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Initial Project Description
Sussex Flood Mitigation Proposal
Sussex, New Brunswick

GEMTEC Project: 0857.12

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Submitted to:

Impact Assessment Agency of Canada -
Atlantic Region
200-1801 Hollis Street
Halifax, NS
B3J 3N4

Initial Project Description
Sussex Flood Mitigation Proposal
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January 2, 2025
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GEMTEC Consulting Engineers and Scientists Limited
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Hanwell, NB, Canada
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January 2, 2025 File: 0857.12

Impact Assessment Agency of Canada - Atlantic Region
200-1801 Hollis Street
Halifax, NS
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Attention: Anthony Blouin, Ph.D., Project Manager

Re: Initial Project Description
Sussex Flood Mitigation Proposal, Sussex, New Brunswick

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) is pleased to submit this electronic copy of the Initial Project Description document for the Sussex Flood Mitigation Proposal. The proposed Project involves the construction of two flood diversion channels to divert flood waters away from the downtown core of Sussex, New Brunswick into the Kennebecasis River.

Please do not hesitate to contact the undersigned if you have any questions or concerns about the document or the information presented herein.

<original signed by>

Paul Vanderlaan, P.Eng.
Environmental Regulatory Specialist/
Senior Environmental Engineer

<original signed by>

Kurtis Westbury, M.Sc.
Biologist

PV/HA/ep/kw

Enclosures
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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) was retained by Sussex (formerly the “Town of Sussex” and the “Village of Sussex Corner”) to develop a Flood Mitigation Proposal (herein referred to as the “Project”) to address the on-going flooding challenges experienced within the community.

Sussex is centrally located between New Brunswick’s three main cities, Moncton, Fredericton, and Saint John, in south central New Brunswick. The Kennebecasis River flows around Sussex to the southwest, while three tributaries of the Kennebecasis River, Trout Creek, Parsons Brook, and Ward Creek, flow directly through the community, as shown below. Together, these four watercourses form part of the Kennebecasis Watershed.

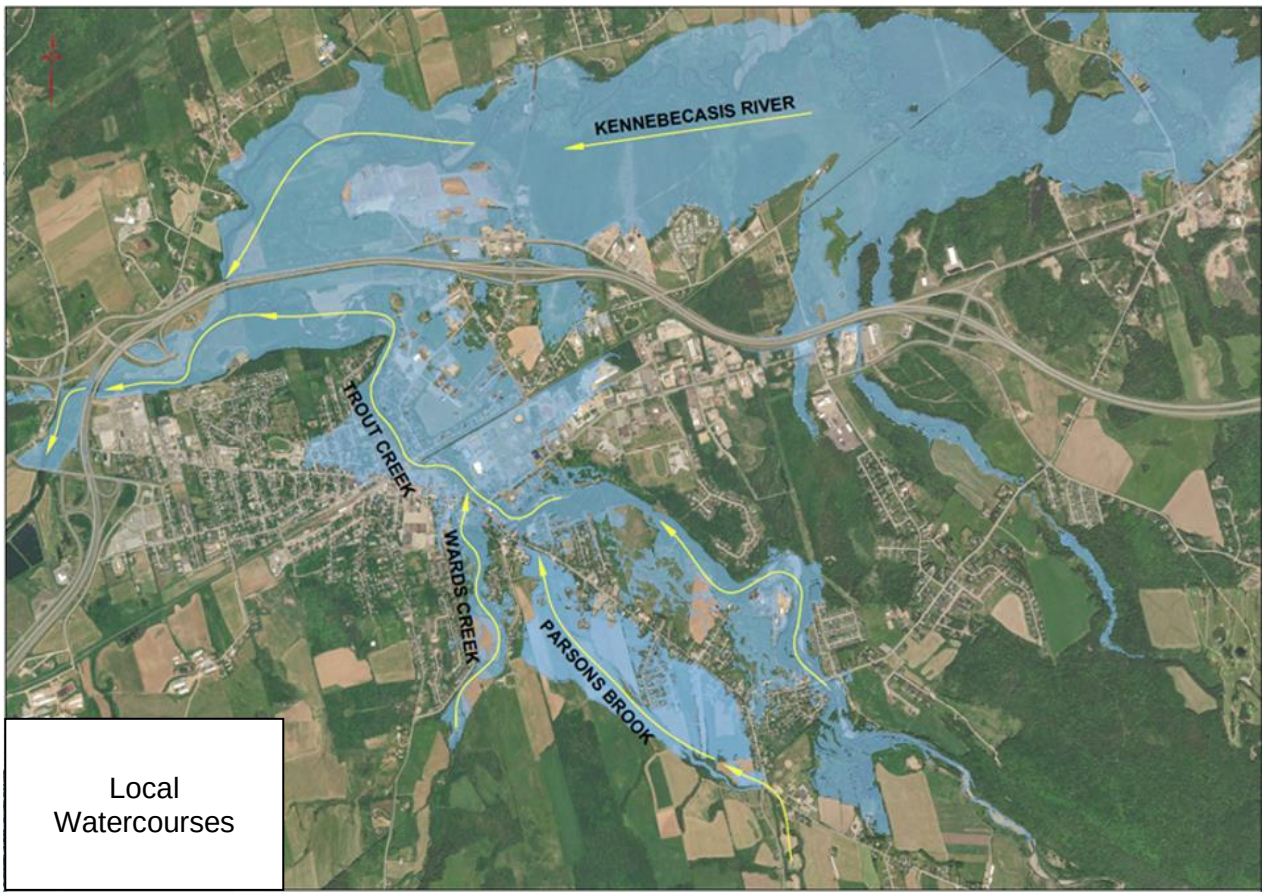

Figure 1: Local Sussex Watercourses

Extreme climate change-driven flooding in Sussex has caused millions of dollars in damage over the past decade and threatens the long-term viability of the community. The Municipality of Sussex commissioned several studies and developed a Regional Flood Risk Mitigation Plan to alleviate the recurring flooding issues. As an initial step of the Mitigation Plan, a flood berm was constructed along the Kennebecasis River behind the town’s Gateway Mall in 2019, providing

flood protection for the northwestern area of the town during the flood events of December 2020 and February 2024.

The proposed Project presented herein includes the remaining measures to be implemented as part of the Regional Flood Risk Mitigation Plan. This will include the construction of two diversion channels to divert flood flows from Parsons Brook and Trout Creek away from the downtown core into the Kennebecasis River. The Parsons Brook diversion channel as proposed, will extend approximately 580 metres, diverting flow from Parsons Brook into Trout Creek. The Trout Creek diversion channel as proposed, will extend approximately 1,600 m, diverting flow from Trout Creek to the flood plain of the Kennebecasis River. The proposed diversion channels are shown on Figure 2, Appendix A.

Both diversion channels will only divert flows from Parsons Brook and Trout Creek to the Kennebecasis River during flood events. Non-flood flows will remain in Parsons Brook and Trout Creek maintaining flows supporting the existing aquatic environment. The diversion of flood waters is proposed to address challenges associated with the recurring flooding in the area and there are no other benefits gained, commercially or otherwise, from the proposed diversion of flood waters.

In addition to the two diversion channels, additional infrastructure upgrades that are included as part of the larger Regional Flood Risk Mitigation Plan include:

- Construction of a flood berm around the Meadow Crescent subdivision in the former Village of Sussex Corner (now Ward 2).
- Construction of a two bridge/overpass structures on New Brunswick Route 1 (eastbound and westbound) where the highway intersects with the proposed Trout Creek diversion channel.
- Construction of a culvert or bridge at Leonard Drive where the roadway intersects with the Trout Creek diversion channel.
- Rasing the bridge deck elevation of the section of New Brunswick Route 890 that crosses the Kennebecasis River.
- Raising the bridge deck elevation of the covered bridge adjacent to the section of New Brunswick Route 890 that will also be raised.
- Addition of minor flow control measures on the storm sewer systems in downtown Sussex along Trout Creek.

The Meadow Crescent flood berm and the addition of minor flow control measures on the storm sewer systems are not designated projects under the *Physical Activities Regulations*. The implementation of these flood control measures is independent of the Project as presented herein and are therefore not described in detail.

With respect to the diversion channels, Section 60 of the *Physical Activities Regulations* identifies “The construction, operation, decommissioning and abandonment of a new structure for the diversion of 10 000 000 m^3/year or more of water from a natural water body into another natural water body” as a project designated to be subject to the *Impact Assessment Act*. As such, the following document provides an Initial Project Description as per Schedule 1 of the regulations.

It should be noted the diversion channels will only divert flood flows from tributaries to locations upstream of the natural confluence in the same receiving stream. Flood water from Parson Brook will be diverted to Trout Creek at a location approximately 3 kilometres (km) upstream of the natural confluence of Parsons Brook and Trout Creek measured along Trout Creek or 2.3 km, measured as the crow flies. Likewise, flood waters in Trout Creek will be diverted to the Kennebecasis River at a location approximately 8.8 km upstream of the natural confluence of the Trout Creek and the Kennebecasis River measured along the Kennebecasis River, or 4.3 km measured as the crow flies. Water diverted by the construction of the diversion channels will remain in the same Kennebecasis River drainage basin.

2.0 GENERAL INFORMATION

General information required per Schedule 1 of the *Physical Activities Regulations* is summarized in Table 1.

Table 1: General Information of the Project

Project Name	Sussex Flood Mitigation Proposal
Project Type	Flood Impact Reduction via Diversion Channels
Project Location	Sussex, New Brunswick
Proponent Name	Sussex
Primary Proponent Contact	Scott M. Hatcher, P.Eng. Chief Administrative Officer 524 Main Street Sussex, NB E4E 3E4 (506) 432-4553
Primary GEMTEC Contact	Hans Arisz, P.Eng. Manager, Water Resources/Senior Hydrologist 124 Greenview Drive Hanwell, NB E3C 0M7 (506) 471-7930

2.1 Stakeholder Engagement

During the development of the Municipality of Sussex's Regional Flood Risk Mitigation Plan and subsequently the Sussex Flood Mitigation Funding Application, extensive engagement with organizations and landowners was conducted. Stakeholder engagement to date includes:

- Landowners along the proposed diversion channel alignments
- Gateway Operations Inc. (responsible for managing the operations, maintenance, and rehabilitation of New Brunswick Route 1 Highway)
- Sussex Downtown Business Association
- Sussex and District Chamber of Commerce
- New Brunswick Department of Transportation and Infrastructure
- New Brunswick Highway Corporation
- Canadian National Railway
- J.D. Irving Limited
- General public (via public presentations on October 26, 2016, September 10, 2020, and March 30, 2022)

Concerns raised during engagement with the above stakeholders included:

- Changes in anticipated water levels. Specifically, increases in water levels in the watercourses receiving flood flows from the diversion channels (i.e., the section of Trout Creek between the two diversion channels and the Kennebecasis River immediately downstream of the discharge point of the Trout Creek diversion channel).
- The cost for construction, operation, and maintenance of the two bridge/overpass structures where the Trout Creek diversion channel is proposed to intersect with New Brunswick Route 1 Highway.
- The requirement to increase the elevation of the bridge crossing the Kennebecasis River on New Brunswick Route 890.
- The use of privately owned land for the proposed diversion channels and development of agreements in principle for the sale and/or occupation of the lands for the Project.

Engagement and dialogue with the referenced stakeholders will be on-going throughout the planning and implementation of the Project.

2.1.1 Future Stakeholder Engagement

Sussex/GEMTEC are committed to continue to engage with stakeholders as the Project advances. Future engagement activities may include the following:

- Online updates will continue to be provided on the Sussex website.

- Sussex/GEMTEC will communicate directly with elected officials, Regional Service Commissions, community groups (e.g., Sussex Downtown Business Association, Sussex and District Chamber of Commerce, Sussex Trail Association etc.), environmental groups (e.g., Kennebecasis Watershed Restoration Committee, Nature Sussex, New Brunswick Environmental Network, Fundy Model Forest etc.) and other stakeholders to enable them to become familiar with the Project.
- Notifications containing a high-level project description will be send to area residents and landowners.
- An Open House will be held during the provincial EIA process to which stakeholders, Community Groups, Environmental Organizations, and the public are invited to attend.
- Newspaper ads will be placed to advertise the above referenced Open House as appropriate.

Sussex/GEMTEC will prepare, and make available to the public, a public consultation summary report which will:

- Describe the involvement activities.
- Identify key public and private stakeholders directly contacted.
- Include copies of all correspondence received from and sent to stakeholders, elected officials, and the general public.
- Summarize any issues or concerns raised during, or received because of, the consultation activities and indicate how these issues were addressed.

2.2 Indigenous Engagement

The Federal Government of Canada and the Provincial Government of New Brunswick have a constitutional Duty to Consult, and accommodate where required, Indigenous Peoples whenever a decision or activity is being contemplated that could adversely impact Indigenous or Treaty rights. In New Brunswick the Department of Indigenous Affairs (DIA) has been mandated with the coordination of the Duty to Consult process. Project Proponents play a valuable role in the consultation process by engaging Indigenous Peoples in the development of any Project or proposal and are encouraged to engage Indigenous Groups early in the planning process.

In addition, and as stated in the Infrastructure Canada's (INFC) Guide to Recipients for Indigenous Consultation, federal funding of projects can be considered Crown conduct to potentially trigger the duty to consult. In situations where there is the potential for adverse impacts on First Nation Rights, INFC funding is made conditional upon INFC's duty to consult and accommodate. Procedural aspects of the process can be delegated to proponents/recipients and recipients are directed to initiate the process by sending a consultation letter to Indigenous communities.

In keeping with the above guidance and direction, notification emails containing a high-level project description were sent directly from the Municipality of Sussex to the Chiefs of all Mi'gmaq and Wolastoqey First Nations. Mi"gmawe'l Tplu"taqnn Incorporated (MTI) and Wolastoqey Nation of New Brunswick (WNNB) Personnel, Individual First Nation Consultation Coordinators and the DIA were copied on all notifications.

The six Wolastoqey First Nations represented by WNNB include:

- Kingsclear First Nation (Pilick)
- Madawaska Maliseet First Nation (Matawaskiye)
- Oromocto First Nation (Welamukotuk)
- St. Mary's First Nation (Sitanisk)
- Tobique First Nation (Negotkuk)
- Woodstock First Nation (Wotstak)

The eight Mi'gmaq First Nations represented by MTI include:

- Buctouche MicMac First Nation (Tjipõgtõtjg)
- Eel Ground First Nation (Natoaganeg)
- Eel River Bar First Nation (Ugpi'Ganjig)
- Esgenoôpetitj First Nation
- Fort Folly First Nation (Amlamgog)
- Indian Island First Nation (L'Nui Menikuk)
- Metepenagiag First Nation
- Pabineau First Nation (Oinpegitjoig L'Noiegati)

Elsipogtog First Nation was notified independently, as they are not a member of MTI. Kopit Lodge was copied on the email to Elsipogotog First Nation. Peskotomuhkati at Skutik First Nation was also notified independently.

Notification to all First Nations listed above was sent via email on June 7, 2024. Feedback was received directly from Oromocto First Nation (Welamukotuk) and Peskotomuhkati at Skutik First Nation and from MTI representing eight of the nine Mi'gmaq First Nations of New Brunswick. The feedback received is presented below:

- Oromocto First Nation (Welamukotuk): No concerns based on the information package provided; however, more information was requested to advise if the Project will affect Welamukotuk or any other First Nation along the Wolastoq (Saint John River).
- Peskotomuhkati at Skutik First Nation: Defers consultation to the Mi'gmaq First Nation communities as the Project is not in Peskotomuhkati territory.

- MTI: Responded with a Mi'gmaq Rights Impact Assessment (MRIA) notification letter, requiring the completion of a MRIA stating Mi'gmaq Aboriginal and Treaty Rights are potentially affected by the Project.

An initial meeting with MTI representatives, Eli Larry and Steve Ginnish, took place on July 26, 2024. During the meeting, GEMTEC/Sussex received an overview of the MRIA Framework. MTI emphasized the need to address archaeological concerns due to the extensive earthwork component of the project. In response, GEMTEC agreed to have an archaeological monitor present during the archaeological walkover, to be conducted by Colbr Consulting Inc., the archaeological subcontractor.

GEMTEC/Sussex committed to keeping communication channels open and provided MTI with a draft of this Initial Project Description (IPD) for the Impact Assessment Agency. MTI acknowledged that while the full framework process might not be necessary, they will collaborate to complete the required steps efficiently. Since the meeting, GEMTEC has hired an Indigenous Monitor, Emily Sanipass, who will participate in the archaeological fieldwork. Feedback from MTI on the IPD is pending.

Indigenous engagement is an important component of the Project. To ensure appropriate Indigenous engagement activities are completed, Sussex and GEMTEC are committed to working closely with representatives from Infrastructure Canada, the Impact Assessment Agency, and the New Brunswick Department of Indigenous Affairs. All correspondence, including that already received, resulting from the above notifications will be documented. Concerns raised will be addressed in coordination with the First Nations representatives and DIA.

2.2.1 Future Indigenous Engagement

Sussex/GEMTEC are committed to continue to engage with First Nations as the Project advances. Future engagement activities may include the following:

- Online updates will continue to be provided on the Sussex website.
- Sussex and GEMTEC will communicate directly with First Nations, as per Engagement and Consultation Contact Protocol (NB Department of Indigenous Affairs August 2024) to enable them to share project details.
- An Open House will be held during the provincial EIA process to which First Nation members, are invited to attend.
- Newspaper ads will be placed to advertise the above referenced Open House as appropriate.

Sussex/GEMTEC will generate a summary report documenting First Nation Engagement which will:

- Describe the engagement activities completed.
- Identify First Nations directly contacted.
- Include copies of all correspondence received from and sent to First Nations.
- Summarize any issues or concerns raised during, or received because of, the engagement activities and indicate how these issues were addressed.

2.3 Regional and Strategic Assessment

The Project will not involve any development on federal lands or land outside of New Brunswick, and it is not anticipated to have any impacts on federal lands or land outside of New Brunswick. As such, no regional assessment relevant to the Project is being or has been carried out under the *Impact Assessment Act* (IAA).

In addition, no strategic assessments are currently underway in the region. The Strategic Assessment of Climate Change (SACC) under section 95 of the IAA applies to the Project.

2.4 Gender Based Analysis Plus

As the Project is currently in the planning stages, a Gender Based Analysis (GBA) Plus has not yet been completed. If a federal impact assessment is necessary for the Project, a GBA Plus will be included as part of the process.

3.0 PROJECT INFORMATION

3.1 Objective

Extreme climate change-driven flooding in Sussex has caused millions of dollars in damage over the past decade and threatens the long-term viability of the community. The recurring flooding in Sussex along Trout Creek and Parsons Brook has resulted in over $60 million in damages from six flood events since 2014.

Following flooding during both April and December 2014, the municipality commissioned a study (2016 Sussex Flood Study, RVA) to quantify the probability and severity of future flood events and update the 1985 provincial flood risk mapping. The study indicated the expected effects of climate change will result in an increase in the probability and severity of future flood events from those presented in the 1985 provincial flood risk mapping. The updated flood risk mapping produced during this study and subsequently refined during the 2022 Property Damage Assessment identified significant increases in flooding in the downtown core along Trout Creek and Parsons Brook.

The 2022 Property Damage Assessment report estimated a year 2100 flood event with a 100-year return period under the current conditions would impact 465 buildings and result in damages between $28 million and $119 million. This same flood event under after the

implementation of the Project was estimated to impact 114 buildings and result in damages between $6.9 million and $28.9 million (75% reduction).

Most recent flooding in February 2024 recorded flood water level elevations above those experienced during the April and December 2014 flood events. Although the total cost of the damages incurred is not yet known, this recent event underscores the critical need for the implementation of the flood mitigation measures of the Project.

The flood mitigation measures of the Project mirror the Red River Floodway in Manitoba, which diverts water around the City of Winnipeg (albeit at a much smaller scale). The Red River Floodway was constructed in response to the 1950 Red River Flood and following its completion in 1968, is estimated to have prevented over $40 billion in cumulative flood damage.

The primary objective of the Sussex Flood Mitigation Project is to reduce the impact of climate change-driven flood events on the community's infrastructure and economy. By implementing targeted flood mitigation measures, the project aims to significantly decrease the frequency, severity, and extent of flooding along Trout Creek and Parsons Brook. The project seeks to safeguard critical infrastructure, reduce property damage, and minimize disruption to the local population. These efforts are designed to enhance the long-term resilience of Sussex against future flood events.

3.2 Provisions in the *Physical Activities Regulations*

Section 60 of the *Physical Activities Regulations* identifies "The construction, operation, decommissioning and abandonment of a new structure for the diversion of 10 000 000 m^3/year or more of water from a natural water body into another natural water body" as a project designated to be subject to the *Impact Assessment Act*.

The diversion channels will be designed to accommodate flows in excess of a 20-year return period with a magnitude of up to 60 m^3/s and 220 m^3/s for the Parsons Brook diversion channel and Trout Creek diversion channel, respectively. Due to the unpredictability of flood occurrences, providing an estimate of annual flow through the diversion channels is not feasible.

The construction of the diversion channels will be completed within the Kennebecasis River Watershed. While flood flows will be diverted from Parsons Brook to Trout Creek, and ultimately to the Kennebecasis River, the flows will remain within the same drainage basin. The Project is proposed to enhance flood resiliency by diverting flows during flood events, thereby reducing the risk of flood-related damage. There are no other benefits gained, commercially or otherwise, from the proposed diversion of flood waters.

3.3 Activities, Infrastructure, Structures and Works

The proposed Project includes the construction of two diversion channels to divert flood flows from Parsons Brook and Trout Creek away from the Sussex downtown core into the

Kennebecasis River. The diversion channels will be configured to only divert flood flows during events in excess of a 20-year return period. Non-flood flows will continue to follow the existing alignment channels ensuring natural maintenance flows supporting the existing environment will not be affected. Details of the two proposed diversion channels are described in the following sections.

3.3.1 Parsons Brook Diversion Channel

The Parsons Brook diversion channel will be designed to accommodate flows of up to 60 m^3/s. The channel will be approximately 580 m long, extending in a north easterly direction from Parsons Brook, just east of the New Line Road and Dutch Valley Road Intersection near the Sussex Corner Elementary School, to Trout Creek. The discharge point into Trout Creek will be located approximately 350 m upstream of the Post Road Bridge, as shown in Figure 3, Appendix A. This discharge point is approximately 3 km upstream of the natural confluence of Parsons Brook and Trout Creek measured along Trout Creek, or 2.3 km measured as the crow flies.

The diversion channel will be located within a 50 m wide corridor with a base width of approximately 20 m. The minimum depth of the channel will be 2 m with 3H:1V side slopes. An access road will be constructed adjacent to the channel. The channel will be constructed with in-situ material and lined with grassed vegetation. A passive concrete intake control structure (i.e. not containing any movable gates requiring human-initiated operation) will regulate flow, ensuring drainage from Parsons Brook into the diversion channel occurs only during flood flows.

During the construction phase of the project, the entire alignment of the diversion channel will be cleared and grubbed, the channel will be excavated, and excavation spoils will be used to construct the access road adjacent to the channel or trucked off-site. Laydown areas for the channel construction will be limited to the footprint of the channel and adjacent access road. The concrete intake control structure will be combined with a culvert under the Dutch Valey Road. Construction laydown area for this intake control structure is expected to be several hundred square metres in size and likely to be located in the nearby parking and park area on the north side of the Dutch Valley Road. Temporary works will include water control works as well as erosion and sediment control works along the northern bank of Parsons Brook during the construction of the intake control structure and within the wetland along the southern bank of Trout Creek during the construction of the diversion channel.

The Parsons Brook diversion channel will be lined with grassed vegetation and any disturbed areas will be revegetated using native vegetation to provide protection against sediment erosion. The Parsons Brook diversion channel and associated intake control structure construction duration is estimated at 12 months (if performed sequentially).

During the operation phase of the project, activities potentially impacting the terrestrial and aquatic environments project are limited to diverting part of the Parsons Brook flood flows to

Trout Creek. The frequency of flow diversions is anticipated to be once every 5 years on average, while the duration of the flow diversion is anticipated to be up to 12 hours per diversion event.

The project is not expected to be decommissioned as it will permanently mitigate flood risks in Sussex. Refurbishment work is anticipated to be limited to reconstructing the intake control structure every 80 years.

3.3.2 Trout Creek Diversion

The proposed Trout Creek diversion channel will be designed to accommodate flows of up to 220 m^3/s. The channel will be approximately 1,600 m long, extending northerly from the sharp bend on Trout Creek near Brown's Paving Ltd. to the flood plain of the Kennebecasis River east of the Aiton Road and north of Route 1, as shown on Figure 4, Appendix A. The discharge point will be located approximately 8.8 km upstream of the Trout Creek and Kennebecasis River confluence as measured along the Kennebecasis River, or 4.3 km measured as the crow flies. The diversion channel will be located within an 80 m wide corridor with a base width of approximately 50 m. The minimum depth of the channel will be 2 m with 3H:1V side slopes. An access road will be constructed adjacent the length of the channel. The channel will be constructed with in-situ material and lined with grass vegetation. A passive concrete intake control structure will regulate flow, ensuring drainage from Trout Creek into the diversion channel occurs only during flood flows.

The Trout Creek diversion channel will require the construction of two bridge/overpass structures on New Brunswick Route 1 where the highway intersects the channel as well as a culvert or bridge structure at Leonard Drive. As the Project is currently in the preliminary planning and design stage, detailed design plans for these structures are not yet available. The locations of these structures are shown on Figures 5 and 6, respectively, in Appendix A.

During the construction phase of the Project, the entire alignment of the diversion channel will be cleared and grubbed, the channel will be excavated, and excavation spoils will be used to construct the access road adjacent to the channel or trucked to spoils disposal areas on the properties through which the diversion channel will be constructed. Laydown areas for the channel construction are estimated to be several thousand square metres in size and will include the footprint of the channel and adjacent access road, as well as spoils disposal areas east of the Trout Creek diversion channel. Exact locations of disposal areas are yet to be determined but will avoid environmentally sensitive/high value areas (to be reviewed in detail during the New Brunswick Provincial Environmental Impact Assessment Review). The concrete intake control structure will be located on the north bank of Trout Creek. Construction laydown area for this intake control structure is expected to be several hundred square metres in size and likely to be located back from the north bank of Trout Creek near the intake control structure. Temporary works will include water control works as well as erosion and sediment

control works along the north bank of Trout Creek during the construction of the intake control structure and within the Kennebecasis River floodplain north of Route 1 during the construction of the diversion channel.

The Trout Creek diversion channel will be lined with grassed vegetation and any disturbed areas will be revegetated using native vegetation to provide protection against sediment erosion. The Trout Creek diversion channel and associated intake control structure construction duration is estimated at 24 months (if performed sequentially).

During the construction phase of the project, the existing roadway embankments for both Route 1 (4 lanes on two separate parallel embankments) and Leonard Drive (2 lanes on a single embankment) will be excavated, and excavation spoils will be used to construct the access road adjacent to the channel, backfill the bridge or culvert structures, or trucked off-site. Laydown areas for the construction of the Route 1 highway bridges and the bridge/culverts on Leonard Drive are estimated to be 10,000 square metres in size and will likely be located on properties immediately adjacent to the bridges/culverts. Temporary works are expected to include highway cross-overs in the centre median between the east-bound and west-bound lanes on Route 1 on either side of the proposed bridges (traffic flow on Route 1 will need to be maintained) and traffic barriers on Leonard Drive (traffic on Leonard Drive is expected to be blocked during construction). All work will be done in the dry and no temporary water control works are expected other than excavation dewatering. Water pumped from excavations will be discharged to nearby ditches in a manner compliant with applicable environmental regulations (such as total suspended solids concentrations).

Any disturbed areas will be revegetated using native vegetation and New Brunswick Department of Transportation and Infrastructure (NBDTI)-approved hydroseed mix to provide protection against sediment erosion. The Route 1 bridges construction duration is estimated at 36 months, while the Leonard Drive construction duration is estimated at 9 months (if performed sequentially).

During the operation phase of the project, activities potentially impacting the terrestrial and aquatic environments are limited to diverting part of the Trout Creek flood flows to the Kennebecasis River. The frequency of flow diversions is anticipated to be once every 5 years on average, while the duration of the flow diversion is anticipated to be up to 14 hours per diversion event.

3.3.3 Bridge Deck Raising: Route 890 and Salmon Covered Bridge

The proposed diversion channels will result in minor water level increases in the Kennebecasis River between the discharge point of the Trout Creek diversion channel and the natural confluence of Trout Creek and the Kennebecasis River. Temporary water level increases in the Kennebecasis River during flood events will be addressed by raising of the bridge deck elevations at Route 890 and the adjacent covered bridge, shown in Figure 7, Appendix A. As

the Project is currently in the preliminary planning stages, detailed design plans for these changes to the structures are not yet available; however, a 0.6 m increase in elevation is expected for both bridge decks.

During the construction phase of the project, no clearing and grubbing and limited excavation is expected. Any excavation spoils will be used as backfill against the raised bridges. Laydown areas required to raise the bridges are expected to be several thousand square metres in size and are likely limited to the approaches to the covered bridge (i.e. impact of natural areas will be avoided or will be very limited). Temporary in-water works may include construction and traffic by-pass trestles, and sediment and erosion control measures will be used to mitigate water quality impacts in the Kennebecasis River.

Any disturbed areas will be revegetated using native vegetation and NBDTI hydroseed mix to provide protection against sediment erosion. The construction duration to raise both bridges is estimated at 14 months (if performed sequentially). The operation of the raised bridges remains unchanged from current practices, and no additional environmental impacts are anticipated. Both bridges will be refurbished or replaced as per the infrastructure renewal policies of NBDTI and the remaining service life of both bridges is estimated at approximately 60 years.

3.4 Construction Schedule and Project Lifecycle

The Project is anticipated to be completed within three to five years, pending receipt of all necessary regulatory approvals. Design work is currently on-going to refine project details (e.g. channel size, environmental constraints, exact alignment, bridges type and size) and provide cost-certainty and is expected to be completed during 2025. Construction activities for the diversion channels will occur seasonally due to frozen ground in winter and high-water tables during spring. Construction of the bridges on Route 1 will take two seasons and is tentatively scheduled for 2026 and 2027. Raising of the bridges on Route 890 and the construction of the bridge/culverts under Leonard Drive is tentatively scheduled for 2026 or 2027. Construction of the hydraulic control structures at the intake to both diversion channels is tentatively scheduled for 2026 while the excavation of the diversion channels is tentatively scheduled for 2026 and 2027. Full project commissioning is tentatively scheduled for 2028. All Project activities expected during the construction phase include:

- Modifications to existing utilities and services (e.g., syphon sewer lines, lower watermain)
- Placement of staging areas
- Vegetation clearing and grubbing
- Excavation of earth
- Grading
- Seeding, hydro-seeding, and sodding (i.e. soil reinforcement)
- Construction of dikes and Meadow Crescent berm

- Construction of access roads to run parallel with both diversion channels
- Installation of temporary cofferdams
- Dewatering at intake control structure
- Construction of intake control structure
- Construction of culverts (bridge or multi-barrel culvert at Leonard Drive)
- Construction of a two bridge/overpass structures on New Brunswick Route 1
- Raising of bridge decks at Route 890 and historical covered bridge

The Project lifecycle is anticipated to span between 80 to 100 years. This timeframe represents the period during which the diversion channels are expected to function effectively, managing floodwaters and providing protection against flood damage. Over this lifecycle, the channels will require routine maintenance such as annual mowing and clearing of debris to ensure their continued efficiency, but they are designed to offer a long-term, sustainable solution to flood control. This lifecycle estimation also considers the durability of the construction materials and the overall design, ensuring that the channels will serve their intended purpose well into the future. All Project activities expected during the operation phase include:

- Snow clearing for access to intake control structures
- Vegetation management (occasional mowing every 1-2 years to prevent overgrowth)
- Infrastructure maintenance (e.g. intake repairs)
- Potential dredging to resolve sedimentation at areas directly downstream of intakes during large flood events

The project is not expected to be decommissioned as it will permanently mitigate flood risks in Sussex. Refurbishment work is anticipated to be limited to reconstructing the intake control structure every 80 years.

3.5 Alternative Means and Alternatives

During the early stages of flood mitigation planning, multiple flood control options were carefully evaluated to manage potential flood risks. One of the initial considerations was the construction of a dam upstream to create a flood storage reservoir. However, this option was quickly deemed impractical due to the extensive land requirements, which made it unfeasible. Another option explored was the use of piping to channel flood flows. Yet, the volume of water to be managed resulted in the required piping being impractically large and costly. The use of flood berms along Trout Creek through the Sussex downtown core was evaluated but was found to have impractically large land requirements and provide far less flood protection than the flood diversion channels for a similar capital cost. Consequently, the focus shifted to the construction of diversion channels, which emerged as the preferred method for managing floodwaters effectively while overcoming the limitations of the previous options.

GEMTEC completed a Property Damage Assessment Report for Sussex in 2022 to assist in the selection of the preferred arrangement and size of flood diversion channels. As part of the assessment, hydraulic analysis was performed to estimate flood levels along Trout Creek, Parsons Brook, Wards Creek, and the Kennebecasis River resulting from a future (projected to the year 2100) 100-year return period design storm event. Flood inundation maps were developed and overlain over property and building footprint mapping to identify flooded properties, and stage-damage curves were used to translate flooding depth into damage costs.

The analyses were performed for baseline conditions (i.e., flooding resulting from the future design storm during current conditions without flood diversion channels) and five diversion channel scenarios with various diversion channel arrangements and sizes. The damage analysis indicated that 465 properties would be affected during the model flood event for baseline conditions. The five alternative scenarios and the resulting flood analyses are summarized below:

Scenario 1: Construct a diversion channel from Trout Creek to the Kennebecasis River limiting the downstream Trout Creek flows to 10 m^3/s and no diversion channel from Parsons Brook to Trout Creek.

- In this scenario, the flow into Trout Creek is aggressively limited to the maximum of 10 m^3/s (less than 5% of it's total flow). The number of affected properties reduce by 200, roughly a 57% decline from the easting conditions' 465 properties. However, the necessary channel size to reduce the flows to such low levels is unrealistically large. Besides the much higher construction costs, acquiring the necessary permits for such a large structure and aggressive flow limit may be more challenging. Furthermore, the water levels at the next biggest area of concern (along Main Street and Skyline Avenue) remain high and unaffected by the diversion channel in this scenario.

Scenario 2: Construct a diversion channel from Trout Creek to the Kennebecasis River limiting the downstream Trout Creek flows to 60 m^3/s and construct a diversion channel from Parsons Brook to Trout Creek limiting the downstream Parsons Brook flows to 30 m^3/s.

- The flow diversion channels from Trout Creek and Parsons Brook carry 160 m^3/s and 60 m^3/s respectively (73% of Trout Creek and 66% of Parsons Brook's flow during peak time). The number of affected properties drop to 165, about 65% decrease, and the channel specifications remain within a practical range. The drawback in this scenario is the aggravated flood levels in the area between the Parsons Brook's diversion outlet and Trout Creek's diversion intake. The number of affected properties in this area increase from 54 to 62.

Scenario 3: Construct a diversion channel from Trout Creek to the Kennebecasis River limiting the downstream Trout Creek flows to 40 m3/s and construct a diversion channel from Parsons Brook to Trout Creek limiting the downstream Parsons Brook flows to 25 m^3/s.

- The two diversion channels from Trout Creek and Parsons Brook carry 40 m^3/s and 25 m^3/s respectively (82% of Trout Creek and 72% of Parsons Brook's total flow during peak time). The number of affected properties drop to 133, about 71% decrease. The channel specifications are larger than the previous scenario by 10% to 15% but remain within a practical range. Like Scenario 2, the drawback in this scenario is the aggravated flood levels in the area between the Parsons Brook's diversion outlet and Trout Creek's diversion intake. The number of affected properties in this area increases from 54 to 63.

Scenario 4: Construct a 20 m wide diversion channel from Trout Creek to the Kennebecasis River without downstream Trout Creek flow limits and no diversion channel from Parsons Brook to Trout Creek.

- A 20 m wide channel can transfer up to 120 m^3/s (54% of Trout Creek's maximum flow) from Trout Creek to Kennebecasis River. The flows in Parsons Brook remain unchanged. This scenario results in roughly 27% decrease in flood damages. While the channel size and construction costs in this case are very attractive, the reduction in flood damages is low and the return on investment is poor.

Scenario 5: Diversion channels as per Scenario 2 with additional low-cost flow control measures in ditches and storm sewers in downtown area.

- This scenario is a modified form of Scenario 2. A few low-cost flow control measures in downtown Sussex can reduce the inundation significantly and increase the return on investment in this scenario. The total number of damaged properties is reduced to 114, about 75% decrease from existing conditions. Like Scenario 2 and 3, the disadvantage of this scenario is the aggravated flood levels in the area between the Parsons Brook diversion outlet and Trout Creek diversion intake. The number of affected properties in this area increase from 54 to 62. The results of this study indicated that Scenario 5 may have the highest return on investment among other scenarios.

Based on the results of the study, the optimum combination of flood mitigation measures was identified as Scenario 5, the proposed Project presented herein. This Project includes very specific measures to reduce flood impacts on the downtown core of the municipality. The proposed alignment of the diversion channels takes advantage of the existing topography, and the eastern Trout Creek diversion channel is proposed to be in what is believed to have been one of the previous historic alignments of Trout Creek before meandering of the main channel would have resulted in its current alignment.

4.0 LOCATION INFORMATION

4.1 Sussex

Sussex is centrally located between New Brunswick's three main cities, Moncton, Fredericton, and Saint John, in south central New Brunswick. In January 2023, the Town of Sussex amalgamated with the village of Sussex Corner and part of the local service district of the parish of Sussex. The population of the amalgamated Sussex is around 5,900; however, it is the regional service center, recreation, and entertainment hub to more than 25,000 people in surrounding communities.

According to the most recent census data from 2020, taken prior to the amalgamation, the median age in the Town of Sussex was 48, compared to 50 in the Village of Sussex Corner. The median household income was $54,800 in the Town and $64,500 in Sussex Corner. Unemployment rates also differed between the two areas, with the Town at 11.1% and Sussex Corner at 6.8%.

Sussex's economy is primarily driven by agriculture, retail, and tourism, with a notable emphasis on dairy farming and community events. Other major employment sectors include forestry and wood products, manufacturing and light industry, healthcare and social services, and education.

4.1.1 Weather and Climate

Sussex experiences a humid, continental climate characterized by significant seasonal variations. Sussex's climate is influenced by its inland location and proximity to the Bay of Fundy, which can bring in moisture-laden air, particularly impacting winter snowfall and summer humidity.

Summers in Sussex are warm with average temperatures ranging from 15ºC to 25ºC. Precipitation during this period is moderate with occasional thunderstorms. The fall season is marked by cooling temperatures gradually decreasing from around 15ºC in September to below freezing by November. Rainfall is common during this period. Winters are cold and snowy, with average temperatures ranging from -10ºC to -2ºC. Sussex experiences significant snowfall in the winter months, making it a hub for winter activities such as skiing. Come spring, there is a gradual warming with temperatures rising from near freezing in March to about 15ºC by May. The snowmelt during this time can lead to wet conditions and rainfall is frequent.

Seasonal precipitation in Sussex, New Brunswick, varies throughout the year, with the following general patterns:

- Winter (December to February): Precipitation during winter is typically lower but falls mostly as snow. On average, winter months receive about 100–150 mm of precipitation, mostly in the form of snow.

- Spring (March to May): Spring sees an increase in precipitation, often in the form of rain as temperatures rise. This season generally receives 150–200 mm of precipitation, with April and May being the wettest months due to snowmelt and spring rains.
- Summer (June to August): Summer is the wettest season, with frequent thunderstorms and occasional heavy rain showers. Precipitation in the summer months typically ranges from 200–250 mm, with July and August seeing the highest totals due to thunderstorms and increased moisture in the atmosphere.
- Fall (September to November): Fall sees moderate precipitation, typically between 150–200 mm, as temperatures begin to cool and rainfall increases in frequency. October is often the wettest month during this period.

Overall, the annual precipitation in Sussex is approximately 1,000–1,200 mm, with the majority falling during the warmer months, particularly in late spring and summer. The area experiences relatively consistent rainfall throughout the year, with peaks linked to seasonal transitions and thunderstorms.

4.1.2 Topography and Hydrology

Sussex is located in a river valley surrounded by gently rolling hills. The downtown core is situated at an approximate elevation of 20 metres above sea level (masl) with the surrounding hills reaching elevations of up to 200 masl.

The Kennebecasis River is one of the primary rivers in southern New Brunswick. It originates at the foothills of the Caledonia Highlands and generally flows in a southwesterly direction to its junction with the Saint John River in Saint John, approximately 60 km southwest of Sussex. In Sussex, the Kennebecasis River is a moderately sized, slow-flowing river that meanders around the northwestern municipal boundary of Sussex.

Three tributaries of the Kennebecasis River flow north/northwest through the Sussex community including Trout Creek, Parsons Brook, and Ward Creek. Trout Creek is a smaller, steeper and faster-flowing stream compared to the Kennebecasis River. Its flow is highly influenced by seasonal precipitation and snowmelt. Trout Creek meets the Kennebecasis River at the natural confluence just north of the Bensen Athletic Complex located on Blazers Way at Kingswood University. Parsons Brook, a smaller tributary, feeds directly into Trout Creek northeast of the Sussex Lions Club located on Main Street. The third tributary, Ward Creek, is a slow-moving stream with a relatively shallow depth. It also feeds directly into Trout Creek approximately 375 m downstream of the Parsons Brook/Trout Creek confluence. Together, these four watercourses form part of the larger Kennebecasis Watershed, having a drainage area of 1,364 square kilometres at its confluence with the Saint John River.

Hydrometric data is available for the Kennebecasis River from Environment Canada hydrometric station 01AP004 “Kennebecasis River at Apohaqui”. This hydrometric station has

continuous flow data from 1961 and monitors flows from a 1,100 km^2 drainage area. The mean monthly discharge is 25.9 m^3/s, with a minimum monthly mean discharge of 1.93 m^3/s (August 1965) and a maximum monthly mean discharge of 114 m^3/s (February 1981).

Flooding in Sussex is driven by the flows on Trout Creek and Parsons Brook. The relatively long shape and relatively steep slope of the Trout Creek and Parsons Brook watersheds result in rapidly fluctuating (flashy) flows through Sussex during intense precipitation and rapid snowmelt events. Increases in the precipitation intensity and rate of snowmelt driven by climate change result in more frequent flooding along Trout Creek (6 flood events during the last 10 years resulting in a cumulative damage estimate of $60M).

4.1.3 Hydrogeology

The hydrogeological conditions in the Sussex, New Brunswick area are influenced by a mix of bedrock and surficial geological formations. The region predominantly features sedimentary bedrock, including sandstone and shale, which can affect the permeability and water flow in the area. Groundwater in Sussex typically flows through fractured bedrock and unconsolidated sediments, such as gravel, sand, and till, which can act as aquifers.

The aquifers in this area are often unconfined and are replenished primarily through precipitation and surface water infiltration. The presence of several rivers and wetlands, including the Kennebecasis River, provides a significant surface water source, which can influence local groundwater levels. The region also experiences seasonal variations in groundwater levels, with higher recharge during wetter months and potential water shortages during drier periods.

Overall, Sussex's hydrogeological conditions are characterized by a combination of bedrock and unconsolidated material, with groundwater quality being influenced by local land use, geology, and precipitation patterns.

4.1.4 Ecological Environment

Habitat-based ecological studies are currently ongoing to fulfill the provincial environmental impact assessment (EIA) requirements. The results of which will be provided under separate cover once completed. These studies include desktop analyses and field studies as summarized below:

- Wetland Delineation and Functional Assessment
- Rare Plant and Vegetation Survey
- Breeding Bird Survey (to avoid contravention of the *Migratory Bird Convention Act* (MBCA)
- Fish and Fish Habitat Assessment
- Species at Risk (SAR) / Species of Conservation Concern (SOCC) (to avoid contravention of the *Species at Risk Act* (SARA)
- Heritage and Archeological Assessment

The above studies will provide ecological information specific to the Project location. However, as the studies are currently ongoing, the reports have not been finalized and will be provided under separate cover, once completed.

A preliminary desktop review of rare and endangered flora and fauna data obtained from the Atlantic Canada Conservation Data Centre (ACCDC) identified numerous species (verified and non-verified records) within a 5 km radius of the Project Area. These records are summarized in the following sub-sections.

4.1.4.1 Flora

The ACCDC report identified 27 flora species (23 vascular and 4 nonvascular) within 5 km of the Project Area. Two of the 23 flora species are considered SAR under this assessment:

- **Butternut (*Juglans cinerea*)** is a vascular plant listed as Endangered under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Species at Risk Act (SARA), and New Brunswick Species at Risk Act (NBSARA) public registry. Butternut can occur in a wide range of habitats; most notable these habitats include floodplains, streambanks, terraces and ravine slopes (COSEWIC, 2017). Based on a map and coordinates provided by ACCDC, butternut was observed along Trout Creek, approximately 2 km upstream of the proposed Parsons Brook diversion channel outlet, and along the section of Trout Creek located between the two proposed diversion channels.
- **Black ash (*Fraxinus nigra*)** is not on Schedule 1 of the SARA; however, is Threatened under COSEWIC and under consideration for addition to Schedule 1. Based on the provincial rankings, Black ash is considered vulnerable to apparently secure (S3/S4) in New Brunswick specifically. Black ash is found primarily in wetlands, swamps, floodplains, and fens, but can also be found in moist upland forests (COSEWIC, 2018). Like Butternut, based on a map and coordinates provided by ACCDC, Black ash was observed along Trout Creek, approximately 2 km upstream of the proposed Parsons Brook diversion channel outlet.

The remaining 25 flora species identified in the ACCDC report are considered to be SOCC; however, they are not listed under COSEWIC, SARA, or NBSARA. The list of all the flora species identified is included in the ACCDC report in Appendix B.

It is important to note that the species identified above are based solely on a desktop review of available data from the ACCDC. The presence of these species within the Project Area has not been confirmed through field surveys at this time. Field surveys will be conducted to document any actual occurrences of these species within the project site. Should any of the identified species be observed, a further assessment will be undertaken to evaluate the potential impacts.

If the project poses a risk to these species, appropriate mitigation measures or avoidance strategies will be implemented to minimize any potential harm to their populations and habitats.

4.1.4.2 Wildlife and Wildlife Habitat

The ACCDC report lists 14 fauna species as occurring within the search radius; 14 of which are considered SAR (i.e. listed under COSEWIC, SARA, and/or NBSARA). These species are summarized in Table 2.

Table 2: Summary of Wildlife SAR (ACCDC Data)

Common Name	Scientific Name	NB SARA Status	SARA Status	COSEWIC Status	Provincial S-Rank
Bank swallow	*Riparioa riparia*	-	THR	THR	S2B
Barn swallow	*Hirundo rustica*	THR	THR	SC	S2B
Bobolink	*Dolichonyx oryzivorus*	THR	THR	SC	S3B
Canada warbler	*Cardellina canadensis*	THR	THR	SC	S3S4B
Chimney swift	*Chaetura pelagica*	THR	THR	THR	S2S3B, S2M
Common nighthawk	*Chordeiles minor*	THR	SC	SC	S3B, S4M
Cougar - Eastern population	*Puma concolor pop. 1*	END	-	Data Deficient	SU
Eastern wood-pewee	*Contopus virens*	SC	SC	SC	S3B
Evening grosbeak	*Coccothraustes vespertinus*	-	SC	SC	S3B, S3S4N, SUM
Grey wolf	*Canis lupus*	EXT	-	Not at Risk	SX
Lesser yellowlegs	*Tringa flavipes*	-	-	THR	S3M
Monarch	*Danaus plexippus*	SC	SC	END	S2S3?B
Olive-sided flycatcher	*Contopus cooperi*	THR	SC	SC	S3B
Rusty blackbird	*Euphagus carolinus*	SC	SC	SC	S2S3B, S3M
Wood thrush	*Hylocichla mustelina*	THR	THR	THR	S1S2B
Yellow-banded bumble bee	*Bombus terricola*	-	SC	SC	S4

[1]: SC represents Special Concern, THR represents Threatened, END represents Endangered, EXT represents Extirpated
[2]: Provincial S-Rank are as follows: S1 is critically imperiled in the province; S2 is imperiled in the province; S3 is vulnerable in the province; S4 is apparently secure in the province; S5 is secure in the province; S#S# is to indicate a range of uncertainty about the status of the species in the province; SNR is the provincial conservation status is not yet assessed, SX is presumed to be extirpated from the province. A breeding status qualifier is included in the ranking where: B is the breeding population of the species in the province: N is the nonbreeding population of the species in the province, M is a migrant species occurring regularly on migration. ? denotes inexact or uncertain numeric rank.

In addition to the SAR, the ACCDC report lists three location sensitive species that are known within the 5 km of the Project Area. Concern over exploitation of these location sensitive species prevents the New Brunswick Department of Natural Resources and Energy Development (NRED) from publishing the precise location of their nests. The species listed in the ACCDC report include:

- **Bald eagle (*Haliaeetus leucocphalus*)** is considered regionally Endangered under the NBSARA. These birds will often establish a nest in the top of a tall tree or near water. Although Bald Eagles can be found throughout New Brunswick, they are more common in southern New Brunswick and near open water (Nature NB, 2013).
- **Wood turtle (*Glyptemys insculpta*)** is listed as Threatened under SARA and the NBSARA. This species is generally found in forested habitats and require daily water resources, and are thus associated with clear, freshwater streams and the associated floodplains. The preferred streams contain a year-around flow with substrate beds of sand, gravel and sometimes cobble. Wood Turtles also use bogs, marshy pastures, beaver ponds, oxbow lakes, riparian and shrub areas, meadows, hay and agricultural fields, and transmission line rights-of-way (Environment Canada, 2016).
- **Snapping turtle (*Chelydra serpentina*)** is considered Special Concern under SARA and the NBSARA. This species is primarily found in slow-moving freshwater habitats such as ponds, marshes, lakes, and rivers, where they can easily access soft, muddy substrates. Snapping Turtles are highly aquatic but may venture onto land to nest in sandy or gravelly areas. They are often associated with wetlands, shallow bodies of water, and areas with abundant aquatic vegetation. Snapping Turtles can also be found in beaver ponds, bogs, and along riparian zones where they can easily bask or forage (Environment and Climate Change Canada, 2016).

As with the flora species in Section 4.1.4.1, the wildlife species listed are based on desktop data and the actual presence of species in the Project Area has not ben confirmed. Field surveys will be conducted to document any actual occurrences of these species within the project site. Should any of the identified species be observed, a further assessment will be undertaken to evaluate the potential impacts. If the project poses a risk to these species, appropriate mitigation measures or avoidance strategies will be implemented to minimize any potential harm to their populations and habitats.

4.1.4.3 Fish and Fish Habitat

The Kennebecasis River Watershed is a Level 2 Watershed within the broader Saint John River Basin Level 1 Watershed, with an area of approximately 2,146 km^2 (New Brunswick Department of Natural Resources and Energy Development, 2024). The Lower portion of the main stem of the Kennebecasis River (confluence of Trout Creek to Bloomfield) is predominantly comprised of flatwater habitat (56.8%), followed by run habitat (30.1%), and pool habitat (11.4%). The dominant substrate of the reach was sand (38.4%), followed by gravel (31.1%), rubble (14.3%),

and fines (10.4%). Bedrock, boulder, and rock each represented less than 5% of the surveyed reach (Connell, 1995). For reference, the size classification of substrate (Fisheries and Oceans Canada, 2008) as considered by Department of Fisheries and Oceans Canada (DFO) is provided in
Table 3.

Table 3: DFO substrate classification

Substrate Class	Size (mm)
Fines	0.0005 – 0.05
Sand	0.025 – 2.5
Gravel	5.0 – 53
Rubble	53 – 179
Rock	180 – 460
Boulder	> 461
Bedrock	NA

Water quality sampling by the Kennebecasis Watershed Restoration Committee (KWRC) at Salmon Covered Bridge (Kennebecasis Watershed Restoration Committee, 2024) indicates this particular reach of the Kennebecasis River contains suitable fish habitat with an average dissolved oxygen (DO) of 9.06 mg/L between July and October (Kennebecasis Watershed Restoration Committee, 2024), above the required DO level (> 5mg/L) for suitable Brook trout (*Salvelinus fonitalis*) habitat (Fisheries and Oceans Canada, 2008). Water temperature ranged from 5.2°C in October to 22.1°C in August, with an optimal temperature for Brook trout in July (13.1°C; Kennebecasis Watershed Restoration Committee, 2024). Turbidity levels did not exceed 3 nephelometric turbidity units (NTU), which is not anticipated to have a direct impairment on fish (Rosetta, 2005; Birtwell, Farrell, & Jonsson, 2008). Despite this, reported total phosphorus (TP) was at a high range with levels in July (0.03 mg/L) nearing eutrophication, which can have adverse impact on fish and fish habitat (Canadian Council of Ministers of the Environment, 2004). Excessive nutrients in the Kennebecasis River Watershed have historically been attributed to runoff from surrounding agriculture and industry in Kings County as well as pollutants entering the watershed system following flood events (Whalen & Strang, 2017).

Trout Creek is a tributary of the Kennebecasis River that spans 26.75 km from south of Waterford, through Sussex, where it empties into the Kennebecasis River (Kennebecasis Watershed Restoration Committee, 2024). It is defined as a very fluid system that rapidly transports water and substrate downstream through Sussex, characterized by predominantly run habitat (54.6%), followed by riffle habitat (24.1%), and pool habitat (20.4%). The substrate of Trout Creek is composed mostly of gravel (32.5%), rubble (26.4%), and sand (17.9%; Connell, 1995).

KWRC conducts regular water quality sampling at the Canadian National Railway (CN) overpass near Maple Ave in Sussex, approximately 3 km downstream from the proposed intake control structure for the Trout Creek diversion channel (see Section 4.2.2). Located in the lower portion of Trout Creek, which flows through Sussex's urban infrastructure and surrounding agricultural areas, this site frequently faces water quality challenges, such as elevated nutrient levels (KWRC, 2017). However, from 2017 to 2023, nutrient levels in Trout Creek remained below the exceedance thresholds established by the Canadian Council of Ministers of the Environment (CCME). Dissolved oxygen (DO) levels consistently met the minimum requirements for Brook Trout but often exceeded the CCME's recommended maximum of 6.0 mg/L (Kennebecasis Watershed Restoration Committee, 2024)

Various sources have documented the freshwater fish species of New Brunswick; however, the account of species in the Kennebecasis River Watershed is not yet fully refined. KWRC provides a list of fish species within the Kennebecasis River Watershed based on a counting fence study from 1999 at McCully Station Bridge (approximately 3.5 km from the outflow of the Trout Creek diversion channel), annual creel census reports (Whalen, McKnight, & MacQuarrie, 2014), and electrofishing studies (Somers & Curry, 2009).

More recently, Gautreau and Curry (Gautreau & Curry, 2020) generated species distribution maps for inland fish species of New Brunswick based on species account records from the New Brunswick Museum, NRED, the New Brunswick Cooperative Fish and Wildlife Research Unit, and the Canadian Rivers Institute at the University of New Brunswick. Table 4 lists the fish species documented within the Kennebecasis River Watershed.

Table 4: List of reported fish species in the Kennebecasis River Watershed

	Common Name	Scientific Name	KWRC Reporting	Gautreau and Curry (2020)
	Alewife	*Alosa pseudoharengus*	✓	✓
*	American eel	*Anguilla rostrata*	✓	✓
	American shad	*Alosa sapidissima*	✓	✓
*	Atlantic salmon	*Salmo salar*	✓	✓
*	Atlantic sturgeon	*Acipenser oxyrinchus*	×	✓
	Atlantic tomcod	*Microgadus tomcod*	×	✓
	Banded killifish	*Fundulus diaphanus*	×	✓
	Blacknose dace	*Rhinichthys atratulus*	✓	✓
	Blacknose shiner	*Notropis heterolepis*	×	✓
	Blackspotted stickleback	*Gasterosteus wheatlandi*	×	✓
	Blueback herring	*Alosa aestivalis*	×	✓
	Brook stickleback	*Culaea inconstans*	×	✓

	Common Name	Scientific Name	KWRC Reporting	Gautreau and Curry (2020)
	Brook trout	*Salvelinus fontinalis*	✓	✓
	Brown bullhead	*Ameiurus nebulosus*	✓	✓
	Burbot	*Lota lota*	✓	✓
	Chain pickerel	*Esox niger*	✓	✓
	Common shiner	*Luxilus cornutus*	✓	✓
	Creek chub	*Semotilus atromaculatus*	✓	✓
	Fallfish	*Semotilus corporalis*	×	✓
	Finescale dace	*Chrosomus neogaeus*	✓	✓
	Fourspine stickleback	*Apeltes quadracus*	✓	✓
	Golden shiner	*Notemigonus crysoleucas*	✓	✓
	Lake chub	*Couesius plumbeus*	×	✓
	Lake whitefish	*Coregonus clupeaformis*	×	✓
	Longnose sucker	*Catostomus catostomus*	✓	✓
	Mummichog	*Fundulus heteroclitus*	×	✓
	Muskellunge	*Esox masquinongy*	×	✓
	Ninespine stickleback	*Pungitius pungitius*	✓	✓
	Northern redbelly dace	*Chrosomus eos*	×	✓
	Pearl dace	*Semotilus margarita*	✓	✓
	Pumpkinseed	*Lepomis gibbosus*	×	✓
	Rainbow smelt	*Osmerus mordax*	×	✓
	Rainbow trout	*Oncorhynchus mykiss*	✓	✓
	Redbreast sunfish	*Lepomis auritus*	×	✓
	Sea lamprey	*Petromyzon marinus*	✓	✓
*	Shortnose sturgeon	*Acipenser brevirostrum*	✓	✓
	Slimy sculpin	*Cottus cognatus*	✓	✓
	Smallmouth bass	*Micropterus dolomieu*	×	✓
*	Striped bass	*Morone saxatilis*	✓	✓
	Threespine stickleback	*Gasterosteus aculeatus*	✓	✓
	White perch	*Morone americana*	×	✓
	White sucker	*Catostomus commersonii*	✓	✓
	Yellow perch	*Perca flavescens*	×	✓

[1]: * Indicates that the species is listed on either the Provincial or Federal *Species at Risk Act*

Five (5) of the fish species that occur in the Kennebecasis River Watershed are listed under the provincial or federal *Species at Risk Act*. These include American eel (*Anguilla rostrata*), Atlantic salmon (*Salmo salar*) – Outer Bay of Fundy population, Atlantic sturgeon (*Acipenser oxyrinchus*) – Maritimes populations, Shortnose sturgeon (*Acipense brevirostrum*), and Striped bass (*Morone saxatilis*) – Bay of Fundy population. The protection federal and provincial conservation statuses are presented in Table 5.

Table 5: Conservation statuses of fish species in the Kennebecasis River Watershed

Common Name	Scientific Name	NB SARA Status	SARA Status	COSEWIC Status	Provincial S-Rank
American eel	*Anguilla rostrata*	THR	-	THR	S4N
Atlantic salmon	*Salmo salar*	END	-	END	SNR
Atlantic sturgeon	*Acipenser oxyrinchus*	THR	-	THR	S3B,S3N
Shortnose sturgeon	*Acipenser brevirostrum*	SC	SC	SC	S3
Striped bass	*Morone saxatilis*	SC	-	SC	S3S4B,S3S4N

[1]: END represents Endangered, THR represents Threatened, SC represents Special Concern.
[2]: Provincial S-Rank are as follows: S1 is critically imperiled in the province; S2 is imperiled in the province; S3 is vulnerable in the province; S4 is apparently secure in the province; S5 is secure in the province; S#S# is to indicate a range of uncertainty about the status of the species in the province; SNR is the provincial conservation status is not yet assessed. A breeding status qualifier is included in the ranking where: B is the breeding population of the species in the province: N is the nonbreeding population of the species in the province.

Supporting documentation includes the federal DFO aquatic SAR maps, which provides a general overview of aquatic SAR and their critical habitat.

Based on the DFO mapping, Trout Creek, Parsons Brook, Kennebecasis River and smaller tributaries that flow in and around Sussex were all identified as watercourses where freshwater aquatic SAR of Special Concern are found or potentially found. There are no marine aquatic species in or near the Project. One freshwater aquatic SAR was listed to occur or potentially occur in these watercourses, the Shortnose sturgeon. The only known Canadian population of Shortnose sturgeon is found in the Saint John River system. This species spawn in fast-flowing water over boulder and gravel beds. In the Saint John River, they are believed to spawn in a 10 km area below the Mactaquac Dam, 138 km upstream from the river's estuary. In Canada, one confirmed overwintering site is at the junction of the Kennebecasis and Hammond rivers, where adults stay in fast-moving water at depths of 3 to 6 metres. Juveniles are less understood, but have been found 35 to 120 km upstream, with smaller juveniles appearing further upriver, indicating younger fish may prefer upstream habitats (COSEWIC, 2015).

Similar to the flora and wildlife discussed in the preceding sections, the information regarding fish and fish habitat is derived from desktop analysis. Fieldwork will follow to confirm species presence and assess potential impacts. If the project poses a risk to these species, appropriate mitigation measures or avoidance strategies will be implemented to minimize any potential harm to their populations and habitats.

4.1.4.4 Migratory Birds

A search of publicly available databases revealed a total of 136 recorded bird species in the Project Area. This information was gathered from the following sources:

- Maritimes Breeding Bird Atlas (Bird Studies Canada et al., 2024)
- eBird (Cornell Lab of Ornithology, 2024)
- iNaturalist (California Academy of Sciences, 2024)
- ACCDC (Atlantic Canada Conservation Data Centre, 2024)

The Maritimes Breeding Bird Atlas (MBBA) data are organized into 10-km x 10-km grids, with the Project Area located within grid 20LR06, part of the broader Region #12: Saint John. Surveyors follow a standard protocol to collect breeding bird data, which is subsequently reviewed by leading Maritimes bird experts prior to publication. eBird and iNaturalist are databases that contains species observation data reported by avid birdwatchers and naturalists, which can be reviewed and verified by peers within the naturalist community. The full list of bird species recorded in proximity to the Project Area are presented in Appendix C.

The migratory bird screening did not reveal any additional SAR observations that were not captured in the ACCDC report. The screening, however, allowed for an approximation of the distance from the recorded observation to the Project Area. The recorded SAR, the distance from the Project Area, and the time of their observation are presented in Table 6.

Table 6: Bird SAR observations in proximity to the Project Area

Common Name	Scientific Name	Nearest Observation from Project Area	Date of Recorded Observation	Database(s)
Bald eagle	*Haliaeetus leucocephalus*	~500 m	August 2022	MBBA,eBird, iNaturalist
Bank swallow	*Riparia riparia*	~4.5 km	September 2023	eBird
Barn swallow	*Hirundo rustica*	~1.4 km	May 2013	MBBA, eBird
Bobolink	*Dolichonyx oryzivorus*	~1.4 km	May 2013	MBBA,eBird, iNaturalist
Canada warbler	*Cardellina canadensis*	< 1 km	May 2015	eBird
Common nighthawk	*Chordeiles minor*	< 1 km	July 2024	MBBA,eBird, iNaturalist
Evening grosbeak	*Hesperiphona vespertina*	< 1 km	October 2016	MBBA,eBird, iNaturalist
Lesser yellowlegs	*Tringa flavipes*	~4.5 km	August 2024	eBird
Olive-sided flycatcher	*Contopus cooperi*	~20 km	June 2019	eBird
Rusty blackbird	*Euphagus carolinus*	~500 m	December 2017	eBird
Wood thrush	*Hylocichla mustelina*	~1.7 km	June 1994	eBird

Forest and Wetland layers from NRED (New Brunswick Department of Natural Resources and Energy Development, 2024) were analyzed to assess the Ecological Land Classification (ELC), offering insight into the area's potential to support bird habitat. The Project Area encompasses various environments that could provide habitat for migratory birds, including:

- **Hardwood forest** composed of early successional species such as red maple (*Acer rubrum*), sugar maple (*Acer saccharum*), paper birch (*Betula papyrifera*), and trembling aspen (*Populus tremuloides*) that support a variety of bird species, including SAR such as Canada warbler (*Cardellina canadensis*), Eastern wood-pewee (*Contopus virens*), Olive-sided flycatcher (*Contopus cooperi*), Rusty blackbird (*Euphagus carolinus*), and Eastern whip-poor-will (*Antrostomus vociferus*). Specifically, the hardwood stands categorized by NRED identified in the Project Area include:
    - Poplar Hardwood Forest
    - Intolerant Hardwood Forest
- **Softwood forest** dominated by coniferous species such as balsam fir (*Abies balsamea*), black spruce (*Picea mariana*), red spruce (*Picea rubens*), white spruce (*Picea glauca*),

and eastern white cedar (*Thuja occidentalis*). The forest cover of softwood stands provides essential bird habitat for SAR such as Evening grosbeak (*Hesperiphona vespertina*) as well as warblers, woodpeckers, and raptor species. Specifically, the softwood stands categorized by NRED identified in the Project Area include:

    - Black Spruce Forest
    - Intolerant Softwood Forest
    - Spruce Forest

- **Mixedwood forest** composed of a blend of deciduous and coniferous tree species such as red maple, sugar maple, paper birch, balsam fir, and spruce *spp*. The mixedwood forest near the Project Area has potential to provide habitat to foraging Barn swallow (*Hirundo rustica*) due to its proximity to human structures. Mixedwood forests are critical to migratory birds such as warblers, for stopover feeding and nesting during the breeding season. Specifically, the softwood stands categorized by NRED identified in the Project Area include:
    - Birch Mixedwood Forest
    - Balsam Fir Mixedwood Forest
- **Forested wetland** identified by NRED was found to overlap with the Project Area, specifically at the proposed intake structure location for the Trout Creek diversion channel and near the proposed outflow of Parsons Brook diversion channel. This includes forested areas characterised by saturated soils and tree-dominated vegetation such as red maple and black spruce. In addition to the SAR species noted above, large trees in this area could provide habitat to Bald eagle (*Haliaeetus leucocephalus*) due to its proximity to Trout Creek. Forested wetlands often serve as a hotspot due to its foraging resources, nesting habitat, and in this case, proximity to a riparian zone.

4.1.4.5 Ecologically Significant Areas

In addition to rare and endangered flora and fauna, the ACCDC report provides the location and information of significant or managed natural areas. A Managed Area (MA) is a site with some level of protection for wildlife within the boundaries. The Ecologically Significant Areas (ESAs) are sites that may or may not have legal protection.

The ACCDC report did not identify any MAs within the search radius. Two ESAs were identified:

- **Sussex Salt Spring ESA**: Located approximately 2.6 km northeast of the proposed Trout Creek diversion channel outlet. According to the ACCDC data provided, this is one of very few known inland salt springs with high salinity and vegetation characteristic of coastal salt marshes. Saltwater bubbles up from underground, is caught in a small pool, and the outflow is quickly diluted in freshwater ditch/tributary.
- **Rockville Escarpment ESA**: Located on Trout Creek approximately 3.3 km upstream of the proposed Parsons Brook diversion channel outlet into Trout Creek. According to the ACCDC data provided, this is a large escarpment and cliff area hosting

- 3.3 km from the Parsons Brook diversion channel, southeast
- Large escarpment and cliff area hosting rock spikemoss, rock harlequin, and bearberry. The escarpment also hosts a stand of White and Red Pines, with a few Jack Pines and Red Oak in some areas.

Both the Sussex Salt Spring ESA and the Rockville Escarpment ESA are located at substantial distances from the Project Area, with the Sussex Salt Spring ESA situated approximately 2.6 km northeast and the Rockville Escarpment ESA located around 3.3 km upstream of the Parsons Brook diversion channel outlet. Given their upstream locations and the considerable separation from the Project Area, no direct or indirect impacts are anticipated to these ecologically significant areas as a result of the proposed activities.

4.1.4.6 Wetlands

As noted previously in Section 4.1.4.6, a Wetland Delineation and Functional Assessment will be completed for the Project. According to provincial wetland mapping (New Brunswick Department of Natural Resources and Energy Development, 2024), the proposed Parsons Brook and Trout Creek diversion channels intersect mapped wetland areas. In New Brunswick, all watercourses and wetlands on the ground which meet the Department of Environment and Local Government (DELG) definitions are regulated, whether they are identified on the reference map or not. The reference map is a useful predictive tool to assist in the Watercourse and Wetland Alteration (WAWA) permitting process. However, these areas will be confirmed upon completed of the Wetland Delineation and Functional Assessment.

4.2 Project Location

The proposed Project crosses municipally owned, provincially owned, and privately owned land. There are no water lots required for Project implementation. Information pertaining to the location of each of the proposed Project elements is presented in the following sub-sections.

4.2.1 Parsons Brook Diversion Channel

The Parsons Brook diversion channel will extend from Parsons Brook in a north easterly direction, discharging into Trout Creek. The coordinates for the intake control structure and discharge point of this channel are provided in Table 7.

Table 7: Parsons Brook Diversion Channel Coordinates[1]

Location	Latitude	Longitude
Intake Control Structure	45.705995	-65.479529
Discharge	45.709643	-65.473646

[1]Coordinates provided in decimal degrees.

The lands on which the Parson's Brook diversion channel will be located are identified in Table 8.

Table 8: Legal Description of Land: Parsons Brook Diversion Channel

Property Identifier	Property Owner
00208785	Education and Early Childhood Education (Government of New Brunswick)
00203141	Private landowner Private landowner
30255863	Private landowner

The proposed alignment of the Parsons Brook diversion channel intersects recreational greenspace associated with the Sussex Corner Elementary School and is within 100 m of the actual school building. The nearest residence is approximately 50 m from the intake structure at the intersection of Dutch Valley Road and New Line Road. Several additional residences located along Dutch Valley Road, New Line Road, and Needle Street are within 200 m of this proposed channel.

4.2.2 Trout Creek Diversion Channel

The Trout Creek diversion channel will extend from Trout Creek in a northerly direction, discharging to the flood plain of the Kennebecasis River. The coordinates for the intake control structure and discharge point of this channel are provided in Table 5.

Table 9: Trout Creek Diversion Channel Coordinates[1]

Location	Latitude	Longitude
Intake Control Structure	45.719109	-65.477649
Discharge	45.732685	-65.476435

[1]Coordinates provided in decimal degrees.

The lands on which the Trout Creek diversion channel will be located are identified in Table 10.

Table 10 Legal Description of Land: Trout Creek Diversion Channel

Property Identifier	Property Owner
30192033	Town of Sussex
30192041	Town of Sussex
00204248	Blue Skies Above Inc.
30011001	Town of Sussex

Property Identifier	Property Owner
30208615	Alantra Leasing Inc. Locations Alantra Inc.
00203901	Alantra Leasing Inc. Locations Alantra Inc.
30264469	Private landowner
30259907	Master's Touch Hard Surface Cleaning Ltd.
30217707	707357 NB Inc.
30137640	New Brunswick Highway Corporation
30137590	New Brunswick Highway Corporation
00200741	J D Irving Limited
30285258	J D Irving Limited
30285241	Transportation (Government of New Brunswick)
30025902	Private landowner
00200683	Private landowner

Five residences located along the eastern side of Bryant Drive and Canterbury Court are within 200 m of the southernmost portion of the proposed Trout Creek diversion channel. At the intersection with Leonard Drive, the channel will be within 20 to 30 m of the residences located on either side of the road.

4.2.3 Route 890 and Salmon Covered Bridge

New Brunswick Route 890 is a secondary highway in southeastern New Brunswick near Sussex, oriented in a north-south direction. Adjacent to the route is the Salmon Covered Bridge, a wooden covered structure spanning the Kennebecasis River. The coordinates for the center of each bridge are provided in Table 11.

Table 11: Route 890 and Salmon Covered Bridge Coordinates[1]

Location	Latitude	Longitude
Route 890 Bridge	45.745172	-65.497799
Salmon Covered Bridge	45.745277	-65.498084

[1]Coordinates provided in decimal degrees.

4.3 Proximity to Federal Lands

According to the Directory of Federal Real Property, the nearest federal properties to the Project are 800 m west of the proposed intake control structure for the Parsons Brook diversion channel

(Property Number 34046, National Defence) and 950 m east of the proposed intake control structure for the Trout Creek diversion channel (Property Number 19165, Canada Post).

4.4 Proximity to Traditional Indigenous Lands

It is acknowledged the Project is in the traditional unceded territory of the Wolastoqiyik (Maliseet) People. This territory, and all New Brunswick, are covered by the “Treaties of Peace and Friendship” which Wolastoqiyik (Maliseet), Mi’gmaq and Passamaquoddy Peoples first signed with the British Crown in 1725. The treaties did not deal with surrender of lands and resources but in fact recognized Wolastoqiyik (Maliseet), Mi’gmaq and Passamaquoddy title and established the rules for what was to be an ongoing relationship between nations.

According to First Nations Communities mapping provided by the province of New Brunswick, the nearest First Nations reserve community to the Project is Welamukotuk (Oromocto First Nation), located approximately 75 km northeast of Sussex. Continued engagement with Mi’gmaq and Wolastoqey First Nations will assist in the identification of traditional lands within proximity of the Project.

4.5 Archaeological Considerations

A preliminary archaeological investigation pedestrian survey will be completed to identify potential archaeological sites within the Project Area. The pedestrian survey will be completed by a Senior Archaeologist accompanied by an Indigenous Monitor.

5.0 JURISDICTIONAL INVOLVEMENT

5.1 Funding Applications

The costs associated with the Project are estimated at $38.25 million and include $15.7 million for the NBDTI Highway bridges on New Brunswick Route 1. All costs are in 2022 dollars based on a Class D cost estimate, and include 15% soft costs, 4.3% net taxes and 25% contingency. The above costs do not include land acquisition and property purchases.

Sussex municipality does not have the fiscal capacity to fund the Project by itself. A funding application to Infrastructure Canada's Disaster Mitigation and Adaptation Fund (DMAF) was submitted for the Project in July 2023 for $15.3 million, accounting for 40% of the project eligible costs. In addition to the request for federal funding, an application was submitted to the Provincial Government of New Brunswick under the Investing in Canada Infrastructure Program (ICIP) for just over $12.6 million, accounting for 33%. Approval for both the federal DMAF and provincial ICIP funding was received for the Project on June 25, 2024.

The remaining project costs (27%, $10.3 million) are to be covered by the municipality. Sussex will secure this portion through expensing reserved funds, borrowing, and utilizing capital funds from the annual budgets during the years of design and construction.

5.2 Federal Lands

No federal lands will be used for the purpose of carrying out the Project and the Project is not defined as a federal work or undertaking as defined in subsection 3(1) of the *Canadian Environmental Protection Act*.

5.3 Environmental Assessment: Non-Federal Jurisdictions

Based on a letter from the New Brunswick Department of Environment and Local Government (NBDELG) sent to GEMTEC dated August 24, 2021, the Project will require EIA registration and review. Registration is required per item (r) "all projects involving the transfer of water between drainage basins" of Schedule A of the provincial *Environmental Impact Assessment Regulation - Clean Environment Act*. Baseline fieldwork surveys in support of provincial EIA registration are currently underway. It is anticipated the EIA registration document will be submitted to NBDELG in Q1 of 2025.

In addition to EIA registration, based on the proposed work within existing watercourses and wetlands, implementation of the Project will require approval by the NBDELG's Source and Surface Water Protection Branch via the issuance of Watercourse and Wetland Alteration (WAWA) permits per the *Watercourse and Wetland Alteration Regulation* (90-80) of the *Clean Water Act.*

5.4 Summary of Potential Permits/Authorizations

A list of the potential permits and/or authorizations (federal and provincial) that may be required for implementation of the Project is summarized below:

- NBDERD Licence of Occupation
- NBDELG WAWA Permit
- DFO Fisheries Act Authorization
- Navigation Protection Act (NPA) Notice of Works Form to Transport Canada
- NBDELG EIA Certificate of Determination
- NBDTI Highway Occupancy Permit
- NB Highway Corporation Highway Occupancy Permit

In addition to the necessary permits and approvals outlined above, an Environmental Management Plan (EMP) will be developed to ensure the project complies with key environmental regulations, such as the Canadian Environmental Protection Act (CEPA), SARA, MBCA, and Fisheries Act. The EMP will detail the mitigative measures to be implemented during both the construction and operational phases of the project. This plan will include spill response protocols, procedures for in-water works, an erosion and sediment control plan, and procedures for handling encounters with species at risk, ensuring all environmental obligations are met throughout the project's lifecycle.

6.0 POTENTIAL EFFECTS OF THE PROJECT

6.1 Changes to Environmental Components

6.1.1 Fish, Fish Habitat, and Aquatic Species

The diversion channels will be configured to only divert flood flows during events more than a 20-year return period. Non-flood flows will continue to follow the existing watercourse alignments ensuing natural maintenance flows supporting the existing environment will not be affected.

During flows more than a 20-year return period, there is the potential fish may become trapped within the diversion channel. This risk is comparable to the natural trapping of fish in floodplains, where water pooling in undulations becomes isolated from the river or stream as flood waters recede. To mitigate this, the diversion channels will be designed to completely drain, minimizing the likelihood of aquatic species being trapped after a flood event.

Temporary disruptions to aquatic habitat are expected during the construction phase of the Project, including dewatering for in-water works. Accidental contaminant spills or erosion and sedimentation could result in harm to fish species and/or destruction of fish habitat during construction. However, appropriate mitigation measures will be implemented to minimize the risk to the aquatic environment. Any disruptions to aquatic habitat will be restored upon completion of the construction phase of the Project.

Table 12 below outlines the potential effects of the Project to fish and fish habitat during each phase and details the mitigations measures that will be implemented to prevent or reduce these effects.

Table 12 Preliminary list of changes to fish and fish habitat[1]

Source of Potential Effect	Project Phase	Potential Changes to Environment	Area of Influence	Proposed Mitigations
• Dewatering during construction of intake control structures	• Construction	• Temporary removal of fish habitat • Altered flows in Trout Creek and Parsons Brooks once areas are isolated	• The specific sections of Trout Creek and Parsons Brook where the proposed intake control structures are planned for construction will experience direct impacts due to dewatering. • Altered flows could impact fish habitat both downstream and upstream of the isolated area	• The construction area will be isolated to not allow fish passage during in-water works. • Fish salvages will be conducted by qualified biologists prior to commencing any in-water works. Fish will be relocated upstream of the isolated construction area. • Previous research supporting the project design indicates the proposed location for the intake control structure of the Trout Creek diversion channel has a wide bank full width and experiences near-dry conditions at certain times of the year. Construction will take place during periods of minimal flow, minimizing impacts to the rest of the watercourse.
• Introduction of invasive species through the use of machinery and other equipment during excavation	• Construction	• Introduction of aquatic invasive species could adversely impact the native species (e.g. zebra mussels could alter water quality and substrate composition)	• Kennebecasis River Watershed (potentially the broader Saint John River watershed)	• The use of construction equipment will follow the *Clean Equipment Protocol for Industry* (Halloran, Anderson, & Tassie, 2013).
• The release of sediment due to erosion of soils from construction areas including the intake control structures and channel excavation.	• Construction	• Degradation in the quality of fish habitat and/or fish mortality	• Trout Creek downstream of the intake control structure and the Kennebecasis River floodplain down stream of the Trout Creek diversion channel.	• Erosion and sediment control measures (ESC) will be installed during construction including silt fencing and erosion control blankets to support construction of intake control structures and excavation, respectively. • Hydro-seeding and sodding will be incorporated into the design of the diversion channels to promote vegetation growth and soil stabilization.
• If not properly designed, the diversion channels could initiate sediment deposition in Trout Creek and transport sediment from Trout Creek to the Kennebecasis River floodplain during flood events.	• Operation	• Degradation in the quality of fish habitat and/or fish mortality	• Sediment deposition in Trout Creek will be limited to the area immediately downstream of the diversion channel intake control structure. • Sediment transport into the Kennebecasis River floodplain would be limited to the area immediately downstream of the diversion channel outlet.	• Intake control structure design will incorporate deflectors to minimize flow velocity reductions (and resulting potential sediment deposition) in Trout Creek, as well as a control weir to minimize the flow of sediment bedload into the diversion channel.
• Altered flows when diversion channels are operating	• Operation	• Operation of the diversion channels could alter the natural flow regime resulting in disturbance to fish habitat	• Parsons Brook, Trout Creek, and the Kennebecasis River.	• The proposed location of the diversion channel was selected to ensure that flow is not redirected to another water basin. • During 20-year return periods, the diversion channels will redirect flow away from downtown Sussex, though discharge into the Kennebecasis River will be retained.
• Change in flow conditions in the diversion channels during and following flood events	• Operation	• The change in flow conditions could leave fish stranded in dry spots or small deoxygenated pools of water leading to mortality.	• Parsons Brook Diversion Channel, Trout Creek Diversion Channel	• This risk is comparable to the natural trapping of fish in floodplains, where water pooling in undulations becomes isolated from the river or stream as flood waters recede • The diversion channels will be designed to completely drain, minimizing the likelihood of aquatic species being trapped after a flood event.

[1]: As defined in subsection 2(1) of the *Fisheries Act, 1985*

6.1.2 Wetlands

According to provincial wetland mapping (New Brunswick Department of Natural Resources and Energy Development, 2024), the proposed Parsons Brook and Trout Creek diversion channels intersect wetland areas. In New Brunswick, all watercourses and wetlands on the ground which meet the Department of Environment and Local Government (DELG) definitions are regulated, whether they are identified on the reference map or not. The reference map is a useful predictive tool to assist in the Watercourse and Wetland Alteration (WAWA) permitting process. However, a wetland delineation assessment will need to be completed to determine the total area of wetland affected by the Project.

Implementation of the Project will require approval by the DELG's Source and Surface Water Protection Branch via the issuance of WAWA permits. Per the provincial *Watercourse and Wetland Alteration Regulation* (90-80) of the *Clean Water Act*, all loss of wetland habitat in New Brunswick must be compensated at a ratio of 2:1 through the restoration, creation, or enhancement of wetland habitat. Therefore, any potential habitat loss because of the Project will be off-set two-fold.

6.1.3 Migratory Birds

To ensure migratory birds are not disturbed, vegetation clearing will be completed outside of the typical bird-breeding season (May 1 to August 31). The areas to be cleared will be clearly marked to prevent unnecessary clearing. In the event vegetation clearing must take place within the bird-breeding season (May 1 to August 31), a non-intrusive nesting survey of the Project Area will be conducted by a bird expert. If a nesting bird species is encountered, contact with and disturbance of the species and its habitat will be avoided. A vegetated buffer will be established around any nests encountered to protect them from disturbance and work in that area will be avoided until after the birds have fledged or vacated.

Additionally, some bird species will nest in unattended/un-vegetated soil piles. If soil piles are to be left unattended/un-vegetated, the piles will be covered to avoid potential nesting. If a nesting bird is discovered, the nest site will be protected with silt fencing and a buffer until the bird has vacated the nest, as determined by a bird expert.

Excessive noise and light during construction can interfere with birds' communication, navigation, and foraging behaviour, ultimately causing birds to avoid the area. Steps to reduce noise pollution will be taken during construction and construction activities will be limited during critical migratory periods (i.e. Spring and Fall migration).

The Project will ultimately reduce the extent of floodplain, an area that migratory birds utilize to access feeding and nesting grounds. The diversion channels, however, will capture the majority of surface water that previously inundated Sussex, thereby restoring floodplain-like conditions that provide essential feeding and nesting habitats for migratory birds during flood events. Table 13 below outlines the potential effects of the Project migratory birds during each phase and details the mitigations measures that will be implemented to prevent or reduce these effects.

Table 13 Preliminary list of changes to migratory birds[1]

Source of Potential Effect	Project Phase	Potential Changes to Environment	Area of Influence	Proposed Mitigations
• Tree clearing at proposed diversion channel locations and associated infrastructure	• Construction	• Removal of migratory bird habitat • Direct mortality to nesting birds	• Within the Project footprint	• Tree clearing will occur beyond the breeding bird season (May 1 to August 31) • Compensation plantings will occur following construction to revegetate the riparian zone of the diversion channels
• Noise and light from construction equipment	• Construction	• High noise from heavy machinery can interfere with birds' communication, navigation, and foraging behaviour, ultimately causing birds to avoid the area during construction • Lighting from construction equipment can disorient migratory birds	• Within the Project footprint	• Steps to reduce noise pollution will be taken during construction and construction activities will be limited during critical migratory periods (i.e. Spring and Fall migration)
• Stockpiling of soil during excavation	• Construction	• Temporary soil stockpiles during excavation can attract bird species, particularly Bank swallow, who utilize the piles as breeding habitat. The removal of these piles could damage or destroy Bank swallow habitat, a species at risk	• Within the Project footprint	• Soil stockpiles will be covered to avoid potential nesting • If a nesting bird is discovered, the nest site will be protected with silt fencing and a buffer until the bird has vacated the nest, as determined by a bird expert
• Floodplain alteration	• Operation	• The altered floodplain will prevent natural flooding, which migratory birds utilize to access feeding and nesting grounds	• Sussex region, riparian zones of Trout Creek	• The diversion channels will capture the majority of surface water that previously inundated Sussex, thereby restoring floodplain-like conditions that provide essential feeding and nesting habitats for migratory birds during flood events

[1]: As defined in subsection 2(1) of the *Migratory Birds Convention Act, 1994*

6.2 Federal Lands

No environmental changes to federal lands in or outside of the Province of New Brunswick are expected from the implementation of the Project.

No non-negligible adverse changes to the marine environment outside Canada that may be caused by pollution are anticipated to occur from the implementation of the Project.

In addition, no non-negligible adverse changes to the interprovincial or international waters that may be caused by pollution are anticipated.

6.3 Indigenous/Cultural Considerations

As outlined in Section 2.2, the Project is in the early planning stages and, as such, Indigenous engagement activities are in early stages. Thorough consultation with Indigenous groups will assist in the identification of impacts to the health, social, or economic conditions of Indigenous peoples due to the Project. Currently, no changes are anticipated.

Sussex/GEMTEC initiated Indigenous engagement and sent a high-level project description directly to the Chiefs of all Mi'gmaq and Wolastoqey First Nations. Given the project proposal is in the early planning stages of development, the responses from Indigenous groups did not articulate specific information on the potential impacts to Indigenous peoples on physical and cultural heritage; current use of lands and resources for traditional purposes or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

Sussex/GEMTEC were advised by one Indigenous organization that they would defer consultation to the Mi'gmaq First Nation communities. In addition, Mi'gmawe'l Tplu'taqnn (MTI), an Indigenous rights organization that for the purposes of the MRIA framework and its application, represents eight Mi'gmaq communities in New Brunswick, advised a MRIA was required to be completed to assess the potential impacts of the Project on Mi'gmaq Aboriginal and Treaty Rights and Title.

The MRIA framework is a self determining Mi'gmaq lead comprehensive process used to evaluate potential adverse impacts of project proposals on Mi'gmaq rights, interests, and cultural heritage. Rooted in the principles of Mi'gmaq law and knowledge systems, the framework provides a structured approach to identify, assess, and address impacts on physical and cultural heritage, traditional land use, and historically or archaeologically significant structures or sites.

In addition, the project proposal will be the subject of a Provincial EIA registration and review. The New Brunswick EIA process is a comprehensive framework to identify, assess and mitigate potential adverse effects of proposed projects. It incorporates and places particular emphasis on Indigenous peoples and recognises their unique relationship with the land, their cultural heritage, and the importance of their traditional practices.

It is proposed that any non-negligible adverse impacts on physical and cultural heritage, the current use of lands and resources for traditional purposes or any structure or thing that is of historical, archaeological, paleontological or architectural significance, that may be caused by the implementation of the Project, will be identified, assessed, and mitigated through the application of the MTI Mi'gmaq Rights Impact Framework and the New Brunswick EIA Process.

Although, from the engagement activities completed with Indigenous communities to date, there have been no concerns raised related to social, economic or health effects as a result of implementation of the Project, and given no non-negligible adverse impacts are anticipated, the same processes (i.e., the MTI Mi'gmaq Rights Impact Framework and the New Brunswick EIA Process) will also be employed to validate with potentially impacted Indigenous groups whether any non-negligible adverse changes to the health, social or economic conditions of Indigenous Peoples may be caused by the implementation of the Project.

6.4 Estimate of Greenhouse Gas Emissions

Greenhouse gas emissions associated with the construction of the project have been prepared based on preliminary material quantity take offs and the most likely sources of construction materials using the methodology prescribed in the Climate Lens Assessment of the Infrastructure Canada Disaster Mitigation and Adaptation Fund (DMAF; Infrastructure Canada, 2023).Construction activities will include excavation, hauling and placement of excess fill, pile driving, installation of erosion protection measures, reinforced concrete placement, road construction and paving. A detailed report showing the carbon footprint (as tonnes of eCO_2) of construction activities, material quantities, material sources and trucking, and construction labour is presented in Appendix D. The total project Green House Gas emissions are estimated at 595.3 tonnes of CO_2e. This estimate compares well against the measured consumption of diesel, gasoline and electricity during the construction of large bridge projects.

6.5 Waste Generation and Emissions

Earthworks required to construct the two diversion channels will generate large quantities of excess soils. These soils will be placed along the banks of the channels and on the surrounding lands to minimize hauling of materials off-site. Preliminary estimates of the excess soil volumes generated during excavation of the diversion channels is presented in Table 14.

Table 14: Excess Soil Volume Estimates

Diversion Channel	Estimate of Excess Soil Volume from Excavation
Parsons Brook Diversion Channel	30,160 m^3
Trout Creek Diversion Channel	179,000 m^3
Estimated Total	**209,360 m^3**

In addition to the excess soil, other sources of waste or emissions generated during the construction of the two diversion channels include:

- Air emissions and noise/vibration from construction equipment.
- Accidental releases of hazardous materials such as petroleum products from construction equipment.
- Disturbed soil and stockpiled materials could result in runoff to the watercourses during rain events; and
- Nuisance dust during dry periods.

Standard dust control measures will be implemented to mitigate air quality impacts. These measures may include minimizing activities that generate fugitive dust during periods of high winds and using water as a dust suppressant. Dry materials and rubbish will be covered or wetted down to prevent blowing dust or debris. Should the use of other dust suppressants such as calcium chloride or magnesium chloride be required, they will be used in accordance with guidance offered in the Environment Canada report entitled, *Best Practices for the Use and Storage of Chloride- Based Dust Suppressants* (Environment Canada, 2007).

Additionally, equipment will be kept in good working condition, inspected daily for leaks, and equipment idling time will be minimized where possible to decrease greenhouse gas emissions. The proponent will comply with all applicable air quality regulations and pollution control devices will be implemented when possible. Furthermore, increased dust and air emissions will be temporary and will return to normal levels once construction has been completed.

Any disturbed areas with the potential to erode will be stabilized using standard construction measures. These measures may include, but are not limited to, straw bales, check dams, silt fencing and sand bagging. Erosion control measures will be inspected daily, especially prior to and following a heavy precipitation event to ensure they are functioning properly and are maintained and/or replaced as required. Once construction is completed, the area disturbed by the construction activities will be stabilized. Erosion control measures will be left in place until all disturbed areas have been stabilized. Banks will be stabilized and revegetated using non-invasive species after construction.

A spill contingency plan will be put in place to respond to an emergency and will be detailed in an Environmental Protection Plan to be prepared by the Proponent. It will include at a minimum:

- Information related to refueling and maintenance activities. These activities will take place on level terrain and at least 30 metres from environmentally sensitive areas (i.e., wetlands and watercourses).
- Identifying the material involved and refer to the Material Safety Data Sheet (MSDS).
- Stopping the flow of the product being spilled, if safe to do so, taking precautions to avoid personal injury.

- Controlling and containing the spilled product promptly using a spill kit. Contaminated materials and soils shall be disposed of at an approved facility. Spill kits will be placed on each piece of machinery to mitigate potential petroleum hydrocarbon spills.
- Recording the details of the spill in a spill form including: (a) Name and contact information of the person reporting the spill; (b) Date and time of spill; (c) Type and approximate amount of product spilled; (d) Location of spill or leak; (e) Source of spill or leak; (f) Type of accident; (g) Weather conditions; and (h) Status of the spill (ongoing or contained, cleanup efforts).
- Contact the Construction Manager, who will report the spill to the New Brunswick Department of Environment and Local Government at the 24-hour environmental emergencies reporting system and/or the Coast Guard Environmental Emergency number.
- The contaminated soil will be removed for disposal at an approved disposal facility. Solid waste (including oil containers and packaging from construction materials) and construction waste (e.g., concrete, wood and steel) will be disposed of at an approved site.

Spill kits will be kept on site. Any stationary equipment such as generators will have pads to capture and prevent the leakage of fluids into the environment. All spills will be cleaned up at the time of the spill and will not to be left unattended. Emergency response plans will be put into place and implemented in the event of a chemical release to the environment. Remediation will be carried out to meet regulatory requirements. All contractors and site operators will be required to take precautions to prevent leaks from equipment.

7.0 REFERENCES

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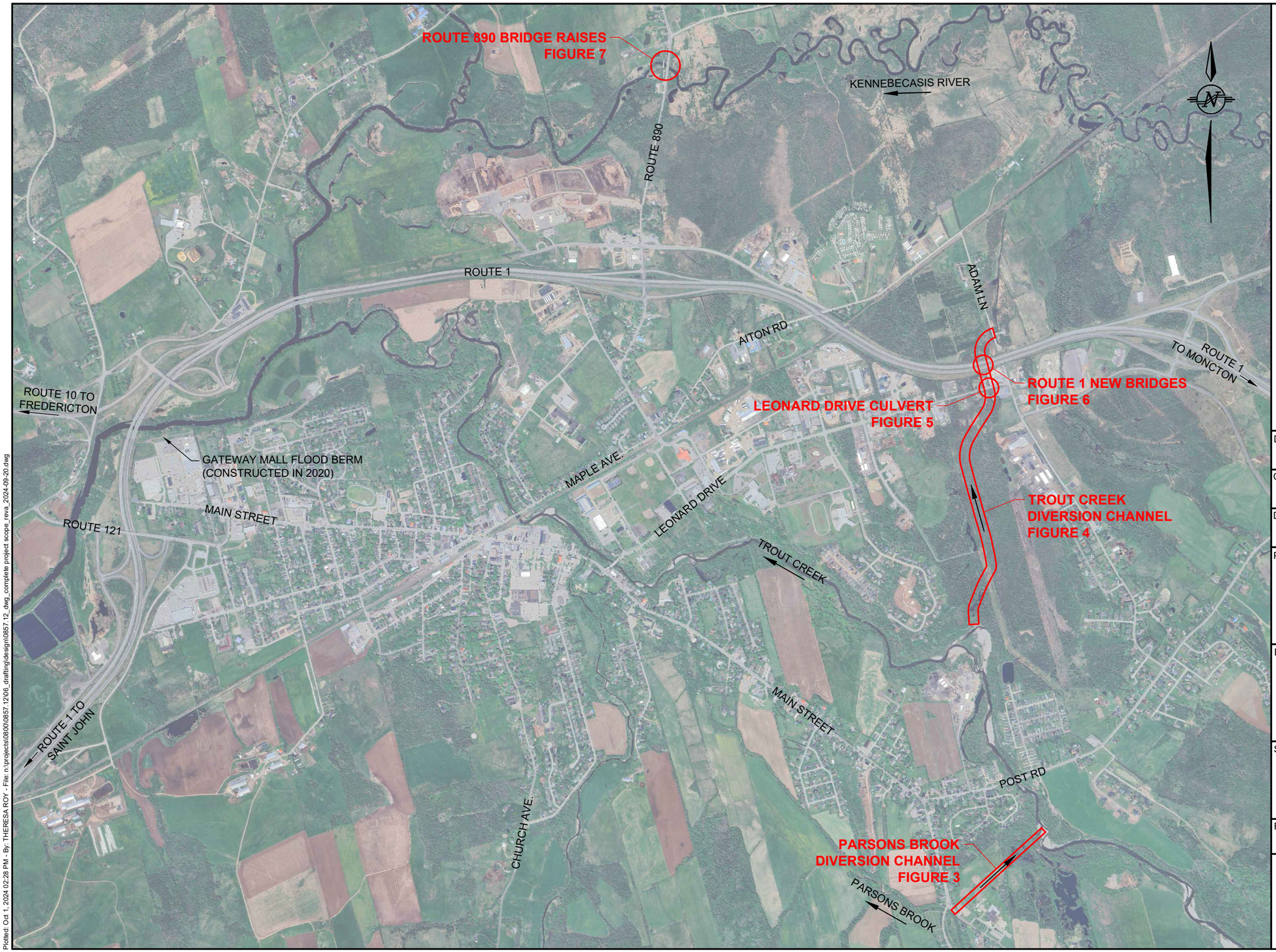
APPENDIX A

Preliminary Figures 2 through 7



DRAWN BY: TLR	CHECKED BY: HA
CALCULATIONS BY: --	CHECKED BY: --

DATE: OCTOBER 2024

PROJECT:

TOWN OF SUSSEX
SUSSEX, NB

DRAWING:

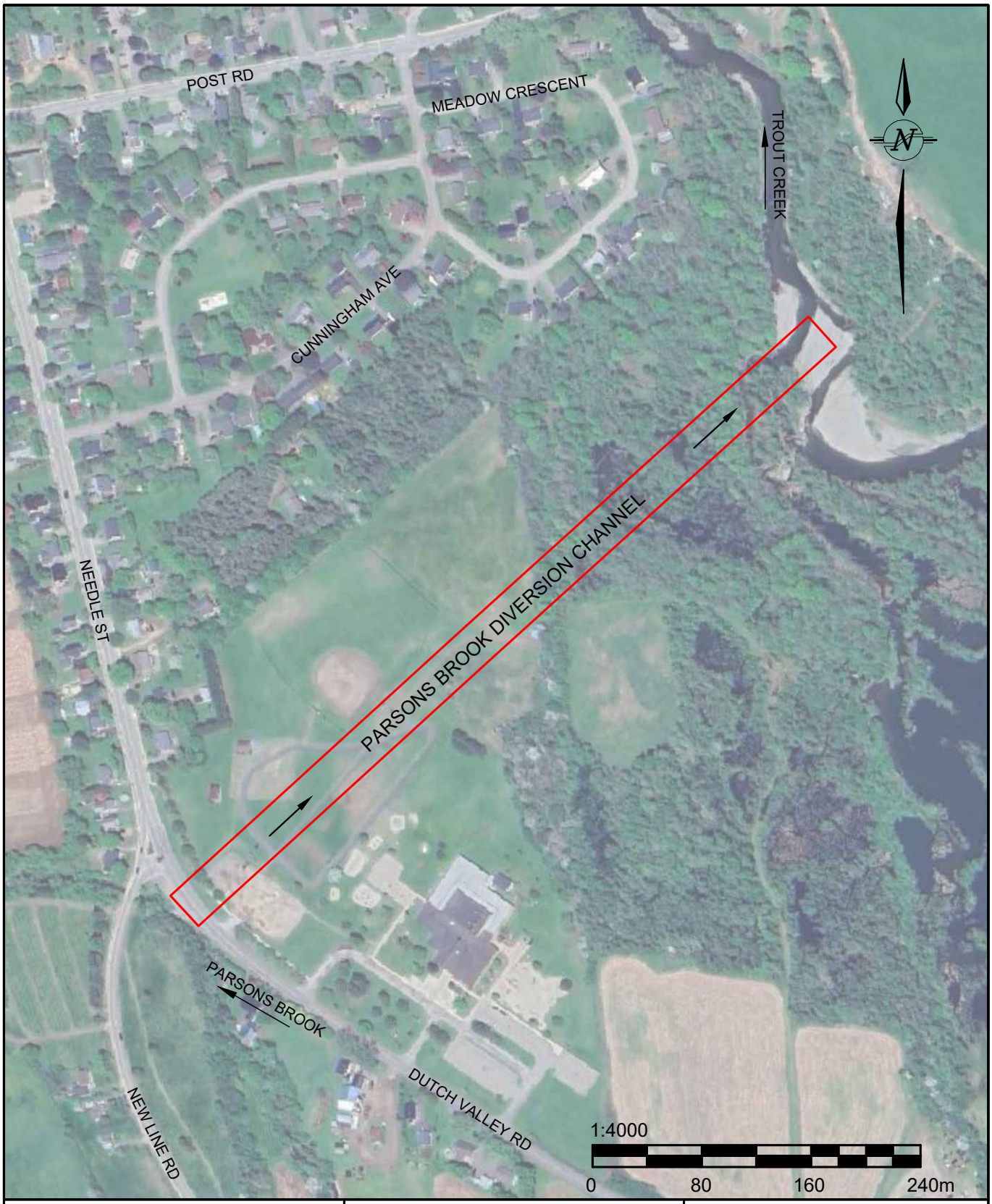
AREA OF INTEREST
OVERALL MAP

SCALE: 1:20000

0 400 800 1200m

FILE NO.: 0857.12	DRAWING: FIGURE 2

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS



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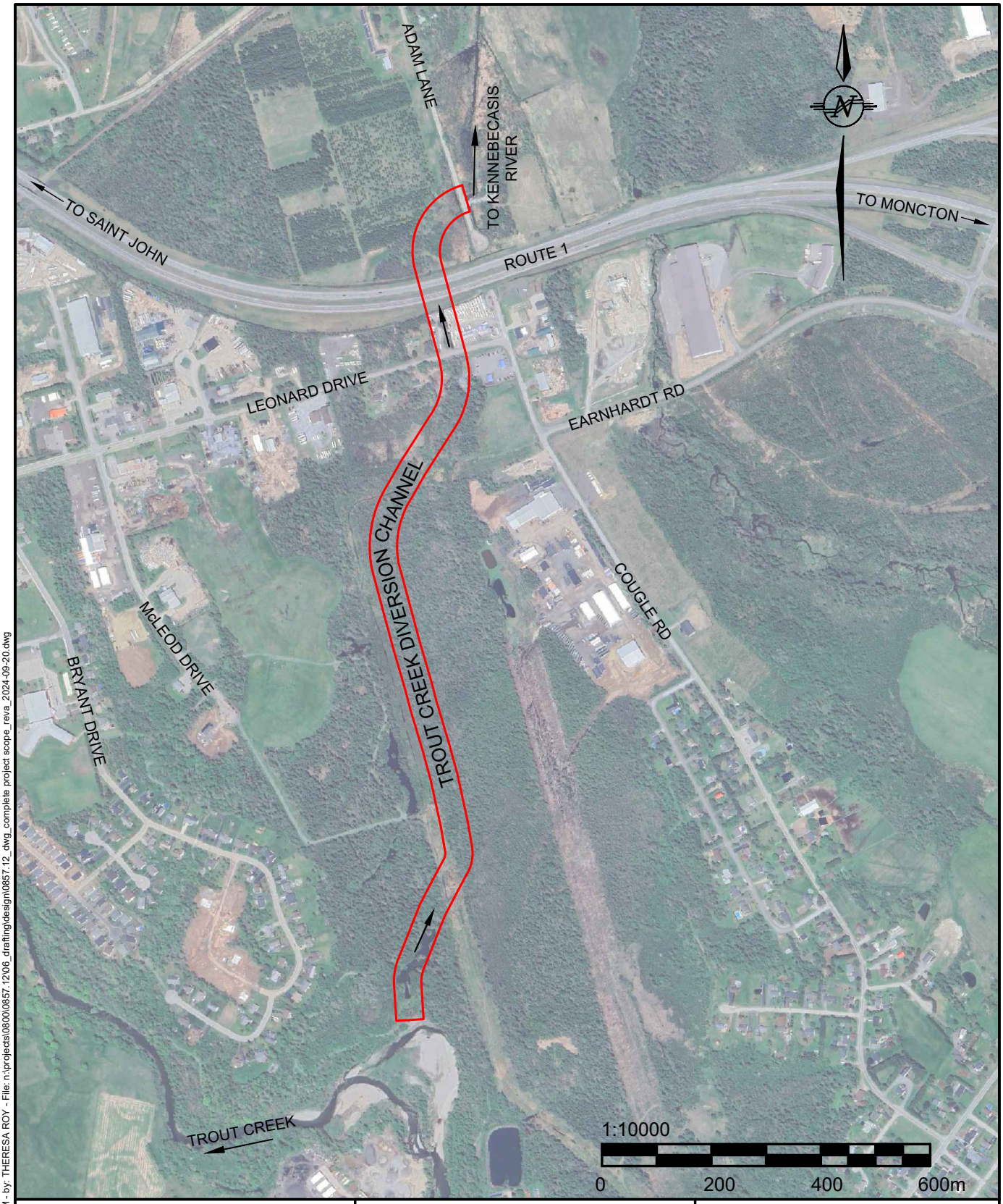
TOWN OF SUSSEX SUSSEX, NB		PARSONS BROOK DIVERSION CHANNEL			
DRAWN BY	DATE	FILE NO.	DRAWING NO.	REVISION NO.	GEMTEC CONSULTING ENGINEERS AND SCIENTISTS
TLR	OCT. 2024	0857.12	FIGURE 3	0	



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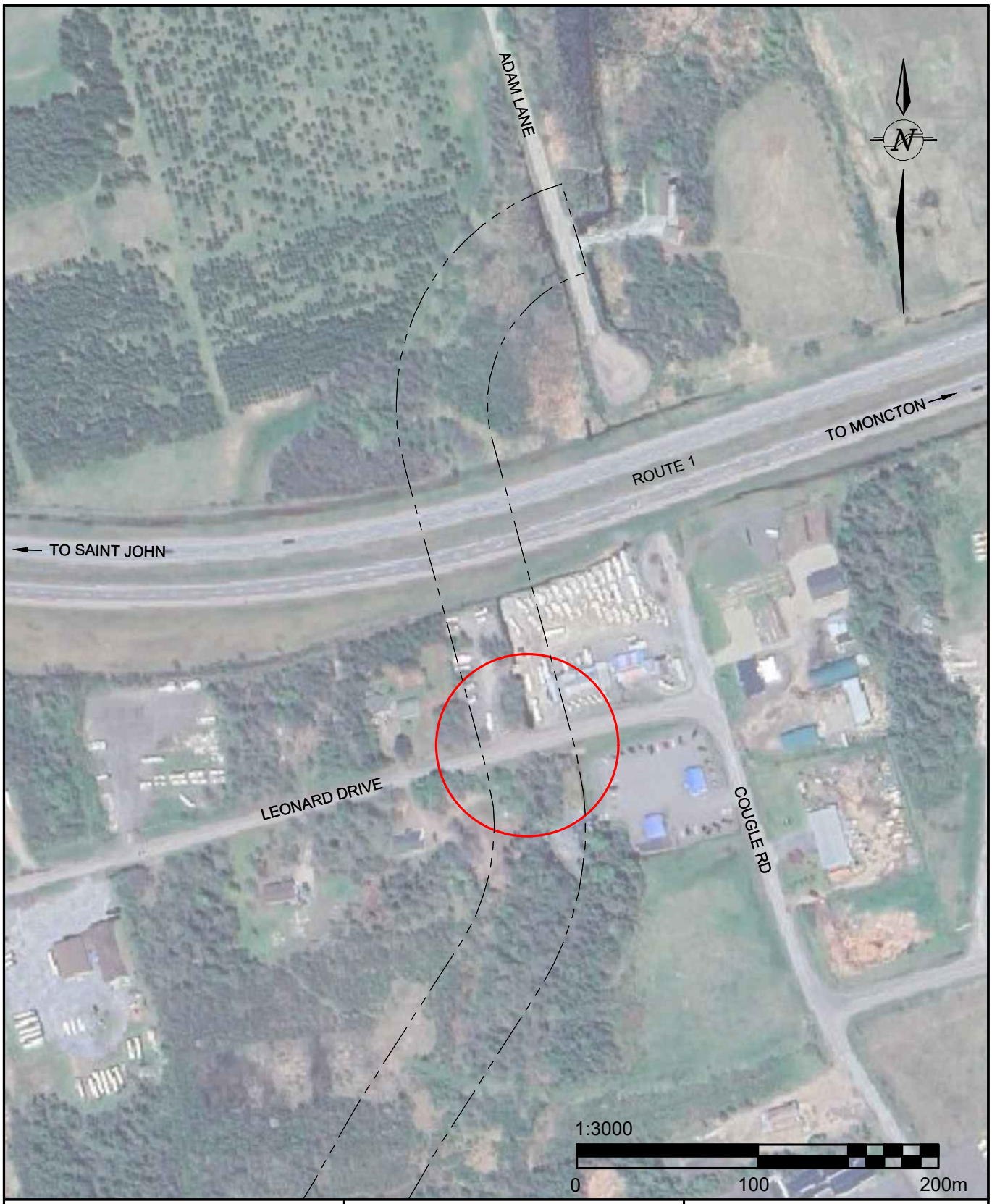
TOWN OF SUSSEX SUSSEX, NB	TROUT CREEK DIVERSION CHANNEL

DRAWN BY	DATE	FILE NO.	DRAWING NO.	REVISION NO.
TLR	OCT. 2024	0857.12	FIGURE 4	0

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS



PROJECT		DRAWING			
TOWN OF SUSSEX SUSSEX, NB		LEONARD DRIVE CULVERT			
DRAWN BY	DATE	FILE NO.	DRAWING NO.	REVISION NO.	
TLR	OCT. 2024	0857.12	FIGURE 5	0	

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

PROJECT		DRAWING			
TOWN OF SUSSEX SUSSEX, NB		ROUTE 1 BRIDGES			
DRAWN BY	DATE	FILE NO.	DRAWING NO.	REVISION NO.	
TLR	OCT. 2024	0857.12	FIGURE 6	0	

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

PROJECT	DRAWING			
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DRAWN BY	DATE	FILE NO.	DRAWING NO.	REVISION NO.
TLR	OCT. 2024	0857.12	FIGURE 7	0

GEMTEC
CONSULTING ENGINEERS AND SCIENTISTS

APPENDIX B

ACCDC Report

DATA REPORT 8083: Sussex, NB

Prepared 31 May 2024
by P. Greyson, Conservation Data Analyst

CONTENTS OF REPORT

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:

Filename	Contents
SussexNB_8083ob.xls	Rare or legally-protected Flora and Fauna in your study area
SussexNB_8083ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
SussexNB_8083msa.xls	Managed and Biologically Significant Areas in your study area
SussexNB_8083ff_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

Data Management, GIS
Charity Robicheau
Senior Conservation Data Analyst
(902) 300-3512
charity.robicheau@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

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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.

2.0 RARE AND ENDANGERED SPECIES

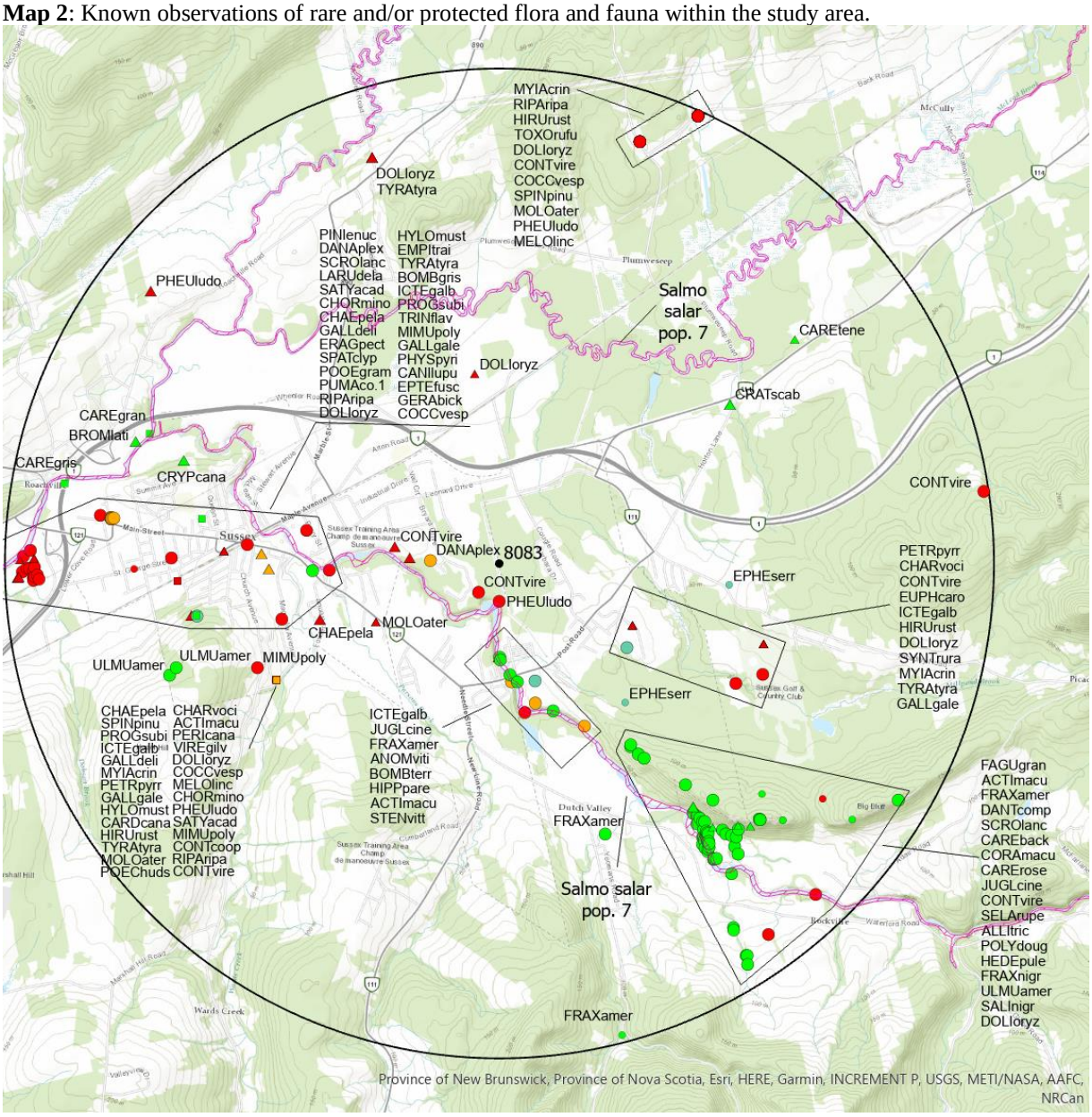
2.1 FLORA

The study area contains 86 records of 23 vascular and 5 records of 4 nonvascular flora (Map 2 and attached: *ob.xls), excluding 'location-sensitive' species.

2.2 FAUNA

The study area contains 212 records of 38 vertebrate and 15 records of 6 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List), excluding 'location-sensitive species'. Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within the study area.



RESOLUTION

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

HIGHER TAXON

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

3.0 SPECIAL AREAS

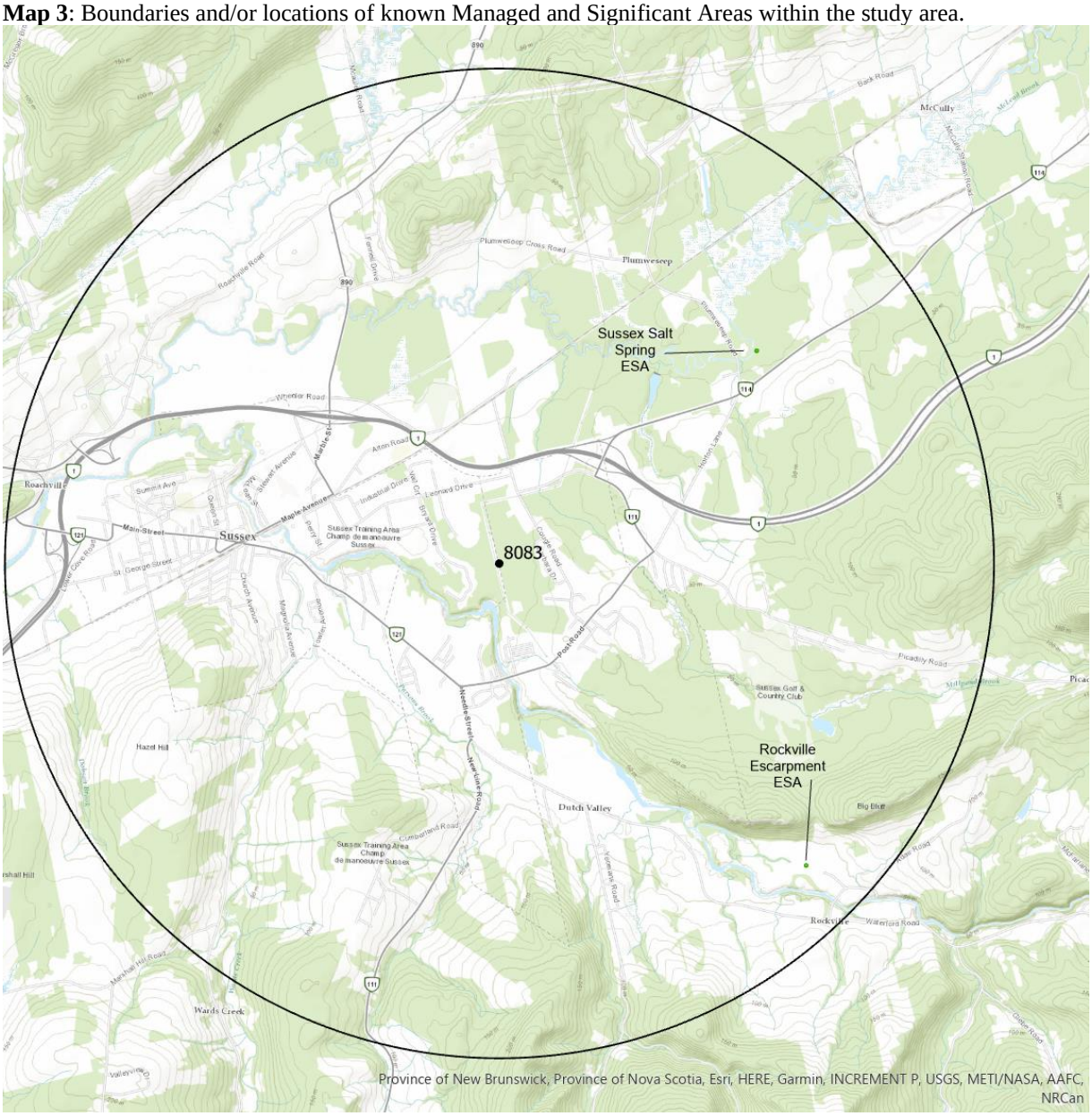
3.1 MANAGED AREAS

The GIS scan identified no managed areas in the vicinity of the study area (Map 3).

3.2 SIGNIFICANT AREAS

The GIS scan identified 2 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 (± 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	*Syntrichia ruralis*	a Moss				S1	1	1.5 ± 0.1
N	*Anomodon viticulosus*	a Moss				S2	1	1.2 ± 0.1
N	*Ephemerum serratum*	a Moss				S2S3	2	1.9 ± 0.01
N	*Physcomitrium pyriforme*	Pear-shaped Urn Moss				S3S4	1	3.1 ± 0.1
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	18	0.9 ± 0.2
P	*Fraxinus nigra*	Black Ash	Threatened			S3S4	2	3.5 ± 0.2
P	*Cryptotaenia canadensis*	Canada Honewort				S1	1	3.4 ± 1.0
P	*Polygonum douglasii*	Douglas Knotweed				S1	2	3.9 ± 0.01
P	*Carex backii*	Rocky Mountain Sedge				S1	1	2.4 ± 0.01
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	1	4.5 ± 5.0
P	*Danthonia compressa*	Flattened Oat Grass				S1	1	2.5 ± 0.2
P	*Selaginella rupestris*	Rock Spikemoss				S1	7	3.6 ± 0.5
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S2	2	2.4 ± 0.2
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	3	3.7 ± 0.5
P	*Allium tricoccum*	Wild Leek				S2S3	9	3.2 ± 0.2
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	1	3.1 ± 5.0
P	*Crataegus scabrida*	Rough Hawthorn				S3	1	2.8 ± 1.0
P	*Salix nigra*	Black Willow				S3	1	3.9 ± 0.2
P	*Carex granularis*	Limestone Meadow Sedge				S3	1	3.8 ± 5.0
P	*Carex rosea*	Rosy Sedge				S3	1	3.5 ± 0.01
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	1	3.9 ± 2.8
P	*Fagus grandifolia*	American Beech				S3S4	6	2.3 ± 0.2
P	*Fraxinus americana*	White Ash				S3S4	7	1.1 ± 0.2
P	*Ulmus americana*	White Elm				S3S4	16	3.3 ± 0.2
P	*Carex tenera*	Tender Sedge				S3S4	1	3.7 ± 0.5
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	1	2.9 ± 0.2
P	*Eragrostis pectinacea*	Tufted Love Grass				S3S4	2	1.9 ± 0.01

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened	Threatened	S1S2B	2	2.5 ± 7.07
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2B	13	2.5 ± 7.07
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	55	1.4 ± 0.5
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	1	4.7 ± 0.2
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Threatened	S2B	9	1.5 ± 0.5
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S2S3B,S3M	1	2.8 ± 0.5
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S3B	15	0.4 ± 0.2
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	1	2.5 ± 7.07
A	*Dolichonyx oryzivorus*	Bobolink	Special Concern	Threatened	Threatened	S3B	18	1.9 ± 0.5
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	5	2.3 ± 0.2
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B,S4M	5	2.5 ± 7.07
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Threatened	S3S4B	1	2.5 ± 7.07
A	*Canis lupus*	Grey Wolf	Not At Risk		Extirpated	SX	1	1.9 ± 1.0
A	*Puma concolor pop. 1*	Cougar - Eastern population	Data Deficient		Endangered	SU	1	0.9 ± 1.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Gallinula galeata*	Common Gallinule				S1B	3	2.5 ± 7.07
A	*Progne subis*	Purple Martin				S1B	2	2.5 ± 7.07
A	*Empidonax traillii*	Willow Flycatcher				S1S2B	1	3.3 ± 7.07
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2B	3	1.5 ± 0.5
A	*Mimus polyglottos*	Northern Mockingbird				S2B	4	2.5 ± 7.07
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	1	3.3 ± 7.07
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	1	4.1 ± 0.2
A	*Toxostoma rufum*	Brown Thrasher				S2S3B	1	4.9 ± 0.25
A	*Icterus galbula*	Baltimore Oriole				S2S3B	5	0.9 ± 0.81
A	*Larus delawarensis*	Ring-billed Gull				S2S3B,S4N,S5M	4	2.0 ± 0.2
A	*Spinus pinus*	Pine Siskin				S3	5	2.5 ± 7.07
A	*Spatula clypeata*	Northern Shoveler				S3B	2	4.8 ± 0.2
A	*Charadrius vociferus*	Killdeer				S3B	13	1.5 ± 0.5
A	*Myiarchus crinitus*	Great Crested Flycatcher				S3B	4	2.5 ± 7.07
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	7	0.4 ± 0.2
A	*Molothrus ater*	Brown-headed Cowbird				S3B	5	1.4 ± 0.5
A	*Perisoreus canadensis*	Canada Jay				S3S4	1	2.5 ± 7.07
A	*Poecile hudsonicus*	Boreal Chickadee				S3S4	1	2.5 ± 7.07
A	*Eptesicus fuscus*	Big Brown Bat				S3S4	1	3.2 ± 1.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B	11	2.5 ± 7.07
A	*Vireo gilvus*	Warbling Vireo				S3S4B	1	2.5 ± 7.07
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S4M	4	1.5 ± 0.2
A	*Melospiza lincolnii*	Lincoln's Sparrow				S3S4B,S4M	2	2.5 ± 7.07
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	2	2.5 ± 7.07
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Special Concern	S2S3?B	8	0.7 ± 0.2
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern		S4	1	1.2 ± 0.2
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	1	1.5 ± 0.2
I	*Stenocorus vittiger*	Shrub Long-horned Beetle				S3	1	1.9 ± 0.2
I	*Satyrium acadica*	Acadian Hairstreak				S3	3	2.4 ± 2.5
I	*Bombus griseocollis*	Brown-belted Bumble Bee				S3S4	1	2.3 ± 1.66

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?
Chrysemys picta picta	Eastern Painted Turtle	Special Concern		No
Chelydra serpentina	**Snapping Turtle**	**Special Concern**	**Special Concern**	**YES**
Glyptemys insculpta	**Wood Turtle**	**Threatened**	**Threatened**	**YES**
Haliaeetus leucocephalus	**Bald Eagle**		**Endangered**	**YES**
Falco peregrinus pop. 1	Peregrine Falcon - anatum/tundrius pop.		Endangered	No
Cicindela marginipennis	Cobblestone Tiger Beetle	Endangered	Endangered	No
Coenonympha nipisiquit	Maritime Ringlet	Endangered	Endangered	No
Bat hibernaculum or bat species occurrence		[Endangered][1]	[Endangered][1]	No

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

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the 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
71	iNaturalist.ca. 2023. iNaturalist Data Export December 2022. iNaturalist.org; iNaturalist.ca, Web site: 128634 recs.
38	eBird. 2014. eBird Basic Dataset. Version: EBD_relNov-2014. Ithaca, New York. Nov 2014. Cornell Lab of Ornithology, 25036 recs.
38	SwiftWatch. 2022. Total Chimney Swift counts from roost watches for the duration of the SwiftWatch program (2011-2021). Birds Canada.
32	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
29	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
29	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
22	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
10	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.
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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 63680 records of 158 vertebrate and 2975 records of 112 invertebrate fauna; 8599 records of 325 vascular and 3039 records of 249 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 (± 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	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	155	34.8 ± 1.0	NB
A	*Myotis septentrionalis*	Northern Myotis	Endangered	Endangered	Endangered	S1	29	11.9 ± 1.0	NB
A	*Perimyotis subflavus*	Tricolored Bat	Endangered	Endangered	Endangered	S1	27	10.1 ± 0.1	NB
A	*Charadrius melodus melodus*	Piping Plover melodus subspecies	Endangered	Endangered	Endangered	S1B	72	49.0 ± 7.07	NB
A	*Sterna dougallii*	Roseate Tern	Endangered	Endangered	Endangered	S1B	1	76.4 ± 0.5	NS
A	*Dermochelys coriacea pop. 2*	Leatherback Sea Turtle - Atlantic population	Endangered	Endangered	Endangered	S1S2N	3	66.6 ± 50.0	NB
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy population	Endangered	Endangered	Endangered	S2	662	11.7 ± 0.1	NB
A	*Salmo salar pop. 7*	Atlantic Salmon - Outer Bay of Fundy population	Endangered		Endangered	SNR	415	30.3 ± 0.01	NB
A	*Rangifer tarandus pop. 2*	Caribou - Atlantic-Gaspésie population	Endangered	Endangered	Extirpated	SX	4	43.6 ± 1.0	NB
A	*Lanius ludovicianus*	Loggerhead Shrike	Endangered	Endangered		SXB	1	68.5 ± 0.5	NB
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B	55	10.1 ± 0.15	NB
A	*Asio flammeus*	Short-eared Owl	Threatened	Special Concern	Special Concern	S1S2B	63	56.6 ± 0.15	NB
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened	Threatened	S1S2B	42	12.3 ± 7.07	NB
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened	Threatened	S1S2B	150	10.3 ± 7.07	NB
A	*Hydrobates leucorhous*	Leach's Storm-Petrel	Threatened			S1S2B	4	68.3 ± 0.2	NB
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Threatened	Threatened	S2B	9	32.1 ± 7.07	NB
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2B	1151	10.1 ± 0.5	NB
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2S3	2475	100.0 ± 0.01	NB
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	960	1.4 ± 0.5	NB
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened		Threatened	S3B,S3N	8	41.5 ± 0.2	NB
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S3M	1226	22.8 ± 0.2	NB
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S3M	179	53.2 ± 0.5	NB
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S4N	7081	17.4 ± 0.02	NB
A	*Coturnicops noveboracensis*	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B,SUM	8	49.5 ± 7.07	NB
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern population	Special Concern	Special Concern	Endangered	S1B,S2N	20	43.5 ± 0.2	NB
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Special Concern	Threatened	Threatened	S2B	71	15.1 ± 7.07	NB
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Threatened	S2B	1656	1.5 ± 0.5	NB
A	*Salmo salar pop. 12*	Atlantic Salmon - Gaspe - Southern Gulf of St. Lawrence population	Special Concern		Special Concern	S2S3	2	81.1 ± 50.0	NB
A	*Balaenoptera physalus pop. 1*	Fin Whale - Atlantic population	Special Concern	Special Concern	Special Concern	S2S3	3	54.0 ± 1.0	NB
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S2S3B,S3M	151	13.6 ± 7.07	NB
A	*Acipenser brevirostrum*	Shortnose Sturgeon	Special Concern	Special Concern	Special Concern	S3	11	40.1 ± 10.0	NB
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	162	1.3 ± 0.2	NB
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S3B	1097	0.4 ± 0.2	NB
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Special Concern	Threatened	S3B	570	100.0 ± 0.15	NB
A	*Dolichonyx oryzivorus*	Bobolink	Special Concern	Threatened	Threatened	S3B	2200	1.9 ± 0.5	NB
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	440	11.4 ± 7.07	NB
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Special Concern	Threatened	S3B,S4M	461	11.4 ± 7.07	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S3M	20	42.9 ± 0.5	NB
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern	Special Concern	S3N	70	25.4 ± 219.99	NB
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Threatened	S3S4B	921	11.4 ± 7.07	NB
A	*Chrysemys picta picta*	Eastern Painted Turtle	Special Concern	Special Concern		S4	317	12.3 ± 0.2	NB
A	*Phocoena phocoena pop. 1*	Harbour Porpoise - Northwest Atlantic Population	Special Concern		Special Concern	SNR	16	40.6 ± 0.33	NB
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S1?	12	34.1 ± 0.1	NB
A	*Fulica americana*	American Coot	Not At Risk			S1B	78	35.7 ± 0.2	NB
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk		Endangered	S1B,S3M	593	26.1 ± 0.5	NB
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	50	40.0 ± 1.0	NB
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1S2B	50	31.9 ± 9.66	NB
A	*Buteo lineatus*	Red-shouldered Hawk	Not At Risk			S1S2B	41	12.3 ± 7.07	NB
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B,SUM	3	50.3 ± 0.15	NB
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk			S2	5	54.1 ± 0.1	NB
A	*Chlidonias niger*	Black Tern	Not At Risk			S2B	465	26.7 ± 0.5	NB
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S2N,S3M	59	43.0 ± 2.41	NB
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3	2	51.9 ± 0.01	NB
A	*Desmognathus fuscus pop. 2*	Northern Dusky Salamander - Quebec / New Brunswick population	Not At Risk			S3	56	22.9 ± 1.38	NB
A	*Megaptera novaeangliae*	Humpback Whale	Not At Risk			S3	3	80.8 ± 0.2	NS
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	276	29.7 ± 0.09	NB
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	2	67.4 ± 1.0	NB
A	*Haliaeetus leucocephalus*	Bald Eagle	Not At Risk		Endangered	S4	1822	1.2 ± 0.2	NB
A	*Lynx canadensis*	Canada Lynx	Not At Risk		Endangered	S4	24	27.0 ± 0.2	NB
A	*Canis lupus*	Grey Wolf	Not At Risk		Extirpated	SX	3	1.9 ± 1.0	NB
A	*Puma concolor pop. 1*	Cougar - Eastern population	Data Deficient		Endangered	SU	114	0.9 ± 1.0	NB
A	*Leucoraja ocellata*	Winter Skate	E,NAR			SNR	2	92.0 ± 3.52	NB
A	*Calidris canutus rufa*	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	395	42.9 ± 0.5	NB
A	*Morone saxatilis*	Striped Bass	E,SC			S3S4B,S3S4N	8641	49.0 ± 0.01	NB
A	*Salmo salar*	Atlantic Salmon	E,T,SC			S2S3	3	43.0 ± 0.2	NB
A	*Thryothorus ludovicianus*	Carolina Wren				S1	24	48.2 ± 0.5	NB
A	*Salvelinus alpinus*	Arctic Char				S1	3	17.1 ± 1.0	NB
A	*Vireo flavifrons*	Yellow-throated Vireo				S1?B	17	49.5 ± 7.07	NB
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S4S5M	1872	26.9 ± 0.2	NB
A	*Aythya americana*	Redhead				S1B	18	49.6 ± 0.2	NB
A	*Gallinula galeata*	Common Gallinule				S1B	72	2.5 ± 7.07	NB
A	*Antigone canadensis*	Sandhill Crane				S1B	20	20.7 ± 0.2	NB
A	*Bartramia longicauda*	Upland Sandpiper				S1B	46	10.9 ± 1.0	NB
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B	71	35.1 ± 0.5	NB
A	*Leucophaeus atricilla*	Laughing Gull				S1B	12	40.7 ± 0.5	NB
A	*Rissa tridactyla*	Black-legged Kittiwake				S1B	2	64.5 ± 0.03	NS
A	*Uria aalge*	Common Murre				S1B	11	67.8 ± 0.2	NB
A	*Alca torda*	Razorbill				S1B	15	52.0 ± 0.2	NB
A	*Fratercula arctica*	Atlantic Puffin				S1B	5	40.3 ± 11.0	NB
A	*Progne subis*	Purple Martin				S1B	259	10.1 ± 1.0	NB
A	*Aythya marila*	Greater Scaup				S1B,S2N,S4M	54	35.6 ± 0.2	NB
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S2S3M	157	35.1 ± 0.5	NB
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	335	35.1 ± 0.5	NB
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	70	100.0 ± 0.5	NB
A	*Sterna paradisaea*	Arctic Tern				S1B,SUM	8	37.8 ± 0.15	NB
A	*Chroicocephalus ridibundus*	Black-headed Gull				S1N,S2M	13	28.1 ± 0.5	NB
A	*Branta bernicla*	Brant				S1N,S2S3M	33	44.5 ± 0.5	NB
A	*Calidris alba*	Sanderling				S1N,S3S4M	1196	34.0 ± 0.5	NB
A	*Butorides virescens*	Green Heron				S1S2B	26	35.4 ± 0.26	NB
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B	13	27.9 ± 0.05	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Empidonax traillii*	Willow Flycatcher				S1S2B	145	11.7 ± 7.07	NB
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B	11	49.5 ± 7.07	NB
A	*Troglodytes aedon*	House Wren				S1S2B	30	36.8 ± 0.15	NB
A	*Calidris bairdii*	Baird's Sandpiper				S1S2M	64	53.0 ± 0.5	NB
A	*Melanitta americana*	American Scoter				S1S2N,S5M	281	32.8 ± 0.68	NB
A	*Vespertilionidae sp.*	bat species				S1S3	2	93.3 ± 0.2	NS
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2B	683	1.5 ± 0.5	NB
A	*Cistothorus palustris*	Marsh Wren				S2B	458	36.6 ± 0.2	NB
A	*Mimus polyglottos*	Northern Mockingbird				S2B	175	10.7 ± 0.25	NB
A	*Pooecetes gramineus*	Vesper Sparrow				S2B	123	100.0 ± 0.5	NB
A	*Somateria mollissima*	Common Eider				S2B,S2N,S4M	642	31.3 ± 7.07	NB
A	*Mareca strepera*	Gadwall				S2B,S3M	495	28.7 ± 0.05	NB
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S4S5M	241	17.6 ± 2.1	NB
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	72	12.8 ± 0.2	NB
A	*Phalacrocorax carbo*	Great Cormorant				S2N	33	38.0 ± 0.5	NB
A	*Somateria spectabilis*	King Eider				S2N	3	44.5 ± 0.5	NB
A	*Larus hyperboreus*	Glaucous Gull				S2N	151	41.6 ± 6.44	NB
A	*Melanitta perspicillata*	Surf Scoter				S2N,S4M	83	45.4 ± 0.49	NB
A	*Melanitta deglandi*	White-winged Scoter				S2N,S4M	16	43.0 ± 0.2	NB
A	*Asio otus*	Long-eared Owl				S2S3	20	17.8 ± 7.07	NB
A	*Picoides dorsalis*	American Three-toed Woodpecker				S2S3	15	29.8 ± 7.07	NB
A	*Toxostoma rufum*	Brown Thrasher				S2S3B	56	10.0 ± 0.15	NB
A	*Icterus galbula*	Baltimore Oriole				S2S3B	290	0.9 ± 0.81	NB
A	*Larus delawarensis*	Ring-billed Gull				S2S3B,S4N,S5M	871	2.0 ± 0.2	NB
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	180	43.5 ± 0.5	NB
A	*Calcarius lapponicus*	Lapland Longspur				S2S3N,SUM	32	41.7 ± 0.5	NB
A	*Larus marinus*	Great Black-backed Gull				S3	695	17.2 ± 13.84	NB
A	*Picoides arcticus*	Black-backed Woodpecker				S3	84	20.4 ± 7.07	NB
A	*Loxia curvirostra*	Red Crossbill				S3	202	14.0 ± 0.25	NB
A	*Spinus pinus*	Pine Siskin				S3	495	10.7 ± 0.25	NB
A	*Prosopium cylindraceum*	Round Whitefish				S3	1	67.2 ± 0.12	NB
A	*Salvelinus namaycush*	Lake Trout				S3	2	56.7 ± 0.01	NB
A	*Sorex maritimensis*	Maritime Shrew				S3	106	89.9 ± 0.2	NB
A	*Spatula clypeata*	Northern Shoveler				S3B	574	12.3 ± 7.07	NB
A	*Charadrius vociferus*	Killdeer				S3B	1062	1.5 ± 0.5	NB
A	*Tringa semipalmata*	Willet				S3B	265	40.6 ± 0.16	NB
A	*Cepphus grylle*	Black Guillemot				S3B	122	40.3 ± 11.0	NB
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B	202	12.3 ± 7.07	NB
A	*Myiarchus crinitus*	Great Crested Flycatcher				S3B	370	11.7 ± 7.07	NB
A	*Piranga olivacea*	Scarlet Tanager				S3B	108	11.7 ± 7.07	NB
A	*Pheucticus ludovicianus*	Rose-breasted Grosbeak				S3B	986	0.4 ± 0.2	NB
A	*Passerina cyanea*	Indigo Bunting				S3B	109	22.3 ± 7.07	NB
A	*Molothrus ater*	Brown-headed Cowbird				S3B	387	1.4 ± 0.5	NB
A	*Setophaga tigrina*	Cape May Warbler				S3B,S4S5M	234	15.1 ± 7.07	NB
A	*Mergus serrator*	Red-breasted Merganser				S3B,S4S5N,S5M	209	37.6 ± 0.5	NB
A	*Anas acuta*	Northern Pintail				S3B,S5M	179	28.5 ± 7.07	NB
A	*Anser caerulescens*	Snow Goose				S3M	28	44.5 ± 0.5	NB
A	*Numenius phaeopus hudsonicus*	Whimbrel				S3M	184	43.0 ± 2.82	NB
A	*Arenaria interpres*	Ruddy Turnstone				S3M	414	40.3 ± 11.0	NB
A	*Calidris pusilla*	Semipalmated Sandpiper				S3M	2052	36.0 ± 8.05	NB
A	*Calidris melanotos*	Pectoral Sandpiper				S3M	461	25.4 ± 219.99	NB
A	*Limnodromus griseus*	Short-billed Dowitcher				S3M	1076	40.7 ± 0.5	NB
A	*Phalaropus fulicarius*	Red Phalarope				S3M	4	40.3 ± 11.0	NB
A	*Bucephala albeola*	Bufflehead				S3N	792	33.6 ± 0.5	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Calidris maritima*	Purple Sandpiper				S3N	127	40.3 ± 11.0	NB
A	*Uria lomvia*	Thick-billed Murre				S3N,S3M	6	56.0 ± 0.2	NS
A	*Perisoreus canadensis*	Canada Jay				S3S4	558	11.4 ± 7.07	NB
A	*Poecile hudsonicus*	Boreal Chickadee				S3S4	386	11.4 ± 7.07	NB
A	*Eptesicus fuscus*	Big Brown Bat				S3S4	58	14.7 ± 1.79	NB
A	*Synaptomys cooperi*	Southern Bog Lemming				S3S4	95	10.3 ± 1.0	NB
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B	813	100.0 ± 0.01	NS
A	*Vireo gilvus*	Warbling Vireo				S3S4B	297	11.7 ± 7.07	NB
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S4M	1151	1.5 ± 0.2	NB
A	*Melospiza lincolnii*	Lincoln's Sparrow				S3S4B,S4M	457	11.4 ± 7.07	NB
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	1539	100.0 ± 1.0	NB
A	*Setophaga striata*	Blackpoll Warbler				S3S4B,S5M	79	100.0 ± 0.03	NB
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	1426	43.5 ± 0.5	NB
A	*Morus bassanus*	Northern Gannet				SHB	94	40.3 ± 11.0	NB
C	*Quercus macrocarpa - Acer rubrum / Onoclea sensibilis - Carex arcta Forest*	Bur Oak - Red Maple / Sensitive Fern - Northern Clustered Sedge Forest				S2	1	57.4 ± 0.01	NB
C	*Acer saccharinum / Onoclea sensibilis - Lysimachia terrestris Forest*	Silver Maple / Sensitive Fern - Swamp Yellow Loosestrife Forest				S3	1	86.2 ± 0.05	NB
C	*Acer saccharum - Fraxinus americana / Polystichum acrostichoides Forest*	Sugar Maple - White Ash / Christmas Fern Forest				S3S4	1	43.1 ± 0.01	NB
I	*Bombus bohemicus*	Ashton Cuckoo Bumble Bee	Endangered	Endangered		S1	22	13.2 ± 5.0	NB
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Special Concern	S2S3?B	1022	0.7 ± 0.2	NB
I	*Coccinella novemnotata*	Nine-spotted Lady Beetle	Endangered			SH	1	40.3 ± 11.0	NB
I	*Bombus affinis*	Rusty-patched Bumble Bee	Endangered	Endangered		SH	1	94.5 ± 5.0	NB
I	*Bombus suckleyi*	Suckley's Cuckoo Bumble Bee	Threatened			SH	1	66.7 ± 5.0	NB
I	*Gomphurus ventricosus*	Skillet Clubtail	Special Concern	Endangered	Endangered	S2	123	33.2 ± 0.1	NB
I	*Cicindela marginipennis*	Cobblestone Tiger Beetle	Special Concern	Endangered	Endangered	S2S3	190	50.1 ± 0.01	NB
I	*Ophiogomphus howei*	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2S3	3	63.6 ± 0.1	NB
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Special Concern	S3	18	34.9 ± 1.0	NB
I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S3	103	32.0 ± 0.1	NB
I	*Bombus terricola*	Yellow-banded Bumble Bee	Special Concern	Special Concern		S4	365	1.2 ± 0.2	NB
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle	Special Concern			SH	39	21.4 ± 2.5	NB
I	*Appalachina sayana*	Spike-lip Crater Snail	Not At Risk			S3?	2	58.6 ± 1.0	NB
I	*Cicindela scutellaris*	Festive Tiger Beetle				S1	1	85.5 ± 0.2	NB
I	*Conotrachelus juglandis*	Butternut Curculio				S1	3	91.6 ± 0.2	NB
I	*Haematopota rara*	Shy Cleg				S1	1	96.6 ± 1.0	NB
I	*Corythucha juglandis*	a lace bug				S1	1	91.6 ± 0.2	NB
I	*Erora laeta*	Early Hairstreak				S1	1	69.4 ± 1.0	NB
I	*Polites origenes*	Crossline Skipper				S1?	6	49.4 ± 0.01	NB
I	*Icaricia saepiolus amica*	Greenish Blue				S1S2	4	33.6 ± 2.5	NB
I	*Pachydiplax longipennis*	Blue Dasher				S1S2	2	26.0 ± 0.2	NB
I	*Cicindela ancocisconensis*	Appalachian Tiger Beetle				S2	2	66.5 ± 0.2	NB
I	*Encyclops caeruleus*	Cerulean Long-horned Beetle				S2	1	96.0 ± 0.01	NB
I	*Scaphinotus viduus*	Bereft Snail-eating Beetle				S2	5	28.4 ± 2.87	NB
I	*Brachyleptura circumdata*	Dark-shouldered Long-horned Beetle				S2	6	64.8 ± 0.01	NB
I	*Satyrium calanus falacer*	Falacer Hairstreak				S2	25	65.9 ± 1.0	NB
I	*Strymon melinus*	Gray Hairstreak				S2	6	24.4 ± 0.01	NB
I	*Somatochlora brevicincta*	Quebec Emerald				S2	2	67.6 ± 0.01	NB
I	*Chrysops aestuans*	Furious Deer Fly				S2S3	1	59.9 ± 0.48	NB
I	*Ophiogomphus colubrinus*	Boreal Snaketail				S2S3	37	61.1 ± 0.01	NB
I	*Sphaeroderus nitidicollis*	Polished Snail-eating Beetle				S3	1	64.8 ± 0.5	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
I	*Lepturopsis biforis*	Two-spotted Long-horned Beetle				S3	1	67.7 ± 1.0	NB
I	*Orthosoma brunneum*	Moist Long-horned Beetle				S3	18	55.9 ± 5.0	NB
I	*Pronocera collaris*	Redneck Longhorn Beetle				S3	1	95.6 ± 0.2	NB
I	*Psyrassa unicolor*	Unicoloured Long-horned Beetle				S3	2	99.5 ± 0.2	NB
I	*Elaphrus americanus*	Boreal Elaphrus Beetle				S3	2	55.5 ± 0.5	NB
I	*Semanotus terminatus*	Light Long-horned Beetle				S3	1	95.6 ± 0.2	NB
I	*Desmocerus palliatus*	Elderberry Borer				S3	15	43.3 ± 0.22	NB
I	*Agonum crenistriatum*	Scalloped Harp Ground Beetle				S3	1	69.0 ± 1.0	NB
I	*Agonum consimile*	Consimile Ground Beetle				S3	1	69.0 ± 1.0	NB
I	*Agonum excavatum*	Excavated Harp Ground Beetle				S3	1	76.3 ± 0.5	NB
I	*Clivina americana*	America Pedunculate Ground Beetle				S3	1	76.3 ± 0.5	NB
I	*Lachnocrepis parallela*	Swamp Harp Ground Beetle				S3	1	62.3 ± 0.5	NB
I	*Dyschirius setosus*	Bristly Pedunculate Ground Beetle				S3	3	62.3 ± 0.5	NB
I	*Harpalus fulvilabris*	Fulvia Harpaline Beetle				S3	1	56.3 ± 0.5	NB
I	*Olisthopus parmatus*	Tawny-bordered Harp Ground Beetle				S3	1	64.8 ± 0.5	NB
I	*Tachys scitulus*	Handsome Riverbank Ground Beetle				S3	1	76.3 ± 0.5	NB
I	*Amara pallipes*	Pale-footed Sun Beetle				S3	2	62.3 ± 0.5	NB
I	*Prasocuris vittata*	Banded Leaf Beetle				S3	1	76.1 ± 0.2	NB
I	*Carabus maeander*	Meander Ground Beetle				S3	2	69.0 ± 1.0	NB
I	*Carabus serratus*	Serrated Ground Beetle				S3	2	57.3 ± 0.2	NB
I	*Coccinella hieroglyphica kirbyi*	a Ladybird Beetle				S3	2	67.7 ± 1.0	NB
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	21	1.5 ± 0.2	NB
I	*Stenocorus vittiger*	Shrub Long-horned Beetle				S3	2	1.9 ± 0.2	NB
I	*Gnathacmaeops pratensis*	Meadow Flower Longhorn Beetle				S3	5	67.7 ± 1.0	NB
I	*Pogonocherus mixtus*	Mixed-spotted Flatface Sawyer				S3	1	67.7 ± 1.0	NB
I	*Xylotrechus undulatus*	Spruce Zebra Beetle				S3	2	78.7 ± 1.0	NB
I	*Mioptachys flavicauda*	Yellow-tipped Riverbank Ground Beetle				S3	1	95.6 ± 0.2	NB
I	*Calligrapha rowena*	Rowena's Leaf Beetle				S3	4	43.3 ± 0.2	NB
I	*Badister neopulchellus*	Red-black Spotted Beetle				S3	3	76.3 ± 0.5	NB
I	*Calathus gregarius*	Gregarious Harp Ground Beetle				S3	1	35.7 ± 1.0	NB
I	*Gonioctena americana*	American Aspen Beetle				S3	1	62.3 ± 0.5	NB
I	*Gonotropis dorsalis*	Birch Fungus Weevil				S3	1	95.5 ± 0.2	NB
I	*Naemia seriata*	Seaside Lady Beetle				S3	35	40.5 ± 0.2	NB
I	*Beckerus appressus*	Compressed Click Beetle				S3	1	29.6 ± 0.2	NB
I	*Staphylinus ornaticauda*	Ornate-rumped Rove Beetle				S3	1	96.8 ± 0.2	NB
I	*Saperda vestita*	Linden Borer				S3	1	92.0 ± 0.2	NB
I	*Saperda imitans*	Oblique-banded Long-horned Beetle				S3	4	29.6 ± 1.05	NB
I	*Saperda lateralis*	Red-edged Long-horned Beetle				S3	2	74.1 ± 0.01	NB
I	*Dicerca caudata*	Tailed Jewel Borer				S3	2	57.8 ± 0.2	NB
I	*Enoclerus muttkowskii*	Muttkowski's Checkered Beetle				S3	4	56.1 ± 0.2	NB
I	*Epargyreus clarus*	Silver-spotted Skipper				S3	26	55.0 ± 0.2	NB
I	*Hesperia sassacus*	Indian Skipper				S3	12	24.3 ± 0.05	NB

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I	*Euphyes bimacula*	Two-spotted Skipper				S3	20	66.3 ± 1.0	NB
I	*Tharsalea dospassosi*	Maritime Copper				S3	17	93.4 ± 0.45	NB
I	*Satyrium acadica*	Acadian Hairstreak				S3	24	2.4 ± 2.5	NB
I	*Plebejus idas empetri*	Crowberry Blue				S3	40	36.7 ± 20.0	NB
I	*Argynnis aphrodite winni*	Aphrodite Fritillary				S3	48	25.6 ± 0.01	NB
I	*Boloria bellona*	Meadow Fritillary				S3	51	39.5 ± 0.01	NB
I	*Boloria chariclea grandis*	Purple Lesser Fritillary				S3	9	80.0 ± 7.07	NB
I	*Nymphalis l-album j-album*	Compton Tortoiseshell				S3	37	29.3 ± 0.2	NB
I	*Gomphurus vastus*	Cobra Clubtail				S3	134	38.9 ± 0.03	NB
I	*Celithemis martha*	Martha's Pennant				S3	6	64.0 ± 0.2	NB
I	*Ladona exusta*	White Corporal				S3	2	64.7 ± 0.2	NB
I	*Enallagma pictum*	Scarlet Bluet				S3	4	58.7 ± 0.2	NB
I	*Ischnura kellicotti*	Lilypad Forktail				S3	8	75.0 ± 0.01	NB
I	*Arigomphus furcifer*	Lilypad Clubtail				S3	22	50.7 ± 0.5	NB
I	*Alasmidonta undulata*	Triangle Floater				S3	62	19.5 ± 0.0	NB
I	*Atlanticoncha ochracea*	Tidewater Mucket				S3	172	31.5 ± 0.0	NB
I	*Philomycus flexuolaris*	Winding Mantleslug				S3	10	29.5 ± 2.98	NB
I	*Striatura ferrea*	Black Striate Snail				S3	1	95.4 ± 1.0	NB
I	*Neohelix albolabris*	Whitelip Snail				S3	2	23.9 ± 0.1	NB
I	*Spurwinkia salsa*	Saltmarsh Hydrobe				S3	32	45.6 ± 0.1	NB
I	*Pantala hymenaea*	Spot-Winged Glider				S3B	9	42.8 ± 0.2	NB
I	*Brachygluta abdominalis*	Abdominal Ant-loving Rove Beetle				S3S4	1	99.5 ± 0.2	NB
I	*Chrysobothris neopusilla*	Very Small Jewel Beetle				S3S4	1	43.3 ± 0.2	NB
I	*Dinothenarus capitatus*	Helmet Rove Beetle				S3S4	1	29.5 ± 0.2	NB
I	*Paracardiophorus propinquus*	Kindred Heart Click Beetle				S3S4	3	36.5 ± 0.49	NB
I	*Pedilus elegans*	Elegant Fire-coloured Beetle				S3S4	1	36.5 ± 1.05	NB
I	*Oxygonus montanus*	Catskill Mountain Click Beetle				S3S4	4	27.2 ± 0.58	NB
I	*Collops vittatus*	Banded Soft-winged Flower Beetle				S3S4	4	35.3 ± 0.2	NB
I	*Nitidula bipunctata*	Two-dots Sap Beetle				S3S4	1	95.6 ± 0.2	NB
I	*Hemicrepidius memnonius*	Memnon's Click Beetle				S3S4	3	99.5 ± 0.2	NB
I	*Epuraea peltoides*	Thracian Sap Beetle				S3S4	1	99.5 ± 0.2	NB
I	*Lobiopa undulata*	Waved Sap Beetle				S3S4	3	99.5 ± 0.2	NB
I	*Scaphidium quadriguttatum*	Four-speckled Shining Rove Beetle				S3S4	1	92.0 ± 0.01	NB
I	*Bolitophagus corticola*	Corticolous Darkling Beetle				S3S4	1	99.5 ± 0.2	NB
I	*Capnochroa fuliginosa*	Comb-clawed Beetle				S3S4	1	43.4 ± 0.2	NB
I	*Bombus griseocollis*	Brown-belted Bumble Bee				S3S4	20	13.2 ± 5.0	NB
I	*Lanthus vernalis*	Southern Pygmy Clubtail				S3S4	7	26.4 ± 0.24	NB
I	*Somatochlora forcipata*	Forcipate Emerald				S3S4	12	31.2 ± 0.2	NB
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S3S4	15	30.1 ± 0.2	NB
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered	Endangered	Endangered	SH	2	39.4 ± 1.0	NB
N	*Erioderma pedicellatum (Atlantic pop.)*	Boreal Felt Lichen - Atlantic pop.	Endangered	Endangered	Endangered	SH	2	57.8 ± 0.5	NS
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened		S1?	4	64.4 ± 0.02	NB
N	*Heterodermia squamulosa*	Scaly Fringe Lichen	Threatened			S1?	108	34.7 ± 0.2	NB
N	*Anzia colpodes*	Black-foam Lichen	Threatened	Threatened		S1S2	34	14.6 ± 0.01	NB
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S2	26	46.7 ± 0.01	NB
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened	Threatened		S2S3	812	26.5 ± 0.2	NB
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Special Concern	S1	29	48.1 ± 0.01	NB
N	*Sclerophora peronella (Atlantic pop.)*	Frosted Glass-whiskers (Atlantic population)	Special Concern	Special Concern		S1	2	81.6 ± 3.0	NS
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	36	38.7 ± 0.25	NB
N	*Aloina rigida*	Aloe-Like Rigid Screw Moss				S1	1	74.8 ± 0.1	NB

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N	*Imbribryum muehlenbeckii*	Muehlenbeck's Bryum Moss				S1	1	69.1 ± 1.0	NB
N	*Dicranoweisia crispula*	Mountain Thatch Moss				S1	1	40.7 ± 0.1	NB
N	*Didymodon rigidulus var. gracilis*	a moss				S1	1	40.9 ± 1.0	NB
N	*Sphagnum macrophyllum*	Sphagnum				S1	8	78.0 ± 0.01	NB
N	*Coscinodon cribrosus*	Sieve-Toothed Moss				S1	1	70.2 ± 0.1	NB
N	*Syntrichia ruralis*	a Moss				S1	1	1.5 ± 0.1	NB
N	*Sticta fuliginosa*	Peppered Moon Lichen				S1	14	57.7 ± 0.01	NS
N	*Cladonia straminea*	Reptilian Pixie-cup Lichen				S1	5	32.0 ± 1.0	NB
N	*Parmotrema perlatum*	Powdered Ruffle Lichen				S1	27	63.9 ± 0.01	NS
N	*Punctelia appalachensis*	Appalachian Speckleback Lichen				S1	154	37.9 ± 0.2	NB
N	*Coccocarpia palmicola*	Salted Shell Lichen				S1	1	40.2 ± 1.0	NB
N	*Peltigera collina*	Tree Pelt Lichen				S1	1	89.5 ± 0.1	NS
N	*Peltigera malacea*	Veinless Pelt Lichen				S1	1	34.4 ± 1.0	NB
N	*Bryoria bicolor*	Electrified Horsehair Lichen				S1	1	34.4 ± 1.0	NB
N	*Hygrobiella laxifolia*	Lax Notchwort				S1?	1	32.1 ± 1.0	NB
N	*Atrichum angustatum*	Lesser Smoothcap Moss				S1?	1	96.5 ± 0.36	NS
N	*Bartramia ithyphylla*	Straight-leaved Apple Moss				S1?	2	32.1 ± 0.1	NB
N	*Ptychostomum pallens*	Pale Bryum				S1?	1	86.0 ± 0.2	NS
N	*Pseudocalliergon trifarium*	Three-ranked Spear Moss				S1?	1	76.9 ± 0.1	NB
N	*Dichelyma falcatum*	a Moss				S1?	2	72.2 ± 1.0	NB
N	*Dicranum bonjeanii*	Bonjean's Broom Moss				S1?	2	94.0 ± 0.5	NS
N	*Dicranum condensatum*	Condensed Broom Moss				S1?	2	40.6 ± 0.1	NB
N	*Entodon brevisetus*	a Moss				S1?	1	36.9 ± 10.0	NB
N	*Oxyrrhynchium hians*	Light Beaked Moss				S1?	3	6.5 ± 0.1	NB
N	*Homomallium adnatum*	Adnate Hairy-gray Moss				S1?	3	36.9 ± 10.0	NB
N	*Plagiothecium latebricola*	Alder Silk Moss				S1?	2	40.4 ± 1.0	NB
N	*Rhytidium rugosum*	Wrinkle-leaved Moss				S1?	2	10.5 ± 0.1	NB
N	*Splachnum pensylvanicum*	Southern Dung Moss				S1?	1	74.9 ± 1.0	NB
N	*Enchylium tenax*	Soil Tarpaper Lichen				S1?	1	64.1 ± 0.01	NS
N	*Ephebe hispidula*	Dryside Rockshag Lichen				S1?	1	90.9 ± 0.05	NS
N	*Ephebe perspinulosa*	Thread Lichen				S1?	2	88.7 ± 0.2	NS
N	*Euopsis granatina*	Lesser Rockbud Lichen				S1?	1	88.7 ± 1.33	NS
N	*Pertusaria propinqua*	a Lichen				S1?	2	34.4 ± 1.0	NB
N	*Rhizocarpon umbilicatum*	a Lichen				S1?	2	36.1 ± 1.0	NB
N	*Spilonema revertens*	Rock Hairball Lichen				S1?	4	94.4 ± 0.01	NS
N	*Peltigera venosa*	Fan Pelt Lichen				S1?	2	41.3 ± 0.01	NB
N	*Cladonia oricola*	Cladonia Lichen				S1?	2	91.0 ± 0.01	NB
N	*Cephaloziella spinigera*	Spiny Threadwort				S1S2	2	57.3 ± 0.1	NB
N	*Odontoschisma francisci*	Holt's Notchwort				S1S2	4	37.7 ± 1.0	NB
N	*Harpanthus flotovianus*	Great Mountain Flapwort				S1S2	2	27.5 ± 1.0	NB
N	*Pallavicinia lyellii*	Lyell's Ribbonwort				S1S2	3	36.9 ± 1.0	NB
N	*Radula tenax*	Tenacious Scalewort				S1S2	1	42.7 ± 0.1	NB
N	*Reboulia hemisphaerica*	Purple-margined Liverwort				S1S2	3	40.9 ± 0.2	NB
N	*Solenostoma obovatum*	Egg Flapwort				S1S2	2	42.7 ± 0.1	NB
N	*Brachythecium acuminatum*	Acuminate Ragged Moss				S1S2	6	38.9 ± 100.0	NB
N	*Ptychostomum salinum*	Saltmarsh Bryum				S1S2	1	40.4 ± 1.0	NB
N	*Pseudocampylium radicale*	Long-stalked Fine Wet Moss				S1S2	2	95.1 ± 1.0	NB
N	*Tortula obtusifolia*	a Moss				S1S2	1	40.6 ± 0.1	NB
N	*Distichium inclinatum*	Inclined Iris Moss				S1S2	5	40.9 ± 0.1	NB
N	*Ditrichum pallidum*	Pale Cow-hair Moss				S1S2	4	16.6 ± 1.0	NB
N	*Drummondia prorepens*	a Moss				S1S2	4	82.2 ± 0.2	NS
N	*Fissidens taxifolius*	Yew-leaved Pocket Moss				S1S2	3	89.0 ± 0.2	NS
N	*Sphagnum platyphyllum*	Flat-leaved Peat Moss				S1S2	2	86.9 ± 0.01	NS
N	*Timmia norvegica*	a moss				S1S2	3	14.7 ± 0.1	NB
N	*Timmia norvegica var. excurrens*	a moss				S1S2	1	40.9 ± 0.1	NB

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N	*Tomentypnum falcifolium*	Sickle-leaved Golden Moss				S1S2	1	97.5 ± 1.0	NB
N	*Tortella humilis*	Small Crisp Moss				S1S2	7	27.5 ± 1.0	NB
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1S2	2	80.8 ± 1.0	NB
N	*Hamatocaulis vernicosus*	a Moss				S1S2	1	48.7 ± 100.0	NB
N	*Haplocladium microphyllum*	Tiny-leaved Haplocladium Moss				S1S2	1	94.0 ± 3.2	NS
N	*Umbilicaria vellea*	Grizzled Rocktripe Lichen				S1S2	1	40.6 ± 1.0	NB
N	*Pilophorus cereolus*	Powdered Matchstick Lichen				S1S2	1	54.7 ± 5.0	NB
N	*Peltigera scabrosa*	Greater Toad Pelt Lichen				S1S2	4	36.1 ± 1.0	NB
N	*Calypogeia neesiana*	Nees' Pouchwort				S1S3	1	43.8 ± 1.0	NB
N	*Fuscocephaloziopsis connivens*	Forcipated Pincerwort				S1S3	1	54.8 ± 0.05	NB
N	*Cephaloziella elachista*	Spurred Threadwort				S1S3	1	77.1 ± 5.0	NB
N	*Porella pinnata*	Pinnate Scalewort				S1S3	1	38.0 ± 1.0	NB
N	*Tritomaria scitula*	Mountain Notchwort				S1S3	1	42.8 ± 1.0	NB
N	*Amphidium mougeotii*	a Moss				S2	14	31.6 ± 0.1	NB
N	*Anomodon viticulosus*	a Moss				S2	9	1.2 ± 0.1	NB
N	*Cirriphyllum piliferum*	Hair-pointed Moss				S2	5	17.7 ± 0.01	NB
N	*Dicranella palustris*	Drooping-Leaved Fork Moss				S2	10	25.2 ± 100.0	NB
N	*Didymodon ferrugineus*	Rusty Beard Moss				S2	2	40.9 ± 0.1	NB
N	*Ditrichum flexicaule*	Flexible Cow-hair Moss				S2	1	56.0 ± 1.2	NB
N	*Fontinalis hypnoides*	a moss				S2	1	90.4 ± 0.01	NB
N	*Anomodon tristis*	a Moss				S2	11	35.8 ± 10.0	NB
N	*Hygrohypnum bestii*	Best's Brook Moss				S2	6	13.3 ± 0.1	NB
N	*Hypnum pratense*	Meadow Plait Moss				S2	2	73.9 ± 0.1	NB
N	*Isothecium myosuroides*	Slender Mouse-tail Moss				S2	4	56.0 ± 1.2	NB
N	*Meesia triquetra*	Three-ranked Cold Moss				S2	1	38.9 ± 100.0	NB
N	*Physcomitrium immersum*	a Moss				S2	13	38.0 ± 1.0	NB
N	*Platydictya jungermannioides*	False Willow Moss				S2	4	29.2 ± 0.1	NB
N	*Pohlia elongata*	Long-necked Nodding Moss				S2	10	28.7 ± 0.1	NB
N	*Seligeria calcarea*	Chalk Brittle Moss				S2	3	36.6 ± 0.2	NB
N	*Seligeria recurvata*	a Moss				S2	3	42.2 ± 1.0	NB
N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S2	6	47.1 ± 5.0	NB
N	*Sphagnum flexuosum*	Flexuous Peatmoss				S2	3	34.9 ± 0.1	NB
N	*Tayloria serrata*	Serrate Trumpet Moss				S2	8	32.5 ± 2.8	NB
N	*Tetrodontium brownianum*	Little Georgia				S2	7	35.8 ± 10.0	NB
N	*Tetraplodon mnioides*	Entire-leaved Nitrogen Moss				S2	1	98.6 ± 0.5	NB
N	*Thamnobryum alleghaniense*	a Moss				S2	39	13.3 ± 0.1	NB
N	*Tortula mucronifolia*	Mucronate Screw Moss				S2	1	70.0 ± 0.01	NB
N	*Ulota phyllantha*	a Moss				S2	4	40.6 ± 0.6	NB
N	*Anomobryum julaceum*	Slender Silver Moss				S2	5	35.9 ± 0.1	NB
N	*Usnea ceratina*	Warty Beard Lichen				S2	1	61.7 ± 0.05	NS
N	*Cladonia incrassata*	Powder-foot British Soldiers Lichen				S2	1	92.6 ± 0.5	NB
N	*Cladonia macrophylla*	Fig-leaved Lichen				S2	3	39.0 ± 1.0	NB
N	*Leptogium corticola*	Blistered Jellyskin Lichen				S2	2	67.3 ± 0.01	NB
N	*Leptogium milligranum*	Stretched Jellyskin Lichen				S2	11	89.0 ± 0.01	NS
N	*Nephroma laevigatum*	Mustard Kidney Lichen				S2	16	58.0 ± 2.0	NS
N	*Peltigera lepidophora*	Scaly Pelt Lichen				S2	7	10.0 ± 0.2	NB
N	*Anacamptodon splachnoides*	a Moss				S2?	2	87.5 ± 0.2	NS
N	*Andreaea rothii*	Dusky Rock Moss				S2?	6	32.1 ± 0.1	NB
N	*Anomodon minor*	Blunt-leaved Anomodon Moss				S2?	1	35.0 ± 1.0	NB
N	*Ptychostomum pallescens*	Tall Clustered Bryum				S2?	2	69.3 ± 1.0	NB
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S2?	1	37.3 ± 3.0	NB
N	*Dicranum spurium*	Spurred Broom Moss				S2?	5	85.5 ± 0.01	NS

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N	*Hygrohypnum montanum*	a Moss				S2?	2	28.3 ± 1.0	NB
N	*Schistostega pennata*	Luminous Moss				S2?	3	25.2 ± 100.0	NB
N	*Seligeria diversifolia*	a Moss				S2?	2	35.9 ± 0.1	NB
N	*Sphagnum angermanicum*	a Peatmoss				S2?	3	40.5 ± 10.0	NB
N	*Trichodon cylindricus*	Cylindric Hairy-teeth Moss				S2?	4	42.2 ± 10.0	NB
N	*Plagiomnium rostratum*	Long-beaked Leafy Moss				S2?	7	13.3 ± 0.1	NB
N	*Ramalina labiosorediata*	Chalky Ramalina Lichen				S2?	1	42.2 ± 1.0	NB
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2?	5	76.2 ± 0.01	NB
N	*Imshaugia placorodia*	Eyed Starburst Lichen				S2?	6	98.4 ± 0.01	NB
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2?	2	33.6 ± 1.0	NB
N	*Ptychostomum cernuum*	Swamp Bryum				S2S3	2	40.6 ± 0.6	NB
N	*Buxbaumia aphylla*	Brown Shield Moss				S2S3	7	86.9 ± 0.2	NS
N	*Calliergonella cuspidata*	Common Large Wetland Moss				S2S3	11	39.2 ± 5.0	NB
N	*Drepanocladus polygamus*	Polygamous Hook Moss				S2S3	5	31.0 ± 0.1	NB
N	*Palustriella falcata*	Curled Hook Moss				S2S3	3	31.6 ± 0.1	NB
N	*Didymodon rigidulus*	Rigid Screw Moss				S2S3	10	39.8 ± 2.0	NB
N	*Ephemerum serratum*	a Moss				S2S3	5	1.9 ± 0.01	NB
N	*Fissidens bushii*	Bush's Pocket Moss				S2S3	13	69.3 ± 0.6	NB
N	*Hypnum cupressiforme var. filiforme*	a Moss				S2S3	1	88.4 ± 0.01	NS
N	*Isopterygiopsis pulchella*	Neat Silk Moss				S2S3	9	37.6 ± 1.6	NB
N	*Neckera complanata*	a Moss				S2S3	10	56.0 ± 1.2	NB
N	*Orthotrichum elegans*	Showy Bristle Moss				S2S3	4	34.7 ± 0.83	NB
N	*Pohlia proligera*	Cottony Nodding Moss				S2S3	5	40.8 ± 1.5	NB
N	*Codriophorus fascicularis*	Clustered Rock Moss				S2S3	3	31.6 ± 0.1	NB
N	*Bucklandiella affinis*	Lesser Rock Moss				S2S3	11	31.6 ± 0.1	NB
N	*Saelania glaucescens*	Blue Dew Moss				S2S3	2	40.7 ± 0.1	NB
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2S3	4	58.1 ± 0.1	NB
N	*Seligeria campylopoda*	a Moss				S2S3	1	48.7 ± 100.0	NB
N	*Sphagnum centrale*	Central Peat Moss				S2S3	7	28.7 ± 0.1	NB
N	*Sphagnum subfulvum*	a Peatmoss				S2S3	3	97.5 ± 1.0	NB
N	*Taxiphyllum deplanatum*	Imbricate Yew-leaved Moss				S2S3	2	42.2 ± 1.0	NB
N	*Zygodon viridissimus*	Green Rock Yoke-moss				S2S3	3	42.2 ± 1.0	NB
N	*Schistidium agassizii*	Elf Bloom Moss				S2S3	4	29.1 ± 1.2	NB
N	*Loeskeobryum brevirostre*	a Moss				S2S3	18	13.2 ± 2.0	NB
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2S3	7	31.6 ± 0.1	NB
N	*Sphaerophorus globosus*	Northern Coral Lichen				S2S3	19	34.4 ± 1.0	NB
N	*Cetrariella delisei*	Snowbed Icelandmoss Lichen				S2S3	3	53.8 ± 0.03	NB
N	*Cladonia acuminata*	Scantily Clad Pixie Lichen				S2S3	2	39.4 ± 1.0	NB
N	*Cladonia ramulosa*	Bran Lichen				S2S3	4	38.3 ± 1.0	NB
N	*Cladonia sulphurina*	Greater Sulphur-cup Lichen				S2S3	7	27.5 ± 0.2	NB
N	*Lichenomphalia umbellifera*	Green-pea Mushroom Lichen				S2S3	2	39.5 ± 0.2	NB
N	*Parmeliopsis ambigua*	Green Starburst Lichen				S2S3	1	37.2 ± 1.0	NB
N	*Polychidium muscicola*	Eyed Mossthorns Woollybear Lichen				S2S3	10	30.6 ± 0.01	NB
N	*Punctelia caseana*	Case's Speckled-back Lichen				S2S3	1	40.9 ± 0.2	NB
N	*Cynodontium tenellum*	Delicate Dogtooth Moss				S3	7	40.7 ± 0.1	NB
N	*Hypnum curvifolium*	Curved-leaved Plait Moss				S3	18	31.6 ± 0.1	NB
N	*Tortella fragilis*	Fragile Twisted Moss				S3	1	40.9 ± 0.1	NB
N	*Schistidium maritimum*	a Moss				S3	5	40.6 ± 0.6	NB
N	*Hymenostylium recurvirostrum*	Curve-beak Beardless Moss				S3	14	40.8 ± 1.5	NB
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	9	58.2 ± 3.0	NS

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N	*Solorina saccata*	Woodland Owl Lichen				S3	13	10.4 ± 0.01	NB
N	*Normandina pulchella*	Rimmed Elf-ear Lichen				S3	28	29.3 ± 0.2	NB
N	*Cladonia farinacea*	Farinose Pixie Lichen				S3	5	39.6 ± 1.0	NB
N	*Cladonia strepsilis*	Olive Cladonia Lichen				S3	4	37.3 ± 0.01	NB
N	*Hypotrachyna catawbiensis*	Powder-tipped Antler Lichen				S3	30	29.9 ± 0.2	NB
N	*Scytinium lichenoides*	Tattered Jellyskin Lichen				S3	17	10.1 ± 0.01	NB
N	*Nephroma bellum*	Naked Kidney Lichen				S3	4	29.7 ± 1.0	NB
N	*Peltigera degenii*	Lustrous Pelt Lichen				S3	13	30.8 ± 0.01	NB
N	*Leptogium laceroides*	Short-bearded Jellyskin Lichen				S3	35	33.5 ± 0.2	NB
N	*Peltigera membranacea*	Membranous Pelt Lichen				S3	56	11.0 ± 0.01	NB
N	*Cladonia botrytes*	Wooden Soldiers Lichen				S3	9	54.0 ± 0.25	NB
N	*Cladonia carneola*	Crowned Pixie-cup Lichen				S3	2	39.6 ± 1.0	NB
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S3	9	27.5 ± 0.2	NB
N	*Aulacomnium androgynum*	Little Groove Moss				S3?	9	40.8 ± 1.5	NB
N	*Ptychostomum inclinatum*	Blunt-tooth Thread Moss				S3?	3	40.9 ± 0.1	NB
N	*Dicranella rufescens*	Red Forklet Moss				S3?	5	40.9 ± 0.1	NB
N	*Rhytidiadelphus loreus*	Lanky Moss				S3?	9	38.2 ± 0.01	NB
N	*Sphagnum lescurii*	a Peatmoss				S3?	13	28.3 ± 1.0	NB
N	*Sphagnum inundatum*	a Sphagnum				S3?	2	44.8 ± 0.77	NB
N	*Rostania occultata*	Crusted Tarpaper Lichen				S3?	7	56.9 ± 3.0	NS
N	*Cystocoleus ebeneus*	Rockgossamer Lichen				S3?	3	88.6 ± 0.26	NS
N	*Scytinium subtile*	Appressed Jellyskin Lichen				S3?	12	10.4 ± 0.01	NB
N	*Peltigera neckeri*	Black-saddle Pelt Lichen				S3?	1	32.4 ± 5.0	NB
N	*Stereocaulon subcoralloides*	Coralloid Foam Lichen				S3?	1	42.2 ± 1.0	NB
N	*Anomodon rugelii*	Rugel's Anomodon Moss				S3S4	3	86.6 ± 1.5	NS
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3S4	2	69.1 ± 15.0	NB
N	*Brachytheciastrum velutinum*	Velvet Ragged Moss				S3S4	10	29.1 ± 1.2	NB
N	*Calliergon giganteum*	Giant Spear Moss				S3S4	2	86.7 ± 0.01	NS
N	*Dicranella cerviculata*	a Moss				S3S4	3	32.5 ± 2.8	NB
N	*Dicranella varia*	a Moss				S3S4	1	83.0 ± 3.0	NS
N	*Dicranum majus*	Greater Broom Moss				S3S4	23	31.7 ± 0.05	NB
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	2	34.3 ± 0.1	NB
N	*Encalypta ciliata*	Fringed Extinguisher Moss				S3S4	2	40.9 ± 0.1	NB
N	*Fissidens bryoides*	Lesser Pocket Moss				S3S4	7	43.1 ± 0.1	NB
N	*Elodium blandowii*	Blandow's Bog Moss				S3S4	2	64.6 ± 0.73	NB
N	*Heterocladium dimorphum*	Dimorphous Tangle Moss				S3S4	5	34.7 ± 0.83	NB
N	*Isopterygiopsis muelleriana*	a Moss				S3S4	27	36.6 ± 0.1	NB
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	4	40.5 ± 0.1	NB
N	*Orthotrichum speciosum*	Showy Bristle Moss				S3S4	7	86.9 ± 0.2	NS
N	*Physcomitrium pyriforme*	Pear-shaped Urn Moss				S3S4	28	3.1 ± 0.1	NB
N	*Pogonatum dentatum*	Mountain Hair Moss				S3S4	3	40.6 ± 0.6	NB
N	*Sphagnum compactum*	Compact Peat Moss				S3S4	3	83.9 ± 0.01	NB
N	*Sphagnum torreyanum*	a Peatmoss				S3S4	4	30.2 ± 0.01	NB
N	*Sphagnum austinii*	Austin's Peat Moss				S3S4	1	82.8 ± 1.8	NB
N	*Sphagnum contortum*	Twisted Peat Moss				S3S4	3	58.1 ± 0.8	NB
N	*Sphagnum quinquefarium*	Five-ranked Peat Moss				S3S4	3	34.4 ± 0.6	NB
N	*Splachnum rubrum*	Red Collar Moss				S3S4	1	55.5 ± 1.2	NB
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3S4	14	36.5 ± 1.2	NB
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3S4	3	41.6 ± 0.2	NB
N	*Weissia controversa*	Green-Cushioned Weissia				S3S4	4	40.8 ± 1.5	NB
N	*Abietinella abietina*	Wiry Fern Moss				S3S4	1	40.9 ± 0.1	NB
N	*Trichostomum tenuirostre*	Acid-Soil Moss				S3S4	8	31.6 ± 0.1	NB
N	*Pannaria rubiginosa*	Brown-eyed Shingle Lichen				S3S4	29	29.2 ± 0.2	NB
N	*Pseudocyphellaria holarctica*	Yellow Specklebelly Lichen				S3S4	176	10.1 ± 0.01	NB
N	*Ramalina thrausta*	Angelhair Ramalina Lichen				S3S4	13	32.0 ± 1.0	NB

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N	*Hypogymnia vittata*	Slender Monk's Hood Lichen				S3S4	30	31.6 ± 1.0	NB
N	*Scytinium teretiusculum*	Curly Jellyskin Lichen				S3S4	20	10.7 ± 0.01	NB
N	*Montanelia panniformis*	Shingled Camouflage Lichen				S3S4	5	34.4 ± 1.0	NB
N	*Cladonia terrae-novae*	Newfoundland Reindeer Lichen				S3S4	4	86.3 ± 0.1	NB
N	*Cladonia floerkeana*	Gritty British Soldiers Lichen				S3S4	6	28.6 ± 1.0	NB
N	*Cladonia parasitica*	Fence-rail Lichen				S3S4	3	93.6 ± 0.01	NB
N	*Xylopsora friesii*	a Lichen				S3S4	1	40.6 ± 1.0	NB
N	*Nephroma parile*	Powdery Kidney Lichen				S3S4	34	30.1 ± 0.2	NB
N	*Nephroma resupinatum*	a lichen				S3S4	2	38.5 ± 0.2	NB
N	*Protopannaria pezizoides*	Brown-gray Moss-shingle Lichen				S3S4	47	10.4 ± 0.01	NB
N	*Parmelia fertilis*	Fertile Shield Lichen				S3S4	5	40.7 ± 0.2	NB
N	*Usnea strigosa*	Bushy Beard Lichen				S3S4	55	43.1 ± 0.2	NB
N	*Fuscopannaria sorediata*	a Lichen				S3S4	3	29.3 ± 0.2	NB
N	*Stereocaulon condensatum*	Granular Soil Foam Lichen				S3S4	13	30.9 ± 0.01	NB
N	*Stereocaulon paschale*	Easter Foam Lichen				S3S4	2	64.2 ± 1.0	NS
N	*Pannaria conoplea*	Mealy-rimmed Shingle Lichen				S3S4	45	29.6 ± 0.2	NB
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	2	41.0 ± 0.01	NB
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	136	10.7 ± 0.01	NB
N	*Peltigera neopolydactyla*	Undulating Pelt Lichen				S3S4	12	14.2 ± 0.2	NB
N	*Cladonia cariosa*	Lesser Ribbed Pixie Lichen				S3S4	4	42.7 ± 1.0	NB
N	*Hypocenomyce scalaris*	Common Clam Lichen				S3S4	1	42.2 ± 1.0	NB
N	*Grimmia anodon*	Toothless Grimmia Moss				SH	2	67.7 ± 10.0	NB
N	*Leucodon brachypus*	a Moss				SH	8	35.3 ± 0.1	NB
N	*Orthotrichum gymnostomum*	Aspen Bristle Moss				SH	1	93.0 ± 0.2	NS
N	*Thelia hirtella*	a Moss				SH	6	38.9 ± 100.0	NB
N	*Cyrto-hypnum minutulum*	Tiny Cedar Moss				SH	3	36.2 ± 10.0	NB
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	207	0.9 ± 0.2	NB
P	*Fraxinus nigra*	Black Ash	Threatened			S3S4	402	3.5 ± 0.2	NB
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Endangered	S1	7	68.3 ± 0.05	NB
P	*Symphyotrichum anticostense*	Anticosti Aster	Special Concern	Special Concern	Endangered	S3	2	69.3 ± 0.6	NB
P	*Cryptotaenia canadensis*	Canada Honewort				S1	1	3.4 ± 1.0	NB
P	*Antennaria parlinii ssp. fallax*	Parlin's Pussytoes				S1	5	42.0 ± 1.0	NB
P	*Antennaria howellii ssp. petaloidea*	Pussy-Toes				S1	2	69.8 ± 5.0	NB
P	*Bidens discoidea*	Swamp Beggarticks				S1	4	55.4 ± 0.01	NB
P	*Pseudognaphalium obtusifolium*	Eastern Cudweed				S1	14	55.4 ± 0.5	NB
P	*Hieracium paniculatum*	Panicled Hawkweed				S1	8	32.0 ± 0.5	NB
P	*Solidago multiradiata*	Multi-rayed Goldenrod				S1	19	61.9 ± 0.5	NB
P	*Barbarea orthoceras*	American Yellow Rocket				S1	1	14.7 ± 1.0	NB
P	*Cardamine parviflora*	Small-flowered Bittercress				S1	10	45.8 ± 0.5	NB
P	*Cardamine concatenata*	Cut-leaved Toothwort				S1	2	90.9 ± 0.01	NB
P	*Draba arabisans*	Rock Whitlow-Grass				S1	32	30.3 ± 0.01	NB
P	*Draba glabella*	Rock Whitlow-Grass				S1	15	40.9 ± 0.01	NB
P	*Mononeuria groenlandica*	Greenland Stitchwort				S1	2	80.6 ± 0.01	NB
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	2	92.3 ± 5.0	NB
P	*Chenopodiastrum simplex*	Maple-leaved Goosefoot				S1	9	9.8 ± 1.0	NB
P	*Blitum capitatum*	Strawberry-Blite				S1	4	27.3 ± 1.0	NB
P	*Suaeda rolandii*	Roland's Sea-Blite				S1	16	43.4 ± 0.2	NB
P	*Hypericum virginicum*	Virginia St. John's-wort				S1	2	64.0 ± 0.05	NB
P	*Corema conradii*	Broom Crowberry				S1	100	69.9 ± 10.0	NB
P	*Vaccinium boreale*	Northern Blueberry				S1	4	57.0 ± 0.5	NS
P	*Vaccinium corymbosum*	Highbush Blueberry				S1	2	93.5 ± 0.2	NS
P	*Hylodesmum glutinosum*	Large Tick-trefoil				S1	13	91.7 ± 7.07	NS

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P	*Lespedeza capitata*	Round-headed Bush-clover				S1	11	46.9 ± 0.01	NB
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S1	2	91.9 ± 5.0	NS
P	*Pycnanthemum virginianum*	Virginia Mountain Mint				S1	4	40.2 ± 0.01	NB
P	*Polygonum douglasii*	Douglas Knotweed				S1	2	3.9 ± 0.01	NB
P	*Lysimachia quadrifolia*	Whorled Yellow Loosestrife				S1	14	30.3 ± 0.01	NB
P	*Primula laurentiana*	Laurentian Primrose				S1	71	35.8 ± 3.4	NB
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S1	1	55.3 ± 1.0	NB
P	*Crataegus jonesiae*	Jones' Hawthorn				S1	4	67.3 ± 1.0	NB
P	*Dryas integrifolia*	Entire-leaved Mountain Avens				S1	15	63.4 ± 0.01	NB
P	*Potentilla canadensis*	Canada Cinquefoil				S1	7	33.6 ± 0.02	NB
P	*Rubus flagellaris*	Northern Dewberry				S1	6	66.7 ± 0.2	NS
P	*Salix myrtillifolia*	Blueberry Willow				S1	25	64.1 ± 0.2	NB
P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S1	49	9.2 ± 0.01	NB
P	*Agalinis tenuifolia*	Slender Agalinis				S1	17	81.4 ± 0.2	NB
P	*Viola sagittata var. ovata*	Arrow-Leaved Violet				S1	30	89.1 ± 2.0	NS
P	*Carex annectens*	Yellow-Fruited Sedge				S1	2	98.5 ± 0.01	NB
P	*Carex atlantica ssp. atlantica*	Atlantic Sedge				S1	7	29.8 ± 0.01	NB
P	*Carex backii*	Rocky Mountain Sedge				S1	7	2.4 ± 0.01	NB
P	*Carex blanda*	Eastern Woodland Sedge				S1	2	96.1 ± 0.01	NB
P	*Carex merritt-fernaldii*	Merritt Fernald's Sedge				S1	1	37.7 ± 0.01	NB
P	*Carex salina*	Saltmarsh Sedge				S1	2	71.6 ± 1.0	NB
P	*Carex scirpoidea*	Scirpuslike Sedge				S1	6	9.4 ± 0.01	NB
P	*Carex sterilis*	Sterile Sedge				S1	1	36.6 ± 2.0	NB
P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	15	4.5 ± 5.0	NB
P	*Carex saxatilis*	Russet Sedge				S1	14	47.4 ± 10.0	NB
P	*Cyperus diandrus*	Low Flatsedge				S1	5	87.4 ± 0.2	NB
P	*Scirpus pendulus*	Hanging Bulrush				S1	6	28.4 ± 0.01	NB
P	*Sisyrinchium angustifolium*	Narrow-leaved Blue-eyed-grass				S1	10	70.4 ± 1.0	NB
P	*Juncus greenei*	Greene's Rush				S1	2	93.6 ± 0.4	NB
P	*Juncus stygius ssp. americanus*	Moor Rush				S1	2	96.1 ± 10.0	NB
P	*Juncus subtilis*	Creeping Rush				S1	1	49.4 ± 5.0	NB
P	*Allium canadense*	Canada Garlic				S1	1	40.3 ± 0.5	NB
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S1	19	12.5 ± 0.01	NB
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	3	48.0 ± 0.01	NB
P	*Platanthera flava var. herbiola*	Pale Green Orchid				S1	27	48.0 ± 0.01	NB
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S1	14	10.7 ± 1.2	NB
P	*Bromus pubescens*	Hairy Wood Brome Grass				S1	6	57.4 ± 0.01	NB
P	*Calamagrostis stricta ssp. inexpansa*	Slim-stemmed Reed Grass				S1	2	89.0 ± 0.01	NB
P	*Cinna arundinacea*	Sweet Wood Reed Grass				S1	38	31.4 ± 1.0	NB
P	*Danthonia compressa*	Flattened Oat Grass				S1	28	2.5 ± 0.2	NB
P	*Dichanthelium dichotomum*	Forked Panic Grass				S1	1	45.9 ± 1.0	NB
P	*Glyceria obtusa*	Atlantic Manna Grass				S1	2	98.9 ± 0.5	NB
P	*Potamogeton friesii*	Fries' Pondweed				S1	8	71.2 ± 5.0	NB
P	*Potamogeton nodosus*	Long-leaved Pondweed				S1	8	56.1 ± 0.2	NB
P	*Potamogeton strictifolius*	Straight-leaved Pondweed				S1	2	33.8 ± 2.0	NB
P	*Xyris difformis*	Bog Yellow-eyed-grass				S1	3	64.1 ± 0.1	NB
P	*Asplenium ruta-muraria var. cryptolepis*	Wallrue Spleenwort				S1	4	55.7 ± 0.1	NB
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S1	1	10.7 ± 1.0	NB
P	*Dryopteris filix-mas ssp.*	Britton's Male Fern				S1	4	49.7 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
	brittonii								
P	*Huperzia selago*	Northern Firmoss				S1	1	64.2 ± 1.0	NS
P	*Sceptridium oneidense*	Blunt-lobed Moonwort				S1	4	71.6 ± 5.0	NB
P	*Selaginella rupestris*	Rock Spikemoss				S1	10	3.6 ± 0.5	NB
P	*Cuscuta campestris*	Field Dodder				S1?	3	46.8 ± 5.0	NB
P	*Polygonum aviculare ssp. neglectum*	Narrow-leaved Knotweed				S1?	3	93.8 ± 0.5	NB
P	*Alisma subcordatum*	Southern Water Plantain				S1?	2	39.2 ± 0.4	NB
P	*Carex laxiflora*	Loose-Flowered Sedge				S1?	2	64.3 ± 7.07	NS
P	*Wolffia columbiana*	Columbian Watermeal				S1?	12	57.6 ± 0.01	NB
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S1S2	17	32.3 ± 0.2	NB
P	*Potamogeton bicupulatus*	Snailseed Pondweed				S1S2	3	82.4 ± 0.05	NB
P	*Eriophorum russeolum ssp. albidum*	Smooth-fruited Russet Cottongrass				S1S3	12	45.0 ± 0.01	NB
P	*Spiranthes cernua*	Nodding Ladies'-Tresses				S1S3	30	31.1 ± 0.01	NB
P	*Spiranthes arcisepala*	Appalachian Ladies'-tresses				S1S3	30	29.5 ± 0.2	NB
P	*Spiranthes incurva*	Sphinx Ladies'-tresses				S1S3	2	57.6 ± 0.2	NB
P	*Neottia bifolia*	Southern Twayblade			Endangered	S2	32	45.1 ± 0.9	NB
P	*Sanicula trifoliata*	Large-Fruited Sanicle				S2	1	34.6 ± 5.0	NB
P	*Sanicula odorata*	Clustered Sanicle				S2	4	98.4 ± 2.0	NS
P	*Hieracium robinsonii*	Robinson's Hawkweed				S2	16	31.3 ± 0.01	NB
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S2	4	42.5 ± 1.0	NB
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2	4	53.3 ± 0.01	NB
P	*Viburnum dentatum*	Southern Arrow-Wood				S2	2	40.7 ± 0.2	NB
P	*Viburnum dentatum var. lucidum*	Northern Arrow-Wood				S2	1	84.0 ± 0.0	NB
P	*Astragalus eucosmus*	Elegant Milk-vetch				S2	3	45.0 ± 0.5	NB
P	*Quercus macrocarpa*	Bur Oak				S2	223	12.8 ± 0.2	NB
P	*Nuphar x rubrodisca*	Red-disk Yellow Pond-lily				S2	20	47.1 ± 0.01	NB
P	*Polygaloides paucifolia*	Fringed Milkwort				S2	21	30.0 ± 0.01	NB
P	*Persicaria amphibia var. emersa*	Long-root Smartweed				S2	55	32.3 ± 0.01	NB
P	*Anemone parviflora*	Small-flowered Anemone				S2	9	64.1 ± 0.2	NB
P	*Geum fragarioides*	Barren Strawberry				S2	1	87.3 ± 1.0	NB
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S2	6	2.4 ± 0.2	NB
P	*Carex albicans var. emmonsii*	White-tinged Sedge				S2	16	42.6 ± 0.01	NB
P	*Cyperus lupulinus ssp. macilentus*	Hop Flatsedge				S2	72	46.7 ± 0.01	NB
P	*Galearis rotundifolia*	Small Round-leaved Orchid				S2	3	66.7 ± 0.45	NB
P	*Calypso bulbosa var. americana*	Calypso				S2	6	27.2 ± 0.01	NB
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S2	21	31.8 ± 0.5	NB
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	6	46.0 ± 1.6	NB
P	*Platanthera huronensis*	Fragrant Green Orchid				S2	8	33.1 ± 0.2	NB
P	*Festuca subverticillata*	Nodding Fescue				S2	6	61.5 ± 1.0	NS
P	*Puccinellia nutkaensis*	Alaska Alkaligrass				S2	2	76.1 ± 1.0	NB
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S2	4	58.7 ± 5.0	NB
P	*Schizaea pusilla*	Little Curlygrass Fern				S2	32	29.7 ± 0.1	NB
P	*Coryphopteris simulata*	Bog Fern				S2	36	51.8 ± 0.5	NB
P	*Toxicodendron radicans var. radicans*	Eastern Poison Ivy				S2?	15	31.0 ± 0.01	NB
P	*Symphyotrichum novi-belgii var. crenifolium*	New York Aster				S2?	6	39.3 ± 0.01	NB
P	*Humulus lupulus var. lupuloides*	Common Hop				S2?	5	94.6 ± 0.8	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Crataegus macrosperma*	Big-Fruit Hawthorn				S2?	2	71.0 ± 0.3	NB
P	*Rubus x recurvicaulis*	arching dewberry				S2?	7	20.0 ± 1.0	NB
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2S3	6	86.5 ± 1.0	NS
P	*Symphyotrichum racemosum*	Small White Aster				S2S3	9	34.0 ± 0.01	NB
P	*Alnus serrulata*	Smooth Alder				S2S3	13	51.3 ± 0.2	NB
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S2S3	4	56.7 ± 0.01	NB
P	*Gentiana linearis*	Narrow-Leaved Gentian				S2S3	6	91.4 ± 50.0	NB
P	*Hedeoma pulegioides*	American False Pennyroyal				S2S3	12	3.7 ± 0.5	NB
P	*Aphyllon uniflorum*	One-flowered Broomrape				S2S3	15	44.4 ± 1.0	NB
P	*Persicaria careyi*	Carey's Smartweed				S2S3	14	46.7 ± 5.0	NB
P	*Hepatica americana*	Round-lobed Hepatica				S2S3	10	21.2 ± 1.0	NB
P	*Ranunculus sceleratus*	Cursed Buttercup				S2S3	6	74.7 ± 0.5	NB
P	*Cephalanthus occidentalis*	Common Buttonbush				S2S3	24	51.6 ± 0.07	NB
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2S3	6	31.2 ± 1.0	NB
P	*Euphrasia randii*	Rand's Eyebright				S2S3	11	34.3 ± 0.1	NB
P	*Dirca palustris*	Eastern Leatherwood				S2S3	1	66.8 ± 1.0	NB
P	*Viola novae-angliae*	New England Violet				S2S3	6	46.1 ± 0.41	NB
P	*Carex comosa*	Bearded Sedge				S2S3	6	67.9 ± 1.0	NS
P	*Carex rostrata*	Narrow-leaved Beaked Sedge				S2S3	1	27.4 ± 0.01	NB
P	*Carex vacillans*	Estuarine Sedge				S2S3	3	93.8 ± 0.1	NB
P	*Scirpus atrovirens*	Dark-green Bulrush				S2S3	1	76.9 ± 0.05	NB
P	*Allium tricoccum*	Wild Leek				S2S3	81	3.2 ± 0.2	NB
P	*Corallorhiza maculata var. occidentalis*	Spotted Coralroot				S2S3	16	18.4 ± 1.0	NB
P	*Corallorhiza maculata var. maculata*	Spotted Coralroot				S2S3	11	15.5 ± 0.21	NB
P	*Elymus canadensis*	Canada Wild Rye				S2S3	3	60.7 ± 1.0	NB
P	*Piptatheropsis canadensis*	Canada Ricegrass				S2S3	5	33.1 ± 10.0	NB
P	*Puccinellia phryganodes ssp. neoarctica*	Creeping Alkali Grass				S2S3	1	54.8 ± 0.5	NB
P	*Poa glauca*	Glaucous Blue Grass				S2S3	23	32.2 ± 0.01	NB
P	*Piptatheropsis pungens*	Slender Ricegrass				S2S3	5	38.2 ± 1.0	NB
P	*Potamogeton vaseyi*	Vasey's Pondweed				S2S3	2	71.2 ± 1.0	NB
P	*Isoetes tuckermanii ssp. acadiensis*	Acadian Quillwort				S2S3	1	99.5 ± 0.5	NS
P	*Panax trifolius*	Dwarf Ginseng				S3	45	18.7 ± 0.01	NB
P	*Artemisia campestris ssp. caudata*	Tall Wormwood				S3	146	33.5 ± 0.2	NB
P	*Nabalus racemosus*	Glaucous Rattlesnakeroot				S3	66	30.9 ± 0.01	NB
P	*Tanacetum bipinnatum ssp. huronense*	Lake Huron Tansy				S3	14	38.1 ± 10.0	NB
P	*Pseudognaphalium macounii*	Macoun's Cudweed				S3	5	33.7 ± 5.0	NB
P	*Impatiens pallida*	Pale Jewelweed				S3	12	9.3 ± 0.01	NB
P	*Turritis glabra*	Tower Mustard				S3	1	34.3 ± 0.5	NB
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S3	20	9.4 ± 0.01	NB
P	*Cardamine maxima*	Large Toothwort				S3	43	31.2 ± 0.5	NB
P	*Boechera stricta*	Drummond's Rockcress				S3	20	9.2 ± 0.01	NB
P	*Sagina nodosa*	Knotted Pearlwort				S3	10	91.0 ± 0.01	NB
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S3	1	88.3 ± 0.15	NB
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	17	33.1 ± 0.5	NB
P	*Stellaria longifolia*	Long-leaved Starwort				S3	8	19.7 ± 1.0	NB
P	*Oxybasis rubra*	Red Goosefoot				S3	10	67.4 ± 1.0	NB
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	4	85.6 ± 0.1	NB
P	*Cornus obliqua*	Silky Dogwood				S3	100	32.9 ± 0.2	NB
P	*Lonicera oblongifolia*	Swamp Fly Honeysuckle				S3	1	84.5 ± 5.0	NB
P	*Triosteum aurantiacum*	Orange-fruited Tinker's				S3	7	35.6 ± 0.01	NB

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		Weed							
P	*Viburnum lentago*	Nannyberry				S3	2	33.3 ± 0.2	NB
P	*Rhodiola rosea*	Roseroot				S3	130	9.2 ± 0.01	NB
P	*Shepherdia canadensis*	Soapberry				S3	42	63.3 ± 0.01	NB
P	*Oxytropis campestris var. johannensis*	Field Locoweed				S3	29	51.7 ± 0.5	NB
P	*Bartonia paniculata ssp. iodandra*	Branched Bartonia				S3	43	28.2 ± 1.0	NB
P	*Gentianella amarella ssp. acuta*	Northern Gentian				S3	3	69.8 ± 0.1	NB
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	30	3.1 ± 5.0	NB
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S3	9	27.9 ± 0.01	NB
P	*Myriophyllum humile*	Low Water Milfoil				S3	6	28.9 ± 1.0	NB
P	*Myriophyllum quitense*	Andean Water Milfoil				S3	71	33.8 ± 0.01	NB
P	*Proserpinaca palustris*	Marsh Mermaidweed				S3	6	42.9 ± 0.01	NB
P	*Utricularia resupinata*	Inverted Bladderwort				S3	15	54.7 ± 1.0	NB
P	*Fraxinus pennsylvanica*	Red Ash				S3	178	8.6 ± 0.01	NB
P	*Rumex pallidus*	Seabeach Dock				S3	7	51.2 ± 1.0	NB
P	*Rumex occidentalis*	Western Dock				S3	1	95.5 ± 1.0	NB
P	*Podostemum ceratophyllum*	Horn-leaved Riverweed				S3	11	88.0 ± 0.01	NB
P	*Primula mistassinica*	Mistassini Primrose				S3	11	44.6 ± 0.1	NB
P	*Pyrola minor*	Lesser Pyrola				S3	8	33.1 ± 1.0	NB
P	*Clematis occidentalis*	Purple Clematis				S3	23	13.5 ± 0.5	NB
P	*Ranunculus flabellaris*	Yellow Water Buttercup				S3	18	46.3 ± 0.01	NB
P	*Amelanchier canadensis*	Canada Serviceberry				S3	19	8.8 ± 1.0	NB
P	*Crataegus scabrida*	Rough Hawthorn				S3	9	2.8 ± 1.0	NB
P	*Rubus occidentalis*	Black Raspberry				S3	4	31.6 ± 0.5	NB
P	*Salix myricoides*	Bayberry Willow				S3	2	55.2 ± 0.5	NB
P	*Salix nigra*	Black Willow				S3	188	3.9 ± 0.2	NB
P	*Salix interior*	Sandbar Willow				S3	16	52.7 ± 0.07	NB
P	*Comandra umbellata*	Bastard's Toadflax				S3	11	52.1 ± 10.0	NB
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S3	18	46.0 ± 1.0	NB
P	*Viola adunca*	Hooked Violet				S3	8	9.8 ± 1.0	NB
P	*Sagittaria montevidensis ssp. spongiosa*	Spongy Arrowhead				S3	35	91.4 ± 0.01	NB
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S3	39	41.4 ± 5.0	NB
P	*Carex adusta*	Lesser Brown Sedge				S3	15	33.9 ± 1.0	NB
P	*Carex arcta*	Northern Clustered Sedge				S3	53	31.1 ± 0.01	NB
P	*Carex conoidea*	Field Sedge				S3	21	9.8 ± 1.0	NB
P	*Carex garberi*	Garber's Sedge				S3	5	45.3 ± 0.01	NB
P	*Carex granularis*	Limestone Meadow Sedge				S3	4	3.8 ± 5.0	NB
P	*Carex hirtifolia*	Pubescent Sedge				S3	4	32.8 ± 0.5	NB
P	*Carex ormostachya*	Necklace Spike Sedge				S3	7	39.1 ± 0.01	NB
P	*Carex plantaginea*	Plantain-Leaved Sedge				S3	6	38.5 ± 3.04	NB
P	*Carex prairea*	Prairie Sedge				S3	2	98.6 ± 1.0	NS
P	*Carex rosea*	Rosy Sedge				S3	38	3.5 ± 0.01	NB
P	*Carex sprengelii*	Longbeak Sedge				S3	6	7.4 ± 0.5	NB
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S3	1	30.5 ± 10.0	NB
P	*Carex livida*	Livid Sedge				S3	2	56.1 ± 0.01	NB
P	*Cyperus esculentus var. leptostachyus*	Perennial Yellow Nutsedge				S3	82	19.8 ± 5.0	NB
P	*Cyperus squarrosus*	Awned Flatsedge				S3	46	33.0 ± 1.0	NB
P	*Eriophorum gracile*	Slender Cottongrass				S3	23	61.5 ± 0.2	NB
P	*Elodea nuttallii*	Nuttall's Waterweed				S3	7	47.1 ± 0.04	NB
P	*Juncus vaseyi*	Vasey Rush				S3	6	30.5 ± 0.1	NB
P	*Najas gracillima*	Thread-Like Naiad				S3	3	63.5 ± 0.1	NB
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	41	36.0 ± 1.0	NB

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P	*Neottia auriculata*	Auricled Twayblade				S3	2	31.8 ± 0.1	NB
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	55	19.4 ± 0.01	NB
P	*Platanthera orbiculata*	Small Round-leaved Orchid				S3	22	21.8 ± 1.91	NB
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S3	16	31.0 ± 5.0	NB
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	25	3.9 ± 2.8	NB
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S3	11	11.4 ± 0.01	NB
P	*Leersia virginica*	White Cut Grass				S3	53	47.3 ± 0.01	NB
P	*Schizachyrium scoparium*	Little Bluestem				S3	43	46.8 ± 0.01	NB
P	*Zizania aquatica*	Southern Wild Rice				S3	2	58.2 ± 0.01	NB
P	*Zizania aquatica var. aquatica*	Eastern Wild Rice				S3	6	31.3 ± 0.1	NB
P	*Adiantum pedatum*	Northern Maidenhair Fern				S3	3	21.2 ± 1.0	NB
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S3	21	9.2 ± 0.01	NB
P	*Anchistea virginica*	Virginia chain fern				S3	32	88.9 ± 0.01	NB
P	*Woodsia alpina*	Alpine Cliff Fern				S3	12	9.9 ± 0.01	NB
P	*Woodsia glabella*	Smooth Cliff Fern				S3	68	27.0 ± 0.54	NB
P	*Isoetes tuckermanii ssp. tuckermanii*	Tuckerman's Quillwort				S3	17	25.8 ± 1.0	NB
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3	22	30.3 ± 0.01	NB
P	*Huperzia appressa*	Mountain Firmoss				S3	47	28.7 ± 0.01	NB
P	*Sceptridium dissectum*	Dissected Moonwort				S3	31	49.9 ± 0.5	NB
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S3	20	11.6 ± 1.0	NB
P	*Botrychium simplex*	Least Moonwort				S3	7	39.0 ± 0.01	NB
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S3	8	9.8 ± 5.0	NB
P	*Selaginella selaginoides*	Low Spikemoss				S3	10	30.3 ± 5.0	NB
P	*Crataegus succulenta*	Fleshy Hawthorn				S3?	1	95.1 ± 5.0	NB
P	*Crataegus submollis*	Quebec Hawthorn				S3?	10	28.8 ± 1.0	NB
P	*Platanthera hookeri*	Hooker's Orchid				S3?	36	18.9 ± 1.0	NB
P	*Bidens hyperborea*	Estuary Beggarticks				S3S4	23	85.8 ± 1.0	NB
P	*Solidago altissima*	Tall Goldenrod				S3S4	9	45.7 ± 1.0	NB
P	*Symphyotrichum boreale*	Boreal Aster				S3S4	8	43.4 ± 0.5	NB
P	*Betula pumila*	Bog Birch				S3S4	68	44.1 ± 0.01	NB
P	*Mertensia maritima*	Sea Lungwort				S3S4	47	33.9 ± 0.5	NB
P	*Subularia aquatica ssp. americana*	American Water Awlwort				S3S4	5	27.0 ± 0.01	NB
P	*Lobelia cardinalis*	Cardinal Flower				S3S4	16	83.8 ± 0.2	NB
P	*Callitriche hermaphroditica*	Northern Water-starwort				S3S4	10	32.8 ± 0.01	NB
P	*Viburnum edule*	Squashberry				S3S4	15	30.4 ± 0.01	NB
P	*Crassula aquatica*	Water Pygmyweed				S3S4	5	47.1 ± 0.01	NB
P	*Penthorum sedoides*	Ditch Stonecrop				S3S4	92	19.5 ± 1.0	NB
P	*Elatine americana*	American Waterwort				S3S4	12	33.8 ± 2.0	NB
P	*Hedysarum americanum*	Alpine Hedysarum				S3S4	2	44.9 ± 0.5	NB
P	*Fagus grandifolia*	American Beech				S3S4	405	2.3 ± 0.2	NB
P	*Geranium robertianum*	Herb Robert				S3S4	78	16.1 ± 0.05	NB
P	*Stachys hispida*	Smooth Hedge-Nettle				S3S4	4	43.8 ± 0.5	NB
P	*Stachys pilosa*	Hairy Hedge-Nettle				S3S4	7	51.8 ± 1.0	NB
P	*Teucrium canadense*	Canada Germander				S3S4	9	31.4 ± 0.01	NB
P	*Utricularia radiata*	Little Floating Bladderwort				S3S4	18	76.2 ± 0.02	NB
P	*Utricularia gibba*	Humped Bladderwort				S3S4	17	55.5 ± 0.07	NB
P	*Fraxinus americana*	White Ash				S3S4	248	1.1 ± 0.2	NB
P	*Epilobium densum*	Downy Willowherb				S3S4	23	34.1 ± 5.0	NB
P	*Fallopia scandens*	Climbing False Buckwheat				S3S4	48	20.0 ± 5.0	NB
P	*Rumex persicarioides*	Peach-leaved Dock				S3S4	1	63.9 ± 1.0	NB
P	*Littorella americana*	American Shoreweed				S3S4	7	33.4 ± 1.0	NB
P	*Samolus parviflorus*	Seaside Brookweed				S3S4	36	87.9 ± 0.01	NB
P	*Thalictrum confine*	Northern Meadow-rue				S3S4	89	34.4 ± 0.01	NB
P	*Drymocallis arguta*	Tall Wood Beauty				S3S4	6	45.1 ± 0.01	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Rosa palustris*	Swamp Rose				S3S4	20	21.8 ± 5.0	NB
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S3S4	33	13.1 ± 1.0	NB
P	*Sanguisorba canadensis*	Canada Burnet				S3S4	24	38.7 ± 0.5	NB
P	*Galium boreale*	Northern Bedstraw				S3S4	5	42.6 ± 0.01	NB
P	*Galium labradoricum*	Labrador Bedstraw				S3S4	2	43.2 ± 0.5	NB
P	*Salix pedicellaris*	Bog Willow				S3S4	59	29.4 ± 0.5	NB
P	*Geocaulon lividum*	Northern Comandra				S3S4	20	55.9 ± 1.0	NS
P	*Agalinis neoscotica*	Nova Scotia Agalinis				S3S4	24	83.4 ± 0.01	NB
P	*Limosella australis*	Southern Mudwort				S3S4	26	86.2 ± 0.01	NB
P	*Ulmus americana*	White Elm				S3S4	242	3.3 ± 0.2	NB
P	*Boehmeria cylindrica*	Small-spike False-nettle				S3S4	12	63.6 ± 0.01	NB
P	*Juniperus horizontalis*	Creeping Juniper				S3S4	8	28.7 ± 0.01	NB
P	*Carex capillaris*	Hairlike Sedge				S3S4	24	28.9 ± 0.01	NB
P	*Carex eburnea*	Bristle-leaved Sedge				S3S4	18	30.4 ± 0.2	NB
P	*Carex exilis*	Coastal Sedge				S3S4	111	29.9 ± 0.01	NB
P	*Carex haydenii*	Hayden's Sedge				S3S4	101	28.4 ± 0.01	NB
P	*Carex lupulina*	Hop Sedge				S3S4	101	19.5 ± 5.0	NB
P	*Carex tenera*	Tender Sedge				S3S4	59	3.7 ± 0.5	NB
P	*Carex wiegandii*	Wiegand's Sedge				S3S4	190	23.6 ± 1.0	NB
P	*Carex recta*	Estuary Sedge				S3S4	11	40.8 ± 0.5	NB
P	*Carex atratiformis*	Scabrous Black Sedge				S3S4	1	70.2 ± 0.5	NB
P	*Cladium mariscoides*	Smooth Twigrush				S3S4	17	58.2 ± 0.6	NB
P	*Cyperus dentatus*	Toothed Flatsedge				S3S4	218	32.3 ± 0.01	NB
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S3S4	8	45.5 ± 0.5	NB
P	*Rhynchospora capitellata*	Small-headed Beakrush				S3S4	23	30.3 ± 0.01	NB
P	*Trichophorum clintonii*	Clinton's Clubrush				S3S4	29	31.4 ± 0.01	NB
P	*Bolboschoenus fluviatilis*	River Bulrush				S3S4	63	30.6 ± 0.03	NB
P	*Triglochin gaspensis*	Gaspé Arrowgrass				S3S4	19	33.7 ± 0.1	NB
P	*Lilium canadense*	Canada Lily				S3S4	146	5.4 ± 0.2	NB
P	*Triantha glutinosa*	Sticky False-Asphodel				S3S4	3	45.4 ± 0.5	NB
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	35	2.9 ± 0.2	NB
P	*Liparis loeselii*	Loesel's Twayblade				S3S4	16	35.4 ± 1.0	NB
P	*Neottia cordata*	Heart-leaved Twayblade				S3S4	10	40.9 ± 1.0	NB
P	*Platanthera obtusata*	Blunt-leaved Orchid				S3S4	22	35.4 ± 2.5	NB
P	*Calamagrostis pickeringii*	Pickering's Reed Grass				S3S4	176	36.9 ± 0.01	NB
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S3S4	10	32.8 ± 0.01	NB
P	*Calamagrostis stricta ssp. stricta*	Slim-stemmed Reed Grass				S3S4	5	93.3 ± 0.01	NB
P	*Eragrostis pectinacea*	Tufted Love Grass				S3S4	21	1.9 ± 0.01	NB
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S3S4	8	55.4 ± 0.5	NB
P	*Potamogeton praelongus*	White-stemmed Pondweed				S3S4	11	37.1 ± 0.01	NB
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3S4	41	33.8 ± 0.5	NB
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3S4	195	30.3 ± 0.01	NB
P	*Cryptogramma stelleri*	Steller's Rockbrake				S3S4	3	10.4 ± 0.01	NB
P	*Asplenium viride*	Green Spleenwort				S3S4	25	29.5 ± 0.01	NB
P	*Dryopteris fragrans*	Fragrant Wood Fern				S3S4	84	11.4 ± 1.0	NB
P	*Equisetum palustre*	Marsh Horsetail				S3S4	10	45.2 ± 0.01	NB
P	*Polypodium appalachianum*	Appalachian Polypody				S3S4	36	9.2 ± 0.01	NB
P	*Montia fontana*	Water Blinks				SH	3	69.8 ± 0.25	NS
P	*Solidago caesia*	Blue-stemmed Goldenrod				SX	2	67.6 ± 1.0	NB
P	*Carex swanii*	Swan's Sedge				SX	8	82.8 ± 2.0	NS

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

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3	Clayden, S.R. 2006. Pseudevernia cladonia records. NB Museum. Pers. comm. to S. Blaney, Dec, 4 recs.
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3	Newell, R.E. 2008. Vascular Plants of Muzroll Lake. Pers. comm. to C.S. Blaney, 1 pg. 43 recs.
3	Nova Scotia Department of Lands and Forestry. 2018. Wood Turtle observations in, or near, the cornwallis River watershed. NS DLF, pers. comm. to AC CDC.
3	Nye, T. 2002. Wood Turtle observations in Westmorland, Queens Cos. , Pers. com. to S.H. Gerriets, Dec. 3. 3 recs.
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3	Toner, M. 2001. Lynx Records 1973-2000. NB Dept of Natural Resources, 29 recs.
3	Tremblay, E. 2006. Kouchibouguac National Park Digital Database. Parks Canada, 105 recs.
3	Wallace, S. 2022. Email to Sean Blaney regarding NB DNRED Ranger Wood Turtle sightings from 2021. NB DNRED, 5 records.
3	Watts, Todd. 2021. Todd Watts rare species data 2021. Peskotomakuti First Nation at Skutik, 152 records.
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2	Amirault, D.L. & McKnight, J. 2003. Piping Plover Database 1991-2003. Canadian Wildlife Service, Sackville, unpublished data. 7 recs.
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2	Benjamin, L.K. 2009. NSDNR Fieldwork & Consultants Reports. Nova Scotia Dept Natural Resources, 143 recs.
2	Bishop, G., Bagnell, B.A. 2004. Site Assessment of Musquash Harbour, Nature Conservancy of Canada Property - Preliminary Botanical Survey. B&B Botanical, 12pp.
2	Brown, Constance Lynn. 2023. Wood turtle records for New Brunswick. University of New Brunswick. Pers. comm., 2 records.
2	Canadian Wildlife Service, Dartmouth. 2010. Piping Plover censuses 2007-09, 304 recs.
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2	Connor, Kevin. 2023. Survey123 Black Ash observations. New Brunswick Department of Energy and Resource Development.
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2	Edsall, J. 1992. Summer 1992 Report. New Brunswick Bird Info Line, 2 recs.
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2	NatureServe Canada. 2018. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
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2	Phinney, Lori; Toms, Brad; et. al. 2016. Bank Swallows (Riparia riparia) in Nova Scotia: inventory and assessment of colonies. Merset Tobeiatc Research Institute, 25 recs.
2	Vinson, Neil. 2020. Email - additional Peltigera hydrothyria records, Fundy National Park. Chapman-Lam, Colin J. (ed.) Fundy National Park, 2.
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2	White, S. 2019. Notable species sightings, 2018. East Coast Aquatics.
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1	Anon. Dataset of butterfly records for the Maritime provinces. Museum of Comparative Zoology, Harvard University. 2017.
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1	Belliveau, A.G. E.C. Smith Herbarium Specimen Database 2019. E.C. Smith Herbarium, Acadia University. 2019.
1	Blaney, C.S. 1999. Fieldwork 1999. Atlantic Canada Conservation Data Centre. Sackville NB, 292 recs.
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1	Bredin, K.A. 2000. NB & NS Bog Project, fieldwork. Atlantic Canada Conservation Data Centre, Sackville, 1 rec.
1	Bredin, K.A. 2001. NB Freshwater Mussel Fieldwork. Atlantic Canada Conservation Data Centere, 16 recs.
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1	Brunelle, P.-M. 2005. Wood Turtle observations. Pers. comm. to S.H. Gerriets, 21 Sep. 3 recs, 3 recs.
1	Brunton, Dan. 2022. Record of Isoetes prototypus near Sand Lake, NS. pers. comm.
1	Buchanan, Jean. 2021. Email to Sean Blaney regarding Wood Turtle, Chipman, NB. pers. comm.
1	Cameron, R.P. 2009. Erioderma pedicellatum database, 1979-2008. Dept Environment & Labour, 103 recs.
1	Catling, P.M. 1981. Taxonomy of autumn-flowering Spiranthes species of southern Nova Scotia in Can. J. Bot. , 59:1250-1273. 30 recs.
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1	Clark, R. 2021. Email to S. Blaney, re: Wood Turtle observation from near Hunters Home, Queens Co., NB., May 20 2021. Rosemarie Clark <rsmr_clrk.luvsfam@hotmail.ca>, 1 record.
1	Clavette, A., and others. 2013. Peregrine Falcon nesting information from NatureNB listserv. NatureNB.
1	Clayden, S.R. 2020. Email regarding Blue Felt Lichen (Pectenia plumbea) occurrences in New Brunswick, from Stephen Clayden to Sean Blaney. pers. comm., 2 records.
1	Clayden, S.R. 2020. Email to Sean Blaney regarding Pilophorus cereus and P. fibula at Fidele Lake area, Charlotte County, NB. pers. comm., 2 records.
1	Clayden, S.R. 2022. Email to Sean Blaney regarding Heterodermia squamulosa record in Loch Alva PNA. , 1 record.
1	Cook, K. 2016. Wood Turtle record. Pers comm. to Nova Scotia Department of Lands and Forestry.
1	COSEWIC (Committee on the Status of Wildlife in Canada). 2013. COSEWIC Assessment and Status Report on the Eastern Waterfan Peltigera hydrothyria in Canada. COSEWIC, 46 pp.
1	Crowell, M.J. Plant specimens from Nictaux, NS sent to Sean Blaney for identification. Jacques Whitford Limited. 2005.
1	Dadswell, M.J. 1979. Status Report on Shortnose Sturgeon (Acipenser brevirostrum) in Canada. Committee on the Status of Endangered Wildlife in Canada, 15 pp.
1	DeMerchant, A. 2019. Bank Swallow colony observation. NB Department of Energy and Resource Development, Pers. comm. to J.L. Churchill.
1	Deseta, N. 2021. Email to John Klymko regarding Riparia riparia observations. Nashwaak Watershed Association Inc.

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1	Edsall, J. 1993. Summer 1993 Report. New Brunswick Bird Info Line, 2 recs.
1	Forbes, G.J. 2020. Email regarding a Snapping Turtle (Chelydra serpentina) occurrence in New Brunswick, from Graham Forbes to John Klymko. pers. comm, 1 record.
1	Gautreau-Daigle, H. 2007. Rare plant records from peatland surveys. Coastal Zones Research Institute, Shippagan NB. Pers. comm. to D.M. Mazerolle, 39 recs.
1	Goltz, J.P. 2001. Botany Ramblings April 29-June 30, 2001. N.B. Naturalist, 28 (2): 51-2. 8 recs.
1	Hay, G.U. 1885. Report of Committee on Botany for 1885. Natural History Society of New Brunswick, 42-48.
1	Hill, N. 2014. 2014 Monarch email report, Bridgetown, NS. Fern Hill Institute for Plant Conservation.
1	Hill, N.; Manning, I. 2020. Wild Leek observation, Cornwallis River, NS, floodplain. pers. comm. to J. Churchill.
1	Hill, N.M. 1994. Status report on the Long's bulrush Scirpus longii in Canada. Committee on the Status of Endangered Wildlife in Canada, 7 recs.
1	Hill, N.M., Myra, M. 2017. Email to Sean Blaney regarding rich intervale flora on Nictaux River. Fern Hill Institute, 3 records.
1	Hinds, H.R. 2000. Rare plants of Fundy in Rare Plants of Fundy: maps. Wissink, R. (ed.) Parks Canada, 2 recs.
1	Horace Mouland. 2022. Monarch observation in Wilmot, Nova Scotia. Personal communication, 1 record.
1	Houghton, Andrew. 2021. Email to Sean Blaney re: nesting Snapping Turtle, NB. pers. comm.
1	iNaturalist.ca. 2022. iNaturalist records 2022. iNaturalist.ca (ed.) iNaturalist.org; iNaturalist.ca, Web site: 3 recs.
1	Jessop, B. 2004. Acipenser oxyrinchus locations. Dept of Fisheries & Oceans, Atlantic Region, Pers. comm. to K. Bredin. 1 rec.
1	Kirkland, G.L. Jr. & Schmidt, D.F. 1982. Abundance, habitat, reproduction & morphology of forest-dwelling small mammals of NS & south-eastern NB. Can. Field-Nat., 96(2): 156-162. 1 rec.
1	Kirkland, G.L. Jr., Schmidt, D.F. & Kirkland, C.J. 1979. First record of the long-tailed shrew (Sorex dispar) in New Brunswick. Can. Field-Nat., 93: 195-198. 1 rec.
1	Klymko, J., Sabine, D. 2015. Verification of the occurrence of Bombus affinis (Hymenoptera: Apidae) in New Brunswick, Canada. Journal of and Acadian Entomological Society, 11: 22-25.
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1	LaFlamme, C. 2008. Disovery of Goodyera pubescens at Springdale, NB. Amec Earth and Environmental. Pers. comm. to D.M. Mazerolle, 1 rec.
1	LaPaix, R.W.; Crowell, M.J.; MacDonald, M.; Neily, T.D.; Quinn, G. 2017. Stantec Nova Scotia rare plant records, 2012-2016. Stantec Consulting.
1	Loo, J. & MacDougall, A. 1994. GAP analysis: Summary Report. Fundy Model Forest, 2 recs.
1	MacFarlane, Wayne. 2018. Skunk Cabbage observation on Long Island, Kings Co. NB. Pers. comm., 1 records.
1	MacKinnon, D.S. 2013. Email report of Peregrine Falcon nest E of St. Martins NB. NS Department of Environment and Labour, 1 record.
1	Manning, I. 2020. Peregrine Falcon observation. Pers. comm. to J.L. Churchill.
1	Martin, Alyssa. 2021. Email to Sean Blaney regarding Wood Turtle sighting, NB. pers. comm.
1	Mazerolle, David. 2021. Botanical fieldwork 2019-20200. Parks Canada.
1	McAlpine, D.F. & Collingwood, L. 1989. Rare Salamander Survey in Fundy National Park. Fundy National Park, Internal Documents, 1 rec.
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1	McAlpine, D.F. 1983. Species Record Cards. Fundy National Park, Library, 1 rec.
1	McAlpine, D.F. 2020. Email to John Klymko about Epargyreus clarus record from Grand Bay, NB. Pers. comm.
1	McCorquodale, D. Two specimens of Coccinella novemnotata from New Brunswick. pers. comm. 2022.
1	McIntosh, W. 1904. Supplementary List of the Lepidoptera of New Brunswick. Bulletin of the Natural History Society of New Brunswick, 23: 355-357.
1	McNeil, J.A. 2019. Snapping Turtle records, 2019. Mersey Tobeatic Research Institute.
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1	Munro, Marian C., Newell, R.E, & Hill, Nicholas M. 2014. Nova Scotia Plants. Nova Scotia Provincial Museum of Natural History, Halifax, Nova Scotia, First edition.
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APPENDIX C

List of Bird Species Recorded
in Proximity to the Project Area

Common Name	Scientific Name	Common Name	Scientific Name
Alder flycatcher	*Empidonax alnorum*	Dark-eyed junco	*Junco hyemalis*
American bittern	*Botaurus lentiginosus*	Dickcissel	*Spiza americana*
American black duck	*Anas rubripes*	Downy woodpecker	*Dryobates pubescens*
American crow	*Corvus brachyrhynchos*	Eastern bluebird	*Sialia sialis*
American goldfinch	*Spinus tristis*	Eastern kingbird	*Tyrannus tyrannus*
American kestrel	*Falco sparverius*	Eastern phoebe	*Sayornis phoebe*
American redstart	*Setophaga ruticilla*	Eastern wood-pewee	*Contopus virens*
American robin	*Turdus migratorius*	European starling	*Sturnus vulgaris*
American woodcock	*Scolopax minor*	Evening grosbeak	*Coccothraustes vespertinus*
Bald eagle	*Haliaeetus leucocephalus*	Glossy ibis	*Plegadis falcinellus*
Baltimore oriole	*Icterus galbula*	Golden-crowned kinglet	*Regulus satrapa*
Bank swallow	*Riparia riparia*	Gray catbird	*Dumetella carolinensis*
Barn swallow	*Hirundo rustica*	Gray jay	*Perisoreus canadensis*
Barred owl	*Strix varia*	Great crested flycatcher	*Myiarchus crinitus*
Belted kingfisher	*Megaceryle alcyon*	Greater yellowlegs	*Tringa melanoleuca*
Black-and-white warbler	*Mniotilta varia*	Green-winged teal	*Anas crecca*
Blackburnian warbler	*Setophaga fusca*	Hairy woodpecker	*Dryobates villosus*
Black-capped chickadee	*Poecile atricapillus*	Hermit thrush	*Catharus guttatus*
Black-throated blue warbler	*Setophaga caerulescens*	House finch	*Haemorhous mexicanus*
Black-throated green warbler	*Setophaga virens*	House sparrow	*Passer domesticus*
Blue jay	*Cyanocitta cristata*	Killdeer	*Charadrius vociferus*
Blue-headed vireo	*Vireo solitarius*	Least flycatcher	*Empidonax minimus*
Blue-winged teal	*Spatula discors*	Least sandpiper	*Calidris minutilla*
Bobolink	*Dolichonyx oryzivorus*	Lesser yellowlegs	*Tringa flavipes*
Boreal chickadee	*Poecile hudsonicus*	Lincoln's sparrow	*Melospiza lincolnii*
Broad-winged hawk	*Buteo platypterus*	Magnolia warbler	*Setophaga magnolia*
Brown creeper	*Certhia americana*	Mallard	*Anas platyrhynchos*
Brown thrasher	*Toxostoma rufum*	Merlin	*Falco columbarius*
Brown-headed cowbird	*Molothrus ater*	Mourning dove	*Zenaida macroura*
Canada goose	*Branta canadensis*	Mourning warbler	*Geothlypis philadelphia*
Canada jay	*Perisoreus canadensis*	Nashville warbler	*Leiothlypis ruficapilla*
Canada warbler	*Cardellina canadensis*	Northern waterthrush	*Parkesia noveboracensis*
Canvasback	*Aythya valisineria*	Northern cardinal	*Cardinalis cardinalis*
Cedar waxwing	*Bombycilla cedrorum*	Northern flicker	*Colaptes auratus*
Chestnut-sided warbler	*Setophaga pensylvanica*	Northern harrier	*Circus hudsonius*
Chimney swift	*Chaetura pelagica*	Northern mockingbird	*Mimus polyglottos*
Chipping sparrow	*Spizella passerina*	Northern parula	*Setophaga americana*
Chukar	*Alectoris chukar*	Northern saw-whet owl	*Aegolius acadicus*
Cliff swallow	*Petrochelidon pyrrhonota*	Northern shoveler	*Spatula clypeata*
Common gallinule	*Gallinula galeata*	Olive-sided flycatcher	*Contopus cooperi*
Common grackle	*Quiscalus quiscula*	Ovenbird	*Seiurus aurocapilla*
Common merganser	*Mergus merganser*	Peregrine falcon - anatum/tundrius pop.	*Falco peregrinus*
Common nighthawk	*Chordeiles minor*	Philadelphia vireo	*Vireo philadelphicus*
Common yellowthroat	*Geothlypis trichas*	Pileated woodpecker	*Dryocopus pileatus*

Common Name	Scientific Name	Common Name	Scientific Name
Pine grosbeak	*Pinicola enucleator*	Yellow-bellied sapsucker	*Sphyrapicus varius*
Pine siskin	*Spinus pinus*	Yellow-rumped warbler	*Setophaga coronata*
Pine warbler	*Setophaga pinus*		
Purple finch	*Haemorhous purpureus*		
Purple martin	*Progne subis*		
Red-bellied woodpecker	*Melanerpes carolinus*		
Red-breasted nuthatch	*Sitta canadensis*		
Red-eyed vireo	*Vireo olivaceus*		
Red-shouldered hawk	*Buteo lineatus*		
Red-tailed hawk	*Buteo jamaicensis*		
Red-winged blackbird	*Agelaius phoeniceus*		
Ring-billed gull	*Larus delawarensis*		
Ring-necked pheasant	*Phasianus colchicus*		
Rock pigeon	*Columba livia*		
Rose-breasted grosbeak	*Pheucticus ludovicianus*		
Ruby-crowned kinglet	*Corthylio calendula*		
Ruby-throated hummingbird	*Archilochus colubris*		
Ruffed grouse	*Bonasa umbellus*		
Rusty blackbird	*Euphagus carolinus*		
Savannah sparrow	*Passerculus sandwichensis*		
Song sparrow	*Melospiza melodia*		
Sora	*Porzana carolina*		
Spotted sandpiper	*Actitis macularius*		
Spruce grouse	*Canachites canadensis*		
Swainson's thrush	*Catharus ustulatus*		
Swamp sparrow	*Melospiza georgiana*		
Tennessee warbler	*Leiothlypis peregrina*		
Tree swallow	*Tachycineta bicolor*		
Tufted titmouse	*Baeolophus bicolor*		
Turkey vulture	*Cathartes aura*		
Veery	*Catharus fuscescens*		
Vesper sparrow	*Pooecetes gramineus*		
Warbling vireo	*Vireo gilvus*		
White-breasted nuthatch	*Sitta carolinensis*		
White-throated sparrow	*Zonotrichia albicollis*		
White-winged crossbill	*Loxia leucoptera*		
Wild turkey	*Meleagris gallopavo*		
Willow flycatcher	*Empidonax traillii*		
Wilson's snipe	*Gallinago delicata*		
Wilson's warbler	*Cardellina pusilla*		
Winter wren	*Troglodytes hiemalis*		
Wood thrush	*Hylocichla mustelina*		
Yellow warbler	*Setophaga petechia*		
Yellow-bellied flycatcher	*Empidonax flaviventris*		

APPENDIX D

GHG Emissions Assessment

GEMTEC
www.gemtec.ca

Submitted to:

Town of Sussex
524 Main Street
Sussex, New Brunswick
E4E 3E4

Sussex Flood Mitigation Proposal
Climate Lens Assessment

Town of Sussex, New Brunswick

November 19, 2024
GEMTEC Project: 857.12

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GEMTEC Consulting Engineers and Scientists Limited
124 Greenview Drive,
Hanwell, NB, Canada
E3C 0M7

November 19, 2024 File: 857.12

Town of Sussex
524 Main Street
Sussex, New Brunswick E4E 3E4

Attention: Scott Hatcher, P.Eng. - Chief Administrative Officer

Re: Sussex Flood Mitigation Proposal
Climate Lens Assessment, Town of Sussex, New Brunswick

1.0 INTRODUCTION

A Climate Lens assessment is a requirement of the Disaster Mitigation and Adaptation Fund (DMAF), among others. It has two components: the Green House Gas (GHG) emissions assessment, which will measure the anticipated GHG emissions impact of an infrastructure project, and the climate change resilience assessment, which will employ a risk management approach to anticipate, prevent, withstand, respond to, and recover from a climate change related disruption or impact.

The performance of a GHG mitigation assessment is required for the DMAF Funding Agreement, while the climate change resilience assessment was included in the DMAF funding application.

GEMTEC Consulting Engineers and Scientists Ltd. (GEMTEC) is qualified to conduct this GHG emissions assessment for the Sussex Flood Mitigation Proposal (the Project), in accordance with the methodology outlined by the Government of Canada. This assessment presents the *Equivalent Ex Ante Estimation for scope 1 carbon dioxide emissions (CO2e)*.

Ex Ante estimation involves predicting greenhouse gas (GHG) emissions before a project's development, operation, and actual GHG generation. Scope 1 emissions represent direct GHG emissions originating from sources controlled or owned by the organization, such as fuel combustion in heavy equipment and vehicles.

During the design and construction of the Project, Scope 1 emissions will primarily arise from:

- Site visits for surveying, environmental assessments, inspections, material sampling, etc.
- Mobilization and demobilization of heavy equipment to the site.

- Fuel combustion by heavy equipment on-site during construction.
- Fuel combustion or electricity consumption for worker commuting to and from the site, including gasoline, diesel, or electricity for electric vehicles.
- Fuel combustion resulting from transporting building materials to the site.

After construction of the Project has been completed, emissions associated with the operation and maintenance of the Project will be estimated over the asset's lifespan (100 years). These emissions sources mirror those listed for the construction phase but pertain to repair and maintenance activities, including:

- Fuel combustion resulting from routine and periodic inspection, repairs, and maintenance work.
- Fuel combustion resulting from emergency repairs on-site.

The design team, in consultation with the representatives of Sussex, will incorporate mitigation measures to reduce the Project's GHG emissions. Examples of mitigation measures include:

- Request the contractor to adopt and enforce an anti idling strategy to reduce idling time for construction equipment and vehicles during construction.
- Integrate renewable energy sources on the construction site where possible.
- Encourage construction worker carpooling arrangements.
- Request the contractor to utilize vehicles and equipment with enhanced fuel efficiency.
- Encourage the use of electric/hybrid vehicles instead of gas or diesel for transportation of workers or materials to the project site as part of routine and periodic maintenance.
- Preference for locally sourced materials whenever feasible.
- Use of low-carbon or locally sourced materials for infrastructure repairs (e.g., asphalt, steel, cement, etc.)

2.0 PROJECT DETAILS

2.1 Project Overview

2.1.1 Project Title

Sussex Flood Mitigation Project

2.1.2 Ultimate Recipient

Sussex (formerly the "Town of Sussex" and the "Village of Sussex Corner" prior to amalgamation in 2023).

2.2 Project Description

Extreme climate change-driven flooding in Sussex has caused millions of dollars in damage over the past decade. Sussex commissioned several studies and developed a Regional Flood Risk

Mitigation Plan to alleviate the recurring flooding issues. As an initial step of the Mitigation Plan, a flood berm was constructed along the Kennebecasis River behind the Town's Gateway Mall in 2019, providing flood protection for the northwestern area of the Town during the flood events of December 2020 and February 2024. Flood studies were conducted by GEMTEC in 2022 to estimate flood levels in the Kennebecasis River and its tributaries resulting from a future (projected to the year 2100) 100-year storm event. Without additional flood mitigation measures, it was predicted over 450 properties would be affected by this future flood event. As a result, several different flood control options were evaluated. The results of the study identified the optimum combination of flood mitigation measures, establishing the path forward for further flood prevention measures.

The Flood Mitigation proposal includes the optimum combination of flood mitigation measures, which are also the remaining measures to be implemented as part of the Regional Flood Risk Mitigation Plan. This will include the construction of two channels that will redirect excess floodwater from Parsons Brook and Trout Creek into the Kennebecasis River. By implementing targeted flood mitigation measures, the project aims to significantly decrease the frequency, severity, and extent of flooding along Trout Creek and Parsons Brook. The project seeks to safeguard critical infrastructure, reduce property damage, and minimize disruption to the local population. These efforts are designed to enhance the long-term resilience of Sussex against future flood events.

The key components of the Project include:

- **Parsons Brook Diversion Channel**. A 580 metre channel extending northeast from Parsons Brook near Sussex Corner Elementary School to Trout Creek, with the discharge point located 350 metres upstream of the Post Road Bridge. The channel will pass through recreational greenspace near the school, coming within 100 metres of the building. The closest residence to the channel is 50 metres from the intake structure at the intersection of Dutch Valley Road and New Line Road, with several other homes within 200 metres of the proposal channel.
- **Trout Creek Diversion Channel.** A 1,600 metre channel extending north from Trout Creek near Brown's Paving Ltd. to the floodplain of the Kennebecasis River, east of Aiton Road and north of Route 1. Five homes along Bryant Drive and Canterbury Court are within 200 metres of the channel's southern end, and at Leonard Drive, the channel will be 20 to 30 metres from nearby homes.

Other upgrades associated with the Project include the construction of two bridge/overpass structures on New Brunswick Route 1, construction of a culvert or bridge at Leonard Drive, raising the bridge deck elevation of a section of New Brunswick Route 890 and the adjacent covered bridge, and the addition of minor flow control measures to the storm sewer system downtown Sussex.

2.2.1 Project Location

The proposed Project crosses municipally owned, provincially owned, and privately-owned land. The locations of different project components are shown on Figure 1, Appendix A.

2.3 Project Timeline

Project completion is anticipated within three to five years, pending receipt of all necessary regulatory approvals. Design work to refine project details (e.g. channel size, environmental constraints, exact alignment, bridges type and size) and provide cost-certainty is expected to be completed during 2025. Construction activities for the diversion channels will occur seasonally due to frozen ground in winter and high-water tables during spring. Construction of the bridges on Route 1 will take two seasons and is tentatively scheduled for 2026 and 2027. Raising of the bridges on Route 890 and the construction of the bridge/culverts under Leonard Drive is tentatively scheduled for 2026 or 2027. Construction of the hydraulic control structures at the inlet to both diversion channels is tentatively scheduled for 2026 while the excavation of the diversion channels is tentatively scheduled for 2026 and 2027. Full project commissioning is tentatively scheduled for 2028.

3.0 PROJECT CONSTRUCTION

3.1 Project Construction Phases and Activities

I. Project design
II. Construction a new culvert or bridge at Leonard Drive
III. Raising the bridge deck elevation of a section of New Brunswick Route 890 and the adjacent covered bridge deck of two bridges on Route 890
IV. Overpasses construction on Route1
V. Construction of intake control structures for both diversion channels
VI. Clearing and grubbing
VII. Diversion channels construction

3.2 Identification of Construction GHG Elements

This section provides an overview of the greenhouse gas (GHG) emissions from equipment used throughout the project's design, construction, and maintenance phases. It includes a tabular presentation of the anticipated Scope-1 Emissions associated with each type of equipment at various stages of the project. The main types of GHG elements in this project are:

- Light-duty Vehicles (LDV): This category encompasses sedans and light-duty trucks fueled by gasoline. These vehicles will be utilized across all project stages, transporting personnel to and from the project site and meetings, as well as carrying light equipment and materials.

- Heavy-duty Vehicles and Machinery (HDV&M): This equipment, predominantly diesel-powered, includes excavators, loaders, cranes, and heavy-duty trucks, will be employed during construction and for transporting substantial materials to and from the project site.
- Various Tools and Equipment (T&E): such as chain saws, air compressors, drills, hydraulic jacks, and plate compactors. This equipment is predominantly gasoline-powered and will be used at various stages of the project.
- Mobile Office (MO): a mobile office will be accounted for in each phase of the project.

3.3 Activities and GHG Elements by Construction Phase

3.3.1 Project Design

This phase entails site investigations and preparing engineered design drawings. Site visits and coordination meetings between the design team and the Project's stakeholders will be necessary at this stage. Table 1 presents the sub-tasks, GHG sources, and operation hours or kilometres driven by the GHG sources:

Table 1: Summary of GHG Sources: Project Design

	Task	Sub-task	GHG Source	Operation	
				Hours	Km
Project Design	Engineering Design	Meetings with the town of Sussex	LDV		1220
	Geotechnical Investigation	Site surveys	Backhoe	3	
		Site investigation	LDV		600

3.3.1.1 Leonard Drive Bridge

This phase entails the following tasks, and Table 2 presents the sub-tasks, GHG sources, and operation hours or kilometres driven by the GHG source. It should be noted the final design for the diversion channel crossing has not been selected and could be a culvert or bridge structure. However, it is expected that construction of a bridge will result in higher GHG emissions than the installation of a pre-cast concrete culvert. To be conservative, a bridge structure has been assumed for this crossing:

1. Mobilization and de-mobilization of equipment and site office
2. Traffic diversion
3. Ground preparation
4. Foundation construction
5. Substructure construction
6. Superstructure construction
7. Materials testing
8. Project management and supervision

Table 2: Summary of GHG Sources: Leonard Drive Bridge Construction

	Task	Sub-task	GHG Source	Operation	
				Hours	Km
Constructing a new bridge on Leonard Drive	Mobilization/ Demobilization	Hauling excavator to project location	Transportation Truck		610
		Hauling mobile office to project location	Transportation Truck		400
		Transportation of workers and fuel	LDV		600
	Substrcture construction	Excavation	Excavator	50	
		Backfilling	Excavator	50	
		Compaction	Compactor	10	
		Concrete forming	Truck	20	
		Concrete pouring	Concrete Mixing Truck	24	120
			Concrete pump	24	60
		Concrete testing	LDV		960
	Superstructure construction	Concrete forming	Truck	12	
		Concrete pouring	Concrete Mixing Truck	36	180
			Concrete pump	36	60
			LDV		300
		Paving and marking	Truck	10	
			Roller	10	
			Paver	10	
			LDV		300
		Signage and railing	LDV		300
			Truck	50	
	Material testing	Transporting samples from site to lab	LDV		1280
	Transporting workers and fuel	Workers commute to site	LDV		51200
		Transporting fuel to equipment on site	LDV		150
		Miscelaneous contruction material transportation	LDV		2500
	Erosion protection	Erosion protection work	Truck	40	
			Excavator	20	
	Hydroseeding	Hydroseeding	LDV		600
	Site Supervision	Engineers and supervisors commute to site			12800
		Mobile Office		2880	

3.3.1.2 Raising Bridge Deck Elevation on Route 890 and Adjacent Covered Bridge

This phase entails the following tasks, and Table 3 presents the sub-tasks, GHG sources, and operation hours or kilometres driven by the GHG sources:

1. Mobilization and demobilization of equipment and site office
2. Traffic control plan
3. Removing existing bridge decks
4. Ground preparation
5. Foundation construction
6. Materials testing
7. Reinstating bridge decks
8. Project management and supervision

Table 3: Summary of GHG Sources: Raising Bridge Deck Elevation

	Task	Sub-task	GHG Source	Operation	
				Hours	Km
Raising two bridges on Route 890	Hauling equipment to project location	Hauling excavator to project location	Transportation Truck		610
		Hauling mobile office to project location	Transportation Truck		400
	Construction and supervision personnel travel	Transportation of workers and fuel	LDV		600
	Raising existing superstructure		Jacks and cranes	20	
	Substrcture construction	Filling to new bridge height	Excavator	144	
			Truck	216	
			LDV		600
		Compaction	Compactor	20	
		Concrete forming	Truck	20	
		Concrete pouring	Concrete Mixing Truck	16	
			Concrete pump	16	
		Concrete testing	LDV		320
		Paving and marking	Truck	40	
			Roller	40	
			Paver	40	
			LDV		3000
		Signage and railing	LDV		1000
			Truck	30	
	Material testing	Transporting samples from site to lab	LDV		
	Transporting workers and fuel	Workers commute to site	LDV		62500
		Transporting fuel to equipment on site	LDV		200
	Site Supervision	Engineers and supervisors commute to site	LDV		12500
		Mobile Office		4320	

3.3.1.3 Overpass Construction on Route1

This phase entails the following tasks, and Table 4 presents the sub-tasks, GHG sources, and operation hours or kilometres driven by the GHG sources:

1. Mobilization and demobilization of equipment and site office
2. Prepare a temporary road for traffic diversion
3. Ground preparation
4. Foundation construction
5. Substructure construction
6. Superstructure construction
7. Materials testing
8. Project management and supervision

Table 4: Summary of GHG Sources: Overpass Construction on Route 1

	Task	Sub-task	GHG Source	Operation	
				Hours	Km
Overpasses Construction on Route 1	Hauling equipment to project location	Hauling excavator to project location	Transportation Truck		610
		Hauling mobile office to project location	Transportation Truck		400
	Construction and supervision personnel travel	Transportation of workers and fuel	LDV		600
	Temporary Road Construction	Excavation	Excavator	200	
		Filling	Truck	50	
		Compaction	Compactor	10	
		Paving	Truck	20	
			Roller	5	
			LDV		600
	Substrcture construction	Excavation	Excavator	200	
		Filling	Truck	40	
		Compaction	Compactor	5	
		Concrete forming	Truck	5	
		Concrete pouring	Concrete Mixing Truck	33	
			Concrete pump	33	
		Concrete testing	LDV		1320
	Superstructure construction	Concrete forming	Truck	20	
		Concrete pouring	Concrete Mixing Truck	72	
			Concrete pump	72	
		Concrete testing	LDV		1320
		Paving and marking	Truck	50	
			Roller	50	
			Paver	50	
			LDV		4000
		Signage and railing	LDV		1000
			Truck	30	
	Transporting workers and fuel	Workers commute to site	LDV		50000
		Transporting fuel to equipment on site	LDV		200
	Site Supervision	Engineers and supervisors commute to site	LDV		12500
		Mobile Office		11520	

3.3.1.4 Intake Control Structure at Trout Creek

This phase entails the following tasks, and Table 5 presents the sub-tasks, GHG sources, and operation hours or kilometres driven by the GHG source:

1. Mobilization and demobilization of equipment and site office
2. Prepare the foundation
3. Install framework for concrete
4. Pour concrete
5. Test material
6. Install control gate
7. Project management and supervision

Table 5: Summary of GHG Sources: Intake Control Structure at Trout Creek

	Task	Sub-task	GHG Source	Operation	
				Hours	Km
Building a weir where the proposed first channel meets Trout Creek	Hauling equipment to project location	Hauling excavator to project location	Transportation Truck		610
		Hauling mobile office to project location	Transportation Truck		400
	Construction and supervision personnel travel	Transportation of workers and fuel	LDV		600
	Preparation work	Excavation	Excavator	200	
		Filling	Truck	50	
		Compaction	Compactor	10	
		Concrete form work	Truck	10	
	Concrete pouring	Concrete pouring of pinchers	Concrete Mixing Truck	32	
		Concrete pouring of Weirs	Concrete pump	32	
	Material testing	Material testing	LDV		400
	Transporting workers and fuel	Transportation of workers and fuel	LDV		48000
	Site Supervision	Engineers and supervisors commute to site			
		Mobile Office		1440	

3.3.1.5 Intake Control Structure at Parsons Brook

This phase entails the following tasks, and Table 6 presents the sub-tasks, GHG sources, and operation hours or kilometres driven by the GHG sources:

1. Mobilization and demobilization of equipment and site office
2. Prepare the foundation
3. Install framework for concrete
4. Pour concrete
5. Test material
6. Install control gate
7. Project management and supervision

Table 6: Summary of GHG Sources: Intake Control Structure at Parsons Brook

	Task	Sub-task	GHG Source	Operation	
				Hours	Km
Building a weir where the proposed second channel meets Parsons Brook	Hauling equipment to project location	Hauling excavator to project location	Transportation Truck		610
		Hauling mobile office to project location	Transportation Truck		400
	Construction and supervision personnel travel	Transportation of workers and fuel	LDV		600
	Preparation work	Excavation	Excavator	200	
		Filling	Truck	50	
		Compaction	Compactor	10	
		Concrete form work	Truck	10	
	Concrete pouring	Concrete pouring of	Concrete Mixing	27	
		Concrete pouring of Weirs	Concrete pump	27	
	Material testing	Material testing	LDV		400
	Transporting workers and fuel	Transportation of workers and fuel	LDV		48000
	Site Supervision	Engineers and supervisors commute to site	Mobile Office		
		Mobile Office		1440	

3.3.1.6 Clearing and Grubbing

This phase entails the following tasks and Table 7 presents the sub-tasks, GHG sources, and operation hours or kilometres driven by the GHG sources:

1. Mobilization and demobilization of equipment and site office
2. Surveying and marking the boundaries of the area to be cleared and grubbed for both channels.
3. Vegetation Removal**:** Vegetation such as trees, shrubs, grass, and weeds are cut down or uprooted. Depending on the size and type of vegetation, this will involve using chainsaws or excavators.
4. Debris Removal: Any debris, including rocks, branches, and other organic matter, is to be cleared and removed from the site.
5. Excavation: After clearing and grubbing, the site will be excavated and graded to establish the desired contours and levels.
6. Project management and supervision.

Table 7: Summary of GHG Sources: Clearing and Grubbing

	Task	Sub-task	GHG Source	Operation	
				Hours	Km
Clearing and Grubbing	Hauling equipment to project location	Hauling excavator to project location	Transportation Truck		610
		Hauling mobile office to project location	Transportation Truck		400
	Construction and supervision personnel travel	Transportation of workers and fuel	LDV		600
	Clearing	Clearing site from vegetation	Excavator	1500	
	Hauling	Hauling organic material and debris to recycling location	Truck	123	
	Construction and supervision personnel travel	Transporting workers and fuel	LDV		
	Transporting workers and fuel	Transportation of workers and fuel	LDV		24600
	Site Supervision	Engineers and supervisors commute to site			
		Mobile Office		2880	

3.3.1.7 Diversion Channels Construction

This phase entails the following tasks, and Table 8 presents the sub-tasks, GHG sources, and operation hours or kilometres driven by the GHG sources:

1. Mobilization and demobilization of equipment and site office
2. Excavate the channel to the desired depth
3. Construct a berm along both sides of the channel using the material produced from excavating
4. Construct the channel bottom
5. Project management and supervision

Table 8: Summary of GHG Sources: Diversion Channels Construction

Diversion Channels Construction		Excavation	Excavator	300	
	Channel ground preparation	Grading	Excavator	300	
	Installing Channel bottom cover	Channel bottom cover transportation	Truck	309.9	
		Channel bottom cover installation	Excavator or Crane	1395	
	Transporting workers and fuel	Transportation of workers and fuel	LDV		96000
	Site Supervision	Engineers and supervisors commute to site			
		Mobile Office		5760	

3.4 GHG Emissions

Table 9 presents the equipment type, operating hours or travel kilometres, fuel consumption rate, fuel type, and total fuel consumption associated with the project activities.

Table 9: GHG Emissions: Equipment

Equipment Type	Operation		Consumption Rate		Consumption		
	Hours	Km			Diesel (L)	Gasoline (L)	Electricity (kW)
Backhoe	3		9	L/hr	27		
Excavator	4559		9.16	L/hr	41,756		
Transportation Trucks	6060		17	L/hr	103,020		
Compactor	65		12	L/hr	780		
Truck	1206		16	L/hr	19,294		
Concrete Mixing Truck	239		11	L/hr	2,633		
Concrete pump	240		11	L/hr	2,640		
Roller	105		10	L/hr	1,050		
Paver	100		10	L/hr	1,000		
LDV		418970	10.55	L/100 Km		44,201	
Mobile Office	30240		1.5	kW/hr			45360
Various Tools and equipment	500		1	L/hr		500	
					172,200	**44,201**	**45,360**

Table 10 presents the GHG emissions associated with diesel and gasoline, and the equivalent CO_2 (CO_2e). These emissions factors are based on Canada's official greenhouse gas inventory reports.

The electric power CO_2 emissions factor is determined to be 0.267 kg/kW. This calculation is based on the average electric intensity from the "Average P/T Grid Electricity Emission Intensities for New Brunswick" as outlined in the DMAF Climate Lens Guidance- Version 2.1 document. The presented factor represents the average intensity over the project's construction period.

Table 10: CO_2e Emission Factors: Diesel and Gasoline Fuel

Liquid Fuels	Physical-Based Emission Factors			
	CO_2 (kg/L)	CH_4 (g/L)	N_2O (g/L)	CO_2e (kg/L)
Diesel	2.663	0.133	0.4	2.786
Gasoline	2.307	0.1	0.02	2.315

The GHG emissions are calculated by multiplying the estimated fuel consumption by its emissions factor. The total CO_2e emissions estimated for this project are presented in Table 11.

Table 11: Estimate of Total CO_2e Emissions for the Project

Fuel Type	Consumption	UoM	CO2e emissions factor		CO2e (Tonnes)
Diesel	172,200	Liter	2.786	Kg/L	479.7
Gasoline	44,701	Liter	2.315	Kg/L	103.5
Electricity	45,360	kWh	0.267	Kg/kW	12.1
					595.3

3.5 Notes and Assumptions

Notes and assumptions considered when estimating the emissions for each phase of the project included:

- The emissions in each phase of the project were estimated for the light and heavy-duty vehicles, whereas the emissions from the various tools and equipment and the mobile office were estimated for all phases for work.
- The average fuel consumption for light-duty vehicles such as those contemplated for this Project range between 8.6L/100km for sedans and 12.5 L/100km for trucks, with an average consumption of 10.55L/100km.
- The excavators are considered to have an 18-ton capacity.

4.0 CLOSURE

The ex-ante scope 1 carbon dioxide emissions for the Sussex Flood Mitigation Proposal were estimated at 595.3 tonnes of CO_2e.

<original signed by>

Hans Arisz, M.Sc.E., P.Eng., FCSCE

HA/pb

Enclosures Attachment A Figure 1 Flood Mitigation Measures Overview
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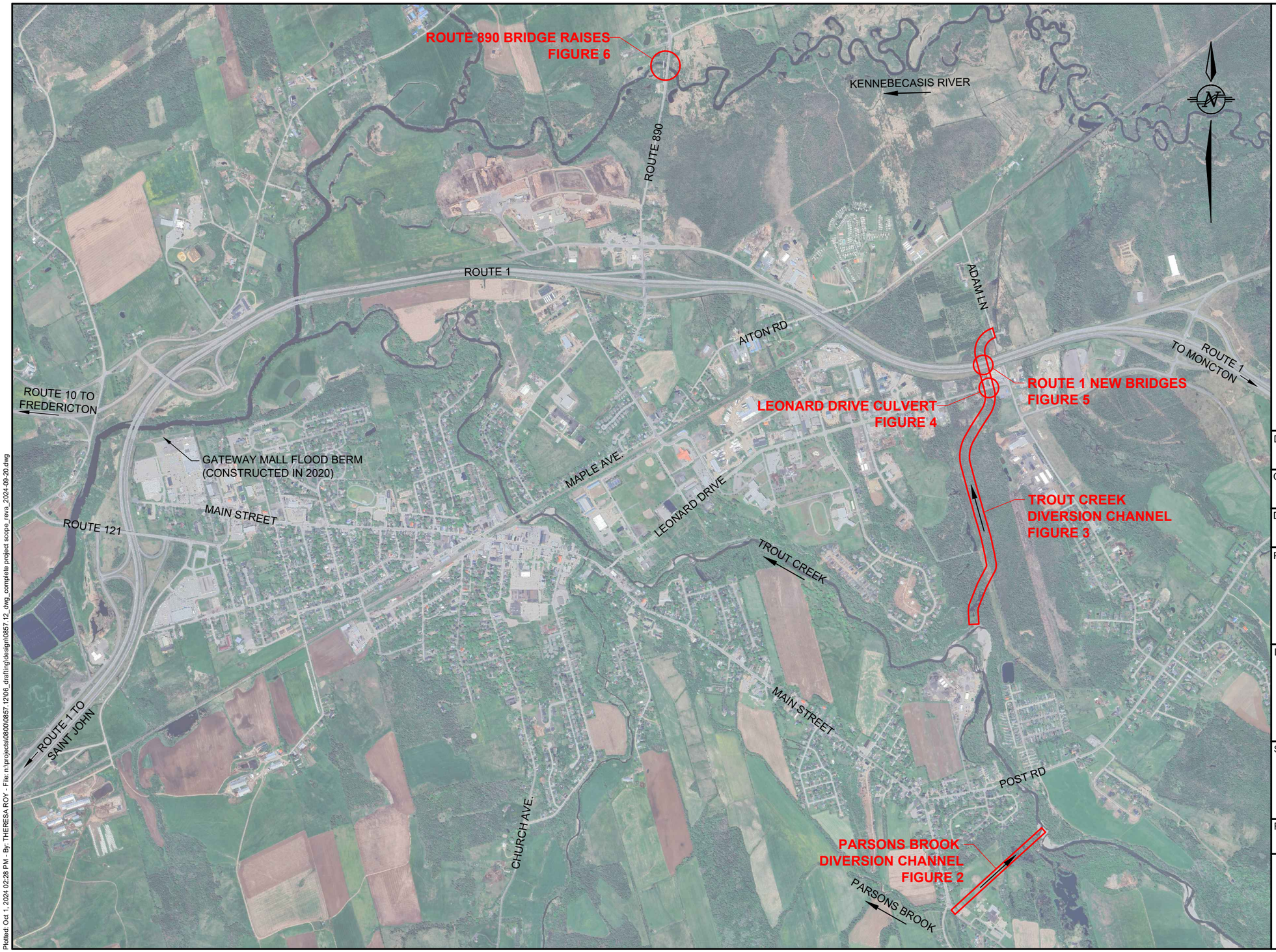
APPENDIX A

Figure 1: Flood Mitigation Measures Overview



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CALCULATIONS BY: --	CHECKED BY: --

DATE: OCTOBER 2024

PROJECT:

SUSSEX FLOOD MITIGATION
PROPOSAL
SUSSEX, NEW BRUNSWICK

DRAWING:

FLOOD MITIGATION
MEASURES
OVERVIEW

SCALE: 1:20000

0 400 800 1200m

FILE NO.: 0857.12	DRAWING: FIGURE 1

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