	a Moss				S2	12	2.5 ± 1.0	NB
N	<i>Anomodon viticulosus</i>	a Moss				S2	8	8.7 ± 1.0	NB
N	<i>Cirriphyllum piliferum</i>	Hair-pointed Moss				S2	4	57.7 ± 0.0	NB
N	<i>Cynodontium strumiferum</i>	Strumose Dogtooth Moss				S2	1	92.9 ± 8.0	NB
N	<i>Dicranella palustris</i>	Drooping-Leaved Fork Moss				S2	10	33.6 ± 100.0	NB
N	<i>Didymodon ferrugineus</i>	Rusty Beard Moss				S2	2	9.9 ± 1.0	NB
N	<i>Ditrichum flexicaule</i>	Flexible Cow-hair Moss				S2	1	2.5 ± 1.0	NB
N	<i>Anomodon tristis</i>	a Moss				S2	4	78.7 ± 10.0	NB
N	<i>Hypnum pratense</i>	Meadow Plait Moss				S2	1	19.7 ± 0.0	NB
N	<i>Isopterygiopsis pulchella</i>	Neat Silk Moss				S2	7	77.8 ± 0.0	NB
N	<i>Isothecium myosuroides</i>	Slender Mouse-tail Moss				S2	6	2.5 ± 1.0	NB
N	<i>Meesia triquetra</i>	Three-ranked Cold Moss				S2	2	47.9 ± 100.0	NB
N	<i>Orthotrichum speciosum</i>	Showy Bristle Moss				S2	3	85.6 ± 0.0	NS
N	<i>Physcomitrium immersum</i>	a Moss				S2	7	16.8 ± 1.0	NB
N	<i>Platydictya jungermannioides</i>	False Willow Moss				S2	4	52.8 ± 0.0	NB
N	<i>Pohlia elongata</i>	Long-necked Nodding Moss				S2	10	72.3 ± 0.0	NB
N	<i>Seligeria calcarea</i>	Chalk Brittle Moss				S2	3	2.5 ± 1.0	NB
N	<i>Sphagnum centrale</i>	Central Peat Moss				S2	7	72.3 ± 0.0	NB
N	<i>Sphagnum lindbergii</i>	Lindberg's Peat Moss				S2	8	21.7 ± 1.0	NB
N	<i>Sphagnum flexuosum</i>	Flexuous Peatmoss				S2	2	80.0 ± 0.0	NB
N	<i>Tayloria serrata</i>	Serrate Trumpet Moss				S2	8	28.3 ± 1.0	NB
N	<i>Tetradontium brownianum</i>	Little Georgia				S2	7	77.9 ± 1.0	NB
N	<i>Tetraplodon mnioides</i>	Entire-leaved Nitrogen Moss				S2	3	44.4 ± 0.0	NB
N	<i>Thamnobryum alleghaniense</i>	a Moss				S2	19	40.2 ± 0.0	NB
N	<i>Tortula mucronifolia</i>	Mucronate Screw Moss				S2	1	16.8 ± 0.0	NB
N	<i>Ulota phyllantha</i>	a Moss				S2	7	51.2 ± 1.0	NB
N	<i>Anomobryum julaceum</i>	Slender Silver Moss				S2	5	43.0 ± 0.0	NB
N	<i>Cladonia macrophylla</i>	Fig-leaved Lichen				S2	3	81.2 ± 1.0	NB
N	<i>Leptogium corticola</i>	Blistered Jellyskin Lichen				S2	24	68.7 ± 0.0	NB
N	<i>Leptogium milligranum</i>	Stretched Jellyskin Lichen				S2	2	78.4 ± 0.0	NS
N	<i>Nephroma laevigatum</i>	Mustard Kidney Lichen				S2	15	61.6 ± 0.0	NB
N	<i>Peltigera lepidophora</i>	Scaly Pelt Lichen				S2	2	50.2 ± 0.0	NB
N	<i>Andreaea rothii</i>	a Moss				S2?	6	20.5 ± 0.0	NB
N	<i>Anomodon minor</i>	Blunt-leaved Anomodon Moss				S2?	1	86.9 ± 1.0	NB
N	<i>Brachythecium digastrum</i>	a Moss				S2?	2	44.0 ± 0.0	NB
N	<i>Ptychostomum pallescens</i>	Tall Clustered Bryum				S2?	2	16.1 ± 1.0	NB
N	<i>Dichelyma capillaceum</i>	Hairlike Dichelyma Moss				S2?	1	80.9 ± 3.0	NB
N	<i>Dicranum spurium</i>	Spurred Broom Moss				S2?	6	38.2 ± 0.0	NB
N	<i>Hygrohypnum montanum</i>	a Moss				S2?	2	55.9 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Schistostega pennata</i>	Luminous Moss				S2?	3	33.6 ± 100.0	NB
N	<i>Seligeria campylopoda</i>	a Moss				S2?	1	19.1 ± 100.0	NB
N	<i>Seligeria diversifolia</i>	a Moss				S2?	2	43.0 ± 0.0	NB
N	<i>Sphagnum angermanicum</i>	a Peatmoss				S2?	3	41.2 ± 10.0	NB
N	<i>Trichodon cylindricus</i>	Cylindric Hairy-teeth Moss				S2?	1	94.4 ± 10.0	NB
N	<i>Plagiomnium rostratum</i>	Long-beaked Leafy Moss				S2?	6	40.1 ± 0.0	NB
N	<i>Ramalina labiosorediata</i>	Chalky Ramalina Lichen				S2?	1	81.6 ± 1.0	NB
N	<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen				S2?	2	95.8 ± 0.0	NB
N	<i>Imshaugia placodioides</i>	Eyed Starburst Lichen				S2?	1	96.9 ± 0.0	NS
N	<i>Nephroma arcticum</i>	Arctic Kidney Lichen				S2?	1	75.0 ± 1.0	NB
N	<i>Ptychostomum cernuum</i>	Swamp Bryum				S2S3	3	19.1 ± 4.0	NB
N	<i>Buxbaumia aphylla</i>	Brown Shield Moss				S2S3	2	90.1 ± 15.0	NB
N	<i>Calliergonella cuspidata</i>	Common Large Wetland Moss				S2S3	16	5.4 ± 0.0	NB
N	<i>Drepanocladus polygamus</i>	Polygamous Hook Moss				S2S3	1	75.0 ± 0.0	NB
N	<i>Palustriella falcata</i>	a Moss				S2S3	3	2.5 ± 1.0	NB
N	<i>Didymodon rigidulus</i>	Rigid Screw Moss				S2S3	11	15.0 ± 0.0	NB
N	<i>Ephemerum serratum</i>	a Moss				S2S3	3	54.5 ± 0.0	NB
N	<i>Fissidens bushii</i>	Bush's Pocket Moss				S2S3	7	15.0 ± 0.0	NB
N	<i>Hypnum cupressiforme var. filiforme</i>	a Moss				S2S3	1	84.3 ± 0.0	NS
N	<i>Neckera complanata</i>	a Moss				S2S3	5	2.5 ± 1.0	NB
N	<i>Orthotrichum elegans</i>	Showy Bristle Moss				S2S3	3	77.5 ± 2.0	NB
N	<i>Pohlia prolifera</i>	Cottony Nodding Moss				S2S3	4	78.1 ± 1.0	NB
N	<i>Codriophorus fascicularis</i>	Clustered Rock Moss				S2S3	4	72.1 ± 0.0	NB
N	<i>Racomitrium affine</i>	a Moss				S2S3	1	82.5 ± 1.0	NB
N	<i>Saelania glaucescens</i>	Blue Dew Moss				S2S3	2	83.0 ± 0.0	NB
N	<i>Scorpidium scorpioides</i>	Hooked Scorpion Moss				S2S3	4	5.4 ± 0.0	NB
N	<i>Sphagnum subfulvum</i>	a Peatmoss				S2S3	4	43.1 ± 1.0	NB
N	<i>Taxiphyllum deplanatum</i>	Imbricate Yew-leaved Moss				S2S3	3	51.2 ± 1.0	NB
N	<i>Zygodon viridissimus</i>	a Moss				S2S3	5	82.8 ± 1.0	NB
N	<i>Schistidium agassizii</i>	Elf Bloom Moss				S2S3	6	72.2 ± 0.0	NB
N	<i>Loeskeobryum brevirostre</i>	a Moss				S2S3	15	2.5 ± 1.0	NB
N	<i>Cyrtomnium hymenophylloides</i>	Short-pointed Lantern Moss				S2S3	7	53.0 ± 0.0	NB
N	<i>Cladonia acuminata</i>	Scantily Clad Pixie Lichen				S2S3	2	75.7 ± 1.0	NB
N	<i>Cladonia ramulosa</i>	Bran Lichen				S2S3	4	79.4 ± 1.0	NB
N	<i>Cladonia sulphurina</i>	Greater Sulphur-cup Lichen				S2S3	5	74.5 ± 0.0	NB
N	<i>Parmeliopsis ambigua</i>	Green Starburst Lichen				S2S3	1	73.2 ± 1.0	NB
N	<i>Sphaerophorus globosus</i>	Northern Coral Lichen				S2S3	17	71.9 ± 1.0	NB
N	<i>Cynodontium tenellum</i>	Delicate Dogtooth Moss				S3	1	51.2 ± 1.0	NB
N	<i>Hypnum curvifolium</i>	Curved-leaved Plait Moss				S3	11	72.1 ± 0.0	NB
N	<i>Tortella fragilis</i>	Fragile Twisted Moss				S3	1	78.4 ± 0.0	NB
N	<i>Schistidium maritimum</i>	a Moss				S3	10	51.2 ± 1.0	NB
N	<i>Hymenostylium recurvirostre</i>	Hymenostylium Moss				S3	9	78.1 ± 1.0	NB
N	<i>Collema nigrescens</i>	Blistered Tarpaper Lichen				S3	1	85.2 ± 3.0	NS
N	<i>Solorina saccata</i>	Woodland Owl Lichen				S3	7	50.2 ± 0.0	NB
N	<i>Normandina pulchella</i>	Rimmed Elf-ear Lichen				S3	21	74.4 ± 1.0	NB
N	<i>Cladonia farinacea</i>	Farinose Pixie Lichen				S3	5	81.2 ± 1.0	NB
N	<i>Cladonia strepsilis</i>	Olive Cladonia Lichen				S3	5	18.0 ± 0.0	NB
N	<i>Hypotrachyna catawbiensis</i>	Powder-tipped Antler Lichen				S3	29	77.6 ± 0.0	NB
N	<i>Scytinium lichenoides</i>	Tattered Jellyskin Lichen				S3	7	50.2 ± 0.0	NB
N	<i>Nephroma bellum</i>	Naked Kidney Lichen				S3	3	73.7 ± 1.0	NB
N	<i>Nephroma resupinatum</i>	a lichen				S3	1	85.6 ± 0.0	NS
N	<i>Peltigera degenii</i>	Lustrous Pelt Lichen				S3	3	74.3 ± 1.0	NB
N	<i>Usnea strigosa</i>	Bushy Beard Lichen				S3	16	2.8 ± 0.0	NB
N	<i>Stereocaulon condensatum</i>	Granular Soil Foam Lichen				S3	9	70.5 ± 0.0	NB
N	<i>Leptogium laceroides</i>	Short-bearded Jellyskin				S3	7	79.8 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Peltigera membranacea</i>	Membranous Pelt Lichen				S3	16	53.0 ± 0.0	NB
N	<i>Cladonia carneola</i>	Crowned Pixie-cup Lichen				S3	2	81.2 ± 1.0	NB
N	<i>Cladonia deformis</i>	Lesser Sulphur-cup Lichen				S3	9	71.9 ± 1.0	NB
N	<i>Aulacomnium androgynum</i>	Little Groove Moss				S3?	13	2.5 ± 1.0	NB
N	<i>Dicranella rufescens</i>	Red Forklet Moss				S3?	3	78.4 ± 0.0	NB
N	<i>Rhytidiadelphus loreus</i>	Lanky Moss				S3?	4	76.2 ± 0.0	NB
N	<i>Sphagnum lescurii</i>	a Peatmoss				S3?	9	2.7 ± 0.0	NB
N	<i>Sphagnum inundatum</i>	a Sphagnum				S3?	2	18.4 ± 0.0	NB
N	<i>Scytinium subtile</i>	Appressed Jellyskin Lichen				S3?	6	27.8 ± 0.0	NB
N	<i>Rostania occultata</i>	Crusted Tarpaper Lichen				S3?	5	85.6 ± 3.0	NS
N	<i>Stereocaulon subcoralloides</i>	Coralloid Foam Lichen				S3?	1	81.6 ± 1.0	NB
N	<i>Anomodon rugelii</i>	Rugel's Anomodon Moss				S3S4	3	84.2 ± 0.0	NS
N	<i>Barbula convoluta</i>	Lesser Bird's-claw Beard Moss				S3S4	2	82.2 ± 0.0	NS
N	<i>Brachytheciastrum velutinum</i>	Velvet Ragged Moss				S3S4	5	73.3 ± 1.0	NB
N	<i>Calliergon giganteum</i>	Giant Spear Moss				S3S4	1	84.6 ± 0.0	NS
N	<i>Dicranella cerviculata</i>	a Moss				S3S4	5	51.2 ± 1.0	NB
N	<i>Dicranum majus</i>	Greater Broom Moss				S3S4	24	44.4 ± 0.0	NB
N	<i>Dicranum leioneuron</i>	a Dicranum Moss				S3S4	1	77.3 ± 0.0	NB
N	<i>Encalypta ciliata</i>	Fringed Extinguisher Moss				S3S4	1	78.7 ± 0.0	NB
N	<i>Fissidens bryoides</i>	Lesser Pocket Moss				S3S4	4	9.7 ± 5.0	NB
N	<i>Elodium blandowii</i>	Blandow's Bog Moss				S3S4	2	10.2 ± 0.0	NB
N	<i>Heterocladium dimorphum</i>	Dimorphous Tangle Moss				S3S4	5	77.5 ± 2.0	NB
N	<i>Isopterygiopsis muelleriana</i>	a Moss				S3S4	24	2.5 ± 1.0	NB
N	<i>Myurella julacea</i>	Small Mouse-tail Moss				S3S4	5	2.5 ± 1.0	NB
N	<i>Physcomitrium pyriforme</i>	Pear-shaped Urn Moss				S3S4	8	51.7 ± 0.0	NB
N	<i>Pogonatum dentatum</i>	Mountain Hair Moss				S3S4	3	51.2 ± 1.0	NB
N	<i>Sphagnum quinquefarium</i>	Five-ranked Peat Moss				S3S4	5	2.5 ± 1.0	NB
N	<i>Sphagnum torreyanum</i>	a Peatmoss				S3S4	6	29.0 ± 0.0	NB
N	<i>Sphagnum austinii</i>	Austin's Peat Moss				S3S4	2	28.6 ± 1.0	NB
N	<i>Sphagnum contortum</i>	Twisted Peat Moss				S3S4	2	5.0 ± 0.0	NB
N	<i>Splachnum rubrum</i>	Red Collar Moss				S3S4	1	26.1 ± 1.0	NB
N	<i>Tetraphis geniculata</i>	Geniculate Four-tooth Moss				S3S4	13	21.2 ± 0.0	NB
N	<i>Tetraplodon angustatus</i>	Toothed-leaved Nitrogen Moss				S3S4	3	20.3 ± 0.0	NB
N	<i>Weissia controversa</i>	Green-Cushioned Weissia				S3S4	6	2.0 ± 1.0	NB
N	<i>Abietinella abietina</i>	Wiry Fern Moss				S3S4	2	78.4 ± 0.0	NB
N	<i>Trichostomum tenuirostre</i>	Acid-Soil Moss				S3S4	9	15.0 ± 0.0	NB
N	<i>Pannaria rubiginosa</i>	Brown-eyed Shingle Lichen				S3S4	22	27.8 ± 0.0	NB
N	<i>Pseudocyphellaria holarctica</i>	Yellow Specklebelly Lichen				S3S4	73	18.0 ± 0.0	NB
N	<i>Ramalina thrausta</i>	Angelhair Ramalina Lichen				S3S4	12	71.9 ± 1.0	NB
N	<i>Hypogymnia vittata</i>	Slender Monk's Hood Lichen				S3S4	27	71.9 ± 1.0	NB
N	<i>Scytinium teretiusculum</i>	Curly Jellyskin Lichen				S3S4	3	78.4 ± 0.0	NS
N	<i>Montanelia panniformis</i>	Shingled Camouflage Lichen				S3S4	5	74.5 ± 1.0	NB
N	<i>Cladonia terrae-novae</i>	Newfoundland Reindeer Lichen				S3S4	5	37.1 ± 0.0	NB
N	<i>Cladonia floerkeana</i>	Gritty British Soldiers Lichen				S3S4	5	18.1 ± 0.0	NB
N	<i>Vahlia leucophaea</i>	Shelter Shingle Lichen				S3S4	8	77.6 ± 0.0	NB
N	<i>Xylopsora friesii</i>	a Lichen				S3S4	1	78.6 ± 1.0	NB
N	<i>Nephroma parile</i>	Powdery Kidney Lichen				S3S4	17	20.4 ± 0.0	NB
N	<i>Protopannaria pezizoides</i>	Brown-gray Moss-shingle Lichen				S3S4	28	47.8 ± 0.0	NB
N	<i>Usnea subrubicunda</i>	Reddish Beard Lichen				S3S4	3	84.2 ± 3.0	NS
N	<i>Fuscopannaria sorediata</i>	a Lichen				S3S4	2	84.4 ± 1.0	NB
N	<i>Stereocaulon paschale</i>	Easter Foam Lichen				S3S4	1	79.8 ± 1.0	NS
N	<i>Pannaria conoplea</i>	Mealy-rimmed Shingle Lichen				S3S4	46	68.7 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Physcia tenella</i>	Fringed Rosette Lichen				S3S4	1	84.6 ± 0.0	NB
N	<i>Anaptychia palmulata</i>	Shaggy Fringed Lichen				S3S4	42	18.5 ± 0.0	NB
N	<i>Peltigera neopolydactyla</i>	Undulating Pelt Lichen				S3S4	10	73.2 ± 1.0	NB
N	<i>Cladonia cariosa</i>	Lesser Ribbed Pixie Lichen				S3S4	3	83.2 ± 1.0	NB
N	<i>Hypocenomyce scalaris</i>	Common Clam Lichen				S3S4	1	81.6 ± 1.0	NB
N	<i>Dermatocarpon luridum</i>	Brookside Stippleback Lichen				S3S4	120	20.7 ± 0.0	NB
N	<i>Grimmia anodon</i>	Toothless Grimmia Moss				SH	2	14.6 ± 10.0	NB
N	<i>Leucodon brachypus</i>	a Moss				SH	7	78.5 ± 100.0	NB
N	<i>Thelia hirtella</i>	a Moss				SH	2	47.9 ± 100.0	NB
N	<i>Cyrto-hypnum minutulum</i>	Tiny Cedar Moss				SH	3	76.6 ± 10.0	NB
P	<i>Juglans cinerea</i>	Butternut	Endangered	Endangered	Endangered	S1	161	12.5 ± 0.0	NB
P	<i>Polemonium vanbruntiae</i>	Van Brunt's Jacob's-ladder	Threatened	Threatened	Threatened	S1	74	47.2 ± 0.0	NB
P	<i>Fraxinus nigra</i>	Black Ash	Threatened			S4S5	247	9.2 ± 0.0	NB
P	<i>Isoetes prototypus</i>	Prototype Quillwort	Special Concern	Special Concern	Endangered	S2	26	23.2 ± 0.0	NB
P	<i>Symphotrichum anticostense</i>	Anticosti Aster	Special Concern	Special Concern	Endangered	S2S3	6	15.0 ± 0.0	NB
P	<i>Pterospora andromedea</i>	Woodland Pinedrops			Endangered	S1	19	87.6 ± 0.0	NB
P	<i>Cryptotaenia canadensis</i>	Canada Honewort				S1	1	52.6 ± 1.0	NB
P	<i>Sanicula trifoliata</i>	Large-Fruited Sanicle				S1	1	20.3 ± 5.0	NB
P	<i>Antennaria parlinii</i> ssp. <i>fallax</i>	Parlin's Pussytoes				S1	7	40.7 ± 1.0	NB
P	<i>Antennaria howellii</i> ssp. <i>petaloidea</i>	Pussy-Toes				S1	2	17.3 ± 1.0	NB
P	<i>Bidens discoidea</i>	Swamp Beggarticks				S1	4	59.4 ± 0.0	NB
P	<i>Pseudognaphalium obtusifolium</i>	Eastern Cudweed				S1	7	73.2 ± 0.0	NB
P	<i>Helianthus decapetalus</i>	Ten-rayed Sunflower				S1	14	89.9 ± 0.0	NB
P	<i>Hieracium paniculatum</i>	Panicled Hawkweed				S1	17	30.8 ± 0.0	NB
P	<i>Hieracium robinsonii</i>	Robinson's Hawkweed				S1	12	71.8 ± 0.0	NB
P	<i>Barbarea orthoceras</i>	American Yellow Rocket				S1	2	45.6 ± 1.0	NB
P	<i>Cardamine parviflora</i>	Small-flowered Bittercress				S1	18	15.3 ± 0.0	NB
P	<i>Cardamine concatenata</i>	Cut-leaved Toothwort				S1	3	72.2 ± 0.0	NB
P	<i>Draba arabisans</i>	Rock Whitlow-Grass				S1	33	1.7 ± 0.0	NB
P	<i>Draba cana</i>	Lance-leaved Draba				S1	10	87.8 ± 0.0	NB
P	<i>Draba glabella</i>	Rock Whitlow-Grass				S1	14	2.1 ± 0.0	NB
P	<i>Mononeuria groenlandica</i>	Greenland Stitchwort				S1	2	28.4 ± 0.0	NB
P	<i>Chenopodium simplex</i>	Maple-leaved Goosefoot				S1	13	58.7 ± 1.0	NB
P	<i>Blitum capitatum</i>	Strawberry-Blite				S1	4	15.2 ± 1.0	NB
P	<i>Suaeda rolandii</i>	Roland's Sea-Blite				S1	3	84.9 ± 0.0	NB
P	<i>Hypericum virginicum</i>	Virginia St. John's-wort				S1	2	12.7 ± 0.0	NB
P	<i>Corema conradii</i>	Broom Crowberry				S1	25	17.2 ± 10.0	NB
P	<i>Vaccinium boreale</i>	Northern Blueberry				S1	2	46.5 ± 0.0	NB
P	<i>Vaccinium corymbosum</i>	Highbush Blueberry				S1	2	89.1 ± 1.0	NS
P	<i>Euphorbia polygonifolia</i>	Seaside Spurge				S1	1	96.5 ± 0.0	NB
P	<i>Hylodesmum glutinosum</i>	Large Tick-trefoil				S1	14	94.8 ± 0.0	NS
P	<i>Lespedeza capitata</i>	Round-headed Bush-clover				S1	11	56.9 ± 0.0	NB
P	<i>Gentiana rubricaulis</i>	Purple-stemmed Gentian				S1	5	60.0 ± 0.0	NB
P	<i>Lomatogonium rotatum</i>	Marsh Felwort				S1	3	76.8 ± 0.0	NB
P	<i>Proserpinaca pectinata</i>	Comb-leaved Mermaidweed				S1	2	49.5 ± 0.0	NB
P	<i>Pycnanthemum virginianum</i>	Virginia Mountain Mint				S1	4	21.4 ± 0.0	NB
P	<i>Polygonum douglasii</i>	Douglas Knotweed				S1	1	55.1 ± 0.0	NB
P	<i>Lysimachia quadrifolia</i>	Whorled Yellow Loosestrife				S1	16	13.4 ± 1.0	NB
P	<i>Primula laurentiana</i>	Laurentian Primrose				S1	50	72.2 ± 0.0	NB
P	<i>Ranunculus sceleratus</i>	Cursed Buttercup				S1	6	21.4 ± 0.0	NB
P	<i>Crataegus jonesiae</i>	Jones' Hawthorn				S1	5	78.4 ± 1.0	NB
P	<i>Potentilla canadensis</i>	Canada Cinquefoil				S1	1	86.0 ± 0.0	NB
P	<i>Rubus flagellaris</i>	Northern Dewberry				S1	7	20.3 ± 1.0	NB
P	<i>Galium brevipes</i>	Limestone Swamp Bedstraw				S1	2	15.0 ± 0.0	NB

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P	<i>Saxifraga paniculata</i> ssp. <i>laestadii</i>	Laestadius' Saxifrage				S1	47	1.7 ± 10.0	NB
P	<i>Agalinis tenuifolia</i>	Slender Agalinis				S1	9	74.5 ± 0.0	NB
P	<i>Agalinis purpurea</i> var. <i>parviflora</i>	Small-flowered Purple False Foxglove				S1	10	8.7 ± 1.0	NB
P	<i>Gratiola lutea</i>	Golden Hedge-hyssop				S1	2	27.2 ± 0.0	NB
P	<i>Pedicularis canadensis</i>	Canada Lousewort				S1	4	68.0 ± 0.0	NB
P	<i>Viola sagittata</i> var. <i>ovata</i>	Arrow-Leaved Violet				S1	44	76.5 ± 0.0	NS
P	<i>Alisma subcordatum</i>	Southern Water Plantain				S1	4	15.3 ± 0.0	NB
P	<i>Carex atlantica</i> ssp. <i>atlantica</i>	Atlantic Sedge				S1	1	59.3 ± 0.0	NB
P	<i>Carex backii</i>	Rocky Mountain Sedge				S1	8	54.3 ± 0.0	NB
P	<i>Carex cephaloidea</i>	Thin-leaved Sedge				S1	2	98.7 ± 0.0	NB
P	<i>Carex merritt-feraldii</i>	Merritt Fernald's Sedge				S1	3	89.6 ± 0.0	NB
P	<i>Carex scirpoidea</i>	Scirpuslike Sedge				S1	6	52.1 ± 0.0	NB
P	<i>Carex waponahkikensis</i>	Dawn-land Sedge				S1	1	96.1 ± 0.0	NB
P	<i>Carex sterilis</i>	Sterile Sedge				S1	2	88.2 ± 2.0	NB
P	<i>Carex grisea</i>	Inflated Narrow-leaved Sedge				S1	13	25.4 ± 0.0	NB
P	<i>Carex saxatilis</i>	Russet Sedge				S1	14	1.1 ± 5.0	NB
P	<i>Cyperus diandrus</i>	Low Flatsedge				S1	7	74.5 ± 1.0	NB
P	<i>Cyperus lupulinus</i> ssp. <i>macilentus</i>	Hop Flatsedge				S1	64	52.2 ± 0.0	NB
P	<i>Rhynchospora capillacea</i>	Slender Beakrush				S1	3	90.9 ± 0.0	NB
P	<i>Scirpus pendulus</i>	Hanging Bulrush				S1	6	54.5 ± 0.0	NB
P	<i>Sisyrinchium angustifolium</i>	Narrow-leaved Blue-eyed-grass				S1	15	18.8 ± 1.0	NB
P	<i>Juncus greenii</i>	Greene's Rush				S1	1	60.8 ± 0.0	NB
P	<i>Juncus subtilis</i>	Creeping Rush				S1	1	33.5 ± 5.0	NB
P	<i>Allium canadense</i>	Canada Garlic				S1	11	21.7 ± 0.0	NB
P	<i>Goodyera pubescens</i>	Downy Rattlesnake-Plantain				S1	16	63.5 ± 0.0	NB
P	<i>Malaxis monophyllos</i> var. <i>brachypoda</i>	North American White Adder's-mouth				S1	1	80.5 ± 0.0	NS
P	<i>Malaxis monophyllos</i>	White Adder's-mouth				S1	1	99.5 ± 0.0	NB
P	<i>Platanthera flava</i>	Southern Rein-Orchid				S1	1	99.5 ± 0.0	NB
P	<i>Platanthera flava</i> var. <i>herbiola</i>	Pale Green Orchid				S1	26	55.4 ± 0.0	NB
P	<i>Platanthera macrophylla</i>	Large Round-Leaved Orchid				S1	11	43.8 ± 0.0	NB
P	<i>Spiranthes casei</i>	Case's Ladies'-Tresses				S1	6	87.8 ± 0.0	NB
P	<i>Bromus pubescens</i>	Hairy Wood Brome Grass				S1	6	55.0 ± 0.0	NB
P	<i>Cinna arundinacea</i>	Sweet Wood Reed Grass				S1	5	29.8 ± 0.0	NB
P	<i>Danthonia compressa</i>	Flattened Oat Grass				S1	17	55.0 ± 1.0	NB
P	<i>Dichanthelium dichotomum</i>	Forked Panic Grass				S1	1	11.8 ± 1.0	NB
P	<i>Festuca subverticillata</i>	Nodding Fescue				S1	2	85.1 ± 1.0	NS
P	<i>Glyceria obtusa</i>	Atlantic Manna Grass				S1	3	49.6 ± 0.0	NB
P	<i>Sporobolus compositus</i>	Rough Dropseed				S1	17	90.0 ± 1.0	NB
P	<i>Potamogeton friesii</i>	Fries' Pondweed				S1	6	17.3 ± 5.0	NB
P	<i>Potamogeton nodosus</i>	Long-leaved Pondweed				S1	8	49.0 ± 0.0	NB
P	<i>Potamogeton strictifolius</i>	Straight-leaved Pondweed				S1	2	5.7 ± 0.0	NB
P	<i>Xyris difformis</i>	Bog Yellow-eyed-grass				S1	3	12.7 ± 0.0	NB
P	<i>Asplenium ruta-muraria</i> var. <i>cryptolepis</i>	Wallrue Spleenwort				S1	4	1.7 ± 0.0	NB
P	<i>Cystopteris laurentiana</i>	Laurentian Bladder Fern				S1	1	54.1 ± 1.0	NB
P	<i>Dryopteris clintoniana</i>	Clinton's Wood Fern				S1	1	97.2 ± 0.0	NB
P	<i>Huperzia selago</i>	Northern Firmoss				S1	1	79.8 ± 1.0	NS
P	<i>Sceptridium oneidense</i>	Blunt-lobed Moonwort				S1	4	53.4 ± 0.0	NB
P	<i>Sceptridium rugulosum</i>	Rugulose Grapefern				S1	1	87.9 ± 1.0	NB
P	<i>Schizaea pusilla</i>	Little Curlygrass Fern				S1	32	28.7 ± 0.0	NB
P	<i>Cuscuta campestris</i>	Field Dodder				S1?	3	56.5 ± 5.0	NB

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P	<i>Polygonum aviculare</i> ssp. <i>neglectum</i>	Narrow-leaved Knotweed				S1?	4	78.5 ± 0.0	NB
P	<i>Carex laxiflora</i>	Loose-Flowered Sedge				S1?	2	79.0 ± 5.0	NS
P	<i>Wolffia columbiana</i>	Columbian Watermeal				S1?	6	60.6 ± 0.0	NB
P	<i>Micranthes virginiensis</i>	Early Saxifrage				S1S2	14	87.7 ± 0.0	NB
P	<i>Potamogeton bicupulatus</i>	Snailseed Pondweed				S1S2	5	34.7 ± 0.0	NB
P	<i>Selaginella rupestris</i>	Rock Spikemoss				S1S2	42	54.2 ± 1.0	NB
P	<i>Coryphopteris simulata</i>	Bog Fern				S1S2	21	58.5 ± 0.0	NB
P	<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S1S3	2	3.4 ± 0.0	NB
P	<i>Eriophorum russeolum</i> ssp. <i>albidum</i>	Smooth-fruited Russet Cottongrass				S1S3	3	94.6 ± 0.0	NB
P	<i>Spiranthes arcisepala</i>	Appalachian Ladies'-tresses				S1S3	12	25.5 ± 0.0	NB
P	<i>Neottia bifolia</i>	Southern Twayblade			Endangered	S2	17	71.5 ± 0.0	NB
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	3	92.1 ± 0.0	NB
P	<i>Sanicula odorata</i>	Clustered Sanicle				S2	1	96.3 ± 0.0	NB
P	<i>Solidago racemosa</i>	Racemose Goldenrod				S2	14	89.3 ± 0.0	NB
P	<i>Ionactis linariifolia</i>	Flax-leaved Aster				S2	1	85.4 ± 0.0	NB
P	<i>Symphotrichum racemosum</i>	Small White Aster				S2	11	20.7 ± 0.0	NB
P	<i>Pseudognaphalium macounii</i>	Macoun's Cudweed				S2	7	17.4 ± 0.0	NB
P	<i>Impatiens pallida</i>	Pale Jewelweed				S2	10	52.5 ± 0.0	NB
P	<i>Alnus serrulata</i>	Smooth Alder				S2	12	36.0 ± 0.0	NB
P	<i>Betula minor</i>	Dwarf White Birch				S2	1	97.7 ± 0.0	NB
P	<i>Boechnera stricta</i>	Drummond's Rockcress				S2	25	16.7 ± 5.0	NB
P	<i>Sagina nodosa</i>	Knotted Pearlwort				S2	24	15.0 ± 0.0	NB
P	<i>Sagina nodosa</i> ssp. <i>borealis</i>	Knotted Pearlwort				S2	2	34.4 ± 0.0	NB
P	<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	9	15.0 ± 0.0	NB
P	<i>Atriplex glabriuscula</i> var. <i>franktonii</i>	Frankton's Saltbush				S2	6	36.2 ± 1.0	NB
P	<i>Oxybasis rubra</i>	Red Goosefoot				S2	4	13.1 ± 1.0	NB
P	<i>Hypericum x dissimulatum</i>	Disguised St. John's-wort				S2	2	60.1 ± 0.0	NB
P	<i>Triosteum aurantiacum</i>	Orange-fruited Tinker's Weed				S2	13	89.9 ± 0.0	NB
P	<i>Viburnum lentago</i>	Nannyberry				S2	15	76.9 ± 0.0	NB
P	<i>Viburnum recognitum</i>	Northern Arrow-Wood				S2	2	71.2 ± 0.0	NB
P	<i>Astragalus eucosmus</i>	Elegant Milk-vetch				S2	10	9.7 ± 0.0	NB
P	<i>Oxytropis campestris</i> var. <i>johannensis</i>	Field Locoweed				S2	36	2.5 ± 50.0	NB
P	<i>Quercus macrocarpa</i>	Bur Oak				S2	116	13.2 ± 1.0	NB
P	<i>Gentiana linearis</i>	Narrow-Leaved Gentian				S2	5	80.5 ± 5.0	NB
P	<i>Myriophyllum humile</i>	Low Water Milfoil				S2	9	60.1 ± 1.0	NB
P	<i>Proserpinaca palustris</i>	Marsh Mermaidweed				S2	31	20.7 ± 0.0	NB
P	<i>Hedeoma pulegioides</i>	American False Pennyroyal				S2	59	4.7 ± 1.0	NB
P	<i>Nuphar x rubrodiscalis</i>	Red-disk Yellow Pond-lily				S2	12	16.0 ± 0.0	NB
P	<i>Aphyllon uniflorum</i>	One-flowered Broomrape				S2	18	1.6 ± 2.0	NB
P	<i>Polygaloides paucifolia</i>	Fringed Milkwort				S2	19	60.1 ± 0.0	NB
P	<i>Polygala senega</i>	Seneca Snakeroot				S2	2	98.6 ± 1.0	NB
P	<i>Persicaria amphibia</i> var. <i>emersa</i>	Long-root Smartweed				S2	51	13.1 ± 0.0	NB
P	<i>Persicaria careyi</i>	Carey's Smartweed				S2	17	11.6 ± 5.0	NB
P	<i>Podostemum ceratophyllum</i>	Horn-leaved Riverweed				S2	8	50.1 ± 0.0	NB
P	<i>Anemone multifida</i>	Cut-leaved Anemone				S2	1	91.6 ± 0.0	NB
P	<i>Hepatica americana</i>	Round-lobed Hepatica				S2	37	40.4 ± 1.0	NB
P	<i>Ranunculus flabellaris</i>	Yellow Water Buttercup				S2	17	31.3 ± 0.0	NB
P	<i>Crataegus scabrida</i>	Rough Hawthorn				S2	9	2.2 ± 0.0	NB
P	<i>Crataegus succulenta</i>	Fleshy Hawthorn				S2	1	81.0 ± 5.0	NB
P	<i>Cephalanthus occidentalis</i>	Common Buttonbush				S2	21	48.2 ± 0.0	NB
P	<i>Salix candida</i>	Sage Willow				S2	2	95.4 ± 1.0	NB

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P	<i>Agalinis neoscotica</i>	Nova Scotia Agalinis			S2		19	80.3 ± 1.0	NS
P	<i>Euphrasia randii</i>	Rand's Eyebright			S2		21	34.0 ± 0.0	NB
P	<i>Scrophularia lanceolata</i>	Lance-leaved Figwort			S2		5	15.3 ± 5.0	NB
P	<i>Dirca palustris</i>	Eastern Leatherwood			S2		16	58.8 ± 1.0	NB
P	<i>Phryma leptostachya</i>	American Lopseed			S2		4	93.3 ± 1.0	NB
P	<i>Verbena urticifolia</i>	White Vervain			S2		17	87.7 ± 2.0	NB
P	<i>Viola novae-angliae</i>	New England Violet			S2		13	15.6 ± 0.0	NB
P	<i>Symplocarpus foetidus</i>	Eastern Skunk Cabbage			S2		82	2.0 ± 1.0	NB
P	<i>Carex comosa</i>	Bearded Sedge			S2		7	80.7 ± 0.0	NS
P	<i>Carex granularis</i>	Limestone Meadow Sedge			S2		7	52.6 ± 5.0	NB
P	<i>Carex gynocrates</i>	Northern Bog Sedge			S2		1	55.0 ± 1.0	NB
P	<i>Carex hirtifolia</i>	Pubescent Sedge			S2		5	28.3 ± 0.0	NB
P	<i>Carex livida</i>	Livid Sedge			S2		2	3.9 ± 0.0	NB
P	<i>Carex plantaginea</i>	Plantain-Leaved Sedge			S2		5	76.7 ± 0.0	NB
P	<i>Carex prairea</i>	Prairie Sedge			S2		1	94.6 ± 5.0	NS
P	<i>Carex rostrata</i>	Narrow-leaved Beaked Sedge			S2		3	20.2 ± 0.0	NB
P	<i>Carex salina</i>	Saltmarsh Sedge			S2		2	18.3 ± 1.0	NB
P	<i>Carex sprengelii</i>	Longbeak Sedge			S2		4	48.3 ± 0.0	NB
P	<i>Carex tenuiflora</i>	Sparse-Flowered Sedge			S2		2	81.9 ± 0.0	NB
P	<i>Carex albicans</i> var. <i>emmonsii</i>	White-tinged Sedge			S2		8	20.1 ± 0.0	NB
P	<i>Cyperus squarrosus</i>	Awned Flatsedge			S2		46	17.1 ± 0.0	NB
P	<i>Eriophorum gracile</i>	Slender Cottongrass			S2		9	20.7 ± 0.0	NB
P	<i>Blysmopsis rufa</i>	Red Bulrush			S2		3	15.0 ± 0.0	NB
P	<i>Elodea nuttallii</i>	Nuttall's Waterweed			S2		7	15.2 ± 0.0	NB
P	<i>Juncus vaseyi</i>	Vasey Rush			S2		6	72.9 ± 0.0	NB
P	<i>Allium tricoccum</i>	Wild Leek			S2		63	10.9 ± 0.0	NB
P	<i>Najas gracillima</i>	Thread-Like Naiad			S2		11	50.9 ± 0.0	NB
P	<i>Calypso bulbosa</i> var. <i>americana</i>	Calypso			S2		7	5.1 ± 0.0	NB
P	<i>Coeloglossum viride</i>	Long-bracted Frog Orchid			S2		9	22.2 ± 5.0	NB
P	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper			S2		5	8.7 ± 1.0	NB
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses			S2		14	9.4 ± 0.0	NB
P	<i>Spiranthes ochroleuca</i>	Yellow Ladies'-tresses			S2		9	50.9 ± 0.0	NB
P	<i>Agrostis mertensii</i>	Northern Bent Grass			S2		1	84.1 ± 1.0	NB
P	<i>Dichanthelium linearifolium</i>	Narrow-leaved Panic Grass			S2		14	43.3 ± 0.0	NB
P	<i>Elymus canadensis</i>	Canada Wild Rye			S2		18	15.0 ± 0.0	NB
P	<i>Leersia virginica</i>	White Cut Grass			S2		42	31.0 ± 0.0	NB
P	<i>Piptatheropsis canadensis</i>	Canada Ricegrass			S2		6	46.7 ± 0.0	NB
P	<i>Puccinellia phryganodes</i> ssp. <i>neoarctica</i>	Creeping Alkali Grass			S2		11	47.3 ± 0.0	NB
P	<i>Poa glauca</i>	Glaucous Blue Grass			S2		18	17.4 ± 2.0	NB
P	<i>Puccinellia nutkaensis</i>	Alaska Alkaligrass			S2		7	22.8 ± 1.0	NB
P	<i>Schizachyrium scoparium</i>	Little Bluestem			S2		54	15.3 ± 0.0	NB
P	<i>Zizania aquatica</i>	Southern Wild Rice			S2		2	15.0 ± 0.0	NB
P	<i>Zizania aquatica</i> var. <i>aquatica</i>	Eastern Wild Rice			S2		5	29.6 ± 0.0	NB
P	<i>Piptatheropsis pungens</i>	Slender Ricegrass			S2		4	84.0 ± 0.0	NB
P	<i>Potamogeton vaseyi</i>	Vasey's Pondweed			S2		6	17.3 ± 1.0	NB
P	<i>Asplenium trichomanes</i>	Maidenhair Spleenwort			S2		24	15.0 ± 0.0	NB
P	<i>Anchistea virginica</i>	Virginia chain fern			S2		15	80.5 ± 0.0	NB
P	<i>Woodsia alpina</i>	Alpine Cliff Fern			S2		11	1.7 ± 0.0	NB
P	<i>Selaginella selaginoides</i>	Low Spikemoss			S2		12	17.4 ± 6.0	NB
P	<i>Toxicodendron radicans</i> var. <i>radicans</i>	Eastern Poison Ivy			S2?		14	16.0 ± 0.0	NB
P	<i>Symphotrichum novi-belgii</i>	New York Aster			S2?		7	15.1 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>var. crenifolium</i> <i>Humulus lupulus</i> var. <i>lupuloides</i>	Common Hop				S2?	4	77.0 ± 0.0	NB
P	<i>Rubus x recurvicaulis</i>	arching dewberry				S2?	5	3.5 ± 5.0	NB
P	<i>Galium obtusum</i>	Blunt-leaved Bedstraw				S2?	6	15.0 ± 0.0	NB
P	<i>Salix myricoides</i>	Bayberry Willow				S2?	7	73.2 ± 0.0	NB
P	<i>Carex vacillans</i>	Estuarine Sedge				S2?	3	83.3 ± 1.0	NB
P	<i>Platanthera huronensis</i>	Fragrant Green Orchid				S2?	4	75.9 ± 0.0	NB
P	<i>Solidago altissima</i>	Tall Goldenrod				S2S3	5	9.1 ± 1.0	NB
P	<i>Callitriche hermaphroditica</i>	Northern Water-starwort				S2S3	10	14.3 ± 1.0	NB
P	<i>Lonicera oblongifolia</i>	Swamp Fly Honeysuckle				S2S3	2	30.3 ± 6.0	NB
P	<i>Elatine americana</i>	American Waterwort				S2S3	7	9.7 ± 0.0	NB
P	<i>Bartonia paniculata</i>	Branched Bartonia				S2S3	1	59.3 ± 0.0	NB
P	<i>Bartonia paniculata</i> ssp. <i>iodandra</i>	Branched Bartonia				S2S3	40	28.7 ± 0.0	NB
P	<i>Geranium robertianum</i>	Herb Robert				S2S3	54	1.7 ± 0.0	NB
P	<i>Myriophyllum quitense</i>	Andean Water Milfoil				S2S3	71	0.9 ± 0.0	NB
P	<i>Epilobium coloratum</i>	Purple-veined Willowherb				S2S3	17	15.2 ± 1.0	NB
P	<i>Rumex pallidus</i>	Seabeach Dock				S2S3	10	15.8 ± 0.0	NB
P	<i>Rumex occidentalis</i>	Western Dock				S2S3	1	75.8 ± 1.0	NB
P	<i>Rubus pensilvanicus</i>	Pennsylvania Blackberry				S2S3	28	16.3 ± 0.0	NB
P	<i>Galium labradoricum</i>	Labrador Bedstraw				S2S3	6	70.6 ± 0.0	NB
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	12	14.9 ± 1.0	NB
P	<i>Corallorhiza maculata</i> var. <i>occidentalis</i>	Spotted Coralroot				S2S3	12	69.8 ± 1.0	NB
P	<i>Corallorhiza maculata</i> var. <i>maculata</i>	Spotted Coralroot				S2S3	7	33.9 ± 1.0	NB
P	<i>Neottia auriculata</i>	Auricled Twayblade				S2S3	9	20.3 ± 1.0	NB
P	<i>Spiranthes cernua</i>	Nodding Ladies'-Tresses				S2S3	29	54.7 ± 1.0	NB
P	<i>Eragrostis pectinacea</i>	Tufted Love Grass				S2S3	14	15.0 ± 0.0	NB
P	<i>Stuckenia filiformis</i>	Thread-leaved Pondweed				S2S3	7	5.5 ± 0.0	NB
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S2S3	12	5.5 ± 0.0	NB
P	<i>Isoetes tuckermanii</i> ssp. <i>acadiensis</i>	Acadian Quillwort				S2S3	9	53.7 ± 0.0	NB
P	<i>Ophioglossum pusillum</i>	Northern Adder's-tongue				S2S3	10	17.0 ± 1.0	NB
P	<i>Panax trifolius</i>	Dwarf Ginseng				S3	31	20.6 ± 0.0	NB
P	<i>Artemisia campestris</i> ssp. <i>caudata</i>	Tall Wormwood				S3	133	15.0 ± 0.0	NB
P	<i>Artemisia campestris</i>	Field Wormwood				S3	24	51.1 ± 0.0	NB
P	<i>Bidens hyperborea</i>	Estuary Beggarticks				S3	1	15.0 ± 0.0	NB
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane				S3	83	7.8 ± 0.0	NB
P	<i>Nabalus racemosus</i>	Glaucous Rattlesnakeroot				S3	74	3.0 ± 1.0	NB
P	<i>Tanacetum bipinnatum</i> ssp. <i>huronense</i>	Lake Huron Tansy				S3	25	5.7 ± 1.0	NB
P	<i>Symphyotrichum boreale</i>	Boreal Aster				S3	15	2.0 ± 1.0	NB
P	<i>Betula pumila</i>	Bog Birch				S3	22	15.0 ± 0.0	NB
P	<i>Turritis glabra</i>	Tower Mustard				S3	2	15.0 ± 0.0	NB
P	<i>Arabis pycnocarpa</i>	Cream-flowered Rockcress				S3	24	15.3 ± 1.0	NB
P	<i>Cardamine maxima</i>	Large Toothwort				S3	47	10.5 ± 0.0	NB
P	<i>Subularia aquatica</i> ssp. <i>americana</i>	American Water Awlwort				S3	14	39.8 ± 0.0	NB
P	<i>Lobelia cardinalis</i>	Cardinal Flower				S3	282	15.0 ± 0.0	NB
P	<i>Stellaria humifusa</i>	Saltmarsh Starwort				S3	15	22.0 ± 0.0	NB
P	<i>Ceratophyllum echinatum</i>	Prickly Hornwort				S3	18	8.5 ± 0.0	NB
P	<i>Hudsonia tomentosa</i>	Woolly Beach-heath				S3	4	15.0 ± 0.0	NB
P	<i>Cornus obliqua</i>	Silky Dogwood				S3	89	14.6 ± 0.0	NB
P	<i>Crassula aquatica</i>	Water Pygmyweed				S3	3	32.4 ± 0.0	NB
P	<i>Rhodiola rosea</i>	Roseroot				S3	130	1.8 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Penthorum sedoides</i>	Ditch Stonecrop			S3		87	17.8 ± 0.0	NB
P	<i>Elatine minima</i>	Small Waterwort			S3		29	8.2 ± 0.0	NB
P	<i>Astragalus alpinus</i>	Alpine Milk-vetch			S3		2	15.0 ± 0.0	NB
P	<i>Astragalus alpinus var. brunetianus</i>	Alpine Milk-Vetch			S3		3	89.4 ± 0.0	NB
P	<i>Hedysarum americanum</i>	Alpine Hedysarum			S3		3	10.4 ± 0.0	NB
P	<i>Gentianella amarella ssp. acuta</i>	Northern Gentian			S3		3	16.3 ± 5.0	NB
P	<i>Geranium bicknellii</i>	Bicknell's Crane's-bill			S3		22	15.0 ± 0.0	NB
P	<i>Myriophyllum farwellii</i>	Farwell's Water Milfoil			S3		17	15.0 ± 0.0	NB
P	<i>Myriophyllum heterophyllum</i>	Variable-leaved Water Milfoil			S3		82	11.3 ± 0.0	NB
P	<i>Myriophyllum verticillatum</i>	Whorled Water Milfoil			S3		21	4.3 ± 5.0	NB
P	<i>Teucrium canadense</i>	Canada Germander			S3		6	81.0 ± 5.0	NS
P	<i>Stachys hispida</i>	Smooth Hedge-Nettle			S3		12	11.5 ± 0.0	NB
P	<i>Utricularia radiata</i>	Little Floating Bladderwort			S3		38	22.0 ± 0.0	NB
P	<i>Nuphar microphylla</i>	Small Yellow Pond-lily			S3		28	6.2 ± 1.0	NB
P	<i>Epilobium hornemannii</i>	Hornemann's Willowherb			S3		7	44.4 ± 0.0	NB
P	<i>Epilobium hornemannii ssp. hornemannii</i>	Hornemann's Willowherb			S3		1	74.6 ± 0.0	NB
P	<i>Epilobium strictum</i>	Downy Willowherb			S3		23	9.0 ± 0.0	NB
P	<i>Polygala sanguinea</i>	Blood Milkwort			S3		42	42.1 ± 0.0	NB
P	<i>Persicaria arifolia</i>	Halberd-leaved Tearthumb			S3		24	31.5 ± 0.0	NB
P	<i>Persicaria punctata</i>	Dotted Smartweed			S3		10	59.3 ± 2.0	NB
P	<i>Fallopia scandens</i>	Climbing False Buckwheat			S3		43	10.8 ± 0.0	NB
P	<i>Littorella americana</i>	American Shoreweed			S3		30	8.2 ± 0.0	NB
P	<i>Primula mistassinica</i>	Mistassini Primrose			S3		13	1.7 ± 0.0	NB
P	<i>Pyrola minor</i>	Lesser Pyrola			S3		6	46.1 ± 1.0	NB
P	<i>Clematis occidentalis</i>	Purple Clematis			S3		31	10.8 ± 5.0	NB
P	<i>Ranunculus gmelinii</i>	Gmelin's Water Buttercup			S3		26	29.7 ± 0.0	NB
P	<i>Thalictrum confine</i>	Northern Meadow-rue			S3		83	4.9 ± 5.0	NB
P	<i>Amelanchier canadensis</i>	Canada Serviceberry			S3		20	1.7 ± 1.0	NB
P	<i>Rosa palustris</i>	Swamp Rose			S3		75	3.5 ± 5.0	NB
P	<i>Rubus occidentalis</i>	Black Raspberry			S3		25	20.1 ± 0.0	NB
P	<i>Sanguisorba canadensis</i>	Canada Burnet			S3		17	79.8 ± 0.0	NB
P	<i>Galium boreale</i>	Northern Bedstraw			S3		9	12.9 ± 1.0	NB
P	<i>Salix nigra</i>	Black Willow			S3		177	1.2 ± 1.0	NB
P	<i>Salix pedicellaris</i>	Bog Willow			S3		56	15.0 ± 0.0	NB
P	<i>Salix interior</i>	Sandbar Willow			S3		34	15.0 ± 0.0	NB
P	<i>Comandra umbellata</i>	Bastard's Toadflax			S3		2	15.0 ± 0.0	NB
P	<i>Parnassia glauca</i>	Fen Grass-of-Parnassus			S3		2	15.0 ± 0.0	NB
P	<i>Limosella australis</i>	Southern Mudwort			S3		1	99.3 ± 0.0	NB
P	<i>Boehmeria cylindrica</i>	Small-spike False-nettle			S3		54	59.5 ± 0.0	NB
P	<i>Pilea pumila</i>	Dwarf Clearweed			S3		45	20.5 ± 0.0	NB
P	<i>Viola adunca</i>	Hooked Violet			S3		11	15.0 ± 0.0	NB
P	<i>Viola nephrophylla</i>	Northern Bog Violet			S3		22	7.8 ± 0.0	NB
P	<i>Carex arcta</i>	Northern Clustered Sedge			S3		55	15.0 ± 0.0	NB
P	<i>Carex capillaris</i>	Hairlike Sedge			S3		24	7.9 ± 0.0	NB
P	<i>Carex chordorrhiza</i>	Creeping Sedge			S3		24	48.0 ± 1.0	NB
P	<i>Carex conoidea</i>	Field Sedge			S3		25	9.1 ± 1.0	NB
P	<i>Carex eburnea</i>	Bristle-leaved Sedge			S3		18	18.4 ± 0.0	NB
P	<i>Carex exilis</i>	Coastal Sedge			S3		110	3.5 ± 0.0	NB
P	<i>Carex garberi</i>	Garber's Sedge			S3		2	9.2 ± 0.0	NB
P	<i>Carex haydenii</i>	Hayden's Sedge			S3		91	14.7 ± 0.0	NB
P	<i>Carex lupulina</i>	Hop Sedge			S3		91	14.2 ± 0.0	NB
P	<i>Carex michauxiana</i>	Michaux's Sedge			S3		71	4.4 ± 0.0	NB
P	<i>Carex ormostachya</i>	Necklace Spike Sedge			S3		10	47.3 ± 1.0	NB
P	<i>Carex rosea</i>	Rosy Sedge			S3		33	9.1 ± 0.0	NB
P	<i>Carex tenera</i>	Tender Sedge			S3		57	15.0 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Carex tuckermanii</i>	Tuckerman's Sedge				S3	90	14.3 ± 0.0	NB
P	<i>Carex vaginata</i>	Sheathed Sedge				S3	1	92.3 ± 0.0	NB
P	<i>Carex wiegandii</i>	Wiegand's Sedge				S3	145	20.2 ± 0.0	NB
P	<i>Carex recta</i>	Estuary Sedge				S3	10	31.0 ± 0.0	NB
P	<i>Carex atratiformis</i>	Scabrous Black Sedge				S3	2	15.0 ± 0.0	NB
P	<i>Cyperus dentatus</i>	Toothed Flatsedge				S3	230	4.7 ± 5.0	NB
P	<i>Cyperus esculentus</i> var. <i>leptostachyus</i>	Perennial Yellow Nutsedge				S3	83	15.0 ± 0.0	NB
P	<i>Eleocharis intermedia</i>	Matted Spikerush				S3	2	66.9 ± 0.0	NB
P	<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush				S3	8	3.9 ± 0.0	NB
P	<i>Rhynchospora capitellata</i>	Small-headed Beakrush				S3	22	49.3 ± 0.0	NB
P	<i>Rhynchospora fusca</i>	Brown Beakrush				S3	33	3.9 ± 0.0	NB
P	<i>Trichophorum clintonii</i>	Clinton's Clubrush				S3	49	7.9 ± 0.0	NB
P	<i>Bolboschoenus fluviatilis</i>	River Bulrush				S3	58	12.5 ± 0.0	NB
P	<i>Schoenoplectus torreyi</i>	Torrey's Bulrush				S3	42	10.7 ± 0.0	NB
P	<i>Lemna trisulca</i>	Star Duckweed				S3	27	2.5 ± 1.0	NB
P	<i>Triantha glutinosa</i>	Sticky False-Asphodel				S3	10	9.3 ± 0.0	NB
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S3	8	7.6 ± 10.0	NB
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3	20	1.7 ± 0.0	NB
P	<i>Platanthera blephariglottis</i>	White Fringed Orchid				S3	159	15.0 ± 0.0	NB
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	62	17.7 ± 1.0	NB
P	<i>Bromus latiglumis</i>	Broad-Grummed Brome				S3	22	49.4 ± 0.0	NB
P	<i>Calamagrostis pickeringii</i>	Pickering's Reed Grass				S3	131	3.9 ± 0.0	NB
P	<i>Dichanthelium depauperatum</i>	Starved Panic Grass				S3	38	48.6 ± 0.0	NB
P	<i>Muhlenbergia richardsonis</i>	Mat Muhly				S3	9	89.9 ± 0.0	NB
P	<i>Heteranthera dubia</i>	Water Stargrass				S3	59	8.5 ± 0.0	NB
P	<i>Potamogeton obtusifolius</i>	Blunt-leaved Pondweed				S3	15	15.0 ± 0.0	NB
P	<i>Potamogeton richardsonii</i>	Richardson's Pondweed				S3	35	15.7 ± 0.0	NB
P	<i>Xyris montana</i>	Northern Yellow-Eyed-Grass				S3	48	5.1 ± 0.0	NB
P	<i>Zannichellia palustris</i>	Horned Pondweed				S3	7	5.7 ± 0.0	NB
P	<i>Adiantum pedatum</i>	Northern Maidenhair Fern				S3	18	15.0 ± 0.0	NB
P	<i>Cryptogramma stelleri</i>	Steller's Rockbrake				S3	3	11.0 ± 1.0	NB
P	<i>Asplenium viride</i>	Green Spleenwort				S3	23	1.8 ± 0.0	NB
P	<i>Dryopteris fragrans</i>	Fragrant Wood Fern				S3	65	15.0 ± 0.0	NB
P	<i>Dryopteris goldiana</i>	Goldie's Woodfern				S3	7	92.7 ± 5.0	NB
P	<i>Woodsia glabella</i>	Smooth Cliff Fern				S3	67	25.3 ± 1.0	NB
P	<i>Equisetum palustre</i>	Marsh Horsetail				S3	9	8.1 ± 0.0	NB
P	<i>Isoetes tuckermanii</i> ssp. <i>tuckermanii</i>	Tuckerman's Quillwort				S3	27	29.6 ± 1.0	NB
P	<i>Isoetes tuckermanii</i>	Tuckerman's Quillwort				S3	2	15.0 ± 0.0	NB
P	<i>Diphasiastrum x sabinifolium</i>	Savin-leaved Ground-cedar				S3	18	15.0 ± 0.0	NB
P	<i>Huperzia appressa</i>	Mountain Firmoss				S3	38	13.3 ± 1.0	NB
P	<i>Sceptridium dissectum</i>	Dissected Moonwort				S3	29	5.4 ± 0.0	NB
P	<i>Botrychium lanceolatum</i> ssp. <i>angustisegmentum</i>	Narrow Triangle Moonwort				S3	15	15.0 ± 0.0	NB
P	<i>Botrychium simplex</i>	Least Moonwort				S3	8	73.6 ± 0.0	NB
P	<i>Polypodium appalachianum</i>	Appalachian Polypody				S3	35	13.4 ± 1.0	NB
P	<i>Utricularia resupinata</i>	Inverted Bladderwort				S3?	19	10.6 ± 1.0	NB
P	<i>Crataegus submollis</i>	Quebec Hawthorn				S3?	16	9.8 ± 1.0	NB
P	<i>Mertensia maritima</i>	Sea Lungwort				S3S4	45	15.0 ± 0.0	NB
P	<i>Lobelia kalmii</i>	Brook Lobelia				S3S4	20	5.4 ± 1.0	NB
P	<i>Suaeda calceoliformis</i>	Horned Sea-blite				S3S4	8	25.6 ± 1.0	NB
P	<i>Myriophyllum sibiricum</i>	Siberian Water Milfoil				S3S4	37	3.4 ± 0.0	NB
P	<i>Stachys pilosa</i>	Hairy Hedge-Nettle				S3S4	7	7.8 ± 0.0	NB
P	<i>Utricularia gibba</i>	Humped Bladderwort				S3S4	31	14.8 ± 0.0	NB
P	<i>Rumex fueginus</i>	Tierra del Fuego Dock				S3S4	1	89.9 ± 1.0	NB
P	<i>Drymocallis arguta</i>	Tall Wood Beauty				S3S4	31	9.5 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Rubus chamaemorus</i>	Cloudberry				S3S4	104	4.4 ± 1.0	NB
P	<i>Geocaulon lividum</i>	Northern Comandra				S3S4	15	13.9 ± 0.0	NB
P	<i>Juniperus horizontalis</i>	Creeping Juniper				S3S4	29	15.0 ± 0.0	NB
P	<i>Cladium mariscoides</i>	Smooth Twigrush				S3S4	63	5.4 ± 0.0	NB
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	26	25.5 ± 1.0	NB
P	<i>Eriophorum russeolum ssp. russeolum</i>	Russet Cottongrass				S3S4	7	94.7 ± 0.0	NB
P	<i>Triglochin gaspensis</i>	Gasp Arrowgrass				S3S4	20	21.5 ± 1.0	NB
P	<i>Spirodela polyrhiza</i>	Great Duckweed				S3S4	39	18.5 ± 0.0	NB
P	<i>Corallorhiza maculata</i>	Spotted Coralroot				S3S4	27	15.0 ± 0.0	NB
P	<i>Calamagrostis stricta</i>	Slim-stemmed Reed Grass				S3S4	7	15.0 ± 0.0	NB
P	<i>Distichlis spicata</i>	Salt Grass				S3S4	4	58.1 ± 0.0	NB
P	<i>Potamogeton oakesianus</i>	Oakes' Pondweed				S3S4	42	10.9 ± 5.0	NB
P	<i>Montia fontana</i>	Water Blinks				SH	3	74.1 ± 1.0	NB
P	<i>Solidago caesia</i>	Blue-stemmed Goldenrod				SX	2	15.2 ± 1.0	NB
P	<i>Celastrus scandens</i>	Climbing Bittersweet				SX	2	90.0 ± 100.0	NB
P	<i>Carex swanii</i>	Swan's Sedge				SX	82	78.1 ± 0.0	NS

5.1 SOURCE BIBLIOGRAPHY (100 km)

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

# recs	CITATION
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5929	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
4641	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
3516	Erpworth, W. 2016. Species at Risk records, 2014-2016. Fort Folly Habitat Recovery Program, 38 recs.
3385	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
2901	Pardieck, K.L., Ziolkowski Jr., D.J., Lutmerding, M., Aponte, V.I., and Hudson, M-A.R. 2020. North American Breeding Bird Survey Dataset 1966 - 2019: U.S. Geological Survey data release, https://doi.org/10.5066/P9J6QUF6
1998	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
1697	Berrigan, L. 2019. Maritimes Marsh Monitoring Project 2013, 2014, 2016, 2017, and 2018 data. Bird Studies Canada, Sackville, NB.
1022	Paquet, Julie. 2018. Atlantic Canada Shorebird Survey (ACSS) database 2012-2018. Environment Canada, Canadian Wildlife Service.
807	Askanas, H. 2016. New Brunswick Wood Turtle Database. New Brunswick Department of Energy and Resource Development.
607	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2003.
567	Wallace, S. 2020. Stewardship Department species occurrence data on NTNB preserves. Nature Trust of New Brunswick.
546	Chapman, C.J. 2019. Atlantic Canada Conservation Data Centre 2019 botanical fieldwork. Atlantic Canada Conservation Data Centre, 11729 recs.
545	Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero).
542	Stantec. 2014. Energy East Pipeline Corridor Species Occurrence Data. Stantec Inc., 4934 records.
490	eBird. 2020. eBird Basic Dataset. Version: EBD_relNov-2019. Ithaca, New York. Nov 2019, Cape Breton Bras d'Or Lakes Watershed subset. Cornell Lab of Ornithology.
464	Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs.
444	Blaney, C.S.; Mazerolle, D.M. 2009. Fieldwork 2009. Atlantic Canada Conservation Data Centre. Sackville NB, 13395 recs.
427	Blaney, C.S.; Mazerolle, D.M. 2008. Fieldwork 2008. Atlantic Canada Conservation Data Centre. Sackville NB, 13343 recs.
420	Benedict, B. Connell Herbarium Specimens (Data) . University New Brunswick, Fredericton. 2003.
407	Churchill, J.L. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre, 2318 recs.
395	Sollows, M.C., 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
359	Blaney, C.S. & Mazerolle, D.M. 2011. NB WTF Fieldwork on Magaguadavic & Lower St Croix Rivers. Atlantic Canada Conservation Data Centre, 4585 recs.
353	Chapman-Lam, C.J. 2021. Atlantic Canada Conservation Data Centre 2020 botanical fieldwork. Atlantic Canada Conservation Data Centre, 17309 recs.
348	Brunelle, P.-M. (compiler). 2009. ADIP/MDDS Odonata Database: data to 2006 inclusive. Atlantic Dragonfly Inventory Program (ADIP), 24200 recs.
327	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs. https://doi.org/10.1037/arc0000014 .
286	Churchill, J.L. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2018. Atlantic Canada Conservation Data Centre, 907 recs.
284	Belland, R.J. Maritimes moss records from various herbarium databases. 2014.
284	Mazerolle, D.M. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
260	Belliveau, A.G. 2020. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2019, 2020. E.C. Smith Herbarium.
259	Churchill, J.L. 2019. Atlantic Canada Conservation Data Centre Fieldwork 2019. Atlantic Canada Conservation Data Centre.

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248	Mazerolle, D.M. 2020. Atlantic Canada Conservation Data Centre botanical fieldwork 2019. Atlantic Canada Conservation Data Centre.
240	Sollows, M.C., 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
236	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.
229	Blaney, C.S.; Mazerolle, D.M.; Klymko, J.; Spicer, C.D. 2006. Fieldwork 2006. Atlantic Canada Conservation Data Centre. Sackville NB, 8399 recs.
214	Goltz, J.P. 2012. Field Notes, 1989-2005. , 1091 recs.
212	Mazerolle, D.M. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 13515 recs.
203	Clayden, S.R. 2007. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, download Mar. 2007, 6914 recs.
198	Nature Trust of New Brunswick. 2021. Nature Trust of New Brunswick site inventory data submitted in April 2021. Nature Trust of New Brunswick, 2189 records.
197	Hinds, H.R. 1986. Notes on New Brunswick plant collections. Connell Memorial Herbarium, unpubl, 739 recs.
192	Churchill, J.L.; Klymko, J.D. 2016. Bird Species at Risk Inventory on the Acadia Research Forest, 2016. Atlantic Canada Conservation Data Centre, 1043 recs.
184	Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs.
184	Blaney, C.S. & Mazerolle, D.M. 2011. Field data from NCC properties at Musquash Harbour NB & Goose Lake NS. Atlantic Canada Conservation Data Centre, 1739 recs.
172	Riley, J. 2020. Digby County lichen observations. Pers. comm. to J.L. Churchill.
169	Klymko, J. 2020. Atlantic Canada Conservation Data Centre zoological fieldwork 2019. Atlantic Canada Conservation Data Centre.
165	Klymko, J. 2019. Atlantic Canada Conservation Data Centre zoological fieldwork 2018. Atlantic Canada Conservation Data Centre.
165	Phinney, Lori. 2020. Pre- and post White-nose Syndrome bat acoustic monitoring, NS. Mersey Tobeatic Research Institute, 1279 recs.
165	Tranquilla, L. 2015. Maritimes Marsh Monitoring Project 2015 data. Bird Studies Canada, Sackville NB, 5062 recs.
157	Parks Canada. 2010. Specimens in or near National Parks in Atlantic Canada. Canadian National Museum, 3925 recs.
154	iNaturalist. 2018. iNaturalist Data Export 2018. iNaturalist.org and iNaturalist.ca, Web site: 11700 recs.
150	Riley, J. 2019. Digby County lichen observations. Pers. comm. to J.L. Churchill, 50 recs.
144	Blaney, C.S.; Mazerolle, D.M. 2012. Fieldwork 2012. Atlantic Canada Conservation Data Centre, 13,278 recs.
136	Belliveau, A.G. 2018. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
130	Blaney, C.S. 2000. Fieldwork 2000. Atlantic Canada Conservation Data Centre. Sackville NB, 1265 recs.
129	Blaney, C.S.; Spicer, C.D.; Popma, T.M.; Hanel, C. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 2252 recs.
121	Clayden, S. Digitization of Wolfgang Maass Nova Scotia forest lichen collections, 1964-2004. New Brunswick Museum. 2018.
120	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2013. Atlantic Canada Conservation Data Centre Fieldwork 2013. Atlantic Canada Conservation Data Centre, 9000+ recs.
119	Benedict, B. Connell Herbarium Specimen Database Download 2004. Connell Memorial Herbarium, University of New Brunswick. 2004.
118	Stewart, J.I. 2010. Peregrine Falcon Surveys in New Brunswick, 2002-09. Canadian Wildlife Service, Sackville, 58 recs.
115	Richardson, Leif. 2018. Maritimes Bombus records from various sources. Richardson, Leif.
114	Bishop, G. & Papoulias, M.; Arnold (Chaplin), M. 2005. Grand Lake Meadows field notes, Summer 2005. New Brunswick Federation of Naturalists, 1638 recs.
109	Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs.
107	Manthorne, A. 2014. MaritimesSwiftwatch Project database 2013-2014. Bird Studies Canada, Sackville NB, 326 recs.
106	Sollows, M.C. 2008. NBM Science Collections databases: herpetiles. New Brunswick Museum, Saint John NB, download Jan. 2008, 8636 recs.
104	Eaton, S. 2014. Nova Scotia Wood Turtle Database. Environment and Climate Change Canada, 4843 recs.
101	iNaturalist. 2020. iNaturalist butterfly records selected for the Maritimes Butterfly Atlas. iNaturalist.
100	Boyne, A.W. 2000. Tern Surveys. Canadian Wildlife Service, Sackville, unpublished data. 168 recs.
97	Sabine, D.L. 2005. 2001 Freshwater Mussel Surveys. New Brunswick Dept of Natural Resources & Energy, 590 recs.
94	Porter, Caitlin. 2021. Field data for 2020 in various locations across the Maritimes. Atlantic Canada Conservation Data Centre, 3977 records.
90	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
88	Erskine, A.J. 1999. Maritime Nest Records Scheme (MNRS) 1937-1999. Canadian Wildlife Service, Sackville, 313 recs.
86	Blaney, C.S. 2017. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
86	Blaney, C.S. 2019. Sean Blaney 2019 field data. Atlantic Canada Conservation Data Centre, 4407 records.
84	Belliveau, A.G. 2018. E.C. Smith Herbarium and Atlantic Canada Conservation Data Centre Fieldwork 2018. E.C. Smith Herbarium, 6226 recs.
82	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
79	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2015. Atlantic Canada Conservation Data Centre Fieldwork 2015. Atlantic Canada Conservation Data Centre, # recs.
78	Beardmore, T. 2017. Wood turtle data: observations May 2017. Nashwaaksis Stream, NB. Natural Resources Canada, 78 records.
77	Honeyman, K. 2019. Unique Areas Database, 2018. J.D. Irving Ltd.
76	Scott, Fred W. 1998. Updated Status Report on the Cougar (Puma Concolor cougar) [Eastern population]. Committee on the Status of Endangered Wildlife in Canada, 298 recs.
75	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
74	Nussey, Pat & NCC staff. 2019. AEI tracked species records, 2016-2019. Chapman, C.J. (ed.) Atlantic Canada Conservation Data Centre, 333.
72	Robinson, S.L. 2015. 2014 field data.
70	Blaney, C.S.; Mazerolle, D.M.; Belliveau, A.B. 2014. Atlantic Canada Conservation Data Centre Fieldwork 2014. Atlantic Canada Conservation Data Centre, # recs.
69	Klymko, J. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre.
66	Cowie, Faye. 2007. Surveyed Lakes in New Brunswick. Canadian Rivers Institute, 781 recs.
65	Newell, R.E. 2005. E.C. Smith Digital Herbarium. E.C. Smith Herbarium, Irving Biodiversity Collection, Acadia University, Web site: http://luxor.acadiau.ca/library/Herbarium/project/ . 582 recs.
64	e-Butterfly. 2016. Export of Maritimes records and photos. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
62	Thomas, A.W. 1996. A preliminary atlas of the butterflies of New Brunswick. New Brunswick Museum.
58	Speers, L. 2008. Butterflies of Canada database: New Brunswick 1897-1999. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 2048 recs.
57	Belliveau, A.G., Churchill, J.L. 2019. Compilation of flora and fauna observation records from Isle Haute, Nova Scotia. Acadia University; Atlantic Canada Conservation Data Centre, 522 recs.

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57	NatureServe Canada. 2019. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
55	Klymko, J.J.D. 2016. 2015 field data. Atlantic Canada Conservation Data Centre.
55	McAlpine, D.F. 1998. NBM Science Collections: Wood Turtle records. New Brunswick Museum, Saint John NB, 329 recs.
50	Epworth, W. 2012. Species at Risk records, 2009-11. Fort Folly Habitat Recovery Program, 162 recs.
49	Paquet, Julie. 2019. Atlantic Canada Shorebird Survey ACS database for 2019. Environment Canada, Canadian Wildlife Service.
48	McLean, K. 2020. Species occurrence records from Clean Annapolis River Project fieldwork in 2020. Clean Annapolis River Project, 206 records.
48	Wisniowski, C. & Dowding, A. 2019. NB species occurrence data for 2016-2018. Nature Trust of New Brunswick.
47	Sabine, M. 2016. Black Ash records from the NB DNR Forest Development Survey. New Brunswick Department of Natural Resources.
42	Benjamin, L.K. (compiler). 2007. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 8439 recs.
42	Blaney, C.S. 2020. Sean Blaney 2020 field data. Atlantic Canada Conservation Data Centre, 4407 records.
42	Brazner, J. 2016. Nova Scotia Forested Wetland Bird Surveys. Nova Scotia Department of Lands and Forestry.
41	McAlpine, D.F. 1998. NBM Science Collections databases to 1998. New Brunswick Museum, Saint John NB, 241 recs.
40	Neily, T.H. 2019. Tom Neily NS Bryophyte records (2009-2013). T.H. Neily, Atlantic Canada Conservation Data Centre, 1029 specimen records.
39	Wissink, R. 2006. Fundy National Park Digital Database. Parks Canada, 41 recs.
38	Kennedy, Joseph. 2010. New Brunswick Peregrine records, 2009. New Brunswick Dept Natural Resources, 19 recs (14 active).
37	Klymko, J.J.D. 2018. 2017 field data. Atlantic Canada Conservation Data Centre.
36	Cowie, F. 2007. Electrofishing Population Estimates 1979-98. Canadian Rivers Institute, 2698 recs.
36	Spicer, C.D. 2002. Fieldwork 2002. Atlantic Canada Conservation Data Centre. Sackville NB, 211 recs.
34	Wisniowski, C. & Dowding, A. 2020. NB species occurrence data for 2020. Nature Trust of New Brunswick.
33	Blaney, C.S.; Mazerolle, D.M. 2010. Fieldwork 2010. Atlantic Canada Conservation Data Centre. Sackville NB, 15508 recs.
33	Mills, E. Connell Herbarium Specimens, 1957-2009. University New Brunswick, Fredericton. 2012.
31	Benjamin, L.K. (compiler). 2012. Significant Habitat & Species Database. Nova Scotia Dept Natural Resources, 4965 recs.
31	Jobin, C. & Clow, A., Van Dijk, J. 2019. Eastern Waterfern data, Mount Allison Fundy Field Camp 2019. Chapman, C.J. (ed.) Fundy National Park and Mount Allison University, 31 recs.
31	McNeil, J.A. 2016. Blandings Turtle (<i>Emydoidea blandingii</i>), Eastern Ribbonsnake (<i>Thamnophis sauritus</i>), Wood Turtle (<i>Glyptemys insculpta</i>), and Snapping Turtle (<i>Chelydra serpentina</i>) sightings, 2016. Mersey Tobeatic Research Institute, 774 records.
31	Scott, F.W. 2002. Nova Scotia Herpetofauna Atlas Database. Acadia University, Wolfville NS, 8856 recs.
29	Munro, Marian K. Nova Scotia Provincial Museum of Natural History Herbarium Database. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia. 2013.
28	McLean, K. 2019. Wood Turtle observations. Clean Annapolis River Project.
28	Porter, Caitlin. 2020. Observations for 26 EcoGifts sites in southwest New Brunswick. Atlantic Canada Conservation Data Centre, 1073 records.
27	Doucet, D.A. 2008. Fieldwork 2008: Odonata. ACCDC Staff, 625 recs.
27	Hinds, H.R. 1999. Connell Herbarium Database. University New Brunswick, Fredericton, 131 recs.
27	Mazerolle, D.M. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
27	McNeil, J.A. 2018. Wood Turtle records, 2018. Mersey Tobeatic Research Institute, 68 recs.
26	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
25	Benedict, B. Connell Herbarium Specimens. Digital photos. University New Brunswick, Fredericton. 2005.
24	Beardmore, T. 2017. 2017 Butternut observations. Natural Resources Canada.
24	Chapman, C.J. 2018. Atlantic Canada Conservation Data Centre botanical fieldwork 2018. Atlantic Canada Conservation Data Centre, 11171 recs.
24	East Coast Aquatics Inc. 2021. Species at Risk records from Spicer North Mountain Quarry Expansion Environmental Assessment. East Coast Aquatics, 44 records.
23	Patrick, Allison. 2021. Animal and plant records from NCC properties from 2019 and 2020. Nature Conservancy Canada.
23	Pronych, G. & Wilson, A. 1993. Atlas of Rare Vascular Plants in Nova Scotia. Nova Scotia Museum, Halifax NS, I:1-168, II:169-331. 1446 recs.
22	Sollows, M.C.. 2009. NBM Science Collections databases: Coccinellid & Cerambycid Beetles. New Brunswick Museum, Saint John NB, download Feb. 2009, 569 recs.
21	Doucet, D.A. & Edsall, J.; Brunelle, P.-M. 2007. Miramichi Watershed Rare Odonata Survey. New Brunswick ETF & WTF Report, 1211 recs.
20	McLean, K. 2019. Species At Risk observations. Clean Annapolis River Project.
20	Tingley, S. (compiler). 2001. Butterflies of New Brunswick. , Web site: www.geocities.com/Yosemite/8425/buttrfly. 142 recs.
19	Clayden, S.R. 2005. Confidential supplement to Status Report on Ghost Antler Lichen (<i>Pseudevernia cladonia</i>). Committee on the Status of Endangered Wildlife in Canada, 27 recs.
19	Layberry, R.A. & Hall, P.W., LaFontaine, J.D. 1998. The Butterflies of Canada. University of Toronto Press. 280 pp+plates.
19	Pike, E., Tingley, S. & Christie, D.S. 2000. Nature NB Listserve. University of New Brunswick, listserv.unb.ca/archives/naturenb. 68 recs.
18	Basquill, S.P., Porter, C. 2019. Bryophyte and lichen specimens submitted to the E.C. Smith Herbarium. NS Department of Lands and Forestry.
18	Klymko, J.J.D. 2016. 2014 field data. Atlantic Canada Conservation Data Centre.
18	Munro, Marian K. Tracked lichen specimens, Nova Scotia Provincial Museum of Natural History Herbarium. Atlantic Canada Conservation Data Centre. 2019.
17	Blaney, C.S.; Spicer, C.D. 2001. Fieldwork 2001. Atlantic Canada Conservation Data Centre. Sackville NB, 981 recs.
17	Clayden, S.R. 2012. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 57 recs.
16	Blaney, C.S.; Mazerolle, D.M.; Oberndorfer, E. 2007. Fieldwork 2007. Atlantic Canada Conservation Data Centre. Sackville NB, 13770 recs.
16	Blaney, C.S.; Spicer, C.D.; Mazerolle, D.M. 2005. Fieldwork 2005. Atlantic Canada Conservation Data Centre. Sackville NB, 2333 recs.
16	Caissie, A. Herbarium Records. Fundy National Park, Alma NB. 1961-1993.
16	LaPaix, R.W.; Crowell, M.J.; MacDonald, M.; Neily, T.D.; Quinn, G. 2017. Stantec Nova Scotia rare plant records, 2012-2016. Stantec Consulting.
16	Sabine, M. 2016. NB DNR staff incidental Black Ash observations. New Brunswick Department of Natural Resources.
15	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2000.
15	Epworth, W. 2013. Species at Risk records, 2013. Fort Folly Habitat Recovery Program, 27 recs.

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15	McLean, K. 2020. Wood Turtle observations . Clean Annapolis River Project.
15	Toms, B. 2018. Bat Species data from www.batconservation.ca for Nova Scotia. Mersey Tobeatic Research Institute, 547 Records.
15	Webster, R.P. Database of R.P. Webster butterfly collection. 2017.
15	Westwood, A., Staicer, C. 2016. Nova Scotia landbird Species at Risk observations. Dalhousie University.
14	Haughtian, S.R. 2018. Description of Fuscopannaria leucosticta field work in 2017. New Brunswick Museum, 314 recs.
13	G.Proulx, R. Newell, A. Mills, D. Bayne. 2018. Selaginella rupestris records, Digby Co. Nova Scotia Lands and Forestry, 1387601 recs.
13	Goltz, J.P. & Bishop, G. 2005. Confidential supplement to Status Report on Prototype Quillwort (Isoetes prototypus). Committee on the Status of Endangered Wildlife in Canada, 111 recs.
13	Neily, T.H. & Pepper, C.; Toms, B. 2020. Nova Scotia lichen database [as of 2020-03-18]. Mersey Tobeatic Research Institute.
13	Roland, A.E. & Smith, E.C. 1969. The Flora of Nova Scotia, 1st Ed. Nova Scotia Museum, Halifax, 743pp.
13	Wissink, R. 2000. Rare Plants of Fundy: maps. Parks Canada, 20 recs.
12	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
12	Manthorne, A. 2019. Incidental aerial insectivore observations. Birds Canada.
12	Webster, R.P. 2004. Lepidopteran Records for National Wildlife Areas in New Brunswick. Webster, 1101 recs.
11	Edsall, J. 2001. Lepidopteran records in New Brunswick, 1997-99. , Pers. comm. to K.A. Bredin. 91 recs.
11	Kennedy, Joseph. 2010. New Brunswick Peregrine records, 2010. New Brunswick Dept Natural Resources, 16 recs (11 active).
11	Neily, T. H. 2018. Lichen and Bryophyte records, AEI 2017-2018. Tom Neily; Atlantic Canada Conservation Data Centre.
10	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
10	Belliveau, A.G. 2016. Atlantic Canada Conservation Data Centre Fieldwork 2016. Atlantic Canada Conservation Data Centre, 10695 recs.
10	Klymko, J. Dataset of butterfly records at the New Brunswick Museum not yet accessioned by the museum. Atlantic Canada Conservation Data Centre. 2016.
10	Neily, T.H. Tom Neily NS Sphagnum records (2009-2014). T.H. Neily, Atlantic Canada Conservation Data Centre. 2019.
10	Noseworthy, J. 2013. Van Brunt's Jacob's-ladder observations along tributary of Dipper Harbour Ck. Nature Conservancy of Canada, 10 recs.
10	Wisniowski, C. 2018. Optimizing wood turtle conservation in New Brunswick through collaboration, strategic planning, and landowner outreach. Nature Trust of New Brunswick, 10 records.
9	Bredin, K.A. 2001. WTF Project: Freshwater Mussel Fieldwork in Freshwater Species data. Atlantic Canada Conservation Data Center, 101 recs.
9	McAlpine, D.F. 1983. Status & Conservation of Solution Caves in New Brunswick. New Brunswick Museum, Publications in Natural Science, no. 1, 28pp.
9	Richardson, D., Anderson, F., Cameron, R., McMullin, T., Clayden, S. 2014. Field Work Report on Black Foam Lichen (Anzia colpodes). COSEWIC.
9	Shortt, R. Connell Herbarium Black Ash specimens. University New Brunswick, Fredericton. 2019.
8	Basquill, S.P. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre, Sackville NB, 69 recs.
8	Blaney, C.S. 2003. Fieldwork 2003. Atlantic Canada Conservation Data Centre. Sackville NB, 1042 recs.
8	e-Butterfly. 2019. Export of Maritimes records and photos. McFarland, K. (ed.) e-butterfly.org.
8	Hinds, H.R. 1992. Rare Vascular Plants of Fundy National Park. , 10 recs.
8	King, Amelia. 2020. Belleisle Watershed Coalition Turtle Watch Data. Belleisle Watershed Coalition.
8	Litvak, M.K. 2001. Shortnose Sturgeon records in four NB rivers. UNB Saint John NB. Pers. comm. to K. Bredin, 6 recs.
8	McNeil, J.A. 2019. Snapping Turtle records, 2019. Mersey Tobeatic Research Institute.
8	Mersey Tobeatic Research Institute. 2021. 2020 Monarch records from the MTRI monitoring program. Mersey Tobeatic Research Institute, 72 records.
8	Spicer, C.D. 2001. Powerline Corridor Botanical Surveys, Charlotte & Saint John Counties. A M E C International, 1269 recs.
8	Webster, R.P. 2006. Survey for Suitable Salt Marshes for the Maritime Ringlet, New Populations of the Cobblestone Tiger Beetle, & New Localities of Three Rare Butterfly Species. New Brunswick WTF Report, 28 recs.
8	Webster, R.P. Atlantic Forestry Centre Insect Collection, Maritimes butterfly records. Natural Resources Canada. 2014.
8	Zinck, M. & Roland, A.E. 1998. Roland's Flora of Nova Scotia. Nova Scotia Museum, 3rd ed., rev. M. Zinck; 2 Vol., 1297 pp.
7	Oldham, M.J. 2000. Oldham database records from Maritime provinces. Oldham, M.J.; ONHIC, 487 recs.
7	Patrick, A.; Horne, D.; Noseworthy, J. et. al. 2017. Field data for Nova Scotia and New Brunswick, 2015 and 2017. Nature Conservancy of Canada.
7	Speers, L. 2001. Butterflies of Canada database. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 190 recs.
6	Christie, D.S. 2000. Christmas Bird Count Data, 1997-2000. Nature NB, 54 recs.
6	Parker, M.S.R. 2011. Hampton Wind Farm 2010: significant floral/faunal observations. , 13 recs.
5	Blaney, C.S.; Spicer, C.D.; Rothfels, C. 2004. Fieldwork 2004. Atlantic Canada Conservation Data Centre. Sackville NB, 1343 recs.
5	Cameron, R.P. 2018. Degellia plumbea records. Nova Scotia Environment.
5	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
5	Edsall, J. 2007. Personal Butterfly Collection: specimens collected in the Canadian Maritimes, 1961-2007. J. Edsall, unpubl. report, 137 recs.
5	Ferguson, D.C. 1954. The Lepidoptera of Nova Scotia. Part I, macrolepidoptera. Proceedings of the Nova Scotian Institute of Science, 23(3), 161-375.
5	NatureServe Canada. 2018. iNaturalist Butterfly Data Export . iNaturalist.org and iNaturalist.ca.
4	Blaney, C.S. Miscellaneous specimens received by ACCDC (botany). Various persons. 2001-08.
4	Blaney, C.S.; Mazerolle, D.M. 2011. Fieldwork 2011. Atlantic Canada Conservation Data Centre. Sackville NB.
4	Cronin, P. & Ayer, C.; Dube, B.; Hooper, W.C.; LeBlanc, E.; Madden, A.; Pettigrew, T.; Seymour, P. 1998. Fish Species Management Plans (draft). NB DNRE Internal Report. Fredericton, 164pp.
4	Doucet, D.A. 2007. Lepidopteran Records, 1988-2006. Doucet, 700 recs.
4	Hicklin, P.W. 1999. The Maritime Shorebird Survey Newsletter. Calidris, No. 7. 6 recs.
4	LaPaix, R.W. 2014. Trans-Canada Energy East Pipeline Environmental Assessment, Records from 2013-14. Stantec Consulting, 5 recs.
4	Layberry, R.A. 2012. Lepidopteran records for the Maritimes, 1974-2008. Layberry Collection, 1060 recs.
4	Majka, C.G. & McCorquodale, D.B. 2006. The Coccinellidae (Coleoptera) of the Maritime Provinces of Canada: new records, biogeographic notes, and conservation concerns. Zootaxa. Zootaxa, 1154: 49-68. 7 recs.
4	Marshall, L. 1998. Atlantic Salmon: Southwest New Brunswick outer-Fundy SFA 23. Dept of Fisheries & Oceans, Atlantic Region, Science. Stock Status Report D3-13. 6 recs.
4	NS DNR. 2017. Black Ash records from NS DNR Permanent Sample Plots (PSPs), 1965-2016. NS Dept of Natural Resources.

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4	Olsen, R. Herbarium Specimens. Nova Scotia Agricultural College, Truro. 2003.
4	Pepper, C. 2021. Rare bird, plant and mammal observations in Nova Scotia, 2017-2021.
4	Phinney, Lori; Toms, Brad; et. al. 2016. Bank Swallows (<i>Riparia riparia</i>) in Nova Scotia: inventory and assessment of colonies. Merser Tobeatic Research Institute, 25 recs.
4	Sabine, M. 2016. Black Ash records from NB DNR permanent forest sampling Plots. New Brunswick Department of Natural Resources, 39 recs.
3	Adams, J. & Herman, T.B. 1998. Thesis, Unpublished map of <i>C. insculpta</i> sightings. Acadia University, Wolfville NS, 88 recs.
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Appendix D

Wetland Delineation Report (2021)



December 15, 2021

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

Attention: Courtney Johnson
Biologist, Source and Surface Water Management Branch

***RE: Wetland Assessment and Delineation, Town of Rothesay, Kings County,
New Brunswick***

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INTRODUCTION

Dillon Consulting Limited (Dillon) is pleased to provide this letter report summarizing the results of a wetland assessment and delineation conducted on a wetland located north of Turnbull Court, adjacent to the Kennebecasis River, in the Town of Rothesay, Kings County, New Brunswick (refer to **Figure 1** provided in **Appendix A**). The Town of Rothesay (the Town) is proposing to replace and renew an existing sanitary sewer line (i.e., the Project) located adjacent to the Kennebecasis River and a provincially significant wetland (PSW).

Due to the proximity of the Project to the wetland, and as part of the *Watercourse and Wetland Alteration Regulation 89-80* under the *New Brunswick Clean Water Act*, Dillon hired a sub-consultant (Boreal Environmental) to conduct wetland assessment and delineation within the extent of the proposed sanitary sewer line upgrade and the PSW (i.e., the study area). The field wetland assessment and delineation was conducted on October 5, 2021 by Boreal Environmental staff trained in wetland identification, delineation and ecology, and is intended to support the Project's application for a *Watercourse and Wetland Alteration (WAWA)* permit application, which will be submitted to the New Brunswick Department of Environment and Local Government (NBDELG).

OVERVIEW OF THE PROJECT

As an extension of last year's sanitary sewer line upgrades, the Town is proposing to upgrade an existing sanitary sewer line that is at the end of its service life and at risk of recurring flooding. The existing underground sanitary sewer line is located adjacent to and within the flood zone of the Kennebecasis River, between Tennis Court Road and Turnbull Court within Property Identification (PID) Nos. 00255463, 30054381, 30176630, 30274104, 30323190, 30191407, 30326813, 30311211, 30313597, 00258582, and 30192629.



The proposed upgrade includes the removal and replacement of existing degraded infrastructure (i.e., the existing underground gravity sewer line) and installation of underground sanitary sewer line with raised manholes which has been designed to mitigate and alleviate impacts of flooding during the spring freshet. During the 2017-2019 spring freshets, water levels reached 4.66-5.76 metres (GNB 2019). In 2020, the water levels in Rothesay ranged from 0.3-2.5 metres (Canadian Hydrographic Service 2021). Several design and environmental constraints have been taken into consideration throughout the engineering design process for the Project. The constraints are as follows:

- The Project is located adjacent to and within a mapped PSW, which has been delineated in the field (i.e., the basis of this report);
- The Project is located on privately owned properties, requiring permission and consultation with several property owners;
- The existing infrastructure is located within the flood of the Kennebecasis River, and is at the end of its service life and poses an increasingly elevated environmental risk due to potential leakages, and existing manholes that are at grade and within the flood zone (i.e., at recurring risk of flood water infiltration); and
- There is a relatively small allowable development area between the PSW and existing constraints on private property such as steep elevation or significant infilling that are not conducive to construction requirements.

The Town has conducted engagement and consultation with each private property owner and is in the process of obtaining written permission for the alignment of the new infrastructure as is presented on **Figure 1**.

Initially, based on the provincial WAWA Reference Map, the proposed Project was within the boundaries of the 30 meter (m) buffer, but not within the PSW itself (refer to the extent of the mapped wetland on **Figure 1**). For more information please refer to the project description submitted with the original WAWA application. Following the “Protocol for Wetland Delineation in New Brunswick” (NBDELG 2020), a wetland assessment and delineation was conducted to verify and confirm the boundaries of the PSW on the ground in relation to the proposed Project. The results of the assessment and delineation will be used to inform and update the WAWA application submitted to NBDELG, as well as the sanitary sewer line upgrade construction details to better mitigate against potential impacts to the PSW.

The following sections outline the methodology and results of the wetland assessment and delineation.



METHODOLOGY

The following subsections describe the desktop and field methods used to determine, assess and delineate the identified PSW located within the study area (refer to **Figure 1**).

Desktop Analysis

Prior to completing the field assessment, Dillon reviewed readily available information from reputable sources. Dillon completed a review of the following sources and data lists:

- Publicly available GIS map layers (e.g., forest and non-forest inventory, wetland inventory, Protected Natural Areas, Wildlife Management Zones);
- High resolution aerial photography; and
- The WAWA Reference Map.

The methods used during the field portion of the assessment are described below.

Field Wetland Determination, Delineation and Characterization

The methods of wetland determination and delineation are based upon established protocols for wetland delineation, which are outlined in the U.S. Army Corps of Engineers “Wetland Delineation Manual” (Environmental Laboratory, 1987/2008). Wetland determination and delineation is primarily focused upon establishing the wetland-upland edge, and is based upon the presence of positive indicators for three parameters, including:

- Hydric (wet) soil conditions;
- Hydrophytic (wet adapted) vegetation; and
- Wetland hydrology.

A minimum of two sample points consisting of one wetland point (wet pit) and one upland point (up pit) for these three parameters were established at representative locations within the field identified wetlands. Upon positive wetland determination (i.e., positive indicators identified for soils, hydrology and vegetation), a wetland edge condition was established and georeferenced using a handheld Geographic Positions System (GPS) unit (3 to 5 m accuracy). In New Brunswick, it is required that wetland boundary data points be collected with a GPS with an advertised accuracy less than 5 metres (NBDELG 2020).



Boreal's approach for the assessment of the PSW included confirming the WAWA Reference Mapping and comparing it to existing field conditions. Field observations included obtaining the standard positive wetland determination (as described above) at separate upland and wetland points located on the edge of the PSW.

Hydric Soils

Hydric soil conditions develop when an area is inundated or saturated with water for a sufficient length of time during the growing season, such that an anaerobic (oxygen free) environment is established in the soil. These anaerobic conditions may manifest themselves in a variety of ways, such as through the formation of redox features (reduction-oxidation), the development of organic soils (i.e., peat-formation), the creation of hydrogen sulphide (rotten egg odour), and many others (Environmental Laboratory 1987).

Soil sampling was performed to the point of refusal (i.e., limit) to identify conditions in both wetland and upland conditions. Soil horizons were documented in terms of their texture, thickness, color, and presence of hydric soil indicators. Hydric soil indicators were determined as per "Field Indicators of Hydric Soils in the United States" (USDA 2010).

Hydrophytic Vegetation

Hydrophytic vegetation arises in areas where inundation or saturation by water is able to exert a controlling influence on the plant community assemblage. In these areas, those plant species which are adapted to high-moisture environments tend to dominate. In order for a given area to classify as a wetland, hydrophytic vegetation should account for the majority (>50%) of a sample sites' total vegetation (Environmental Laboratory 1987).

Most plant species have their own wetland indicator status that estimates the species' probability of occurring in a wetland. Wetland indicator statuses for plant species were determined as per United States Department of Agriculture (USDA) Region 1 (Nova Scotia/New Brunswick) listings and include: facultative (FAC), facultative wetland (FACW) or obligate (OBL).

Plant species encountered at each sample location were cataloged into three separate strata (tree, shrub and herbaceous (i.e., herb)) and their percent (%) cover within a given plot size was documented at 10 m, 5 m and 1.5 m radius, respectively.



Wetland Hydrology

Wetland hydrology is established by the presence of primary and secondary hydrology indicators. Primary hydrology indicators (of which at least one must be present) include conditions such as the presence of surface water, a high water table, ground saturation, and drift and sediment deposits, among many others. Secondary indicators (of which two are required, in the absence of a primary indicator) include surface soil cracking, obvious drainage patterns, and moss trim lines, among others (Environmental Laboratory 1987).

Both at the prepared soil pits within the wetland and over the greater wetland area, observations were made regarding the presence of a hydrological regime which would sustain wetland characteristics. The context of the site, location and the micro-topography of the wetland area are taken into consideration during the field assessment.

RESULTS

Desktop Analysis

Based on a review of available mapping (i.e., GIS layers and the WAWA reference map), the mapped wetland adjacent to the Project is depicted as a 4.1 hectare (ha) PSW. Based on high resolution aerial photography provided by the NBDELG (refer to **Photo 1** in **Appendix B**), the wetland and the adjacent private residential properties in the general area experience significant seasonal flooding associated with the spring freshet, as flood waters are clearly visible on high resolution aerial imagery.

Field Wetland Determination, Characterization and Delineation

The field wetland delineation was conducted on October 5, 2021 by Boreal Environmental staff Derrick Mitchell, B.Sc.F., R.P.F. and Ryan Power, M.Sc., who are certified in wetland identification, delineation, and ecology (see attached CVs in **Appendix D**). Wetland protocol in New Brunswick states that the recognized period for wetland delineation is June 1-September 30; however, the delineators are confident that there was appropriate vegetation present, and there was no snow or frozen ground on October 5, 2021 (see attached photos in **Appendix B** for site conditions). The delineation was based on the Northcentral and Northeast Regional Supplement of the U.S. Army Corps of Engineers Wetlands Delineation Manual (1987). The wetland identified within the study area consists of the WAWA Reference Map mapped PSW with additions to the boundary as verified through the field delineation (refer to **Figure 1**). The PSW assessed and delineated during the field assessment was characterized as one wetland type, as described below.



Riverine Floodplain

The riverine floodplain is associated with the riparian areas of Taylor’s Brook and its confluence with the Kennebecasis River. It encompassed the entire portion of the PSW assessed (**Figure 1**). The tree species found in the delineated area is red ash (*Fraxinus pennsylvanica*) in both the tree stratum as well as the understory, and grey alder (*Alnus incana*) in the understory. Other vegetation found in this area include: bluejoint reed grass (*Calamagrostis canadensis*), sensitive fern (*Onoclea sensibilis*) and royal fern (*Osmunda regalis*), among others (**Table 1**).

The wetland is influenced by extensive flooding from Taylor’s Brook and the Kennebecasis River during the spring freshet and perhaps during other times of the year (e.g., fall recharge). The wetland complex was also noted to have been impacted by past anthropogenic activities (i.e., infilling and former development of a railway (western extent of the PSW) and private residential properties (northern, eastern and southern extents of the PSW). **Table 1**, below, provides a wetland profile for the wetland site characteristics observed in the field.

TABLE 1 - DESCRIPTION OF WETLAND SITE CHARACTERISTICS

Wetland Type	Riverine Floodplain
Tree stratum	<ul style="list-style-type: none"> Red ash (FACW)
Shrub stratum	<ul style="list-style-type: none"> Red ash (FACW), and grey alder (FACW)
Herb stratum	<ul style="list-style-type: none"> Bluejoint grass (FAC), sensitive fern (FACW), royal fern (OBL), swamp yellow loosestrife (<i>Lysimachia terrestris</i>) [FACW], alternate-leaved dogwood (<i>Cornus alternifolia</i>) [FAC], field horsetail (<i>Equisetum arvense</i>) [FAC], reed canary grass (<i>Phalaris arundinacea</i>) [FACW], northern bugleweed (<i>Lycopus uniflorus</i>) [FACW], white meadowsweet (<i>Spiraea alba</i>) [FAC]
Primary indicator(s)	<ul style="list-style-type: none"> High water table (A2), Saturation (A3), Drift deposits (B3), Water-stained leaves (B9)
Secondary indicator(s)	<u>Not observed</u>
Hydric soil indicator(s)	<ul style="list-style-type: none"> Depleted matrix (F3)

Note:

Wetland Indicator Definitions: FAC: Facultative, FACU: Facultative Upland, FACW: Facultative Wetland

It should be noted that approximately 7.04 ha of the wetland was delineated during the October 5, 2021 field assessment (i.e., wetland area in proximity to the Project). For additional site photographs, refer to **Appendix B**.



Upland Habitats

The upland habitats adjacent to the PSW area consisted of developed land primarily comprised of private residential properties with manicured lawns, houses, garages, storage areas, and historical remnants of old buildings. Sections along the residential lots directly adjacent to the PSW consist of large manicured lawns, infill and wild flowers. There is some intact upland forest along the northern boundary of the PSW/Taylor’s Brook. The existing well house (constructed in 2021) and pump station is located to the north (PID No. 00255919) and the existing railway is situated directly along the PSW’s western border along the Kennebecasis River (PID No. 00255620). **Table 2** below presents an upland profile characteristic of the predominant upland habitat.

TABLE 2 - DESCRIPTION OF UPLAND SITE CHARACTERISTICS

Location	Upland
Dominant Upland Vegetation	
Tree stratum	<ul style="list-style-type: none"> Red ash, red maple (<i>Acer rubrum</i>) [FAC], paper birch (<i>Betula cordifolia</i>) [FACU]
Shrub stratum	<ul style="list-style-type: none"> Hawthorns (<i>Crataegus spp.</i>)
Herb stratum	<ul style="list-style-type: none"> Raspberry (<i>Rubus idaeus</i>) [FAC], yellow avens (<i>Geum aleppicum</i>) [FAC], Stonecrop (<i>Sedum spp.</i>)
Upland Soils	
Soil Profile	<ul style="list-style-type: none"> Dark brown sand

SUMMARY

Boreal Environmental (on behalf of Dillon Consulting) biologists certified in wetland identification, delineation and ecology conducted a three parameter field wetland delineation (focusing on hydric soils, hydrophytic vegetation and hydrological indicators) on behalf of the Town of Rothesay, of a PSW located between Tennis Court Road and Turnbull Court adjacent to the Kennebecasis River in the Town of Rothesay, Kings County, New Brunswick.

Overall, based on the results of Dillon’s assessment, the provincial WAWA Reference Mapping closely resembled the field conditions observed on October 5, 2021; however, was less representative toward the eastern boundary of the PSW where it extended further inland (**Figure 1**). Dillon characterized approximately 4.1 ha of PSW complex consisting of riverine floodplain habitat.

The results of the field wetland delineation were implemented into the engineering design of the proposed new sanitary sewer line. Where possible, the new sanitary



sewer line alignment was placed within the alignment of the existing infrastructure and outside of the newly delineated wetland boundary to the extent possible. As discussed previously above, there are existing design and construction constraints based on the geographical location, requirements around private property ownership and site characteristics such as steep elevation/infilling on the upland areas that are not conducive to construction requirements. Therefore, as depicted within **Figure 1**, unavoidable direct impacts to the wetland are required in two areas. This direct impact will be in the form of wetland footprint loss as a result of the Project. The direct impacts to the PSW are expected to total 2106 square meters (refer to **Figure 1**), which is the area that requires permitting for these alterations as part of the WAWA permit application.

CLOSING

This report was prepared by Dillon biologists certified in wetland identification, delineation and ecology, on behalf of the Town of Rothesay. Dillon has used the degree of care and skill ordinarily exercised under similar circumstances at the time the work was performed by reputable members of the environmental consulting profession practicing in Canada. Dillon assumes no responsibility for conditions which were beyond its scope of work. There is no warranty expressed or implied by Dillon.

The material in the report reflects Dillon's best judgment in light of the information available to Dillon at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Dillon accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Sincerely,

DILLON CONSULTING LIMITED

Bethany Goodine, B.Sc.ENR
Biologist

CAS:SPD:trw

Enclosed: Appendix A: Figure 1: Site Location & Wetland Delineation
 Appendix B: Site Photographs
 Appendix C: Wetland Delineation Data Forms
 Appendix D: Wetland Consultant CV

Our file: 19-9889



References

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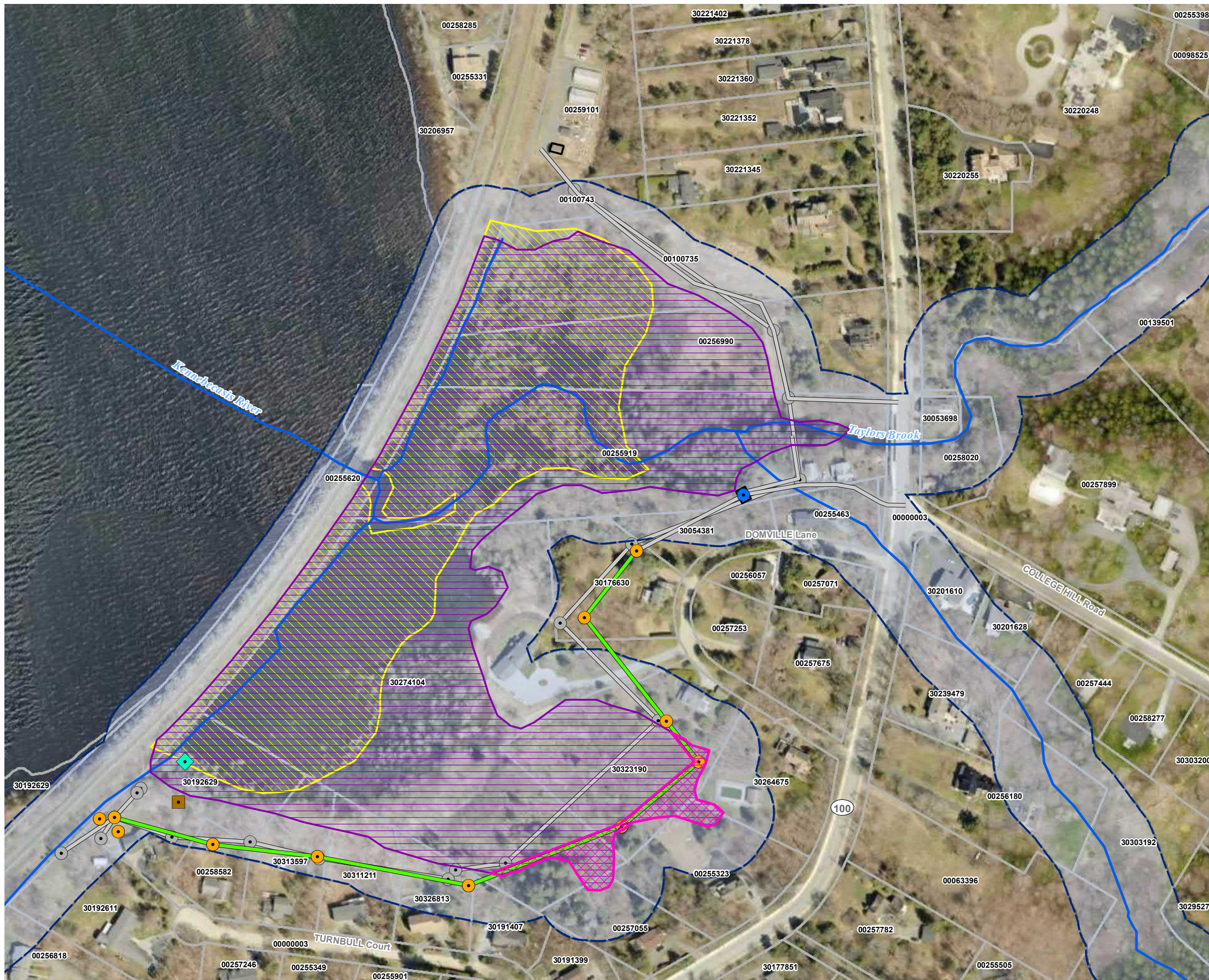
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USDA (United States Department of Agriculture, Natural Resources Conservation Service). 2010. Field Indicators of Hydric Soils in the United States, Version 7.0. L.M. Vasilas, G.W. Hurt, and C.V. Noble (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

Appendix A

Figures



TOWN OF ROTHESAY
TURNBULL COURT - SANITARY RENEWAL

WAWA PERMIT APPLICATION
FIGURE 1

- Upland Data Point
- Wetland Data Point
- Permanent Impact to Wetland (2106 sq.m)
- Field Delineated Wetland Boundary
- Existing Wet Well
- Proposed Sanitary Manhole
- Existing Lift Station
- Proposed Sanitary Sewer
- Existing Sanitary Sewer
- Existing Sanitary Manhole
- Existing Sanitary Pipe Alignment
- Watercourse
- Mapped Provincially Significant Wetland
- 30 m Watercourse and Wetland Buffer
- Waterbody
- Property Boundary

0 5 10 20 Meters

SCALE 1:2200

MAP DRAWING INFORMATION:
DATA PROVIDED BY GEONB

MAP CREATED BY: JAB
MAP CHECKED BY: AS
MAP PROJECTION: NAD 1983 CSRS NBDS

X:\PROJECTS\PROJECTS\GIS\Projects\199889_Turnbull_Crt_Sani_Renewal\data_maps\mxds\19-9889_TurnbullCt_WAWA_20211130.mxd



PROJECT: 19-9889
STATUS: DRAFT
DATE: 2021/11/30

Appendix B

Site Photographs



Photo 1. Aerial imagery depicting spring flood conditions at the study area (NBDELG 2020). Date of imagery unknown



Photo 2. Representative photo of tree strata in wetland data point, taken by Boreal Environmental during wetland delineation (October 5, 2021).



Photo 3. Representative photo of shrub and herb strata in wetland data point, taken by Boreal Environmental during wetland delineation (October 5, 2021).



Photo 4. Representative photo of herb strata in wetland data point, taken by Boreal Environmental during wetland delineation (October 5, 2021).



Photo 5. Soil pit of hydric soils in wetland data point, taken by Boreal Environmental during wetland delineation (October 5, 2021).



Photo 6. Representative photo of tree strata in upland data point, taken by Boreal Environmental during wetland delineation (October 5, 2021).



Photo 7. Sparse understory at upland data point, taken by Boreal Environmental during wetland delineation (October 5, 2021).



Photo 8. Upland soil data point, taken by Boreal Environmental during wetland delineation (October 5, 2021).



Photo 9. Drift deposits near wetland boundary, taken by Boreal Environmental during wetland delineation (October 5, 2021).



Photo 10. Example of residential properties surrounding the floodplain, taken by Boreal Environmental during wetland delineation (October 5, 2021).

Appendix C

Wetland Delineation Data Forms

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: Rothesay Municipality/County: Kings County Sampling Date: October 05, 2021
 Applicant/Owner: Dillon Consulting Sampling Point: Dillon WL1 up
 Investigator(s): Derrick Mitchell and Ryan Power Affiliation: Boreal Environmental Landform (hillslope, terrace, etc.): NA
 Local relief (concave, convex, none): Concave Slope (%): 0 X coord: 2538996.9 Y coord: 7375661.2
 Datum: NAD83 NBDS Soil Map Unit Name/Type: NA Wetland Type: Riverine Floodplain

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain in Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, optional Wetland Site ID: _____
Remarks: (Explain alternative procedures here or in a separate report.) Wetland soils are disturbed/infilled.	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>15</u>)	Absolute % Cover	Dominant Species?	Indicator Status															
1. <u>Fraxinus pennsylvanica</u>	<u>30</u>	YES	FACW	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>4</u> (A) Total Number of Dominant Species Across All Strata: <u>4</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)														
2. <u>Acer rubrum</u>	<u>15</u>	YES	FAC															
3. <u>Betula cordifolia</u>	<u>5</u>		FACU															
4. _____																		
5. _____																		
	<u>50</u>	= Total Cover		Prevalence Index worksheet: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: right;">Total % Cover of:</td> <td style="text-align: right;">Multiply by:</td> </tr> <tr> <td>OBL species _____ x 1 = _____</td> <td></td> </tr> <tr> <td>FACW species <u>30</u> x 2 = <u>60</u></td> <td></td> </tr> <tr> <td>FAC species <u>22</u> x 3 = <u>66</u></td> <td></td> </tr> <tr> <td>FACU species _____ x 4 = _____</td> <td></td> </tr> <tr> <td>UPL species <u>2</u> x 5 = <u>10</u></td> <td></td> </tr> <tr> <td>Column Totals: <u>54</u> (A) <u>136</u> (B)</td> <td></td> </tr> </table> Prevalence Index = B/A = <u>2.52</u>	Total % Cover of:	Multiply by:	OBL species _____ x 1 = _____		FACW species <u>30</u> x 2 = <u>60</u>		FAC species <u>22</u> x 3 = <u>66</u>		FACU species _____ x 4 = _____		UPL species <u>2</u> x 5 = <u>10</u>		Column Totals: <u>54</u> (A) <u>136</u> (B)	
Total % Cover of:	Multiply by:																	
OBL species _____ x 1 = _____																		
FACW species <u>30</u> x 2 = <u>60</u>																		
FAC species <u>22</u> x 3 = <u>66</u>																		
FACU species _____ x 4 = _____																		
UPL species <u>2</u> x 5 = <u>10</u>																		
Column Totals: <u>54</u> (A) <u>136</u> (B)																		
Sapling/Shrub Stratum (Plot size: <u>5</u>)	Absolute % Cover	Dominant Species?	Indicator Status															
1. <u>Crataegus spp.</u>	<u>60</u>	YES	+															
2. _____																		
3. _____																		
4. _____																		
5. _____																		
6. _____																		
	<u>60</u>	= Total Cover																
Herb Stratum (Plot size: <u>1</u>)	Absolute % Cover	Dominant Species?	Indicator Status															
1. <u>Rubus idaeus</u>	<u>5</u>	YES	FAC	Hydrophytic Vegetation Indicators: <input type="checkbox"/> Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> Dominance Test is >50% <input checked="" type="checkbox"/> Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> Morphological Adaptations ¹ (Provide supporting data in Remarks or on a separate sheet) <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain) ¹ Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.														
2. <u>Geum aleppicum</u>	<u>2</u>	YES	FAC															
3. <u>Sedum spp.</u>	<u>2</u>	YES	UPL															
4. _____																		
5. _____																		
6. _____																		
7. _____																		
8. _____																		
9. _____																		
10. _____																		
	<u>9</u>	= Total Cover																
Woody Vine Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status															
1. <u>No woody vines</u>				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>														
2. _____																		
	<u>119</u>	= Total Cover																
Remarks: (Include photo numbers here or on a separate sheet.) Sparse understory																		

WETLAND DELINEATION DATA FORM – NEW BRUNSWICK

Project/Site: Rothesay Municipality/County: Kings County Sampling Date: October 05, 2021
 Applicant/Owner: Dillon Consulting Sampling Point: Dillon WL1 wet
 Investigator(s): Derrick Mitchell and Ryan Power Affiliation: Boreal Environmental Landform (hillslope, terrace, etc.): Terrace
 Local relief (concave, convex, none): Concave Slope (%): 1 X coord: 2539000.6 Y coord: 7375685.2
 Datum: NAD83 NBDS Soil Map Unit Name/Type: NA Wetland Type: Riverine Floodplain

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil X, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes _____ No X
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No _____ Hydric Soil Present? Yes <u>X</u> No _____ Wetland Hydrology Present? Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____ If yes, optional Wetland Site ID: _____
Remarks: (Explain alternative procedures here or in a separate report.)	

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: <u>15</u>)	Absolute % Cover	Dominant Species?	Indicator Status															
1. <u>Fraxinus pennsylvanica</u>	<u>80</u>	<u>YES</u>	<u>FACW</u>	Dominance Test worksheet: Number of Dominant Species That Are OBL, FACW, or FAC: <u>5</u> (A) Total Number of Dominant Species Across All Strata: <u>5</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)														
2. _____																		
3. _____																		
4. _____																		
5. _____																		
<u>80</u> = Total Cover				Prevalence Index worksheet: <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Total % Cover of:</td> <td style="width: 50%;">Multiply by:</td> </tr> <tr> <td>OBL species <u>5</u></td> <td>x 1 = <u>5</u></td> </tr> <tr> <td>FACW species <u>137</u></td> <td>x 2 = <u>274</u></td> </tr> <tr> <td>FAC species <u>36</u></td> <td>x 3 = <u>108</u></td> </tr> <tr> <td>FACU species _____</td> <td>x 4 = _____</td> </tr> <tr> <td>UPL species _____</td> <td>x 5 = _____</td> </tr> <tr> <td>Column Totals: <u>178</u> (A)</td> <td><u>387</u> (B)</td> </tr> </table> Prevalence Index = B/A = <u>2.17</u>	Total % Cover of:	Multiply by:	OBL species <u>5</u>	x 1 = <u>5</u>	FACW species <u>137</u>	x 2 = <u>274</u>	FAC species <u>36</u>	x 3 = <u>108</u>	FACU species _____	x 4 = _____	UPL species _____	x 5 = _____	Column Totals: <u>178</u> (A)	<u>387</u> (B)
Total % Cover of:	Multiply by:																	
OBL species <u>5</u>	x 1 = <u>5</u>																	
FACW species <u>137</u>	x 2 = <u>274</u>																	
FAC species <u>36</u>	x 3 = <u>108</u>																	
FACU species _____	x 4 = _____																	
UPL species _____	x 5 = _____																	
Column Totals: <u>178</u> (A)	<u>387</u> (B)																	
<u>30</u> = Total Cover																		
Sapling/Shrub Stratum (Plot size: <u>5</u>)																		
1. <u>Fraxinus pennsylvanica</u>	<u>20</u>	<u>YES</u>	<u>FACW+</u>															
2. <u>Alnus incana</u>	<u>10</u>	<u>YES</u>	<u>FACW</u>															
3. _____																		
4. _____																		
5. _____																		
6. _____																		
<u>30</u> = Total Cover																		
Herb Stratum (Plot size: <u>1</u>)																		
1. <u>Calamagrostis canadensis</u>	<u>30</u>	<u>YES</u>	<u>FAC</u>															
2. <u>Onclea sensibilis</u>	<u>20</u>	<u>YES</u>	<u>FACW</u>															
3. <u>Osmunda regalis</u>	<u>5</u>		<u>OBL</u>															
4. <u>Lysimachia terrestris</u>	<u>2</u>		<u>FACW</u>															
5. <u>Cornus alterniflora</u>	<u>2</u>		<u>FAC</u>															
6. <u>Equisetum arvense</u>	<u>3</u>		<u>FAC</u>															
7. <u>Phalaris arudinacea</u>	<u>2</u>		<u>FACW</u>															
8. <u>Calamagrostis canadensis</u>	<u>2</u>		<u>FACW</u>															
9. <u>Lycopus unifloris</u>	<u>1</u>		<u>FACW</u>															
10. <u>Spiraea alba</u>	<u>1</u>		<u>FAC</u>															
<u>68</u> = Total Cover																		
Woody Vine Stratum (Plot size: _____)																		
1. <u>No woody vines</u>																		
2. _____																		
<u>178</u> = Total Cover																		
Remarks: (Include photo numbers here or on a separate sheet.)																		

Hydrophytic Vegetation Indicators:
 ___ Rapid Test for Hydrophytic Vegetation
X Dominance Test is >50%
X Prevalence Index is ≤3.0¹
 ___ Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
 ___ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No _____

Adapted from U.S. Army Corps of Engineers form for North Central and North East Region (Version 2.0), and Field Indicators for Identifying Hydric Soils in New England (Version 4.0) Supplement for use in New Brunswick (2019)

SOIL

Sampling Point: Dillon_WL1_wet

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (cm)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-1							Organic	
1-29	7.5YR/3/1						Silt	
29-37	10YR/4/3						Sand	
37-50	7.5YR/3/1						Mucky silt	
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. ² Location: PL=Pore Lining, M=Matrix.								

Hydric Soil Indicators: <input type="checkbox"/> Histosol (A1) <input type="checkbox"/> Histic Epipedon (A2) <input type="checkbox"/> Black Histic (A3) <input type="checkbox"/> Hydrogen Sulfide (A4) <input type="checkbox"/> Stratified Layers (A5) <input type="checkbox"/> Depleted Below Dark Surface (A11) <input type="checkbox"/> Thick Dark Surface (A12) <input type="checkbox"/> Sandy Mucky Mineral (S1) <input type="checkbox"/> Sandy Gleyed Matrix (S4) <input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> Stripped Matrix (S6) <input type="checkbox"/> Dark Surfaces (S7) <input type="checkbox"/> Polyvalue Below Surface (S8) <input type="checkbox"/> Thin Dark Surface (S9) <input type="checkbox"/> Loamy Gleyed Matrix (F2) <input checked="" type="checkbox"/> Depleted Matrix (F3) <input type="checkbox"/> Redox Dark Surface (F6) <input type="checkbox"/> Depleted Dark Surface (F7) <input type="checkbox"/> Redox Depressions (F8)	Indicators for Problematic Hydric Soils³: <input type="checkbox"/> Coast Prairie Redox (A16) <input type="checkbox"/> 5 c Mucky Peat or Peat (S3) <input type="checkbox"/> Iron-Manganese Masses (F12) <input type="checkbox"/> Piedmont Floodplain Soils (F19) <input type="checkbox"/> Red Parent Material (F21) <input type="checkbox"/> Very Shallow Dark Surface (F22) <input type="checkbox"/> Other (Explain in Remarks)
--	---	--

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed): Type: NA Depth (cm): NA	Hydric Soil Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
---	---

Remarks: Disturbed soil conditions from infilling.

HYDROLOGY

Wetland Hydrology Indicators: Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
<input type="checkbox"/> Surface Water (A1) <input checked="" type="checkbox"/> High Water Table (A2) <input checked="" type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input checked="" type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or Crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7) <input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)	<input checked="" type="checkbox"/> Water-Stained Leaves (B9) <input type="checkbox"/> Aquatic Fauna (B13) <input type="checkbox"/> Marl Deposits (B15) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Thin Muck Surface (C7) <input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Moss Trim Lines (B16) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Crayfish Burrows (C8) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Stunted or Stressed Plants (D1) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> Microtopographic Relief (D4) <input type="checkbox"/> FAC-Neutral Test (D5)

Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (cm): _____ Water Table Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (cm): <u>8</u> Saturation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Depth (cm): <u>0</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
--	---

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Adapted from U.S. Army Corps of Engineers form for North Central and North East Region (Version 2.0), and Field Indicators for Identifying Hydric Soils in New England (Version 4.0) Supplement for use in New Brunswick (2019)

Appendix D

Wetland Consultant CV



Derrick Mitchell, *B.Sc.F., R.P.F*
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Professional Affiliations

Association of Registered Professional Foresters of New Brunswick
Recognized Wetland Delineator New Brunswick Department of Environment and Local Government
Qualified Wetland Delineator Nova Scotia Department of Environment

Formal Education

2003 Bachelor of Science in Forestry and Environmental Management - University of New Brunswick, Fredericton, NB

Continuing Education

2006 Wetland Delineation Certification Course, Humboldt Field Research Institute (Stueben, Me)
2008 Sedge and Grass identification workshop UNB Department of Biology (Fredericton, NB)
2008 Watercourse Alteration Certification Course, Maritime College of Forest Technology (Fredericton, NB)
2009 Willow and Aquatic plant identification workshop UNB Department of Biology (Fredericton, NB)
2010 Water Management and Wetland Restoration Training Course, University of Guelph (Kemptville, ON)
2011 Electro-fishing online training and field practicum (Fredericton, NB)
2014 Seabird observer workshop (Dartmouth, NS)
2016 Wetland Ecosystem System Protocol Atlantic Canada (WESPAC) workshop (Fredericton, NB)

Conferences

2009 NBEIA Wetlands Forum (Fredericton, NB)
2010 NBEIA Wetlands Forum (Moncton, NB)
2010 Atlantic Land Reclamation conference (Halifax, NS)
2011 Advances in Ecological Restoration (CFB Gagetown, Oromocto, NB)
2012 Nova Scotia Wetland Forum (Halifax, NS)
2013 Atlantic Land Reclamation Conference (Sackville, NS)
2015 Atlantic Land Reclamation Conference (Fredericton, NB)

Volunteer Activities

Atlantic Coastal Action Program (ACAP Saint John) (Treasurer)
Canadian Land Reclamation Association (Past member)
Hammond River Angling Association (Past President)
City of Saint John Planning and Advisory Committee (Past member)
New Brunswick Wetland Delineators Association (Past Vice chair)

Publications

Betts, M.G., **Mitchell, D.**, Diamond, A.W. and Bety, J. Uneven rates of landscape change as a source of bias in roadside wildlife surveys. *Journal of Wildlife Management*. 2007

Summary of Qualifications

Mr. Mitchell is a terrestrial ecologist, registered professional forester (*R.P.F.*) and principal of Boreal Environmental. With 20 years of experience working in the environmental industry, his expertise includes; environmental permitting, environmental compliance, habitat mapping, remote sensing, ecological restoration, natural resource/forest management and Geographic Information Systems (GIS).

Mr. Mitchell has 15 years of experience delineating wetlands throughout Atlantic Canada. He is a recognized wetland delineator and vice chair of the Wetland Delineators Association in New Brunswick and listed as a qualified/recognized wetland professional in New Brunswick and Nova Scotia. He received formal wetland delineation training in 2006 at the Humboldt Field Research Institute in Stueben, Me. He has worked on many large-scale industrial projects and developments including; pipelines, transmission line corridors, highways, mining projects in New Brunswick, Newfoundland and Labrador and Nova Scotia.

Beyond his focus on wetland related projects, Mr. Mitchell has a broad range of experience in conducting biophysical surveys and analysis including; watercourse assessments, avifauna surveys, Species at Risk assessments, and geospatial analysis for various commercial and residential developments throughout the Atlantic provinces. His clients include; NB Department of Transportation and Infrastructure, Fredericton International Airport Authority, Saint John Industrial Parks, Defense Construction Canada, Gulf Operators, OSCO Construction Group, Dexter Construction, Maritime Hydroseed, Gemtec, Hive Engineering, Dillon Consulting, EXP Services, Stantec, WSP, CBCL, McCallum Environmental, Strum Environmental, and Sikumiut Environmental.

Current Projects

Burchill Wind Energy Project - Natural Forces – Lead consultant for bird and bat (avifauna), rare plant, and wetland assessments. Produced baseline technical reports as part of the Environmental Impact Assessment submission (Saint John, NB 2019 - ongoing).

Kent Hills 3 Wind Energy Expansion Project – TransAlta - Responsible for conducting bird breeding surveys, Searcher efficiency trials, wetland delineation/functions assessments and wetland monitoring. Produced wetland monitoring reports (Kent Hills, NB 2019 – ongoing).

Milltown Generating Station Decommissioning – Dillon/NB Power – Project lead for rare plant, avifauna, and wetland surveys. Produced baseline report for Environmental Impact Statement submission (St. Stephen, NB 2020 - ongoing).

Route 11 Wetland Monitoring Project - New Brunswick Department of Transportation and Infrastructure (NB DTI) – Long-term wetland and rare plant monitoring program. Comparative analysis of hydrological and vegetative conditions at periodic intervals over 10 years (2011 – ongoing Tracadie, NB).

Past Projects

Hammerdown Gold Mining Project - Gemtec - Responsible for conducting rare plant and wildlife species at risk assessment including; migratory and breeding bird studies, bat studies, and wetland surveys. Produced baseline report for Environmental Impact Statement submission. Data was used to inform mitigation measures used to protect the population (King's Point, NL 2019 – 2020).

Fundy Solid Waste Pit and Quarry Project - Fundy Solid Waste Commission – Responsible for conducting several studies for the Project including; rare plant, bird habitat surveys and wetland delineation. Produced baseline report as part of the Environmental Impact Assessment submission (Saint John, NB 2018).

Anaconda Gold Mining Project - Gemtec - Conducted breeding bird point counts, rare plant and wetland surveys. Produced baseline report for Environmental Impact Statement submission. Conducted follow-up surveys to determine the distribution of Common Wintergreen, a Species at Risk, at a landscape level. Data was used to inform mitigation measures used to protect the population (Baie Verte, NL 2017 – 2018).

Springhill Construction Pit and Quarry Project - Gemtec - Responsible for conducting several studies for the Project including; rare plant and bird habitat surveys and wetland delineation. Produced baseline report as part of the Environmental Impact Assessment submission (Fredericton, NB 2017).

Anderson Bridge Replacement Project - NBDTI - Responsible for conducting several studies for the Project including; rare plant and bird habitat surveys. Produced baseline report as part of the Environmental Impact Assessment submission (Miramichi, NB 2017).

Anaconda Gold Mining Project - Gemtec - Responsible for conducting rare plant and wildlife species at risk assessment including; wildlife and avifauna surveys, rare plant and wetland surveys. (Goldboro, NS 2017 – 2018).

Bat Species at Risk assessment - CBCL Limited - Inspection of buildings scheduled for demolition on the Gagetown military base for use by bat species at risk (Gagetown, NB 2016).

Bat echolocation analysis - McCallum Environmental - Identification of bat species through echolocation analysis. Completion of echolocation analysis was conducted in support of the Environmental Assessment for the Paintearth, Stirling and Wheatland wind farm projects in Alberta (AB 2016).

Wetland Compensation Plan - Fredericton International Airport Authority - Wetland delineation/functional assessment, species at risk assessment. Wetland Compensation Plan development (Fredericton, NB 2016).

Energy East Pipeline Project (NB) - Stantec - Rare plant, wetland delineation, functional assessment, species at risk assessments (plants, birds, amphibians/reptiles) and wetland inventory geodatabase development (NB 2015).

Caraquet Bypass Route 11 - NBDTI - Migratory bird nesting survey and reporting focusing on common nighthawk (SARA listed species) (Caraquet, NB 2015).

Wetland Predictive Model Validation Project - LiDAR based wetland predictive model validation partnership with University of New Brunswick Forestry Dept., Cities of New Brunswick Association, and New Brunswick Department of Environment and Local Government (NB 2015).

Gold Mining Project - McCallum Environmental - Wetland delineation/functional assessments, species at risk assessment, breeding bird and bat hibernacula surveys (Goldenville, NS 2013).

Labrador West Transmission Line Project - Integrated Informatics - Ecological Land Classification (ELC). Habitat mapping using PurVIEW (3D geodatabase mapping extension) and high resolution stereo imagery to interpret vegetation community types along a 276 km transmission line route. Developed GIS database for interpreted upland and wetland community types (NL 2013).

Evaluation of Wetland Restoration Potential - Armco/Ramar - Developed LiDAR based wetland predictive model that incorporated vegetation and landform parameters. Predictive model used to prioritize potential

wetland restoration opportunities for the Sackville River watershed. Partnership with McCallum Environmental (Bedford, NS 2013).

Hammond River Restoration Project (Scoodic Brook) - Hammond River Angling Association - Supervised the re-alignment and buffer re-vegetation of a 200 meter section of the Hammond River. Regulatory compliance monitoring included water quality monitoring (i.e., TSS sampling), maintaining and installing erosion and sedimentation control/prevention structures (Upham, NB 2012).

Hazen Brook Restoration Project - Hammond River Angling Association - Restoration plan, restoration supervision, and environmental compliance monitoring (Saint John, NB 2012).

Natural Resources Management Plan - Defense Construction Canada (DCC) - species at risk assessment, wetland delineation, forest characterization, habitat assessment and associated reporting. (Canadian Forces Arms Depot Bedford, NS 2012).

Sustainable Development Strategic Science (SDSS) Woodland Caribou Project - Sikumiut Environmental (SEM) Management/Integrated Informatics - Satellite imagery (i.e., Landsat, SPOT 5) and high-resolution aerial photography to interpret vegetation communities for the entire island of Newfoundland (NL, 2012).

Bat echolocation analysis - Strum Environmental - Identification of bat species through echolocation analysis. Analysis and reporting conducted in support of Environmental Assessment registration for several proposed wind farm developments in Nova Scotia (February 2012).

Bat echolocation analysis - McCallum Environmental - Identification of bat species through echolocation analysis. Analysis and report conducted in support of Environmental Impact Assessment registration for a proposed wind farm in central Nova Scotia (February 2012).

New Canaan Breeding Bird Monitoring - McCallum Environmental - Breeding bird survey proposed wind farm in New Canaan, NS (May to July 2012).

Iron Ore Canada Mining Project - Integrated Informatics – Used Landsat, SPOT 5, and high-resolution aerial photography to interpret vegetation communities (NL, 2012).

CFB Gagetown Land Reclamation Project - Defense Construction Canada - Surface water hydrology mapping and erosion control/prevention planning (Oromocto, NB 2012).

Damage Control Division Fire training School Wind Energy Project - Defense Construction Canada - Passage migration and over-wintering bird surveys and associated reporting. Habitat mapping and geo-database development (Halifax, NS 2012).

14 Wing Greenwood Wetland Study - Defense Construction Canada - Wetland delineation, functional analysis, species at risk assessment, and breeding bird survey (Greenwood, NS 2011).

Route 1 Gateway Project - Dexter Construction - Migratory bird nesting surveys and associated reporting (Saint John, NB 2011).

Summerside Wind Farm Project - City of Summerside - Migratory bird surveys, bird/bat carcass monitoring, searcher efficiency trials and associated reporting (2010).

Water treatment facility site selection project - City of Saint John - Wetland delineation, functional analysis, watercourse mapping and habitat assessment (2010).



Eider Rock Project - Irving Oil Ltd. - Technical lead for wetland field assessments, watershed level wetland functional assessment, watercourse mapping, species at risk assessment, habitat assessments and author of the terrestrial habitat chapter of the Project Eider Rock EIA (Saint John, NB 2007 – 2009).

Uranium Mine Project- Aurora Energy Resources - Ecological Land Classification (ELC) for a proposed uranium mine. Conducted supplementary breeding bird surveys (Postville, NL 2008).

Lameque transmission line and wind farm - Acciona - Technical lead for wetland assessments, watershed level wetland, Species at Risk assessments, watershed level wetland functional analysis and associated reporting. (Lameque, NB 2008).

Lower Churchill Falls Hydro-electric Dam Project - Nalcor - Technical lead for Ecological Land Classification (ELC) assessment. Conducted supplementary breeding bird surveys (Goose Bay, NL 2007).

Brunswick Pipeline Project - Emera - Technical lead for wetland assessments, watershed level wetland functional analysis and author of terrestrial habitat chapter for the Brunswick Pipeline EIA (Saint John, NB 2007).

Route 7 Bypass Project - New Brunswick Department of Transportation - Technical lead for wetland assessments, watershed level wetland functional analysis and author of the wetland VEC for the EIA (Welsford, NB 2007).

Route 1 Gateway Project - New Brunswick Department of Transportation - Technical lead for wetland assessments and co-author of the wetland VEC for the EIA (New Brunswick, 2006).

Kent Hills Transmission Line and Wind Farm - TransAlta - Technical lead for wetland delineation, watershed level wetland functional analysis and migratory bird surveys (Kent Hills, NB 2006).

References

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Appendix E

Master Plant List

Scientific Name	Common Name	SRank	X Coord	Y Coord	NoteRank	SProt
<i>Abies balsamea</i>	Balsam Fir	S5	45.380299	-65.999003		
<i>Acer platanoides</i>	Norway Maple	SNA	45.380018	-66.001579	Exotic	
<i>Acer rubrum</i>	Red Maple	S5	45.383311	-65.999059		
<i>Acer saccharinum</i>	Silver Maple	S4	45.383311	-65.999059		
<i>Agrostis scabra</i>	Rough Bent Grass	S5	45.380010	-65.999424		
<i>Alnus incana</i>	Speckled Alder	S5	45.380299	-65.999003		
<i>Amelanchier spp.</i>	Serviceberry species		45.380082	-66.001659		
<i>Angelica sylvestris</i>	Woodland Angelica	SNA	45.379763	-66.000142	Exotic	
<i>Anthriscus sylvestris</i>	Wild Chervil	SNA	45.380138	-66.001949	Exotic	
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	S5	45.379979	-65.999564		
<i>Athyrium filix-femina</i>	Common Lady Fern	S5	45.380332	-65.999003		
<i>Berberis thunbergii</i>	Japanese Barberry	SNA	45.380332	-65.999003	Exotic	
<i>Betula alleghaniensis</i>	Yellow Birch	S5	45.380001	-65.999433		
<i>Betula cordifolia</i>	Heart-leaved Birch	S5	45.380001	-65.999434		
<i>Carex arctata</i>	Black Sedge	S5	45.380375	-66.002162		
<i>Carex echinata</i>	Star Sedge	S5	45.380281	-65.999275		
<i>Carex flava</i>	Yellow Sedge	S5	45.379793	-66.000200		
<i>Carex gynandra</i>	Nodding Sedge	S5	45.380134	-65.998963		
<i>Carex intumescens</i>	Bladder Sedge	S5	45.379793	-66.000200		
<i>Carex stipata</i>	Awl-fruited Sedge	S5	45.380289	-65.999242		
<i>Chelone glabra</i>	White Turtlehead	S5	45.379793	-66.000200		
<i>Claytosmunda claytoniana</i>	Interrupted Fern	S5	45.379954	-66.001202		
<i>Clematis virginiana</i>	Virginia Clematis	S5	45.380170	-66.001954		
<i>Cornus sericea</i>	Red Osier Dogwood	S5	45.380170	-66.002611		
<i>Corylus cornuta</i>	Beaked Hazel	S5	45.380292	-66.002611		
<i>Crataegus spp</i>	Hawthorn species		45.380174	-66.002180		
<i>Daucus carota</i>	Queen Anne's Lace	SNA	45.379943	-66.001017	Exotic	
<i>Doellingeria umbellata</i>	Hairy Flat-top White Aster	S5	45.380299	-65.999003		
<i>Dryopteris cristata</i>	Crested Wood Fern	S5	45.380134	-65.998963		
<i>Dryopteris intermedia</i>	Evergreen Wood Fern	S5	45.380134	-65.998963		
<i>Equisetum arvense</i>	Field Horsetail	S5	45.379974	-65.999570		
<i>Equisetum sylvaticum</i>	Woodland Horsetail	S5	45.380297	-65.999239		
<i>Fragaria virginiana</i>	Wild Strawberry	S5	45.379862	-66.000629		
<i>Frangula alnus</i>	Glossy Buckthorn	SNA	45.379862	-66.000629	Exotic	

Scientific Name	Common Name	SRank	X Coord	Y Coord	NoteRank	SProt
<i>Fraxinus americana</i>	White Ash	S3S4	45.380332	-65.999003		
<i>Fraxinus pennsylvanica</i>	Red Ash	S3	45.380299	-65.999003		
<i>Galium trifidum</i>	Three-petaled Bedstraw	S5	45.379917	-65.999622		
<i>Galium triflorum</i>	Three-flowered Bedstraw	S5	45.380177	-65.999393		
<i>Geum canadense</i>	White Avens	S5	45.380163	-66.001954		
<i>Geum rivale</i>	Water Avens	S5	45.380085	-65.999479		
<i>Glyceria melicaria</i>	Slender Manna Grass	S5	45.380299	-65.999003		
<i>Glyceria striata</i>	Fowl Manna Grass	S5	45.380134	-65.998963		
<i>Gymnocarpium dryopteris</i>	Common Oak Fern	S5	45.381758	-65.997830		
<i>Hesperis matronalis</i>	Dame's Rocket	SNA	45.379936	-66.001218	Exotic	
<i>Juncus effusus</i>	Soft Rush	S5	45.380281	-65.999271		
<i>Juncus filliformis</i>	Thread Rush	S5	45.380162	-65.999319		
<i>Lysimachia ciliata</i>	Fringed Yellow Loosestrife	S5	45.379917	-65.999622		
<i>Lysimachia nummularia</i>	Creeping Yellow Loosestrife	SNA	45.379964	-66.001398	Exotic	
<i>Lysimachia terrestris</i>	Swamp Yellow Loosestrife	S5	45.380173	-65.999320		
<i>Malus spp.</i>	Apple tree	SNA	45.379793	-66.000200	Exotic	
<i>Matteuccia struthiopteris</i>	Ostrich Fern	S5	45.380299	-65.999003		
<i>Myosotis laxa</i>	Small Forget-Me-Not	S5	45.380332	-65.999003		
<i>Oclemena x blakei</i>	a hybrid White Panicked American-Aster	SNA	45.380003	-65.999428	Hybrid	
<i>Onoclea sensibilis</i>	Sensitive Fern	S5	45.380299	-65.999003		
<i>Osmundastrum cinnamomeum</i>	Cinnamon Fern	S5	45.380224	-65.999317		
<i>Packera aurea</i>	Golden Groundsel	S4S5	45.380048	-65.999464		
<i>Phalaris arundinacea</i>	Reed Canary Grass	S5	45.380324	-66.002228		
<i>Picea glauca</i>	White Spruce	S5	45.380038	-65.999445		
<i>Picea rubens</i>	Red Spruce	S5	45.379793	-66.000200		
<i>Poa annua</i>	Annual Blue Grass	SNA	45.380297	-66.002198	Exotic	
<i>Populus balsamifera</i>	Balsam Poplar	S5	45.379752	-66.000034		
<i>Potentilla simplex</i>	Old Field Cinquefoil	S5	45.379904	-66.000848		
<i>Prunella vulgaris</i>	Common Self-heal	S5	45.380216	-66.002229		
<i>Prunus virginiana</i>	Chokecherry	S5	45.380299	-65.999003		
<i>Pteridium aquilinum</i>	Bracken Fern	S5	45.379862	-66.000629		
<i>Ranunculus repens</i>	Creeping Buttercup	SNA	45.379940	-66.001014	Exotic	
<i>Reynoutria japonica</i>	Japanese Knotweed	SNA	45.379963	-66.001399	Exotic	

Scientific Name	Common Name	SRank	X Coord	Y Coord	NoteRank	SProt
<i>Rubus idaeus</i>	Red Raspberry	S5	45.379862	-66.000629		
<i>Rubus pubescens</i>	Dwarf Red Raspberry	S5	45.380207	-65.999299		
<i>Salix alba</i>	White Willow	SNA	45.380172	-65.999161		
<i>Scirpus microcarpus</i>	Small-fruited Bulrush	S5	45.380279	-65.999278		
<i>Sedum album</i>	White Stonecrop	SNA	45.380222	-66.002231	Exotic	
<i>Smilax herbacea</i>	Herbaceous Carrion Flower	S4	45.380339	-66.002090		
<i>Solanum dulcamara</i>	Bittersweet Nightshade	SNA	45.380173	-66.002188	Exotic	
<i>Solidago canadensis</i>	Canada Goldenrod	S5	45.380216	-66.002184		
<i>Solidago rugosa</i>	Rough-stemmed Goldenrod	S5	45.380299	-65.999003		
<i>Spiraea alba</i>	White Meadowsweet	S5	45.380331	-66.002093		
<i>Symphyotrichum puniceum</i>	Purple-stemmed Aster	S5	45.380332	-65.999003		
<i>Thelypteris palustris</i>	Eastern Marsh Fern	S5	45.380178	-65.999301		
<i>Thuja occidentalis</i>	Eastern White Cedar	S5	45.380006	-65.999467		
<i>Tilia cordata</i>	Little-leaved Linden	SNA	45.380332	-65.999003	Exotic	
<i>Tussilago farfara</i>	Coltsfoot	SNA	45.379756	-66.000024	Exotic	
<i>Vaccinium myrtilloides</i>	Velvet-leaved Blueberry	S5	45.379879	-65.999641		
<i>Viola cucullata</i>	Marsh Blue Violet	S5	45.379793	-66.000200		

Appendix F

Raw Bird Survey Results

fid	Date	Temp	Beaufort	Weather	Time	Common Name	Scientific Name	SRank	Number	X coord	Y coord	Breeding Evidence	Breeding Code	Comments
1	23-Jun-22	12	1	Overcast	5:55	Grey Catbird	<i>Dumetella carolinensis</i>	S4B	1	45.38348	-65.99935	Singing	Possible	
2	23-Jun-22	12	1	Overcast	5:55	Song Sparrow	<i>Melospiza melodia</i>	S5B	1	45.38339	-65.99911	Singing	Possible	
3	23-Jun-22	12	1	Overcast	5:55	Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B	1	45.38329	-65.99902	Singing	Possible	
4	23-Jun-22	12	1	Overcast	5:55	Alder Flycatcher	<i>Empidonax alnorum</i>	S5B	1	45.38307	-65.99898	Singing	Possible	
5	23-Jun-22	12	1	Overcast	5:55	Black-and-White Warbler	<i>Mniotilta varia</i>	S5B	1	45.38317	-65.99880	Singing	Possible	
6	23-Jun-22	12	1	Overcast	5:55	Northern Parula	<i>Setophaga americana</i>	S5B	1	45.38284	-65.99843	Singing	Possible	
7	23-Jun-22	12	1	Overcast	5:55	American Robin	<i>Turdus migratorius</i>	S5B	1	45.38275	-65.99811	Singing	Possible	
8	23-Jun-22	12	1	Overcast	5:55	American Redstart	<i>Setophaga ruticilla</i>	S5B	1	45.38284	-65.99771	Singing	Possible	
9	23-Jun-22	12	1	Overcast	5:55	Northern Parula	<i>Setophaga americana</i>	S5B	1	45.38211	-65.99736	Singing	Possible	
10	23-Jun-22	12	1	Overcast	5:55	Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B	1	45.38202	-65.99802	Singing	Possible	
11	23-Jun-22	12	1	Overcast	5:55	Northern Cardinal	<i>Cardinalis cardinalis</i>	S4	1	45.38163	-65.99798	Singing	Possible	
12	23-Jun-22	12	1	Overcast	5:55	Northern Parula	<i>Setophaga americana</i>	S5B	1	45.38168	-65.99851	Singing	Possible	
13	23-Jun-22	12	1	Overcast	5:55	American Robin	<i>Turdus migratorius</i>	S5B	1	45.38161	-65.99834	Singing	Possible	
14	23-Jun-22	12	1	Overcast	5:55	Mourning Dove	<i>Zenaida macroura</i>	S5B,S4N	1	45.38146	-65.99852	Singing	Possible	
15	23-Jun-22	12	1	Overcast	5:55	Veery	<i>Catharus fuscescens</i>	S4B	1	45.38190	-65.99890	Singing	Possible	
16	23-Jun-22	12	1	Overcast	5:55	Common Yellowthroat	<i>Geothlypis trichas</i>	S5B	1	45.38139	-65.99908	Singing	Possible	
17	23-Jun-22	12	1	Overcast	5:55	American Redstart	<i>Setophaga ruticilla</i>	S5B	1	45.38070	-65.99883	Singing	Possible	
18	23-Jun-22	12	1	Overcast	5:55	Alder Flycatcher	<i>Empidonax alnorum</i>	S5B	1	45.38063	-65.99887	Singing	Possible	
19	23-Jun-22	12	1	Overcast	5:55	Northern Parula	<i>Setophaga americana</i>	S5B	1	45.38081	-65.99850	Singing	Possible	
20	23-Jun-22	12	1	Overcast	5:55	American Robin	<i>Turdus migratorius</i>	S5B	1	45.38076	-65.99838	Singing	Possible	
21	23-Jun-22	12	1	Overcast	5:55	American Robin	<i>Turdus migratorius</i>	S5B	1	45.38064	-65.99874	Singing	Possible	
22	23-Jun-22	12	1	Overcast	5:55	American Robin	<i>Turdus migratorius</i>	S5B	1	45.38067	-65.99854	Fledgling calling	Confirmed Fledgling	
23	23-Jun-22	12	1	Overcast	5:55	American Goldfinch	<i>Spinus tristis</i>	S5	1	45.38050	-65.99858	during flyover	Observed	
24	23-Jun-22	12	1	Overcast	5:55	Song Sparrow	<i>Melospiza melodia</i>	S5B	1	45.38041	-65.99846	Observe	Observed	
25	23-Jun-22	12	1	Overcast	5:55	Black-throated Green Warbler	<i>Setophaga virens</i>	S5B	1	45.38039	-65.99880	Singing	Possible	
26	23-Jun-22	12	1	Overcast	5:55	Alder Flycatcher	<i>Empidonax alnorum</i>	S5B	1	45.38023	-65.99891	Singing	Possible	
27	23-Jun-22	12	1	Overcast	5:55	Song Sparrow	<i>Melospiza melodia</i>	S5B	1	45.38012	-65.99905	Singing	Possible	
28	23-Jun-22	12	1	Overcast	5:55	Northern Parula	<i>Setophaga americana</i>	S5B	1	45.38013	-65.99896	Singing	Possible	
29	23-Jun-22	12	1	Overcast	5:55	American Robin	<i>Turdus migratorius</i>	S5B	1	45.37999	-65.99921	Singing	Possible	

June 23, 2022

Breeding Bird Survey Raw Data

Turnbull Court

30	23-Jun-22	12	1	Overcast 5:55	Common Yellowthroat	<i>Geothlypis trichas</i>	S5B	1	45.38040	-65.99948	Singing	Possible
31	23-Jun-22	12	1	Overcast 5:55	Northern Parula	<i>Setophaga americana</i>	S5B	1	45.38005	-65.99946	Singing	Possible
32	23-Jun-22	12	1	Overcast 5:55	Song Sparrow	<i>Melospiza melodia</i>	S5B	1	45.37998	-65.99957	Singing	Possible
33	23-Jun-22	12	1	Overcast 5:55	American Redstart	<i>Setophaga ruticilla</i>	S5B	1	45.37992	-65.99962	Singing	Possible
34	23-Jun-22	12	1	Overcast 5:55	American Robin	<i>Turdus migratorius</i>	S5B	1	45.37992	-65.99962	Observe	Observed
35	23-Jun-22	12	1	Overcast 5:55	Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B	1	45.37995	-65.99967	Singing	Possible
36	23-Jun-22	12	1	Overcast 5:55	Black-and-White Warbler	<i>Mniotilta varia</i>	S5B	1	45.37985	-66.00012	Singing	Possible
37	23-Jun-22	12	1	Overcast 5:55	Song Sparrow	<i>Melospiza melodia</i>	S5B	1	45.37986	-66.00136	Singing	Possible
38	23-Jun-22	12	1	Overcast 5:55	Mallard	<i>Anas platyrhynchos</i>	S5B,S4N	1	45.38058	-66.00111	Calling	Possible
39	23-Jun-22	12	1	Overcast 5:55	Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	S5B	1	45.38000	-66.00115	Singing	Possible
40	23-Jun-22	12	1	Overcast 5:55	Northern Cardinal	<i>Cardinalis cardinalis</i>	S4	1	45.37993	-66.00201	Singing	Possible
41	23-Jun-22	12	1	Overcast 5:55	American Redstart	<i>Setophaga ruticilla</i>	S5B	1	45.37994	-66.00214	Singing	Possible
42	23-Jun-22	12	1	Overcast 5:55	Song Sparrow	<i>Melospiza melodia</i>	S5B	1	45.38025	-66.00246	Singing	Possible
43	23-Jun-22	12	1	Overcast 5:55	Song Sparrow	<i>Melospiza melodia</i>	S5B	1	45.37995	-66.00187	Singing	Possible
45	23-Jun-22	12	1	Overcast 5:55	Downy Woodpecker	<i>Dryobates pubescens</i>	S5	1	45.38014	-66.00219	Singing	Possible
46	23-Jun-22	12	1	Overcast 5:55	Black-capped Chickadee	<i>Poecile atricapillus</i>	S5	1	45.38017	-66.00218	Singing	Possible
47	23-Jun-22	12	1	Overcast 5:55	Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	S5B	1	45.38028	-66.00229	Singing	Possible
48	23-Jun-22	12	1	Overcast 5:55	American Goldfinch	<i>Spinus tristis</i>	S5	1	45.38017	-66.00261	Singing	Possible
49	23-Jun-22	12	1	Overcast 5:55	Common Grackle	<i>Quiscalus quiscula</i>	S5B	3	45.38029	-66.00172	Calling	Possible 3
50	23-Jun-22	12	1	Overcast 5:55	Tree Swallow	<i>Tachycineta bicolor</i>	S4B	1	45.38091	-66.00102	Observe	Observed Foraging over water
51	23-Jun-22	12	1	Overcast 5:55	Common Grackle	<i>Quiscalus quiscula</i>	S5B	3	45.38170	-66.00049	Food carry	Confirmed At least 3 observed food carry
52	23-Jun-22	12	1	Overcast 5:55	Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	S1S2B	1	45.38099	-66.00072	Observed	Observed Adult black crown night heron
53	23-Jun-22	12	1	Overcast 5:55	American Crow	<i>Corvus brachyrhynchos</i>	S5	1	45.38049	-66.00055	Calling	Possible