

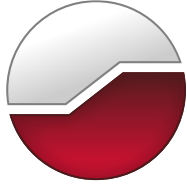


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**Initial Project Description Summary
Sussex Flood Mitigation Proposal
Sussex, New Brunswick**

GEMTEC Project: 0857.12



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Submitted to:

Impact Assessment Agency of Canada -
Atlantic Region
200-1901 Hollis Street
Halifax, NS
B3J 3N4

Initial Project Description Summary Sussex Flood Mitigation Proposal Sussex, New Brunswick

January 9, 2025
GEMTEC Project: 0857.12

1.0 GENERAL INFORMATION

The Municipality of Sussex (Sussex) are proposing a Flood Mitigation Proposal (herein referred to as the “Project”) to alleviate recurring flooding issues that has caused millions of dollars in damage over the past decade and threatens the long-term viability of the community. This will include the construction of two diversion channels to divert flood flows away from the downtown core into the Kennebecasis River, which flows around Sussex to the southwest. The recurring flooding in Sussex has resulted in over \$60 million in damages from six flood events since 2014. The project aims to significantly decrease the frequency, severity, and extent of flooding, ultimately safeguarding critical infrastructure, reducing property damage, and minimizing disruption to the local population. These efforts are designed to enhance the long-term resilience of Sussex against future flood events. The Project Area is shown in Figure 1, with the Project’s proposed layout shown in Figure 2 (see end of document for figures). The Project Area is proposed on various parcels of land owned by a combination of private landowners, corporations, Sussex, and the Province of New Brunswick. The Project is proposed on lands within the Province of New Brunswick with no Federal Crown lands included within the Project Area.

Table 1 Proponent information and project contact

Proponent	Project Contact
Sussex 524 Main Street Sussex, New Brunswick, Canada, E4E 3E4	Scott M. Hatcher, P.Eng. Chief Administrative Officer scott.hatcher@sussex.ca

Project details and submission for general inquiries are available at www.sussex.ca

The development of the larger Regional Flood Risk Mitigation Plan and the subsequent Flood Mitigation Proposal involved extensive consultations with landowners, businesses, government agencies, and Indigenous communities. An initial public meeting was held in March 2022 to gather input. A project description was shared with the Chiefs of all Mi’gmaq and Wolastoqey First Nations including Mi’gmawe’l Tplu’taqnn Incorporated (MTI), which represents eight Mi’gmaq First Nations. MTI requested a Mi’gmaq Rights Impact Assessment (MRIA) to ensure Aboriginal and Treaty rights are considered by the proponent. The proponent met with MTI representatives in July 2024 to discuss archaeological concerns and agreed to have an Indigenous Monitor present during the archaeological assessment. Ongoing communication and cooperation with Indigenous groups, Infrastructure Canada, the New Brunswick Department of Indigenous Affairs, as well as stakeholders and members of the community to ensure all concerns are addressed appropriately.

Studies to quantify the probability and severity of future flood events were commissioned by Sussex following flooding in 2014. Should the Project move forward, construction is anticipated to begin in spring 2026.

1.1 Relevant Regional Studies, Plans and Assessments

No regional assessment relevant to the Project is being or has been carried out under the *Impact Assessment Act* (IAA).

1.2 Strategic Assessments

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.

2.0 FEDERAL IMPACT ASSESSMENT AND PROVINCIAL ENVIRONMENTAL IMPACT ASSESSMENT

2.1 Federal *Impact Assessment Act*

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 m³/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.

Following the submission of the Initial Project Description, the Impact Assessment Agency of Canada (IAAC) will determine whether a federal Impact Assessment is required.

2.2 Provincial *Environmental Impact Assessment Regulation*

The *Environmental Impact Assessment Regulation* (87-83) of the New Brunswick *Clean Environment Act* states that “all projects involving the transfer of water between drainage basins” (87-108) “are designated as [undertakings] that may result in a significant environmental impact” (87-83), thus requiring an Environment Impact Assessment (EIA). Baseline fieldwork surveys in support of provincial EIA registration are currently underway. It is anticipated the EIA registration document will be submitted to the New Brunswick Department of Environment and Local Government (NBDELG) in Q1 of 2025.

2.3 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*.

3.0 PROJECT INFORMATION

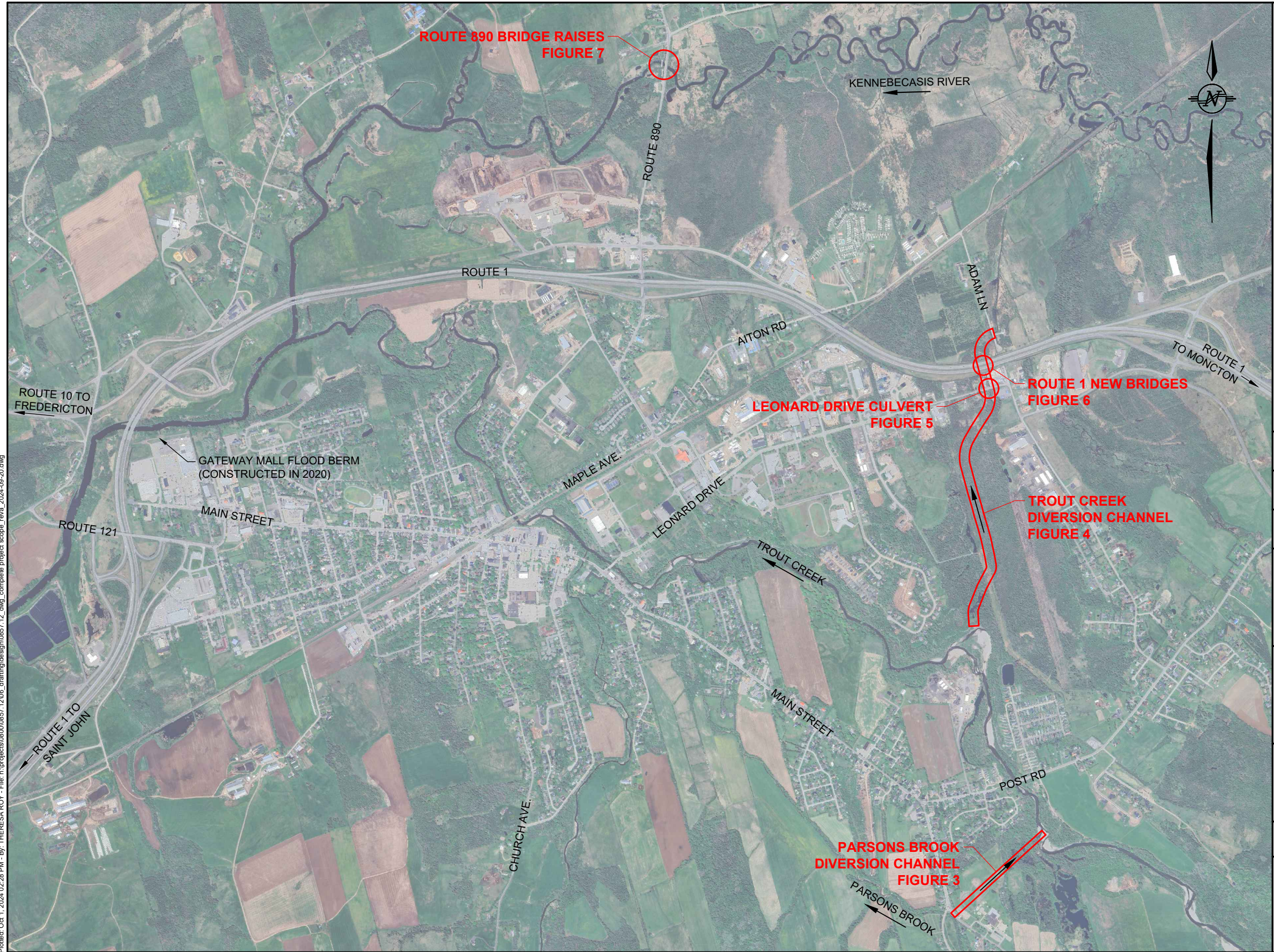
The Project involves the construction and operation of two diversion channels aimed at mitigating flood risks in the downtown core of Sussex. In addition to the two diversion channels, additional infrastructure upgrades that are included as part of the larger Regional Flood Risk Mitigation Plan include:

- Construction of a flood berm around the Meadow Crescent subdivision.
- Construction of a two bridge/overpass structures on New Brunswick Route 1 (eastbound and westbound) where the highway intersects with a proposed diversion channel.
- Construction of a culvert or bridge at Leonard Drive where the roadway intersects with diversion channel.
- Raising 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.

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.

3.1 Activities, Infrastructure, Structures and Physical 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 (Figure 1). The Parsons Brook diversion channel will divert flood flows from Parsons Brook into Trout Creek, while the Trout Creek diversion channel will divert flows from Trout Creek into the floodplain of the Kennebecasis River. To address elevated water levels in the Kennebecasis River during flooding events, two bridge decks will need to be raised.



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DATE
OCTOBER 2024

PROJECT
TOWN OF SUSSEX
SUSSEX, NB

DRAWING
AREA OF INTEREST
OVERALL MAP

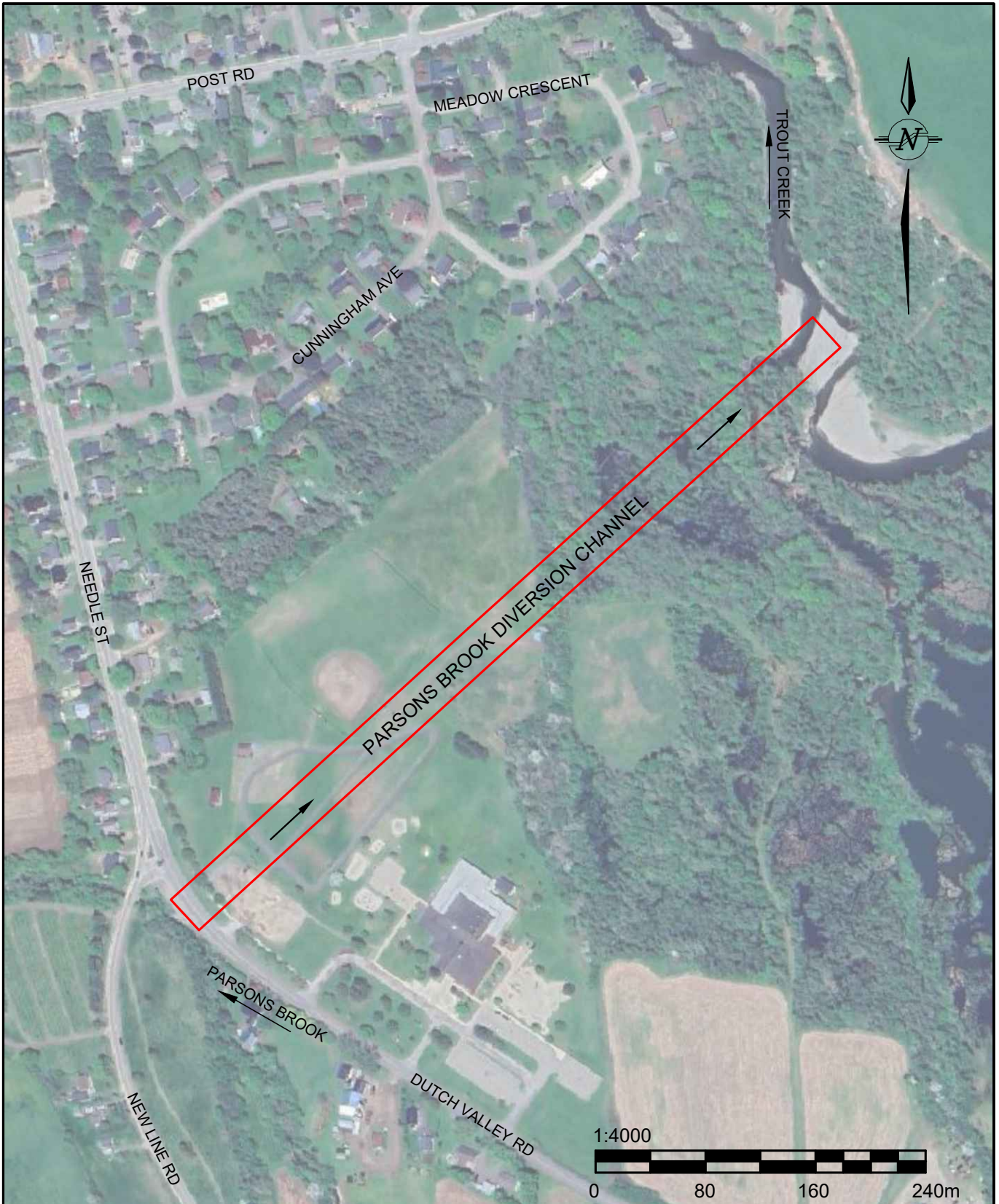
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FILE NO. 0857.12 DRAWING FIGURE 1




3.1.1 Parsons Brook Diversion Channel

The Parsons Brook diversion channel will be designed to accommodate flows of up to 60 m³/s. The channel will be approximately 580 m long, extending in a north easterly direction from Parsons Brook. The discharge point into Trout Creek will be located approximately 350 m upstream of the Post Road Bridge (Figure 2). 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 existing 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.



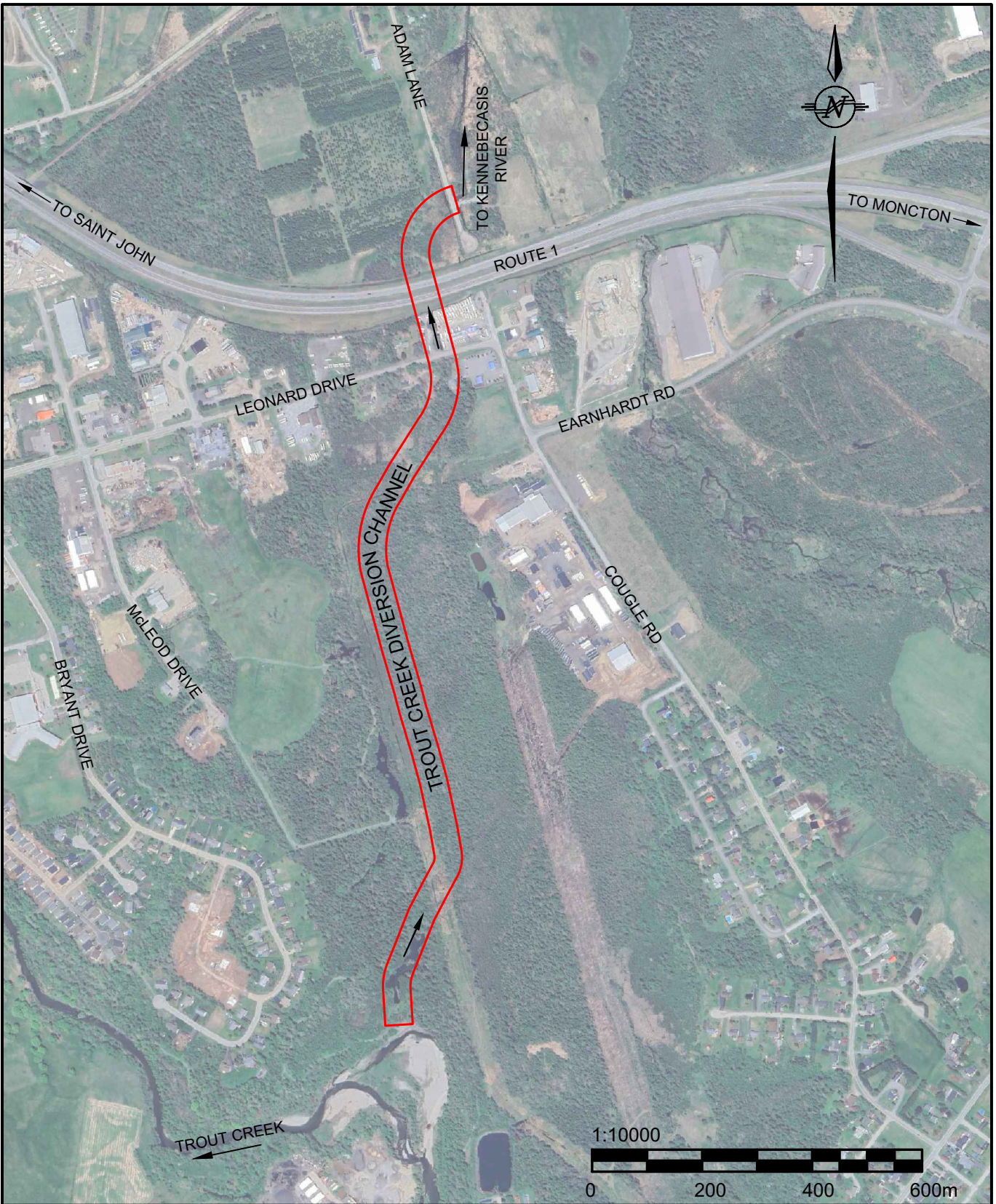
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PROJECT		DRAWING			 GEMTEC CONSULTING ENGINEERS AND SCIENTISTS
TOWN OF SUSSEX SUSSEX, NB		PARSONS BROOK DIVERSION CHANNEL			
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3.1.2 Trout Creek Diversion Channel

The Trout Creek diversion channel will be designed to accommodate flows of up to 220 m³/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 (Figure 3). 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 existing 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.

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PROJECT
TOWN OF SUSSEX
SUSSEX, NB

DRAWING
TROUT CREEK
DIVERSION CHANNEL

DRAWN BY
TLR

DATE
OCT. 2024

FILE NO.
0857.12

DRAWING NO.
FIGURE 3

REVISION NO.
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3.1.3 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. A 0.6 m increase in elevation is expected for both bridge decks. 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.

3.2 Environmental Studies

The following environmental studies have been completed or are planned as part of the baseline assessments to characterize the existing conditions of the Project's environment:

- Hydrology
- Hydrogeology
- Wetland Delineation and Functional Assessment
- Rare Plant and Vegetation Survey
- Breeding Bird Survey
- Fish and Fish Habitat Assessment
- Species at Risk (SAR) / Species of Conservation Concern (SOCC) screening
- Heritage and Archaeological Assessment

3.3 Construction Schedule and Project Lifecycle

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.

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

Project activities expected during the operations 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.

Both raised bridges will be refurbished or replaced as per the infrastructure renewal policies of New Brunswick Department of Transportation and Infrastructure (NB DTI) and the remaining service life of both bridges is estimated at approximately 60 years.

4.0 ALTERNATIVES

The alternative options considered for managing flood risks instead of building diversion channels were:

- **Building an upstream dam** to create a reservoir that could store excess floodwaters
- **Installing underground pipes** to channel floodwaters through the area
- **Constructing flood berms** along Trout Creek through the downtown core to contain the flood waters.

After evaluating these options, the decision was made to proceed with flood diversion channels as the preferred solution due to feasibility and cost efficiency. The following five scenarios were explored as potential solutions for managing flood risks in Sussex.

- **Scenario 1:** Create a large channel to divert flow from Trout Creek flow to the Kennebecasis River, drastically reducing the number of flooded properties by 57%. However, the channel's size and cost were impractical, and the high-water levels elsewhere in Sussex remain unchanged.

- **Scenario 2:** Create diversion channels for both Trout Creek and Parsons Brook to reduce the flooded properties by 65%. The channel sizes are manageable, but flood levels increase in a specific area between the Parsons Brook diversion channel outlet and the Trout Creek diversion channel intake, slightly worsening conditions for some properties.
- **Scenario 3:** Similar to Scenario 2 but with smaller flow limits. Flooded properties decrease by 71%, though the channel specifications are slightly larger. As in Scenario 2, some areas near the outlets see increased flooding.
- **Scenario 4:** A simpler option with a single channel carrying 54% of Trout Creek’s flow to the Kennebecasis River. Flood damage decreases by only 27%, making it less cost-effective despite lower construction expenses.
- **Scenario 5:** Similar to Scenario 2 but this approach adds low-cost flow control measures downtown, improving flood protection further. Flooded properties drop by 75%, offering the best return on investment. However, it still causes increased flooding in the same problematic area as Scenarios 2 and 3.

Each scenario balances costs, benefits, and challenges, with Scenario 5 offering the highest return on investment.

5.0 PROJECT LOCATION INFORMATION

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. The proposed Project crosses municipally owned, provincially owned, and privately owned land. There are no water lots required for Project implementation.

The Project Area is spans multiple parcels of land owned by private landowners, corporations, Sussex, and the Province of New Brunswick. Sussex has been consulting with private landowners to discuss easements on their property. The geographic coordinates of the Project components are presented in Table 2.

Table 2 Project component locations

Location	Latitude	Longitude
Parsons Brook Diversion Channel Intake Control Structure	45.705995	-65.479529
Parsons Brook Diversion Channel Discharge	45.709643	-65.473646
Trout Creek Diversion Channel Intake Control Structure	45.719109	-65.477649
Trout Creek Diversion Channel Discharge	45.732685	-65.476435
Route 890 Bridge	45.745172	-65.497799

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.

6.0 ENVIRONMENTAL FEATURES

6.1 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 at the northern limit of the town boundary. Parsons Brook, a smaller tributary, feeds directly into Trout Creek southeast of the downtown core. 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 km² drainage area. The mean monthly discharge is 25.9 m³/s, with a minimum monthly mean discharge of 1.93 m³/s (August 1965) and a maximum monthly mean discharge of 114 m³/s (February 1981).

6.2 Hydrogeology

The hydrogeological (groundwater) conditions in Sussex, New Brunswick, are influenced by the region's geology, which includes sedimentary rocks such as sandstone and shale, along with unconsolidated materials like gravel, sand, and till. Groundwater flows through fractures in the bedrock and permeable layers of these loose materials, which act as natural aquifers, storing and transmitting water underground.

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.

6.3 Ecological Environment

A preliminary desktop review of rare and endangered plant and animal 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 as well as results from additional desktop analyses are summarized in the following sub-sections.

6.3.1 Vegetation

The ACCDC report identified 27 plant species within 5 km of the Project Area. Two of these species are considered SAR under this assessment. These include Butternut (*Juglans cinerea*), observed along Trout Creek, approximately 2 km upstream of the proposed Parsons Brook diversion channel outlet, and along the section of Trout Creek between the two proposed diversion channels, and Black Ash (*Fraxinus nigra*), observed along Trout Creek, approximately 2 km upstream of the proposed Parsons Brook diversion channel outlet.

The remaining 25 plant species identified in the ACCDC report are considered to be SOCC; however, they are not listed under COSEWIC, SARA, or NBSAR. All plant species are presented in an appendix of the IPD.

6.3.2 Wildlife and Wildlife Habitat

The ACCDC report lists 14 animal species as occurring within the 5 km radius; 14 of which are considered SAR (i.e. listed under COSEWIC, SAR, and/or NBSAR). This includes:

- Bank swallow (*Riparioa riparia*)

- Barn swallow (*Hirundo rustica*)
- Bobolink (*Dolichonyx oryzivorus*)
- Canada warbler (*Cardellina canadensis*)
- Chimney swift (*Chaetura pelagica*)
- Common nighthawk (*Chordeiles minor*)
- Cougar - Eastern population (*Puma concolor* pop. 1)
- Eastern wood-pewee (*Contopus virens*)
- Evening grosbeak (*Coccothraustes vespertinus*)
- Grey wolf (*Canis lupus*)
- Lesser yellowlegs (*Tringa flavipes*)
- Monarch (*Danaus plexippus*)
- Olive-sided flycatcher (*Contopus cooperi*)
- Rusty blackbird (*Euphagus carolinus*)
- Wood thrush (*Hylocichla mustelina*)
- Yellow-banded bumble bee (*Bombus terricola*)

In addition to the SAR, the ACCDC report lists three location sensitive species that are known within the 5 km of the Project Area. The species listed in the ACCDC report include:

- Bald eagle (*Haliaeetus leucocphalus*)
- Wood turtle (*Glyptemys insculpta*)
- Snapping turtle (*Chelydra serpentina*)

6.3.3 Fish and Fish Habitat

The Kennebecasis River Watershed is part of the larger Saint John River Basin, covering an area of about 2,146 km². The lower section of the Kennebecasis River mostly has flat water, followed by areas with fast-moving water and deeper pools. The riverbed is mainly made up of sand, with gravel, rubble, and smaller particles like silt. Bedrock, boulders, and rock make up less than 5% of the substrate.

Water quality assessments have been previously conducted by local environmental organizations in the Kennebecasis River at Salmon Covered Bridge, showing that this stretch of the river provides suitable habitat for fish species such as Brook trout (*Salvelinus fontinalis*), with temperature and dissolved oxygen (DO) generally falling in the optimal range for the species. Turbidity levels are low, indicating that the water is clear enough for healthy fish life. However, phosphorus levels are higher than ideal, which can lead to nutrient overload, causing excessive algae growth and potentially disrupting fish habitat. This elevated phosphorus is primarily due to runoff from nearby agricultural and industrial activities, as well as pollutants introduced during flood events.

Trout Creek is characterized by fast-moving water, which transports water and substrate downstream. The creek has a mix of run habitats, riffles, and pools, with the substrate mainly composed of gravel, rubble, and sand.

Regular water quality monitoring by local environmental organizations in Trout Creek has revealed that this area is impacted by urban and agricultural runoff but generally meets the required DO levels for Brook trout.

A screening of fish species was conducted using publicly available information. The full list of fish species occurring in the Kennebecasis River Watershed is included in the IPD, while the fish SAR include:

- American eel (*Anguilla rostrata*)
- Atlantic salmon (*Salmo salar*)
- Atlantic sturgeon (*Acipenser oxyrinchus*)
- Shortnose sturgeon (*Acipenser brevirostrum*)
- Striped bass (*Morone saxatilis*)

6.3.4 Migratory Birds

A search of publicly available databases revealed a total of 136 recorded bird species in the Project Area. The full list of bird species observed in proximity to the Project Area are presented in an appendix of the IPD. The migratory bird screening did not reveal any additional SAR observations that were not captured in the ACCDC report and presented above. The screening, however, allowed for an approximation of the distance from the recorded observation to the Project Area, with records of Bald eagle and Rusty blackbird in close proximity (~500 m).

Forest and Wetland layers from NRED were analyzed to assess the area's potential to support bird habitat. The Project Area encompasses various environments that could provide habitat for migratory birds, including:

- Hardwood forest
- Softwood forest
- Mixedwood forest
- Forested wetland

These environments have the ecological components to house various SAR including Canada warbler, Bald eagle, Barn swallow, Eastern whip-poor-will (*Antrostomus vociferus*), Eastern wood-pewee, Evening grosbeak, Olive-sided flycatcher, and Rusty blackbird.

7.0 POTENTIAL EFFECTS OF THE PROJECT

7.1 Changes to Environmental Components

7.1.1 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 ensuring natural maintenance flows supporting the existing environment will not be affected. During flows more than a 20-year return period, there is the potential for effects on fish and fish habitat. Table 3 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 3 Preliminary list of changes to fish and fish habitat¹

Source of Potential Effect	Project Phase	Potential Changes to Environment	Area of Influence	Proposed Mitigations
<ul style="list-style-type: none"> Dewatering during construction of intake control structures 	<ul style="list-style-type: none"> Construction 	<ul style="list-style-type: none"> Temporary removal of fish habitat Altered flows in Trout Creek and Parsons Brooks once areas are isolated 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> 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.
<ul style="list-style-type: none"> Introduction of invasive species through the use of machinery and other equipment during excavation 	<ul style="list-style-type: none"> Construction 	<ul style="list-style-type: none"> Introduction of aquatic invasive species could adversely impact the native species (e.g. zebra mussels could alter water quality and substrate composition) 	<ul style="list-style-type: none"> Kennebecasis River Watershed (potentially the broader Saint John River watershed) 	<ul style="list-style-type: none"> The use of construction equipment will follow the <i>Clean Equipment Protocol for Industry</i>.
<ul style="list-style-type: none"> The release of sediment due to erosion of soils from construction areas including the intake control structures and channel excavation. 	<ul style="list-style-type: none"> Construction 	<ul style="list-style-type: none"> Degradation in the quality of fish habitat and/or fish mortality 	<ul style="list-style-type: none"> Trout Creek downstream of the intake control structure and the Kennebecasis River floodplain down stream of the Trout Creek diversion channel. 	<ul style="list-style-type: none"> 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.
<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> Operation 	<ul style="list-style-type: none"> Degradation in the quality of fish habitat and/or fish mortality 	<ul style="list-style-type: none"> 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. 	<ul style="list-style-type: none"> 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.
<ul style="list-style-type: none"> Altered flows when diversion channels are operating 	<ul style="list-style-type: none"> Operation 	<ul style="list-style-type: none"> Operation of the diversion channels could alter the natural flow regime resulting in disturbance to fish habitat 	<ul style="list-style-type: none"> Parsons Brook, Trout Creek, and the Kennebecasis River. 	<ul style="list-style-type: none"> 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.
<ul style="list-style-type: none"> Change in flow conditions in the diversion channels during and following flood events 	<ul style="list-style-type: none"> Operation 	<ul style="list-style-type: none"> The change in flow conditions could leave fish stranded in dry spots or small deoxygenated pools of water leading to mortality. 	<ul style="list-style-type: none"> Parsons Brook Diversion Channel, Trout Creek Diversion Channel 	<ul style="list-style-type: none"> 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*

7.1.2 Wetlands

According to provincial wetland mapping, the proposed Parsons Brook and Trout Creek diversion channels intersect wetland areas. 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.

7.1.3 Migratory Birds

The Project has the potential to affect migratory birds through various pathways. Construction activities, such as vegetation clearing, could disturb breeding and nesting birds, while excessive noise and light may disrupt their communication, navigation, and feeding behaviors. Additionally, the reduction of floodplain areas, which migratory birds rely on for feeding and nesting, could impact their habitat. Table 4 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 4 Preliminary list of changes to migratory birds¹

Source of Potential Effect	Project Phase	Potential Changes to Environment	Area of Influence	Proposed Mitigations
<ul style="list-style-type: none"> Tree clearing at proposed diversion channel locations and associated infrastructure 	<ul style="list-style-type: none"> Construction 	<ul style="list-style-type: none"> Removal of migratory bird habitat Direct mortality to nesting birds 	<ul style="list-style-type: none"> Within the Project footprint 	<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Noise and light from construction equipment 	<ul style="list-style-type: none"> Construction 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Within the Project footprint 	<ul style="list-style-type: none"> 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)
<ul style="list-style-type: none"> Stockpiling of soil during excavation 	<ul style="list-style-type: none"> Construction 	<ul style="list-style-type: none"> 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 	<ul style="list-style-type: none"> Within the Project footprint 	<ul style="list-style-type: none"> 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
<ul style="list-style-type: none"> Floodplain alteration 	<ul style="list-style-type: none"> Operation 	<ul style="list-style-type: none"> The altered floodplain will prevent natural flooding, which migratory birds utilize to access feeding and nesting grounds 	<ul style="list-style-type: none"> Sussex region, riparian zones of Trout Creek 	<ul style="list-style-type: none"> 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*

7.2 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*.

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.

7.3 Indigenous/Cultural Considerations

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.

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.

7.4 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. 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. The total project Green House Gas emissions are estimated at 595.3 tonnes of CO₂e. This estimate compares well against the measured consumption of diesel,

gasoline and electricity during the construction of large bridge projects. A detailed report showing the carbon footprint (as tonnes of eCO₂) of construction activities, material quantities, material sources and trucking, and construction labour is presented in an appendix of the IPD.

7.5 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. 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.

To address these risks, standard dust control measures, such as water suppression and proper waste handling, will be implemented to minimize air quality impacts. Equipment will be kept in good working condition, inspected daily for leaks, and idling time will be minimized where possible to reduce emissions. ESC measures such as straw bales and silt fencing will stabilize disturbed areas to prevent a release of sediment off-site. Spill response plans, including on-site spill kits and proper waste disposal will be prepared in the case of accidental spills.

8.0 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. 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 sent 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

A funding application to Housing, Infrastructure and Communities 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.

9.0 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.

A high-level project description was sent directly from Sussex to the Chiefs of all Mi'gmaq and Wolastoqey First Nations. MTI and Wolastoqey Nation of New Brunswick (WNNB) Personnel, Individual First Nation Consultation Coordinators and the New Brunswick Department of Indigenous Affairs (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 (Tjipōgtōtjg)
- 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 shared the project description alongside Elsipogotog First Nation. Peskotomuhkati at Skutik First Nation was also notified independently.

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 between Sussex and MTI representatives emphasized the need to address archaeological concerns due to the extensive earthwork component of the project. In response, GEMTEC has hired an Indigenous Monitor who will participate in the archaeological fieldwork. Additionally, MTI was provided a draft of the IPD. Feedback on the IPD is pending.

Sussex is 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 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

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.

10.0 NEXT STEPS

The next steps for the Project involve continuing field studies and analysis to assess the potential environmental and socio-economic impacts. Ongoing consultation with Indigenous communities, stakeholders, and relevant authorities will continue as it is an essential part of the environmental review process.

Following the submission of the Initial Project Description, IAAC will determine whether a federal Impact Assessment is required.

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structural	structures
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