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ENGINEERING SERVICES D'INGÉNIERIE

Environmental Impact Assessment

Our File No.: 309-21-C
July 29, 2022

Inkerman Multi-use Bridge Reconstruction
Inkerman, New Brunswick

Prepared for:

New Nouveau Brunswick CANADA

New Brunswick Department of Transportation and Infrastructure

Prepared by:

ROY CONSULTANTS

July 29, 2022

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Our File No.: 309-21-C[1]

Dear Sir:

Subject: Environmental Impact Assessment
Inkerman Multi-Use Bridge, Inkerman, NB

We are pleased to present you with this report for the aforementioned study subject.

We sincerely thank you for your business and we trust this report is to your entire satisfaction. However, should you have any questions or comments, or should you require further assistance, please do not hesitate to contact the undersigned.

Yours truly,

Jon Burtt, EP
Environmental Specialist

JB/sl

Enc.

[1] Ref.: "Y:\2021\309-21_Inkerman Bridge EIA - JB\C\Report\309-21 Inkerman Bridge EIA_July29,2022.docx"

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EXECUTIVE SUMMARY

The New Brunswick Department of Transportation and Infrastructure (NBDTI) is proposing to rebuild the Inkerman Multi-use Bridge after it was destroyed by fire in September 2017. Before it was destroyed, the bridge served as a crossing for pedestrians, cyclists, snowmobilers and all-terrain vehicle users, avoiding potential unsafe interactions with automobile traffic on nearby Route 113. NBDTI is proposing to replace the former wooden bridge with a new, multiple-span steel structure placed on concrete abutments. The new structure will ensure continued marine navigation through the channel and provide a safe river crossing for multiple user groups. The bridge is also part of the new Véloroute de la Péninsule Acadienne, a regional multi-use trail system contributing to tourism on the Acadian Peninsula.

Photo No. 1: Inkerman Bridge (2018)

As per item i of Schedule A of the *Environmental Impact Assessment* (EIA) *Regulation* "all causeways and multiple-span bridges" must undergo review to identify and**,** if necessary, mitigate, potential environmental impacts. Based on the environmental impact assessment, which included an archaeological field survey and an underwater benthic habitat survey, and taking into account proposed mitigation measures, no significant adverse environmental impacts were identified for the proposed project.

1 THE PROPONENT

1.1 Proponent Name

The proponent is the New Brunswick Department of Transportation and Infrastructure (NBDTI).

1.2 Proponent Address

New Brunswick Department of Transportation and Infrastructure (NBDTI)
Buildings Division
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1.3 NBDTI Contact

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1.4 Principal Contact for the Purpose of the Environmental Impact Assessment

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1.5 Property Ownership

The project is located on provincial Crown Land owned by the New Brunswick Department of Natural Resources and Energy (NBDNRE), per SNB Planet.

2 THE UNDERTAKING

2.1 Name of the Undertaking

The name of the undertaking is the *Inkerman Multi-use Bridge Reconstruction*.

2.2 Background

In September 2017, the Inkerman Walking Bridge, a wooden bridge on creosote-treated wooden piles which crossed the Pokemouche River at Inkerman, was destroyed by fire. The bridge served as a river crossing for pedestrians, cyclists, snowmobilers and all-terrain vehicle (ATV) owners, and avoided unsafe interactions with automobiles on the nearby Route 113 bridge. Based on the local demand for a replacement bridge and the potential risk to public safety, NBDTI is proposing to reconstruct the bridge with a new, multiple-span steel and concrete structure. The new structure will be part of the regional multi-use trail system contributing to local tourism (Véloroute de la Péninsule acadienne), will provide navigation for watercraft on the river, and a safe crossing for users.

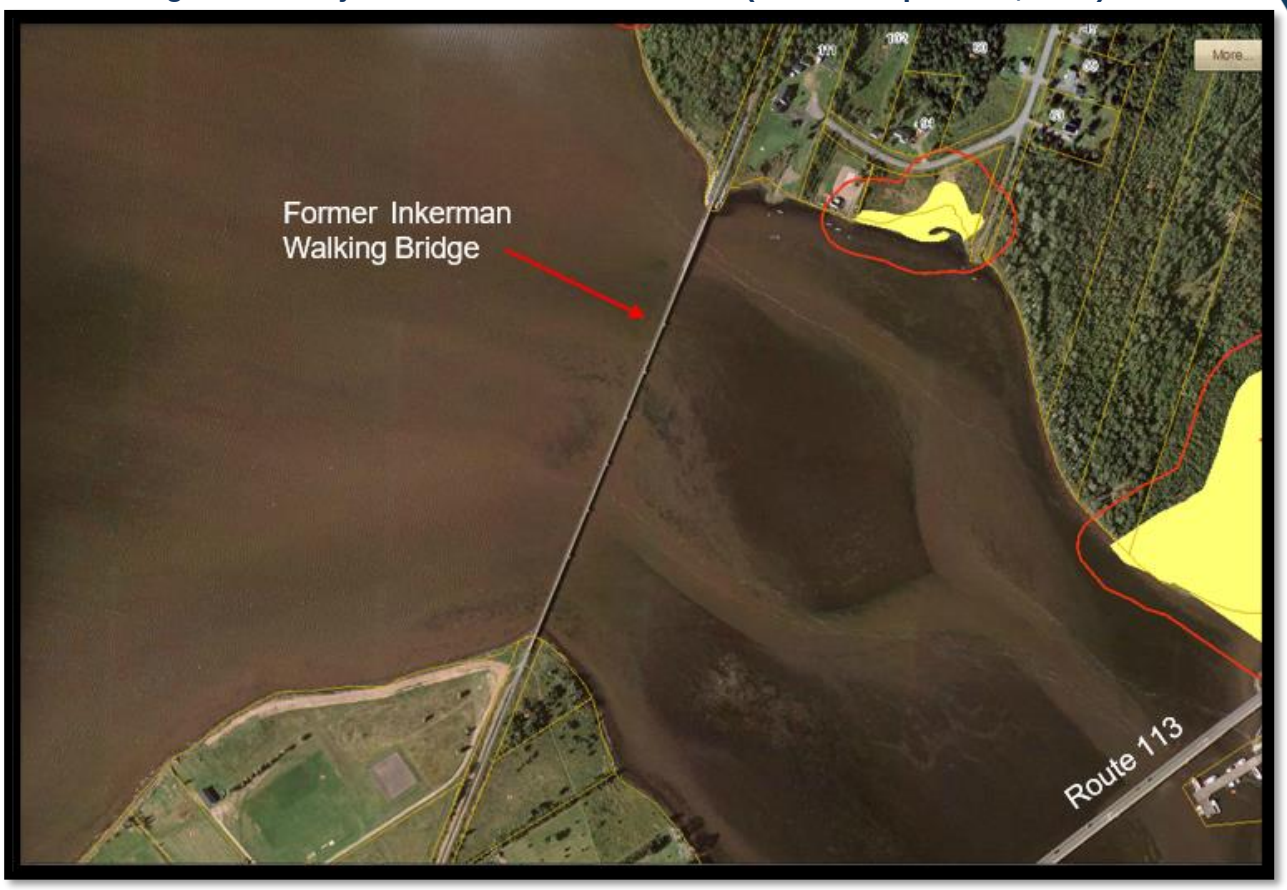
2.3 Project Overview

NBDTI is conducting an environmental impact assessment (EIA) of the proposed reconstruction of the Inkerman Multi-use Bridge, as required by the New Brunswick *Environmental Impact Assessment Regulation* to determine the potential environmental impacts from the proposed project. The project will include the construction of a new multiple-span steel bridge on concrete abutments, which will ensure safe passage through the navigation channel as well as provide a safe crossing for users.

The proposed structure will be built in the same alignment and general footprint as the former wooden structure and will consist of 11 spans. The spans will vary in length between approximately 36 metres and 42 metres and be placed atop reinforced concrete pier caps, which will in turn be placed on rock-socketed piles. Existing piers or piles will be avoided wherever possible.

The scope of this environmental impact assessment includes the footprint of the bridge, the upland approaches at each end (including construction laydown areas) and fish habitat (up- and downstream) in proximity to the project development area (PDA).

Figure A: Subject Site Prior to Destruction (GeoNB MapViewer, 2018)



2.4 Purpose, Rationale and Need for the Undertaking

The Inkerman Walking Bridge served multiple roles in the Inkerman community. It provided snowmobilers and ATV owners a safe crossing of the Pokemouche River at Inkerman during winter months. In the summertime, pedestrians and cyclists used the bridge to link to the larger Véloroute de la Péninsule acadienne system, a trail system linking Acadian Peninsula communities for cycling, hiking, ATV and snowmobile tourism.

At present, the community uses the nearby Route 113 bridge to cross the Pokemouche River. In addition to reinstating the bridge for multiple users, the reconstruction of the bridge will most importantly prevent potential unsafe interactions on the Route 113 bridge between pedestrians and other users, with motor vehicles.

Photo No. 2: Route 113 Bridge (GoogleEarth©)

2.5 Project Location

The proposed project spans the Pokemouche River, in the community of Inkerman, parish of Inkerman, in Gloucester County, New Brunswick. The northeastern and southwestern approaches consist of one linear parcel of land owned by the New Brunswick Department of Natural Resources and Energy (NBDNRE), identified by Service New Brunswick's PID No. 20478673. This parcel is the former Canadian National Railway right-of-way (ROW), which has been converted into a multi-use trail, part of the Sentier NB Trail system. The centre of the site is geo-referenced at LAT 47°40'32.95"N, LONG 64°49'09.04"W.

The parcel is located within the Acadian Peninsula Regional Service Commission (RSC No. 4)'s planning area. No zoning plan is available for Inkerman. Refer to Figures B and C for the project location and Figure D for a view of area property parcels.

The Pokemouche River widens immediately upstream of the bridge site and is known as Lac Inkerman. Approximately 600 metres downstream of the site, Route 113 crosses the river, which then becomes Pokemouche Bay, which connects to the Northumberland Strait via the Pokemouche Gully.

Construction laydown and staging will take place on PID 20445532 on the southwestern end of the bridge. Per SNB, this parcel is owned by the Inkerman Recreation Council Inc., and NBDTI will obtain landowner permission prior to using this area for the project.

Figure B: Project Location (Red Star) (GeoNB, 2022)

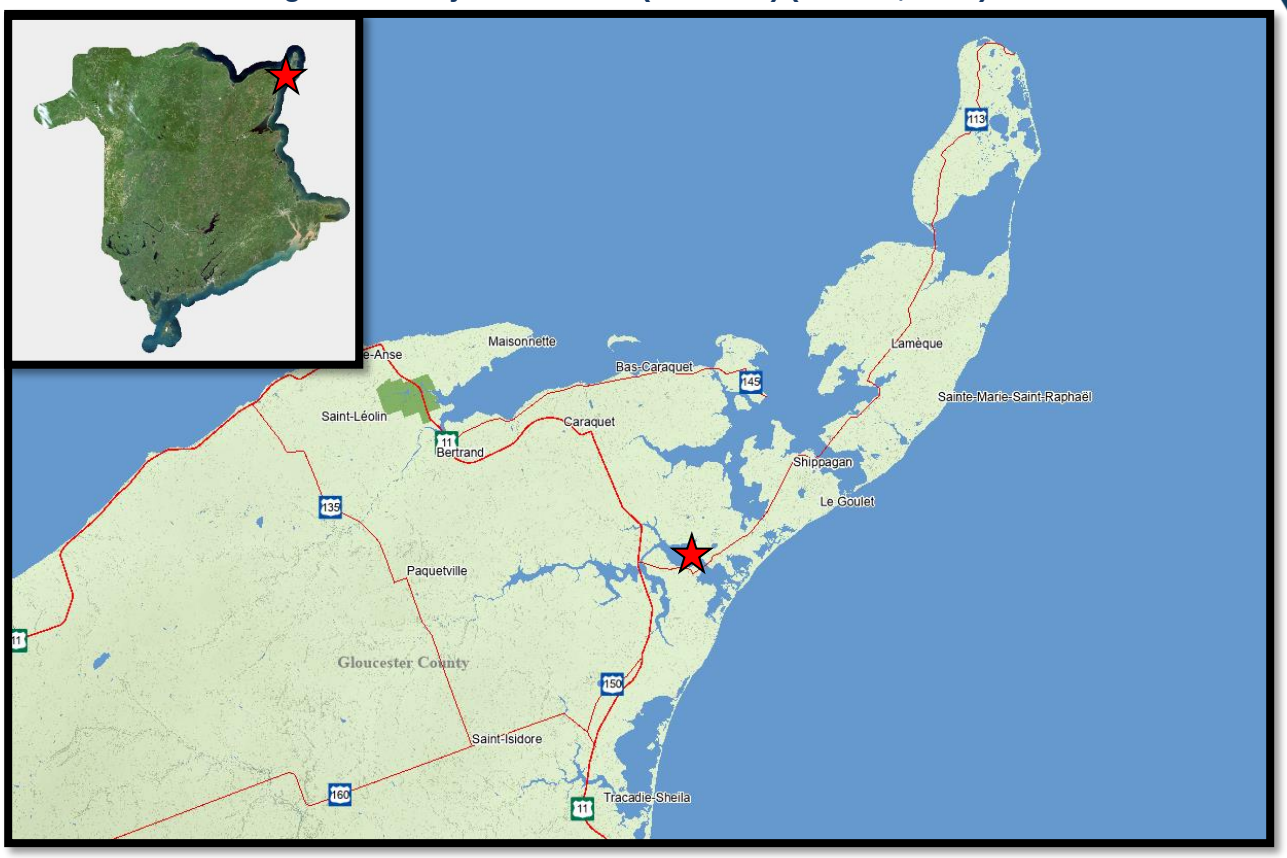


Figure C: Project Location (GeoNB, 2018)

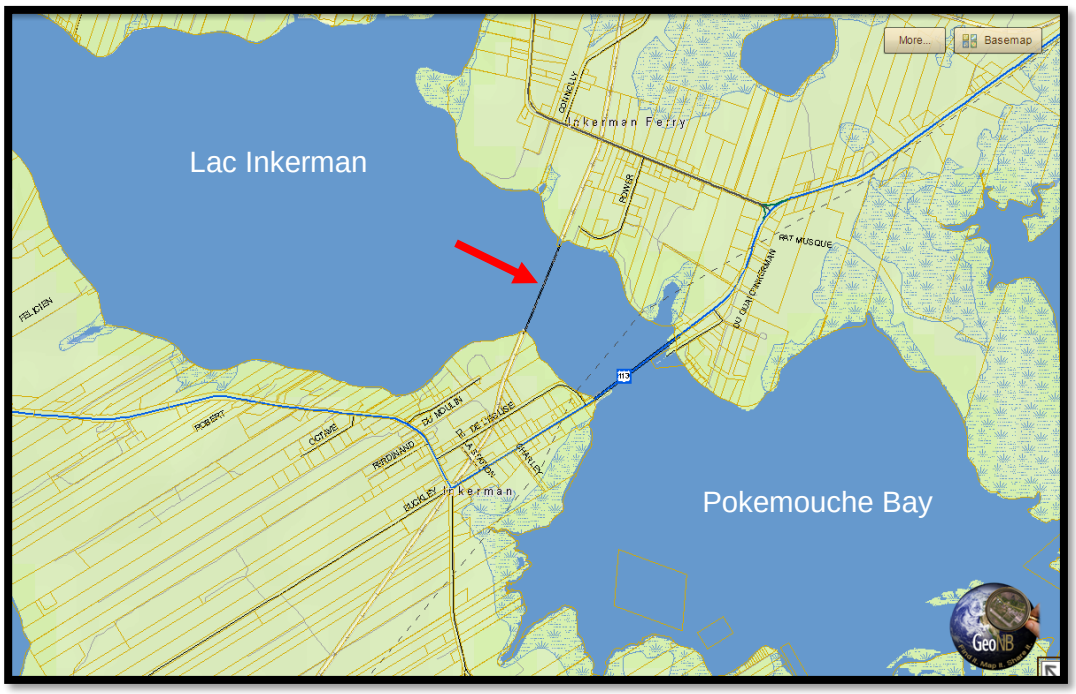
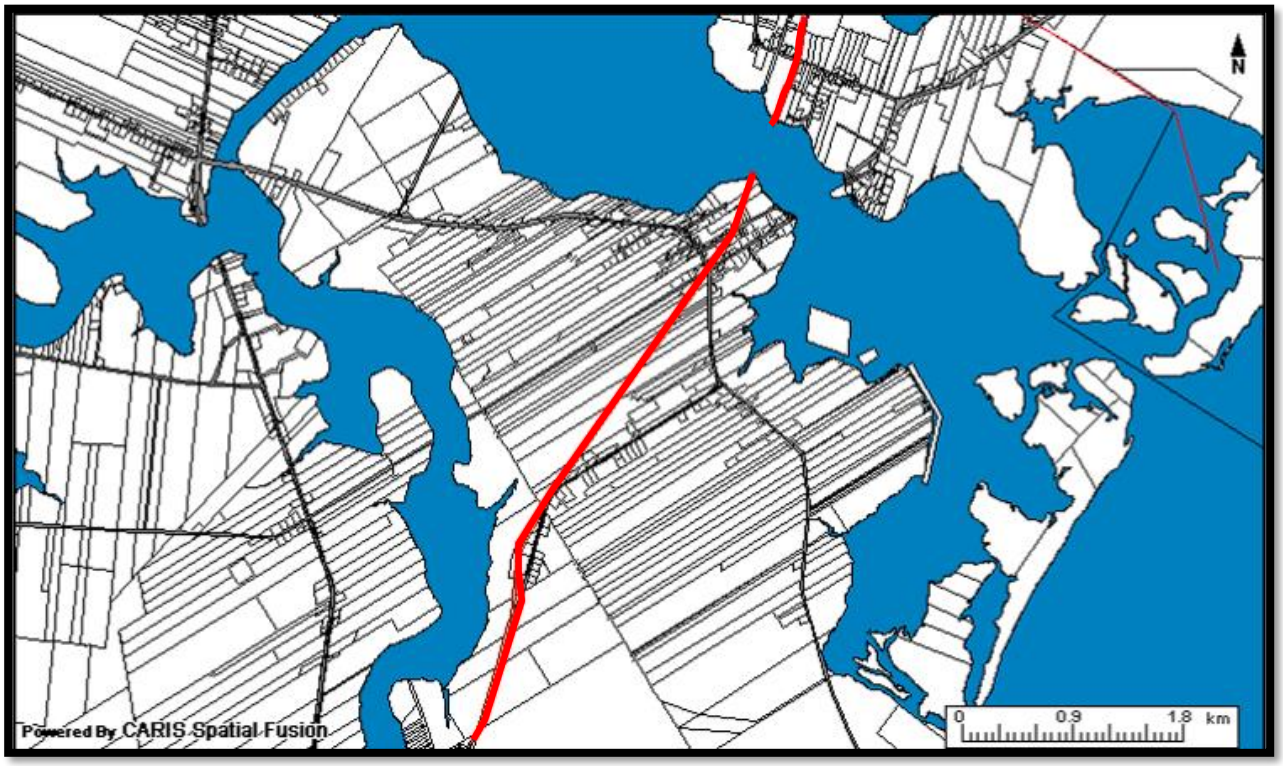


Figure D: Subject Property PID 20478673 (in Red, SNB, 2022)



2.6 Siting Considerations

The proposed site is the same location and footprint as the former Inkerman Walking Bridge, which connected the main Sentier NB Trail from the south (Municipality of Tracadie-Sheila and points south) with the Town of Shippagan, Lamèque Island and the City of Bathurst (and points north). The location is the narrowest portion of Inkerman Lake, and the ROW property is already owned by the Province.

Based on the project rationale and for the above reasons, this site is the most suitable option for the bridge reconstruction and for reconnecting various regions via the existing multi-use trail system.

The null ("do nothing") alternative was considered, but determined to be impractical. Not replacing the bridge at this location will result in all foot, bicycle, ATV and snowmobile traffic continuing to share the Route 113 bridge with automobiles and trucks, resulting in potentially dangerous interactions and a higher potential for accidents.

2.7 Physical Components and Dimensions of the Undertaking

2.7.1 Former Bridge

The bridge that was destroyed by fire served as a river crossing for pedestrians, cyclists, snowmobilers and all-terrain vehicle owners. It was a 460-metre wooden bridge on wood piles, with two steel spans at the northern end over the navigation channel. The fire almost completely destroyed the bridge, leaving only the steel spans and the charred tops of wooden piles protruding from the water. Approximately 250 creosote-treated piles remain along the length of the project's footprint. Older submerged rock crib structures were also left in situ from the previous bridge structure along the length of the project's footprint.

Photo No. 3: Remnants of Bridge and Northeastern Approach (Looking North, November 30, 2017)

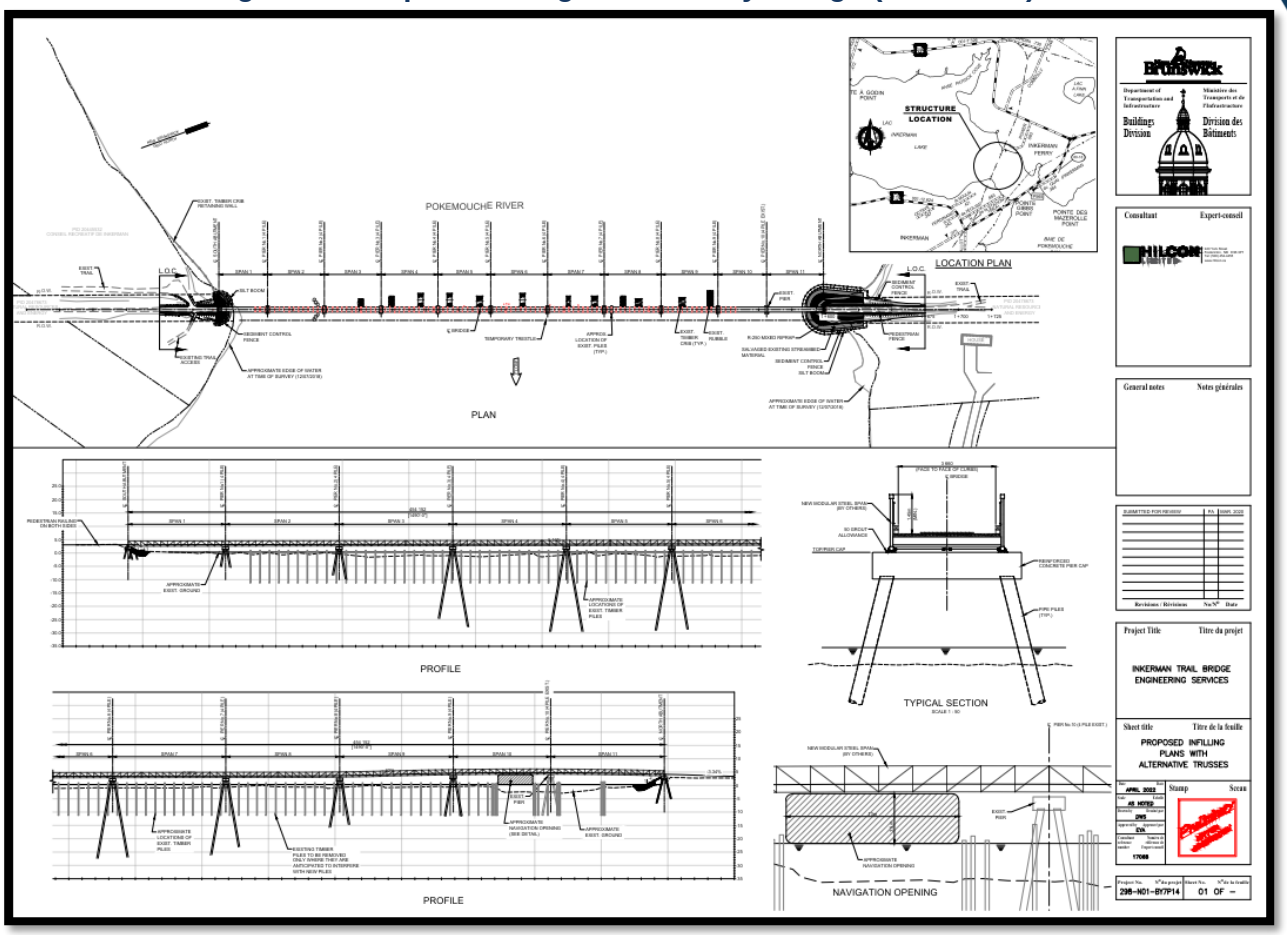
The remaining, partially destroyed creosote-treated wooden piles, which are deteriorating from the 2017 fire and years of weathering, are in very poor condition. Removing the piles would likely result in breakage and localized impacts to sediments and water quality. A review of available literature shows there are both advantages and disadvantages to removing creosote-treated wooden piles, depending on their structural integrity and level of degradation. Based on available information, it is proposed that only those piles interfering with the installation of the new bridge construction or with navigation be removed.

Photo No. 4: Charred Creosote-treated Wooden Piles (Looking South, December 6, 2017)

2.7.2 Proposed Design

The proposed bridge will consist of an eleven-span steel structure on reinforced concrete pier caps over new piles. The bridge will contain nine (9) piers spaced between 36 metres and 42 metres apart and a concrete abutment on approach areas at each end. Minor modification of the southern approach will occur, resulting in approximately 15 m^2 of infill, and approximately 500 m^2 will be infilled at the northern approach to support the new structure. The new bridge will be constructed within the same alignment as the previous bridge, taking advantage of the approaches at the north and south ends and the existing trail system.

Figure E: Proposed Bridge Preliminary Design (Hilcon Ltd)



Each approach will remain within the existing alignment; however, a small expansion of the southern approach (15m^2) and the northern approach (approximately 500 m^2) will be required. Refer to Appendix A for larger plans of the preliminary bridge design.

2.8 Construction, Operation and Maintenance Details

Project construction will be initiated upon receipt of the appropriate permits and authorizations, subject to the public tendering process, weather and environmental windows. The following sections outline the proposed bridge construction sequence in broad terms. Final detailed design and construction sequences will be outlined in the project's Technical Specifications Document.

2.8.1 Site Preparation

2.8.1.1 Equipment Muster Area

Prior to initiating construction, contractors will establish a secured site for office trailers, staff parking and facilities, and equipment and material storage at each end of the bridge, with the majority of equipment and laydown material to be at the southern end. Equipment parking,

refuelling and a storage location for removed creosote timbers will be established outside the 30-metre riparian buffer zone to ensure protection of the Pokemouche River.

2.8.1.2 Installation of Environmental Controls

Prior to initiating any aspect of the construction, sediment and erosion controls will be installed to contain sediment and keep it from migrating outside the work site and impacting water quality and/or fish habitat. Environmental controls will be implemented per the DTI Environmental Management Manual (EMM) (latest edition). Refer to Sections 4 and 5 for additional information.

2.8.1.3 Geotechnical Investigation

Prior to construction, a geotechnical investigation consisting of drilling boreholes in the riverbed was necessary to determine depth to bedrock, type of bedrock and substrate for the design of the bridge piles and piers. This work was completed in the fall of 2018 and identified type and depth to bedrock. Refer to Appendix G for the complete geotechnical report. Should any additional geotechnical investigating be required, it will be initiated as needed with the proper approvals.

2.8.1.4 Removal of Existing Piles

At present, approximately 250 partially burned creosote-treated wooden piles remain in the water. Due to damage from the bridge fire and subsequent ice and water action, these piles are not usable. No provincial or federal guidelines provide guidance directly addressing the environmental risks or impacts from derelict creosote-treated piles in water. The Canada Department of Fisheries and Oceans' (DFO) "Guidelines to Protect Fish and Fish Habitat from Treated Wood Used in Aquatic Environments in the Pacific Region (2000)" provide information on the impacts from using new or recycled treated wood in fresh- and saltwater environments. However, the United States Environmental Protection Agency (USEPA) "Best Management for Piling Removal and Placement in Washington State (2016)" provides directly relevant guidance on removing creosote-laden wood from marine environments, including recommended methods of removal, and the advantages of removing them versus leaving them in place.

Based on the deteriorated condition of the creosote piles, their removal is not likely feasible – removing the piles with grapple equipment, slings or using vibration may cause the tops of the piles to break off, releasing creosote-laden debris and/or chemicals into the water. This could create localized impacts to water quality, requiring isolation of the site and collection of the material. This will also likely create impacts in the sediment around the base of the piles, as deeper material is brought to the surface and dispersed.

Based on site observations and water depth, leaving the piles in place will not constitute a risk to navigation and will minimize the risk of impacting water and sediment quality; therefore, where possible, the piles will be left in place. Any piles interfering with the placement of new piles or piers, or which might be hazardous to navigation, will be removed per the recommendations of the USEPA guidelines:

- Complete removal where possible;
- Vibratory extraction is the preferred method;

- Sediment disturbance should be minimized – equipment should be on land or ice, or on a floating platform (barge);
- No barge grounding should occur;
- A floating boom, silt curtain and other mitigation measures should be implemented – refer to mitigation measures in sections 4 and 5, and
- Removed piles should be managed to prevent contamination of soil or groundwater at the site, and properly disposed of at an approved facility.

Approximately 20 piles are anticipated to be removed via this method, but the final number may vary once construction is initiated.

2.8.2 Bridge Construction

2.8.2.1 Infilling Area

Construction of the bridge will require in-water infilling of a small area at the southern approach and an area at the northern approach, resulting in an increase in footprint of the approach along the shoreline on both sides of the trail. The total infill area will be approximately 515 m^2.

2.8.2.2 Installation of New Piles

The foundation of the new bridge will include concrete piers placed on approximately 36 new pipe piles (4 piles per pier) and 12 H-piles (6 per abutment). Piles will vary in length depending on depth to bedrock (refer to Figure in Appendix A). The piles will be driven down to bedrock using pile-driving equipment from a temporary trestle or from land-based equipment on ice. Refer to Appendix A for approximate locations of piles in relation to existing piles and rubble.

2.8.2.3 Installation of Concrete and Steel Spans

Once the piles are in place, the concrete piers will be installed on the riverbed on the new piles. This will be accomplished sequentially from south to north, using a truck-mounted crane (or similar equipment), with assistance from the temporary trestle. As each pier is stabilized in place, the steel spans will be installed and attached.

2.8.2.4 Installation of Decking, Railings, Etc.

Final construction activities will consist of the installation of pressure-treated wooden decking and steel railings, signage and final landscaping of bridge approaches. This work will be primarily completed manually.

2.8.2.5 Reclamation of Laydown Area

Upon completion of the bridge, all construction equipment and trailers will be removed from the site. The equipment laydown area will be levelled and reseeded with native “highway mix” seeds, as necessary. All sediment and erosion measures will remain in place until exposed areas are revegetated.

2.8.3 Operation and Maintenance

The new bridge will be operated year-round with little to no maintenance. Structural inspections will be completed by NBDTI as part of the government's infrastructure maintenance program, and any repairs to the new bridge will be completed by NBDTI on an as-needed basis.

2.8.4 Hazardous Materials – Handling and Storage

No hazardous materials will be required for the construction of the proposed bridge, with the exception of petroleum products required for motorized equipment. Petroleum and/or chemical products will be stored off site and refuelling will take place at least 30 metres away from any wetland or watercourse in a designated area.

Any creosote-laden timber piles or debris from the removal of the existing piers will be captured in the boomed-off construction area and removed from the river as quickly as possible. This material will be considered hazardous and stored in an impermeable container or bin (i.e.: a sealed dumpster kept on site specifically for this purpose) until it can be transported to an approved landfill such as the Red Pine Solid Waste Management Facility or similar approved site.

The temporary storage of creosote waste will be at least 30 metres from any wetland or watercourse area.

2.9 Regulatory Approvals

The following approvals are required for the reconstruction of the bridge, as per applicable federal and provincial legislation.

- *Environmental Impact Assessment Regulation*: A Certificate of Determination (CoD) will be required for the proposed project.
- *Watercourse and Wetland Alteration Regulation*: A Watercourse and Wetland Alteration Permit (WAWA) will be required for any work in or within 30 m of a watercourse or wetland. This includes any excavation or infilling within 30 m of the Pokemouche River and the in-stream work required for the reconstruction of the bridge.
- *Crown Lands and Forest Act*: A Licence of Occupation will be required for the work carried out on Crown Land, including the former CNR right-of-way, and the work within the Pokemouche River, which is submerged Crown Land.
- *Canadian Navigable Waters Act*: A Licence to Construct will be required from the Navigation Protection Program, through the Public Resolution Process for Unscheduled Waters. This is required as the bridge is considered a "works" under the Act. The public resolution process involves seeking public input, including posting the proposed project on the Canadian Common Project Registry, and allowing a 30-day comment period.
- *Fisheries Act*: A Fisheries Act Authorization (FAA) will be required from the Department of Fisheries and Oceans (DFO) for the potential Harmful Alteration, Disruption or Destruction (HADD) of fish habitat in the Pokemouche River. The WAWA permit application will act as a Request for Review; DFO will review the project description and determine if an application for an FAA is required.

3 DESCRIPTION OF THE ENVIRONMENT

The subject site consists of a linear parcel (PID 20478673) of land, the former Canadian National Railway (CNR) right-of-way, which spans approximately 450 metres across the Pokemouche River. The former bridge connected the Sentier NB Trail from the south, with the trail system on the Acadian Peninsula (to the northeast) and the trail system towards Caraquet, Bathurst and beyond (to the northwest).

The Pokemouche River is the dominant natural feature of the PDA, consisting of a shallow, tidal waterway with a deeper channel on the eastern side of the river. Immediately upstream of the bridge, the Pokemouche River widens into Inkerman Lake, and becomes the Pokemouche Estuary downstream.

3.1 Physical and Natural Features

3.1.1 General

Inkerman is located on the Acadian Peninsula, in northeastern New Brunswick. This area is within the Caraquet Ecodistrict of the Eastern Lowlands Ecoregion (DNR, 2007). The ecoregion's coastal areas (on the Northumberland Strait and the Chaleur Bay) are defined by fringe sand dunes, salt marshes and lagoons. The area gets most of its moisture from the prevailing westerly winds intercepted by the highlands to the west, and the Northumberland coastline experiences some of the higher summer temperatures in New Brunswick.

The Caraquet Ecodistrict consists of the coastal edge of the ecoregion, which rims the Acadian Peninsula coastline. Inkerman is located within the largest landscape zone of the ecodistrict, which extends from Caraquet Island (at the northern tip of Miscou Island) to Bartibog Bridge, and is linked by a continuous chain of sand dunes, sand spits, protected bays and salt marshes. The Pokemouche River is one of the largest of the Ecodistrict's estuaries. Summer wind velocity is nearly twice the speed of inland breezes due to the proximity to the coast (DNR, 2007).

This region has a long history of settlement and forest interventions, resulting in an intolerant hardwood-dominated forest. Red Maple *(Acer rubrum*), Trembling Aspen (*Populus tremuloides*) and Grey Birch (*Betula populifolia*) are the predominant tree species, while valley bottoms are covered with species such as Black Spruce (*Picea glauca*) and Jack Pine (*Pinus banksiana*), indicating a history of frequent forest fires. Today, approximately 70% of the Ecodistrict is forested, with the remaining area consisting of wetlands, agriculture, watercourses, roads and "other" (DNR, 2007).

The Caraquet Ecodistrict lies within the traditional Mi'kmaq territory of Gespegeog and contains many archaeological sites. For at least 4,000 years, the Mi'kmaq or their ancestors had settlements at the mouths of the Tabusintac, Tracadie and Pokemouche Rivers where they fished, gathered shellfish, and hunted seabirds and mammals (DNR, 2007).

3.1.2 Topography

The topography of the land in the vicinity is generally flat and slopes gently towards the Pokemouche River. Surface water flows towards the Pokemouche River, which then flows southeast towards the Pokemouche Bay and the Northumberland Strait. The topography at the southwestern and northeastern approaches is very flat. The southwestern approach is surrounded by residential and grassed areas. The northeastern approach is surrounded by residential and vegetated areas. Due to the flat topography, during precipitation events, surface runoff is assumed to infiltrate into the ground or slowly flow overland towards the Pokemouche River.

3.1.3 Geology

The subject site is underlain by Late Carboniferous-aged sedimentary rocks of the Pictou Group consisting of red to grey sandstone, conglomerate and siltstone (NBDNR, 2008). Surficial geology of the site is comprised of Late Wisconsinan and/or Early Holocene-aged marine sediments consisting of sand, silt, some gravel and clay; generally 0.5 m to 3 m thick (Rampton, 1984).

3.1.4 Groundwater

There are no municipal or industrial water supplies in proximity to the subject site.

Residences in the area obtain their potable water from individual private wells. A search of the NB Online Well Log System (OWLS) identified 14 wells within 500 metres of the bridge site, ranging from 4.27 m to 29.8 m in depth.

Based on the nature of the proposed project, adverse impacts to local groundwater resources from the reconstruction and operation of the walking bridge are not anticipated; therefore, no further assessment of groundwater resources was completed and is not discussed further in this report.

3.1.5 Surface Water – Watercourses

The dominant surface water feature is the Pokemouche River, which flows northwest to southeast under the proposed bridge site. The river is subject to tidal flows and elevations extending upriver approximately 16 kilometres. Immediately upstream of the bridge site, the river widens into Inkerman Lake; downstream of the Route 113 bridge, the river enters the Pokemouche Bay estuary.

The water depth where the existing bridge piles are located varies from 0 to 5 feet in the main row of piles at low tide. Several rock-filled timber cribs from previous bridges are also located between the rows of timber piles (hence the zero depth). The main channel on the north side where the steel section of the former bridge was located is deeper at around 14 feet. Tidal variation is minor at about 2 feet.

Other surface water features in the area consist of Lac à Finn, Lac Scott, Lac Grégoire and Lac Arnée. All are located within 5 km north of the bridge site, but will not be impacted by the project.

The Gulf of St. Lawrence is located 3.5 km southeast of the bridge site.

Following the fire in September 2017, a surface water quality sampling program was commissioned by the New Brunswick Department of Environment and Local Government and ERD. Samples were obtained at several locations along the span of the former bridge as well as upriver (background) and downriver locations. Grab surface water samples were collected for petroleum hydrocarbons (PH), polycyclic aromatic hydrocarbons (PAH), arsenic and chromium between September and December 2017. Several exceedances of applicable surface water quality guidelines were noted for PAH, arsenic and chromium prior to the removal of burnt debris from the water. Following removal of debris, all surface water quality results met applicable guidelines. Refer to the sampling results in Appendix G.

Potential impacts to surface water from the proposed project are further examined in Section 4.4.

3.1.6 Wetlands

Six (6) Provincially Significant Wetlands (PSW) are located within 1.5 km of the project site (GeoNB MapViewer, Figure F).

At the northeastern bridge approach, the nearest provincially significant wetland is located approximately 115 metres east and downstream of the bridge (or approximately 85 metres to the edge of the 30-metre wetland buffer area). A Provincially Significant Wetland is also located approximately 175 metres northwest of the bridge.

At the southwestern approach to the bridge, the nearest provincially significant wetland is located approximately 500 metres southeast of the bridge, and another is located approximately 700 metres southwest of the bridge.

An unmapped wetland is located east of the northern approach, is approximately 750 m^2 in size and located 18 metres from the edge of the project development area. Although no functional assessment of this wetland was conducted, it appears to have the attributes of a coastal (brackish) wetland, and was therefore considered a PSW for the purpose of this assessment. Although the proposed project development area is within 30 metres of this wetland, work at the northern end of the bridge will be restricted to the trail and bridge's footprint only. No temporary or permanent impingement of this wetland will occur as a result of the project and all construction activities on the bridge and approach will be isolated from the wetland's edge. Refer to section 4.5 for additional information and mitigation measures related to wetlands.

3.1.7 Vegetation

The PDA includes the former CNR ROW, the slopes and ditches on each side, and the potential equipment storage/laydown area near the southern approach.

The southwestern approach consists of the end of the multi-use trail, which is currently blocked by a concrete barrier, and a gravel parking area at the end of du Moulin Street. The majority of vegetation is flattened by ATV and vehicles parking and turning at this location. Below the concrete barrier, a thin strip of low vegetation leads to a narrow sand and gravel beach.

Figure F: Regulated Wetlands in Proximity to the Subject Site (GeoNB, 2018)

Figure G: Unmapped Wetland at North Bridge Approach

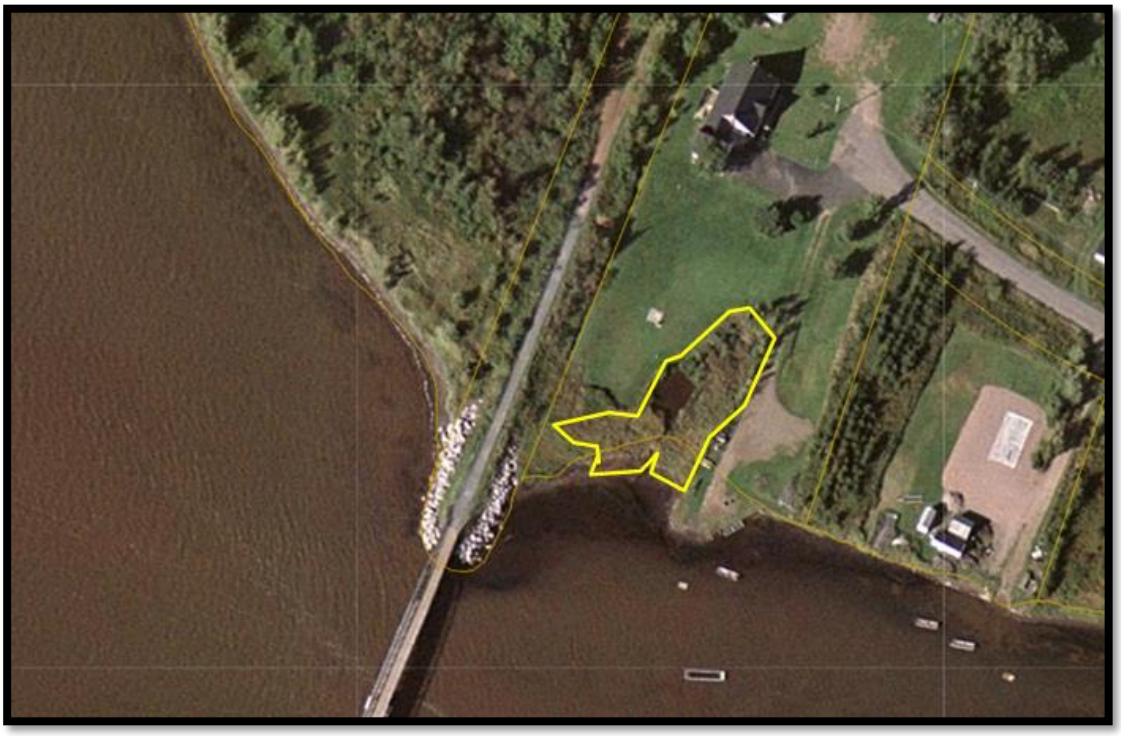


Photo No. 5: Unmapped Wetland East of Northern Bridge Approach

Terrestrial vegetation consists of common shrubs, wildflowers and grass species, including Speckled Alder (*Alnus incana*), Raspberry (*Rubus idaeus*), Fireweed (*Chamaenerion angustifolium*), Goldenrod (*Solidago spp*.), Daisy (*Bellis perennis*), Buttercup (*Ranunculus spp*.), Clover (*Trifolium spp*.) and grass species.

Aquatic vegetation (eelgrass - *Zostera*) within the river will be impacted within the PDA, at the northeastern approach, due to the infilling of approximately 515m^2 below the normal high water mark at both approaches (15m^2 at the south approach, 500 m^2 at the north approach). Eelgrass coverage in these areas ranges from 5% to 90%. Refer to section 3.1.9 for additional information on aquatic habitat.

3.1.8 Wildlife and Wildlife Habitat

PID 20478673 is part of the NB Trail recreational network, which is active throughout the year. The bridge and approaches consist of the crushed rock surface and rip rap/cobble sloped sides.

The terrestrial portion of the proposed project's footprint (i.e.: the right-of-way and its edge) is not considered significant wildlife habitat. Pedestrians, cyclists and ATV owners use the trail year-round, with additional use by snowmobilers in the winter. This activity ensures the majority of wildlife avoids the use of the trail where possible. Common mammal species are anticipated to transit the site, following the shoreline of the Pokemouche River or crossing the ROW. Species which are anticipated to forage or hunt the shoreline area include the North American river otter (*Lontra canadensis*), American mink (*Neovision vision*), Muskrat (*Ondatra zibethicus*) and racoon (*Procyon lotor*), among others.

Photo No. 6: Southwestern Approach

The area adjacent to the southern bridge approach is a cleared residential area and is therefore not considered significant terrestrial wildlife habitat. The area adjacent to the northern approach is more rural in nature, consisting primarily of forested land, and is therefore considered more suitable habitat for small and large mammals, amphibians, etc.; however, the proposed project is not anticipated to impact wildlife use of these areas, and the bridge's footprint itself is not considered terrestrial wildlife habitat.

No terrestrial wildlife species or signs were observed during multiple visits to the site.

The bridge's footprint below the waterline is considered aquatic wildlife habitat, as further described in Section 3.1.9.

Photo No. 7: Typical Vegetation Near Southern Approach

3.1.9 Aquatic Wildlife and Aquatic Habitat

DTI commissioned an Underwater Benthic Habitat Survey (UBHS) of the area within and immediately adjacent to the bridge's footprint to identify potential aquatic habitat types and aquatic species within the PDA. Wood PLC conducted the UBHS in June 2019, following transects parallel and perpendicular to the bridge's ROW. Video was collected by a Seabotix underwater Remotely Operated Vehicle (ROV).

The UBHS report identified two (2) general habitat types: Predominantly sand and silt barrens, and low-canopy, limited cover algal beds. The sand and silt barren habitat had a greater sand to silt ratio and contained eelgrass beds with some macrofloral debris. Periwinkles and shell hash of blue mussel, clam and oyster shells were common. The low-canopy algal bed habitat was primarily in and around the former bridge structure piles and supported a limited bed of brown algae (with soft sour weed), and the piles provided habitat for blue mussel colonies.

Single occurrences of flounder were noted in four (4) transects, periwinkles were common throughout the site and blue mussels were observed on the existing wooden piles. Clam and oyster shell hash was also observed (Wood, 2019).

Section 35(1) of the *Fisheries Act* prohibits serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, and is defined as "…the death of fish or any permanent alteration to, or destruction of, fish habitat" without authorization by the Minister.

Eelgrass coverage ranges between 5% and 90% where the habitat is to be impacted by infilling (515m^2 total). Refer to the complete Wood PLC report in Appendix D and Section 4.2 for more information on the subject of aquatic wildlife and habitat.

3.1.10 Migratory Birds

Migratory birds are an important consideration in any project. Environment Canada regulates the protection of migratory birds through the *Migratory Birds Convention Act* (MBCA), which protects migratory birds, their eggs, nests and young through the *Migratory Birds Regulations* (MBR).

"Under Section 6 of the *Migratory Birds Regulations* (MBR), no person shall disturb, destroy or take a nest or egg of a migratory bird; or to be in possession of a live migratory bird, or its carcass, skin, nest or egg, except under authority of a permit. It is important to note that under the current MBR, no permits can be issued for the incidental take of migratory birds caused by development projects or other economic activities. Furthermore, Section 5.1 of the MBCA describes prohibitions related to deposit of substances harmful to migratory birds.

Migratory birds protected by the MBCA include all seabirds except cormorants and pelicans, all waterfowl, all shorebirds and most landbirds (birds with principally terrestrial life cycles). Most of these birds are specifically named in the Environment Canada publication titled Birds Protected in Canada under the *Migratory Birds Convention Act*, Canadian Wildlife Service Occasional Paper No. 1.

> "5.1 (1) No person or vessel shall deposit a substance that is harmful to migratory birds, or permit such a substance to be deposited, in waters or an area frequented by migratory birds or in a place from which the substance may enter such waters or such an area.
>
> (2) No person or vessel shall deposit a substance or permit a substance to be deposited in any place if the substance, in combination with one or more substances, results in a substance — in waters or an area frequented by migratory birds or in a place from which it may enter such waters or such an area — that is harmful to migratory birds."

The proposed project's footprint and the area immediately adjacent are anticipated to support shorebirds and waterfowl foraging and hunting, but does not contain significant migratory bird nesting habitat. Waterfowl and shorebird species are likely to avoid the area during construction activities, due to the presence of machinery and human activity.

Refer to section 3.1.13 for more information on environmentally significant areas for migratory birds and Section 3.1.11 for information on Species at Risk.

3.1.11 Species at Risk

Canada's *Species at Risk Act* (SARA) is one of three (3) major components in the Government of Canada Strategy for the Protection of Species at Risk (SAR). It is designed as a key tool for the conservation and protection of Canada's biological diversity and fulfills an important commitment under the United Nations Convention on Biological Diversity. New Brunswick also has a *Species at Risk Act*, which complements the federal Act.

The purpose of SARA is to:

- Prevent wildlife species from becoming extinct or extirpated (lost from the wild in Canada);
- Help in the recovery of extirpated, endangered or threatened species; and
- Ensure that species of special concern do not become endangered or threatened.

Information was requested from the Atlantic Canada Conservation Data Centre (ACCDC) for observations of rare and/or endangered flora and fauna species within a 5 km radius of the subject site. A review of each species' habitat requirements was completed and compared with site characteristics.

No potential adverse environmental impacts on Species at Risk were identified as a result of this project, based on a review of project site characteristics, anticipated impacts and the habitat requirements for Species at Risk. A summary of this analysis is presented in the following sections.

Table 1: ACCDC S-rank and Rarity Definitions

Atlantic Canada Conservation Data Centre (ACCDC) S-Rank www.accdc.com/en/rank-definitions.html	
S-RANK DEFINITIONS	
SX	Presumed Extirpated - Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SH	Possibly Extirpated (Historical)—Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
S1	Critically Imperiled - Critically imperiled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.
S2	Imperiled - Imperiled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the province.
S3	Vulnerable - Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4	Apparently Secure - Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	Secure - Common, widespread, and abundant in the province.
SNR	Unranked - Provincial conservation status not yet assessed.

SU	Unrankable – Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA	Not Applicable - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S#	Range Rank - A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).
SH	Possibly Extirpated (Historical)—Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
Not Provided	Species is not known to occur in the province.
BREEDING STATUS QUALIFIERS	
N	**Nonbreeding** - Conservation status refers to the non-breeding population of the species in the province.
B	**Breeding** - Conservation status refers to the breeding population of the species in the province.
M	**Migrant** - Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province.
?	**Inexact or uncertain** - Denotes inexact or uncertain numeric rank. (The ? qualifies the character immediately preceding it in the S-rank.)
SPECIES AT RISK (SARA) (CANADA AND NEW BRUNSWICK)	
Extirpated	A wildlife species that no longer exists in the wild in Canada, but exists elsewhere in the wild.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.
Special Concern (SC)	A wildlife species that may become threatened or endangered because of a combination of biological characteristics and identified threats.
NBNRED GENERAL STATUS OF WILDLIFE	
At risk	Species for which a formal assessment has been completed, and determined to be at risk of extirpation or extinction. To be described by this category, a species must be either listed as endangered or threatened by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), or the New Brunswick equivalent.
May be at risk	Species or populations that may be at risk of extirpation or extinction, and are therefore candidates for a detailed risk assessment by COSEWIC or the New Brunswick equivalent.
Sensitive	Species which are not believed to be at risk of extirpation or extinction, but which may require special attention or protection to prevent them from becoming at risk.
Secure	Species that are not believed to be at risk, may be at risk, or sensitive. These are generally species that are widespread and/or abundant. Although some secure species may be declining, their level of decline is not felt to be a threat to their status in the province.

COSEWIC	
X	Extinct in Canada and elsewhere.
XT	Extirpated in Canada but surviving elsewhere.
E	Endangered in Canada.
T	Threatened in Canada.
V	Vulnerable in Canada.
SC	Special Concern in Canada.
DD	Data Deficient: data inadequate for assessment.
NAR	Not At Risk in Canada.

3.1.12 Species at Risk – Flora

No listed flora Species at Risk were identified within the 5 km ACCDC search radius. The following two (2) species of flora categorized provincially as "S1 – Extremely Rare" were identified by the ACCDC scan as being present within a 5 km radius of the project site.

Stellaria longipes, the Long-stalked Starwort, is a perennial wildflower that is typically 15 cm to 40 cm tall. It is typically found in damp meadows, on stream banks and on moist rocky slopes from foothills. Based on the spatial extent of the proposed bridge reconstruction project and the Long-stalked Starwort's habitat requirements, no interaction with this species is anticipated as a result of the project.

Carex glaerosa var. amphigena, commonly known as Gravel Sedge, is a large perennial sedge typically observed in clusters, between 15 cm and 40 cm tall. This sedge is typically found in salt marshes. Based on the spatial extent of the proposed bridge reconstruction and the Gravel Sedge's habitat requirements, no interaction with this species is anticipated as a result of the project.

Based on the temporal and spatial extent of the project and the habitat requirements of the above flora species, no interaction between the project and these species is anticipated.

3.1.13 Species at Risk – Fauna

The ACCDC scan returned a list of 12 Species at Risk (11 bird and 1 fish species) observed within a 5 km radius of the subject site. Each species' breeding/nesting window and habitat requirements were reviewed and compared to the characteristics of the subject site.

Bank Swallow (*Riparia riparia*) has a COSEWIC and SARA status of Threatened. Bank Swallows typically require steep banks, such as riverbanks or ocean bluffs, stockpiled soil or gravel pits as nesting habitat, preferably near open terrestrial habitat for hunting flying insects (grassland, meadows, pastures, etc.). Based on the spatial extent of the proposed bridge reconstruction and the Bank Swallow's habitat requirements, no interaction with this species is anticipated as a result of the project.

Barn Swallow (*Hirundo rustica*) has a COSEWIC Status of Threatened, and a SARA and Provincial Status of Special Concern. Barn Swallows typically require open areas such as fields and grassland for feeding; they nest under the eaves of structures like barns and in trees. Based on the spatial extent of the proposed bridge reconstruction and the Barn Swallow's habitat requirements, no interaction with this species is anticipated as a result of the project.

Barrow's Goldeneye – Eastern pop. (*Bucephala islandica (Eastern pop*.)) has a COSEWIC, SARA and Provincial Status of Special Concern. Barrow's Goldeneyes prefer lake/ponds habitat and breed along lakes in parkland. They nest in tree cavities or nest boxes. Based on the spatial and temporal extents of the proposed bridge reconstruction and the Barrow's Goldeneye's habitat requirements, no interaction with this species is anticipated as a result of the project.

Bobolink (*Dolichonyx oryzivorus*) has a COSEWIC status of Special Concern, and a SARA and Provincial Status of Threatened. Bobolinks prefer to nest in tall grasslands and hayfields, particularly field remnants reverting back to taller vegetation/shrubs. Based on the spatial extent of the proposed bridge reconstruction and the Bobolink's habitat requirements, no interaction with this species is anticipated as a result of the project.

Canada Warbler (*Wilsonia canadensis*) has a COSEWIC status of Special Concern and a SARA and Provincial Status of Threatened. Canada Warblers favour forested habitats such as conifer and deciduous forests. They nest on or near ground within areas of dense shrubs, ferns or rhododendrons. Based on the spatial extent of the proposed bridge reconstruction and the Canada Warbler's habitat requirements, no interaction with this species is anticipated as a result of the project.

Chimney Swift (*Chaetura pelagica*) has a COSEWIC, SARA and Provincial Status of Threatened. Chimney Swifts prefer urban and suburban habitats and are common in areas with large concentrations of chimneys. They nest in artificial sites with vertical surfaces and low light. In rural areas, they nest in hollow trees, tree cavities or caves. Based on the spatial extent of the proposed bridge reconstruction and the Chimney Swift's habitat requirements, no interaction with this species is anticipated as a result of the project.

Olive-sided Flycatcher (*Contopus cooperi*) has a COSEWIC, SARA and Provincial Status of Threatened. Olive-sided Flycatchers prefer open woodland habitats and nest in trees. Based on the spatial extent of the proposed bridge reconstruction and the Olive-sided Flycatcher's habitat requirements, no interaction with this species is anticipated as a result of the project.

Piping Plover melodus ssp. (*Charadrius melodus melodus*) has a COSEWIC, SARA and Provincial Status of Endangered. Piping Plover melodus ssp. prefers shoreline habitats. It nests on the ground above the high-water line in sandy areas with sparse vegetation, including marshes, ocean shores, bays, spoil islands, reservoirs, alkali lakes and rivers. Based on the spatial extent of the proposed bridge reconstruction and the Piping Plover's habitat requirements, no interaction with this species is anticipated as a result of the project.

Red Knot (*Calidris canutus rufa*) has a SARA, COSEWIC and Provincial Status of Endangered. It breeds in drier Arctic tundra areas such as sparsely vegetated hillsides. During migration season, it is found in intertidal, marine habitats, especially near coastal inlets, estuaries and bays. The most important migration sites are located on the north shore of the St. Lawrence River in Quebec. Based on the spatial and temporal extents of the proposed bridge reconstruction and the Red Knot's habitat requirements, no interaction with this species is anticipated as a result of the project.

Short-eared Owl (*Asio flammeus*) has a COSEWIC Status of Threatened and a SARA and Provincial Status of Special Concern. Short-eared Owls prefer grassland habitats and live in large, open areas with low vegetation. They nest on the ground amid grasses and low plants. Based

on the spatial and temporal extents of the proposed bridge reconstruction and the Short-eared Owl's habitat requirements, no interaction with this species is anticipated as a result of the project.

Red-necked Phalarope (*Phalaropus lobatus*) has a COSEWIC and SARA Status of Special Concern. Red-necked Phalaropes prefer ocean habitats and coastal breeding areas (coastal marshes); they nest in arctic and sub-arctic habitats – New Brunswick is within their migration route. Based on the spatial and temporal extents of the proposed bridge reconstruction and the Red-necked Phalarope habitat requirements, no interaction with this species is anticipated as a result of the project.

Striped Bass (*Morone saxatilis)* has a COSEWIC Status of Endangered and a SARA Status of Special Concern. Striped Bass is found in coastal waters, rivers and lakes. It is a migratory fish that travels from saltwater to freshwater to spawn, but landlocked populations do exist. Striped Bass along the eastern shore of New Brunswick breed at only one location, the Northwest Miramichi River; as such, the proposed project is not anticipated to adversely impact the breeding ability or breeding habitat of the Striped Bass.

3.1.14 Location Sensitive Species

In addition to the species identified by ACCDC as occurring within a 5 km radius of the subject site, the following species are location-sensitive, meaning they are known to occur within the region and therefore may occur within proximity to the project.

Bald Eagle (*Haliaeetus leucocephalus*) typically nests in forested areas adjacent to large bodies of water. It nests in trees and tends to use tall sturdy conifers that protrude above the forest canopy. No suitable Bald Eagle nesting habitat is located within the project site, or on surrounding properties, and no nests were observed on or near the site. Based on the spatial and temporal extents of the proposed bridge reconstruction and the Bald Eagle's habitat requirements, no interaction with this species is anticipated as a result of the project.

3.1.15 Atmospheric

No ambient air quality monitoring stations or industrial emitters are located in the Inkerman area. There are three large-scale peat farming operations within a 5 km radius of the bridge, the nearest being 2.7 km to the north. No air quality issues are known to exist in the vicinity of the proposed site. Vehicle emissions are likely the main source of volatile organic compounds (VOC) in the region. Based on the low population density of the area and overall lack of significant air emissions, the ambient air quality is assumed to be acceptable.

3.1.16 Environmentally Significant Areas

A review of the Nature Trust NB Environmentally Significant Area (ESA) database found six (6) ESAs within a 5 km radius of the subject site:

ESA #183 Baie de Petit-Pokemouche

This ESA, located approximately 5 kilometres northeast of the project site, is a large productive coastal salt marsh that has a system of wide sandy channels with few pannes. The site is used by migratory shorebirds and ducks and is important for a variety of waterfowl and furbearers. Pintail, Mallard, Goldeneye, Widgeon, Canada Goose and Piping Plovers have been observed in this area. Given the distance from the project site and its temporal and spatial scales, the project is not anticipated to impact this ESA.

ESA #186 Grand Passage (Pokemouche Beaches)

This ESA, located approximately 4 kilometres southeast of the project site, is located on the shore of the Gulf of St. Lawrence. The site includes a 3 km coastal dune beach and an extensive salt marsh in near pristine state. It is one of the few sites where dune succession can be clearly seen on the Acadian Peninsula and is one of the most important Piping Plover nesting sites. Given the distance from the project site, the project is not anticipated to impact this ESA.

ESA #194 Pallot Road

This ESA, located approximately 4 kilometres southwest of the project site, is located on the east shore of the South Branch Pokemouche River. This ESA is identified as a biologically significant site for flora. The site includes the intersection of three (3) habitats which has resulted in a high diversity and unusual association of plants. Three (3) distinct intersecting habitats can be identified: a pure White Cedar swamp, a bog (or possibly fen-Buckbean is present) and a riparian zone. A spring also runs through the cedar swamp. Given the distance from the project site, the project is not anticipated to impact this ESA.

ESA #195 Pointe aux Rats Musqués/Inkerman

This ESA, approximately 1.5 kilometre east of the project site, is located on the eastern shore of northeastern New Brunswick. Inkerman is located just 2 kilometres west of Pointe aux Rats Musqués. The point is mostly mixed forest that extends from the mainland shore into Baie du Pokemouche. This ESA is identified as a biologically significant site for fauna. Pointe aux Rats Musqués contains the largest Black-crowned Night-heron colony in Eastern Canada. A Great Horned Owl was also identified in this area. The Bindweed was extremely lush and high with old growth covering entire tree trunks. Given the distance from the project site, the project is not anticipated to impact this ESA.

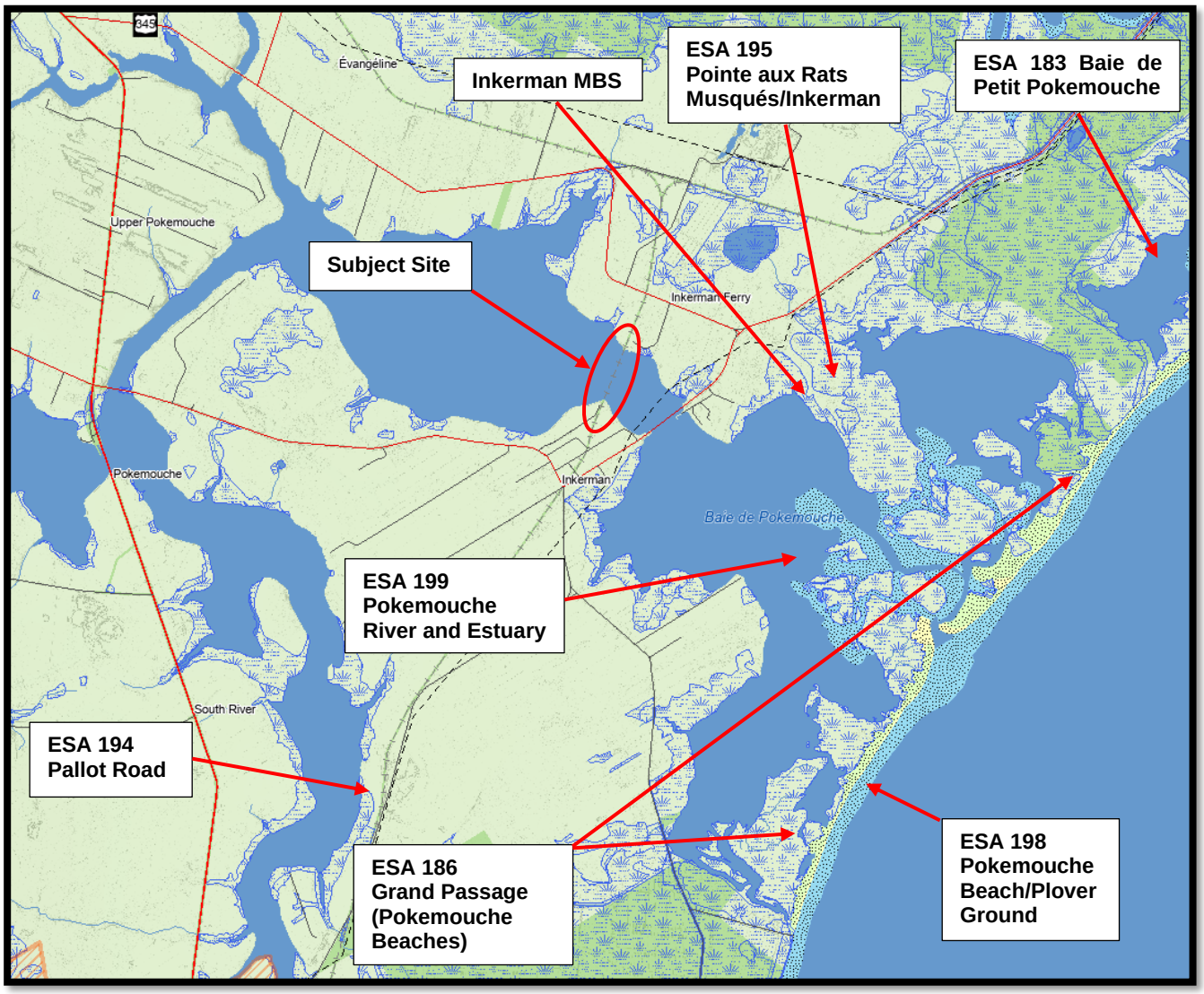
ESA #198 Pokemouche Beach South/Plover Ground

This ESA, over 3 kilometres southeast of the project site, is located in an area that separates Pokemouche Bay from the Gulf of St. Lawrence on the east shore of northeastern New Brunswick. This ESA is identified as a biologically significant site for flora and fauna. This area, which supports rare plants, features old sand dunes and a salt marsh. The Pokemouche South portion of the beach is 7.3 kilometres long and has supported Piping Plovers. This is one of the most productive salt marsh systems on the Acadian Peninsula; many waterfowl and shorebirds use the site for breeding and staging. This ESA site is host to the Northern Blue and Short-tailed Swallowtail butterflies. Given the distance from the project site, the project is not anticipated to impact this ESA.

ESA #199 Pokemouche River and Estuary

This ESA is identified as a biologically significant site for fauna and mammals. Per NatureNB, “Pokemouche River is the best sport fishing location on the Acadian peninsula. It is rare in the region for still having large stretches of its banks forested, providing cover for wildlife. The river supports large Sea Trout (6 lb +) and a very good run of Atlantic salmon. Other species include Eels, Gaspereau and Painted Turtles. Bass have been eliminated. DNRE rates this river as "good" for canoeing. The river changes from swift and shallow at its source at Spruce Brook to deep and meandering at its mouth. The river is also used for sport fishing, wildlife viewing and game hunting. The bay is used by numerous waterfowl, including pintail, mallard, goldeneye, widgeon and a few Canada Geese as a nesting, staging and feeding area. Large numbers of Muskrat, Otter and Mink are evident here.” The proposed project is located within and could impact this ESA. Refer to Sections 4 and 5 for more information.

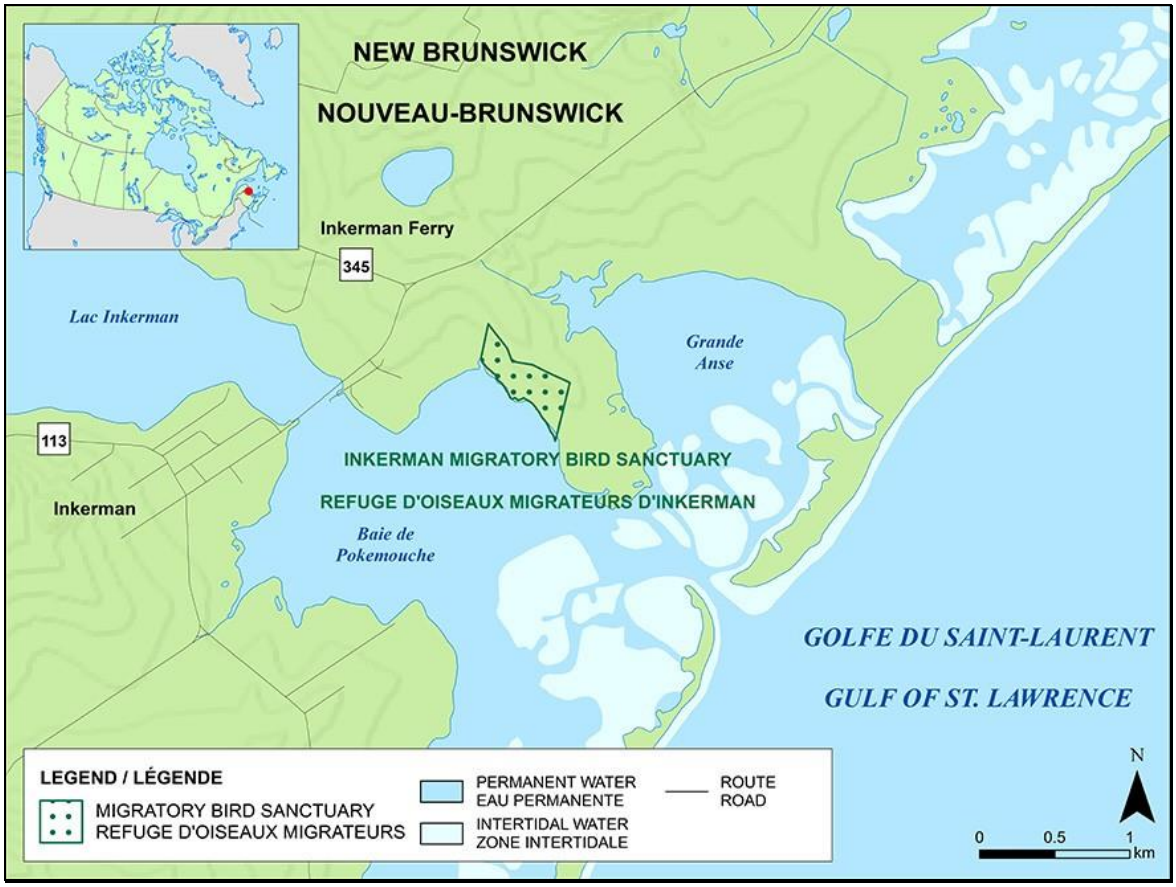
Figure H : ESAs Located Within 5 km Radius of the Subject Site



Inkerman Migratory Bird Sanctuary

The Environment and Climate Change Canada Website was consulted to determine which, if any, Migratory Bird Sanctuary (MBS) is located near the proposed project. The site is not located within a sanctuary; the nearest in proximity to the project is the Inkerman MBS, located approximately 1.5 km east of the project site. The Inkerman MBS is an isolated wooded peninsula situated 2 kilometres northeast of the Village of Inkerman, New Brunswick. The habitat consists of a wooded swamp dominated by red spruce, red maple, white birch and smaller numbers of trembling aspen, balsam fir and white spruce. The sanctuary supports colonial nesting species that require specific habitats and are extremely vulnerable to any threats that may affect this habitat. The colonial nesters using the site are known to be extremely sensitive to human disturbance and require undisturbed habitat in which to raise their young. This habitat usually consists of offshore islands or isolated peninsulas, such as those found on Inkerman MBS. The MBS protects a breeding population of Great Blue Herons (*Ardea Herodias*) and also once supported the largest colony of Black-crowned Night-herons (*Nycticorax nycticorax)* in the Atlantic region; however, these birds have since relocated 18 km north of this site. Given the distance from the project site, the project is not anticipated to impact this ESA.

Figure I: Inkerman Migratory Bird Sanctuary



Important Bird Areas

IBACanada.ca was consulted to determine which, if any, Important Bird Areas (IBA) were located near the proposed project. The site is not located within any IBA; the nearest in proximity to the project are the Pointe aux Rats Musqués Heronry and Pokemouche and Grand Passage beaches.

IBA NB027 Pointe aux Rats Musqués Heronry, Inkerman

This IBA, located approximately 1.5 kilometre east of the project site, is located on the eastern shore of northeastern New Brunswick. Inkerman is located just 2 kilometres west of Pointe aux Rats Musqués. The point is mostly mixed forest that extends from the mainland shore into baie de Petit Pokemouche. Pointe aux Rats Musqués contains a large colony of Black-crowned Night-Herons. The colony also supports Great Blue Herons. The surrounding system of barrier beaches and dunes, which shield several bays and salt marshes from the Atlantic Ocean, has been identified as a separate IBA for the presence of Piping Plovers. American Black Ducks breed and stage in nearby marshes.

IBA NB006 Beaches of Pokemouche and Grand Passage

This IBA, located approximately 2 kilometres southeast of the project site, is located on the eastern shore of northeastern New Brunswick. Inkerman is located just 2 kilometres west of the beaches of Pokemouche and Grand Passage. The site is characterized by a system of barrier beaches and dunes that shield several bays and salt marshes from the ocean. It is comprised of two (2) main sections: Grand Passage beach in the north and Plover Ground (north region) beaches and sand dunes to the south. All these beaches are wide and sandy with the upper portions being colonized by early successional species such as Short-liguled Ammophila. This system of beaches, barrier dunes and bays supports a significant portion of Atlantic Canada's breeding Piping Plover population. Within the site, Piping Plovers are most commonly found at Grand Passage beach, with an average of about 15 birds observed per year. Grand Passage has been noted for high concentrations of Black Ducks. Shorebirds, such as Greater and Lesser Yellowlegs are common at Plover Ground during fall migration.

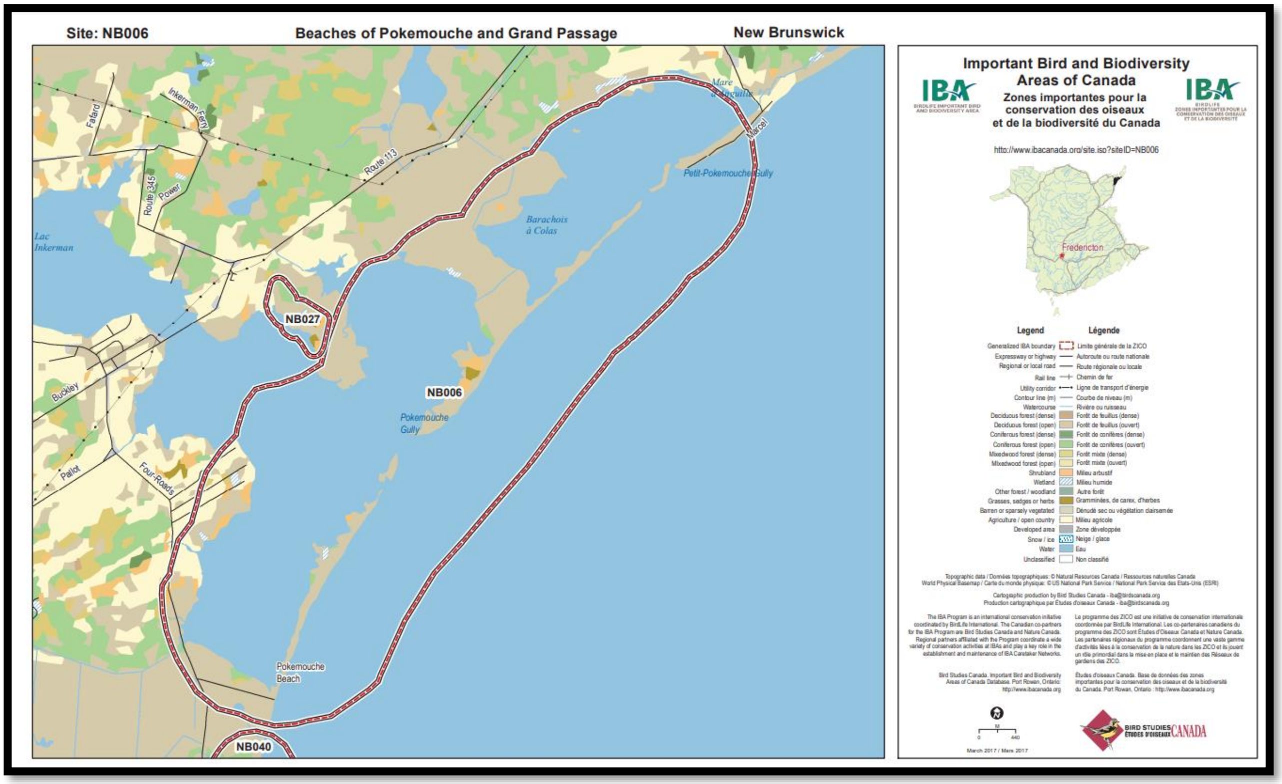
Due to the limited spatial scale of the project, and the distance to these IBAs, the project is not anticipated to adversely impact these areas and is therefore no longer discussed in this report.

3.1.17 Climate

The climate in this region of New Brunswick is greatly influenced by its proximity to the Northumberland Strait. Average summer and winter temperatures are higher than inland due to the nearby warm water of the strait and prevailing west winds. Average precipitation in the region between May and September is 350 mm to 400 mm (DNR, 2007).

Refer to section 7 for additional information on climate change and its potential impacts on the proposed project.

Figure J: IBA No. NB006 and NB 027 (IBA Canada)



3.2 Socio-Economic Environment

3.2.1 Land Use

The project will be on Crown land owned by NBDNRE (now ERD) per the Service New Brunswick Planet Website. No Land Gazette environmental property flags exist for the subject property.

The project is located in an area for which no zoning information is available. A development/building permit would not be required for the construction of the new bridge from the New Brunswick Regional Service Commission 4 (Paul-Emile Robichaud, personal communication). Given that the project will replace an existing bridge and will continue to be part of the Sentier NB Trail system as before, adverse impacts to land use are not anticipated for the proposed project and are no longer discussed in this report.

3.2.2 Population and Economy

According to the Canada Census Bureau, the local service district of Inkerman's 2016 population was 642, down 10% from 2011. Approximately half of the working-age population commutes to work, which is in manufacturing, retail, construction, or agriculture / forestry / fishing / aquaculture. Three (3) active peat harvesting operations are located within 5 kilometres of the proposed bridge, a significant employer in the region.

In recent years, participation in employment in northeastern New Brunswick has generally diminished approximately 10% since 2007, due in part to the ageing population, and out-migration from the area south to larger city centres. "In terms of employment, the healthcare and social assistance (12,100) and retail and wholesale trade (9,700) sectors were by far the largest sectors in the Northeast in 2017…" (PETL, 2018). Tourism (classified as Information, Culture and Recreation) accounted for 1,300 direct jobs in the region.

Residential development includes ribbon development along major roadways, residential development in Inkerman, and a mixture of seasonal and permanent dwellings along the coast.

3.2.3 Archaeological Resources

Archaeological Probability Mapping was obtained from the NB Department of Tourism, Heritage and Culture's Archaeological Services Branch. The shores of the Pokemouche River were traditionally used by the Mi'kmaq people for fishing, harvesting shellfish and gathering, and the areas on both shores are identified as having high probability for archaeological resources. One pre-contact archaeological site is identified within 200 metres of the southwestern end of the bridge (site CkDe-3).

Based on the mapped archaeological sites and the proximity of the site to a watercourse, ERD commissioned an archaeological survey of the project's footprint and adjacent area by Stratis Consulting Inc. The survey included desktop research and a pedestrian survey, but no test pitting was conducted.

The report concluded that the proposed bridge PDA, as described in the preliminary project design, will not impact known archaeological resources and did not recommend further archaeological testing or monitoring. The report does, however, recommend avoiding the buffer

area of known site CkDe-3, and any grubbing or excavation within the 80-metre riparian high potential zone should be avoided. If these mitigation measures are adhered to, this would be considered sufficient mitigation with respect to unknown archaeological resources. Refer to Appendix E for the complete Stratis Consulting Inc. archaeological survey report.

In the event of an accidental discovery of suspected archaeological resources, all work would cease immediately and the Archaeologic Services Branch of the Department of Tourism, Heritage and Culture would be contacted for more information. Refer to sections 4 for additional mitigation measures recommended by Stratis Consulting Inc.

3.2.4 Heritage Sites

A review of the federal and the New Brunswick registers of historic sites Websites shows there are no heritage sites in proximity to the proposed project.

3.2.5 Transportation

The project site is located on the NB Trail, which intersects Route 113 and rue de l'Église on the southwestern approach and intersects Route 345 on the northern approach. Provincial Route Number 113 is a Local Numbered Highway with an Annual Average Daily Traffic of 2,710. Provincial Route Number 345 is also a Local Numbered Highway with an Annual Average Daily Traffic of 3,000 (NB DTI 2017 Traffic Map).

As previously noted, the Route 113 bridge crosses the Pokemouche River roughly 500 m downstream of the proposed project site. Since the destruction of the bridge, all off-road and pedestrian traffic now uses the Route 113 bridge. Although not the primary transportation corridor in the area, Route 113 regularly sees significant traffic, including transport trucks. The construction of the proposed bridge is not anticipated to increase traffic on Route 113 or local roads, but is anticipated to have a positive effect by redirecting pedestrian, cycling, snowmobile and ATV traffic off of Route 113's bridge.

Access to the site will be via existing roadways; no new roads will be constructed or altered as a result of the proposed project, nor will any of these be required within the limits or setback of a DTI road. No significant increase in traffic is anticipated due to the proposed construction. As no adverse impacts on transportation are anticipated, it is no longer discussed in this report.

Photo No. 8: View of NB Trail at the Southern Approach, Looking Southwest (August 7, 2018)

3.2.6 Navigation

The Pokemouche River and Inkerman Lake are primarily recreational waterways; no commercial wharf is located upstream of the subject site. Navigation of the Pokemouche River at this location is through a deep channel (2.5 m) located near the northern bank of the river. The proposed bridge design provides adequate space (13 m wide by 3.5 m high) for recreational craft to safely navigate the site, per the requirements of the *Canada Navigable Waters Act*. The navigation channel will be the same size as the previous bridge channel.

4 ENVIRONMENTAL ASSESSMENT

The environmental impact assessment methodology used herein focuses on those Valued Environmental Components (VEC) present on site that are most likely to be impacted by the project, before mitigation is implemented. VECs are selected based on a review of site information and potential project-VEC interactions. Determination of *Significance* of these potential impacts on VECs is based on an evaluation of magnitude, reversibility, geographic extent, duration and frequency.

Based on the project description and the existing environment, the following potential Valued Environmental Components (VECs) were identified and assessed for the proposed project:

a) Aquatic Wildlife and Habitat;
b) Archaeological and Heritage Resources;
c) Atmosphere (Noise, Dust, Vehicle Emissions);
d) Economy and Employment;
e) Migratory Birds;
f) Navigation;
g) Surface Water Quality;
h) Transportation, and
i) Wetlands.

Where there is a potential for a project-VEC interaction, further discussion is provided in the following sections. For issues where there is limited or no interaction, a rationale is provided and the issue is not discussed further in this report. Potential project-environment interactions are presented in Table 2.

Table No. 2: Potential Project-Environment Interactions Matrix

Activities → / Potential VEC ↓	Construction/ Installation of the Physical Work	Operation / Maintenance of the Physical Work	Decommissioning / Abandonment of the Physical Work	Accidents and Unplanned Events
Aquatic Wildlife and Habitat	-			-
Archaeology and Heritage Resources	-			
Atmospheric Quality	-	-		-
Economy and Employment	+	+		
Land Use				
Migratory Birds	-			-
Navigation	-	-		
Surface Water Quality	-			-
Transportation	+	+		
Wetlands	-			-

4.1 Aquatic Wildlife and Habitat

Existing Conditions

Roy Consultants retained the services of Wood PLC to conduct an underwater benthic habitat survey (UBHS). Wood collected video and photos along 10 transects, which identified two (2) dominant habitat types within the PDA. Habitat 1 consisted of sand and silt barrens where eelgrass is the predominant vegetation. The second habitat consisted of low canopy, limited algal beds.

Project – VEC Interactions, Potential Environmental Effects and Mitigation Measures

Section 35(1) of the *Fisheries Act* states: No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery.

The proposed bridge construction, primarily the infilling of 515 m^2, will permanently impact eelgrass aquatic habitat of varying quality.

Description of Potential Environmental Effect 1

Loss of approximately 515 m^2 of eelgrass aquatic habitat from the infilling at the northern (500m^2) and southern (15m^2) approaches.

Description of Recommended Mitigation Measure 1: Limiting Project Footprint (Avoidance)

The proposed replacement bridge has been designed to limit the actual footprint within the water, particularly within eelgrass areas. An area of infilling over 3,000 m^2 in the *original* bridge design has been reduced to roughly 515 m^2, thereby avoiding significant impacts to fish and fish habitat.

Description of Recommended Mitigation Measure 2: Offsetting

Prior to initiating construction, the proponent would submit a Watercourse and Wetland Alteration Permit application, which acts as a Request for Review to the federal Department of Fisheries and Oceans, to determine if a Fisheries Act Authorization would be required. An Offsetting Plan for the loss of fish habitat, or the inclusion of this project into DTI's habitat offsetting bank, will be completed per the requirements of the *Fisheries Act*.

The proponent or winning contractor will commission a fish rescue within the isolated work area prior to initiating construction. The fish rescue will be conducted by a qualified biologist and a report detailing the methods employed and the number of fish rescued will be submitted to DFO.

Description of Recommended Mitigation Measure 3: Fish Rescue

The proponent or winning contractor would commission a fish rescue from within the isolated work area, prior to initiating construction. The fish rescue would be conducted by a qualified biologist and a report detailing the methods employed and the number of fish rescued would be submitted to DFO.

Prior to initiating construction, the proponent will submit a Request for Review to the federal Department of Fisheries and Oceans to determine if a Fisheries Act Authorization will be required. An Offsetting Plan for the loss of fish habitat will be designed and completed per the requirements of the *Fisheries Act*.

Significance of Potential Impacts

Given the redesign of the bridge to avoid impacts to aquatic habitat, the proposed mitigation to reduce impacts to water quality in the river, the requirement for a fish rescue from the work area and the temporary nature of the project, potential impacts to aquatic wildlife and habitat are not considered likely, not severe due to the small area and therefore are not considered significant.

4.2 Archaeology and Heritage Resources

Existing Conditions

The shores of the Pokemouche River were used by the Mi'kmaq people for fishing, harvesting shellfish and gathering; as such the area on both shores are identified as having a high probability for archaeological resources. One pre-contact archaeological site is identified within 200 metres of the southwestern end of the bridge (site CkDe-3).

Project-VEC Interactions, Potential Environmental Effects

Project construction activities at the southern approach could uncover, damage or destroy unknown archaeological resources.

Description of Potential Environmental Impact 1: Destruction of Archaeological Resources

Although no excavation of the southern approach is anticipated, movement by heavy machinery could uncover previously unknown archaeological resources, resulting in their damage or destruction.

Recommended Mitigation Measure 1

The proponent commissioned an archaeological study of the area to assess the potential risk to unknown and known archaeological resources. The study concluded that the proposed bridge PDA, as described in the preliminary project design, will not impact known archaeological resources and did not recommend further archaeological testing or monitoring.

Recommended Mitigation Measure 2

In the event of an accidental discovery of suspected archaeological resources, all work would cease immediately and the Archaeologic Services Branch of the Department of Tourism, Heritage and Culture would be contacted for more information.

Recommended Mitigation Measure 3

Should any excavation be required within the 80-metre high probability buffer zone or within the 200-metre buffer of known site CkDe-3, additional archaeological surveying will be conducted prior to initiating work in these areas.

Significance of Potential Impacts

Based on the project design, the results of the archaeological survey and the proposed mitigation measures presented here, impacts to archaeological resources are not considered likely and therefore not significant.

4.3 Atmospheric Quality

Existing Conditions

No industrial air emitters are located near the project site. The closest potential source of air pollutants (dust and noise) are three (3) peat bog operations located 2.8 km north of the site, 3.5 km east of the site and 4 km southwest of the site. The primary sources of air impacts in the region are air emissions from internal combustion engines and odours from the proximity of intertidal zones. Air quality is considered acceptable in the region.

Project-VEC Interactions, Potential Environmental Effects

Air quality impacts, such as noise and engine emissions from motorized equipment, could occur during the construction period.

Potential Environmental Impact 1: Noise

Reconstruction of the bridge will require the use of heavy equipment, such as bulldozers, excavators, tractor trailers and crane, which will generate engine noise and back-up signals. Piles will be driven into the soil using an impact or vibratory pile driver. This may disturb or displace wildlife and cause annoyance to nearby residential receptors in the immediate vicinity of the site.

Potential Environmental Impact 2: Air Emissions

The use of motorized equipment will create greenhouse gas emissions and diesel combustion by-products (volatile organic carbon, particulate matter) during the construction of the bridge.

Recommended Mitigation for Potential Environmental Impact 1: Restricted Operating Hours

Hours of operation during construction will be limited to normal workday hours, 7 a.m. to 7 p.m., Monday to Friday, to mitigate the potential for noise to become an annoyance to nearby receptors.

Recommended Mitigation for Potential Environmental Impact 2: Operation of Equipment

Motorized equipment on site will be properly maintained and muffled to reduce noise and emissions.

Idling of equipment when not in use will be prohibited and the scheduled work period will be minimized to the greatest extent possible to minimize the period of time where motorized equipment is used.

Significance of Potential Impacts

Due to the temporary nature of construction and limited hours of use of motorized equipment, proper maintenance of equipment and restriction of operating hours, the potential impacts on air quality are considered temporary, short-term and not severe. Based on this, impacts to air quality from the construction and operation of the project are not considered significant.

4.4 Economy/employment

The replacement of the bridge would result in temporary employment for contractors and labourers during the construction period, approximately 18 months.

As part of the regional trail system used by cyclists, pedestrians, snowmobilers ATV owners, the bridge would provide both direct and indirect tourism benefits to the economy year-round. As these are positive economic impacts, no mitigation is required.

4.5 Migratory Birds

Existing Conditions

The Pokemouche estuary and Inkerman Lake are important staging and feeding areas for waterfowl and shorebirds.

Project – VEC Interactions, Potential Environmental Effects and Mitigation Measures

Construction activities may disturb migrating or foraging shorebird species in the area.

Description of Potential Environmental Effect 1

Migrating or foraging shorebirds may be displaced by an active construction site at the proposed bridge location.

Description of Recommended Mitigation Measure 1

It is anticipated that shorebirds will avoid the work site due to human activity.

Description of Potential Environmental Effect 2

Nesting shorebirds or waterfowl in proximity to the construction site will be disturbed or forced to leave their nests during the breeding season.

Description of Recommended Mitigation Measure 2

No active shorebird or waterfowl nests were identified near the bridge during multiple site visits.

No worker will be permitted to approach or disturb Should a suspected active nest.

If a suspected active nest was be identified within the project development area during construction, work will cease, and a qualified biologist will be contacted to confirm if the nest is active, what species is present, and to provide recommended mitigation. Canadian Wildlife Service will also be advised of the discovery. The proponent will then adhere to the recommendations of the bird biologist and the CWS.

Significance of Potential Impacts

Given the ability of shorebirds and waterfowl to avoid the project during construction and the amount of available foraging area within the Pokemouche Estuary and Inkerman Lake, impacts to migratory birds are considered unlikely and not severe due to the small PDA, and are therefore not considered significant.

4.6 Navigation

Existing Conditions

The Pokemouche River and Inkerman Lake is a popular recreational boating area. Navigation of the Pokemouche River at this location is through a deep channel located near the northern side of the river. The channel is approximately 40 m in width. The proposed bridge design will provide adequate space (3.5m H x 13m W) for pleasure craft to safely transit the site.

Project – VEC Interactions, Potential Environmental Effects and Mitigation Measures

Construction activities may temporarily impede the passage of watercrafts through the channel. Post-construction, the bridge may not be visible to watercrafts at night; this could result in collisions.

Description of Potential Effect 1

When construction reaches the northern portion of the bridge, construction equipment and activities may temporarily impede recreational boat traffic or create potential conflicts with boaters.

Description of Potential Effect 2

The completed bridge may pose a collision hazard to recreational watercrafts at night, or during times of extremely low visibility, if boaters are unaware of the channel's location.

Description of Recommended Mitigation 1

The work area will be properly signed and marked with warning lights to warn boaters. A low-speed and no-wake zone will be implemented, and signage will be erected to advise boaters.

Description of Recommended Mitigation 2

An approval to construct from Transport Canada will be obtained prior to initiating construction. The project will adhere to all mitigation measures recommended by Transport Canada.

Description of Recommended Mitigation 3:

The proposed bridge design maintains the navigation channel width and height from the previous Inkerman Bridge.

Significance of Potential Impacts

Given the above mitigation measures, impacts to navigation are not considered likely, and therefore are not considered significant.

4.7 Surface Water Quality

Existing Conditions

The proposed site contains approximately 250 creosote-treated timber piles, which are not useable for the new structure due to their deteriorated state; however, based on surface sampling completed after the 2017 fire, hydrocarbon impacts to the surface water quality are below applicable thresholds.

Project-VEC Interactions, Potential Environmental Effects

Removal of creosote-treated timber piles may create debris and release petroleum hydrocarbons into the water. Installation of piles and placement of concrete piers in the water may release sediments into the water column.

Potential Environmental Impact 1 – Sediments in Surface Water

The installation of piles into the sediment via vibration or pile driving and the placement of the concrete bridge piers may disturb sediments, creating a plume of sediment-laden water. Additionally, work on land could create areas of exposed soil, which could create sediment migration during heavy rain events.

Potential Environmental Impact 2 – Creosote/Petroleum Hydrocarbons (PAH and PHC) in Water

Approximately 30 to 40 existing, partially burned creosote-treated timbers will need to be removed. These may be damaged or destroyed during the removal process. Exposing the interior of these timber piles, or the creation of wooden debris, could release hydrocarbons to the environment, creating temporary, localized petroleum hydrocarbon impacts to the surface water quality.

Recommended Mitigation for Potential Environmental Impact 1

1) A system of floating booms and silt curtains will be placed around the work area to capture sediment-laden water and prevent it from escaping up- or downstream (depending on the tides). This will isolate the work area and prevent impacts from expanding out of the PDA.

2) Erosion and sediment controls will be placed along the shoreline, as necessary, to ensure no sediments from the equipment laydown areas reach the shoreline.

3) The construction engineering technical specification document will require the winning bidder to develop and follow a detailed, project-specific Environmental Management Plan, to be submitted for review and approval by DELG prior to initiating construction. This will follow the requirements of the DTI EMM, including but not limited to refuelling and fuel storage setbacks, spill response and reporting, as well as standard sediment and erosion mitigation measures.

Recommended Mitigation for Potential Environmental Impact 2

1) Piles that are to remain in place will be avoided by machinery and equipment, and visually monitored to ensure no sheen is visible on the water and no piles are damaged.

2) Timber piles will be completely removed, when possible. A slow, steady pull using vibratory extraction will be used.

3) Removed piles should be managed to prevent contamination of soil or groundwater at the site, temporarily stored in a sealed, waterproof bin outside 30 metres of the normal high-water line and properly disposed of at an approved facility.

4) Sediment disturbance will be minimized – equipment used will be on land or ice, or on a floating platform (barge).

5) Standard construction booms will be installed around the work area to capture and maintain any petroleum product in the water, and will be removed using absorbent pads.

6) No barge grounding should occur to minimize sediment disturbance.

7) A water monitoring program will be developed and implemented during and post construction to determine if any residual water quality impacts remain.

8) The remainder of the piles will be left in place as recommended by the United States Environmental Protected Agency (EPA, 2016) guidance document.

Significance of Potential Impacts

Given the recommended mitigation that will be implemented by the proponent and the temporary nature of the construction, impacts to surface water quality will be short-term, temporary and minor in severity; as such, impacts to surface water quality are not anticipated to be significant.

4.8 Transportation

Access to the construction site will be via existing roads and no road alteration or construction of new roads or work within a DTI road setback are anticipated.

Trucks travelling to and from the work site will be required to adhere to the legal mass and dimension limits prescribed by NB Regulation 201-67 under the NB *Motor Vehicle Act*, except as authorized by a special permit issued pursuant to paragraph 261 of the NB *Motor Vehicle Act*, including spring weight restrictions when applicable.

Although not anticipated, any work occurring within the right-of-way of a provincial road will adhere to the uniform set of traffic control guidelines in the Work Area Traffic Control Manual (WATCM).

The positive impacts of the proposed project will result in fewer pedestrians, cyclists, snowmobilers and ATV owners using the Route 113 bridge, thereby resulting in a lower probability of conflicts between users and motor vehicles.

Based on the above information, no impacts on transportation are anticipated and no additional mitigation is required.

4.9 Wetlands

Existing Conditions

The nearest mapped PSWs and regulated wetlands are well outside the PDA and are not anticipated to be impacted by the project.

An unmapped wetland, approximately 750 m^2 in size, is located within 20 metres of the northeastern approach. A vegetated buffer is present between this wetland and the northern approach/railway ROW.

Project-VEC Interactions, Potential Environmental Effects

Construction of the project could adversely impact this unmapped wetland.

Description of Potential Environmental Impact 1: Disturbance of Wetland Area

During construction, motorized equipment could enter the unmapped wetland or wetland buffer, and damage or destroy wetland vegetation, habitat and wildlife, particularly if the site is snow-covered.

Recommended Mitigation for Potential Environmental Impact 1

1) The wetland is located outside the PDA and interactions between the wetland and the project are not anticipated, particularly given that the construction laydown area and sequence of work will be from the southwest. Nevertheless, the edge of the wetland and wetland buffer area will be delineated by a certified delineator and flagged so that they are visible to construction workers.
2) Construction workers will be advised to avoid the wetland and buffer during all construction activities on the northern approach.

Significance of Potential Impacts

The unmapped wetland is located outside the PDA and is not likely to be impacted by the narrow footprint of the project. Given the proposed mitigation to avoid the wetland, the temporary nature of the project and the fact that it is not likely that project construction or operation will impinge on the wetland's boundaries, potential impacts to the unmapped wetland are not considered likely and are therefore not significant.

4.10 Economy/Employment

The replacement of the bridge will result in temporary employment for contractors and labourers during the construction period, approximately 18 months.

As part of the regional trail system used by cyclists, pedestrians, snowmobilers and ATV owners, the bridge will provide indirect tourism benefits to the economy year-round.

5 ACCIDENTS AND UNPLANNED EVENTS

Accidents and unplanned events can occur whenever motorized equipment and temporary storage of petroleum products is involved in a construction project. All contractors will be required to develop project-specific Environmental Protection Plans, which adhere to the requirements of the NB DTI Environmental Management Manual and the NBDTI Standard Specifications for Highway Infrastructure, which will include requirements for health and safety, reporting work accidents and injuries, chemical spills, etc. to appropriate authorities, petroleum product use and storage requirements, as well as requirements for specific types of construction equipment.

The DTI Environmental Management Manual can be accessed online at:

https://www2.gnb.ca/content/dam/gnb/Departments/trans/pdf/en/RoadsHighways/EnvironmentalManagementManual.pdf

The NBDTI Standard Specifications for Highway Construction can be accessed online at:

https://www2.gnb.ca/content/dam/gnb/Departments/trans/pdf/en/Publications/2019_Standard_Specs-e.pdf

6 CUMULATIVE EFFECTS

"Cumulative Effects are changes to the environment that are caused by an action in combination with other past, present and future human actions." (CEAA, 1999). To properly define and assess cumulative effects that may result from a single project, spatial considerations (region), temporal considerations (timeframe), and past, ongoing and reasonable future projects in conjunction with the proposed subject project must be considered.

The proposed bridge reconstruction is not anticipated to permanently adversely impact Valued Environmental Components within the larger Pokemouche River ecosystem, with the exception of the loss of approximately 515m^2 of eelgrass aquatic habitat. However, the proposed project will require an Authorization under the *Fisheries Act*, including the requirement for an offsetting plan that will compensate for the permanent loss of eelgrass aquatic habitat at a ratio determined by DFO. This will offset the loss of eelgrass habitat and contribute to the amount of quality aquatic habitat within the region when the offsetting plan has been successfully implemented.

Taking into account the proposed bridge design, the minimal footprint of the PDA, the location of the project and the proposed mitigation, no adverse environmental impacts are anticipated as a result of the project and therefore no cumulative effects assessment was conducted for this project.

7 IMPACT OF THE ENVIRONMENT ON THE PROJECT

The 100-year return period flood water level for the section of coastline incorporating Inkerman was estimated by Daigle (2017) for the year 2010 to be 2.3 m ± 0.1 m and for 2100 to be 3.0 m ± 0.5 m. This flood water level is a sum of the Higher High Water Large Tide (1.0 m ±0.1 m), storm surge (1.3 m) and relative sea level rise (0.7 m for the year 2100). The bottom chord of the replacement bridge would normally be set based on the flood water level plus freeboard requirements, generally 1.0 m minimum. However, the Inkerman Trail Bridge is not located on an exposed coastline, but located in a sheltered tidal estuary approximately 3.7 km upstream from where the Pokemouche River discharges into the Gulf of Saint Lawrence through a lagoon system. It is therefore reasonable to assume that the flood level would be muted because the river is poorly connected to the Gulf of Saint Lawrence. The flood water level also ignores possible coastal wave heights and run-up as these will be limited within the estuary due to reduced fetch length.

Ice cover also generally occurs during seasons of highest wind and offers a dampening effect on wave forces. Erosion due to wave action can be expected to increase over the next century due to the gradual decrease in the amount of ice cover along the coastline.

The trail surface and the bridge may be inundated at the 100-year return period flood water level for the year 2100 as the bridge approaches have an elevation of approximately 3.0 m. The trail would have to be raised for a considerable length to avoid any risk of flooding due to the flat topography and low relief of the area. Given this, the design recommends connecting the proposed replacement bridge vertical alignment into the existing trail surface at the bridge approaches with the understanding that flood water levels may infrequently inundate the trail and bridge.

Note all water levels and elevations are provided in CGVD28.

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8 MITIGATION SUMMARY TABLE

Valued Environmental Component (VEC)	Description of Potential Project Interaction with VEC/VSC	Required Mitigation
Aquatic Wildlife and Habitat	1 - The proposed bridge construction, primarily the infilling of 515 m^2, will permanently impact eelgrass aquatic habitat.	1 - The proposed replacement bridge has been designed to limit the actual footprint within the water, particularly within eelgrass areas. An area of infilling over 3,000 m^2 in the original bridge design was reduced to roughly 515$m^2$515 m^2, thereby avoiding significant impacts to fish and fish habitat. 2 - The proponent will obtain a Fisheries Act Authorization from DFO. If necessary, an Offsetting Plan for the loss of fish habitat will be designed and completed per the requirements of the Fisheries Act.
	2 - Individual fish may be trapped behind sediment and silt controls.	3 - The proponent or winning contractor will commission a fish rescue within the isolated work area, as needed. The fish rescue will be conducted by a qualified biologist and a report detailing the methods employed and the number of fish rescued will be prepared for the client.

Archaeology and Heritage Resources	1 - Project construction activities at the southern approach could uncover, damage or destroy unknown archaeological resources.	1 - The proponent commissioned an archaeological study of the area to assess the potential risk to unknown and known archaeological resources. The study concluded that the proposed bridge PDA, as described in the preliminary project design, will not impact known archaeological resources, and did not recommend further archaeological testing or monitoring. 2 - In the event of an accidental discovery of suspected archaeological resources, all work will cease immediately, and the Archaeologic Services Branch of the Department of Tourism, Heritage and Culture will be contacted for more information. 3 - Should any excavation or soil disturbance be required within the 80-metre high probability buffer zone or within the 200-metre buffer of known site CkDe-3, additional archaeological surveying will be required prior to initiating work in these areas.
Atmospheric Quality	1 - The use of heavy equipment and machinery for construction purposes may cause elevated noise levels. 2 - A reduction in air quality can result from emissions of motorized equipment and vehicles for construction activities.	1 - Hours of operation during construction will be limited to normal workday hours, 7 a.m. to 7 p.m., Monday to Friday, to mitigate the potential for noise to become an annoyance to nearby receptors. 2 - Motorized equipment on site will be properly maintained and muffled to reduce noise and emissions. 3 - Idling of equipment when not in use will be prohibited and the scheduled work period will be minimized to the greatest extent possible to minimize the period where motorized equipment is used.

Economy/ Employment	1 - The construction of the bridge will result in temporary construction jobs. No negative impacts on employment are anticipated from this project.	No mitigation required.
Migratory Birds	1 - The Pokemouche estuary and Inkerman Lake are important staging and feeding areas for waterfowl and shorebirds. 2 - Construction activities may disturb migrating or foraging shorebird species in the area. 3 - Nesting shorebirds or waterfowl in proximity to the construction site will be disturbed or forced to leave their nests during the breeding season.	1 - It is anticipated shorebirds will avoid the work site due to human activity. 2 - If a suspected active nest is identified during construction, work will cease, and a qualified biologist will be contacted to confirm if the nest is active and by which species. 3 - No worker will be permitted to approach or disturb a suspected active nest. 4 - Canadian Wildlife Service will be advised of the discovery. The proponent will then adhere to the recommendations of the bird biologist and the CWS.
Navigation	1 - When construction reaches the northern portion of the bridge, construction equipment and activities may temporarily impede recreational boat traffic or create potential conflicts with boaters. 2 - The completed bridge may cause collisions with recreational crafts at night if boaters are unaware of the channel location or during times of extremely low visibility.	1 - The work area will be properly signed and marked with warning lights to warn boaters. A low-speed and no-wake zone will be implemented, and signs erected to advise boaters. 2 - The navigation channel will be marked with buoys to inform boaters of the proper navigation channel. 3 - Additionally, the final detailed design, as well as work plan and mitigation measures for safe navigation of the channel will be submitted to Transport Canada for review and approval prior to construction (Licence to Construct). All conditions of the approval will be adhered to.

Surface Water Quality	1 - Removal of creosote timber piles may create debris and release petroleum hydrocarbons into the water.	1 - Piles that are to remain in place will be avoided by machinery and equipment and visually monitored to ensure no sheen is visible on the water and no piles are damaged. 2 - Timber piles will be completely removed, when removal is necessary. A slow, steady pull using vibratory extraction will be the preferred method. 3 - Typical floating silt fence booms will be installed to isolate the work area from the adjacent waterway. Any petroleum found in the water will be removed using sorbent pads or other acceptable method and properly disposed of. 4 - Removed piles will be managed to prevent contamination of soil or groundwater at the site, temporarily stored in a sealed, waterproof bin outside 30 metres of the normal high-water line and properly disposed of at an approved facility. 5 - The remaining piles will be left in place as recommended by the United States Environmental Protected Agency's (EPA, 2016) guidance document.
	2 - Installation of piles and placement of concrete piers in the water may release sediments into the water column.	6 - A system of floating booms and silt curtains will be placed around the work area to capture sediment-laden water and prevent it from escaping up- or downstream (depending on the tides). This will isolate the work area and prevent impacts from expanding out of the PDA. 7 - Sediment disturbance will be minimized – equipment used will be on land or ice, or on a floating platform (barge). 8 - No barge grounding will be permitted to minimize sediment disturbance.
	3 – Work on land could create areas of exposed soil, which could create	9 - Erosion and sediment controls will be placed along the shoreline, as necessary, to ensure no sediments from the equipment laydown areas reach the water.

	sediment migration during heavy rain events.	10 - The construction engineering technical specification document will require the winning bidder to develop and follow a detailed, project-specific Environmental Management Plan, to be submitted for review and approval by DELG prior to initiating construction. This document will follow DTI's Environmental Management Manual (EMM) and include all of the above. 11 - A water monitoring program will be developed and implemented during and after construction to identify any residual water quality impacts.
Transportation	1 - Construction vehicles will access the site via existing provincial roads and streets.	1 - No alteration or construction of new roads or work within a DTI road setback is anticipated. 2 - Trucks travelling to and from the work site will be required to adhere to the legal mass and dimension limits prescribed by NB Regulation 201-67 under the NB *Motor Vehicle Act*, except as authorized by a special permit issued pursuant to paragraph 261 of the NB *Motor Vehicle Act*, including spring weight restrictions when applicable. 3 - Although not anticipated, any work occurring within the right-of-way of a provincial road will adhere to the uniform set of traffic control guidelines presented in the Work Area Traffic Control Manual (WATCM).
Accidents and Unplanned Events	1 - Accidents and unplanned events can occur whenever heavy motorized equipment and temporary storage of petroleum products are involved in a construction project.	1 - Mitigation addressing accidents and unplanned events during the construction of the proposed bridge will be addressed in a separate Environmental Management Plan, prepared by the contractor and which will adhere to the DTI EMM document, as well as the Canadian Wildlife Service guidance document titled "Birds and Oil CWS Response Plan Guidance" (Appendix F), and others as appropriate.

9 PUBLIC INVOLVEMENT PROGRAM

The public involvement activities proposed for this project registration will be conducted as per the requirements of Schedule C of the Guide to Environmental Impact Assessment in New Brunswick (2012) and will involve the following, based on a program submitted to and approved by the DELG.

1. The proponent shall communicate directly with elected officials (i.e.: MLA and mayor), local service districts, community groups, environmental groups and other key stakeholder groups (companies, agencies, interest groups, etc.) and First Nations as appropriate, enabling them to become familiar with the proposed project and ask questions and/or raise concerns.
2. The proponent shall provide direct, written notification (letter, information flyer, etc.) about the project and its location to potentially affected area residents, landowners and individuals (to be determined in consultation with Sustainable Development, Planning and Impact Evaluation Branch). The notification must include the following:
   a) A brief description of the proposed project;
   b) Information on how to view the registration document;
   c) A description of the proposed location (map is desirable);
   d) The status of the provincial approvals process (i.e.: "The project is currently registered for review with the Department of Environment and Local Government under the *Environmental Impact Assessment Regulation, Clean Environment Act*");
   e) A statement indicating people can ask questions or raise concerns with the proponent regarding the environmental impacts;
   f) Proponent contact information (name, address, phone number, e-mail); and
   g) The date by which comments must be received (See Section 6.0 of the Registration Guide).
3. When the EIA report is completed, it will be submitted to the DELG and placed on the DELG Website and the registration document (and any subsequent submissions in response to issues raised by the Technical Review Committee) shall be made available for public review at 20 McGloin Street, 2nd Floor, Fredericton, New Brunswick.
4. The proponent shall make copies of the project's registration document (and any subsequent submissions in response to issues raised by the Technical Review Committee) available to any interested member of the public, stakeholder or First Nation. *A hard copy will be submitted to the Bathurst DELG Regional Office.*
5. In addition to the above minimum requirements, the proponent shall place notice(s) in L'Acadie Nouvelle and the Telegraph Journal, advising the public of the project and providing an opportunity to submit questions and/or concerns, in writing. A minimum 30 day response period shall be included in the advertisement, and contact information for submittal of comments. *Ads will be placed in L'Acadie Nouvelle and the Telegraph Journal*.
6. Within 60 days of project registration, the proponent shall prepare and submit to the Department of Environment and Local Government a report documenting the above public involvement activities and shall make this report available for public review.

The public involvement strategy will be submitted separately to the DELG Project Manager for approval and a summary report outlining the strategy and its results will be submitted for review within 60 days of the date of registration.

10 RIGHTSHOLDER ENGAGEMENTINDIGENOUS PEOPLES

The proposed project lies within the traditional Mi'gmaq territory of Gespegeog. The provincial government, as the proponent of the project, has a Duty to Consult with First Nations. Any for the proposed reconstruction of Inkerman Bridge. Additionally, any federal permit under the *Fisheries Act* or the CNWA will also require consultation with Indigenous Peoples.

Notification letters with the draft EIA report have been sent to Mi'gmaq First Nations in New Brunswick and Mi'gmawe'l Tplu'taqnn Incorporated (MTI). MTI is an Indigenous Rights Organization that promotes and supports the implementation of Aboriginal and Treaty Rights of its member Nations. Should the project proceed, the Crown would initiate consultation with potentially impacted First Nations at the earliest possible date, subject to provincial and federal consultation guidelines.

In addition to the above, engagement with First Nations in relation to federal permits will be coordinated to ensure early and meaningful engagement occurs for the proposed project.

11 APPROVAL OF THE UNDERTAKING

The following permits, approvals and authorizations are anticipated for the project to include, but not be limited to:

- *Environmental Impact Assessment Regulation*: A Certificate of Determination (CoD) will be required for the proposed project.
- *Watercourse and Wetland Alteration Regulation*: A Watercourse and Wetland Alteration Permit (WAWA) will be required for any work in or within 30 m of a watercourse or wetland. This includes any excavation or infilling within 30 m of the Pokemouche River and the in-stream work required for the reconstruction of the bridge.
- *Crown Lands and Forest Act*: A Licence of Occupation will be required for the work carried out on Crown Land, including the former CNR right-of-way, and the work within the Pokemouche River, which is submerged Crown Land.
- *Canadian Navigable Waters Act*: A Licence to Construct will be required from the Navigation Protection Program, through the Public Resolution Process for Unscheduled Waters. This is required as the bridge is considered a “works” under the Act. The public resolution process involves seeking public input, including posting the proposed project on the Canadian Common Project Registry, and allowing a 30-day comment period.
- *Fisheries Act*: A Fisheries Act Authorization (FAA) will be required from the Department of Fisheries and Oceans (DFO) for the potential Harmful Alteration, Disruption or Destruction (HADD) of fish habitat in the Pokemouche River. The WAWA permit application will act as a Request for Review; DFO will review the project description and determine if an application for an FAA is required.

12 FUNDING

The Department of Natural Resources and Energy Development and the Department of Transportation and Infrastructure are working in conjunction with the Premier's office to determine if funding is available under the Integrated Bilateral Agreement, Community Development Fund or Community Investment Fund. The Integrated Bilateral Agreement supports new infrastructure projects, and the renewal/rehabilitation and modernization of existing infrastructure. These projects will be cost-shared between the federal government, New Brunswick government, municipalities and other partners. The Community Development Fund and Community Investment Fund focuses on contribution to economy and quality of life, recreation and overall community planning.

13 CLOSING STATEMENT

This environmental impact assessment identified Valued Environmental Components, which may potentially be impacted by the reconstruction and operation of the Inkerman Walking Bridge. Significance was determined based on the criteria of likelihood, scale, duration and proposed mitigation.

Potential VECs were identified and assessed as either not potentially impacted by the project, or potential impacts were not considered significant based on the above criteria.

This report was prepared by Roy Consultants for the exclusive use of the proponent. The information contained herein may not be republished or relied upon for any other purpose or by any other third party without the express written notice of the author.

14 REFERENCES CITED

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North American Orchid Conservation Centre https://goorchids.northamericanorchidcenter.org

www.stripertracker.org (striped bass)

www.birdweb.org

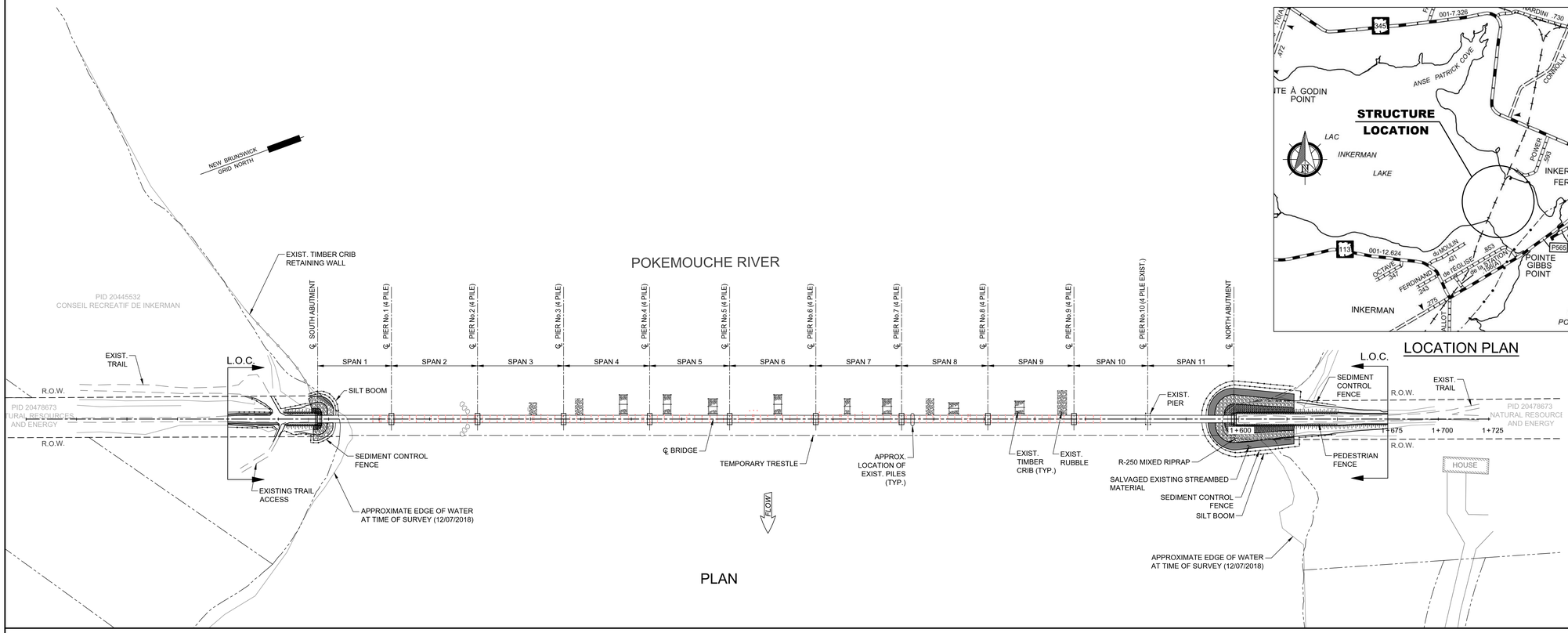
https://www.ec.gc.ca/ap-pa/default.asp?lang=En&n=61281A67-1&pedisable=true. Inkerman migratory bird sanctuary

University of Saskatchewan
http://www.usask.ca/biology/rareplants_sk/root/htm/en/plants-description/blysmus-rufus/y-blysmus-rufus.php

APPENDICES

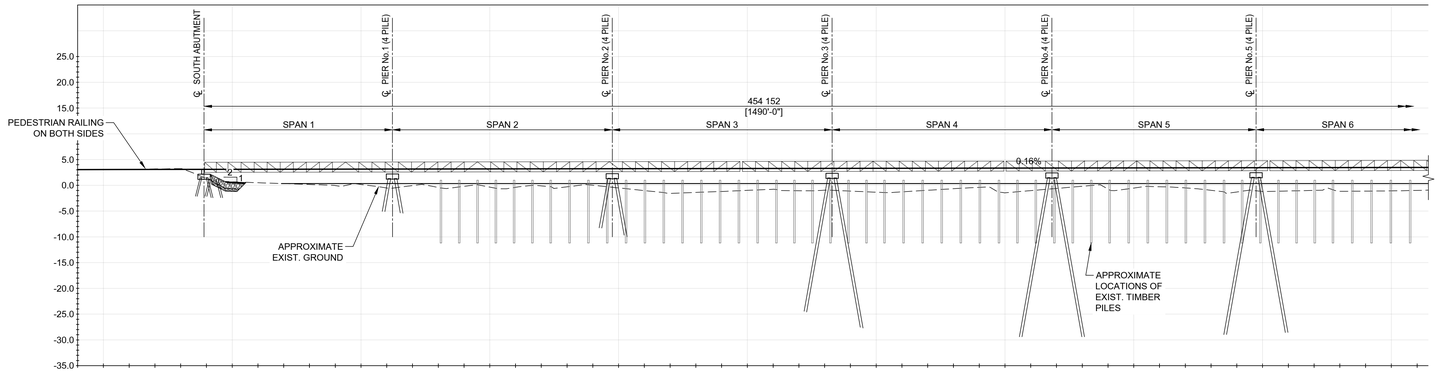
APPENDIX A

Appendix A – Figures



PLAN

LOCATION PLAN



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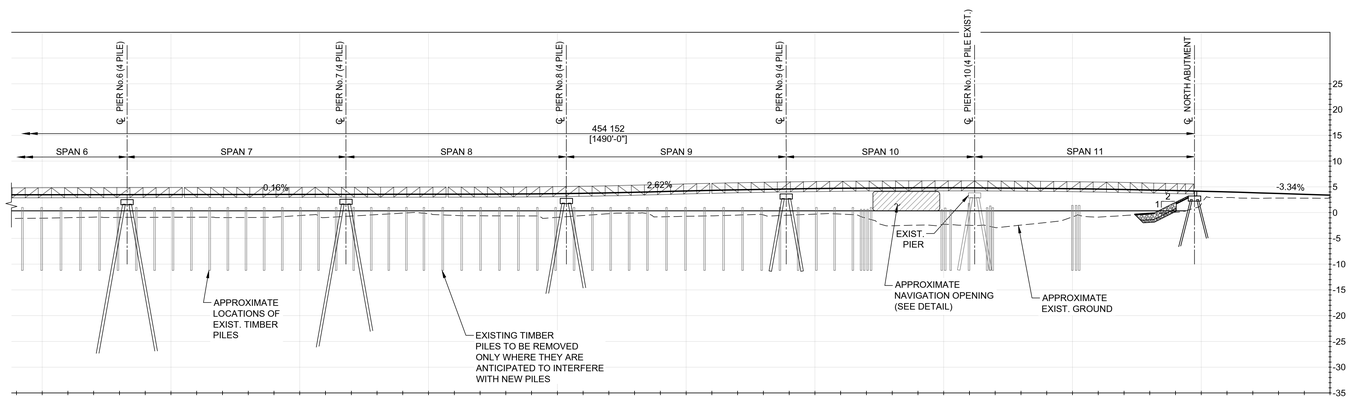

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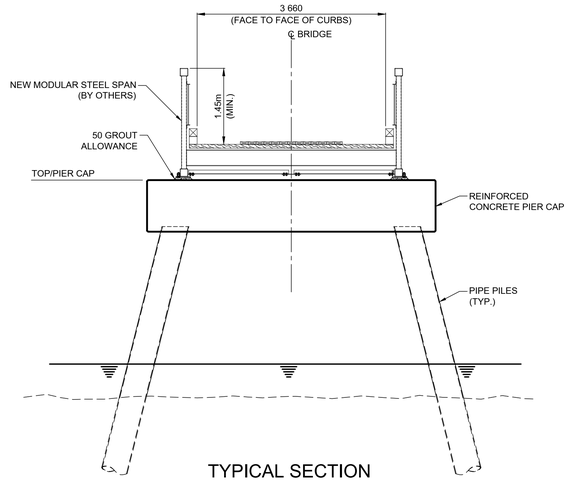

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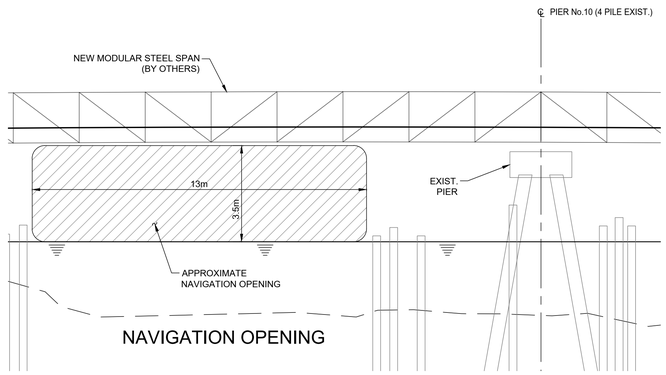
SCALE 1 : 50



NAVIGATION OPENING

Software: AutoCAD Filename: 17068_YYYYMMDD-01_PLAN & PROFILE (CLEAN VER).dwg Plotted: April 7, 2022 Plotted by: Dennis Stickles

New Nouveau Brunswick

Department of Transportation and Infrastructure / **Ministère des Transports et de l'Infrastructure**

Buildings Division / **Division des Bâtiments**

Consultant / **Expert-conseil**

HILCON LIMITED
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Fredericton, NB E3B 3P7
Tel: (506) 454-4455
www.Hilcon.ca

General notes / **Notes générales**

SUBMITTED FOR REVIEW	PA	MAR. 2020
Revisions / Révisions	**No/N^{O}**	**Date**

Project Title / **Titre du projet**

INKERMAN TRAIL BRIDGE
ENGINEERING SERVICES

Sheet title / **Titre de la feuille**

PROPOSED INFILLING
PLANS WITH
ALTERNATIVE TRUSSES

Date / Date	Stamp / Sceau
APRIL 2022	Preliminary NOT FOR CONSTRUCTION
Scale / Échelle: AS NOTED	
Drawn by / Dessiné par: DWS	
Approved by / Approuvé par: EYA	
Consultant reference number / Numéro de référence de l'expert-conseil: 17068	

Project No. / N^{O} du projet	Sheet No. / N^{O} de la feuille
298-N01-BY7P14	01 OF –

APPENDIX B

Appendix B – Site Photos

Photo No. 1: Inkerman Bridge Pre-Fire Looking North (2016)

Photo No. 2: Southern Approach

Photo No. 3: Southern Approach

Photo No. 4: Vegetation at Southern Approach

Photo No. 5: Northern Approach

Photo No. 6: Northern Approach

Photo No. 7: Northern Approach

APPENDIX C

Appendix C – ACCDC Report # 6120

Atlantic Canada Conservation Data Centre
Centre de données sur la conservation du Canada atlantique

DATA REPORT 6120: Inkerman, NB

Prepared 13 August 2018
by J. Churchill, Data Manager

CONTENTS OF REPORT

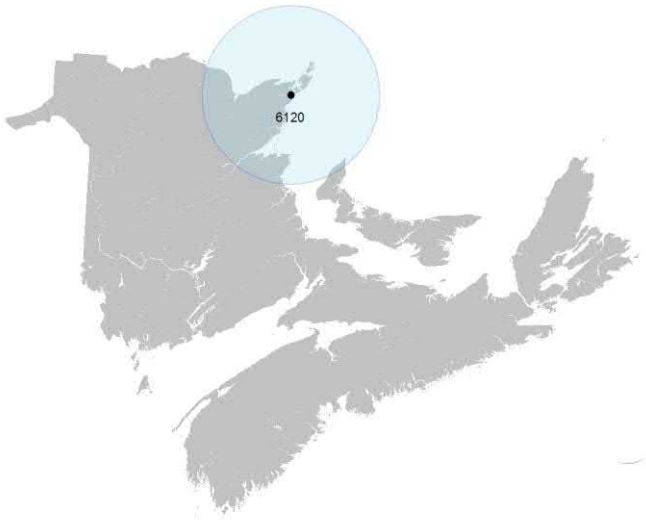
1.0 Preface
- 1.1 Data List
- 1.2 Restrictions
- 1.3 Additional Information
- Map 1: Buffered Study Area

2.0 Rare and Endangered Species
- 2.1 Flora
- 2.2 Fauna
- Map 2: Flora and Fauna

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

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

5.0 Rare Species within 100 km
- 5.1 Source Bibliography



Map 1. A 100 km buffer around the study area

1.0 PREFACE

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

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

1.1 DATA LIST

Included datasets:

Filename	Contents
InkermanNB_6120ob.xls	All Rare and legally protected *Flora and Fauna* in your study area
InkermanNB_6120ob100km.xls	A list of Rare and legally protected *Flora and Fauna* within 100 km of your study area
InkermanNB_6120ma.xls	All *Managed Areas* in your study area
InkermanNB_6120sa.xls	All *Significant Natural Areas* in your study area
InkermanNB_6120ff.xls	Rare and common *Freshwater Fish* in your study area (DFO database)
InkermanNB_6120bc.xls	Rare and common *Colonial Birds* in your study area

1.2 RESTRICTIONS

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

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

1.3 ADDITIONAL INFORMATION

The attached file DataDictionary 2.1.pdf provides metadata for the data provided.

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

Plants, Lichens, Ranking Methods, All other Inquiries
Sean Blaney, Senior Scientist, Executive Director
Tel: (506) 364-2658
sblaney@mta.ca

Animals (Fauna)
John Klymko, Zoologist
Tel: (506) 364-2660
jklymko@mta.ca

Plant Communities
Sarah Robinson, Community Ecologist
Tel: (506) 364-2664
srobinson@mta.ca

Data Management, GIS
James Churchill, Data Manager
Tel: (902) 679-6146
jlchurchill@mta.ca

Billing
Jean Breau
Tel: (506) 364-2657
jrbreau@mta.ca

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

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Stewart Lusk, Natural Resources: (506) 453-7110.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Sherman Boates, NSDNR: (902) 679-6146. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NSDNR Regional Biologist:

Western: Duncan Bayne
(902) 648-3536
Duncan.Bayne@novascotia.ca

Western: Jason Power
(902) 634-7555
Jason.Power@novascotia.ca

Central: Shavonne Meyer
(902) 893-6353
Shavonne.Meyer@novascotia.ca

Central: Kimberly George
(902) 893-5630
Kimberly.George@novascotia.ca

Eastern: Lisa Doucette
(902) 863-7523
Lisa.Doucette@novascotia.ca

Eastern: Terry Power
(902) 563-3370
Terrance.Power@novascotia.ca

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

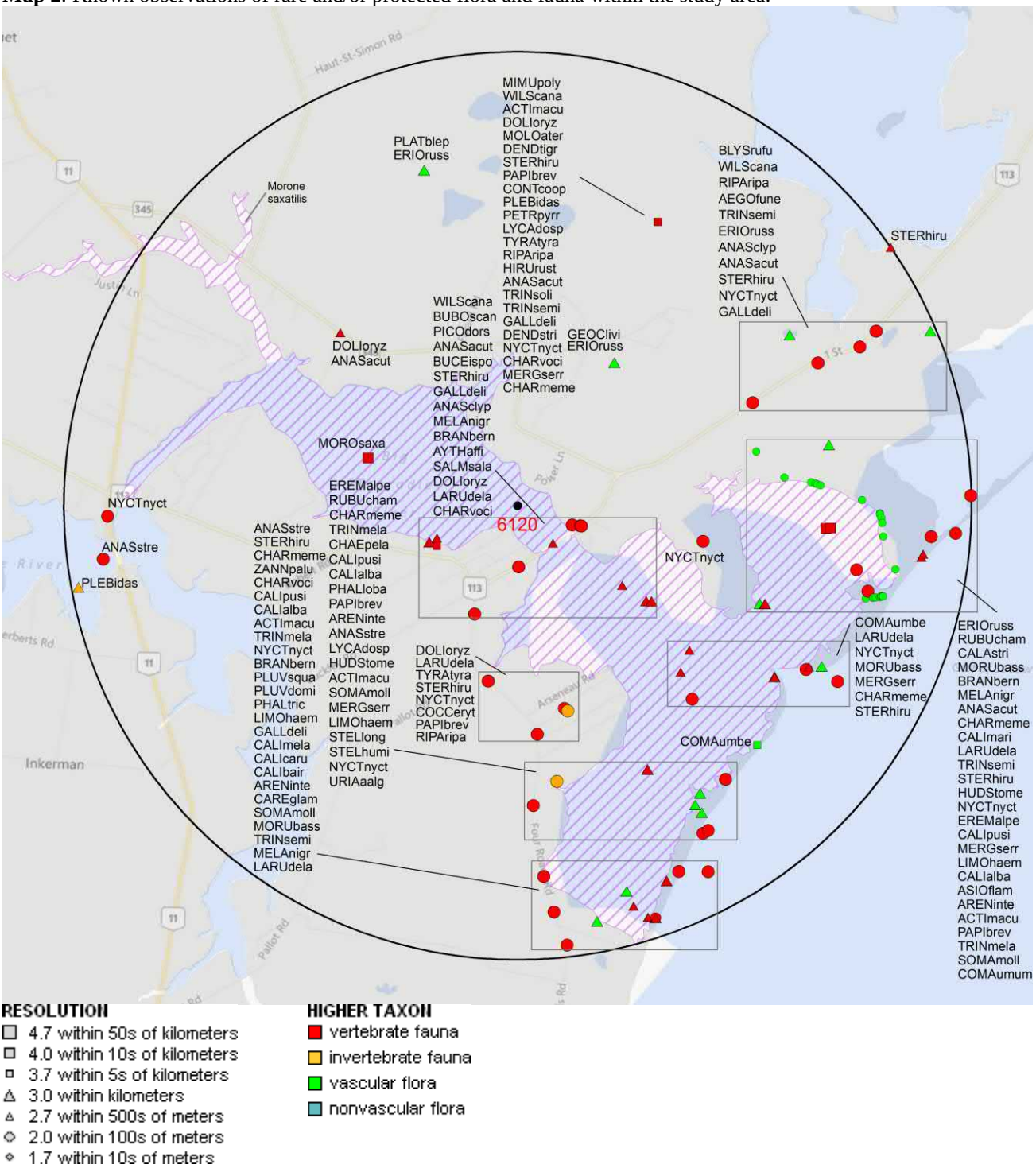
2.1 FLORA

The study area contains 40 records of 13 vascular, no records of nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 580 records of 53 vertebrate, 12 records of 3 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

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

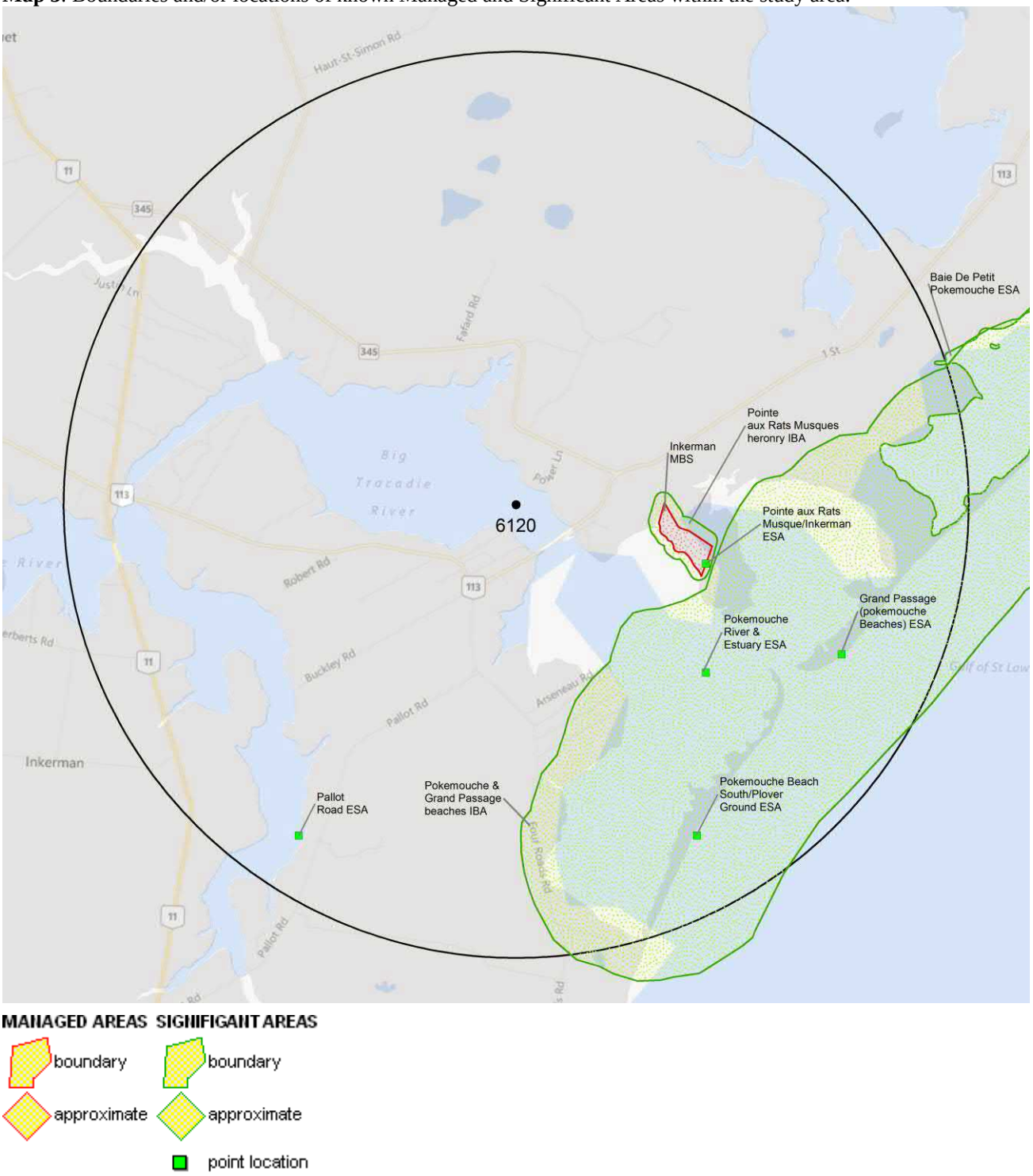


3.0 SPECIAL AREAS

3.1 MANAGED AREAS
The GIS scan identified 1 managed area in the vicinity of the study area (Map 3 and attached file: *ma*.xls).

3.2 SIGNIFICANT AREAS
The GIS scan identified 8 biologically significant sites in the vicinity of the study area (Map 3 and attached file: *sa*.xls).

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



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	Prov GS Rank	# recs	Distance (km)
P	*Stellaria longipes*	Long-stalked Starwort				S1	2 May Be At Risk	1	3.9 ± 1.0
P	*Carex glareosa var. amphigena*	Gravel Sedge				S1	2 May Be At Risk	2	4.7 ± 1.0
P	*Blysmus rufus*	Red Bulrush				S2	3 Sensitive	1	3.5 ± 2.0
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	4 Secure	1	3.8 ± 1.0
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	4 Secure	5	3.8 ± 1.0
P	*Comandra umbellata*	Bastard's Toadflax				S3	4 Secure	2	3.7 ± 4.0
P	*Comandra umbellata ssp. umbellata*	Bastard's Toadflax				S3	4 Secure	6	4.0 ± 0.0
P	*Platanthera blephariglottis*	White Fringed Orchid				S3	4 Secure	1	3.8 ± 1.0
P	*Zannichellia palustris*	Horned Pondweed				S3	4 Secure	1	4.4 ± 1.0
P	*Rubus chamaemorus*	Cloudberry				S3S4	4 Secure	11	2.9 ± 1.0
P	*Geocaulon lividum*	Northern Comandra				S3S4	4 Secure	1	1.9 ± 1.0
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	4 Secure	6	1.9 ± 1.0
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S3S4	4 Secure	2	2.7 ± 0.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	1 At Risk	119	2.9 ± 1.0
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered		Endangered	S2M	1 At Risk	5	4.8 ± 0.0
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Threatened	S2B,S2M	3 Sensitive	2	3.5 ± 7.0
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	1	3.8 ± 0.0
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	3 Sensitive	8	2.5 ± 0.0
A	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	1	3.5 ± 7.0
A	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	4	0.7 ± 0.0
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	3 Sensitive	15	0.7 ± 0.0
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern	Special Concern	S2B,S2M	3 Sensitive	1	2.9 ± 1.0
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	3 Sensitive	2	0.6 ± 0.0
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern			S3M	3 Sensitive	1	3.2 ± 1.0
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	4 Secure	1	1.1 ± 1.0
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B,SUM	2 May Be At Risk	1	4.4 ± 0.0
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	3 Sensitive	30	0.7 ± 0.0
A	*Morone saxatilis*	Striped Bass	E,E,SC			S3	2 May Be At Risk	1	1.7 ± 10.0
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S5M	4 Secure	36	2.9 ± 1.0
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B,S1M	3 Sensitive	1	4.8 ± 0.0
A	*Uria aalge*	Common Murre				S1B,S3N,S3M	4 Secure	1	4.1 ± 0.0
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	4 Secure	2	1.5 ± 0.0
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	2	2.9 ± 1.0
A	*Branta bernicla*	Brant				S1N, S2S3M	4 Secure	4	1.5 ± 0.0
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B,S1S2M	3 Sensitive	67	0.6 ± 0.0
A	*Calidris bairdii*	Baird's Sandpiper				S1S2M	3 Sensitive	1	4.8 ± 0.0
A	*Mimus polyglottos*	Northern Mockingbird				S2B,S2M	3 Sensitive	1	3.5 ± 7.0
A	*Anas strepera*	Gadwall				S2B,S3M	4 Secure	3	3.2 ± 1.0
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	4 Secure	1	3.5 ± 7.0
A	*Picoides dorsalis*	American Three-toed Woodpecker				S2S3	3 Sensitive	1	1.1 ± 1.0
A	*Salmo salar*	Atlantic Salmon				S2S3	2 May Be At Risk	1	1.8 ± 1.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)
A	*Anas clypeata*	Northern Shoveler				S2S3B,S2S3M	4 Secure	2	0.7 ± 0.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	4	3.5 ± 7.0
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	3 Sensitive	3	4.8 ± 0.0
A	*Charadrius vociferus*	Killdeer				S3B,S3M	3 Sensitive	37	0.7 ± 0.0
A	*Tringa semipalmata*	Willet				S3B,S3M	3 Sensitive	14	3.5 ± 7.0
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B,S3M	4 Secure	1	2.3 ± 0.0
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	3	3.5 ± 7.0
A	*Somateria mollissima*	Common Eider				S3B,S4M,S3N	4 Secure	8	2.9 ± 1.0
A	*Dendroica tigrina*	Cape May Warbler				S3B,S4S5M	4 Secure	1	3.5 ± 7.0
A	*Anas acuta*	Northern Pintail				S3B,S5M	3 Sensitive	10	1.1 ± 1.0
A	*Mergus serrator*	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	7	2.9 ± 1.0
A	*Arenaria interpres*	Ruddy Turnstone				S3M	4 Secure	8	2.9 ± 1.0
A	*Melanitta nigra*	Black Scoter				S3M,S1S2N	3 Sensitive	4	1.5 ± 0.0
A	*Calidris maritima*	Purple Sandpiper				S3M,S3N	4 Secure	1	4.5 ± 0.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	6	2.0 ± 0.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	4 Secure	22	2.9 ± 1.0
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	4 Secure	7	0.7 ± 0.0
A	*Larus delawarensis*	Ring-billed Gull				S3S4B,S5M	4 Secure	21	0.7 ± 0.0
A	*Dendroica striata*	Blackpoll Warbler				S3S4B,S5M	4 Secure	1	3.5 ± 7.0
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	4 Secure	15	4.8 ± 0.0
A	*Limosa haemastica*	Hudsonian Godwit				S3S4M	4 Secure	22	2.9 ± 1.0
A	*Calidris pusilla*	Semipalmated Sandpiper				S3S4M	4 Secure	33	2.9 ± 1.0
A	*Calidris melanotos*	Pectoral Sandpiper				S3S4M	4 Secure	11	4.8 ± 0.0
A	*Calidris alba*	Sanderling				S3S4M,S1N	3 Sensitive	17	2.9 ± 1.0
A	*Morus bassanus*	Northern Gannet				SHB,S5M	4 Secure	9	3.4 ± 0.0
I	*Papilio brevicauda*	Short-tailed Swallowtail				S3	4 Secure	5	2.3 ± 0.0
I	*Lycaena dospassosi*	Salt Marsh Copper				S3	4 Secure	2	3.1 ± 0.0
I	*Plebejus idas*	Northern Blue				S3	4 Secure	5	3.5 ± 7.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species "location sensitive". Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting 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			No
Chelydra serpentina	Snapping Turtle	Special Concern	Special Concern	No
Glyptemys insculpta	Wood Turtle	Threatened	Threatened	No
Haliaeetus leucocephalus	**Bald Eagle**		**Endangered**	**YES**
Falco peregrinus pop. 1	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Endangered	No
Cicindela marginipennis	Cobblestone Tiger Beetle	Endangered	Endangered	No
Coenonympha nipisiquit	Maritime Ringlet	Endangered	Endangered	No
Bat Hibernaculum		[Endangered][1]	[Endangered][1]	No

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

4.4 SOURCE BIBLIOGRAPHY

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

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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 16274 records of 120 vertebrate and 432 records of 40 invertebrate fauna; 3520 records of 207 vascular, 174 records of 57 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs. All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (± the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	5	95.0 ± 0.0	PE
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	1 At Risk	1	95.0 ± 0.0	PE
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	1 At Risk	2459	2.9 ± 1.0	NB
A	*Dermochelys coriacea (Atlantic pop.)*	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	1 At Risk	4	51.8 ± 1.0	NB
A	*Calidris canutus rufa*	Red Knot rufa ssp	Endangered		Endangered	S2M	1 At Risk	483	4.8 ± 0.0	NB
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gasp├⌐sie pop.)	Endangered	Endangered	Extirpated	SX	0.1 Extirpated	1	40.1 ± 1.0	NB
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B,S1M	2 May Be At Risk	4	31.8 ± 0.0	NB
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened	Threatened	S1S2B,S1S2M	2 May Be At Risk	26	8.0 ± 1.0	NB
A	*Caprimulgus vociferus*	Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	1 At Risk	27	5.6 ± 0.0	NB
A	*Hirundo rustica*	Barn Swallow	Threatened	Threatened	Threatened	S2B,S2M	3 Sensitive	329	3.5 ± 7.0	NB
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Special Concern	Threatened	S2B,S2M	1 At Risk	3	66.9 ± 7.0	NB
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2S3	1 At Risk	35	53.7 ± 1.0	NB
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	1 At Risk	121	3.8 ± 0.0	NB
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	3 Sensitive	358	2.5 ± 0.0	NB
A	*Contopus cooperi*	Olive-sided Flycatcher	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	135	3.5 ± 7.0	NB
A	*Wilsonia canadensis*	Canada Warbler	Threatened	Threatened	Threatened	S3B,S3M	1 At Risk	196	0.7 ± 0.0	NB
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	3 Sensitive	420	0.7 ± 0.0	NB
A	*Chordeiles minor*	Common Nighthawk	Threatened	Threatened	Threatened	S3B,S4M	1 At Risk	123	15.9 ± 24.0	NB
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S4	4 Secure	6	73.9 ± 1.0	NB
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	1 At Risk	3	26.0 ± 0.0	NB
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Special Concern	Special Concern	Endangered	S1B,S3M	1 At Risk	8	18.4 ± 65.0	NB
A	*Asio flammeus*	Short-eared Owl	Special Concern	Special Concern	Special Concern	S2B,S2M	3 Sensitive	20	2.9 ± 1.0	NB
A	*Bucephala islandica (Eastern pop.)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	3 Sensitive	36	0.6 ± 0.0	NB
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	2 May Be At Risk	42	9.0 ± 7.0	NB
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern			S3B,S3S4N,SUM	3 Sensitive	142	7.0 ± 7.0	NB
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern			S3M	3 Sensitive	6	3.2 ± 1.0	NB
A	*Phocoena phocoena (NW Atlantic pop.)*	Harbour Porpoise - Northwest Atlantic pop.	Special Concern	Threatened		S4		2	10.8 ± 5.0	NB
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	4 Secure	183	6.6 ± 0.0	NB
A	*Podiceps auritus*	Horned Grebe	Special Concern		Special Concern	S4N,S4M	4 Secure	2	14.0 ± 1.0	NB
A	*Odobenus rosmarus rosmarus*	Atlantic Walrus	Special Concern		Extirpated	SX		6	16.9 ± 1.0	NB
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	4 Secure	14	1.1 ± 1.0	NB
A	*Fulica americana*	American Coot	Not At Risk			S1S2B,S1S2M	3 Sensitive	5	7.0 ± 7.0	NB
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B,SUM	2 May Be At Risk	7	4.4 ± 0.0	NB
A	*Buteo lineatus*	Red-shouldered Hawk	Not At Risk	Special Concern		S2B,S2M	2 May Be At Risk	7	7.8 ± 0.0	NB
A	*Chlidonias niger*	Black Tern	Not At Risk			S2B,S2M	3 Sensitive	5	93.9 ± 0.0	NB
A	*Globicephala melas*	Long-finned Pilot Whale	Not At Risk			S2S3		1	58.5 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S3	1 At Risk	19	39.7 ± 1.0	NB
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	3 Sensitive	538	0.7 ± 0.0	NB
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S3M,S2N	3 Sensitive	6	19.9 ± 1.0	NB
A	*Haliaeetus leucocephalus*	Bald Eagle	Not At Risk		Endangered	S4	1 At Risk	226	0.6 ± 0.0	NB
A	*Puma concolor pop. 1*	Eastern Cougar	Data Deficient		Endangered	SNA	5 Undetermined	20	45.1 ± 1.0	NB
A	*Morone saxatilis*	Striped Bass	E,E,SC			S3	2 May Be At Risk	11	1.7 ± 10.0	NB
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S5M	4 Secure	813	2.9 ± 1.0	NB
A	*Aythya americana*	Redhead				S1B,S1M	8 Accidental	1	18.7 ± 1.0	NB
A	*Grus canadensis*	Sandhill Crane				S1B,S1M	8 Accidental	1	75.7 ± 1.0	NB
A	*Bartramia longicauda*	Upland Sandpiper				S1B,S1M	3 Sensitive	6	17.9 ± 1.0	NB
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B,S1M	3 Sensitive	19	4.8 ± 0.0	NB
A	*Leucophaeus atricilla*	Laughing Gull				S1B,S1M	3 Sensitive	1	94.9 ± 0.0	NB
A	*Progne subis*	Purple Martin				S1B,S1M	2 May Be At Risk	1	98.0 ± 10.0	NB
A	*Thryothorus ludovicianus*	Carolina Wren				S1B,S1M	8 Accidental	1	89.0 ± 0.0	NB
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S2S3M	4 Secure	11	11.0 ± 1.0	NB
A	*Uria aalge*	Common Murre				S1B,S3N,S3M	4 Secure	6	4.1 ± 0.0	NB
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	4 Secure	36	1.5 ± 0.0	NB
A	*Aythya marila*	Greater Scaup				S1B,S4M,S2N	4 Secure	21	9.5 ± 1.0	NB
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	2 May Be At Risk	119	2.9 ± 1.0	NB
A	*Sterna paradisaea*	Arctic Tern				S1B,SUM	2 May Be At Risk	35	7.0 ± 7.0	NB
A	*Branta bernicla*	Brant				S1N, S2S3M	4 Secure	64	1.5 ± 0.0	NB
A	*Chroicocephalus ridibundus*	Black-headed Gull				S1N,S2M	3 Sensitive	6	15.9 ± 0.0	NB
A	*Butorides virescens*	Green Heron				S1S2B,S1S2M	3 Sensitive	2	17.3 ± 0.0	NB
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B,S1S2M	3 Sensitive	245	0.6 ± 0.0	NB
A	*Empidonax traillii*	Willow Flycatcher				S1S2B,S1S2M	3 Sensitive	14	23.1 ± 0.0	NB
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B,S1S2M	2 May Be At Risk	3	31.8 ± 0.0	NB
A	*Troglodytes aedon*	House Wren				S1S2B,S1S2M	5 Undetermined	4	22.1 ± 0.0	NB
A	*Rissa tridactyla*	Black-legged Kittiwake				S1S2B,S4N,S5M	4 Secure	24	19.9 ± 1.0	NB
A	*Calidris bairdii*	Baird's Sandpiper				S1S2M	3 Sensitive	26	4.8 ± 0.0	NB
A	*Mimus polyglottos*	Northern Mockingbird				S2B,S2M	3 Sensitive	56	3.5 ± 7.0	NB
A	*Toxostoma rufum*	Brown Thrasher				S2B,S2M	3 Sensitive	21	8.2 ± 7.0	NB
A	*Pooecetes gramineus*	Vesper Sparrow				S2B,S2M	2 May Be At Risk	48	16.8 ± 0.0	NB
A	*Anas strepera*	Gadwall				S2B,S3M	4 Secure	56	3.2 ± 1.0	NB
A	*Alca torda*	Razorbill				S2B,S3N,S3M	4 Secure	7	31.3 ± 7.0	NB
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	3 Sensitive	18	19.4 ± 7.0	NB
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	4 Secure	65	3.5 ± 7.0	NB
A	*Oceanodroma leucorhoa*	Leach's Storm-Petrel				S2B,SUM	3 Sensitive	1	23.0 ± 0.0	NB
A	*Chen caerulescens*	Snow Goose				S2M	4 Secure	5	19.9 ± 1.0	NB
A	*Phalacrocorax carbo*	Great Cormorant				S2N,S2M	4 Secure	36	32.2 ± 4.0	NB
A	*Somateria spectabilis*	King Eider				S2N,S2M	4 Secure	2	19.9 ± 1.0	NB
A	*Larus hyperboreus*	Glaucous Gull				S2N,S2M	4 Secure	18	7.5 ± 0.0	NB
A	*Asio otus*	Long-eared Owl				S2S3	5 Undetermined	9	9.0 ± 7.0	NB
A	*Picoides dorsalis*	American Three-toed Woodpecker				S2S3	3 Sensitive	12	1.1 ± 1.0	NB
A	*Salmo salar*	Atlantic Salmon				S2S3	2 May Be At Risk	118	1.8 ± 1.0	NB
A	*Anas clypeata*	Northern Shoveler				S2S3B,S2S3M	4 Secure	63	0.7 ± 0.0	NB
A	*Myiarchus crinitus*	Great Crested Flycatcher				S2S3B,S2S3M	3 Sensitive	9	67.4 ± 7.0	NB
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B,S2S3M	3 Sensitive	194	3.5 ± 7.0	NB
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	3 Sensitive	97	4.8 ± 0.0	NB
A	*Calcarius lapponicus*	Lapland Longspur				S2S3N,SUM	3 Sensitive	8	5.3 ± 1.0	NB
A	*Cepphus grylle*	Black Guillemot				S3	4 Secure	49	20.7 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
A	*Loxia curvirostra*	Red Crossbill				S3	4 Secure	36	6.3 ± 7.0	NB
A	*Carduelis pinus*	Pine Siskin				S3	4 Secure	123	7.0 ± 7.0	NB
A	*Sorex maritimensis*	Maritime Shrew				S3	4 Secure	30	67.7 ± 0.0	NB
A	*Cathartes aura*	Turkey Vulture				S3B,S3M	4 Secure	6	21.5 ± 0.0	NB
A	*Rallus limicola*	Virginia Rail				S3B,S3M	3 Sensitive	14	10.5 ± 0.0	NB
A	*Charadrius vociferus*	Killdeer				S3B,S3M	3 Sensitive	669	0.7 ± 0.0	NB
A	*Tringa semipalmata*	Willet				S3B,S3M	3 Sensitive	388	3.5 ± 7.0	NB
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B,S3M	4 Secure	56	2.3 ± 0.0	NB
A	*Vireo gilvus*	Warbling Vireo				S3B,S3M	4 Secure	49	10.9 ± 7.0	NB
A	*Piranga olivacea*	Scarlet Tanager				S3B,S3M	4 Secure	17	19.7 ± 7.0	NB
A	*Passerina cyanea*	Indigo Bunting				S3B,S3M	4 Secure	9	6.3 ± 7.0	NB
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	2 May Be At Risk	118	3.5 ± 7.0	NB
A	*Icterus galbula*	Baltimore Oriole				S3B,S3M	4 Secure	40	14.0 ± 1.0	NB
A	*Somateria mollissima*	Common Eider				S3B,S4M,S3N	4 Secure	132	2.9 ± 1.0	NB
A	*Dendroica tigrina*	Cape May Warbler				S3B,S4S5M	4 Secure	121	3.5 ± 7.0	NB
A	*Anas acuta*	Northern Pintail				S3B,S5M	3 Sensitive	204	1.1 ± 1.0	NB
A	*Mergus serrator*	Red-breasted Merganser				S3B,S5M,S4S5N	4 Secure	258	2.9 ± 1.0	NB
A	*Arenaria interpres*	Ruddy Turnstone				S3M	4 Secure	747	2.9 ± 1.0	NB
A	*Phalaropus fulicarius*	Red Phalarope				S3M	3 Sensitive	3	38.7 ± 0.0	NB
A	*Melanitta nigra*	Black Scoter				S3M,S1S2N	3 Sensitive	141	1.5 ± 0.0	NB
A	*Bucephala albeola*	Bufflehead				S3M,S2N	3 Sensitive	27	14.0 ± 1.0	NB
A	*Calidris maritima*	Purple Sandpiper				S3M,S3N	4 Secure	19	4.5 ± 0.0	NB
A	*Synaptomys cooperi*	Southern Bog Lemming				S3S4	4 Secure	10	78.0 ± 0.0	NB
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	3 Sensitive	147	2.0 ± 0.0	NB
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	4 Secure	935	2.9 ± 1.0	NB
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	4 Secure	249	0.7 ± 0.0	NB
A	*Larus delawarensis*	Ring-billed Gull				S3S4B,S5M	4 Secure	368	0.7 ± 0.0	NB
A	*Dendroica striata*	Blackpoll Warbler				S3S4B,S5M	4 Secure	54	3.5 ± 7.0	NB
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	4 Secure	664	4.8 ± 0.0	NB
A	*Limosa haemastica*	Hudsonian Godwit				S3S4M	4 Secure	357	2.9 ± 1.0	NB
A	*Calidris pusilla*	Semipalmated Sandpiper				S3S4M	4 Secure	937	2.9 ± 1.0	NB
A	*Calidris melanotos*	Pectoral Sandpiper				S3S4M	4 Secure	167	4.8 ± 0.0	NB
A	*Calidris alba*	Sanderling				S3S4M,S1N	3 Sensitive	571	2.9 ± 1.0	NB
A	*Morus bassanus*	Northern Gannet				SHB,S5M	4 Secure	212	3.4 ± 0.0	NB
I	*Coenonympha nipisiquit*	Maritime Ringlet	Endangered	Endangered	Endangered	S1	1 At Risk	38	58.5 ± 7.0	NB
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	3 Sensitive	10	67.0 ± 0.0	NB
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern			S3?	3 Sensitive	10	59.0 ± 0.0	NB
I	*Leucorrhinia patricia*	Canada Whiteface				S1	2 May Be At Risk	8	36.6 ± 1.0	NB
I	*Plebejus saepiolus*	Greenish Blue				S1S2	4 Secure	25	15.5 ± 1.0	NB
I	*Strymon melinus*	Grey Hairstreak				S2	4 Secure	8	12.4 ± 0.0	NB
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S2	5 Undetermined	3	94.3 ± 0.0	NB
I	*Coenagrion interrogatum*	Subarctic Bluet				S2	3 Sensitive	5	66.9 ± 1.0	NB
I	*Callophrys henrici*	Henry's Elfin				S2S3	4 Secure	4	59.5 ± 1.0	NB
I	*Desmocerus palliatus*	Elderberry Borer				S3		2	61.3 ± 5.0	NB
I	*Carabus maeander*	a Ground Beetle				S3	5 Undetermined	1	11.2 ± 1.0	NB
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	4 Secure	1	94.1 ± 1.0	NB
I	*Xylotrechus quadrimaculatus*	a Longhorned Beetle				S3		1	19.0 ± 1.0	NB
I	*Xylotrechus undulatus*	a Longhorned Beetle				S3		2	11.0 ± 1.0	NB
I	*Calathus gregarius*	a Ground Beetle				S3	4 Secure	1	66.7 ± 1.0	NB
I	*Hyperaspis disconotata*	a Ladybird Beetle				S3	5 Undetermined	1	74.1 ± 5.0	NB

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I	*Hesperia sassacus*	Indian Skipper				S3	4 Secure	2	97.2 ± 7.0	NB
I	*Euphyes bimacula*	Two-spotted Skipper				S3	4 Secure	2	57.2 ± 10.0	NB
I	*Papilio brevicauda*	Short-tailed Swallowtail				S3	4 Secure	44	2.3 ± 0.0	NB
I	*Papilio brevicauda bretonensis*	Short-tailed Swallowtail				S3	4 Secure	12	21.3 ± 0.0	NB
I	*Lycaena hyllus*	Bronze Copper				S3	3 Sensitive	4	65.1 ± 0.0	NB
I	*Lycaena dospassosi*	Salt Marsh Copper				S3	4 Secure	109	3.1 ± 0.0	NB
I	*Satyrium acadica*	Acadian Hairstreak				S3	4 Secure	3	58.9 ± 7.0	NB
I	*Callophrys polios*	Hoary Elfin				S3	4 Secure	4	13.1 ± 0.0	NB
I	*Callophrys eryphon*	Western Pine Elfin				S3	4 Secure	4	59.5 ± 1.0	NB
I	*Plebejus idas*	Northern Blue				S3	4 Secure	31	3.5 ± 7.0	NB
I	*Plebejus idas empetri*	Crowberry Blue				S3	4 Secure	12	10.5 ± 10.0	NB
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	4 Secure	3	28.8 ± 1.0	NB
I	*Boloria eunomia*	Bog Fritillary				S3	5 Undetermined	5	59.1 ± 0.0	NB
I	*Boloria chariclea*	Arctic Fritillary				S3	4 Secure	7	51.3 ± 7.0	NB
I	*Boloria chariclea grandis*	Purple Lesser Fritillary				S3	4 Secure	4	58.2 ± 10.0	NB
I	*Polygonia satyrus*	Satyr Comma				S3	4 Secure	9	60.9 ± 7.0	NB
I	*Polygonia gracilis*	Hoary Comma				S3	4 Secure	13	58.9 ± 7.0	NB
I	*Somatochlora albicincta*	Ringed Emerald				S3	4 Secure	1	88.9 ± 1.0	NB
I	*Somatochlora cingulata*	Lake Emerald				S3	4 Secure	2	58.1 ± 1.0	NB
I	*Somatochlora forcipata*	Forcipate Emerald				S3	4 Secure	7	41.3 ± 1.0	NB
I	*Lestes eurinus*	Amber-Winged Spreadwing				S3	4 Secure	9	58.1 ± 1.0	NB
I	*Satyrium liparops*	Striped Hairstreak				S3S4	4 Secure	13	14.9 ± 0.0	NB
I	*Satyrium liparops strigosum*	Striped Hairstreak				S3S4	4 Secure	3	59.4 ± 0.0	NB
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle				SH	2 May Be At Risk	9	11.2 ± 1.0	NB
N	*Aulacomnium heterostichum*	One-sided Groove Moss				S1	2 May Be At Risk	1	94.6 ± 0.0	NB
N	*Campylostelium saxicola*	a Moss				S1	2 May Be At Risk	1	92.2 ± 0.0	NB
N	*Zygodon viridissimus var. viridissimus*	a Moss				S1	2 May Be At Risk	1	94.3 ± 0.0	NB
N	*Bryum blindii*	a Moss				S1?	2 May Be At Risk	1	92.4 ± 1.0	NB
N	*Cinclidium stygium*	Sooty Cupola Moss				S1?	2 May Be At Risk	1	70.8 ± 0.0	NB
N	*Tortula cernua*	Narrow-Leafed Chain-Teeth Moss				S1?	2 May Be At Risk	1	92.4 ± 1.0	NB
N	*Dicranum bonjeanii*	Bonjean's Broom Moss				S1?	2 May Be At Risk	1	67.2 ± 1.0	NB
N	*Homomallium adnatum*	Adnate Hairy-gray Moss				S1?	2 May Be At Risk	1	94.5 ± 0.0	NB
N	*Paludella squarrosa*	Tufted Fen Moss				S1?	2 May Be At Risk	1	70.8 ± 0.0	NB
N	*Rhizomnium pseudopunctatum*	Felted Leafy Moss				S1?	2 May Be At Risk	1	95.5 ± 0.0	NB
N	*Odontoschisma sphagni*	Bog-Moss Flapwort				S1S2	6 Not Assessed	1	83.0 ± 0.0	NB
N	*Distichium inclinatum*	Inclined Iris Moss				S1S2	2 May Be At Risk	1	92.4 ± 1.0	NB
N	*Drummondia prorepens*	a Moss				S1S2	2 May Be At Risk	1	92.0 ± 0.0	NB
N	*Seligeria brevifolia*	a Moss				S1S2	3 Sensitive	4	94.6 ± 0.0	NB
N	*Calypogeia neesiana*	Nees' Pouchwort				S1S3	6 Not Assessed	1	26.9 ± 1.0	NB
N	*Cephalozia connivens*	Forcipated Pincerwort				S1S3	6 Not Assessed	1	38.1 ± 10.0	NB
N	*Lophozia badensis*	Dwarf Notchwort				S1S3	6 Not Assessed	1	92.4 ± 1.0	NB
N	*Meesia triquetra*	Three-ranked Cold Moss				S2	2 May Be At Risk	1	42.8 ± 10.0	NB
N	*Pohlia elongata*	Long-necked Nodding Moss				S2	3 Sensitive	4	92.0 ± 0.0	NB
N	*Pohlia sphagnicola*	a moss				S2	3 Sensitive	1	97.2 ± 0.0	NB

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N	*Sphagnum lindbergii*	Lindberg's Peat Moss				S2	3 Sensitive	1	59.4 ± 0.0	NB
N	*Tetrodontium brownianum*	Little Georgia				S2	3 Sensitive	5	92.0 ± 0.0	NB
N	*Tortula mucronifolia*	Mucronate Screw Moss				S2	3 Sensitive	1	92.4 ± 1.0	NB
N	*Anomobryum filiforme*	a moss				S2	5 Undetermined	1	92.4 ± 1.0	NB
N	*Fuscopannaria leucosticta*	Rimmed Shingles Lichen				S2	2 May Be At Risk	83	75.3 ± 0.0	NB
N	*Nephroma laevigatum*	Mustard Kidney Lichen				S2	2 May Be At Risk	3	97.1 ± 0.0	PE
N	*Sphagnum angermanicum*	a Peatmoss				S2?	3 Sensitive	1	88.2 ± 0.0	NB
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2?	5 Undetermined	1	94.8 ± 0.0	NB
N	*Bryum uliginosum*	a Moss				S2S3	3 Sensitive	1	86.6 ± 9.0	NB
N	*Orthotrichum speciosum*	Showy Bristle Moss				S2S3	5 Undetermined	3	86.6 ± 9.0	NB
N	*Pohlia proligera*	Cottony Nodding Moss				S2S3	3 Sensitive	8	92.0 ± 0.0	NB
N	*Scorpidium scorpioides*	Hooked Scorpion Moss				S2S3	3 Sensitive	1	70.8 ± 0.0	NB
N	*Sphagnum subfulvum*	a Peatmoss				S2S3	2 May Be At Risk	2	97.2 ± 0.0	NB
N	*Zygodon viridissimus*	a Moss				S2S3	2 May Be At Risk	1	94.5 ± 0.0	NB
N	*Dendriscocaulon umhausense*	a lichen				S2S3	3 Sensitive	1	91.8 ± 0.0	NB
N	*Schistidium maritimum*	a Moss				S3	4 Secure	1	95.5 ± 0.0	NB
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	3 Sensitive	1	91.8 ± 0.0	NB
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S3	5 Undetermined	1	96.7 ± 0.0	NB
N	*Cladonia farinacea*	Farinose Pixie Lichen				S3	5 Undetermined	1	97.1 ± 0.0	PE
N	*Nephroma bellum*	Naked Kidney Lichen				S3	4 Secure	1	94.6 ± 0.0	PE
N	*Aulacomnium androgynum*	Little Groove Moss				S3?	4 Secure	4	94.5 ± 0.0	NB
N	*Dicranella rufescens*	Red Forklet Moss				S3?	5 Undetermined	1	27.1 ± 7.0	NB
N	*Dicranella varia*	a Moss				S3S4	4 Secure	1	86.6 ± 9.0	NB
N	*Dicranum majus*	Greater Broom Moss				S3S4	4 Secure	4	94.7 ± 0.0	NB
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	4 Secure	1	68.2 ± 10.0	NB
N	*Fissidens bryoides*	Lesser Pocket Moss				S3S4	4 Secure	1	86.6 ± 9.0	NB
N	*Heterocladium dimorphum*	Dimorphous Tangle Moss				S3S4	4 Secure	1	94.6 ± 0.0	NB
N	*Pogonatum dentatum*	Mountain Hair Moss				S3S4	4 Secure	1	92.1 ± 0.0	NB
N	*Sphagnum compactum*	Compact Peat Moss				S3S4	4 Secure	1	92.3 ± 1.0	NB
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3S4	4 Secure	2	97.1 ± 0.0	NB
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3S4	4 Secure	1	94.5 ± 0.0	NB
N	*Abietinella abietina*	Wiry Fern Moss				S3S4	4 Secure	1	86.6 ± 9.0	NB
N	*Pannaria rubiginosa*	Brown-eyed Shingle Lichen				S3S4	3 Sensitive	1	97.1 ± 0.0	PE
N	*Protopannaria pezizoides*	Brown-gray Moss-shingle Lichen				S3S4	4 Secure	1	97.1 ± 0.0	PE
N	*Pseudocyphellaria perpetua*	Gilded Specklebelly Lichen				S3S4	3 Sensitive	3	94.2 ± 0.0	NB
N	*Stereocaulon paschale*	Easter Foam Lichen				S3S4	5 Undetermined	1	76.4 ± 1.0	NB
N	*Leucodon brachypus*	a Moss				SH	2 May Be At Risk	5	91.8 ± 0.0	NB
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	1 At Risk	3	98.5 ± 0.0	NB
P	*Symphyotrichum laurentianum*	Gulf of St Lawrence Aster	Threatened	Threatened	Endangered	S1	1 At Risk	114	18.2 ± 5.0	NB
P	*Symphyotrichum subulatum (Bathurst pop)*	Bathurst Aster - Bathurst pop.	Special Concern	Special Concern	Endangered	S2	1 At Risk	183	47.4 ± 0.0	NB
P	*Lechea maritima var. subcylindrica*	Beach Pinweed	Special Concern			S2	3 Sensitive	175	57.3 ± 0.0	NB
P	*Pterospora andromedea*	Woodland Pinedrops			Endangered	S1	1 At Risk	1	98.1 ± 0.0	NB

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P	*Pseudognaphalium obtusifolium*	Eastern Cudweed				S1	2 May Be At Risk	1	60.4 ± 0.0	NB
P	*Betula michauxii*	Michaux's Dwarf Birch				S1	2 May Be At Risk	3	76.9 ± 0.0	NB
P	*Cardamine parviflora var. arenicola*	Small-flowered Bittercress				S1	2 May Be At Risk	1	84.7 ± 0.0	NB
P	*Draba glabella*	Rock Whitlow-Grass				S1	2 May Be At Risk	7	80.1 ± 0.0	NB
P	*Draba incana*	Twisted Whitlow-grass				S1	2 May Be At Risk	9	29.7 ± 0.0	NB
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	2 May Be At Risk	1	76.3 ± 10.0	NB
P	*Stellaria longipes*	Long-stalked Starwort				S1	2 May Be At Risk	17	3.9 ± 1.0	NB
P	*Triadenum virginicum*	Virginia St John's-wort				S1	2 May Be At Risk	1	99.9 ± 0.0	NB
P	*Vaccinium boreale*	Northern Blueberry				S1	2 May Be At Risk	1	17.2 ± 1.0	NB
P	*Vaccinium uliginosum*	Alpine Bilberry				S1	2 May Be At Risk	5	41.3 ± 2.0	NB
P	*Chamaesyce polygonifolia*	Seaside Spurge				S1	2 May Be At Risk	7	7.7 ± 1.0	NB
P	*Bartonia virginica*	Yellow Bartonia				S1	2 May Be At Risk	3	67.2 ± 0.0	NB
P	*Ranunculus lapponicus*	Lapland Buttercup				S1	2 May Be At Risk	1	75.1 ± 0.0	NB
P	*Ranunculus sceleratus*	Cursed Buttercup				S1	2 May Be At Risk	3	40.2 ± 2.0	NB
P	*Salix serissima*	Autumn Willow				S1	2 May Be At Risk	4	69.1 ± 0.0	NB
P	*Carex glareosa var. amphigena*	Gravel Sedge				S1	2 May Be At Risk	3	4.7 ± 1.0	NB
P	*Carex rariflora*	Loose-flowered Alpine Sedge				S1	2 May Be At Risk	10	18.0 ± 0.0	NB
P	*Carex viridula var. elatior*	Greenish Sedge				S1	2 May Be At Risk	11	69.0 ± 0.0	NB
P	*Cyperus bipartitus*	Shining Flatsedge				S1	2 May Be At Risk	3	74.9 ± 0.0	NB
P	*Juncus greenei*	Greene's Rush				S1	2 May Be At Risk	2	93.0 ± 0.0	PE
P	*Zigadenus elegans ssp. glaucus*	Mountain Death Camas				S1	2 May Be At Risk	7	80.1 ± 0.0	NB
P	*Malaxis brachypoda*	White Adder's-Mouth				S1	2 May Be At Risk	3	69.0 ± 0.0	NB
P	*Calamagrostis stricta ssp. inexpansa*	Slim-stemmed Reed Grass				S1	2 May Be At Risk	1	94.6 ± 0.0	NB
P	*Catabrosa aquatica var. laurentiana*	Water Whorl Grass				S1	2 May Be At Risk	4	44.4 ± 0.0	NB
P	*Dichanthelium xanthophysum*	Slender Panic Grass				S1	2 May Be At Risk	3	66.9 ± 0.0	NB
P	*Puccinellia ambigua*	Dwarf Alkali Grass				S1	5 Undetermined	2	30.0 ± 0.0	NB
P	*Zizania aquatica var. brevis*	Indian Wild Rice				S1	2 May Be At Risk	5	74.9 ± 0.0	NB
P	*Potamogeton friesii*	Fries' Pondweed				S1	2 May Be At Risk	2	95.0 ± 3.0	PE
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S1	2 May Be At Risk	1	75.8 ± 0.0	NB
P	*Bidens heterodoxa*	Connecticut Beggar-Ticks				S1?	2 May Be At Risk	5	17.7 ± 1.0	NB
P	*Carex crawei*	Crawe's Sedge				S1S2	2 May Be At Risk	1	30.7 ± 0.0	NB
P	*Thelypteris simulata*	Bog Fern				S1S2	2 May Be At Risk	1	96.1 ± 1.0	NB
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S1S3	2 May Be At Risk	24	53.2 ± 1.0	NB
P	*Listera australis*	Southern Twayblade			Endangered	S2	1 At Risk	6	95.9 ± 0.0	NB
P	*Osmorhiza depauperata*	Blunt Sweet Cicely				S2	3 Sensitive	5	69.9 ± 1.0	NB
P	*Ionactis linariifolius*	Stiff Aster				S2	3 Sensitive	38	64.3 ± 0.0	NB
P	*Symphyotrichum subulatum*	Annual Saltmarsh Aster				S2	1 At Risk	152	47.4 ± 0.0	NB
P	*Arabis drummondii*	Drummond's Rockcress				S2	3 Sensitive	4	67.1 ± 1.0	NB
P	*Sagina nodosa*	Knotted Pearlwort				S2	3 Sensitive	6	15.8 ± 5.0	NB
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2	3 Sensitive	1	98.6 ± 5.0	PE
P	*Stellaria longifolia*	Long-leaved Starwort				S2	3 Sensitive	1	82.1 ± 0.0	NB
P	*Atriplex franktonii*	Frankton's Saltbush				S2	4 Secure	6	7.9 ± 1.0	NB
P	*Chenopodium rubrum*	Red Pigweed				S2	3 Sensitive	6	57.1 ± 0.0	NB

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P	*Oxytropis campestris var. johannensis*	Field Locoweed				S2	3 Sensitive	1	70.3 ± 10.0	NB
P	*Nuphar lutea ssp. rubrodisca*	Red-disked Yellow Pond-lily				S2	3 Sensitive	1	76.9 ± 0.0	NB
P	*Hepatica nobilis var. obtusa*	Round-lobed Hepatica				S2	3 Sensitive	1	96.0 ± 0.0	NB
P	*Crataegus scabrida*	Rough Hawthorn				S2	3 Sensitive	2	67.1 ± 1.0	NB
P	*Rosa acicularis ssp. sayi*	Prickly Rose				S2	2 May Be At Risk	99	64.3 ± 0.0	NB
P	*Salix candida*	Sage Willow				S2	3 Sensitive	59	5.5 ± 10.0	NB
P	*Sagittaria calycina var. spongiosa*	Long-lobed Arrowhead				S2	4 Secure	56	74.9 ± 0.0	NB
P	*Carex gynocrates*	Northern Bog Sedge				S2	3 Sensitive	12	69.0 ± 0.0	NB
P	*Carex livida var. radicaulis*	Livid Sedge				S2	3 Sensitive	5	39.8 ± 0.0	NB
P	*Carex salina*	Saltmarsh Sedge				S2	3 Sensitive	14	5.0 ± 0.0	NB
P	*Carex sprengelii*	Longbeak Sedge				S2	3 Sensitive	1	71.2 ± 0.0	NB
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S2	2 May Be At Risk	2	9.5 ± 10.0	NB
P	*Carex albicans var. emmonsii*	White-tinged Sedge				S2	3 Sensitive	7	57.3 ± 0.0	NB
P	*Eriophorum gracile*	Slender Cottongrass				S2	2 May Be At Risk	8	20.3 ± 0.0	NB
P	*Blysmus rufus*	Red Bulrush				S2	3 Sensitive	41	3.5 ± 2.0	NB
P	*Juncus vaseyi*	Vasey Rush				S2	3 Sensitive	38	41.1 ± 0.0	NB
P	*Amerorchis rotundifolia*	Small Round-leaved Orchis				S2	2 May Be At Risk	12	14.6 ± 3.0	NB
P	*Calypso bulbosa var. americana*	Calypso				S2	2 May Be At Risk	2	8.0 ± 0.0	NB
P	*Coeloglossum viride var. virescens*	Long-bracted Frog Orchid				S2	2 May Be At Risk	1	83.4 ± 1.0	NB
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	2 May Be At Risk	2	79.5 ± 2.0	NB
P	*Goodyera oblongifolia*	Menzies' Rattlesnake-plantain				S2	3 Sensitive	21	21.0 ± 5.0	NB
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	3 Sensitive	1	80.6 ± 0.0	NB
P	*Agrostis mertensii*	Northern Bent Grass				S2	2 May Be At Risk	47	67.1 ± 0.0	NB
P	*Dichanthelium linearifolium*	Narrow-leaved Panic Grass				S2	3 Sensitive	1	78.0 ± 0.0	NB
P	*Piptatherum canadense*	Canada Rice Grass				S2	3 Sensitive	1	67.3 ± 0.0	NB
P	*Poa glauca*	Glaucous Blue Grass				S2	4 Secure	3	75.8 ± 0.0	NB
P	*Puccinellia laurentiana*	Nootka Alkali Grass				S2	3 Sensitive	18	32.3 ± 0.0	NB
P	*Puccinellia phryganodes*	Creeping Alkali Grass				S2	3 Sensitive	2	32.5 ± 0.0	NB
P	*Zizania aquatica var. aquatica*	Indian Wild Rice				S2	5 Undetermined	1	97.2 ± 1.0	NB
P	*Piptatherum pungens*	Slender Rice Grass				S2	2 May Be At Risk	6	60.5 ± 0.0	NB
P	*Woodwardia virginica*	Virginia Chain Fern				S2	3 Sensitive	9	67.4 ± 0.0	NB
P	*Selaginella selaginoides*	Low Spikemoss				S2	3 Sensitive	14	69.0 ± 0.0	NB
P	*Symphyotrichum novi-belgii var. crenifolium*	New York Aster				S2?	5 Undetermined	1	44.3 ± 0.0	NB
P	*Crataegus macrosperma*	Big-Fruit Hawthorn				S2?	5 Undetermined	1	67.1 ± 0.0	NB
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2?	4 Secure	5	14.1 ± 0.0	NB
P	*Salix myricoides*	Bayberry Willow				S2?	3 Sensitive	3	18.9 ± 5.0	NB
P	*Carex vacillans*	Estuarine Sedge				S2?	3 Sensitive	3	91.7 ± 10.0	NB
P	*Platanthera huronensis*	Fragrant Green Orchid				S2?	5 Undetermined	1	68.4 ± 0.0	NB
P	*Callitriche hermaphroditica*	Northern Water-starwort				S2S3	4 Secure	4	9.9 ± 2.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Lonicera oblongifolia*	Swamp Fly Honeysuckle				S2S3	3 Sensitive	1	41.3 ± 2.0	NB
P	*Elatine americana*	American Waterwort				S2S3	3 Sensitive	6	45.4 ± 0.0	NB
P	*Bartonia paniculata ssp. iodandra*	Branched Bartonia				S2S3	3 Sensitive	2	81.6 ± 0.0	NB
P	*Epilobium coloratum*	Purple-veined Willowherb				S2S3	3 Sensitive	2	97.0 ± 50.0	NB
P	*Rumex maritimus var. persicarioides*	Peach-leaved Dock				S2S3	5 Undetermined	2	30.5 ± 4.0	NB
P	*Rumex pallidus*	Seabeach Dock				S2S3	3 Sensitive	5	15.6 ± 0.0	NB
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S2S3	4 Secure	2	21.7 ± 2.0	NB
P	*Galium labradoricum*	Labrador Bedstraw				S2S3	3 Sensitive	34	7.6 ± 0.0	NB
P	*Valeriana uliginosa*	Swamp Valerian				S2S3	3 Sensitive	8	69.0 ± 0.0	NB
P	*Carex adusta*	Lesser Brown Sedge				S2S3	4 Secure	4	41.2 ± 3.0	NB
P	*Juncus brachycephalus*	Small-Head Rush				S2S3	3 Sensitive	2	69.0 ± 0.0	NB
P	*Corallorhiza maculata var. maculata*	Spotted Coralroot				S2S3	3 Sensitive	1	82.0 ± 10.0	NB
P	*Listera auriculata*	Auricled Twayblade				S2S3	3 Sensitive	12	31.2 ± 0.0	NB
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	3 Sensitive	2	8.5 ± 1.0	NB
P	*Stuckenia filiformis ssp. alpina*	Thread-leaved Pondweed				S2S3	3 Sensitive	2	41.4 ± 1.0	NB
P	*Stuckenia pectinata*	Sago Pondweed				S2S3	3 Sensitive	20	7.6 ± 0.0	NB
P	*Potamogeton praelongus*	White-stemmed Pondweed				S2S3	4 Secure	1	16.7 ± 0.0	NB
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	3 Sensitive	4	41.3 ± 2.0	NB
P	*Panax trifolius*	Dwarf Ginseng				S3	3 Sensitive	3	18.5 ± 3.0	NB
P	*Arnica lanceolata*	Lance-leaved Arnica				S3	4 Secure	17	67.1 ± 50.0	NB
P	*Artemisia campestris ssp. caudata*	Field Wormwood				S3	4 Secure	5	41.3 ± 5.0	NB
P	*Bidens hyperborea*	Estuary Beggarticks				S3	4 Secure	51	22.2 ± 0.0	NB
P	*Bidens hyperborea var. hyperborea*	Estuary Beggarticks				S3	4 Secure	4	86.5 ± 1.0	NB
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	4 Secure	6	70.3 ± 0.0	NB
P	*Symphyotrichum boreale*	Boreal Aster				S3	3 Sensitive	9	38.8 ± 1.0	NB
P	*Betula pumila*	Bog Birch				S3	4 Secure	138	22.4 ± 1.0	NB
P	*Arabis glabra*	Tower Mustard				S3	5 Undetermined	8	71.7 ± 0.0	NB
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	4 Secure	12	3.8 ± 1.0	NB
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	4 Secure	138	3.8 ± 1.0	NB
P	*Crassula aquatica*	Water Pygmyweed				S3	4 Secure	12	45.6 ± 0.0	NB
P	*Elatine minima*	Small Waterwort				S3	4 Secure	1	87.7 ± 1.0	NB
P	*Hedysarum alpinum*	Alpine Sweet-vetch				S3	4 Secure	5	70.3 ± 0.0	NB
P	*Gentianella amarella ssp. acuta*	Northern Gentian				S3	4 Secure	6	42.0 ± 1.0	NB
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	4 Secure	4	31.8 ± 5.0	NB
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	4 Secure	6	34.6 ± 0.0	NB
P	*Teucrium canadense*	Canada Germander				S3	3 Sensitive	42	49.8 ± 0.0	NB
P	*Nuphar lutea ssp. pumila*	Small Yellow Pond-lily				S3	4 Secure	4	15.0 ± 0.0	NB
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	4 Secure	13	83.6 ± 0.0	NB
P	*Epilobium strictum*	Downy Willowherb				S3	4 Secure	6	20.2 ± 0.0	NB
P	*Polygonum arifolium*	Halberd-leaved Tearthumb				S3	4 Secure	17	66.9 ± 0.0	NB
P	*Polygonum punctatum var. confertiflorum*	Dotted Smartweed				S3	4 Secure	5	46.3 ± 0.0	NB
P	*Polygonum scandens*	Climbing False Buckwheat				S3	4 Secure	4	63.4 ± 0.0	NB
P	*Samolus valerandi ssp. parviflorus*	Seaside Brookweed				S3	4 Secure	115	42.3 ± 9.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Pyrola minor*	Lesser Pyrola				S3	4 Secure	4	34.3 ± 10.0	NB
P	*Clematis occidentalis*	Purple Clematis				S3	4 Secure	4	94.5 ± 0.0	NB
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	4 Secure	17	8.5 ± 1.0	NB
P	*Thalictrum venulosum*	Northern Meadow-rue				S3	4 Secure	1	94.6 ± 0.0	NB
P	*Amelanchier canadensis*	Canada Serviceberry				S3	4 Secure	2	81.1 ± 0.0	NB
P	*Rosa palustris*	Swamp Rose				S3	4 Secure	3	67.0 ± 1.0	NB
P	*Sanguisorba canadensis*	Canada Burnet				S3	4 Secure	75	26.4 ± 0.0	NB
P	*Galium boreale*	Northern Bedstraw				S3	4 Secure	4	27.4 ± 1.0	NB
P	*Salix pedicellaris*	Bog Willow				S3	4 Secure	25	17.5 ± 5.0	NB
P	*Comandra umbellata*	Bastard's Toadflax				S3	4 Secure	68	3.7 ± 4.0	NB
P	*Comandra umbellata ssp. umbellata*	Bastard's Toadflax				S3	4 Secure	6	4.0 ± 0.0	NB
P	*Parnassia glauca*	Fen Grass-of-Parnassus				S3	4 Secure	11	69.0 ± 0.0	NB
P	*Limosella australis*	Southern Mudwort				S3	4 Secure	62	25.1 ± 1.0	NB
P	*Veronica serpyllifolia ssp. humifusa*	Thyme-Leaved Speedwell				S3	4 Secure	7	18.5 ± 3.0	NB
P	*Viola adunca*	Hooked Violet				S3	4 Secure	3	41.3 ± 2.0	NB
P	*Viola nephrophylla*	Northern Bog Violet				S3	4 Secure	5	69.0 ± 0.0	NB
P	*Carex aquatilis*	Water Sedge				S3	4 Secure	9	31.1 ± 0.0	NB
P	*Carex arcta*	Northern Clustered Sedge				S3	4 Secure	1	98.9 ± 0.0	NB
P	*Carex atratiformis*	Scabrous Black Sedge				S3	4 Secure	3	94.1 ± 1.0	NB
P	*Carex capillaris*	Hairlike Sedge				S3	4 Secure	1	71.0 ± 0.0	NB
P	*Carex chordorrhiza*	Creeping Sedge				S3	4 Secure	6	34.9 ± 0.0	NB
P	*Carex conoidea*	Field Sedge				S3	4 Secure	1	56.3 ± 10.0	NB
P	*Carex eburnea*	Bristle-leaved Sedge				S3	4 Secure	2	94.5 ± 0.0	NB
P	*Carex garberi*	Garber's Sedge				S3	3 Sensitive	18	67.1 ± 0.0	NB
P	*Carex haydenii*	Hayden's Sedge				S3	4 Secure	1	45.6 ± 0.0	NB
P	*Carex ormostachya*	Necklace Spike Sedge				S3	4 Secure	5	33.1 ± 0.0	NB
P	*Carex tenera*	Tender Sedge				S3	4 Secure	1	59.5 ± 0.0	NB
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	4 Secure	4	34.9 ± 10.0	NB
P	*Carex vaginata*	Sheathed Sedge				S3	3 Sensitive	8	69.0 ± 0.0	NB
P	*Carex wiegandii*	Wiegand's Sedge				S3	4 Secure	28	61.6 ± 1.0	NB
P	*Carex recta*	Estuary Sedge				S3	4 Secure	15	18.1 ± 0.0	NB
P	*Cyperus dentatus*	Toothed Flatsedge				S3	4 Secure	1	94.7 ± 10.0	NB
P	*Eleocharis intermedia*	Matted Spikerush				S3	4 Secure	2	27.6 ± 2.0	NB
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S3	4 Secure	1	95.0 ± 0.0	PE
P	*Rhynchospora capitellata*	Small-headed Beakrush				S3	4 Secure	25	64.8 ± 0.0	NB
P	*Trichophorum clintonii*	Clinton's Clubrush				S3	4 Secure	35	64.4 ± 0.0	NB
P	*Lemna trisulca*	Star Duckweed				S3	4 Secure	2	9.9 ± 2.0	NB
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	3 Sensitive	18	14.1 ± 2.0	NB
P	*Liparis loeselii*	Loesel's Twayblade				S3	4 Secure	31	12.9 ± 0.0	NB
P	*Platanthera blephariglottis*	White Fringed Orchid				S3	4 Secure	117	3.8 ± 1.0	NB
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	3 Sensitive	7	16.2 ± 5.0	NB
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	3 Sensitive	1	99.7 ± 0.0	NB
P	*Dichanthelium depauperatum*	Starved Panic Grass				S3	4 Secure	21	57.3 ± 0.0	NB
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	4 Secure	6	14.9 ± 0.0	NB
P	*Potamogeton richardsonii*	Richardson's Pondweed				S3	3 Sensitive	2	8.5 ± 1.0	NB
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3	4 Secure	83	5.7 ± 1.0	NB
P	*Zannichellia palustris*	Horned Pondweed				S3	4 Secure	62	4.4 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	Prov GS Rank	# recs	Distance (km)	Prov
P	*Cryptogramma stelleri*	Steller's Rockbrake				S3	4 Secure	3	76.0 ± 0.0	NB
P	*Asplenium trichomanes-ramosum*	Green Spleenwort				S3	4 Secure	3	75.9 ± 0.0	NB
P	*Dryopteris fragrans var. remotiuscula*	Fragrant Wood Fern				S3	4 Secure	2	94.5 ± 0.0	NB
P	*Woodsia glabella*	Smooth Cliff Fern				S3	4 Secure	1	94.5 ± 0.0	NB
P	*Equisetum palustre*	Marsh Horsetail				S3	4 Secure	1	95.8 ± 0.0	NB
P	*Lycopodium sabinifolium*	Ground-Fir				S3	4 Secure	6	8.3 ± 1.0	NB
P	*Huperzia appalachiana*	Appalachian Fir-Clubmoss				S3	3 Sensitive	2	70.2 ± 1.0	NB
P	*Botrychium lanceolatum var. angustisegmentum*	Lance-Leaf Grape-Fern				S3	3 Sensitive	4	83.1 ± 0.0	NB
P	*Botrychium simplex*	Least Moonwort				S3	4 Secure	8	38.3 ± 1.0	NB
P	*Mertensia maritima*	Sea Lungwort				S3S4	4 Secure	5	28.4 ± 1.0	NB
P	*Lobelia kalmii*	Brook Lobelia				S3S4	4 Secure	4	70.3 ± 1.0	NB
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	4 Secure	31	6.5 ± 0.0	NB
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	4 Secure	11	7.5 ± 0.0	NB
P	*Stachys pilosa*	Hairy Hedge-Nettle				S3S4	5 Undetermined	1	77.4 ± 0.0	NB
P	*Utricularia gibba*	Humped Bladderwort				S3S4	4 Secure	1	72.2 ± 1.0	NB
P	*Rumex maritimus*	Sea-Side Dock				S3S4	4 Secure	41	8.0 ± 0.0	NB
P	*Rumex maritimus var. fueginus*	Tierra del Fuego Dock				S3S4	4 Secure	22	26.6 ± 0.0	NB
P	*Potentilla arguta*	Tall Cinquefoil				S3S4	4 Secure	4	77.8 ± 0.0	NB
P	*Rubus chamaemorus*	Cloudberry				S3S4	4 Secure	162	2.9 ± 1.0	NB
P	*Geocaulon lividum*	Northern Comandra				S3S4	4 Secure	63	1.9 ± 1.0	NB
P	*Juniperus horizontalis*	Creeping Juniper				S3S4	4 Secure	11	33.5 ± 0.0	NB
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	4 Secure	75	1.9 ± 1.0	NB
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3S4	4 Secure	58	17.1 ± 5.0	NB
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	3 Sensitive	9	14.1 ± 2.0	NB
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S3S4	4 Secure	26	2.7 ± 0.0	NB
P	*Distichlis spicata*	Salt Grass				S3S4	4 Secure	40	38.5 ± 3.0	NB
P	*Potamogeton oakesianus*	Oakes' Pondweed				S3S4	4 Secure	1	89.5 ± 0.0	NB
P	*Polygonum raii*	Sharp-fruited Knotweed				SH	0.1 Extirpated	9	19.9 ± 10.0	NB
P	*Montia fontana*	Water Blinks				SH	2 May Be At Risk	1	80.9 ± 1.0	NB
P	*Botrychium campestre*	Prairie Moonwort				SH	2 May Be At Risk	1	80.1 ± 0.0	NB

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

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APPENDIX D

Appendix D – Underwater Benthic Habitat Survey Report (Wood)

POKEMOUCHE BAY
UNDERWATER BENTHIC HABITAT SURVEY
Inkerman, New Brunswick

DRAFT REPORT

Submitted to:
Roy Consultants Ltd.
Fredericton, New Brunswick

Submitted by:
Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited
Fredericton, New Brunswick

July 2019

TE181035

12 July 2019

TE181035

Mr. Jonathan Burtt, B.ScF., E.P.
Environmental Specialist
Roy Consultants
364 York Street, Suite 201
Fredericton, New Brunswick
E3B 3P7

Dear Mr. Burtt

Re: Underwater Benthic Habitat Survey, Pokemouche Bay, Inkerman, New Brunswick

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood), is pleased to provide Roy Consultants Ltd. (Roy) with the findings of an Underwater Benthic Habitat Survey (UBHS). The UBHS was undertaken around the remnants of a bridge across Pokemouche Bay between Inkerman and Inkerman Ferry, New Brunswick (NB).

Wood appreciates the opportunity to provide services to Roy. Please do not hesitate to call if you have any questions regarding this or any other matter.

Respectfully submitted,

Wood Environment & Infrastructure Solutions,
a Division of Wood Canada Limited

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1.0 INTRODUCTION

At the request of Roy Consultants Ltd. (Roy), Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood) completed an Underwater Benthic Habitat Survey (UBHS) to support potential *Fisheries Act* permitting for the deconstruction of existing bridge infrastructure and the construction of a new bridge in Inkerman, New Brunswick (NB) (Figure 1-1).

2.0 SCOPE AND METHODOLOGY

Qualitative and quantitative observations were obtained around the remnants of a bridge across Pokemouche Bay between Inkerman and Inkerman Ferry, NB. The site is located in a narrows between Pokemouche Bay and Inkerman Lake. Video survey techniques were used to map substrate types and document presence and abundance of macrofaunal and macrofloral species. Wood contracted Acadian Marine and Diving to complete the video collection on June 6, 2019.

Video footage was collected using a Seabotix Remotely Operated Vehicle (ROV). A total of 1,120 m of video surveillance was divided into ten transects within the study area. All transects are described from point “a” to “b” as illustrated in Figure 1-1. Tidal currents did not allow for the use of the benthic transect lines. The currents also negatively impacted the mobility of the ROV. To collect the video the ROV was held near the surface of the water beside the boat. The ROV and GPS clock were synced to determine the 5 m increments. Because the ROV was near the surface the seabed was not visible in portions of T1 and T5 when crossing the two channels. The seabed was characterized from video collected within the channels in transects T3 and T9. Seabed characterization consisted of observations from review of the video footage. Observations of substrate type, flora, and fauna along the video transect were made for each 5 m segment.

2.1 Substrate Classification

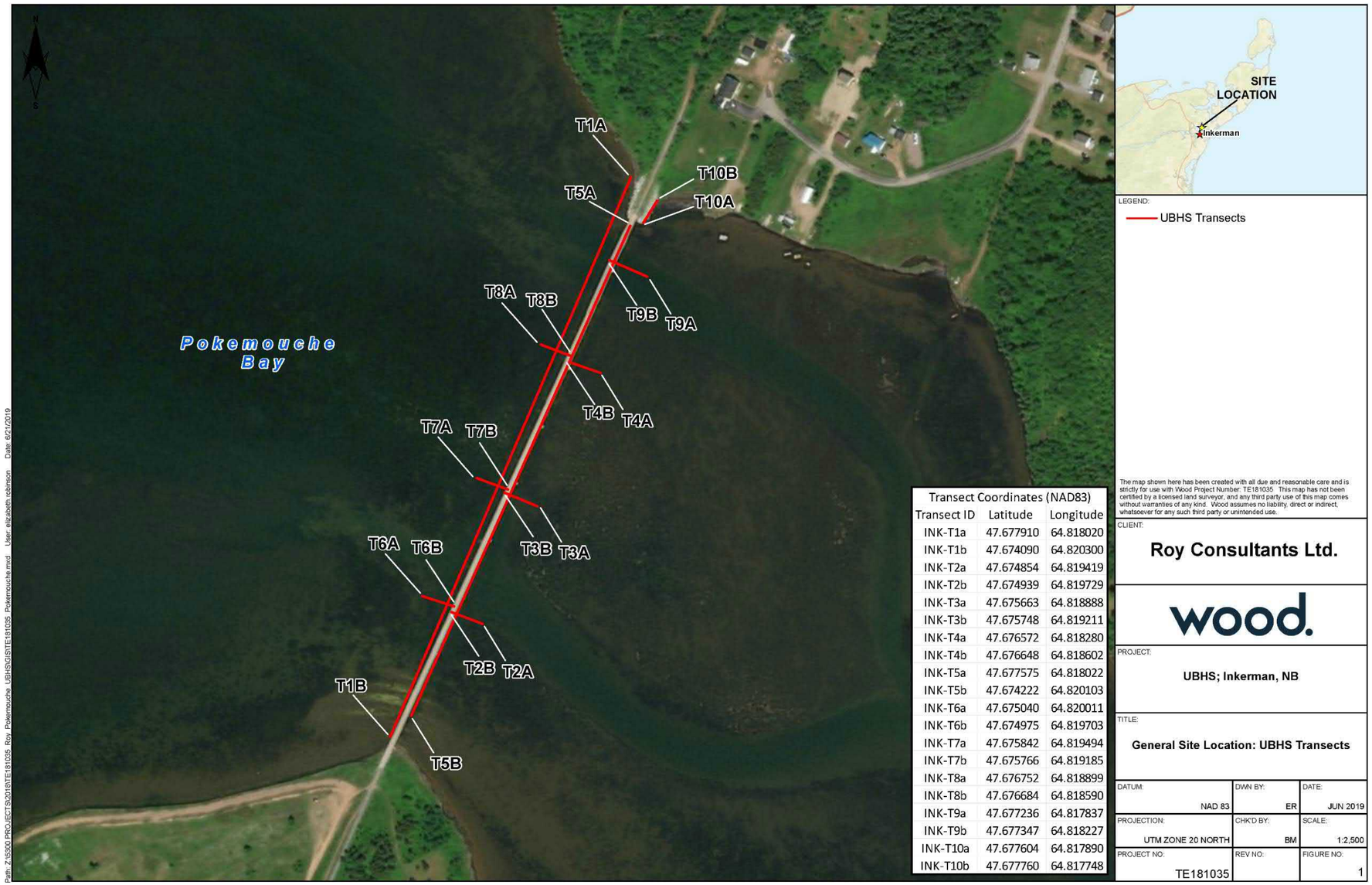
Substrate observed in the video was classified according to the definitions in Table 2.1, each expressed as a relative percentage of coverage along each 5 m segment. The particle size classes were based on the Wentworth-Udden particle scale (Kelly et al. 2009; Wentworth, 1922). For ease of interpretation, the broad class categories were used for graphing the substrate data.

Table 2.1 Marine Substrate Classification Categories

Broad Class	Detailed Class	Size Range (mm)
Bedrock		**Continuous Rock**
Coarse	Boulder	>250
	Rock	130-250
Medium	Cobble	30-130
	Gravel	2-30
Fine	Sand	0.06-2
	Silt/Clay	Material encompassing both silt and clay; <0.06

Source: Based on Wentworth-Udden particle scale (Kelly et al., 2009; Wentworth, 1922)

Figure 1 General Site Location: UBHS Transects, Pokemouche Bay, Inkerman, NB



2.2 Macroflora and Macrofauna Classification

Species were identified to the lowest possible taxonomic level using available field guides (Gosner, 1978 and Villalard-Bohnsack, 2003). Identification was dependent on quality of video and prominence of identifying characteristics. Flora was expressed as a relative percentage of coverage for each section. Sedentary and mobile fauna were enumerated where possible and categorized using a semi-quantitative abundance scale (Simkanin et al., 2005; Kelly et al., 2009) as defined in Table 2.2. For graphing purposes, seaweed species have been grouped by their Class (red, brown or green). Other aquatic plants present (e.g., eelgrass) are added to the graph when applicable.

Table 2.2 Macrofaunal Abundance Categories

Abundance Category	Code	Description
Abundant	A	Numerous observations made throughout the entire 5 m segment (quantified if possible).
Common	C	Numerous observations made intermittently along the 5 m segment (quantified if possible).
Occasional	O	Quantifiable observations made intermittently along the 5 m segment.
Uncommon	U	Quantifiable observations made infrequently along the 5 m segment.

Source: Based on Simkanin et al. (2005) Abundant, Common, Frequent, Occasional and Rare (ACFOR) scale.

3.0 UNDERWATER BENTHIC HABITAT SURVEY RESULTS

The results of the underwater habitat survey are provided in Tables A.1 to A.10 (Appendix A) and summarized in the following subsections. A list of the species observed during the survey is provided in Appendix B, while a photo log of video screen shots showing representative habitat types along the length of the transect have been included in Appendix C.

Observations of macrofaunal and macrofloral life were noted in all transects, as further described in this section and in the associated tables in Appendix A (where encountered). Macrofloral debris (i.e., detritus from macrofloral species) was noted along segments of all transects.

3.1 Transect 1 (T1)

Transect 1 (T1) was 485 m long and ran in an approximate northeast to southwest orientation. Many segments of the transect that fall within the channel were not visible, these blank segments are noted in Table A.1 (60-105 m, 280-330 m, and 335-370 m).

Substrate:
The substrate was predominantly sand with lesser amounts of silt. Segment 330-335 m contained a small percentage of rock. The substrate transitioned to predominantly gravel with lesser amounts of sand and silt at the final two segments, 475-485 m.

Macrofauna:
Macrofaunal life was noted throughout the entire length of the transect. Uncommon occurrences of periwinkles (*Littorina littorea*) were noted in four of the segments (Table A.1). Considering periwinkles were commonly observed throughout all other transects, it is likely that the video quality hindered periwinkle observation in T1. Single occurrences of unidentified fish species were noted in three consecutive segments (10-25 m). Shell hash was noted throughout the length of T1 mainly consisting of blue mussel (*Mytilus edulis*) and clam shells.

Macroflora:
Macrofloral life was present throughout T1. Eelgrass (*Zostera marina)* beds were present along the majority of T1 (Table A.1) at varying degrees of cover (5-100%). Living eelgrass was covered with an unidentified brown filamentous epiphytic alga. Dead eelgrass was present in thirteen segments at 10-20% cover. Macrofloral debris (free floating dead eelgrass) with cover ranging between <5% and 10% was noted throughout the transect. An insignificant amount of unidentified filamentous green algae was present in the first few segments.

Figure 2 Substrate Composition along T1

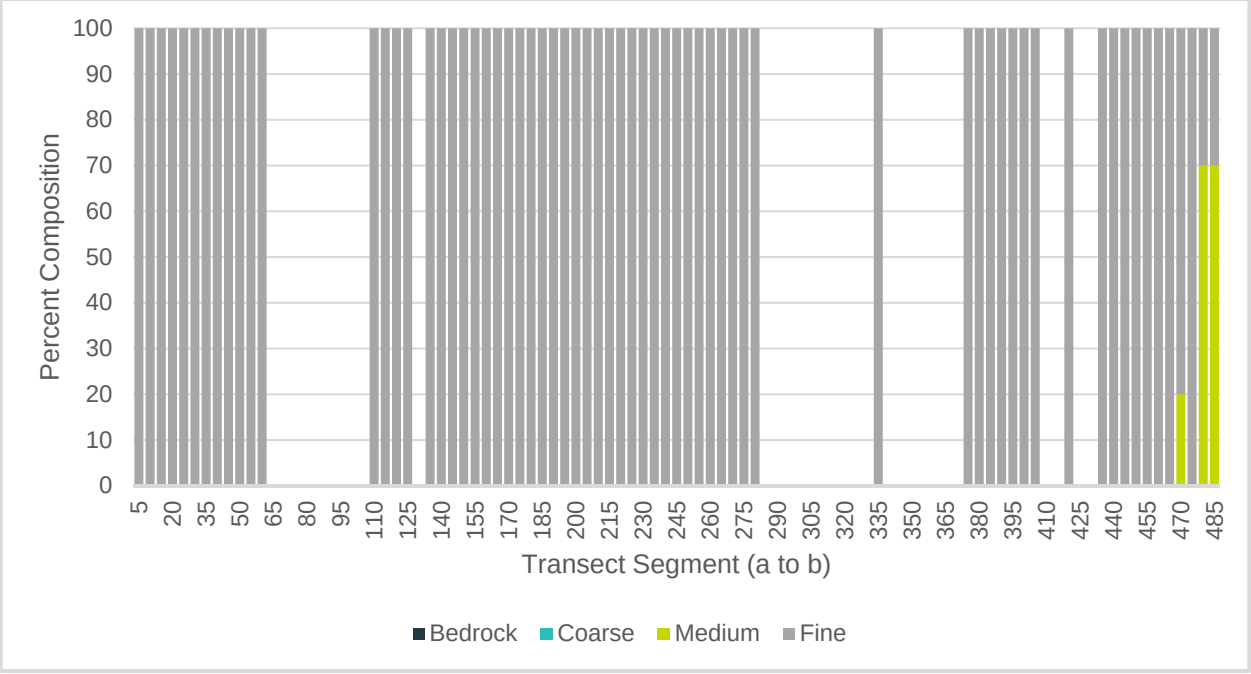
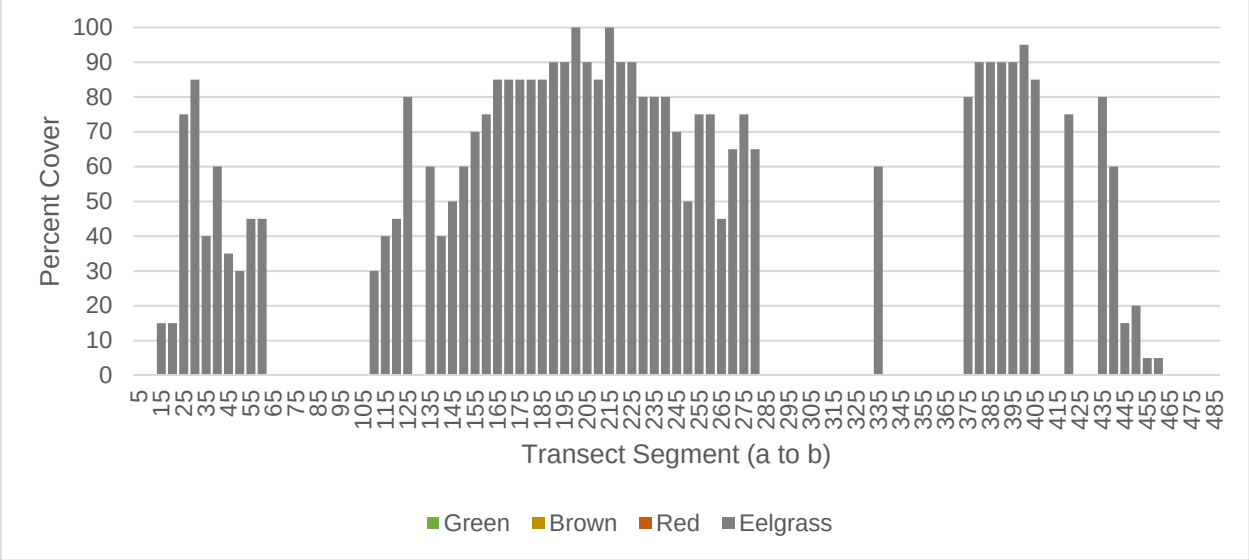


Figure 3 Macrofloral Cover along T1



3.2 Transect 2 (T2)

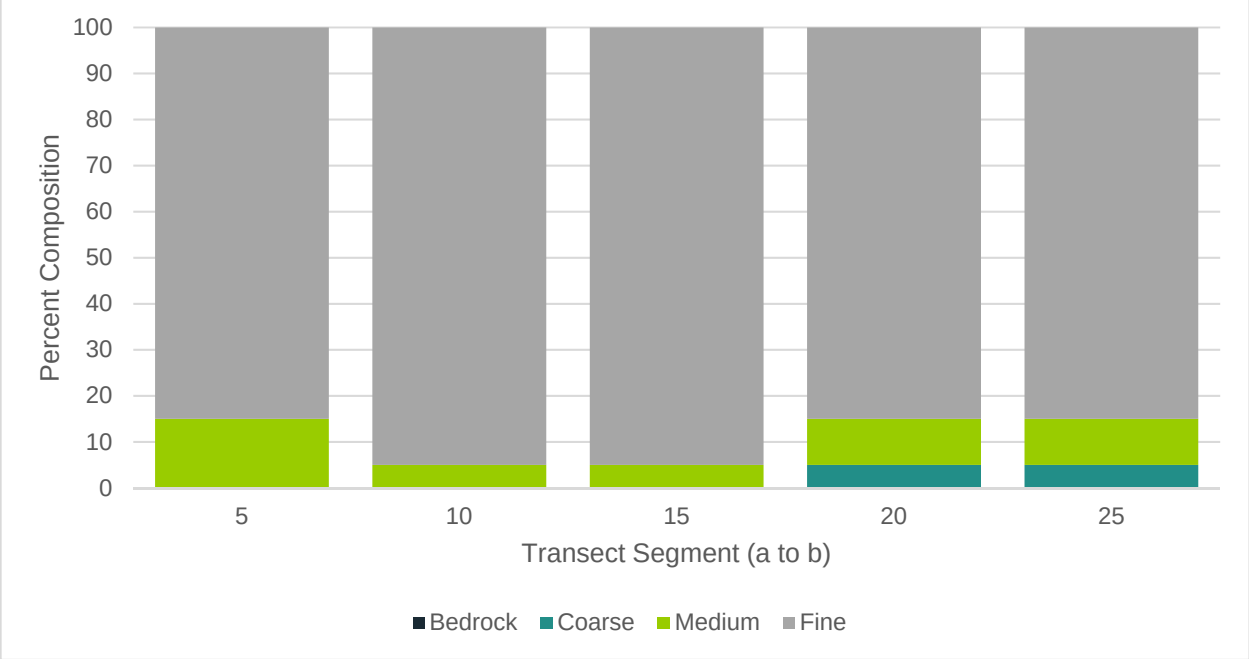
Transect 2 (T2) was 25 m long and ran in an approximate southeast to northwest orientation. Woody debris was noted in segment 15-20 m.

Substrate:
The substrate was predominantly sand, with lesser amounts of silt throughout the transect. All segments included a varying mix of gravel, cobble, and rock at 5-10% coverage.

Macrofauna:
Macrofaunal life was noted throughout the entire length of the transect. Common occurrences of periwinkles were noted in segments 0-20 m. Uncommon occurrences of unidentified fish species were noted in 2 segments (Table A.2). A single occurrence of flounder was noted in segment 0-5 m. Abundant shell hash was noted in all segments, primarily composed of blue mussel and clam shells.

Macroflora:
Macrofloral life in T2 was limited to dead eelgrass beds with 20% to 50% coverage. This is not considered substantial, as the dead eelgrass is likely to detach under strong currents and become free-floating macrofloral debris.

Figure 4 Substrate Composition along T2



3.3 Transect 3 (T3)

Transect 3 (T3) was 25 m long and ran in an approximate southeast to northwest orientation.

Substrate:
The substrate was predominantly sand with lesser amounts of silt throughout the transect, with a small amount of rock (5%) in segment 0-5 m.

Macrofauna:
Macrofaunal life was noted throughout T3. Common occurrences of periwinkles were noted in segments 5-25 m (Table A.3). There was a single occurrence of an unidentified fish species in segment 20-25 m. Abundant shell hash composed of blue mussel and clam shells was noted in the first four segments.

Macroflora:
Macrofloral life was present throughout the length of T3. All segments were composed of a varying mix of eelgrass and dead eelgrass beds (20-50% and 20-30% respectively). Living eelgrass was covered with an unidentified brown filamentous epiphytic alga.

Figure 5 Substrate Composition along T3

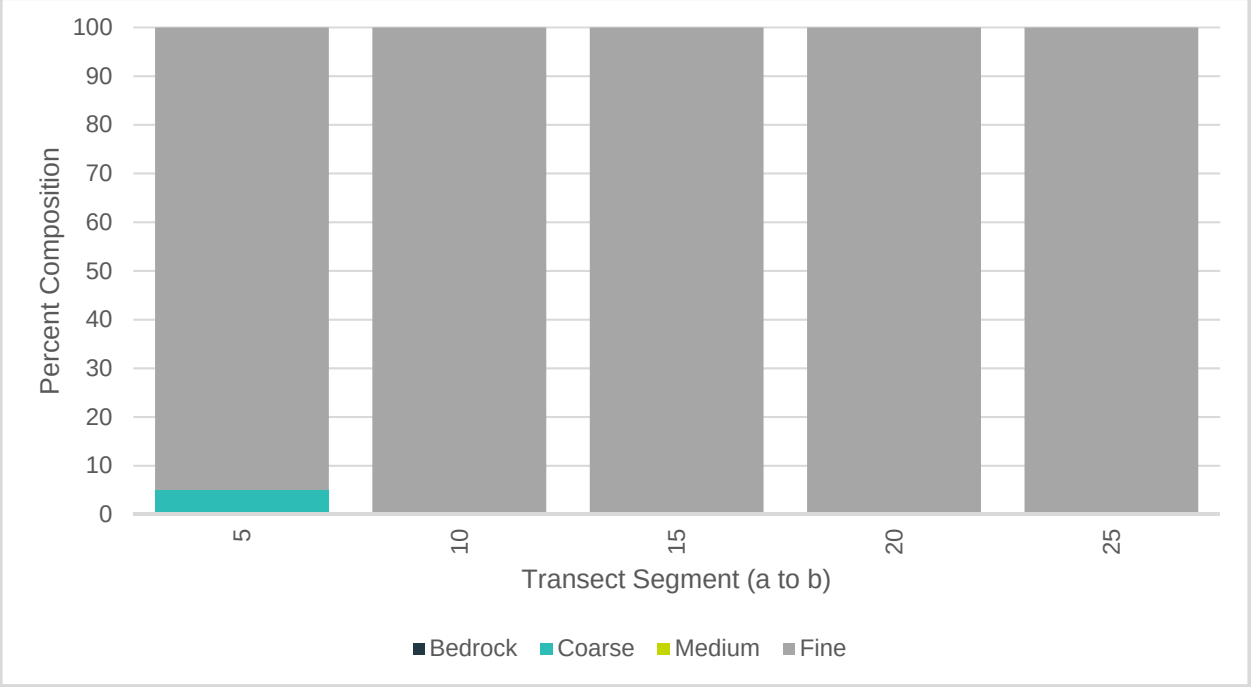
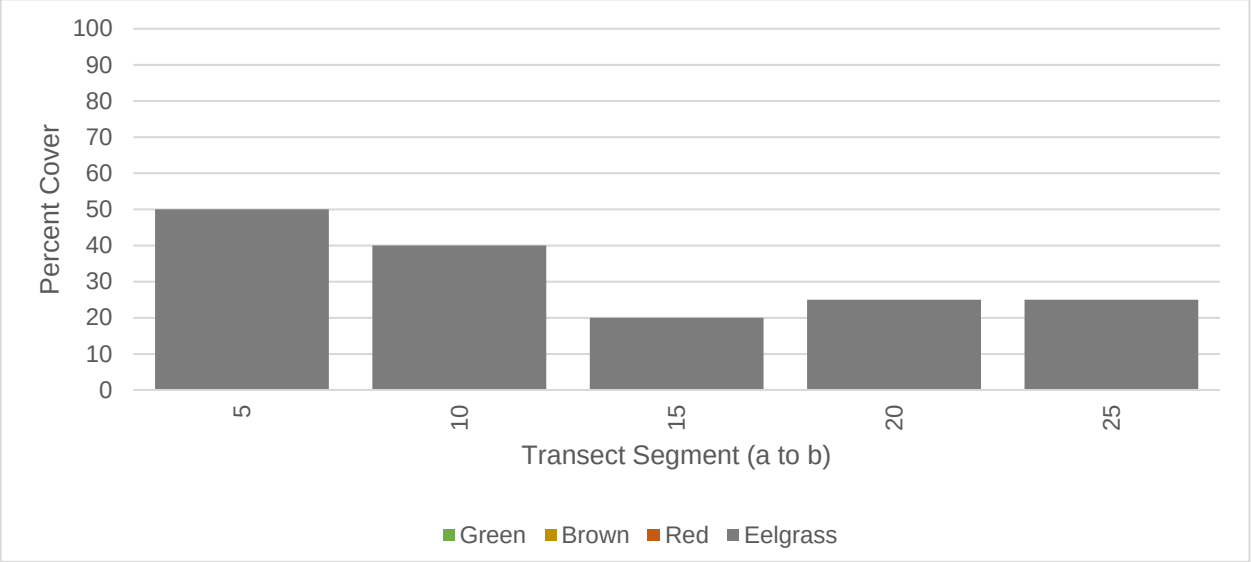


Figure 6 Macrofloral Cover along T3



3.4 Transect 4 (T4)

Transect 4 (T4) was 25 m long and ran in an approximate southeast to northwest orientation. Large woody debris was noted in the 10-15 m segment.

Substrate:
The substrate was predominantly sand with lesser amounts of silt. Segments 5-15 m had trace amounts of rock, cobble, and gravel.

Macrofauna:
Macrofaunal life was present throughout T4. Periwinkles were common in all segments of T4 (Table A.4). There were uncommon occurrences of unidentified fish in segments 5-10 m and 20-25 m. Shell hash was noted throughout T4, mainly consisting of blue mussel and clam shells.

Macroflora:
Macrofloral life was present throughout T4. The first segment had 100% cover of eelgrass with a brown filamentous epiphyte (epiphyte present throughout transect). The other four segments had varying eelgrass cover (20-90%) and macrofloral debris composed of eelgrass and sparse sugar kelp (*Saccharina latissima*).

Figure 7 Substrate Composition along T4

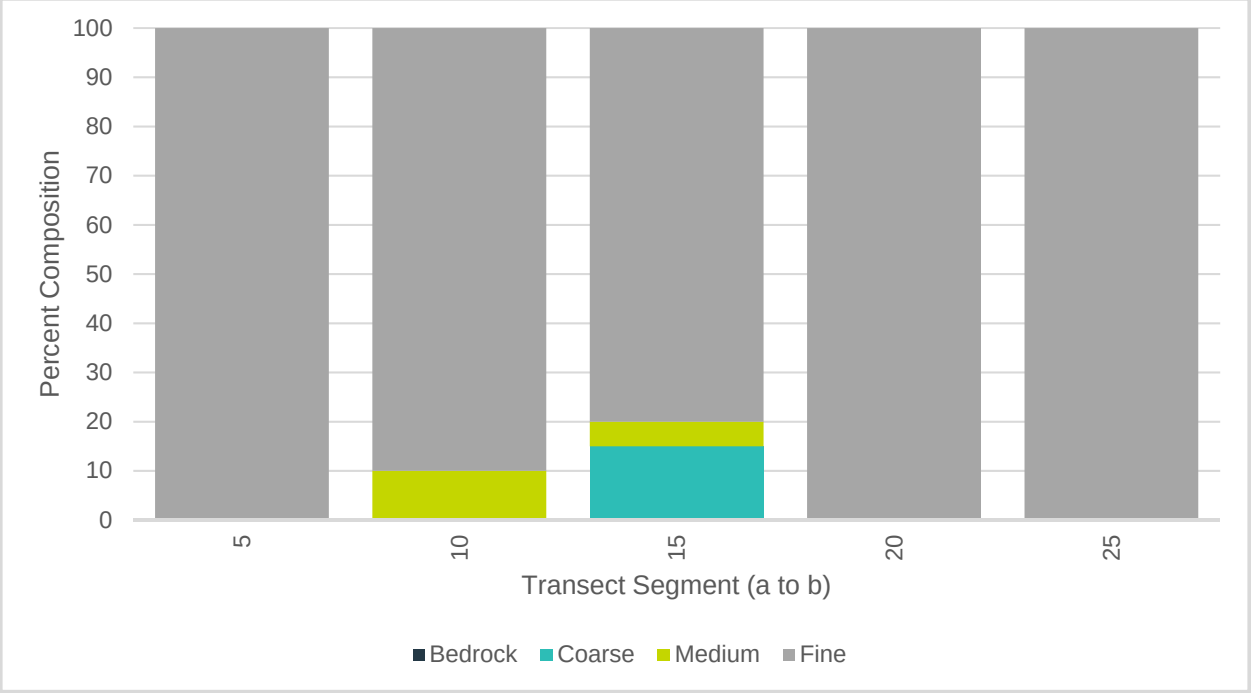
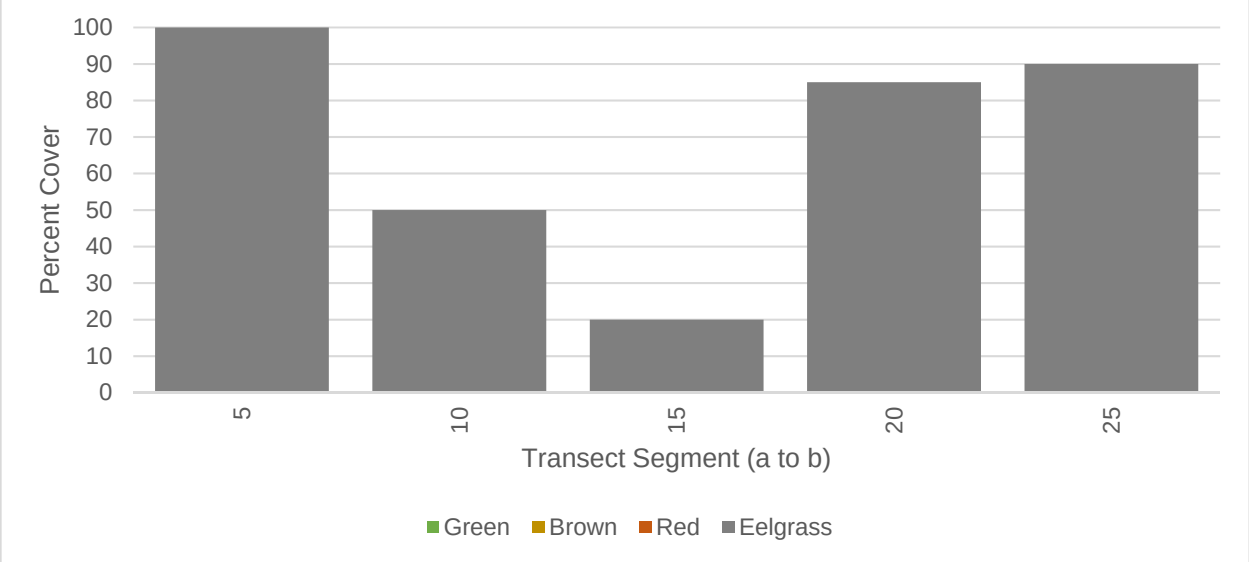


Figure 8 Macrofloral Cover along T4



3.5 Transect 5 (T5)

Transect 5 (T5) was 415 m long and ran in an approximate northeast to southwest orientation. Many segments of the transect that fall within the channel were not visible, these blank segments are noted in Table A.5 (60-95 m, 275-380 m, and 390-410 m).

Substrate:
The substrate was predominantly sand with lesser amounts of silt throughout the transect. The first thirteen segments included a small percentage of gravel (5-10%).

Macrofauna:
Macrofaunal life was common throughout the transect. Periwinkles were common in all visible segments (Table A.5). Shell hash was noted throughout all visible segments of T5. Shell hash was primarily composed of blue mussel and clam shells.

Macroflora:
Macrofloral life was present throughout the length of T5. Eelgrass beds spanned the entire length of the transect with cover ranging from 5-100% (Table A.5). Dead eelgrass beds were interspersed with living beds at cover ranging from 15-50%. All macrofloral debris present was composed of eelgrass.

Figure 9 Substrate Composition along T5

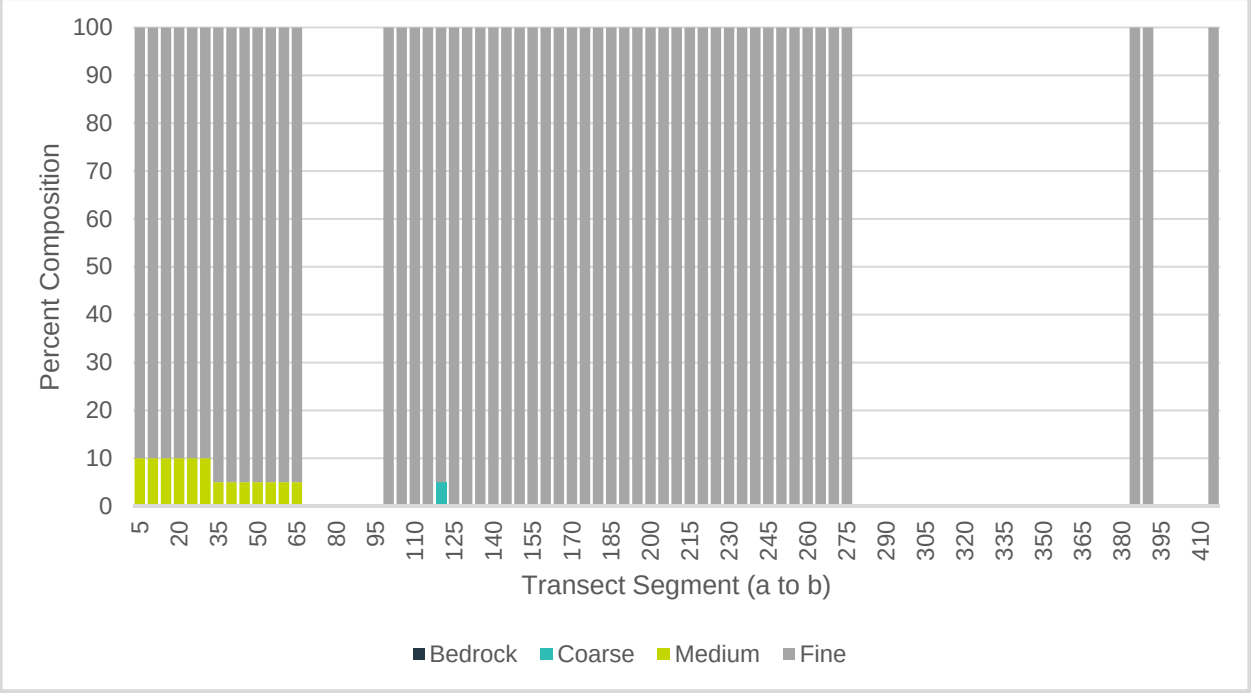
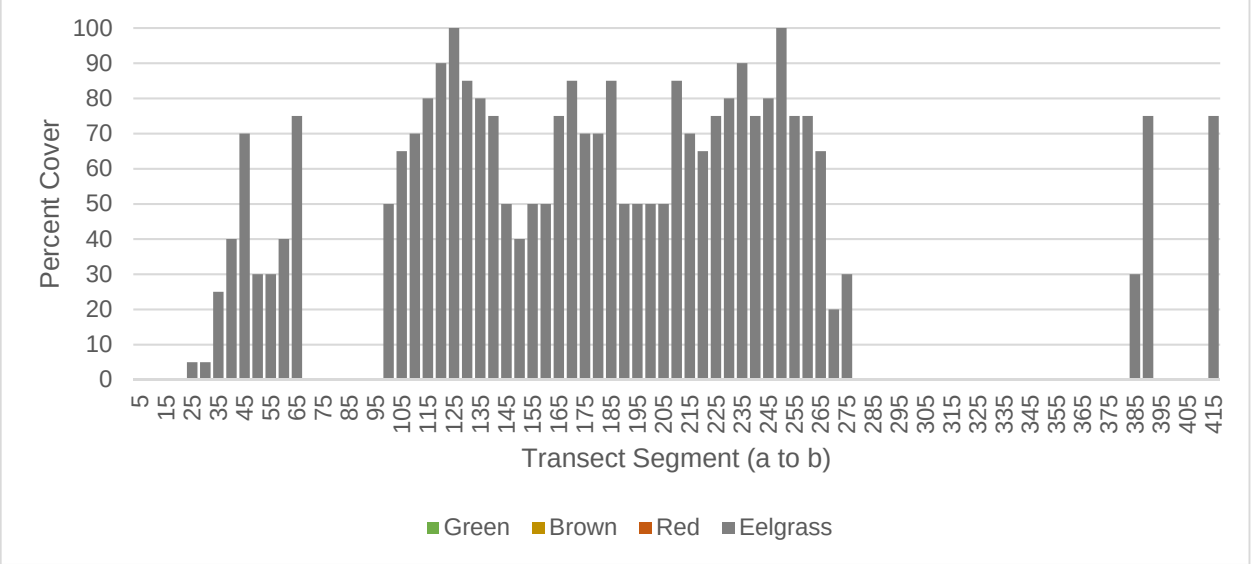


Figure 5 Macrofloral Cover along T5



3.6 Transect 6 (T6)

Transect 6 (T6) was 25 m long and ran in an approximate northwest to southeast orientation. Small woody debris was noted in the first two segments.

Substrate:
The substrate was exclusively sand with lesser amounts of silt.

Macrofauna:
Macrofaunal life was present throughout the transect. Periwinkles were common throughout four segments of T6 (Table A.6). Uncommon occurrences of unidentified fish species were noted in all five segments. A single occurrence of flounder (species not identified) was noted in the 0-5 m segment. Shell hash was noted throughout the length of T6. Shell hash was primarily composed of blue mussel and clam shells with some American oyster shells (*Crassostrea virginica).*

Macroflora:
Macrofloral life was present throughout T6. Eelgrass beds covered 5-75% of the first four segments. Macrofloral debris composed of eelgrass was present with <5-15% cover.

Figure 11 Substrate Composition along T6

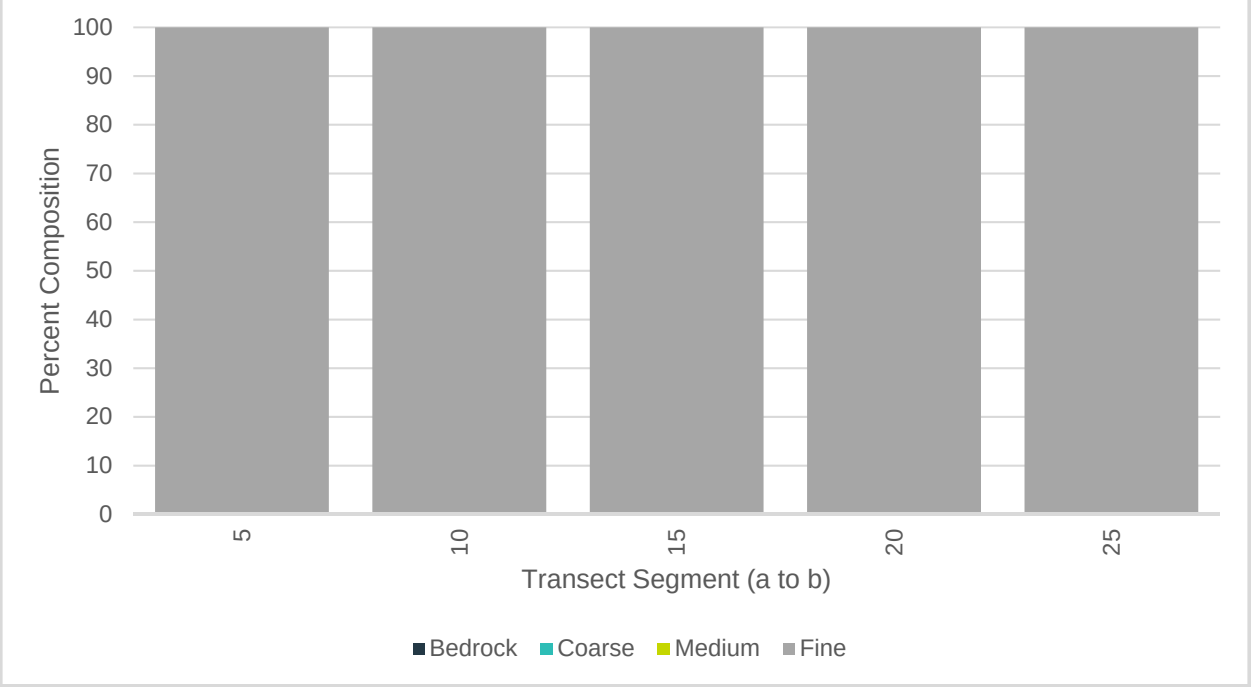
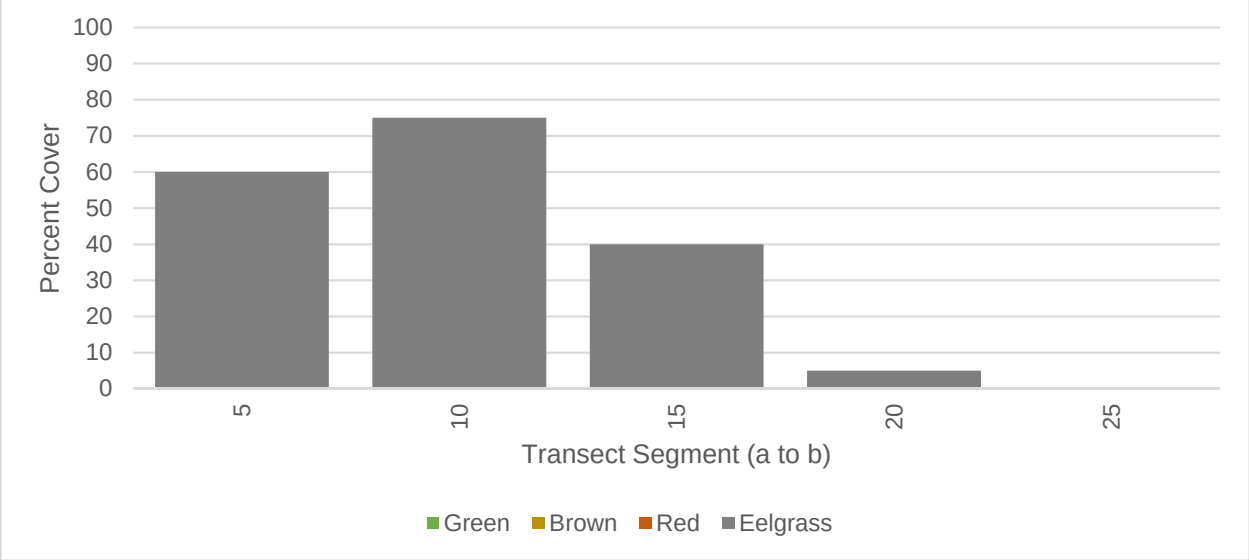


Figure 12 Macrofloral Cover along T6



3.7 Transect 7 (T7)

Transect 7 (T7) was 25 m long and ran in an approximate northwest to southeast orientation.

Substrate:
The substrate was exclusively sand with lesser amounts of silt.

Macrofauna:
Macrofaunal life was present throughout the transect. Periwinkles were common in all segments (Table A.7). A single flounder (species not identified) was noted in segment 5-10 m. Shell hash was noted throughout most of the length of T7. Shell hash was primarily composed of blue mussel and clam shells. Blue mussels were commonly noted to cover the vertical columns of the bridge.

Macroflora:
Macrofloral life was present throughout T7. Eelgrass beds with and unidentified brown epiphyte were noted with 65-100% cover. Macrofloral debris composed of eelgrass was present in two segments at <5-10% cover.

Figure 13 Substrate Composition along T7

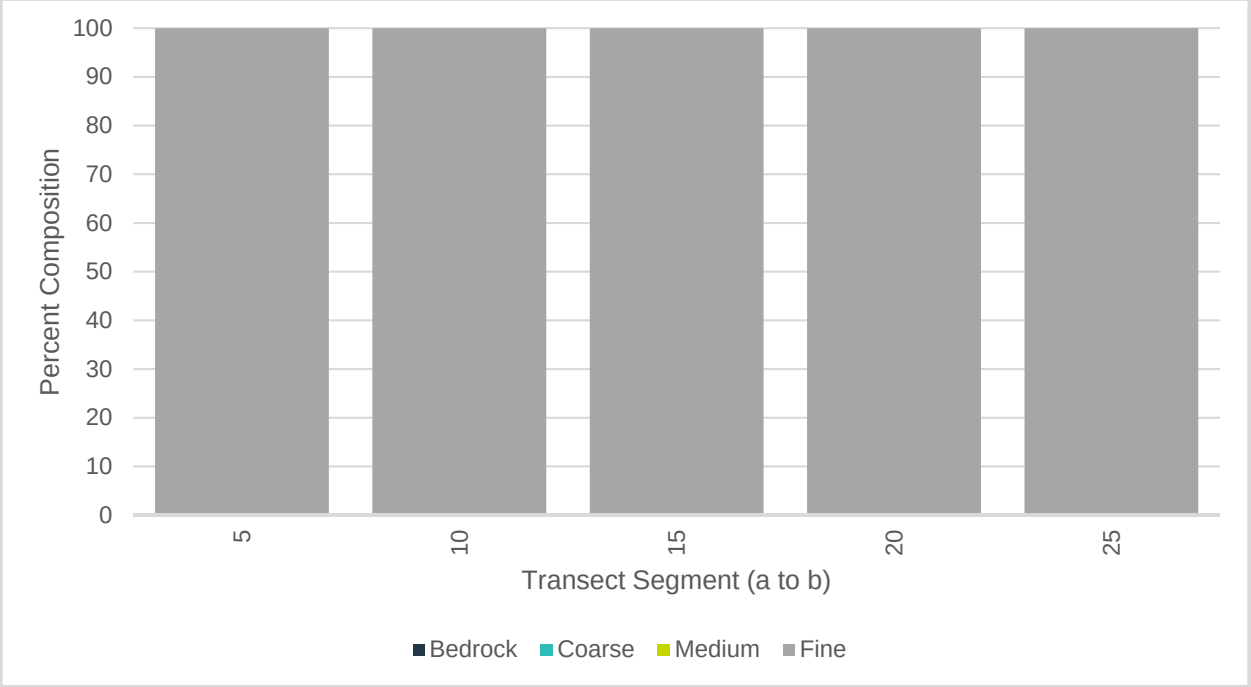
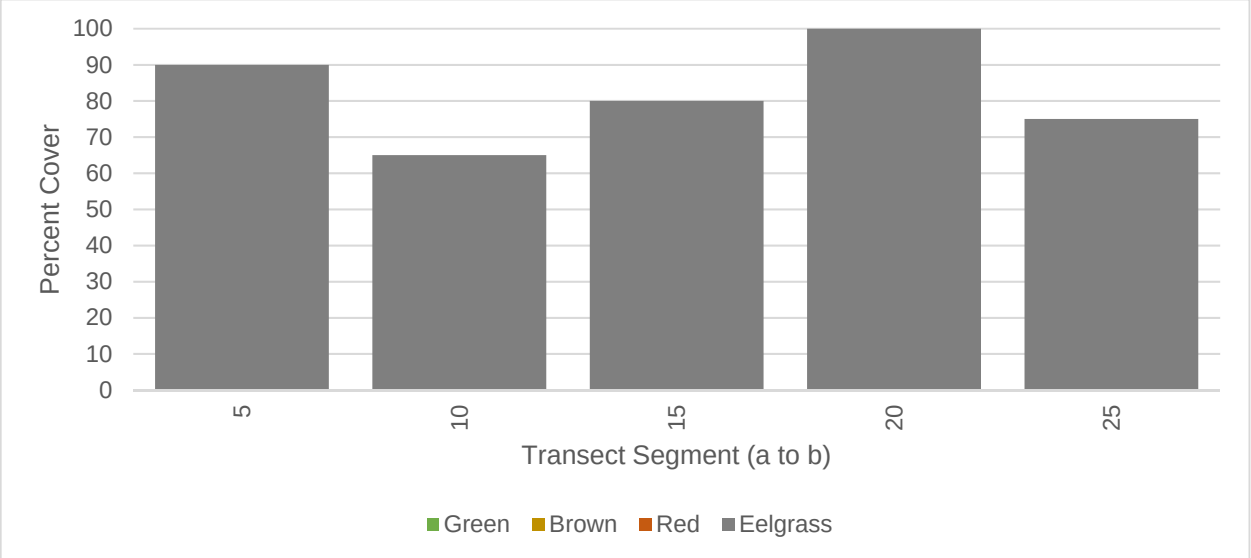


Figure 14 Macrofloral Cover along T7



3.8 Transect 8 (T8)

Transect 8 (T8) was 25 m long and ran in an approximate northwest to southeast orientation.

Substrate:
The substrate was predominantly sand with lesser amounts of silt throughout the transect. The last two segments from 15-25 m had trace amounts of rock.

Macrofauna:
Macrofaunal life was common throughout the transect. Periwinkles were common in all segments of T8 (Table A.8). Uncommon occurrences of unidentified fish species were noted in two segments, 10-20 m. Shell hash was noted throughout the last three segments of T8. Shell hash was primarily composed of blue mussel and clam shells. Blue mussels were commonly noted to cover the vertical columns of the bridge.

Macroflora:
Macrofloral life was dense throughout T8. Eelgrass beds were present with cover spanning 75-80%. Living eelgrass was covered with an unidentified brown filamentous epiphytic alga. Dead eelgrass was present with 20-75% cover in the last two segments. Insignificant scraps of sugar kelp were also present in segment 20-25 m.

Figure 15 Substrate Composition along T8

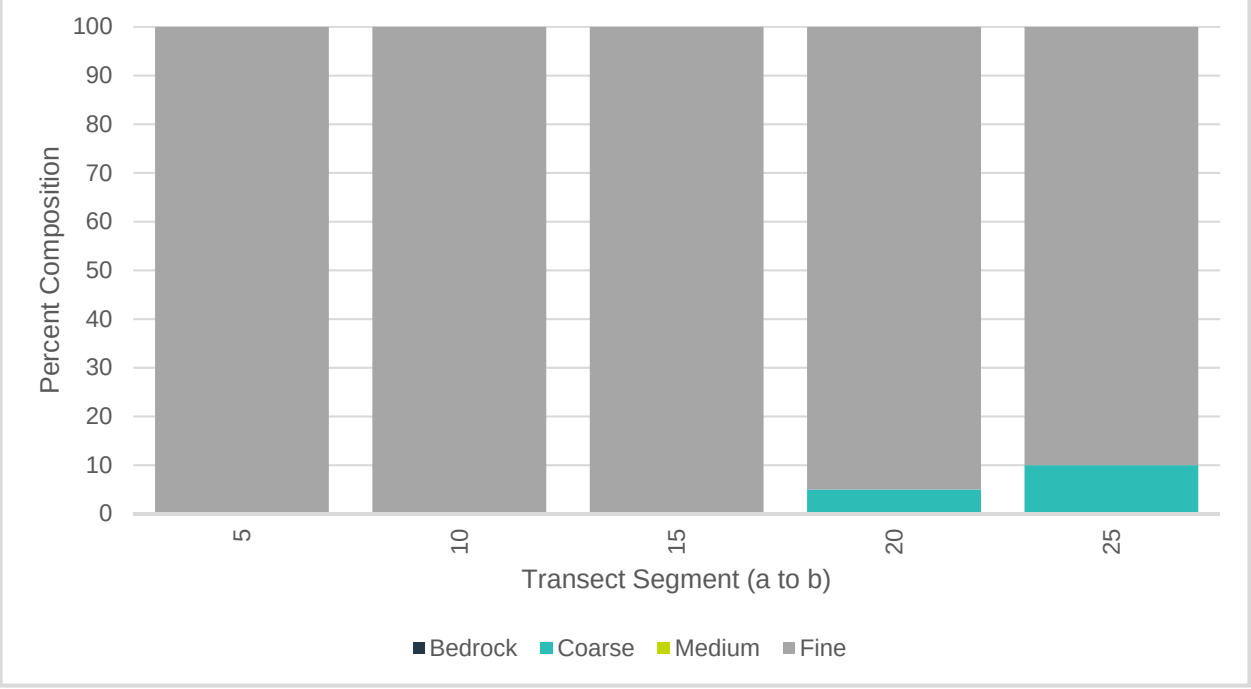
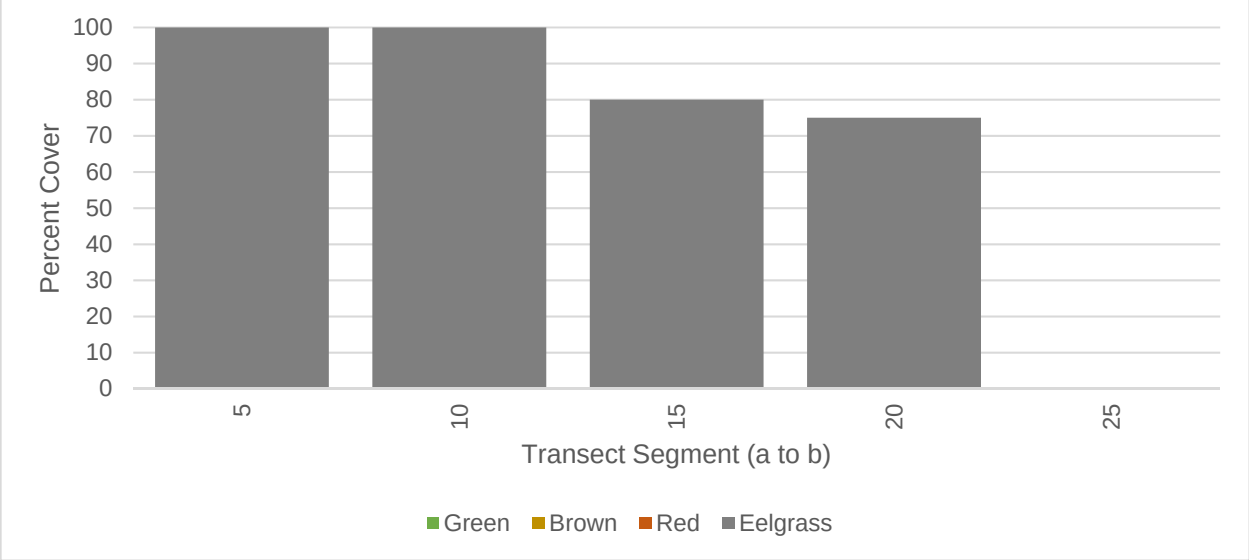


Figure 16 Macrofloral Cover along T8



3.9 Transect 9 (T9)

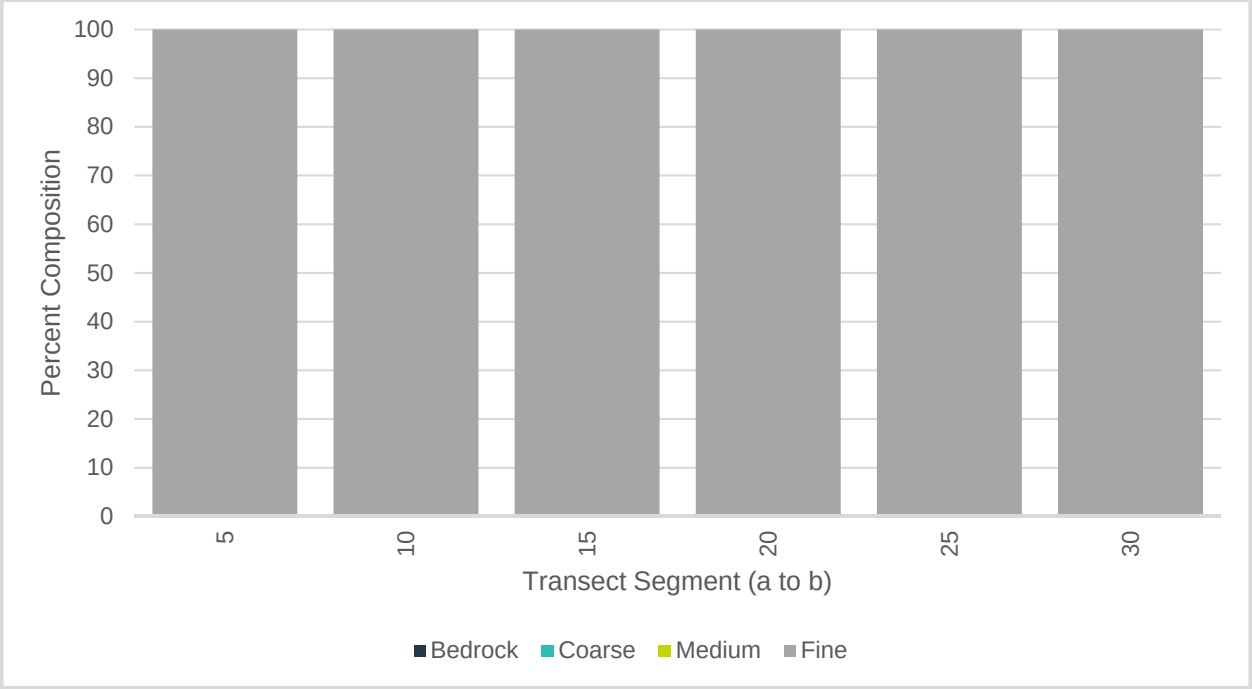
Transect 9 (T9) was 30 m long and ran in an approximate southeast to northwest orientation.

Substrate:
The substrate was exclusively sand with lesser amounts of silt.

Macrofauna:
Macrofaunal life was common throughout the transect. Periwinkles were common throughout all segments of T9 (Table A.9). Uncommon occurrences of unidentified fish species were noted in three segments. A single occurrence of flounder (species not identified) was noted in the 25-30 m segment. Shell hash was noted throughout the length of T9. Shell hash was primarily composed of blue mussel, clam, and American oyster shells.

Macroflora:
Macrofloral life was limited throughout in T9. Dead eelgrass beds spanned the entire transect with 20-80% cover. Trace fragments of sugar kelp were noted.

Figure 17 Substrate Composition along T9



3.10 Transect 10 (T10)

Transect 10 (T10) was 20 m long and ran in an approximate northeast to southwest orientation.

Substrate:
The substrate was predominantly sand with lesser amounts of silt, cobble, and gravel.

Macrofauna:
Macrofaunal life was common throughout the transect. Periwinkles were common throughout all segments of T10 (Table A.10). Shell hash was noted throughout the length of T10. Shell hash was primarily composed of blue mussel and clam shells.

Macroflora:
Macrofloral life was limited in T10. An unidentified filamentous green alga was noted in all segments with cover ranging from <5-20%. Eelgrass was noted in the 10-15 m segment at 5% cover. Macrofloral debris composed of eelgrass was present in all segments with cover ranging from 10-20%.

Figure 18 Substrate Composition along T10

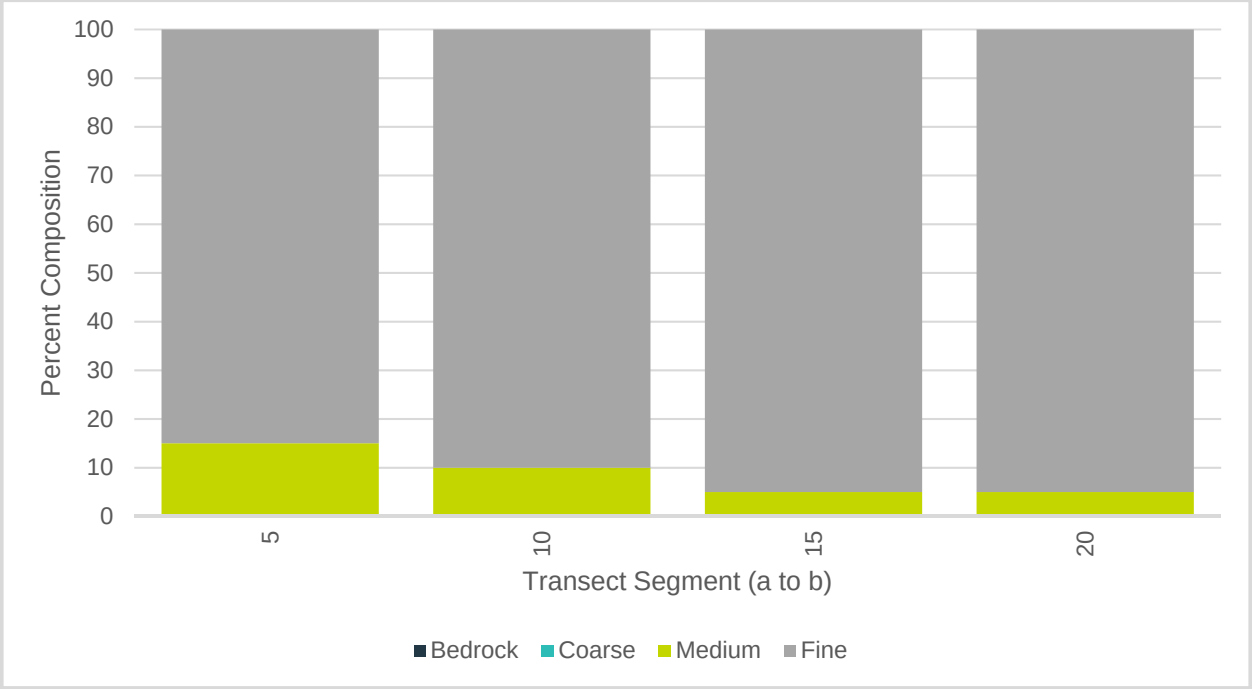
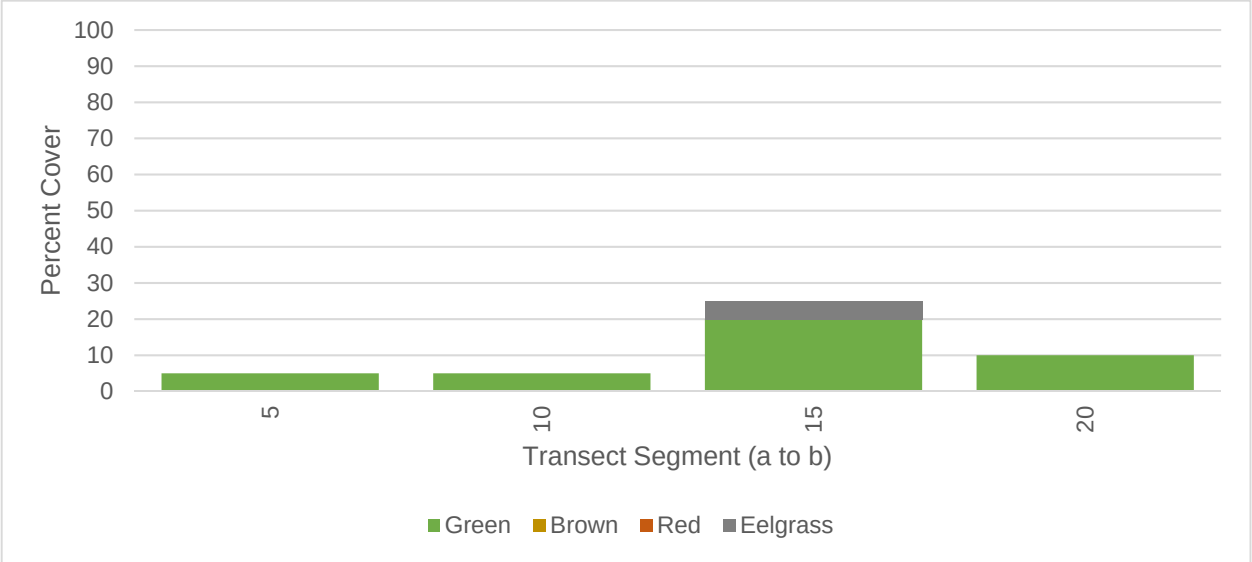


Figure 19 Macrofloral Cover along T10



4.0 GENERAL SITE HABITAT

Two general habitat types were identified within the area, as described below. The general habitat description was determined using the UBHS video.

- Predominantly sand and silt barrens, with a greater sand to silt ratio. Vegetation was primarily eelgrass beds with some macrofloral debris. Periwinkles were common across all areas. Trace shell hash, primarily blue mussel, clam, and American oyster shells was present in most areas. The presence of clam and oyster shells indicate the potential for clam and oyster beds surrounding the bridge.
- Low canopy, limited cover algal beds. The columns of the existing bridge structure support a limited bed of brown algae, including soft sour weed. The columns provide habitat for blue mussel colonies.

5.0 SUMMARY

Characterization of the substrate and benthic communities along ten transects within the footprint of the proposed deconstruction of existing bridge infrastructure and the construction of a new bridge at Pokemouche Bay in Inkerman, NB was completed using an underwater video survey.

The substrate of all transects was predominantly sand with a lesser amount of silt. A few transects had limited amounts of rock, cobble, and gravel.

Periwinkles were common throughout all transects. Single occurrences of flounder were noted in four transects. There were uncommon occurrences of unidentified fish species in seven transects. Blue mussels were noted to cover the vertical columns of the bridge in T7 and T8. Shell hash was noted throughout much of the transects, mainly composed of blue mussel, clam, and American oyster shells.

All transects had substantial macrofloral communities. Eelgrass beds (live and dead) were present in all transects. The eelgrass beds had an unidentified brown filamentous epiphytic algal growth throughout all transects. An unidentified green filamentous alga was present in T10. The columns of the bridge (visible in T7 and T8) are host to a dense growth of soft sour weed. Macrofloral debris was composed of predominantly eelgrass with sparse fragments of sugar kelp.

6.0 REFERENCES

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7.0 CLOSING

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If any conditions become apparent that differ significantly from our understanding of conditions as presented in this Report, we request that we be notified immediately to reassess the conclusions provided herein. This Report was prepared by Wood Biologist, Elizabeth Robinson, B.Sc. and reviewed by Kimberlea Green, P.Geo., M.Sc, EP.

Respectfully submitted,

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APPENDIX A
Transcript of Video and Onsite Observations

Table A.1 485 m Survey – Transect T1, 06 June 2019

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
0-5 **T1 Start (a)**	0-5	Sand (80%); Silt (20%)	Shell hash	Macrofloral debris (<5%)
5-10	5-10	Sand (80%); Silt (20%)	Periwinkles (**C**); Shell hash	Macrofloral debris (<5%)
10-15	10-15	Sand (80%); Silt (20%)	Unidentified fish species (**U**: 1 individual); Shell hash	Eelgrass (15%); Macrofloral debris (10%); Brown filamentous epiphyte on eelgrass throughout transect
15-20	15-20	Sand (80%); Silt (20%)	Periwinkles (**C**); Unidentified fish species (**U**: 1 individual); Shell hash	Eelgrass (15%); Macrofloral debris (10%)
20-25	20-25	Sand (80%); Silt (20%)	Periwinkles (**C**); Unidentified fish species (**U**: 1 individual); Shell hash	Eelgrass (75%); Macrofloral debris (<5%)
25-30	25-30	Sand (90%); Silt (10%)	Shell hash	Eelgrass (85%)
30-35	30-35	Sand (90%); Silt (10%)	Shell hash	Eelgrass (40%); Macrofloral debris (10%)
35-40	35-40	Sand (90%); Silt (10%)	Shell hash	Eelgrass (60%); Macrofloral debris (10%)
40-45	40-45	Sand (90%); Silt (10%)	Shell hash	Eelgrass (35%); Dead eelgrass (15%)
45-50	45-50	Sand (90%); Silt (10%)	Shell hash	Eelgrass (30%); Dead eelgrass (15%)
50-55	50-55	Sand (90%); Silt (10%)	Shell hash	Eelgrass (45%); Dead eelgrass (15%)
55-60	55-60	Sand (90%); Silt (10%)	Shell hash	Eelgrass (45%)
60-65	60-65	Not visible due to channel depth.		
65-70	65-70			
70-75	70-75			
75-80	75-80			
80-85	80-85			
85-90	85-90			
90-95	90-95			
95-100	95-100			
100-105	100-105			
105-110	105-110	Sand (80%); Silt (20%)	Shell hash	Eelgrass (30%); Macrofloral debris (10%)
110-115	110-115	Sand (80%); Silt (20%)	Shell hash	Eelgrass (40%); Macrofloral debris (<5%)
115-120	115-120	Sand (80%); Silt (20%)	Shell hash	Eelgrass (45%); Macrofloral debris (<5%)
120-125	120-125	Sand (80%); Silt (20%)	Shell hash	Eelgrass (80%)
125-130	125-130	Not visible due to channel depth.		
130-135	130-135	Sand (80%); Silt (20%)	Shell hash	Eelgrass (60%)
135-140	135-140	Sand (80%); Silt (20%)	Shell hash	Eelgrass (40%)
140-145	140-145	Sand (80%); Silt (20%)	Shell hash	Eelgrass (50%); Dead eelgrass (15%)
145-150	145-150	Sand (80%); Silt (20%)	Shell hash	Eelgrass (60%); Macrofloral debris (<10%)
150-155	150-155	Sand (80%); Silt (20%)	Shell hash	Eelgrass (70%)
155-160	155-160	Sand (80%); Silt (20%)	Shell hash	Eelgrass (75%)
160-165	160-165	Sand (80%); Silt (20%)	Shell hash	Eelgrass (85%)
165-170	165-170	Sand (80%); Silt (20%)	Shell hash	Eelgrass (85%)
170-175	170-175	Sand (80%); Silt (20%)	Shell hash	Eelgrass (85%)
175-180	175-180	Sand (80%); Silt (20%)	Shell hash	Eelgrass (85%)
180-185	180-185	Sand (80%); Silt (20%)	Shell hash	Eelgrass (85%)
185-190	185-190	Sand (80%); Silt (20%)	Shell hash	Eelgrass (90%)
190-195	190-195	Sand (80%); Silt (20%)	Shell hash	Eelgrass (90%)
195-200	195-200	Sand (80%); Silt (20%)	Shell hash	Eelgrass (100%)
200-205	200-205	Sand (80%); Silt (20%)	Shell hash	Eelgrass (90%)
205-210	205-210	Sand (80%); Silt (20%)	Shell hash	Eelgrass (85%)
210-215	210-215	Sand (80%); Silt (20%)	None observed	Eelgrass (100%)
215-220	215-220	Sand (80%); Silt (20%)	Shell hash	Eelgrass (90%)
220-225	220-225	Sand (80%); Silt (20%)	Shell hash	Eelgrass (90%)
225-230	225-230	Sand (80%); Silt (20%)	Shell hash	Eelgrass (80%); Macrofloral debris (<10%)
230-235	230-235	Sand (80%); Silt (20%)	Shell hash	Eelgrass (80%)
235-240	235-240	Sand (80%); Silt (20%)	Shell hash	Eelgrass (80%)
240-245	240-245	Sand (80%); Silt (20%)	Shell hash	Eelgrass (70%); Dead eelgrass (15%)
245-250	245-250	Sand (80%); Silt (20%)	Shell hash	Eelgrass (50%); Dead eelgrass (15%)
250-255	250-255	Sand (80%); Silt (20%)	Shell hash	Eelgrass (75%)
255-260	255-260	Sand (80%); Silt (20%)	Shell hash	Eelgrass (75%); Dead eelgrass (10%)
260-265	260-265	Sand (80%); Silt (20%)	Shell hash	Eelgrass (45%); Dead eelgrass (20%)

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
265-270	265-270	Sand (80%); Silt (20%)	Shell hash	Eelgrass (65%); Dead eelgrass (15%)
270-275	270-275	Sand (80%); Silt (20%)	Periwinkles (**C**); Shell hash	Eelgrass (75%)
275-280	275-280	Sand (80%); Silt (20%)	Shell hash	Eelgrass (65%); Dead eelgrass (20%)
280-285	280-285	Not visible due to channel depth.		
285-290	285-290			
290-295	290-295			
295-300	295-300			
300-305	300-305			
305-310	305-310			
310-315	310-315			
315-320	315-320			
320-325	320-325			
325-330	325-330			
330-335	330-335	Sand (80%); Silt (10%); Rock (10%)	Shell hash	Eelgrass (60%); Macrofloral debris (10%)
335-340	335-340	Not visible due to channel depth.		
340-345	340-345			
345-350	345-350			
350-355	350-355			
355-360	355-360			
360-365	360-365			
365-370	365-370			
370-375	370-375	Sand (80%); Silt (20%)	Shell hash	Eelgrass (80%)
375-380	375-380	Sand (80%); Silt (20%)	Shell hash	Eelgrass (90%)
380-385	380-385	Sand (80%); Silt (20%)	Shell hash	Eelgrass (90%)
385-390	385-390	Sand (80%); Silt (20%)	Shell hash	Eelgrass (90%)
390-395	390-395	Sand (80%); Silt (20%)	Shell hash	Eelgrass (90%)
395-400	395-400	Sand (80%); Silt (20%)	Shell hash	Eelgrass (95%)
400-405	400-405	Sand (80%); Silt (20%)	Shell hash	Eelgrass (85%)
405-410	405-410	Not visible due to channel depth.		
410-415	410-415			
415-420	415-420	Sand (80%); Silt (20%)	Shell hash	Eelgrass (75%)
420-425	420-425	Not visible due to channel depth.		
425-430	425-430			
430-435	430-435	Sand (80%); Silt (20%)	Shell hash	Eelgrass (80%)
435-440	435-440	Sand (80%); Silt (20%)	Shell hash	Eelgrass (60%)
440-445	440-445	Sand (80%); Silt (20%)	Shell hash	Eelgrass (15%); Macrofloral debris (10%)
445-450	445-450	Sand (80%); Silt (20%)	Shell hash	Eelgrass (20%); Macrofloral debris (10%)
450-455	450-455	Sand (80%); Silt (20%)	Shell hash	Eelgrass (5%); Macrofloral debris (5%)
455-460	455-460	Sand (80%); Silt (20%)	Shell hash	Dead eelgrass (15%); Eelgrass (5%);
460-465	460-465	Sand (80%); Silt (20%)	Shell hash	Dead eelgrass (20%)
465-470	465-470	Sand (70%); Gravel (20%); Silt (10%)	Shell hash	Dead eelgrass (20%)
470-475	470-475	Sand (90%); Silt (10%)	Shell hash	Macrofloral debris (10%)
475-480	475-480	Gravel (70%); Sand (20%); Silt (10%)	Shell hash	Macrofloral debris (<5%)
480-485 **T1 End (b)**	480-485	Gravel (70%); Sand (20%); Silt (10%)	Shell hash	Macrofloral debris (10%)

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.2 25 m Survey – Transect T2, 06 June 2019

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
0-5 **T2 Start (a)**	0-5	Sand (75%); Silt (10%); Gravel (10%); Cobble (5%)	Flounder (**U**: 1 individual); Periwinkles (**C**); Shell hash	Dead eelgrass (20%)
5-10	5-10	Sand (75%); Silt (20%); Gravel (5%)	Unidentified fish species (**U**: 2 individuals); Periwinkles (**C**); Shell hash	Dead eelgrass (30%)
10-15	10-15	Sand (75%); Silt (20%); Gravel (5%)	Periwinkles (**C**); Shell hash	Dead eelgrass (45%)
15-20	15-20	Sand (75%); Silt (10%); Gravel (10%); Rock (5%); Woody debris	Unidentified fish species (**U**: 1 individual); Periwinkles (**C**); Shell hash	Dead eelgrass (50%)
20-25 **T2 End (b)**	20-25	Sand (75%); Silt (10%); Gravel (10%); Rock (5%)	Shell hash	Dead eelgrass (30%)

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.3 25 m Survey – Transect T3, 06 June 2019

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
0-5 **T3 Start (a)**	0-5	Sand (75%); Silt (20%); Rock (5%)	Shell hash	Eelgrass (50%); Dead eelgrass (20%); Brown filamentous epiphyte on eelgrass throughout transect
5-10	5-10	Sand (80%); Silt (20%)	Periwinkles (**C**); Shell hash	Eelgrass (40%); Dead eelgrass (30%)
10-15	10-15	Sand (80%); Silt (20%)	Periwinkles (**C**); Shell hash	Eelgrass (20%); Dead eelgrass (20%)
15-20	15-20	Sand (80%); Silt (20%)	Periwinkles (**C**); Shell hash	Eelgrass (25%); Dead eelgrass (25%)
20-25 **T3 End (b)**	20-25	Sand (80%); Silt (20%)	Periwinkles (**C**); Unidentified fish species (**U**: 1 individual)	Eelgrass (25%); Dead eelgrass (30%)

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.4 25 m Survey – Transect T4, 06 June 2019

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
0-5 **T4 Start (a)**	0-5	Sand (80%); Silt (20%)	Periwinkles (**C**); Shell hash	Eelgrass (100%); Brown filamentous epiphyte on eelgrass throughout transect
5-10	5-10	Sand (80%); Silt (10%); Gravel (5%); Cobble (5%)	Periwinkles (**C**); Unidentified fish species (**U**: 1 individual); Shell hash	Eelgrass (50%); Macrofloral debris (15%)
10-15	10-15	Sand (70%); Rock (15%); Silt (10%); Cobble (5%); Large woody debris	Periwinkles (**C**); Shell hash	Eelgrass (20%); Dead eelgrass (50%)
15-20	15-20	Sand (80%); Silt (20%)	Periwinkles (**C**); Shell hash	Eelgrass (85%); Macrofloral debris (10%)
20-25 **T4 End (b)**	20-25	Sand (80%); Silt (20%)	Periwinkles (**C**); Unidentified fish species (**U**: 2 individuals); Shell hash	Eelgrass (90%); Macrofloral debris (5%)

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.5 415 m Survey – Transect T5, 06 June 2019

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
0-5 **T5 Start (a)**	0-5	Sand (80%); Silt (10%); Gravel (10%)	Periwinkles (**C**); Shell hash	Macrofloral debris (<10%)
5-10	5-10	Sand (80%); Silt (10%); Gravel (10%)	Periwinkles (**C**); Shell hash	Macrofloral debris (<5%)
10-15	10-15	Sand (80%); Silt (10%); Gravel (10%)	Periwinkles (**C**); Shell hash	Macrofloral debris (<5%)
15-20	15-20	Sand (80%); Silt (10%); Gravel (10%)	Periwinkles (**C**); Shell hash	Macrofloral debris (<5%)
20-25	20-25	Sand (80%); Silt (10%); Gravel (10%)	Periwinkles (**C**); Shell hash	Eelgrass (5%); Macrofloral debris (<5%)
25-30	25-30	Sand (80%); Silt (10%); Gravel (10%)	Periwinkles (**C**); Shell hash	Eelgrass (5%); Macrofloral debris (<5%)
30-35	30-35	Sand (80%); Silt (15%); Gravel (5%)	Periwinkles (**C**); Shell hash	Eelgrass (25%); Macrofloral debris (10%)
35-40	35-40	Sand (80%); Silt (15%); Gravel (5%)	Periwinkles (**C**); Shell hash	Eelgrass (40%); Macrofloral debris (<5%)
40-45	40-45	Sand (80%); Silt (15%); Gravel (5%)	Periwinkles (**C**); Shell hash	Eelgrass (70%); Dead eelgrass (15%)
45-50	45-50	Sand (80%); Silt (15%); Gravel (5%)	Periwinkles (**C**); Shell hash	Eelgrass (30%); Dead eelgrass (15%)
50-55	50-55	Sand (85%); Silt (10%); Gravel (5%)	Periwinkles (**C**); Shell hash	Eelgrass (30%); Dead eelgrass (15%)
55-60	55-60	Sand (85%); Silt (10%); Gravel (5%)	Periwinkles (**C**); Shell hash	Eelgrass (40%); Dead eelgrass (20%)
60-65	60-65	Sand (85%); Silt (10%); Gravel (5%)	Periwinkles (**C**); Shell hash	Eelgrass (75%); Dead eelgrass (25%)
65-70	65-70	Not visible due to channel depth.		
70-75	70-75			
75-80	75-80			
80-85	80-85			
85-90	85-90			
90-95	90-95			
95-100	95-100	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (50%); Macrofloral debris (10%)
100-105	100-105	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (65%); Dead eelgrass (20%)
105-110	105-110	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (70%); Macrofloral debris (10%)
110-115	110-115	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (80%); Macrofloral debris (10%)
115-120	115-120	Sand (90%); Silt (5%); Rock (5%)	Periwinkles (**C**); Shell hash	Eelgrass (90%); Macrofloral debris (<5%)
120-125	120-125	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (100%)
125-130	125-130	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (85%)
130-135	130-135	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (80%); Macrofloral debris (<5%)
135-140	135-140	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (75%); Macrofloral debris (<5%)
140-145	140-145	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (50%); Macrofloral debris (<5%)
145-150	145-150	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (40%)
150-155	150-155	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (50%); Macrofloral debris (5%)
155-160	155-160	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (50%); Macrofloral debris (5%)
160-165	160-165	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (75%)
165-170	165-170	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (85%)
170-175	170-175	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (70%)
175-180	175-180	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (70%)
180-185	180-185	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (85%)
185-190	185-190	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (50%); Macrofloral debris (5%)
190-195	190-195	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (50%); Macrofloral debris (5%)
195-200	195-200	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (50%); Macrofloral debris (10%)
200-205	200-205	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (50%); Macrofloral debris (10%)
205-210	205-210	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (85%)
210-215	210-215	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (70%); Macrofloral debris (10%)
215-220	215-220	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (65%); Macrofloral debris (10%)
220-225	220-225	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (75%)
225-230	225-230	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (80%)
230-235	230-235	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (90%)

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
235-240	235-240	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (75%)
240-245	240-245	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (80%)
245-250	245-250	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (100%)
250-255	250-255	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (75%); Dead eelgrass (15%)
255-260	255-260	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (75%); Dead eelgrass (15%)
260-265	260-265	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (65%); Dead eelgrass (20%)
265-270	265-270	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (20%); Dead eelgrass (50%)
270-275	270-275	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (30%); Dead eelgrass (50%)
275-280	275-280	Not visible due to channel depth.		
280-285	280-285			
285-290	285-290			
290-295	290-295			
295-300	295-300			
300-305	300-305			
305-310	305-310			
310-315	310-315			
315-320	315-320			
320-325	320-325			
325-330	325-330			
330-335	330-335			
335-340	335-340			
340-345	340-345			
345-350	345-350			
350-355	350-355			
355-360	355-360			
360-365	360-365			
365-370	365-370			
370-375	370-375			
375-380	375-380			
380-385	380-385	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (30%)
385-390	385-390	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (75%)
390-395	390-395	Not visible due to channel depth.		
395-400	395-400			
400-405	400-405			
405-410	405-410			
410-415 **T5 End (b)**	410-415	Sand (90%); Silt (10%)	Periwinkles (**C**); Shell hash	Eelgrass (75%); macrofloral debris (10%)

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.6 25 m Survey – Transect T6, 06 June 2019

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
0-5 **T6 Start (a)**	0-5	Sand (80%); Silt (20%); Small woody debris	Periwinkles (**C**); Flounder (**U**: 1 individual); Unidentified fish species (**U**: 1 individual); Shell hash	Eelgrass (60%); Dead eelgrass (15%)
5-10	5-10	Sand (80%); Silt (20%); Small woody debris	Periwinkles (**C**); Unidentified fish species (**U**: 1 individual); Shell hash	Eelgrass (75%); Macrofloral debris (10%)
10-15	10-15	Sand (80%); Silt (20%)	Periwinkles (**C**); Unidentified fish species (**U**: 1 individual); Shell hash	Eelgrass (40%); Macrofloral debris (10%)
15-20	15-20	Sand (80%); Silt (20%)	Periwinkles (**C**); Blue mussels (**C**); Unidentified fish species (**U**: 2 individuals); Shell hash	Eelgrass (5%); Macrofloral debris (<5%)
20-25 **T6 End (b)**	20-25	Sand (80%); Silt (20%)	Unidentified fish species (**U**: 1 individual); Shell hash	None observed

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.7 25 m Survey – Transect T7, 06 June 2019

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
0-5 **T7 Start (a)**	0-5	Sand (80%); Silt (20%)	Periwinkles (**C**)	Eelgrass (90%); Brown filamentous epiphyte on eelgrass throughout transect
5-10	5-10	Sand (80%); Silt (20%)	Periwinkles (**C**); Flounder (**U**: 1 individual); Shell hash	Eelgrass (65%); Macrofloral debris (<5%)
10-15	10-15	Sand (80%); Silt (20%)	Periwinkles (**C**); Shell hash	Eelgrass (80%)
15-20	15-20	Sand (80%); Silt (20%)	Periwinkles (**C**); Shell hash	Eelgrass (100%)
20-25 **T7 End (b)**	20-25	Sand (80%); Silt (20%)	Periwinkles (**C**); Blue mussels (**C**); Shell hash	Eelgrass (75%); Macrofloral debris (10%)

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.8 25 m Survey – Transect T8, 06 June 2019

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
0-5 **T8 Start (a)**	0-5	Sand (80%); Silt (20%)	Periwinkles (**C**)	Eelgrass (100%); Brown filamentous epiphyte on eelgrass throughout transect
5-10	5-10	Sand (80%); Silt (20%)	Periwinkles (**C**)	Eelgrass (100%)
10-15	10-15	Sand (80%); Silt (20%)	Periwinkles (**C**); Unidentified fish species (**U**: 2 individuals); Shell hash	Eelgrass (80%)
15-20	15-20	Sand (80%); Silt (15%); Rock (5%)	Periwinkles (**C**); Unidentified fish species (**U**: 2 individuals); Shell hash	Eelgrass (75%); Dead eelgrass (20%)
20-25 **T8 End (b)**	20-25	Sand (80%); Silt (10%); Rock (10%)	Periwinkles (**C**); Blue mussels (**C**); Shell hash	Dead eelgrass (75%)

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.9 30 m Survey – Transect T9, 06 June 2019

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
0-5 **T9 Start (a)**	0-5	Sand (80%); Silt (20%)	Periwinkles (**C**); Shell hash	Dead eelgrass (20%)
5-10	5-10	Sand (80%); Silt (20%)	Periwinkles (**C**); Unidentified fish species (**U**: 2 individuals); Shell hash	Dead eelgrass (75%)
10-15	10-15	Sand (80%); Silt (20%)	Periwinkles (**C**); Unidentified fish species (**U**: 1 individual); Shell hash	Dead eelgrass (75%)
15-20	15-20	Sand (80%); Silt (20%)	Periwinkles (**C**); Unidentified fish species (**U**: 1 individual); Shell hash	Dead eelgrass (80%)
20-25	20-25	Sand (80%); Silt (20%)	Periwinkles (**C**); Shell hash	Dead eelgrass (80%)
25-30 **T9 End (b)**	25-30	Sand (80%); Silt (20%)	Periwinkles (**C**); Flounder (**U**: 1 individual); Shell hash	None observed

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

Table A.10 20 m Survey – Transect T10, 06 June 2019

Transect Distance (m)	Transect Tag Numbers	Substrate (Estimated % Coverage)	Macrofaunal Life Observed (Estimated Abundances*)	Macrofloral Life Observed (Estimated % Coverage)
0-5 **T10 Start (a)**	0-5	Sand (75%); Silt (10%); Gravel (10%); Cobble (5%)	Periwinkles (**C**); Shell hash	Macrofloral debris (10%); Filamentous green algae (<5%)
5-10	5-10	Sand (80%); Silt (10%); Gravel (10%)	Periwinkles (**C**); Shell hash	Macrofloral debris (10%); Filamentous green algae (<5%)
10-15	10-15	Sand (80%); Silt (15%); Gravel (5%)	Periwinkles (**C**); Shell hash	Filamentous green algae (20%); Macrofloral debris (10%); Eelgrass (5%)
15-20 **T10 End (b)**	15-20	Sand (80%); Silt (15%); Gravel (5%)	Periwinkles (**C**); Shell hash	Macrofloral debris (20%); Filamentous green algae (10%)

*A = Abundant, C = Common, O = Occasional, U = Uncommon (See below).

A = Abundant
Numerous (not quantifiable) observations made throughout the entire 5 m segment.

C = Common
Numerous (not quantifiable) observations made intermittently along the 5 m segment.

O = Occasional
Quantifiable observations made intermittently along the 5 m segment.

U = Uncommon
Quantifiable observations made infrequently along the 5 m segment.

APPENDIX B
Species List

Table B1 Species List

Classification	Common Name	Scientific Name
Macrofauna		
Actinopterygii	Flounder	No species identified
Mollusca	Blue mussel	*Mytilus edulis*
	Common periwinkle	*Littorina littorea*
Macroflora		
Angiosperms	Eelgrass	*Zostera marina*
Phaeophyta	Filamentous brown epiphyte	No species identified
	Soft sour weed	*Desmarestia viridis*
Chlorophyta	Filamentous green algae	No species identified

APPENDIX C
Photo Log

T1: Substrate in the 5-10 m segment

T1: Eelgrass in the 20-25 m segment

T1: Filamentous green algae in the 25-30 m segment

T1: Shell hash in the 40-45 m segment

T2: Substrate with shell hash in the 0-5 m segment

T2: Flounder in the 0-5 m segment

T2: Periwinkles in the 5-10 m segment

T2: Blue mussel shells in the 20-25 m segment

T3: Brown filamentous epiphyte on eelgrass in the 0-5 m segment

T3: Periwinkles in the 15-20 m segment

T3: Blue mussels on wooden column in the 20-25 m segment

T4: Eelgrass with brown filamentous epiphyte in the 0-5 m segment

T4: Periwinkles and shell hash in the 0-5 m segment

T4: Periwinkles and brown filamentous algae in the 10-15 m segment

T5: Substrate in the 0-5 m segment.

T5: Shell hash in the 45-50 m segment.

T5: Eelgrass in the 115-120 m segment.

T6: Eelgrass with shell hash in the 0-5 m segment.

T6: Flounder in the 0-5 m segment.

T6: Periwinkles in the 0-5 m segment.

T6: Unidentified fish in the 5-10 m segment.

T6: Blue mussels on wooden column in the 15-20 m segment.

T7: Eelgrass and brown filamentous epiphyte in the 0-5 m segment.

T7: Flounder in the 5-10 m segment.

T7: Soft sour weed on wooden column in the 20-25m segment.

T8: Eelgrass with epiphyte in the 0-5 m segment.

T8: Unidentified fish in the 15-20 m segment.

T8: Dead eelgrass and periwinkles 20-25 m segment.

T8: Soft sour weed on wooden column in the 20-25 m segment.

T9: Substrate in the 0-5 m segment.

T9: Dead eelgrass in the 5-10 m segment.

T9: Unidentified fish in the 15-20 m segment.

T10: Filamentous green algae in the 0-5 m segment.

T10: Dead eelgrass and filamentous green algae in the 15-20 m segment.

APPENDIX E

Appendix D – Archaeological Survey Report (Stratis)

ARCHAEOLOGICAL FIELD RESEARCH PERMIT 2019 NB 22: FINAL REPORT

ATV/Walking Bridge at Inkerman

STRATIS CONSULTING INC.
GRANT AYLESWORTH, PHD, RPA NO. 15583

AUGUST 16, 2019

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Project

This section outlines details about the project.

Project Title

ATV/Walking Bridge at Inkerman

Project Description

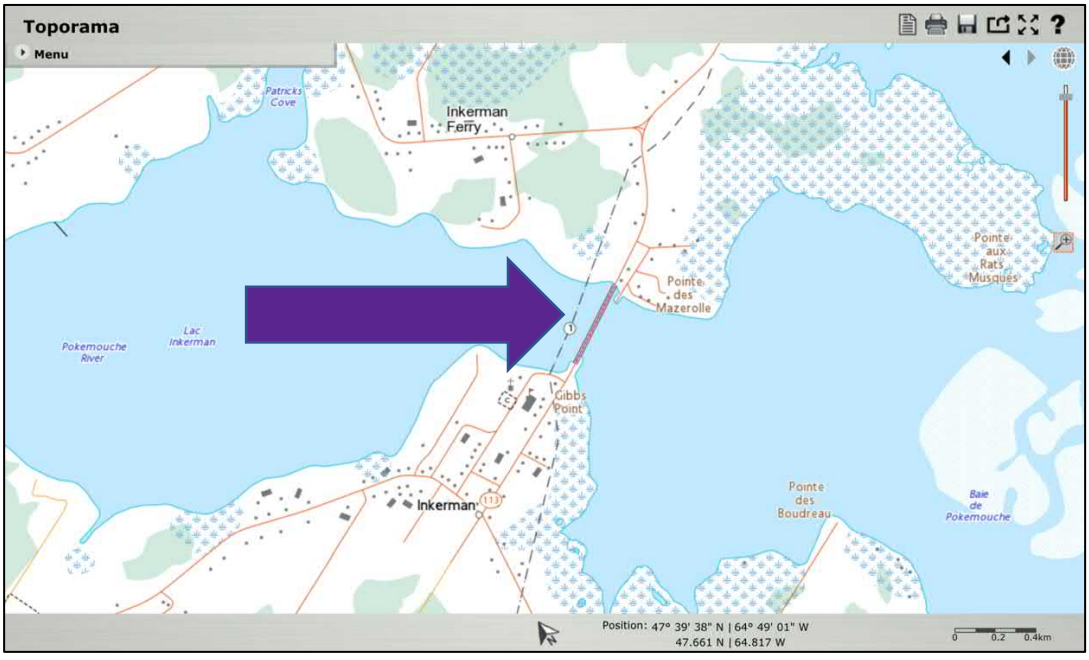
The Proponent is proposing to undertake replacement and/or repair of an ATV/Walking bridge that was formerly a railway bridge across the Pokemouche River at Inkerman, Gloucester County. Most project-related work will be done in the watercourse. Most of the work will be in water. Excavation at land will only be minor excavation in riprap at the north abutment. This riprap is placed around fill material and any other excavation on land is expected to be in existing fill.

Assessment Area

The Assessment Area is four quadrants surrounding the asset upon which work is planned by the Proponent. Four 25 m wide x 25 m quadrants will be assessed, adjacent to where the bridge structure meets land. Where possible, potential laydown areas outside of the quadrants will be identified and assessed.

Project Location

The project is located along the Pokemouche River at Inkerman, Gloucester County (image source: Government of Canada).



Are engineering plans currently available for the Project?	☒Yes	☐No
Are engineering plans for the Project attached? (included on CD)	☒Yes	☐No

Proponent

New Brunswick Department of Transportation and Infrastructure (NBDTI)

The archaeological assessment was sub-contracted on behalf of NBDTI by:

Jonathan Burtt, B.Sc.F., EP.
Environmental Specialist
Roy Consultants
364 rue York Street, Suite 201
Fredericton NB E3B 3P7

+1 506 472 9838 Extension 2403
Email: Jon.burtt@royconsultants.ca

Methodology

Methods followed provincial guidelines.

Heritage & Archaeological Services Branch Guidelines

Published Heritage & Archaeological Services Branch Guidelines were followed during this Archaeological Impact Assessment:

> Archaeological Services. 2012. Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick. Heritage Branch, Department of Culture, Tourism and Healthy Living, Fredericton.

Findings

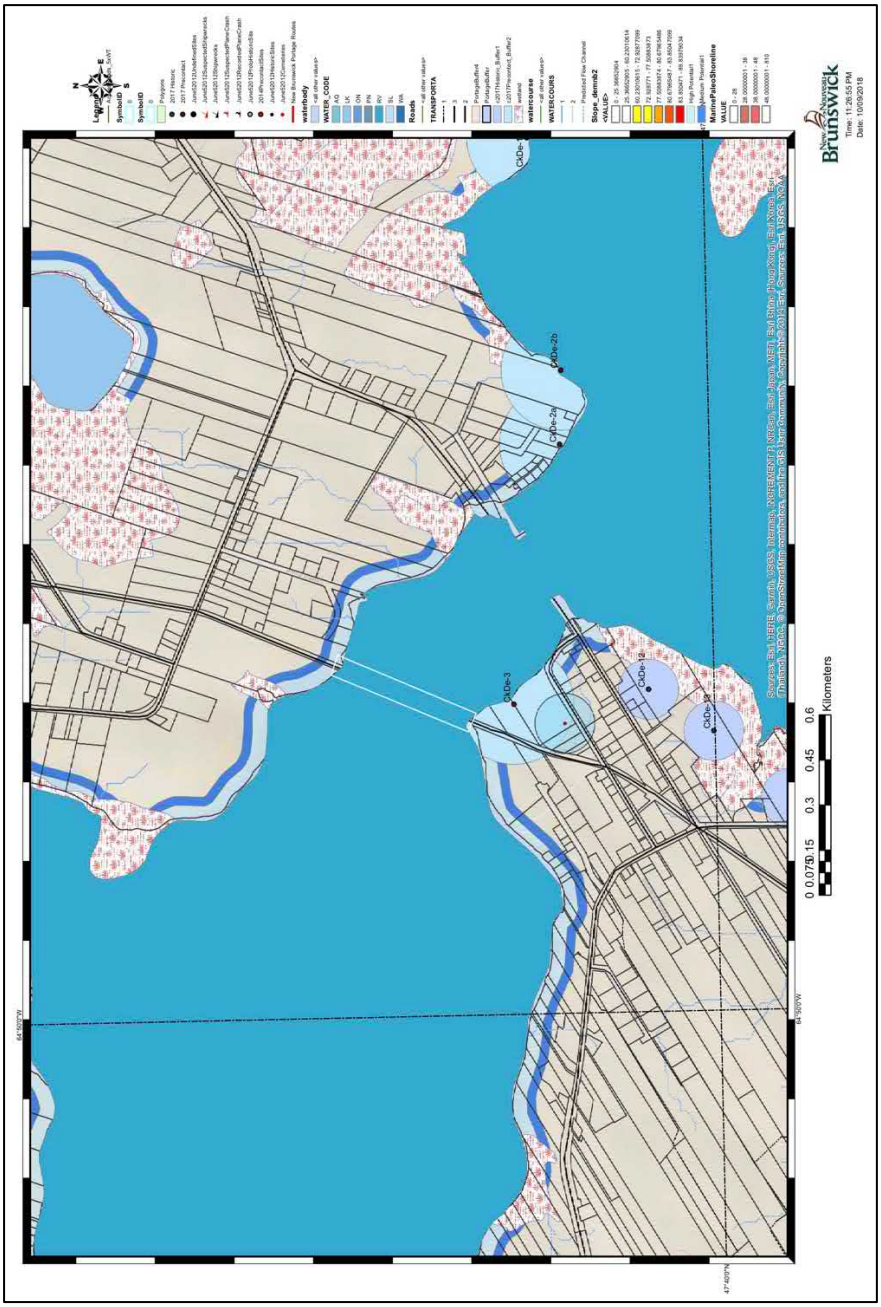
The findings from research and the Preliminary Field Examination are outlined below.

Heritage & Archaeological Services Branch Predictive Model

Does the Predictive Model show known archaeological sites including buffer zones within the assessment area?		☒Yes ☐No
If “Yes”, provide details:	Archaeological site (CkDe-3) was first noted by W.F. Ganong in 1907 and revisited by the Archaeological Survey of Canada in 1970 and again by Sandy Glidden-Hachey in 2001. Ganong had speculated that the area was the location of a village, but the Archaeological Survey of Canada found “little evidence to suggest that this is an extensive site”. The Archaeological Survey of Canada and, later, Glidden-Hachey, both collected some artifacts (both Historic period and Precontact period) from the surface near the watercourse, apparently close to the existing church.	
Does the Predictive Model show elevated archaeological potential within the assessment area?		☒Yes ☐No

If "Yes", provide details:	The model shows likely shows high archaeological potential along the banks of the Pokemouche River at the northern and southern watercourse crossing locations of the existing bridge. The southern area is within the 200 m buffer zone of CkDe-3. It is not anticipated that the project will disturb ground at the known archaeological site.

Predictive Model, as provided by Heritage & Archaeological Services Branch, below. For further discussion of the known archaeological site CkDe-3, see the Direct Consultation section. Other known sites are outside the assessment area.

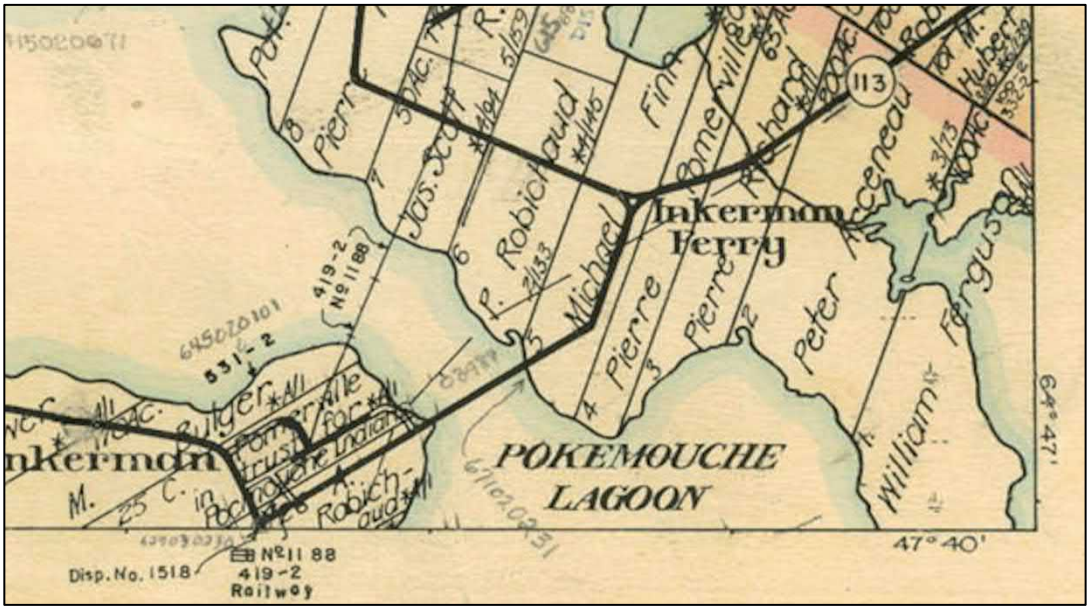


Geology		
Reviews of provincial surficial geology and bedrock geology maps were undertaken.		
Surficial Geology		
The surficial geology of the assessment area was determined according to: Rampton, V. N. 1984. Generalized surficial geology map of New Brunswick. Department of Natural Resources and Energy. Minerals, Policy and Planning Division, NR-8 (scale 1:500 000). Descriptions and abbreviations are taken from Rampton.		
Late Wisconsinan and/or Early Holocene		
Wb	Lacustrine sediments: sand, silt, gravel, and clay deposits in shallow lake basins that were in part formed by retreating Late Wisconsinan ice. Lacustrine and Marine Sediments: Undifferentiated Blankets and plains, sand, silt, minor clay and gravel, patchy thin veneer of organic sediment; generally 1 to 10 m thick. According to Rampton, this covers the project area.	☒Present
Bedrock Geology		
The bedrock geology of the assessment area was determined according to: NBDNRE (New Brunswick Department of Natural Resources and Energy). 2000. Bedrock Geology of New Brunswick. Minerals and Energy Division. Map Nr-1 (2000 Edition). Scale 1:500 000. Descriptions and abbreviations are taken from NBDNRE.		
Quaternary		
LCP	Late Carboniferous Pictou Group stratified rocks, sandstone typical of almost all of eastern New Brunswick.	☒Present

Heritage Place Registries		
A variety of relevant searches regarding the Assessment Area were undertaken in online registries.		
New Brunswick Register of Historic Places		
This Register is available online at: https://www.rhp-rlp.gnb.ca/PublicSearch.aspx?blnLanguageEnglish=True		
Was the New Brunswick Register of Historic Places searched for the assessment area?	☒Yes	☐No
According to the Register, are any registered Historic Places located within the assessment area? "Shannon" and "Wickham" were searched.	☐Yes	☒No
If "Yes", provide details.		
Canadian Register of Historic Places		
This Register is available online at: http://www.historicplaces.ca/en/rep-reg/search-recherche.aspx		
Was the Canadian Register of Historic Places searched for the assessment area?	☒Yes	☐No
According to the Register, are any registered Historic Places located within the assessment area? "Shannon" and "Wickham" were searched.	☐Yes	☒No
If "Yes", provide details.		
National Historic Sites: Parks Canada		
A database is available online at: https://www.pc.gc.ca/en/lhn-nhs/recherche-search		
Was the Parks Canada database of Historic Sites searched for the assessment area?	☒Yes	☐No
According to the database, are any Historic Sites located within the assessment area?	☐Yes	☒No
If "Yes", provide details.		

Provincial Archives of New Brunswick		
A variety of relevant searches were undertaken at the Provincial Archives of New Brunswick.		
Photographic Collections		
Bridges section searched? Place Names section searched? Waterways/Rivers & Streams section searched?	☒Yes ☒Yes ☒Yes	☐No ☐No ☐No
Were any relevant photographs identified? If yes, provide details:	☐Yes	☒No
County Bridge Records		
County Bridge Records searched?	☐Yes	☒No
Any relevant records?	☐Yes	☒No
If yes, provide details: County Bridge Records do not cover railway bridges.		
Bridge Inspection Records		
Bridge Inspection 1976-1991 Records (RS544) searched?	☐Yes	☒No
Any relevant records?	☐Yes	☒No
If yes, provide details:		
Fire Insurance Maps		
Fire Insurance Maps do not exist for rural areas and were therefore not searched.		
Fire Insurance Maps (MC1238) searched?	☐Yes	☒No
Any relevant records?	☐Yes	☒No
If yes, provide details:		
Provincial Secretary: Bridges Administration 1785-1890		
Was the Bridges Administration Records searched?	☐Yes	☒No
Any relevant records?	☐Yes	☒No
If yes, provide details: These records do not cover railway bridges		
Land Grants Index and Records		
Land grant cadastral maps and microfilm records exist for the province of New Brunswick		
Were the Land Grant Records searched?	☒Yes	☐No
Any relevant records?	☒Yes	☐No ☐ N/A

The cadastral land grant map for the area was downloaded from: https://archives.gnb.ca/Exhibits/Communities/Details.aspx?culture=en-CA&community=1837
The cadastral map shows the southern assessment area as granted to “M. Bulger” and the northern assessment area as granted to “Jas. Scott”. The area “in trust for Pocmouche Indians” is outside the assessment area. There is no petition from “Bulger” in the Index to Land Petitions at Provincial Archives of New Brunswick. There is an 1844 petition from “James Scott” on microfilm F4229. There is an 1802 petition from “Michael Bulger” on microfilm F1042, a petition that also names “Pokemouche Indian Church”, the neighbouring property to the south of the assessment area. A grant to “Michael Bulger” was made on 14 August 1814, and this appears to be the property at the southern assessment area. A grant to Scott was not found in the online index but it appears the grant could be found in Gloucester County Book 4, Page 94, if needed. The cadastral map excerpt is below:



Further land grant research was not undertaken as there are no features or structural remains in the assessment areas (northern and southern).

Place Names

Two resources were consulted at PANB:

Rayburn, A. 1975. Geographical Names of New Brunswick. Toponymy Study 2 for Canadian Permanent Committee on Geographical Names. Surveys and Mapping Branch, Department of Energy, Mines and Resources, Ottawa.

Fellows, R. F. 1998 Community Place Names in New Brunswick, Canada. Associates of the Provincial Archives of New Brunswick, Fredericton.

Rayburn searched?	☒Yes	☐No
Fellows searched?	☒Yes	☐No
Any relevant records?	☒Yes	☐No

If "Yes", provide details:

The terms "Inkerman" and "Pokemouche" were used.

Fellows (p.115) stated: "Inkerman: Settlement on the Pokemouche River, 4 mi. NE of Six Roads, on the road to Shippagan; Inkerman Parish, Gloucester County: PO from 1882; in 1898 Inkerman was a station on Caraquet and Gulf Shore Railway and a farming and fishing settlement with 1 post office, 2 stores, a salmon and smelt fishery, 1 hotel, 1 church and a population of 700: today Inkerman is a dispersed community." There was no entry for the Pokemouche River and none of the entries appear to explain the origin of the word "Pokemouche".

Rayburn (p. 220) stated: "Pokemouch River: Flows E into Gulf of St. Lawrence. Derived from Micmac *Pokomoochpetooaak* possibly "salt water extending inward" or in reference to pocket shape of South Branch Pokemouche River. Franquelin 1686 *R. Pakmouche* Bellin 1744 and Mitchell 1755 *R. Poquemouche;* Jeffreys 1755 *Pokemushi R.;* DesBarres 1778 *Bamush R.,* Cooney 1832 and Saunders

1842 *Pokemouche;* Ward 1841 *Pokamouche;* Gesner 1847, Perley 1852 and Loggie 1901 *Pokemouche River."* This entry indicates the varied spellings on different maps.

An online search is available at:
https://archives.gnb.ca/Exhibits/Communities/Home.aspx?culture=en-CA

Other Resources

MC80 was searched for local history information about the assessment area and nothing relevant was found.

National Air Photo Library

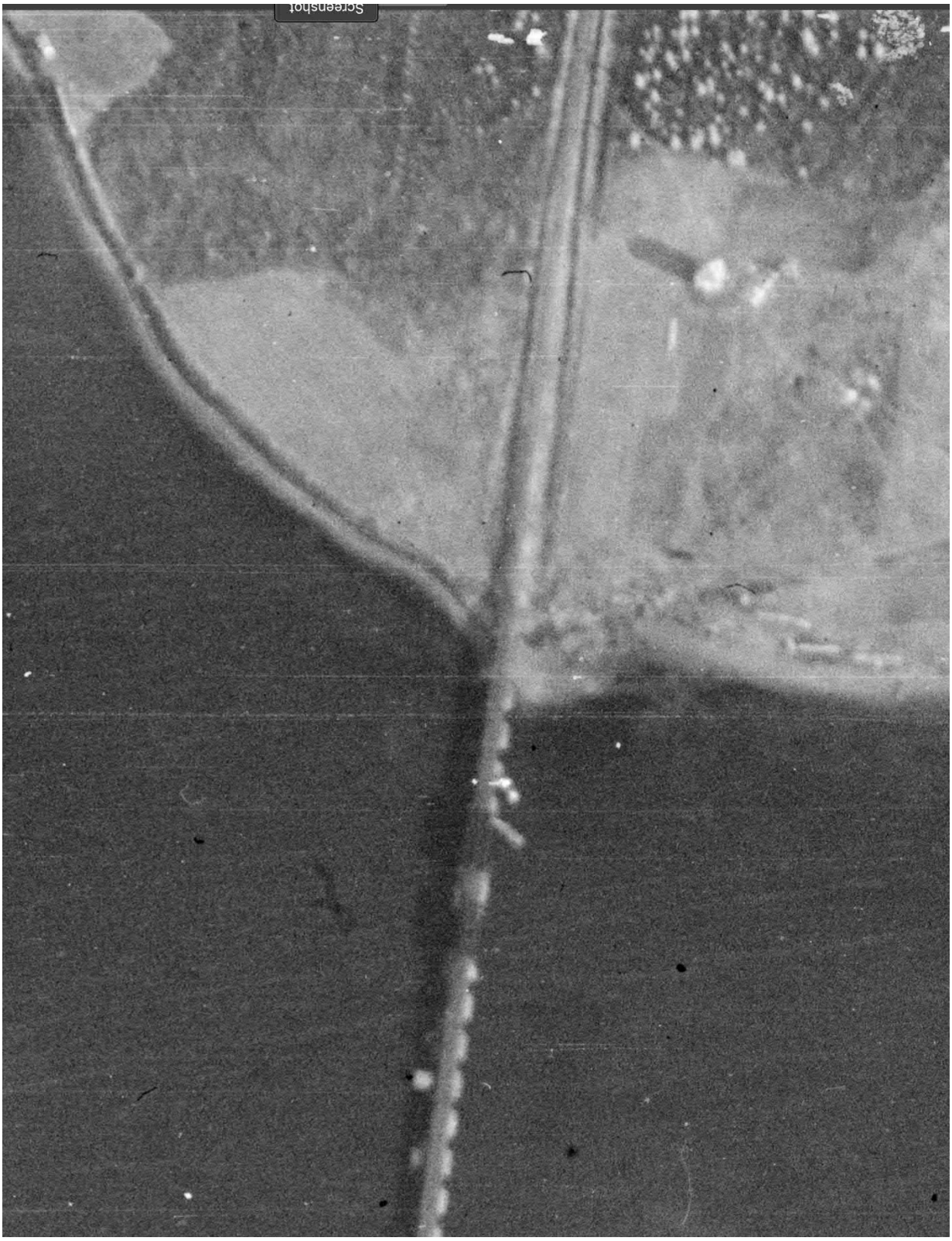
The earliest known aerial photograph was obtained from the National Air Photo Library and will be submitted to Heritage & Archaeological Services Branch as a high-resolution TIFF. Photos were searched at: http://www.nrcan.gc.ca/earth-sciences/geomatics/satellite-imagery-air-photos/9265

Roll Number: A6594
Frame Number: 82
Date of Photograph: 17 June 1939
This image contained cloud cover over the northern assessment area so a second image was obtained.

An excerpt from the above aerial photo shows a closer view of the southern end of the assessment area. A close-up of the northern assessment area is not included because it is under cloud cover. The 1939 aerial image shows that there is some fill material placed west of the structure location and there are roads along the shoreline immediately west and east of the structure location, as well as to the south. The church is visible to the south.

Roll Number: A7390
Frame Number: 11
Date of Photograph: 27 October 1944
Second photograph obtained with no cloud cover of either assessment area.

Below is a closer view of the northern assessment area from the 1944 aerial photograph.



Below is a closer view of the northern assessment area from the 1944 aerial photograph. This appears to show the presence of a retaining wall west of the structure location and agricultural fields east of the structure location.

GeoNB Aerial Imagery

This resource is available online at: http://geonb.snb.ca/geonb/

Below are recent aerial images of the assessment areas dating to 2012. None contain wetlands of flood plan, according to GeoNB.

The northern part of the assessment area is filled under the approach and near the structure location. This fill would not have archaeological potential and the ground on land is not anticipated to be disturbed.

View of the southern assessment area shows fill, retaining wall, and ground disturbance approaching the structure.

Overview of the southern area with arrow indicating CkDe-3 location, outside the assessment area.

Direct Consultation

Consultation with stakeholders, if required, is being undertaken by others.

No historic buildings or features were identified in the assessment area. The remaining structure and approaches have not been designated a heritage site provincially or locally.

Heritage & Archaeological Services Branch (HASB) was consulted and they provided the Maritime Archaeological Resource Inventory form and appended information and this provided some details on the known site, CkDe-3 as follows:

1. A copy of a Maritime Archaeological Resource Inventory (MARI) Form for CkDe-3. This form provides little information. It appears to have been completed at some point following the completion of the Archaeological Survey of Canada research program in the area. The site location is given and it is described as "General Activity" site or "could be burial – unknown". The speculation on the type of site appears to have originated with Ganong and this is not supported by known evidence.
2. A copy of an extract from a sites database, which could be that of the Archaeological Survey of Canada. The copy dates to 11/09/1978 and makes the following statements about CkDe-3:
    a. 9 specimens were collected and there were "only a few artifacts on the beach".
    b. "Ganong referred to this site as an Indian campsite and a burial ground".
    c. W.F. Ganong mentioned the site in a publication, Acadiensis in 1907.
    d. Ganong indicated that this was an Indian village site on land originally granted to them but later sold to the church (this land is visible on the cadastral map in the Land Grant section, above, and is outside the assessment area.
    e. "Little evidence to suggest that this is an extensive site…could be tested".
3. A copy of an additional MARI form that states:
    a. The church is behind the site.
    b. "Quartz flakes" and "china fragments" were collected in 2001.
4. Other photocopies reiterate the above information. It appears that no archaeological testing or excavation has ever been undertaken at CkDe-3

The "buffer" around any archaeological site is one factor that goes towards consideration of archaeological potential. CkDe-3, from the available descriptions, and not considering Ganong's speculation, appears to be a small site that has received little attention from archaeologists. Artifacts have been collected from the surface near the river on two occasions but no archaeologists have tested the site. The site location is considered far enough away from the assessment area that it will not be disturbed by project-related activities.

Preliminary Field Investigation

The Preliminary Field Investigation began by parking north of the northern assessment area and walking down the right of way to the existing northern abutment area. The visit was planned to coincide with low tide. The burned remains of the bridge structure are visible in the water and lead across to the southern assessment area. The northeastern quadrant is partly in a residential yard and is low-lying and flat. There is large riprap around the fill leading up to the abutment. The northwestern quadrant is also low-lying and flat and the fill around the approach is surrounded by large rip rap. The area of fill under the right of way and leading up to the abutment is about 25 m long and this appears to have been built up since the NAPL photos were taken. Excavation of this fill and riprap is not an archaeological concern.

After driving around to the southern assessment area, the southwestern quadrant was walked over. The area is open and grassy and has signs of disturbance at the surface from being used as a road and parking area. There is a wood retaining wall at the water and the area immediately behind this retaining wall appears to have been filled. The approach to the former bridge location is filled and drops about 2 m to the edge of the water. The wood retaining wall ends just north of the watercourse crossing. The southeastern quadrant is low and covered with grass. The filled approach to the former structure location bisects the southern assessment areas and both of these areas appear to have a longitudinal ditch parallel to the approach. Excavation is not anticipated in these areas for project-related activities so the areas of archaeological potential will not be disturbed.

Field Notes

Inkerman
Walking Bridge
7 JULY 2019
1/2
Field examination was planned to take place around low tide. Parked along dirt road beside northern portion of trail to assessment area. Walked going East to northern assessment area. There is fill and riprap extending out into the water and an existing structure up to the former bridge location. The remains of the burned bridge are visible extending across the water to the southern assessment area.
NE quadrant is partly residential property (own two-story and flat NW quadrant is similar but no moved / uses and no recorded house nearby.

INKERMAN
There is about 2.5 m of fill and riprap in and above the watercourse leading to the bridge at this location. Some material clearly added since 1944 aerial photo.
Drive around to southern assessment area. Area is generally open and grassy with scattered disturbance from use as a road and parking area. Wood retaining wall with SW by kind of -standard to 1944 aerial image.
SE quadrant has two-story and overgrown with grass. SW is mowed. There are longitudinal ditches along the sides of the approach fill. The areas outside of fill have archaeological potential - design planning and currently show no excavation in them.
2/2

Field Photographs

Northern approach, overview, from north.

View from north across to southern assessment quadrants.

Northeastern quadrant overview.

Northwestern quadrant overview.

Overview of southwestern quadrant from south, with approach at right centre.

Retaining wall and river edge in southwestern quadrant.

Southeastern quadrant with approach and fill at right.

Southwestern quadrant with approach and fill at left.

View towards south, away from watercourse, from southern approach, showing fill and longitudinal ditches.

Overview of southeastern assessment quadrant showing approach fill and longitudinal ditch at foreground.

Potential Laydown Areas

Potential laydown areas include along the existing right of way in the northern area.

Potential laydown areas include existing right of way and dirt roads in southern area.

Areas to Avoid
The area immediately around CkDe-3, as indicated in the GeoNB aerial image section should be avoided – this area is outside the assessment area and any expected project-related activities so avoidance should pose no issues for construction.

Resource Inventory	
No new heritage resources were identified during the Preliminary Field Examination.	
Were any heritage resources identified within the Assessment Area?	☐Yes ☒No ☐Undetermined

Conclusions and Recommendations

The conclusions and recommendations based on documentary research and the Preliminary Field Examination are outlined below.

Overview and Synthesis

CkDe-3 is a known archaeological site south of the southern assessment area and the CkDe-3 location must be avoided during construction. In general terms, any areas within 80 m of a watercourse have medium to high potential to contain unknown archaeological resources. The approaches to the structure location on the north and south sides of the watercourse consist of fill material and riprap. The northern approach extends markedly into the water. The project, as stated, will not disturb ground on land except to possibly remove some riprap along the northern approach. This riprap and associated fill material are not an archaeological concern.

Recommendations

Is archaeological shovel testing recommended for the Assessment Area?	☐Yes (conditionally) ☒No
Is archaeological monitoring recommended for the Assessment Area?	☐Yes ☒No

Since there is no ground disturbance planned in the medium and high archaeological potential zones shown on the Predictive Model (within 80 m of the watercourse), archaeological testing and monitoring is not recommended. Contractors must undertake not to disturb ground in these high potential areas, including clearing and grubbing activities. Removal of riprap along the northern approach does not require archaeological testing or monitoring.

Disturbing the ground outside of the approach fill (outside longitudinal ditches) beside the northern and southern approaches must be avoided during construction. If these areas can be avoided, then this is considered sufficient mitigation with respect to unknown archaeological resources.

No further archaeological work is recommended.

Legal Requirements - Accidental Discovery of Heritage Resources

Accidental discovery of heritage resources is possible whenever any ground disturbing activities take place. New Brunswick law (Heritage Conservation Act, SNB 2009, c H-4.05), requires that any accidental finds of heritage resources be reported to Heritage & Archaeological Services Branch. Any person or entity doing work on this project for the Proponent, including contractors and sub-contractors, is required by law to notify Heritage & Archaeological Services Branch if any material of archaeological interest is accidentally discovered. The Proponent may have its own protocols and/or manuals and/or standards to be followed during construction.

Closing

This section outlines limitations and uses of this report.

Limitations of this Report

This report is subject to review and acceptance by Heritage & Archaeological Services Branch. Written notification about the acceptability of this report is issued at their discretion. Other agencies and/or stakeholders may review this report before it is deemed acceptable by Heritage & Archaeological Services Branch. No notice of this review or acceptance may be issued to the Proponent.

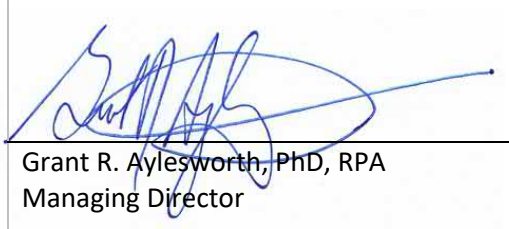
This report has been prepared to fulfill a requirement of an Archaeological Field Research Permit. Beyond that, the use of this report is for the sole benefit of the Proponent and is not intended to be used by any other person or entity, other than for its intended purposes, without the written consent of Stratis and the Proponent. Use of this report by third parties is the responsibility of such third party. This report is copyrighted by Stratis with all rights reserved.

The information and recommendations in this report are based upon work undertaken in accordance with Heritage & Archaeological Services Branch Guidelines and generally accepted practices at the time the work was undertaken. The information and recommendations in this report are in accordance with the author's understanding of the project as it was presented at the time the work was undertaken.

This report was reviewed and approved by the Proponent before submission to Heritage & Archaeological Services Branch.

Signature

This report was prepared and submitted to Heritage & Archaeological Services Branch by the undersigned.



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APPENDIX F

Appendix F – Surface Water Sampling Report

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November 23, 2017

Mr. Ken Kinney, MCIP, RPP
Manager, Planning Section
Crown Lands Branch
NB Department of Energy and Resource Development (ERD)
P.O. Box 6000
Fredericton, NB E3B 5H1

Our File No.: 490-17-C[1]

Mr. Kinney:

Subject: Summary of Surface Water Quality Monitoring – October and November 2017
Pokemouche River
Inkerman, NB

We are pleased to present you with a summary of the October and November 2017 surface water quality results along the Pokemouche River in Inkerman, NB.

1.0 Water Quality Monitoring

The bridge over the Pokemouche River estuary in Inkerman was destroyed by fire in September 2017. ERD mandated Eco-Technologie Ltée to clean debris from the river. Clean-up activities began on October 13, 2017 and were completed on October 19, 2017. The bridge piers are still present in the water and clean-up of the approaches still remains to be done. Surface water quality sampling was conducted following clean-up activities on October 20, 2017 (low tide), October 23 (high tide), November 1 (high tide) and November 2, 2017 (low tide). Samples were collected from sixteen (16) surface water locations along the Pokemouche River including an upriver sampling location (representative of background conditions). Boudreau L&S Excavation Ltée, based out of Tracadie, NB, provided boat services and accompanied Roy Consultants' personnel during surface water sampling.

Grab surface water samples were collected at all surface water sampling locations and were submitted to RPC Science and Engineering in Fredericton, NB for low level petroleum hydrocarbons (PHC) (Atlantic MUST), polycyclic aromatic hydrocarbons (PAH), arsenic and chromium analysis. Refer to Figures 1 and 2 for surface water sampling locations.

[1] 490-17 FINAL Summary Letter Inkerman Monitoring Nov 2017 Rev-1.doc

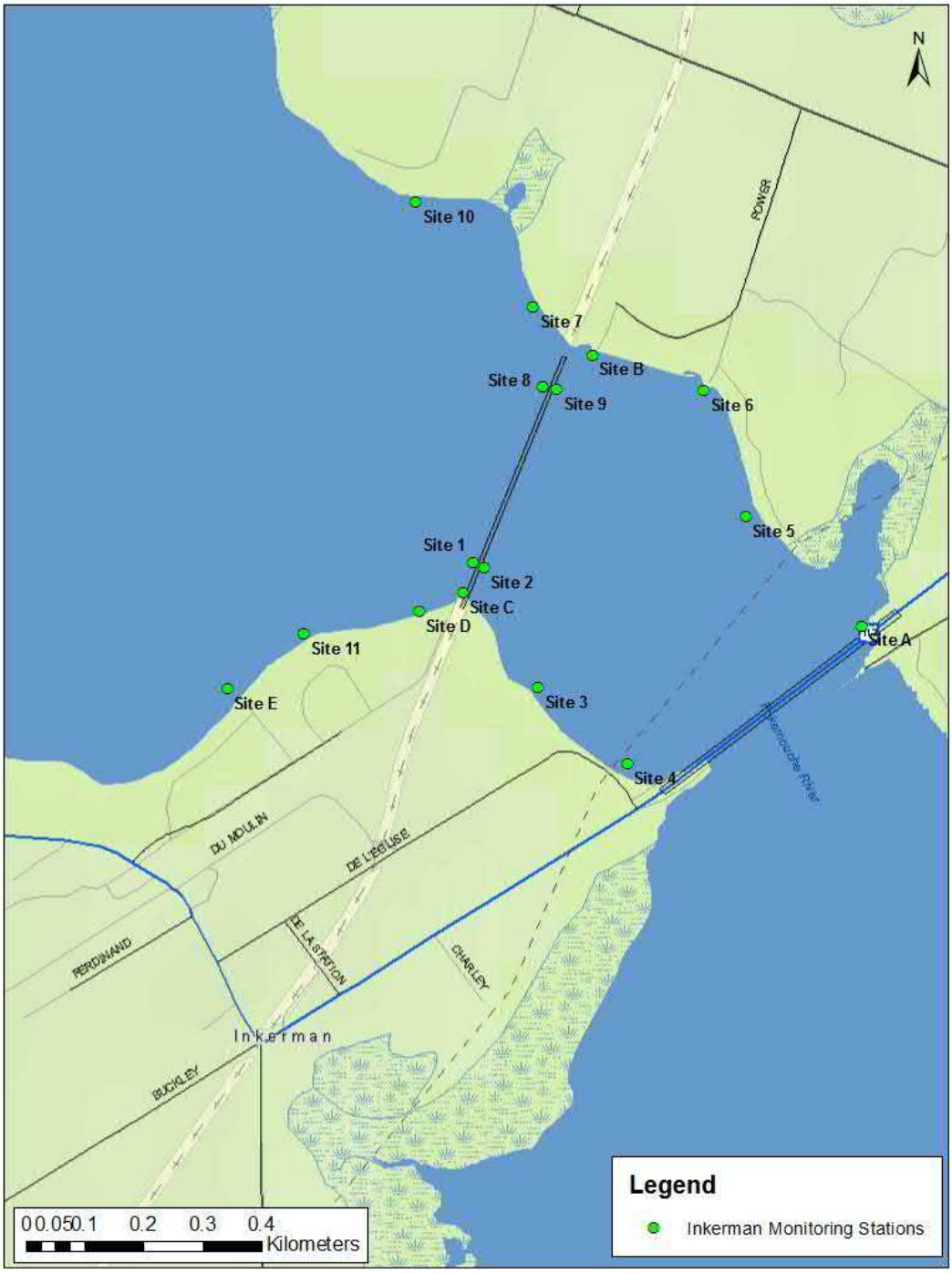

Figure 1: Surface Water Sampling Locations (courtesy of NBDELG)

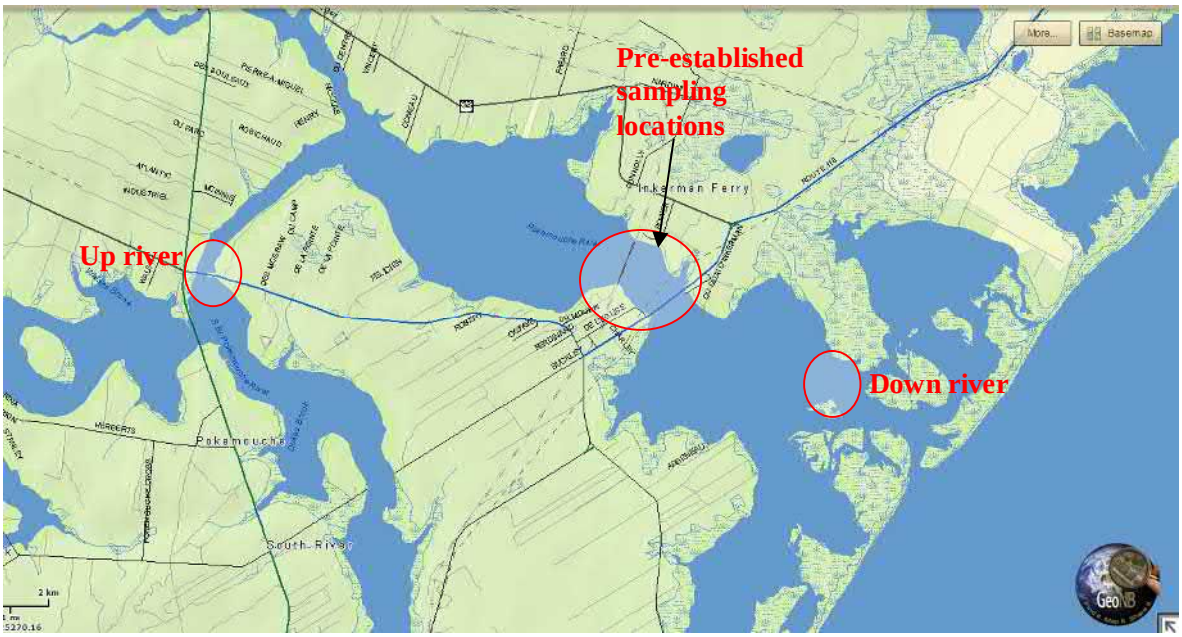

Figure 2: Upriver and Downriver Surface Water Sampling Locations

Figure 3: Upriver sampling location (N 7631972.60; E 2621841.91) established on north side of bridge.

Figure 4: Downriver sampling location (N 7630962.366; E 2628165.21) established in the main channel of the Pokemouche River.

2.0 Screening Criteria

In the absence of applicable provincial surface water quality guidelines, results were compared with acceptable limits of provincial and national guidelines recognized by the New Brunswick Department of Environment and Local Government (NBDELG).

PAHs and trace metal results were compared with the Canadian Council of Ministers of the Environment (CCME) Guidelines for the Protection of Freshwater Aquatic Life and the Nova Scotia Environment (NSE) Tier 1 Environmental Quality Standards for Surface Water (Marine Water Values). Petroleum hydrocarbon results were compared with NSE Tier 1 Environmental Quality Standards for Surface Water (Marine Water Values) and Atlantic Risk-Based Corrective Action (ARBCA) Tier 1 Surface Water Ecological Screening Levels (ESLs) for the Protection of Freshwater and Marine Aquatic Life.

3.0 Summary of Findings

Surface water results are presented in the enclosed Tables 1, 2 and 3. Results from the Roy Consultants' monitoring program (October 20 to November 2) are presented as well as data previously collected by the NBDELG. Laboratory certificates are also enclosed.

3.1 Surface Water Results

Compared to previous sampling completed by the NBDELG, PAH concentrations have decreased below applicable CCME and NSE following clean-up activities at all sites except Site D. Anthracene, pyrene, benz(a)anthracene and benzo(a)pyrene concentrations exceeded NSE and CCME guidelines during the November 1, 2017 sampling event at high tide. Fluoranthene concentrations exceeded the CCME freshwater aquatic life guideline for the November 1, 2017 sampling event. It should be noted that all PAH parameters at Site D had no reportable concentrations (non-detect) for the subsequent sampling event on November 2, 2017 at low tide. The pyrene concentration at Site 1 exceeded NSE and CCME guidelines for the October 23, 2017 sampling event but was below applicable guidelines for the sampling events in November 2017. PAH parameter concentrations were not detected during any sampling events at the "Upriver" sampling location representative of background conditions. This implies that any detection of PAHs in surface water is not naturally occurring and is associated with burned debris. Refer to the enclosed Table 1 for a summary of PAH results.

Petroleum hydrocarbon concentrations in surface water are below NSE and Atlantic RBCA Tier I ESLs at all sampling locations with the exception of Site C, Site 9 and Downriver sampling locations. Modified TPH concentrations exceeded the Tier I ESL of 0.10 mg/L at Site C (0.24 mg/L), Site 9 (0.15 mg/L) and Downriver (0.19 mg/L) during the November 1, 2017 sampling event. Product resemblance reported by the laboratory at all locations was identified as "unknown peaks". Detection of Modified TPH at concentrations below the Tier I ESL were noted at several sampling locations. These sampling locations are located in the immediate vicinity of the burned bridge (Sites 1, 2, 7, 8 and B), downriver of the bridge (Sites 3, 5, 6 and A) and upriver of the bridge (Site E). As the Modified TPH concentrations are also present at Downriver sampling location, the detection of Modified TPH is attributed to burned debris. During the November 2, 2017 sampling event, the only exceedance of the Modified TPH Tier I ESL was noted at Site 9 which is located along the span of the former bridge. A Modified TPH concentration of 0.13 mg/L was noted with a resemblance to "unknown peaks". Refer to the enclosed Table 2 for a summary of PHC results.

No detectable concentrations of arsenic and chromium were reported at any sampling locations during the Roy Consultants' sampling events and previous sampling events completed by the NBDELG. Arsenic and chromium levels are below applicable guidelines and are not posing any unacceptable risks to ecological receptors. Arsenic and chromium are not considered parameters of concern associated with burned debris. Refer to the enclosed Table 3 for a summary of trace metal results.

4.0 Conclusions and Recommendations

PAHs and PHCs are the parameters of concern associated with burned debris. Noticeable decreases in PAH parameter concentrations were noted at most sampling locations following the removal of burned debris from the river. Based on sampling events completed post clean-up, exceedances were noted for several parameters at Site D for the November 1, 2017, sampling event. It was noted that PAH concentrations were non-detect for the subsequent sampling event on November 2, 2017. To confirm that PAH concentrations are decreasing, it is recommended

that four (4) additional sampling events (two at high tide; two at low tide) be completed at Site D. following clean-up activities completed by Neptune Construction.

PHC concentrations at Sites C, 9 and Downriver are attributed to the burned debris. To confirm that PHC concentrations are decreasing, it is recommended four (4) additional sampling events (two at high tide; two at low tide) be completed at all three sites following clean-up activities.

Please do not hesitate to contact the undersigned should you have any questions.

Yours truly,

Gina Burtt, P.Eng., P.Geo.
ENVIRONMENTAL Engineer

Enc.

Table 1: Surface Water Quality Results for PAHs (September to November 2017)

Exceeds applicable NSE surface water quality guidelines
Exceeds applicable CCME surface water quality guidelines
Exceeds both NSE and CCME surface water quality guidelines

Date Sampled					Site A						Site B						
PAHs	**Unit**	**RL**	**NSE**	**CCME**	9-25-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-1-17 High Tide	11-2-17 Low Tide	9-25-17	10-2-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-1-17 High Tide	11-2-17 Low Tide
Naphtalene	ug/L	0.05	1.4 [1]	1.4 [3]	<0.05	0.11	0.10	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	ug/L	0.01	6 [1]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	ug/L	0.01	6 [1]	5.8 [4]	<0.01	0.04	0.03	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	ug/L	0.01	12 [1]	3 [4]	<0.01	0.05	0.03	<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	ug/L	0.01	4.6 [1]	0.4 [4]	0.03	**0.64**	0.10	0.01	0.02	0.02	0.12	0.38	0.06	0.01	0.01	0.03	0.01
Anthracene	ug/L	0.01	0.012 [2]	0.012 [4]	<0.01	**0.06**	0.01	<0.01	<0.01	<0.01	<0.01	**0.03**	0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	ug/L	0.01	11 [1]	0.04 [4]	0.02	**1.3**	0.03	<0.01	0.01	<0.01	**0.11**	**0.44**	**0.12**	<0.01	<0.01	0.01	0.01
Pyrene	ug/L	0.01	0.02 [1]	0.025 [4]	0.01	**0.88**	0.02	<0.01	<0.01	<0.01	**0.07**	**0.31**	**0.08**	<0.01	<0.01	<0.01	<0.01
Benz(a)anthracene	ug/L	0.01	0.018 [2]	0.018 [4]	<0.01	**0.10**	0.01	<0.01	<0.01	<0.01	**0.02**	**0.09**	**0.04**	<0.01	<0.01	<0.01	<0.01
Chrysene/Triphenylene	ug/L	0.01	0.1 [1]		<0.01	**0.46**	<0.01	<0.01	<0.01	<0.01	0.04	**0.23**	0.06	<0.01	<0.01	<0.01	<0.01
Benzo(b+j)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	0.24	<0.01	<0.01	<0.01	<0.01	0.02	0.11	0.03	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	0.24	<0.01	<0.01	<0.01	<0.01	0.02	0.11	0.03	<0.01	<0.01	<0.01	<0.01
Benzo(e)pyrene	ug/L	0.01			<0.01	0.33	<0.01	<0.01	<0.01	<0.01	0.02	0.11	0.05	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	ug/L	0.01	0.01 [1]	0.015 [4]	<0.01	**0.16**	<0.01	<0.01	<0.01	<0.01	0.01	**0.05**	**0.03**	<0.01	<0.01	<0.01	<0.01
Indeno(1, 2, 3-c, d)pyrene	ug/L	0.01	0.21 [2]		<0.01	0.11	<0.01	<0.01	<0.01	<0.01	0.01	0.02	0.02	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	ug/L	0.01	0.17 [2]		<0.01	0.07	<0.01	<0.01	<0.01	<0.01	0.01	0.03	0.02	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	ug/L	0.01	0.26 [2]		<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Date Sampled					Site C						Site D					
PAHs	**Unit**	**RL**	**NSE**	**CCME**	9-25-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	9-25-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Naphtalene	ug/L	0.05	1.4 [1]	1.4 [3]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	ug/L	0.01	6 [1]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	ug/L	0.01	6 [1]	5.8 [4]	<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Fluorene	ug/L	0.01	12 [1]	3 [4]	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Phenanthrene	ug/L	0.01	4.6 [1]	0.4 [4]	0.01	0.15	0.02	0.03	0.02	<0.01	0.04	0.06	0.02	<0.01	0.04	<0.01
Anthracene	ug/L	0.01	0.012 [2]	0.012 [4]	<0.01	**0.03**	<0.01	<0.01	<0.01	<0.01	<0.01	**0.03**	<0.01	<0.01	**0.02**	<0.01
Fluoranthene	ug/L	0.01	11 [1]	0.04 [4]	<0.01	**0.22**	0.02	0.03	0.02	<0.01	0.03	**0.10**	0.03	<0.01	**0.10**	<0.01
Pyrene	ug/L	0.01	0.02 [1]	0.025 [4]	<0.01	**0.15**	0.02	0.02	0.02	<0.01	0.02	**0.80**	0.02	<0.01	**0.07**	<0.01
Benz(a)anthracene	ug/L	0.01	0.018 [2]	0.018 [4]	<0.01	**0.08**	0.01	0.01	0.01	<0.01	0.01	**0.06**	0.01	<0.01	**0.05**	<0.01
Chrysene/Triphenylene	ug/L	0.01	0.1 [1]		<0.01	0.10	<0.01	0.01	0.01	<0.01	<0.01	0.07	0.01	<0.01	0.06	<0.01
Benzo(b+j)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	0.03	<0.01
Benzo(k)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	0.03	<0.01
Benzo(e)pyrene	ug/L	0.01			<0.01	0.10	<0.01	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	<0.01	0.03	<0.01
Benzo(a)pyrene	ug/L	0.01	0.01 [1]	0.015 [4]	<0.01	**0.06**	<0.01	<0.01	<0.01	<0.01	<0.01	**0.06**	<0.01	<0.01	**0.02**	<0.01
Indeno(1, 2, 3-c, d)pyrene	ug/L	0.01	0.21 [2]		<0.01	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	0.01	<0.01
Benzo(g,h,i)perylene	ug/L	0.01	0.17 [2]		<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	0.01	<0.01
Dibenz(a,h)anthracene	ug/L	0.01	0.26 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Date Sampled					Site E							Sample G	Sample I	Site 1				
PAHs	**Unit**	**RL**	**NSE**	**CCME**	9-25-17	10-2-17	10-11-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-11-17	10-11-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Naphtalene	ug/L	0.05	1.4 [1]	1.4 [3]	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	ug/L	0.01	6 [1]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	ug/L	0.01	6 [1]	5.8 [4]	0.20	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	0.02	<0.01	<0.01
Fluorene	ug/L	0.01	12 [1]	3 [4]	0.10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	0.01	<0.01	<0.01
Phenanthrene	ug/L	0.01	4.6 [1]	0.4 [4]	0.19	0.02	<0.01	0.02	<0.01	<0.01	<0.01	0.02	0.04	<0.01	0.01	0.04	0.02	<0.01
Anthracene	ug/L	0.01	0.012 [2]	0.012 [4]	**0.07**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	ug/L	0.01	11 [1]	0.04 [4]	**0.49**	0.01	0.02	0.01	<0.01	<0.01	<0.01	0.01	**0.05**	<0.01	0.02	0.04	0.03	<0.01
Pyrene	ug/L	0.01	0.02 [1]	0.025 [4]	**0.13**	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.01	**0.04**	<0.01	0.01	**0.03**	0.02	<0.01
Benz(a)anthracene	ug/L	0.01	0.018 [2]	0.018 [4]	**0.05**	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.02**	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene/Triphenylene	ug/L	0.01	0.1 [1]		0.06	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	0.01	0.01	<0.01
Benzo(b+j)fluoranthene	ug/L	0.01	0.48 [2]		0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	ug/L	0.01	0.48 [2]		0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(e)pyrene	ug/L	0.01			0.02	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	ug/L	0.01	0.01 [1]	0.015 [4]	0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.02**	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1, 2, 3-c, d)pyrene	ug/L	0.01	0.21 [2]		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	ug/L	0.01	0.17 [2]		0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	ug/L	0.01	0.26 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Date Sampled					Site 2					Site 3				Site 4			
PAHs	**Unit**	**RL**	**NSE**	**CCME**	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Naphtalene	ug/L	0.05	1.4 [1]	1.4 [3]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	ug/L	0.01	6 [1]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	ug/L	0.01	6 [1]	5.8 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Fluorene	ug/L	0.01	12 [1]	3 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	ug/L	0.01	4.6 [1]	0.4 [4]	<0.01	0.02	0.02	<0.01	0.02	0.02	<0.01	0.02	<0.01	0.05	0.01	0.01	<0.01
Anthracene	ug/L	0.01	0.012 [2]	0.012 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	ug/L	0.01	11 [1]	0.04 [4]	<0.01	0.02	0.02	0.01	0.02	0.01	<0.01	0.02	<0.01	**0.06**	<0.01	<0.01	<0.01
Pyrene	ug/L	0.01	0.02 [1]	0.025 [4]	<0.01	0.01	0.01	<0.01	0.01	<0.01	<0.01	0.01	<0.01	**0.04**	<0.01	<0.01	<0.01
Benz(a)anthracene	ug/L	0.01	0.018 [2]	0.018 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Chrysene/Triphenylene	ug/L	0.01	0.1 [1]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01
Benzo(b+j)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Benzo(e)pyrene	ug/L	0.01			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	ug/L	0.01	0.01 [1]	0.015 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1, 2, 3-c, d)pyrene	ug/L	0.01	0.21 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	ug/L	0.01	0.17 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	ug/L	0.01	0.26 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Date Sampled					Site 5				Site 6					Site 7			
PAHs	**Unit**	**RL**	**NSE**	**CCME**	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Naphtalene	ug/L	0.05	1.4 [1]	1.4 [3]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	ug/L	0.01	6 [1]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	ug/L	0.01	6 [1]	5.8 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	ug/L	0.01	12 [1]	3 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	ug/L	0.01	4.6 [1]	0.4 [4]	0.02	<0.01	0.02	0.02	0.02	0.02	0.01	0.03	<0.01	0.04	<0.01	0.03	<0.01
Anthracene	ug/L	0.01	0.012 [2]	0.012 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	ug/L	0.01	11 [1]	0.04 [4]	<0.01	<0.01	0.01	0.01	0.01	<0.01	<0.01	0.01	<0.01	0.03	<0.01	0.02	<0.01
Pyrene	ug/L	0.01	0.02 [1]	0.025 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	0.01	<0.01
Benz(a)anthracene	ug/L	0.01	0.018 [2]	0.018 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Chrysene/Triphenylene	ug/L	0.01	0.1 [1]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01
Benzo(b+j)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(e)pyrene	ug/L	0.01			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	ug/L	0.01	0.01 [1]	0.015 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1, 2, 3-c, d)pyrene	ug/L	0.01	0.21 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	ug/L	0.01	0.17 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	ug/L	0.01	0.26 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Date Sampled					Site 8 (Station 1)						Site 9 (Station 2)						Site 10				
PAHs	**Unit**	**RL**	**NSE**	**CCME**	9-26-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	9-26-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-11-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Naphtalene	ug/L	0.05	1.4 [1]	1.4 [3]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	0.10	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	ug/L	0.01	6 [1]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	ug/L	0.01	6 [1]	5.8 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01
Fluorene	ug/L	0.01	12 [1]	3 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.05	0.01	<0.01	<0.01	<0.01
Phenanthrene	ug/L	0.01	4.6 [1]	0.4 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.13	<0.01	0.02	0.01	0.27	0.07	<0.01	0.02	<0.01
Anthracene	ug/L	0.01	0.012 [2]	0.012 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.03**	<0.01	0.01	<0.01	0.08	0.01	<0.01	<0.01	<0.01
Fluoranthene	ug/L	0.01	11 [1]	0.04 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.16**	<0.01	0.01	0.01	**0.35**	**0.06**	<0.01	0.02	<0.01
Pyrene	ug/L	0.01	0.02 [1]	0.025 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.10**	<0.01	<0.01	<0.01	**0.25**	**0.04**	<0.01	0.01	<0.01
Benz(a)anthracene	ug/L	0.01	0.018 [2]	0.018 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.04**	<0.01	<0.01	<0.01	**0.16**	0.01	<0.01	<0.01	<0.01
Chrysene/Triphenylene	ug/L	0.01	0.1 [1]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.06	<0.01	0.01	<0.01	**0.20**	0.02	<0.01	<0.01	<0.01
Benzo(b+j)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.10	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.10	<0.01	<0.01	<0.01	<0.01
Benzo(e)pyrene	ug/L	0.01			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	0.15	0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	ug/L	0.01	0.01 [1]	0.015 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	**0.02**	<0.01	<0.01	<0.01	**0.11**	<0.01	<0.01	<0.01	<0.01
Indeno(1, 2, 3-c, d)pyrene	ug/L	0.01	0.21 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	0.09	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	ug/L	0.01	0.17 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	ug/L	0.01	0.26 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01

Date Sampled					Site 11				Upriver				Downriver			
PAHs	**Unit**	**RL**	**NSE**	**CCME**	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Naphtalene	ug/L	0.05	1.4 [1]	1.4 [3]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Acenaphthylene	ug/L	0.01	6 [1]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthene	ug/L	0.01	6 [1]	5.8 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	ug/L	0.01	12 [1]	3 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	ug/L	0.01	4.6 [1]	0.4 [4]	0.03	0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	ug/L	0.01	0.012 [2]	0.012 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	ug/L	0.01	11 [1]	0.04 [4]	0.02	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	ug/L	0.01	0.02 [1]	0.025 [4]	0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benz(a)anthracene	ug/L	0.01	0.018 [2]	0.018 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene/Triphenylene	ug/L	0.01	0.1 [1]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b+j)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	ug/L	0.01	0.48 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(e)pyrene	ug/L	0.01			<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	ug/L	0.01	0.01 [1]	0.015 [4]	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Indeno(1, 2, 3-c, d)pyrene	ug/L	0.01	0.21 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	ug/L	0.01	0.17 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	ug/L	0.01	0.26 [2]		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

1) NSE: Nova Scotia Environment Table 3 Environmental Quality Standards for Surface Water (Marine Water)
2) NSE: Nova Scotia Environment Table 3 Environmental Quality Standards for Surface Water (Fresh Water)
3) CCME: Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life (Marine)
4) CCME: Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater) - used for comparison where marine values unavailable

Table 2: Surface Water Quality Results for Petroleum Hydrocarbons (September to November 2017)

Exceeds applicable surface water quality guidelines

					Site A					Site B				
Petroleum Hydrocarbons (PHCs)	**Unit**	**RL [3]**	**RL [4]**	**NSE [1] and Atlantic RBCA Tier I ESL [2]**	2017-10-10	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	2017-10-10	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Benzene	mg/L	0.001	0.001	2.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/L	0.001	0.001	0.77	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	mg/L	0.001	0.001	0.32	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenes	mg/L	0.001	0.001	0.33	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
VPH C6-C10 (less BTEX)	mg/L	0.01	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C10-C16	mg/L	0.05	0.01		<0.05	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01
EPH >C16-C21	mg/L	0.05	0.01		<0.05	0.01	<0.01	0.03	0.03	<0.05	<0.01	0.01	0.01	0.03
EPH >C21-C32	mg/L	0.1	0.01		<0.1	0.03	0.01	0.05	0.04	<0.1	<0.01	0.02	0.02	0.04
Modified TPH	mg/L	0.1	0.02	1.5 (Gas) 0.10 (FO/LO)	<0.1	0.04 (NR)	<0.02	0.08 (UP)	0.07 (UP)	<0.1	<0.02	0.03 (UP)	0.03 (UP)	0.07 (UP)

					Site C					Site D				
Petroleum Hydrocarbons (PHCs)	**Unit**	**RL [3]**	**RL [4]**	**NSE [1] and Atlantic RBCA Tier I ESL [2]**	2017-10-10	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	2017-10-10	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Benzene	mg/L	0.001	0.001	2.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/L	0.001	0.001	0.77	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	mg/L	0.001	0.001	0.32	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenes	mg/L	0.001	0.001	0.33	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
VPH C6-C10 (less BTEX)	mg/L	0.01	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C10-C16	mg/L	0.05	0.01		<0.05	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01
EPH >C16-C21	mg/L	0.05	0.01		<0.05	<0.01	<0.01	0.09	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01
EPH >C21-C32	mg/L	0.1	0.01		<0.1	<0.01	<0.01	0.15	0.01	<0.1	<0.01	<0.01	0.01	<0.01
Modified TPH	mg/L	0.1	0.02	1.5 (Gas) 0.10 (FO/LO)	<0.1	<0.02	<0.02	**0.24 (UP)**	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02

					Site E					Sample G	Sample I	Site 1 (Station 3)				
Petroleum Hydrocarbons (PHCs)	**Unit**	**RL [3]**	**RL [4]**	**NSE [1] and Atlantic RBCA Tier I ESL [2]**	2017-10-11	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	2017-10-11	2017-10-11	2017-10-10	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Benzene	mg/L	0.001	0.001	2.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/L	0.001	0.001	0.77	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	mg/L	0.001	0.001	0.32	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenes	mg/L	0.001	0.001	0.33	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
VPH C6-C10 (less BTEX)	mg/L	0.01	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C10-C16	mg/L	0.05	0.01		<0.05	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01
EPH >C16-C21	mg/L	0.05	0.01		<0.05	<0.01	0.04	0.03	0.02	<0.05	<0.05	<0.05	<0.01	<0.01	0.01	0.01
EPH >C21-C32	mg/L	0.1	0.01		<0.1	<0.01	0.05	0.03	0.03	<0.1	<0.1	<0.1	<0.01	<0.01	0.02	0.02
Modified TPH	mg/L	0.1	0.02	1.5 (Gas) 0.10 (FO/LO)	<0.1	<0.02	0.09 (UP)	0.06 (UP)	0.05 (UP)	<0.1	<0.1	<0.1	<0.02	<0.02	0.03 (UP)	0.03 (UP)

					Site 2 (Station 4)					Site 3				Site 4			
Petroleum Hydrocarbons (PHCs)	**Unit**	**RL [3]**	**RL [4]**	**NSE [1] and Atlantic RBCA Tier I ESL [2]**	2017-10-10	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Benzene	mg/L	0.001	0.001	2.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/L	0.001	0.001	0.77	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	mg/L	0.001	0.001	0.32	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenes	mg/L	0.001	0.001	0.33	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
VPH C6-C10 (less BTEX)	mg/L	0.01	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C10-C16	mg/L	0.05	0.01		<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C16-C21	mg/L	0.05	0.01		<0.05	<0.01	<0.01	0.01	<0.01	<0.01	0.02	0.01	0.01	<0.01	<0.01	<0.01	<0.01
EPH >C21-C32	mg/L	0.1	0.01		<0.1	<0.01	<0.01	0.02	0.01	<0.01	0.03	0.02	0.01	<0.01	<0.01	0.01	<0.01
Modified TPH	mg/L	0.1	0.02	1.5 (Gas) 0.10 (FO/LO)	<0.1	<0.02	<0.02	0.03 (UP)	<0.02	<0.02	0.05 (UP)	0.03 (UP)	0.02 (UP)	<0.02	<0.02	<0.02	<0.02

					Site 5				Site 6					Site 7			
Petroleum Hydrocarbons (PHCs)	**Unit**	**RL [3]**	**RL [4]**	**NSE [1] and Atlantic RBCA Tier I ESL [2]**	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	2017-10-10	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Benzene	mg/L	0.001	0.001	2.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/L	0.001	0.001	0.77	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	mg/L	0.001	0.001	0.32	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenes	mg/L	0.001	0.001	0.33	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
VPH C6-C10 (less BTEX)	mg/L	0.01	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C10-C16	mg/L	0.05	0.01		<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C16-C21	mg/L	0.05	0.01		<0.01	0.01	0.01	0.01	<0.05	<0.01	<0.01	0.02	0.01	<0.01	0.02	<0.01	0.03
EPH >C21-C32	mg/L	0.1	0.01		<0.01	0.02	0.02	0.02	<0.1	<0.01	0.01	0.02	0.02	<0.01	0.03	0.02	0.03
Modified TPH	mg/L	0.1	0.02	1.5 (Gas) 0.10 (FO/LO)	<0.02	0.03 (UP)	0.03 (UP)	0.03 (UP)	<0.1	<0.02	<0.02	0.04 (UP)	0.03 (UP)	<0.02	0.05 (UP)	0.02 (UP)	0.06 (UP)

					Site 8						Site 9					
Petroleum Hydrocarbons (PHCs)	**Unit**	**RL [3]**	**RL [4]**	**NSE [1] and Atlantic RBCA Tier I ESL [2]**	2017-09-26	2017-10-10	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	2017-09-26	2017-10-10	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Benzene	mg/L	0.001	0.001	2.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/L	0.001	0.001	0.77	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	mg/L	0.001	0.001	0.32	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenes	mg/L	0.001	0.001	0.33	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
VPH C6-C10 (less BTEX)	mg/L	0.01	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C10-C16	mg/L	0.05	0.01		<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01
EPH >C16-C21	mg/L	0.05	0.01		<0.05	<0.05	<0.01	0.04	0.01	0.04	<0.05	<0.05	<0.01	0.03	0.06	0.06
EPH >C21-C32	mg/L	0.1	0.01		<0.1	<0.1	<0.01	0.05	0.02	0.05	<0.1	<0.1	<0.01	0.04	0.09	0.07
Modified TPH	mg/L	0.1	0.02	1.5 (Gas) 0.10 (FO/LO)	<0.1	<0.1	<0.02	0.09 (UP)	0.03 (UP)	0.09 (UP)	<0.1	<0.1	<0.02	0.07 (UP)	**0.15 (UP)**	**0.13 (UP)**

					Site 10 (Sample H)					Site 11				Downriver			
Petroleum Hydrocarbons (PHCs)	**Unit**	**RL [3]**	**RL [4]**	**NSE [1] and Atlantic RBCA Tier I ESL [2]**	2017-10-11	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Benzene	mg/L	0.001	0.001	2.1	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Toluene	mg/L	0.001	0.001	0.77	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	mg/L	0.001	0.001	0.32	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Xylenes	mg/L	0.001	0.001	0.33	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
VPH C6-C10 (less BTEX)	mg/L	0.01	0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C10-C16	mg/L	0.05	0.01		<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EPH >C16-C21	mg/L	0.05	0.01		<0.05	0.02	<0.01	0.01	0.03	<0.01	<0.01	0.02	0.01	<0.01	<0.01	0.07	0.03
EPH >C21-C32	mg/L	0.1	0.01		<0.1	0.02	0.01	0.02	0.03	<0.01	0.01	0.03	0.02	<0.01	<0.01	0.12	0.03
Modified TPH	mg/L	0.1	0.02	1.5 (Gas) 0.10 (FO/LO)	<0.1	0.04 (NR)	<0.02	0.03 (UP)	0.06 (UP)	<0.02	<0.02	0.05 (UP)	0.03 (UP)	<0.02	<0.02	**0.19 (UP)**	0.06 (UP)

					Upriver			
Petroleum Hydrocarbons (PHCs)	**Unit**	**RL [3]**	**RL [4]**	**NSE [1] and Atlantic RBCA Tier I ESL [2]**	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Benzene	mg/L	0.001	0.001	2.1	<0.001	<0.001	<0.001	<0.001
Toluene	mg/L	0.001	0.001	0.77	<0.001	<0.001	<0.001	<0.001
Ethylbenzene	mg/L	0.001	0.001	0.32	<0.001	<0.001	<0.001	<0.001
Xylenes	mg/L	0.001	0.001	0.33	<0.001	<0.001	<0.001	<0.001
VPH C6-C10 (less BTEX)	mg/L	0.01	0.01		<0.01	<0.01	<0.01	<0.01
EPH >C10-C16	mg/L	0.05	0.01		<0.01	<0.01	<0.01	<0.01
EPH >C16-C21	mg/L	0.05	0.01		<0.01	<0.01	<0.01	<0.01
EPH >C21-C32	mg/L	0.1	0.01		<0.01	<0.01	<0.01	0.01
Modified TPH	mg/L	0.1	0.02	1.5 (Gas) 0.10 (FO/LO)	<0.02	<0.02	<0.02	<0.02

1) NSE: Nova Scotia Environment Table 3 Tier 1 Environmental Quality Standards for Surface Water (Marine Water Value)
2) Atlantic RBCA Tier I Surface Water Screening Levels for the Protection of Marine Aquatic Life
3) Laboratory Reporting limits for Hydrocarbon Analysis in Water (Atlantic MUST)
4) Laboratory Reporting limits for Hydrocarbon Analysis in Water (Low Level Atlantic MUST)

Table 3: Surface Water Quality Results for Trace Metals (September to November 2017)

Exceeds applicable NSE surface water quality guidelines
Exceeds applicable CCME surface water quality guidelines
Exceeds both NSE and CCME surface water quality guidelines

					Site A						Site B					
Metals	**Unit**	**RL**	**NSE**	**CCME**	9-25-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	9-25-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Arsenic	ug/L	0.02	12.5 [1]	12.5 [3]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	ug/L	0.005		56 [3]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

					Site C						Site D					
Metals	**Unit**	**RL**	**NSE**	**CCME**	9-25-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	9-25-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Arsenic	ug/L	0.02	12.5 [1]	12.5 [3]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	ug/L	0.005		56 [3]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

					Site E						Sample G	Sample I	Site 1 (Station 3)				
Metals	**Unit**	**RL**	**NSE**	**CCME**	9-25-17	10-11-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-11-17	10-11-17	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Arsenic	ug/L	0.02	12.5 [1]	12.5 [3]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	ug/L	0.005		56 [3]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

					Site 2 (Station 4)					Site 3				Site 4			
Metals	**Unit**	**RL**	**NSE**	**CCME**	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Arsenic	ug/L	0.02	12.5 [1]	12.5 [3]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	ug/L	0.005		56 [3]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

					Site 5				Site 6 (Sample F)					Site 7			
Metals	**Unit**	**RL**	**NSE**	**CCME**	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Arsenic	ug/L	0.02	12.5 [1]	12.5 [3]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	ug/L	0.005		56 [3]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

					Site 8 (Station 1)					Site 9 (Station 2)					Site 10 (Sample H)				
Metals	**Unit**	**RL**	**NSE**	**CCME**	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-10-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-11-17	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Arsenic	ug/L	0.02	12.5 [1]	12.5 [3]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	ug/L	0.005		56 [3]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

					Site 11				Upriver				Downriver			
Metals	**Unit**	**RL**	**NSE**	**CCME**	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide	10-20-17 Low Tide	10-23-17 High Tide	11-01-17 High Tide	11-02-17 Low Tide
Arsenic	ug/L	0.02	12.5 [1]	12.5 [3]	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Chromium	ug/L	0.005		56 [3]	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

1) NSE: Nova Scotia Environment Table 3 Environmental Quality Standards for Surface Water (Marine Water)
2) NSE: Nova Scotia Environment Table 3 Environmental Quality Standards for Surface Water (Fresh Water) - used for comparison where marine values unavailable
3) CCME: Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life (Marine)
4) CCME: Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater) - used for comparison where marine values unavailable

Report ID: 253394-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

CERTIFICATE OF ANALYSIS

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			253394-01	253394-02	253394-03	253394-04	253394-05	253394-06
Client Sample ID:			Site A	Site B	Site C	Site D	Site E	Site 1
Date Sampled:			20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C21-C32	mg/L	0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Modified TPH Tier 1	mg/L	0.02	0.04	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
VPH Surrogate (IBB)	%		91	90	93	91	91	92
EPH Surrogate (IBB)	%		114	100	97	99	96	102
EPH Surrogate (C32)	%		122	113	108	108	111	110
Resemblance			NR	ND	ND	ND	ND	ND
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Bruce Phillips
Department Head
Organic Analytical Services

Angela Colford
Lab Supervisor
Organic Analytical Services

Report ID: 253394-OAS Rev01
Report Date: 23-Nov-17
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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			253394-07	253394-08	253394-09	253394-10	253394-11	253394-12
Client Sample ID:			Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Date Sampled:			20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C21-C32	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Modified TPH Tier 1	mg/L	0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02	< 0.02
VPH Surrogate (IBB)	%		90	90	99	90	90	91
EPH Surrogate (IBB)	%		93	97	95	105	109	93
EPH Surrogate (C32)	%		109	117	105	120	120	107
Resemblance			ND	ND	ND	ND	ND	ND
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			253394-13	253394-14	253394-15	253394-16	253394-17	253394-18
Client Sample ID:			Site 8	Site 9	Site 10	Site 11	Down River	Up River
Date Sampled:			20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
EPH >C21-C32	mg/L	0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
Modified TPH Tier 1	mg/L	0.02	< 0.02	< 0.02	0.04	< 0.02	< 0.02	< 0.02
VPH Surrogate (IBB)	%		88	90	89	94	91	93
EPH Surrogate (IBB)	%		98	102	102	105	100	102
EPH Surrogate (C32)	%		108	112	115	124	117	109
Resemblance			ND	ND	NR	ND	ND	ND
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			253394-01	253394-02	253394-03	253394-04	253394-05	253394-06
Client Sample ID:			Site A	Site B	Site C	Site D	Site E	Site 1
Date Sampled:			20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	0.10	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	0.10	0.01	0.02	0.02	0.02	0.01
Anthracene	µg/L	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	0.03	< 0.01	0.02	0.03	0.01	0.02
Pyrene	µg/L	0.01	0.02	< 0.01	0.02	0.02	< 0.01	0.01
Benz(a)anthracene	µg/L	0.01	0.01	< 0.01	0.01	0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		81	88	87	82	88	89
p-terphenyl-d14 (surrogate)	%		96	99	100	102	122	103

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Bruce Phillips
Department Head
Organic Analytical Services

Angela Colford
Lab Supervisor
Organic Analytical Services

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			253394-07	253394-08	253394-09	253394-10	253394-11	253394-12
Client Sample ID:			Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Date Sampled:			20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	0.02	0.02	0.05	0.02	0.02	0.04
Anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	0.02	0.01	0.06	< 0.01	< 0.01	0.03
Pyrene	µg/L	0.01	0.01	< 0.01	0.04	< 0.01	< 0.01	0.02
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	0.01
Chrysene/Triphenylene	µg/L	0.01	< 0.01	< 0.01	0.03	< 0.01	< 0.01	0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		83	84	97	84	75	68
p-terphenyl-d14 (surrogate)	%		117	95	111	113	105	98

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			253394-13	253394-14	253394-15	253394-16	253394-17	253394-18
Client Sample ID:			Site 8	Site 9	Site 10	Site 11	Down River	Up River
Date Sampled:			20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17	20-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	< 0.01	0.02	0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	< 0.01	0.13	0.07	0.03	< 0.01	< 0.01
Anthracene	µg/L	0.01	< 0.01	0.03	0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	< 0.01	0.16	0.06	0.02	< 0.01	< 0.01
Pyrene	µg/L	0.01	< 0.01	0.10	0.04	0.01	< 0.01	< 0.01
Benz(a)anthracene	µg/L	0.01	< 0.01	0.04	0.01	< 0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	0.01	< 0.01	0.06	0.02	< 0.01	< 0.01	< 0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	0.03	0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	0.09	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		74	87	86	86	85	64
p-terphenyl-d14 (surrogate)	%		110	114	110	116	106	107

CERTIFICATE OF ANALYSIS
for
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364 York Street, Suite 102
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Method Summary

OAS-HC04: The Determination of Petroleum Hydrocarbons (Atlantic MUST) in Water(VPH)
OAS-HC04: Determination of Petroleum Hydrocarbons (Atlantic MUST) in Water (EPH)
OAS-SV02:Determination of Polynuclear Aromatic Hydrocarbons in Water

Resemblance Legend

Resemblance Code	Resemblance
AG	Aviation Gasoline
COMMENT	See General Report Comments
FO	Fuel Oil Fraction
FO.LO	Fuel Oil and Lube Oil Fraction
G	Gasoline Fraction
LO	Lube Oil Fraction
ND	Not Detected
NR	No Resemblance (not-petrogenic in origin)
NRLR	No Resemblance in the lube oil range (>C21-C32).
OP	One Product (unidentified)

Resemblance Code	Resemblance
PAH	Possible PAHs Detected
PG	Possible Gasoline Fraction
PLO	Possible Lube Oil Fraction
PWFO	Possible Weathered Fuel Oil Fraction
PWG	Possible Weathered Gasoline Fraction
TO	Tranformer Oil
UP	Unknown Peaks
WFO	Weathered Fuel Oil Fraction
WG	Weathered Gasoline Fraction

General Report Comments

Revision issued to amend sample ID's for 253394-17 and 253394-18 at the request of the client.
Detectable levels of Phenanthrene and Fluoranthene was detected in Blank C1577. Reported results are not blank subtracted.
Return to Baseline: Samples are considered to have returned to baseline if the area from C32-C36 is less than 10% of the area from C10-C32.

Revision Comments

Revision issued to amend sample ID's for 253394-17 and 253394-18 at the request of the client.

Report ID: 253394-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

CERTIFICATE OF ANALYSIS

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Project #: 490-17
Location: Inkerman
QA/QC Report

RPC Sample ID:			BLANKC1573	BLANKC1580	BLANKC1598	BLANKC1599	SPIKEC1573	SPIKEC1580
Type:			VPH	VPH	EPH	EPH	VPH	VPH
Matrix:			water	water	water	water	water	water
Analytes	Units	RL					% Recovery	% Recovery
Benzene	mg/L	0.001	< 0.001	< 0.001	-	-	98%	97%
Toluene	mg/L	0.001	< 0.001	< 0.001	-	-	95%	96%
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	-	-	93%	95%
Xylenes	mg/L	0.001	< 0.001	< 0.001	-	-	88%	90%
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	-	-	90%	100%
EPH >C10 - C16	mg/L	0.01	-	-	< 0.01	< 0.01	-	-
EPH >C16 - C21	mg/L	0.01	-	-	< 0.01	< 0.01	-	-
EPH >C21-C32	mg/L	0.01	-	-	< 0.01	< 0.01	-	-
EPH >C10-C32	mg/L		-	-	-	-	-	-

RL = Reporting Limit

Report ID: 253394-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

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Project #: 490-17
Location: Inkerman
QA/QC Report

RPC Sample ID:			SPIKEC1598	SPIKEC1599
Type:			EPH	EPH
Matrix:			water	water
Analytes	Units	RL	% Recovery	% Recovery
Benzene	mg/L	0.001	-	-
Toluene	mg/L	0.001	-	-
Ethylbenzene	mg/L	0.001	-	-
Xylenes	mg/L	0.001	-	-
VPH C6-C10 (Less BTEX)	mg/L	0.01	-	-
EPH >C10 - C16	mg/L	0.01	-	-
EPH >C16 - C21	mg/L	0.01	-	-
EPH >C21-C32	mg/L	0.01	-	-
EPH >C10-C32	mg/L		106%	107%

Report ID: 253394-OAS Rev01
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Project #: 490-17
Location: Inkerman
QA/QC Report

RPC Sample ID:			BLANKC1577	BLANKC1578	BLANKC1606	SPIKEC1577	SPIKEC1578	SPIKEC1606
Matrix:			water	water	water	water	water	water
Analytes	Units	RL				% Recovery	% Recovery	% Recovery
Naphthalene	µg/L	0.05	< 0.05	< 0.05	< 0.05	79%	63%	86%
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	85%	73%	88%
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	86%	71%	89%
Fluorene	µg/L	0.01	< 0.01	< 0.01	< 0.01	89%	81%	91%
Phenanthrene	µg/L	0.01	0.02	< 0.01	< 0.01	97%	88%	99%
Anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	85%	79%	89%
Fluoranthene	µg/L	0.01	0.01	< 0.01	< 0.01	94%	86%	97%
Pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	90%	88%	96%
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	94%	96%	96%
Chrysene/Triphenylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	107%	105%	116%
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	87%	91%	98%
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	87%	91%	98%
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	72%	76%	85%
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	72%	75%	84%
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	70%	72%	80%
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	64%	69%	76%
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	66%	73%	78%

RL = Reporting Limit

Report ID: 253394-OAS Rev01
Report Date: 23-Nov-17
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Project #: 490-17

Summary of Date Analyzed

	VPH		EPH		PAH	
RPC Sample ID	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**
253394-01	26-Oct-17	26-Oct-17	25-Oct-17	27-Oct-17	24-Oct-17	26-Oct-17
253394-02	26-Oct-17	26-Oct-17	25-Oct-17	27-Oct-17	24-Oct-17	26-Oct-17
253394-03	26-Oct-17	26-Oct-17	25-Oct-17	27-Oct-17	24-Oct-17	26-Oct-17
253394-04	26-Oct-17	26-Oct-17	25-Oct-17	27-Oct-17	24-Oct-17	26-Oct-17
253394-05	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	24-Oct-17	26-Oct-17
253394-06	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	24-Oct-17	26-Oct-17
253394-07	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	25-Oct-17	27-Oct-17
253394-08	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	25-Oct-17	27-Oct-17
253394-09	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	25-Oct-17	27-Oct-17
253394-10	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	25-Oct-17	27-Oct-17
253394-11	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	25-Oct-17	27-Oct-17
253394-12	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	25-Oct-17	27-Oct-17
253394-13	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	25-Oct-17	27-Oct-17
253394-14	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	26-Oct-17	30-Oct-17
253394-15	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	26-Oct-17	30-Oct-17
253394-16	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	26-Oct-17	30-Oct-17
253394-17	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	26-Oct-17	30-Oct-17
253394-18	26-Oct-17	26-Oct-17	25-Oct-17	28-Oct-17	26-Oct-17	30-Oct-17

Report ID: 253394-IAS
Report Date: 06-Nov-17
Date Received: 24-Oct-17

CERTIFICATE OF ANALYSIS

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Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Analysis of Metals in Water

Analytes:			Arsenic	Chromium
Units:			mg/L	mg/L
RL:			0.02	0.005
RPC Sample ID	**Client Sample ID**	**Date Sampled**		
253394-01	Site A	20-Oct-17	< 0.02	< 0.005
253394-02	Site B	20-Oct-17	< 0.02	< 0.005
253394-03	Site C	20-Oct-17	< 0.02	< 0.005
253394-04	Site D	20-Oct-17	< 0.02	< 0.005
253394-05	Site E	20-Oct-17	< 0.02	< 0.005
253394-06	Site 1	20-Oct-17	< 0.02	< 0.005
253394-07	Site 2	20-Oct-17	< 0.02	< 0.005
253394-08	Site 3	20-Oct-17	< 0.02	< 0.005
253394-09	Site 4	20-Oct-17	< 0.02	< 0.005
253394-10	Site 5	20-Oct-17	< 0.02	< 0.005
253394-11	Site 6	20-Oct-17	< 0.02	< 0.005
253394-12	Site 7	20-Oct-17	< 0.02	< 0.005
253394-13	Site 8	20-Oct-17	< 0.02	< 0.005
253394-14	Site 9	20-Oct-17	< 0.02	< 0.005
253394-15	Site 10	20-Oct-17	< 0.02	< 0.005
253394-16	Site 11	20-Oct-17	< 0.02	< 0.005
253394-17	Upriver	20-Oct-17	< 0.02	< 0.005
253394-18	Downriver	20-Oct-17	< 0.02	< 0.005

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 253394-IAS
Report Date: 06-Nov-17
Date Received: 24-Oct-17

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Trace Metals	4.M01/4.M29	EPA 200.8/EPA 200.7	ICP-MS/ICP-ES

Report ID: 253396-OAS Rev01
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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			253396-01	253396-02	253396-03	253396-04	253396-05	253396-06
Client Sample ID:			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Date Sampled:			23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	< 0.01	< 0.01	0.02	< 0.01	0.01	< 0.01
EPH >C21-C32	mg/L	0.01	< 0.01	< 0.01	0.03	< 0.01	0.02	0.01
Modified TPH Tier 1	mg/L	0.02	< 0.02	< 0.02	0.05	< 0.02	0.03	< 0.02
VPH Surrogate (IBB)	%		105	97	105	95	96	94
EPH Surrogate (IBB)	%		107	103	101	106	101	107
EPH Surrogate (C32)	%		112	113	108	105	112	106
Resemblance			ND	ND	UP	ND	UP	ND
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Bruce Phillips
Department Head
Organic Analytical Services

Angela Colford
Lab Supervisor
Organic Analytical Services

Report ID: 253396-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			253396-07	253396-08	253396-09	253396-10	253396-11	253396-12
Client Sample ID:			Site 7	Site 8	Site 9	Site 10	Site 11	Site A
Date Sampled:			23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	0.02	0.04	0.03	< 0.01	< 0.01	< 0.01
EPH >C21-C32	mg/L	0.01	0.03	0.05	0.04	0.01	0.01	0.01
Modified TPH Tier 1	mg/L	0.02	0.05	0.09	0.07	< 0.02	< 0.02	< 0.02
VPH Surrogate (IBB)	%		94	94	94	95	92	95
EPH Surrogate (IBB)	%		106	101	100	106	97	111
EPH Surrogate (C32)	%		109	111	108	107	101	116
Resemblance			UP	UP	UP	ND	ND	ND
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

Report ID: 253396-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			253396-13	253396-14	253396-15	253396-16	253396-17	253396-18
Client Sample ID:			Site B	Site C	Site D	Site E	Down River	Up River
Date Sampled:			23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	0.01	< 0.01	< 0.01	0.04	< 0.01	< 0.01
EPH >C21-C32	mg/L	0.01	0.02	< 0.01	< 0.01	0.05	< 0.01	< 0.01
Modified TPH Tier 1	mg/L	0.02	0.03	< 0.02	< 0.02	0.09	< 0.02	< 0.02
VPH Surrogate (IBB)	%		94	92	92	91	92	92
EPH Surrogate (IBB)	%		103	106	104	106	99	99
EPH Surrogate (C32)	%		113	115	108	116	106	109
Resemblance			UP	ND	ND	UP	ND	ND
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

Report ID: 253396-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			253396-01	253396-02	253396-03	253396-04	253396-05	253396-06
Client Sample ID:			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Date Sampled:			23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	0.04	0.02	< 0.01	0.01	< 0.01	0.01
Anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	0.04	0.02	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/L	0.01	0.03	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		94	82	74	91	76	63
p-terphenyl-d14 (surrogate)	%		109	104	103	98	95	100

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Bruce Phillips
Department Head
Organic Analytical Services

Angela Colford
Lab Supervisor
Organic Analytical Services

Report ID: 253396-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

CERTIFICATE OF ANALYSIS

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			253396-07	253396-08	253396-09	253396-10	253396-11	253396-12
Client Sample ID:			Site 7	Site 8	Site 9	Site 10	Site 11	Site A
Date Sampled:			23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	0.01
Anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		82	80	70	74	64	58
p-terphenyl-d14 (surrogate)	%		111	114	95	110	90	95

Report ID: 253396-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			253396-13	253396-14	253396-15	253396-16	253396-17	253396-18
Client Sample ID:			Site B	Site C	Site D	Site E	Down River	Up River
Date Sampled:			23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17	23-Oct-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/L	0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01
Benz(a)anthracene	µg/L	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		82	87	82	79	99	78
p-terphenyl-d14 (surrogate)	%		114	115	114	111	122	124

CERTIFICATE OF ANALYSIS
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Method Summary

OAS-HC04: The Determination of Petroleum Hydrocarbons (Atlantic MUST) in Water(VPH)
OAS-HC04: Determination of Petroleum Hydrocarbons (Atlantic MUST) in Water (EPH)
OAS-SV02:Determination of Polynuclear Aromatic Hydrocarbons in Water

Resemblance Legend

Resemblance Code	Resemblance
AG	Aviation Gasoline
COMMENT	See General Report Comments
FO	Fuel Oil Fraction
FO.LO	Fuel Oil and Lube Oil Fraction
G	Gasoline Fraction
LO	Lube Oil Fraction
ND	Not Detected
NR	No Resemblance (not-petrogenic in origin)
NRLR	No Resemblance in the lube oil range (>C21-C32).
OP	One Product (unidentified)

Resemblance Code	Resemblance
PAH	Possible PAHs Detected
PG	Possible Gasoline Fraction
PLO	Possible Lube Oil Fraction
PWFO	Possible Weathered Fuel Oil Fraction
PWG	Possible Weathered Gasoline Fraction
TO	Tranformer Oil
UP	Unknown Peaks
WFO	Weathered Fuel Oil Fraction
WG	Weathered Gasoline Fraction

General Report Comments

Detectable levels of Phenanthrene and Fluoranthene was detected in Blank C1608. Reported results are not blank subtracted.
Return to Baseline: Samples are considered to have returned to baseline if the area from C32-C36 is less than 10% of the area from C10-C32.

Revision Comments

Revision issued to amend sample ID's for 253396-17 and 253396-18 at the request of the client.

Report ID: 253396-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

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Project #: 490-17
Location: Inkerman
QA/QC Report

RPC Sample ID:			BLANKC1572	BLANKC1573	BLANKC1598	BLANKC1599	SPIKEC1572	SPIKEC1573
Type:			VPH	VPH	EPH	EPH	VPH	VPH
Matrix:			water	water	water	water	water	water
Analytes	Units	RL					% Recovery	% Recovery
Benzene	mg/L	0.001	< 0.001	< 0.001	-	-	104%	98%
Toluene	mg/L	0.001	< 0.001	< 0.001	-	-	103%	95%
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	-	-	100%	93%
Xylenes	mg/L	0.001	< 0.001	< 0.001	-	-	96%	88%
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	-	-	99%	90%
EPH >C10 - C16	mg/L	0.01	-	-	< 0.01	< 0.01	-	-
EPH >C16 - C21	mg/L	0.01	-	-	< 0.01	< 0.01	-	-
EPH >C21-C32	mg/L	0.01	-	-	< 0.01	< 0.01	-	-
EPH >C10-C32	mg/L		-	-	-	-	-	-

RL = Reporting Limit

Report ID: 253396-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

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Project #: 490-17
Location: Inkerman
QA/QC Report

RPC Sample ID:			SPIKEC1598	SPIKEC1599
Type:			EPH	EPH
Matrix:			water	water
Analytes	Units	RL	% Recovery	% Recovery
Benzene	mg/L	0.001	-	-
Toluene	mg/L	0.001	-	-
Ethylbenzene	mg/L	0.001	-	-
Xylenes	mg/L	0.001	-	-
VPH C6-C10 (Less BTEX)	mg/L	0.01	-	-
EPH >C10 - C16	mg/L	0.01	-	-
EPH >C16 - C21	mg/L	0.01	-	-
EPH >C21-C32	mg/L	0.01	-	-
EPH >C10-C32	mg/L		106%	107%

Report ID: 253396-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

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Project #: 490-17
Location: Inkerman
QA/QC Report

RPC Sample ID:			BLANKC1606	BLANKC1608	SPIKEC1606	SPIKEC1608
Matrix:			water	water	water	water
Analytes	Units	RL			% Recovery	% Recovery
Naphthalene	µg/L	0.05	< 0.05	< 0.05	86%	69%
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	88%	83%
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	89%	79%
Fluorene	µg/L	0.01	< 0.01	< 0.01	91%	84%
Phenanthrene	µg/L	0.01	< 0.01	0.02	99%	96%
Anthracene	µg/L	0.01	< 0.01	< 0.01	89%	87%
Fluoranthene	µg/L	0.01	< 0.01	0.02	97%	100%
Pyrene	µg/L	0.01	< 0.01	< 0.01	96%	95%
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	96%	110%
Chrysene/Triphenylene	µg/L	0.01	< 0.01	< 0.01	116%	124%
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	98%	104%
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	98%	104%
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	85%	100%
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	84%	100%
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	80%	84%
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	76%	89%
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	78%	87%

RL = Reporting Limit

Report ID: 253396-OAS Rev01
Report Date: 23-Nov-17
Date Received: 24-Oct-17

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Project #: 490-17

Summary of Date Analyzed

	VPH		EPH		PAH	
RPC Sample ID	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**
253396-01	25-Oct-17	25-Oct-17	26-Oct-17	28-Oct-17	26-Oct-17	30-Oct-17
253396-02	25-Oct-17	25-Oct-17	26-Oct-17	28-Oct-17	26-Oct-17	30-Oct-17
253396-03	25-Oct-17	25-Oct-17	26-Oct-17	28-Oct-17	26-Oct-17	30-Oct-17
253396-04	25-Oct-17	25-Oct-17	26-Oct-17	30-Oct-17	26-Oct-17	30-Oct-17
253396-05	25-Oct-17	25-Oct-17	26-Oct-17	30-Oct-17	26-Oct-17	30-Oct-17
253396-06	25-Oct-17	25-Oct-17	26-Oct-17	30-Oct-17	26-Oct-17	30-Oct-17
253396-07	25-Oct-17	25-Oct-17	26-Oct-17	30-Oct-17	26-Oct-17	30-Oct-17
253396-08	25-Oct-17	25-Oct-17	26-Oct-17	30-Oct-17	26-Oct-17	31-Oct-17
253396-09	25-Oct-17	25-Oct-17	26-Oct-17	30-Oct-17	26-Oct-17	31-Oct-17
253396-10	25-Oct-17	25-Oct-17	26-Oct-17	30-Oct-17	27-Oct-17	31-Oct-17
253396-11	25-Oct-17	25-Oct-17	26-Oct-17	30-Oct-17	27-Oct-17	31-Oct-17
253396-12	26-Oct-17	26-Oct-17	26-Oct-17	30-Oct-17	27-Oct-17	31-Oct-17
253396-13	26-Oct-17	26-Oct-17	26-Oct-17	30-Oct-17	27-Oct-17	31-Oct-17
253396-14	26-Oct-17	26-Oct-17	26-Oct-17	30-Oct-17	27-Oct-17	31-Oct-17
253396-15	26-Oct-17	26-Oct-17	26-Oct-17	31-Oct-17	27-Oct-17	31-Oct-17
253396-16	26-Oct-17	26-Oct-17	26-Oct-17	31-Oct-17	27-Oct-17	31-Oct-17
253396-17	26-Oct-17	26-Oct-17	26-Oct-17	31-Oct-17	27-Oct-17	31-Oct-17
253396-18	26-Oct-17	26-Oct-17	26-Oct-17	31-Oct-17	27-Oct-17	31-Oct-17

Report ID: 253396-IAS
Report Date: 06-Nov-17
Date Received: 24-Oct-17

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Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Analysis of Metals in Water

Analytes:			Arsenic	Chromium
Units:			mg/L	mg/L
RL:			0.02	0.005
RPC Sample ID	**Client Sample ID**	**Date Sampled**		
253396-01	Site 1	23-Oct-17	< 0.02	< 0.005
253396-02	Site 2	23-Oct-17	< 0.02	< 0.005
253396-03	Site 3	23-Oct-17	< 0.02	< 0.005
253396-04	Site 4	23-Oct-17	< 0.02	< 0.005
253396-05	Site 5	23-Oct-17	< 0.02	< 0.005
253396-06	Site 6	23-Oct-17	< 0.02	< 0.005
253396-07	Site 7	23-Oct-17	< 0.02	< 0.005
253396-08	Site 8	23-Oct-17	< 0.02	< 0.005
253396-09	Site 9	23-Oct-17	< 0.02	< 0.005
253396-10	Site 10	23-Oct-17	< 0.02	< 0.005
253396-11	Site 11	23-Oct-17	< 0.02	< 0.005
253396-12	Site A	23-Oct-17	< 0.02	< 0.005
253396-13	Site B	23-Oct-17	< 0.02	< 0.005
253396-14	Site C	23-Oct-17	< 0.02	< 0.005
253396-15	Site D	23-Oct-17	< 0.02	< 0.005
253396-16	Site E	23-Oct-17	< 0.02	< 0.005
253396-17	Upriver	23-Oct-17	< 0.02	< 0.005
253396-18	Downriver	23-Oct-17	< 0.02	< 0.005

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 253396-IAS
Report Date: 06-Nov-17
Date Received: 24-Oct-17

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Trace Metals	4.M01/4.M29	EPA 200.8/EPA 200.7	ICP-MS/ICP-ES

Report ID: 254451-OAS Rev01
Report Date: 23-Nov-17
Date Received: 02-Nov-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			254451-01	254451-02	254451-03	254451-04	254451-05	254451-06
Client Sample ID:			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Date Sampled:			1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	0.01	0.01	0.01	< 0.01	0.01	0.02
EPH >C21-C32	mg/L	0.01	0.02	0.02	0.02	0.01	0.02	0.02
Modified TPH Tier 1	mg/L	0.02	0.03	0.03	0.03	< 0.02	0.03	0.04
VPH Surrogate (IBB)	%		103	104	101	102	93	95
EPH Surrogate (IBB)	%		98	117	108	113	113	109
EPH Surrogate (C32)	%		107	120	124	124	121	126
Resemblance			UP	UP	UP	ND	UP	UP
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Bruce Phillips
Department Head
Organic Analytical Services

Angela Colford
Lab Supervisor
Organic Analytical Services

Report ID: 254451-OAS Rev01
Report Date: 23-Nov-17
Date Received: 02-Nov-17

CERTIFICATE OF ANALYSIS

for
Roy Consultants Group
364 York Street, Suite 102
Fredericton, NB E3B 3P7

rpc
921 College Hill Rd
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Fax: 506.452.0594
www.rpc.ca

*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			254451-07	254451-08	254451-09	254451-10	254451-11	254451-12
Client Sample ID:			Site 7	Site 8	Site 9	Site 10	Site 11	Site A
Date Sampled:			1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	< 0.01	0.01	0.06	0.01	0.02	0.03
EPH >C21-C32	mg/L	0.01	0.02	0.02	0.09	0.02	0.03	0.05
Modified TPH Tier 1	mg/L	0.02	0.02	0.03	0.15	0.03	0.05	0.08
VPH Surrogate (IBB)	%		96	96	94	92	93	93
EPH Surrogate (IBB)	%		120	103	107	109	112	111
EPH Surrogate (C32)	%		118	113	119	118	120	118
Resemblance			UP	UP	UP	UP	UP	UP
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

Report ID: 254451-OAS Rev01
Report Date: 23-Nov-17
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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			254451-13	254451-14	254451-15	254451-16	254451-17	254451-18
Client Sample ID:			Site B	Site C	Site D	Site E	Site Down River	Site Up River
Date Sampled:			1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	0.01	0.09	< 0.01	0.03	0.07	< 0.01
EPH >C21-C32	mg/L	0.01	0.02	0.15	0.01	0.03	0.12	< 0.01
Modified TPH Tier 1	mg/L	0.02	0.03	0.24	< 0.02	0.06	0.19	< 0.02
VPH Surrogate (IBB)	%		90	92	91	91	94	94
EPH Surrogate (IBB)	%		103	108	100	109	108	109
EPH Surrogate (C32)	%		111	106	106	118	105	119
Resemblance			UP	UP	ND	UP	UP	ND
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

Report ID: 254451-OAS Rev01
Report Date: 23-Nov-17
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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			254451-01	254451-02	254451-03	254451-04	254451-05	254451-06
Client Sample ID:			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Date Sampled:			1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	0.02	< 0.01	0.02	0.01	0.02	0.03
Anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	0.03	0.01	0.02	< 0.01	0.01	0.01
Pyrene	µg/L	0.01	0.02	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		78	80	78	73	77	91
p-terphenyl-d14 (surrogate)	%		118	114	108	121	118	122

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Bruce Phillips
Department Head
Organic Analytical Services

Angela Colford
Lab Supervisor
Organic Analytical Services

Report ID: 254451-OAS Rev01
Report Date: 23-Nov-17
Date Received: 02-Nov-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			254451-07	254451-08	254451-09	254451-10	254451-11	254451-12
Client Sample ID:			Site 7	Site 8	Site 9	Site 10	Site 11	Site A
Date Sampled:			1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	0.03	< 0.01	0.02	0.02	0.02	0.02
Anthracene	µg/L	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	0.02	< 0.01	0.01	0.02	0.02	0.01
Pyrene	µg/L	0.01	0.01	< 0.01	< 0.01	0.01	0.02	< 0.01
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		82	88	82	78	70	81
p-terphenyl-d14 (surrogate)	%		117	115	117	119	123	117

Report ID: 254451-OAS Rev01
Report Date: 23-Nov-17
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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			254451-13	254451-14	254451-15	254451-16	254451-17	254451-18
Client Sample ID:			Site B	Site C	Site D	Site E	Site Down River	Site Up River
Date Sampled:			1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17	1-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	0.03	0.02	0.04	< 0.01	< 0.01	< 0.01
Anthracene	µg/L	0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	0.01	0.02	0.10	< 0.01	< 0.01	< 0.01
Pyrene	µg/L	0.01	< 0.01	0.02	0.07	< 0.01	< 0.01	< 0.01
Benz(a)anthracene	µg/L	0.01	< 0.01	0.01	0.05	< 0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	0.01	< 0.01	0.01	0.06	< 0.01	< 0.01	< 0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		78	82	69	70	85	88
p-terphenyl-d14 (surrogate)	%		114	122	115	117	114	119

CERTIFICATE OF ANALYSIS
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Method Summary

OAS-HC04: The Determination of Petroleum Hydrocarbons (Atlantic MUST) in Water(VPH)
OAS-HC04: Determination of Petroleum Hydrocarbons (Atlantic MUST) in Water (EPH)
OAS-SV02:Determination of Polynuclear Aromatic Hydrocarbons in Water

Resemblance Legend

Resemblance Code	Resemblance
AG	Aviation Gasoline
COMMENT	See General Report Comments
FO	Fuel Oil Fraction
FO.LO	Fuel Oil and Lube Oil Fraction
G	Gasoline Fraction
LO	Lube Oil Fraction
ND	Not Detected
NR	No Resemblance (not-petrogenic in origin)
NRLR	No Resemblance in the lube oil range (>C21-C32).
OP	One Product (unidentified)

Resemblance Code	Resemblance
PAH	Possible PAHs Detected
PG	Possible Gasoline Fraction
PLO	Possible Lube Oil Fraction
PWFO	Possible Weathered Fuel Oil Fraction
PWG	Possible Weathered Gasoline Fraction
TO	Tranformer Oil
UP	Unknown Peaks
WFO	Weathered Fuel Oil Fraction
WG	Weathered Gasoline Fraction

General Report Comments

Return to Baseline: Samples are considered to have returned to baseline if the area from C32-C36 is less than 10% of the area from C10-C32.

Revision Comments

Revision issued to amend sample ID's for 254451-17 and 254451-18 at the request of the client.

Report ID: 254451-OAS Rev01
Report Date: 23-Nov-17
Date Received: 02-Nov-17

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for
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Project #: 490-17
Location: Inkerman
QA/QC Report

RPC Sample ID:			BLANKC1653	BLANKC1655	BLANKC1661	SPIKEC1653	SPIKEC1655	SPIKEC1661
Type:			VPH	VPH	EPH	VPH	VPH	EPH
Matrix:			water	water	water	water	water	water
Analytes	Units	RL				% Recovery	% Recovery	% Recovery
Benzene	mg/L	0.001	< 0.001	< 0.001	-	103%	109%	-
Toluene	mg/L	0.001	< 0.001	< 0.001	-	99%	104%	-
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	-	97%	101%	-
Xylenes	mg/L	0.001	< 0.001	< 0.001	-	94%	99%	-
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	-	100%	101%	-
EPH >C10 - C16	mg/L	0.01	-	-	< 0.01	-	-	-
EPH >C16 - C21	mg/L	0.01	-	-	< 0.01	-	-	-
EPH >C21-C32	mg/L	0.01	-	-	< 0.01	-	-	-
EPH >C10-C32	mg/L		-	-	-	-	-	100%

RL = Reporting Limit

Report ID: 254451-OAS Rev01
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Project #: 490-17
Location: Inkerman
QA/QC Report

RPC Sample ID:			BLANKC1699	BLANKC1700	SPIKEC1699	SPIKEC1700
Matrix:			water	water	water	water
Analytes	Units	RL			% Recovery	% Recovery
Naphthalene	µg/L	0.05	< 0.05	< 0.05	75%	96%
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	91%	99%
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	89%	101%
Fluorene	µg/L	0.01	< 0.01	< 0.01	92%	101%
Phenanthrene	µg/L	0.01	< 0.01	< 0.01	101%	113%
Anthracene	µg/L	0.01	< 0.01	< 0.01	98%	105%
Fluoranthene	µg/L	0.01	< 0.01	< 0.01	104%	105%
Pyrene	µg/L	0.01	< 0.01	< 0.01	104%	106%
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	109%	111%
Chrysene/Triphenylene	µg/L	0.01	< 0.01	< 0.01	117%	127%
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	95%	102%
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	95%	102%
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	85%	86%
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	85%	87%
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	78%	72%
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	78%	79%
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	73%	70%

RL = Reporting Limit

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Project #: 490-17

Summary of Date Analyzed

	VPH		EPH		PAH	
RPC Sample ID	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**
254451-01	3-Nov-17	3-Nov-17	3-Nov-17	6-Nov-17	7-Nov-17	10-Nov-17
254451-02	3-Nov-17	3-Nov-17	3-Nov-17	6-Nov-17	7-Nov-17	10-Nov-17
254451-03	3-Nov-17	3-Nov-17	3-Nov-17	6-Nov-17	7-Nov-17	10-Nov-17
254451-04	3-Nov-17	3-Nov-17	3-Nov-17	6-Nov-17	7-Nov-17	10-Nov-17
254451-05	4-Nov-17	4-Nov-17	3-Nov-17	6-Nov-17	7-Nov-17	10-Nov-17
254451-06	4-Nov-17	4-Nov-17	3-Nov-17	6-Nov-17	7-Nov-17	10-Nov-17
254451-07	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	7-Nov-17	11-Nov-17
254451-08	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	7-Nov-17	11-Nov-17
254451-09	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	7-Nov-17	11-Nov-17
254451-10	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	7-Nov-17	11-Nov-17
254451-11	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	8-Nov-17	11-Nov-17
254451-12	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	8-Nov-17	11-Nov-17
254451-13	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	8-Nov-17	11-Nov-17
254451-14	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	8-Nov-17	11-Nov-17
254451-15	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	8-Nov-17	11-Nov-17
254451-16	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	8-Nov-17	11-Nov-17
254451-17	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	8-Nov-17	11-Nov-17
254451-18	4-Nov-17	4-Nov-17	3-Nov-17	7-Nov-17	8-Nov-17	11-Nov-17

Report ID: 254451-IAS
Report Date: 17-Nov-17
Date Received: 02-Nov-17

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Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Analysis of Metals in Water

Analytes:			Arsenic	Chromium
Units:			mg/L	mg/L
RL:			0.02	0.005
RPC Sample ID	**Client Sample ID**	**Date Sampled**		
254451-01	Site 1	1-Nov-17	< 0.02	< 0.005
254451-02	Site 2	1-Nov-17	< 0.02	< 0.005
254451-03	Site 3	1-Nov-17	< 0.02	< 0.005
254451-04	Site 4	1-Nov-17	< 0.02	< 0.005
254451-05	Site 5	1-Nov-17	< 0.02	< 0.005
254451-06	Site 6	1-Nov-17	< 0.02	< 0.005
254451-07	Site 7	1-Nov-17	< 0.02	< 0.005
254451-08	Site 8	1-Nov-17	< 0.02	< 0.005
254451-09	Site 9	1-Nov-17	< 0.02	< 0.005
254451-10	Site 10	1-Nov-17	< 0.02	< 0.005
254451-11	Site 11	1-Nov-17	< 0.02	< 0.005
254451-12	Site A	1-Nov-17	< 0.02	< 0.005
254451-13	Site B	1-Nov-17	< 0.02	< 0.005
254451-14	Site C	1-Nov-17	< 0.02	< 0.005
254451-15	Site D	1-Nov-17	< 0.02	< 0.005
254451-16	Site E	1-Nov-17	< 0.02	< 0.005
254451-17	Site Up River	1-Nov-17	< 0.02	< 0.005
254451-18	Site Down River	1-Nov-17	< 0.02	< 0.005

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 254451-IAS
Report Date: 17-Nov-17
Date Received: 02-Nov-17

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Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Trace Metals	4.M01/4.M29	EPA 200.8/EPA 200.7	ICP-MS/ICP-ES

Report ID: 254670-OAS Rev01
Report Date: 23-Nov-17
Date Received: 03-Nov-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			254670-01	254670-02	254670-03	254670-04	254670-05	254670-06
Client Sample ID:			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Date Sampled:			2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	0.01	< 0.01	0.01	< 0.01	0.01	0.01
EPH >C21-C32	mg/L	0.01	0.02	0.01	0.01	< 0.01	0.02	0.02
Modified TPH Tier 1	mg/L	0.02	0.03	< 0.02	0.02	< 0.02	0.03	0.03
VPH Surrogate (IBB)	%		103	98	109	105	94	96
EPH Surrogate (IBB)	%		95	96	93	97	95	90
EPH Surrogate (C32)	%		101	96	95	96	98	91
Resemblance			UP	ND	UP	ND	UP	UP
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Bruce Phillips
Department Head
Organic Analytical Services

Angela Colford
Lab Supervisor
Organic Analytical Services

Report ID: 254670-OAS Rev01
Report Date: 23-Nov-17
Date Received: 03-Nov-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			254670-07	254670-08	254670-09	254670-10	254670-11	254670-12
Client Sample ID:			Site 7	Site 8	Site 9	Site 10	Site 11	Site A
Date Sampled:			2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	0.03	0.04	0.06	0.03	0.01	0.03
EPH >C21-C32	mg/L	0.01	0.03	0.05	0.07	0.03	0.02	0.04
Modified TPH Tier 1	mg/L	0.02	0.06	0.09	0.13	0.06	0.03	0.07
VPH Surrogate (IBB)	%		93	93	95	93	90	91
EPH Surrogate (IBB)	%		97	89	93	101	106	96
EPH Surrogate (C32)	%		95	93	98	103	107	100
Resemblance			UP	UP	UP	UP	UP	UP
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

Report ID: 254670-OAS Rev01
Report Date: 23-Nov-17
Date Received: 03-Nov-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			254670-13	254670-14	254670-15	254670-16	254670-17	254670-18
Client Sample ID:			Site B	Site C	Site D	Site E	Site Down River	Site Up River
Date Sampled:			2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10 - C16	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C16 - C21	mg/L	0.01	0.03	< 0.01	< 0.01	0.02	0.03	< 0.01
EPH >C21-C32	mg/L	0.01	0.04	0.01	< 0.01	0.03	0.03	0.01
Modified TPH Tier 1	mg/L	0.02	0.07	< 0.02	< 0.02	0.05	0.06	< 0.02
VPH Surrogate (IBB)	%		99	91	89	91	95	98
EPH Surrogate (IBB)	%		96	102	107	111	95	99
EPH Surrogate (C32)	%		101	104	107	109	98	97
Resemblance			UP	ND	ND	UP	UP	ND
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

Report ID: 254670-OAS Rev01
Report Date: 23-Nov-17
Date Received: 03-Nov-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			254670-01	254670-02	254670-03	254670-04	254670-05	254670-06
Client Sample ID:			Site 1	Site 2	Site 3	Site 4	Site 5	Site 6
Date Sampled:			2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	< 0.01	0.02	< 0.01	< 0.01	0.02	< 0.01
Anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	< 0.01	0.02	< 0.01	< 0.01	0.01	< 0.01
Pyrene	µg/L	0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		87	75	71	82	85	76
p-terphenyl-d14 (surrogate)	%		120	124	123	122	120	117

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Bruce Phillips
Department Head
Organic Analytical Services

Angela Colford
Lab Supervisor
Organic Analytical Services

Report ID: 254670-OAS Rev01
Report Date: 23-Nov-17
Date Received: 03-Nov-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			254670-07	254670-08	254670-09	254670-10	254670-11	254670-12
Client Sample ID:			Site 7	Site 8	Site 9	Site 10	Site 11	Site A
Date Sampled:			2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	0.02
Anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		85	87	84	75	74	75
p-terphenyl-d14 (surrogate)	%		131	123	113	113	111	115

Report ID: 254670-OAS Rev01
Report Date: 23-Nov-17
Date Received: 03-Nov-17

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*** Revised Report ***
Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

PAH in Water

RPC Sample ID:			254670-13	254670-14	254670-15	254670-16	254670-17	254670-18
Client Sample ID:			Site B	Site C	Site D	Site E	Site Down River	Site Up River
Date Sampled:			2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17	2-Nov-17
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Naphthalene	µg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	µg/L	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	µg/L	0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Chrysene/Triphenylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		80	69	67	70	71	67
p-terphenyl-d14 (surrogate)	%		103	104	112	109	116	110

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Method Summary

OAS-HC04: The Determination of Petroleum Hydrocarbons (Atlantic MUST) in Water(VPH)
OAS-HC04: Determination of Petroleum Hydrocarbons (Atlantic MUST) in Water (EPH)
OAS-SV02:Determination of Polynuclear Aromatic Hydrocarbons in Water

Resemblance Legend

Resemblance Code	Resemblance
AG	Aviation Gasoline
COMMENT	See General Report Comments
FO	Fuel Oil Fraction
FO.LO	Fuel Oil and Lube Oil Fraction
G	Gasoline Fraction
LO	Lube Oil Fraction
ND	Not Detected
NR	No Resemblance (not-petrogenic in origin)
NRLR	No Resemblance in the lube oil range (>C21-C32).
OP	One Product (unidentified)

Resemblance Code	Resemblance
PAH	Possible PAHs Detected
PG	Possible Gasoline Fraction
PLO	Possible Lube Oil Fraction
PWFO	Possible Weathered Fuel Oil Fraction
PWG	Possible Weathered Gasoline Fraction
TO	Tranformer Oil
UP	Unknown Peaks
WFO	Weathered Fuel Oil Fraction
WG	Weathered Gasoline Fraction

General Report Comments

Revision issued to amend sample ID's for 254670-17 and 254670-18 at the request of the client.
Detectable levels of Phenanthrene and Fluoranthene was detected in Blank C1713. Reported results are not blank subtracted.
Return to Baseline: Samples are considered to have returned to baseline if the area from C32-C36 is less than 10% of the area from C10-C32.

Revision Comments

Revision issued to amend sample ID's for 254670-17 and 254670-18 at the request of the client.

Report ID: 254670-OAS Rev01
Report Date: 23-Nov-17
Date Received: 03-Nov-17

CERTIFICATE OF ANALYSIS

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Project #: 490-17
Location: Inkerman
QA/QC Report

RPC Sample ID:			BLANKC1655	BLANKC1656	BLANKC1680	SPIKEC1655	SPIKEC1656	SPIKEC1680
Type:			VPH	VPH	EPH	VPH	VPH	EPH
Matrix:			water	water	water	water	water	water
Analytes	Units	RL				% Recovery	% Recovery	% Recovery
Benzene	mg/L	0.001	< 0.001	< 0.001	-	109%	97%	-
Toluene	mg/L	0.001	< 0.001	< 0.001	-	104%	92%	-
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	-	101%	87%	-
Xylenes	mg/L	0.001	< 0.001	< 0.001	-	99%	88%	-
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	-	101%	110%	-
EPH >C10 - C16	mg/L	0.01	-	-	< 0.01	-	-	-
EPH >C16 - C21	mg/L	0.01	-	-	< 0.01	-	-	-
EPH >C21-C32	mg/L	0.01	-	-	< 0.01	-	-	-
EPH >C10-C32	mg/L		-	-	-	-	-	100%

RL = Reporting Limit

Report ID: 254670-OAS Rev01
Report Date: 23-Nov-17
Date Received: 03-Nov-17

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Project #: 490-17
Location: Inkerman
QA/QC Report

RPC Sample ID:			BLANKC1700	BLANKC1713	SPIKEC1700	SPIKEC1713
Matrix:			water	water	water	water
Analytes	Units	RL			% Recovery	% Recovery
Naphthalene	µg/L	0.05	< 0.05	< 0.05	96%	76%
Acenaphthylene	µg/L	0.01	< 0.01	< 0.01	99%	82%
Acenaphthene	µg/L	0.01	< 0.01	< 0.01	101%	83%
Fluorene	µg/L	0.01	< 0.01	< 0.01	101%	83%
Phenanthrene	µg/L	0.01	< 0.01	0.01	113%	98%
Anthracene	µg/L	0.01	< 0.01	< 0.01	105%	86%
Fluoranthene	µg/L	0.01	< 0.01	0.02	105%	98%
Pyrene	µg/L	0.01	< 0.01	< 0.01	106%	94%
Benz(a)anthracene	µg/L	0.01	< 0.01	< 0.01	111%	89%
Chrysene/Triphenylene	µg/L	0.01	< 0.01	< 0.01	127%	120%
Benzo(b+j)fluoranthene	µg/L	0.01	< 0.01	< 0.01	102%	109%
Benzo(k)fluoranthene	µg/L	0.01	< 0.01	< 0.01	102%	109%
Benzo(e)pyrene	µg/L	0.01	< 0.01	< 0.01	86%	78%
Benzo(a)pyrene	µg/L	0.01	< 0.01	< 0.01	87%	80%
Indeno(1,2,3-c,d)pyrene	µg/L	0.01	< 0.01	< 0.01	72%	77%
Benzo(g,h,i)perylene	µg/L	0.01	< 0.01	< 0.01	79%	76%
Dibenz(a,h)anthracene	µg/L	0.01	< 0.01	< 0.01	70%	70%

RL = Reporting Limit

Report ID: 254670-OAS Rev01
Report Date: 23-Nov-17
Date Received: 03-Nov-17

CERTIFICATE OF ANALYSIS

for
Roy Consultants Group
364 York Street, Suite 102
Fredericton, NB E3B 3P7

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Project #: 490-17

Summary of Date Analyzed

	VPH		EPH		PAH	
RPC Sample ID	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**
254670-01	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	8-Nov-17	11-Nov-17
254670-02	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	8-Nov-17	11-Nov-17
254670-03	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	8-Nov-17	11-Nov-17
254670-04	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	8-Nov-17	11-Nov-17
254670-05	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	8-Nov-17	11-Nov-17
254670-06	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	8-Nov-17	11-Nov-17
254670-07	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	8-Nov-17	11-Nov-17
254670-08	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	8-Nov-17	11-Nov-17
254670-09	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	9-Nov-17	14-Nov-17
254670-10	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	9-Nov-17	14-Nov-17
254670-11	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	9-Nov-17	14-Nov-17
254670-12	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	9-Nov-17	14-Nov-17
254670-13	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	9-Nov-17	14-Nov-17
254670-14	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	9-Nov-17	14-Nov-17
254670-15	4-Nov-17	4-Nov-17	7-Nov-17	8-Nov-17	9-Nov-17	14-Nov-17
254670-16	4-Nov-17	4-Nov-17	7-Nov-17	9-Nov-17	9-Nov-17	14-Nov-17
254670-17	4-Nov-17	4-Nov-17	7-Nov-17	9-Nov-17	9-Nov-17	14-Nov-17
254670-18	4-Nov-17	4-Nov-17	7-Nov-17	9-Nov-17	9-Nov-17	14-Nov-17

Report ID: 254670-IAS
Report Date: 17-Nov-17
Date Received: 03-Nov-17

CERTIFICATE OF ANALYSIS

for
Roy Consultants Group
364 York Street, Suite 102
Fredericton, NB E3B 3P7

rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Gina Burtt
Project #: 490-17
Location: Inkerman

Analysis of Metals in Water

Analytes:			Arsenic	Chromium
Units:			mg/L	mg/L
RL:			0.02	0.005
RPC Sample ID	**Client Sample ID**	**Date Sampled**		
254670-01	Site 1	2-Nov-17	< 0.02	< 0.005
254670-02	Site 2	2-Nov-17	< 0.02	< 0.005
254670-03	Site 3	2-Nov-17	< 0.02	< 0.005
254670-04	Site 4	2-Nov-17	< 0.02	< 0.005
254670-05	Site 5	2-Nov-17	< 0.02	< 0.005
254670-06	Site 6	2-Nov-17	< 0.02	< 0.005
254670-07	Site 7	2-Nov-17	< 0.02	< 0.005
254670-08	Site 8	2-Nov-17	< 0.02	< 0.005
254670-09	Site 9	2-Nov-17	< 0.02	< 0.005
254670-10	Site 10	2-Nov-17	< 0.02	< 0.005
254670-11	Site 11	2-Nov-17	< 0.02	< 0.005
254670-12	Site A	2-Nov-17	< 0.02	< 0.005
254670-13	Site B	2-Nov-17	< 0.02	< 0.005
254670-14	Site C	2-Nov-17	< 0.02	< 0.005
254670-15	Site D	2-Nov-17	< 0.02	< 0.005
254670-16	Site E	2-Nov-17	< 0.02	< 0.005
254670-17	Site Up River	2-Nov-17	< 0.02	< 0.005
254670-18	Site Down River	2-Nov-17	< 0.02	< 0.005

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit

Ross Kean

A. Ross Kean, M.Sc.
Department Head
Inorganic Analytical Chemistry

Peter Crowhurst, B.Sc., C.Chem
Analytical Chemist
Inorganic Analytical Chemistry

Report ID: 254670-IAS
Report Date: 17-Nov-17
Date Received: 03-Nov-17

CERTIFICATE OF ANALYSIS
for
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rpc
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Methods

Analyte	RPC SOP #	Method Reference	Method Principle
Trace Metals	4.M01/4.M29	EPA 200.8/EPA 200.7	ICP-MS/ICP-ES

APPENDIX G

Appendix G – Geotechnical Report (EXP)

Inkerman Pokemouche Trail Bridge Replacement

Supplemental Report – Embankment Construction

New Brunswick Department of Transportation and Infrastructure

Type of Document:
Supplement Report

Project Number:
MON-00248797-A0

Prepared By:
Adrian Thompson, P.Eng

Reviewed By:
Robert Gallagher, P.Eng

EXP
40 Henri Dunant
Moncton, NB
t: +1.506.857.8889
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Date Submitted:
March 2020

Legal Notification

This report was prepared by EXP Services Inc. for the account of New Brunswick Department of Transportation and Infrastructure (NBDTI), and provided to NBDTI and Hilcon Limited for the design of the Inkerman Pokemouche Replacement Trail Bridge project.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. EXP Services Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

EXP Quality System Checks	
Project No.: MON-00248797-A0	Date: 2020-03-11
Type of Document: **Final**	Revision No.:0
Prepared By: Adrian Thompson	
Reviewed By: Robert Gallagher	

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Appendix 1 – Laboratory Testing Results **1**

1 Introduction

EXP Services Inc (EXP) was retained by the New Brunswick Department of Transportation and Infrastructure (NBDTI), to work in conjunction with Hilcon Limited, to carry out a geotechnical investigation for the proposed Inkerman Pokemouche Trail Bridge Replacement project, located in Inkerman, New Brunswick. The original scope of this project was to assess the sub-surface conditions along the bridge alignment in order to provide geotechnical information and design parameters for the replacement trail bridge structure.

After the submission of the initial geotechnical report (File: MON-00248797-A0, Date: November 30, 2018), the scope of the project was revised. The current scope consists of the southern portion of the replacement Trail Bridge being replaced with an embankment. This submission outlines the design and construction impact of the embankment installation above the soft marine sediments in the southern portion of the project.

2 Embankment Construction

2.1 Embankment Details

The embankment detail as shown on the Hilcon Limited drawing (Project: 17068, Dated: March 4, 2019) shows an approximate length of the embankment of 140 metres, with a minimum surface width of 5.3 metres at the trail elevation of 3.2 metres. With the existing seabed elevation along the embankment length of about -1.5 metres, this will require four to five metres of embankment fill.

Construction of the embankment on the soft marine sediment will require planning and consideration to account for the sensitive nature of the sediment.

We understand that the embankment will be constructed along the same alignment as the previous bridge. As the existing timbers are still present along the alignment and EXP is not aware if the timber piles will be fully removed as part of the construction, this analysis assumed that the timber piles will be cut off at or slightly below the seabed elevation. To be conservative, the piles were not modelled within the settlement analysis outlined in the following sections.

2.2 Review of Existing Site Conditions

As outlined within the previous geotechnical report, the soil and bedrock conditions along the alignment generally consists of soft marine sediment, underlain by layers sand and glacial till, which is underlain in turn by bedrock. The soft marine sediment ranges in thickness from 2.5 to 17.9 metres over the entire alignment, and ranges in thickness from 4.3 to 12.8 metres within the 140 metres of the proposed embankment construction.

In order to support the assumptions used in the analysis, additional laboratory testing was completed on five previously collect marine sediment samples within the boreholes advanced at the southern portion of the bridge alignment. The laboratory testing consisted of moisture, sieve, and Atterberg limits. The samples are described as a Sandy Elastic Silt based on Atterberg Limits testing, having a moisture content that ranges between 50% and 83%. Results are appended.

2.3 Slope Stability Analysis

The slope stability analysis conducted used Slope/W software, and is based on a required factor of safety of 1.5 against failure. In order to achieve this factor of safety, the analysis showed that a minimum slope of 3 Horizontal to 1 Vertical was required (see Figure 1). The embankment analysis considered the stability of the entire embankment in addition to the intended staged placement of the embankment fill during construction; however, it did not incorporate improved subgrade geotechnical parameter values as consolidation of the marine sediment occurred.

The slope stability analysis referenced the following parameters:

Stratum/Soil	Internal Friction Angle	Total Unit Weight (kN/m3)	Buoyant Unit Weight (kN/m3)	Cohesion
Embankment Fill	35	20.5	10.7	0
Marine Sediment	28	15.8	6.0	0
Sand	28	17	7.2	0

The embankment fill is assumed to be a well graded granular material having a maximum particle size of 200 mm. Following the initial fill layer required to get above the water level, the analysis assumes that lift thicknesses would not exceed 300 mm, and would be compacted to 95% of the maximum dry density as determined by ASTM D698 (latest version).

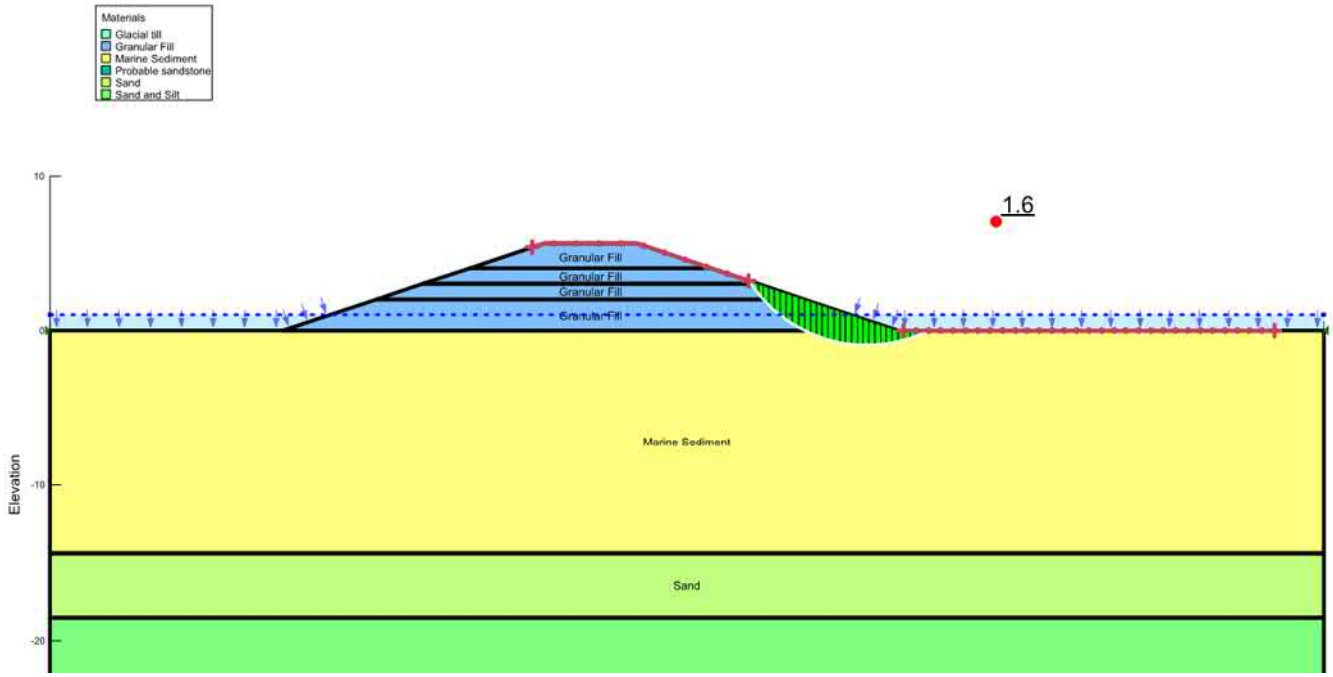


Figure 1: Slope Stability Analysis using Slope/W

Although not considered in our analysis, the use of a geogrid material between the embankment fill and the marine sediment will provide improved short-term and long-term performance. The geogrid placement would be challenging but would provide increased stability to the embankment during construction. If incorporated, it is recommended that Tensar Triax 160, BX1200, or approved alternate be considered.

2.4 Embankment Construction

Construction of the embankment, with the proposed height of 4.7 metres will require a staged approach to construction. The first lift would need to be placed to the water surface or slightly above to allow for compaction effort and construction access, with subsequent series of lifts to a maximum height of 1.2 metres being recommended for initial consideration. The time interval and fill height of each series of lifts would be dependent on the dissipation of pore pressure, which would be monitored with vibrating wire piezometers and settlement plates. Regular inspection and monitoring of the settlement and pore pressure data is highly recommended to expedite the construction sequences. Analysis of the data collected could result in an accelerated fill placement schedule.

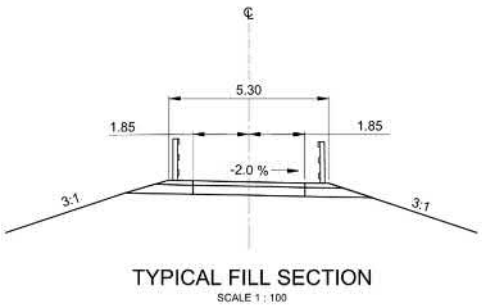


Figure 2: Typical Embankment Dimensions

Placement of the material should start at the center of the embankment alignment, extending toward the sides to allow for the "mudwave" of the seabed surface to extend beyond the embankment footprint. Practices should be implemented to minimize the potential for pockets of soft marine sediment "mud-wave" to remain within the embankment footprint. With 3 Horiztonal to 1 Vertical slopes and a 5.3 metre wide trail, the embankment width will be about 34 metres at the seabed elevation; actual width will vary slightly due to seabed elevation.

The most critical area of embankment construction will be at the southern bridge abutment located at Station 1+250, where soft marine sediments were observed to have a thickness of 12.8 metres. At this location the construction of the embankment and pile driving activities will need to be both considered to reduce the drag-down effect of the piles and the potential of pile bending. Down-drag on piles would reduce the pile capacity, and would need to be assessed depending on construction sequencing. It is recommended that the full height of the embankment be achieved prior to pile driving activities. Placement of a fill surcharge may also be considered to minimize the future settlement within this area.

2.5 Embankment Settlement

The total embankment settlement was analyzed using Sigma/W software. The analysis used the same parameters identified within the Slope/W analysis. The analysis assumes that the fill placement activities will take place 100 days apart to allow for pore pressure dissipation.

As provided in Figure 3 below, the analysis estimates a total settlement of about 800 mm due to the embankment loading. This settlement does not consider the volume of material that may be displaced during fill placement (i.e. "mud-wave"). Should this settlement value be used to calculate fill quantities, we recommend that the fill volume calculation should be increased by 50% to account for the displaced material.

The analysis considered the staged approach required for the site. Settlement expectations for the first lift are slightly above 300mm, with the remaining three fill placement activities showing about 150 to 200mm of settlement. The final three fill placement activities are assumed to each have a thickness of 1.2 metres, each placed in four 300mm thick lifts.

As stated, the analysis expectations do not account for the upper marine sediment that will likely be displaced during fill placement.

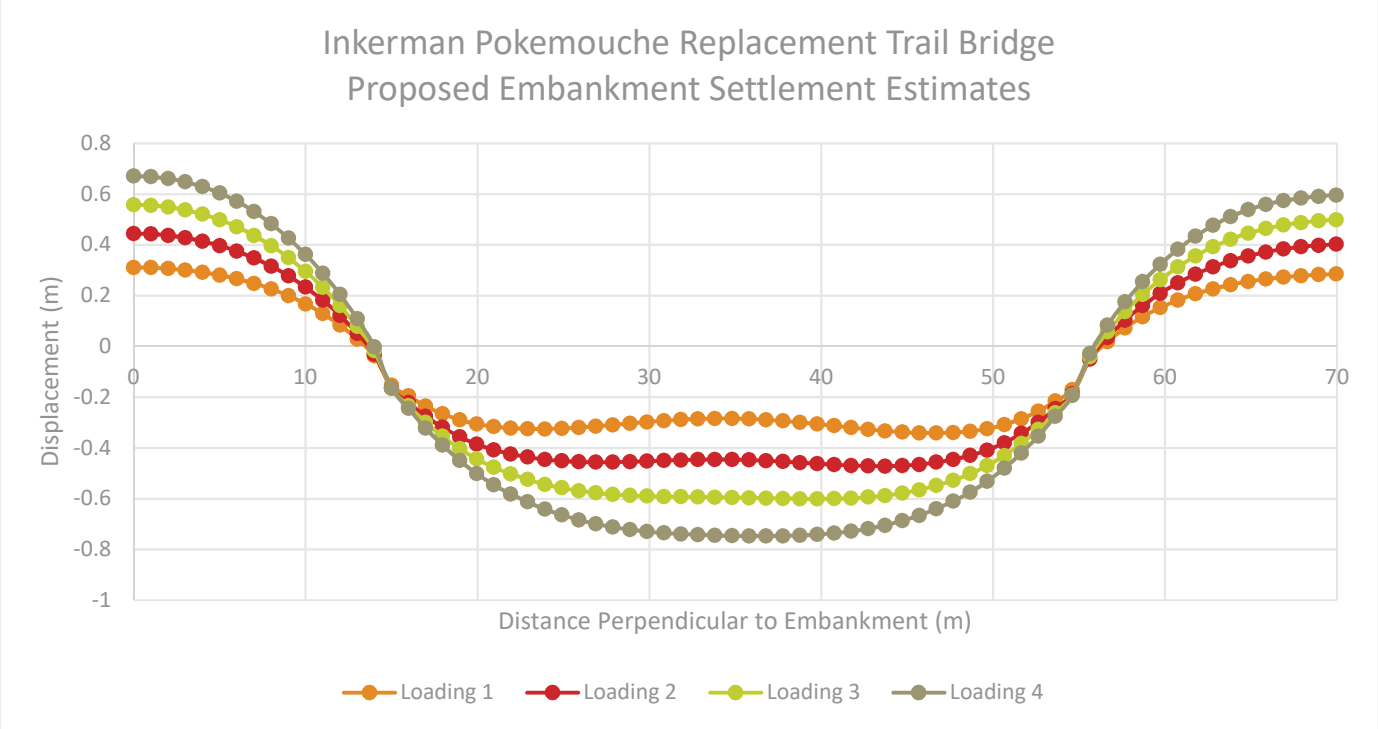


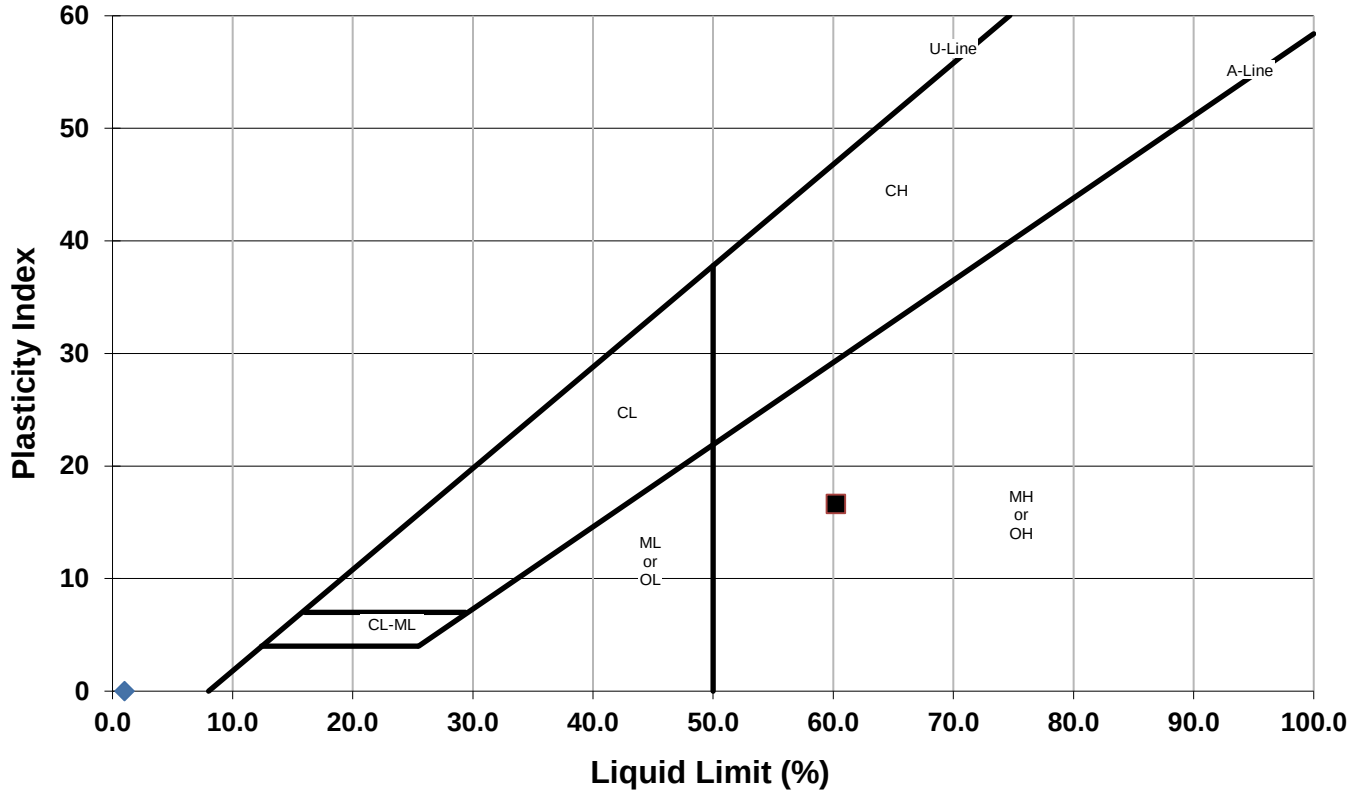
Figure 3: Settlement Estimates from Sigma/W Analysis

3 Closing

This supplemental report has been prepared to assist in the design and construction of the proposed Inkerman Pokemouche Trail Bridge Replacement project, and should be reviewed along with the initial EXP geotechnical report (File: MON-00248797-A0, Dated: November 30, 2018). If any details are included in the final design of the project that differ from the assumptions outlined in the reports, the geotechnical engineer should be consulted. Similarly, if conditions different from those detailed within our analysis are noted during construction, the engineer should be notified to allow reassessment of assumptions, if necessary.

Appendix 1 – Laboratory Testing Results

Plastic Limits
ASTM D4318



Client: NBDTI Job No: MON-00248797-A0

Project: Inkerman Bridge

Sample Date: N/A Test Date: N/A

Sample By: RC Test By: AH

Location: BH5 SS3

DATA SUMMARY

Sample #	Liquid Limit	Plastic Limit	Plastic Index	Soil Symbol	Soil Type	Legend
MON 2019-336	60.2	43.6	16.6	MH	Sandy Elastic Silt	■

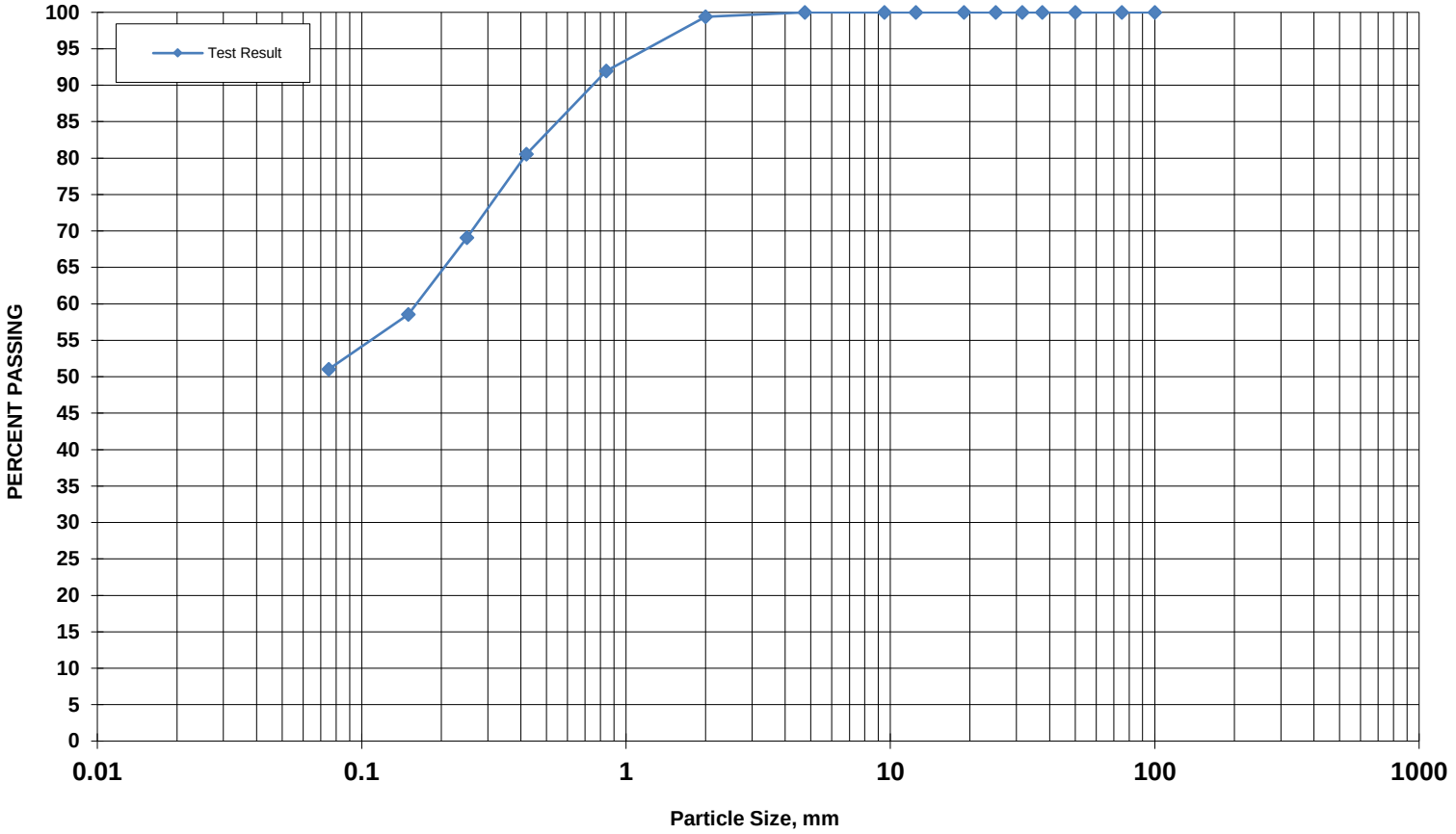
Comment:

MON-00248797-A0

N/A

exp Services Inc. - ASTM/USCS Sieve Analysis

Inkerman Bridge



TEST DATA	
Sieve Size (mm)	Percent Passing (%)
75	100.0
50	100.0
37.5	100.0
31.5	100.0
25	100.0
19	100.0
12.5	100.0
9.5	100.0
4.75	100.0
2	99.4
0.841	92.0
0.42	80.5
0.25	69.1
0.15	58.6
0.075	51.0

Client: NBDTI

Sample: BH5 SS3

Soil Type: Soils

USCS Soil Name: Sandy Elastic Silt

Comment: MON 2020-001

Gravel (%): 0.0

Sand (%): 49.0

Fines (%): 51.0

USCS Symbol: MH

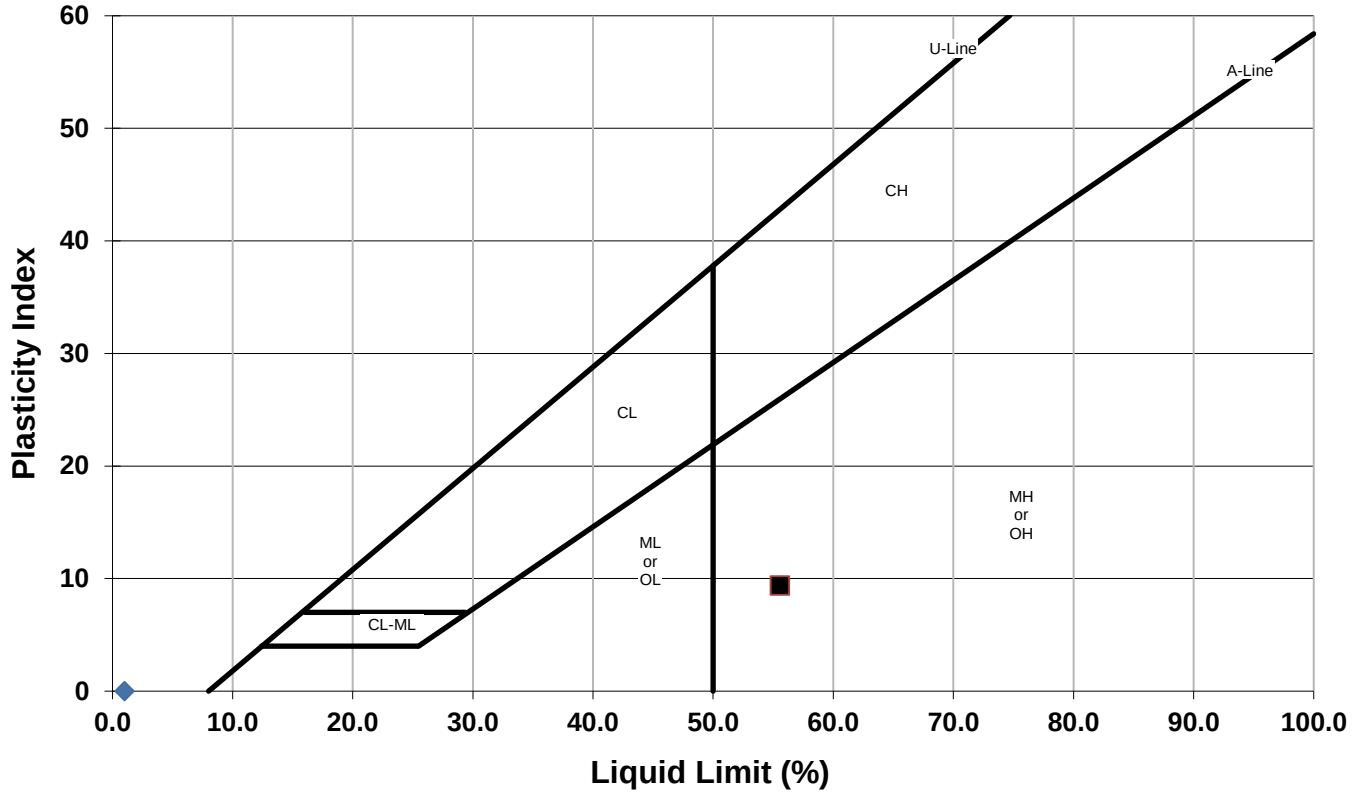
C_u:

C_c:

$W_{content}$(%): 63.6

Test By: RC

Plastic Limits
ASTM D4318



Client: NBDTI Job No: MON-00248797-A0

Project: Inkerman Bridge

Sample Date: N/A Test Date: N/A

Sample By: RC Test By: AH

Location: BH5 SS5

DATA SUMMARY

Sample #	Liquid Limit	Plastic Limit	Plastic Index	Soil Symbol	Soil Type	Legend
MON 2019-336	55.5	46.2	9.4	MH	Sandy Elastic Silt	■

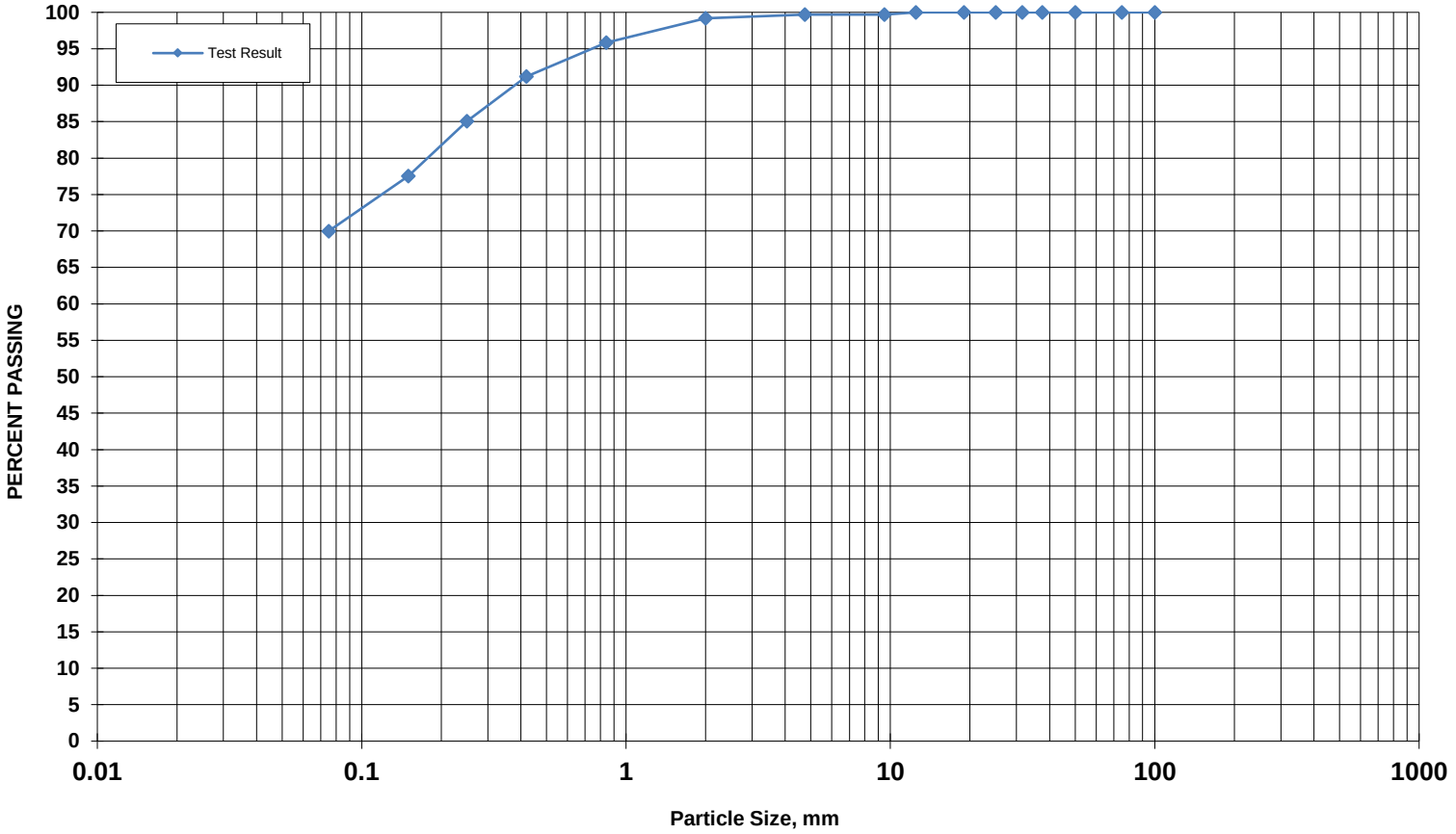
Comment:

MON-00248797-A0

N/A

exp Services Inc. - ASTM/USCS Sieve Analysis

Inkerman Bridge



TEST DATA	
Sieve Size (mm)	Percent Passing (%)
75	100.0
50	100.0
37.5	100.0
31.5	100.0
25	100.0
19	100.0
12.5	100.0
9.5	99.7
4.75	99.7
2	99.2
0.841	95.8
0.42	91.2
0.25	85.1
0.15	77.5
0.075	70.0

Client: NBDTI

Sample: BH5 SS5

Soil Type: Soils

USCS Soil Name: Sandy Elastic Silt

Comment: MON 2020-002

Gravel (%): 0.3

Sand (%): 29.7

Fines (%): 70.0

USCS Symbol: MH

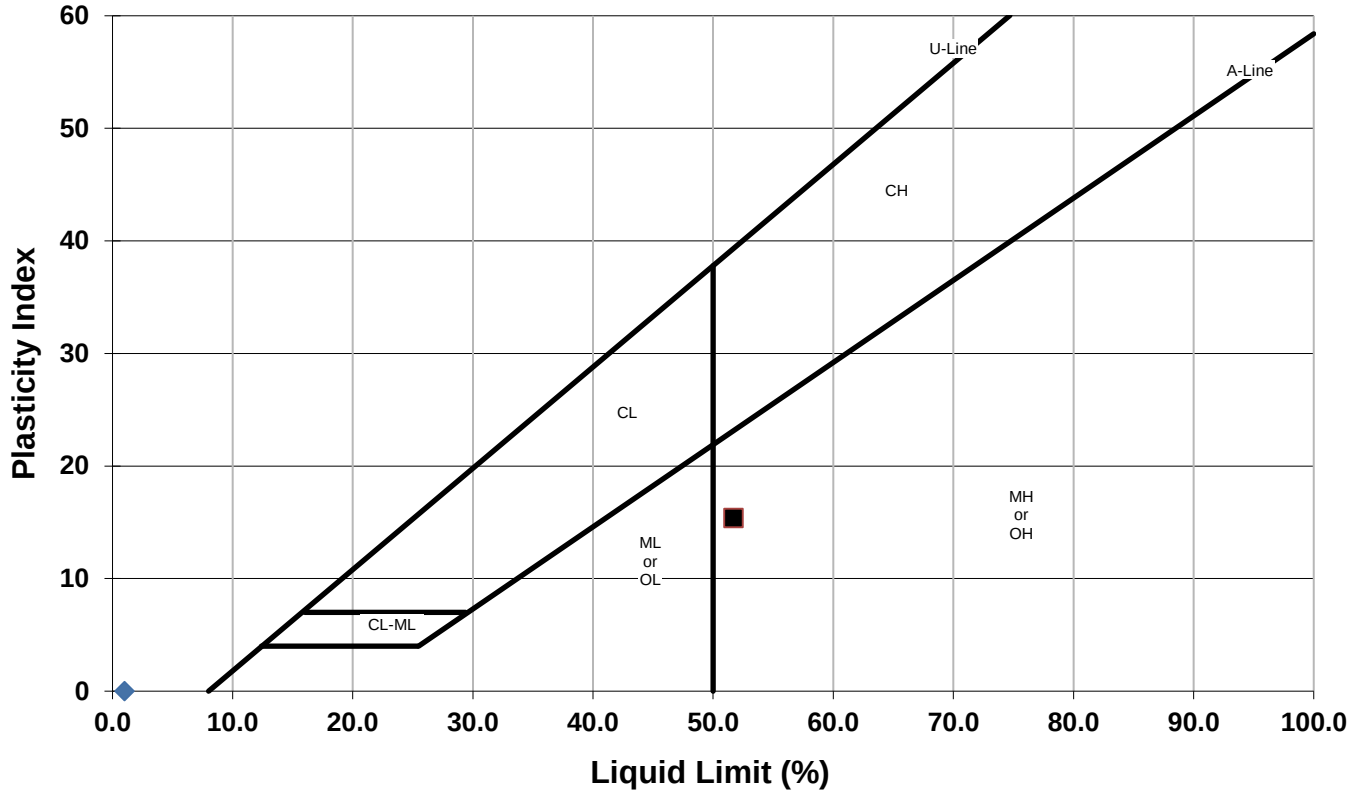
C_u:

C_c:

$W_{content}$(%): 83.3

Test By: RC

Plastic Limits
ASTM D4318



Client: NBDTI Job No: MON-00248797-A0

Project: Inkerman Bridge

Sample Date: N/A Test Date: N/A

Sample By: RC Test By: AH

Location: BH6 SS2

DATA SUMMARY

Sample #	Liquid Limit	Plastic Limit	Plastic Index	Soil Symbol	Soil Type	Legend
MON 2019-336	51.7	36.3	15.4	MH	Sandy Elastic Silt	■

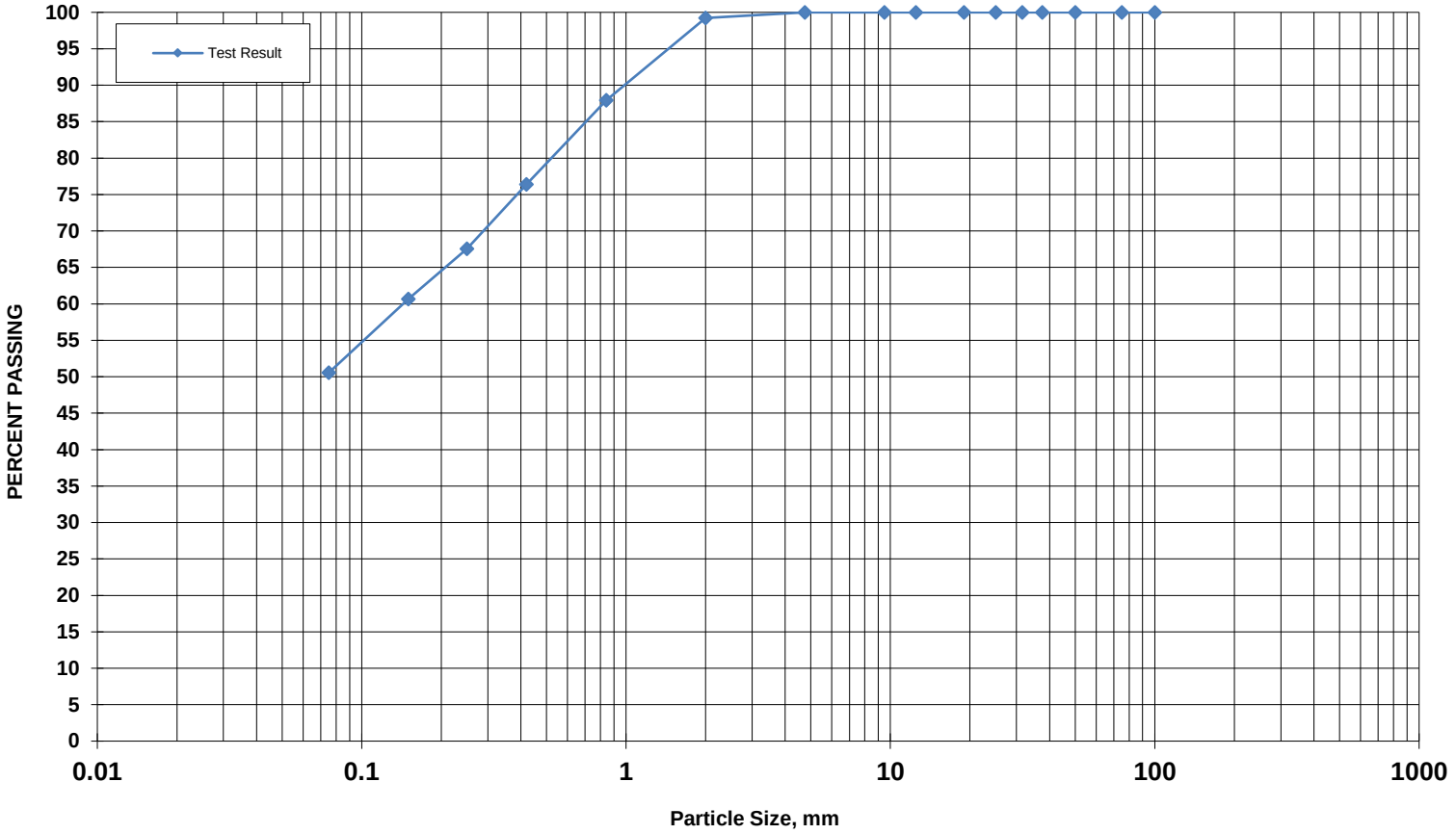
Comment:

MON-00248797-A0

N/A

exp Services Inc. - ASTM/USCS Sieve Analysis

Inkerman Bridge



TEST DATA	
Sieve Size (mm)	Percent Passing (%)
75	100.0
50	100.0
37.5	100.0
31.5	100.0
25	100.0
19	100.0
12.5	100.0
9.5	100.0
4.75	100.0
2	99.2
0.841	87.9
0.42	76.4
0.25	67.6
0.15	60.7
0.075	50.5

Client: NBDTI

Sample: BH6 SS2

Soil Type: Soils

USCS Soil Name: Sandy Elastic Silt

Comment: MON 2020-003

Gravel (%): 0.0

Sand (%): 49.5

Fines (%): 50.5

USCS Symbol: MH

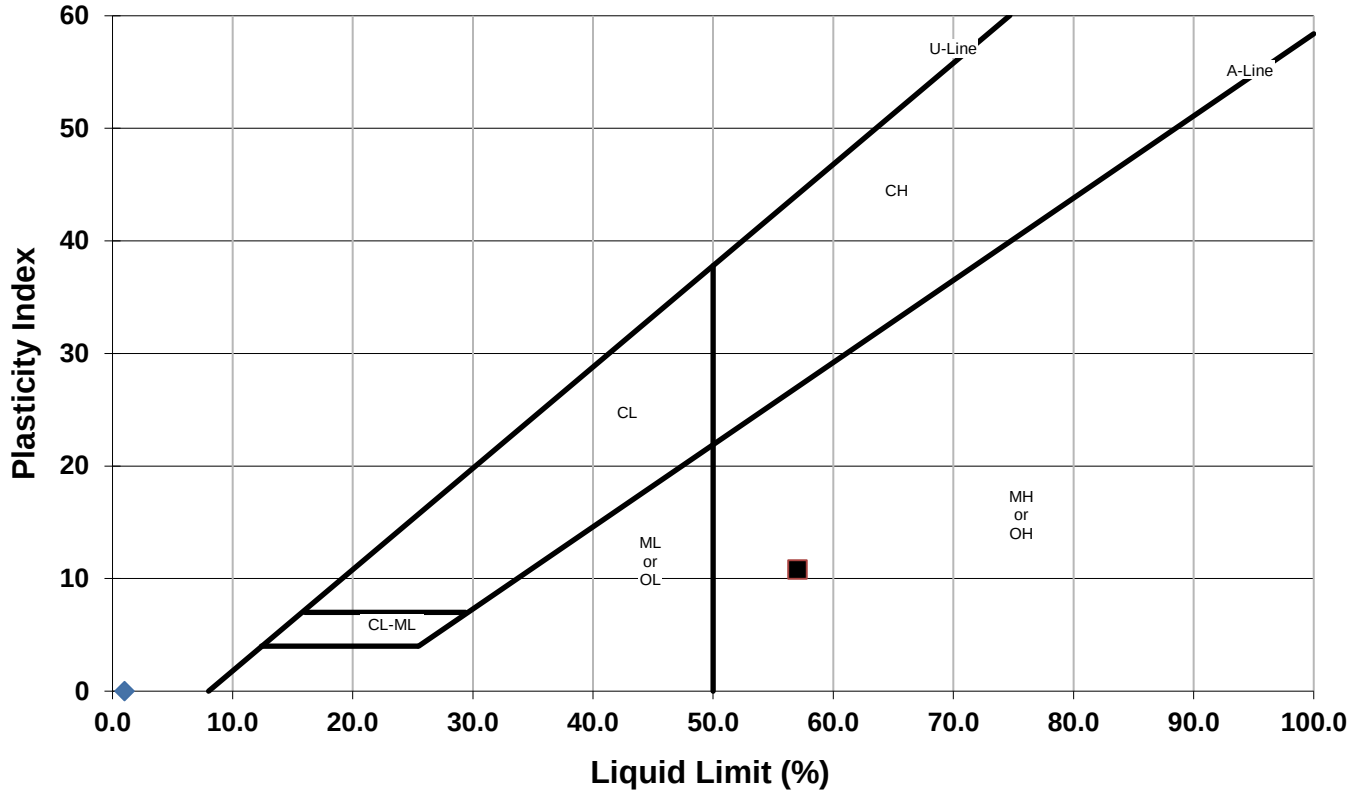
C_u:

C_c:

$W_{content}$(%): 50.6

Test By: RC

Plastic Limits
ASTM D4318



Client: NBDTI Job No: MON-00248797-A0

Project: Inkerman Bridge

Sample Date: N/A Test Date: N/A

Sample By: RC Test By: AH

Location: BH6 SS4

DATA SUMMARY

Sample #	Liquid Limit	Plastic Limit	Plastic Index	Soil Symbol	Soil Type	Legend
MON 2019-336	57.0	46.2	10.8	MH	Sandy Elastic Silt	■

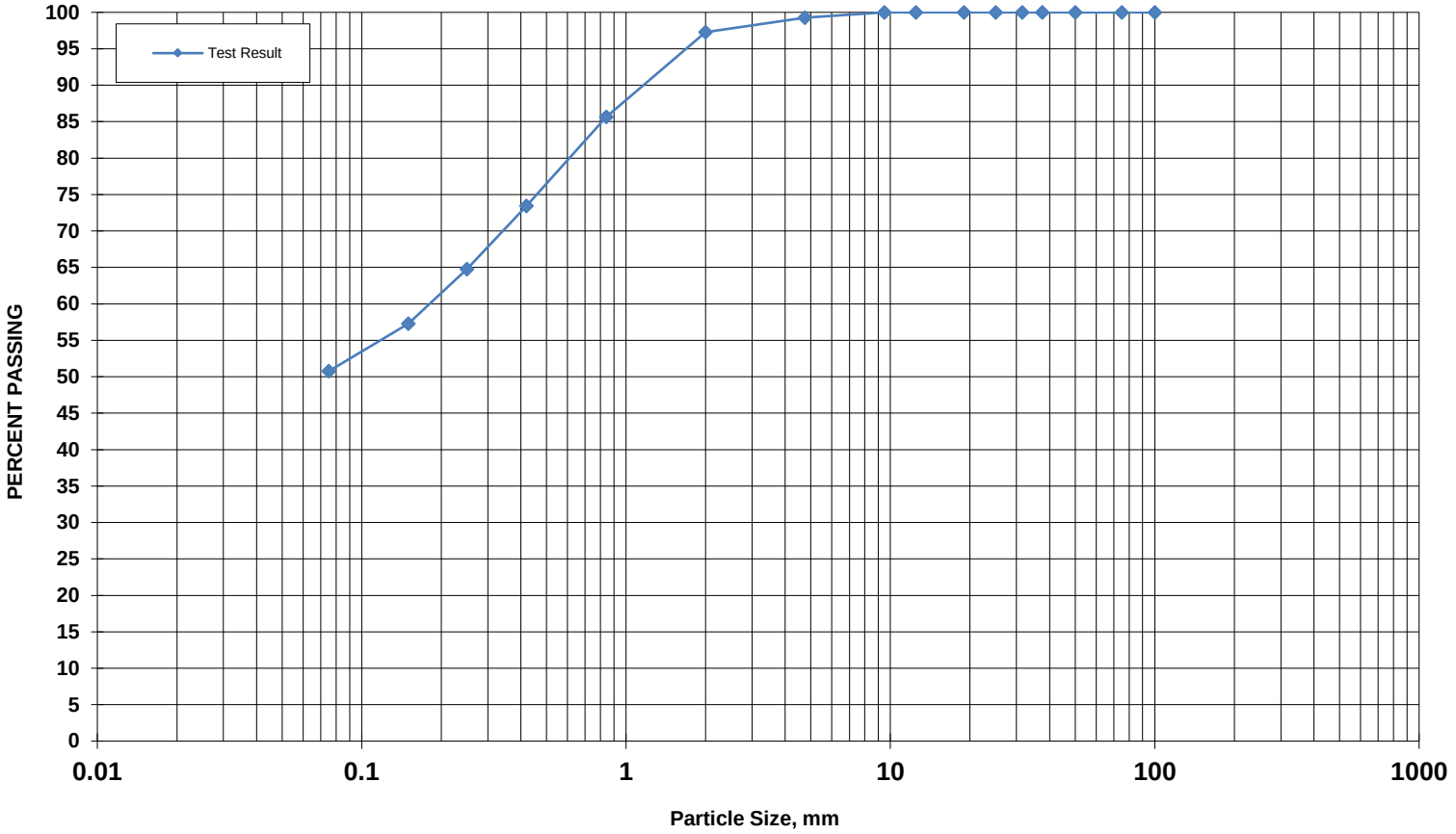
Comment:

MON-00248797-A0

N/A

exp Services Inc. - ASTM/USCS Sieve Analysis

Inkerman Bridge



TEST DATA	
Sieve Size (mm)	Percent Passing (%)
75	100.0
50	100.0
37.5	100.0
31.5	100.0
25	100.0
19	100.0
12.5	100.0
9.5	100.0
4.75	99.3
2	97.3
0.841	85.6
0.42	73.4
0.25	64.8
0.15	57.3
0.075	50.8

Client: NBDTI

Sample: BH6 SS4

Soil Type: Soils

USCS Soil Name: Sandy Elastic Silt

Comment: MON 2020-004

Gravel (%): 0.7

Sand (%): 48.5

Fines (%): 50.8

USCS Symbol: MH

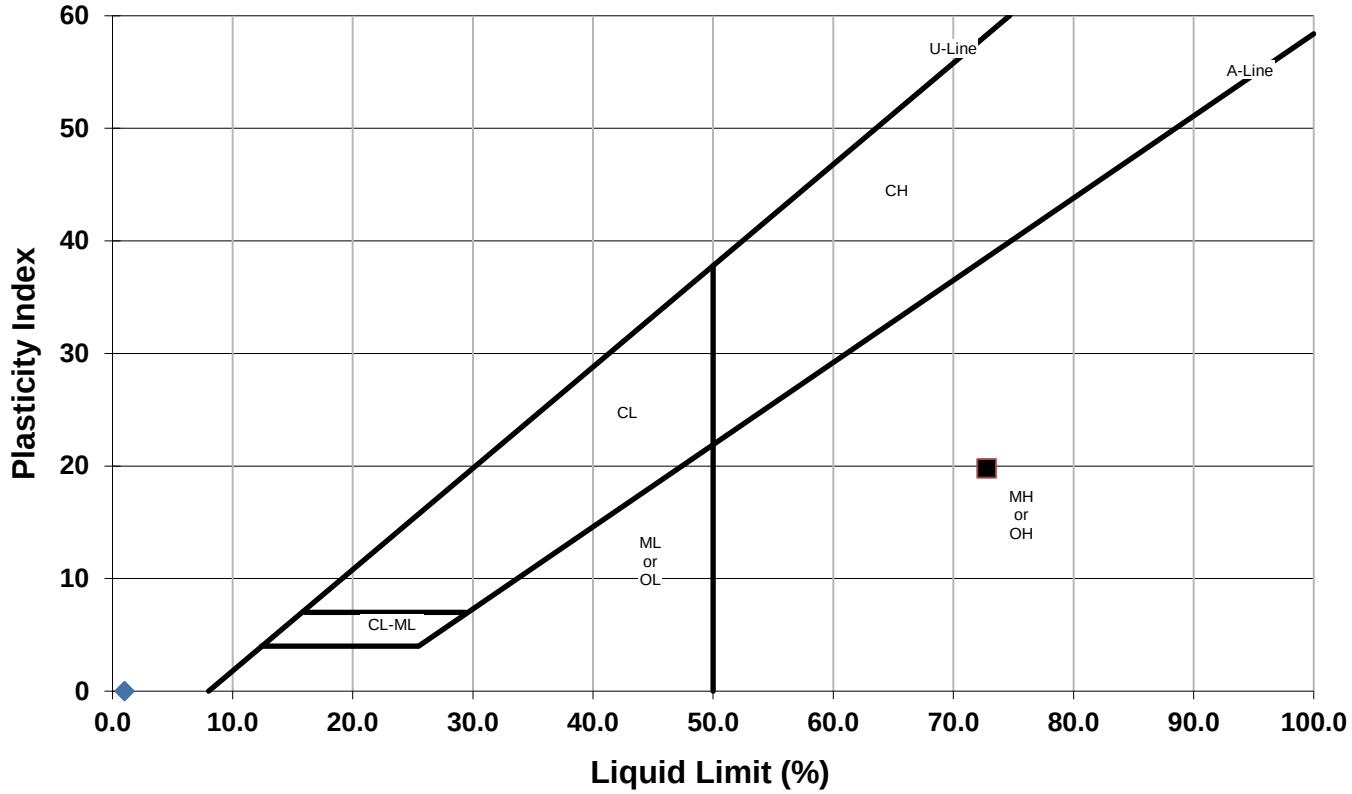
C_u:

C_c:

$W_{content}$(%): 58.7

Test By: RC

Plastic Limits
ASTM D4318



Client: NBDTI Job No: MON-00248797-A0

Project: Inkerman Bridge

Sample Date: N/A Test Date: N/A

Sample By: RC Test By: AH

Location: BH6 SS6

DATA SUMMARY

Sample #	Liquid Limit	Plastic Limit	Plastic Index	Soil Symbol	Soil Type	Legend
MON 2019-336	72.8	53.0	19.8	MH	Sandy Elastic Silt	■

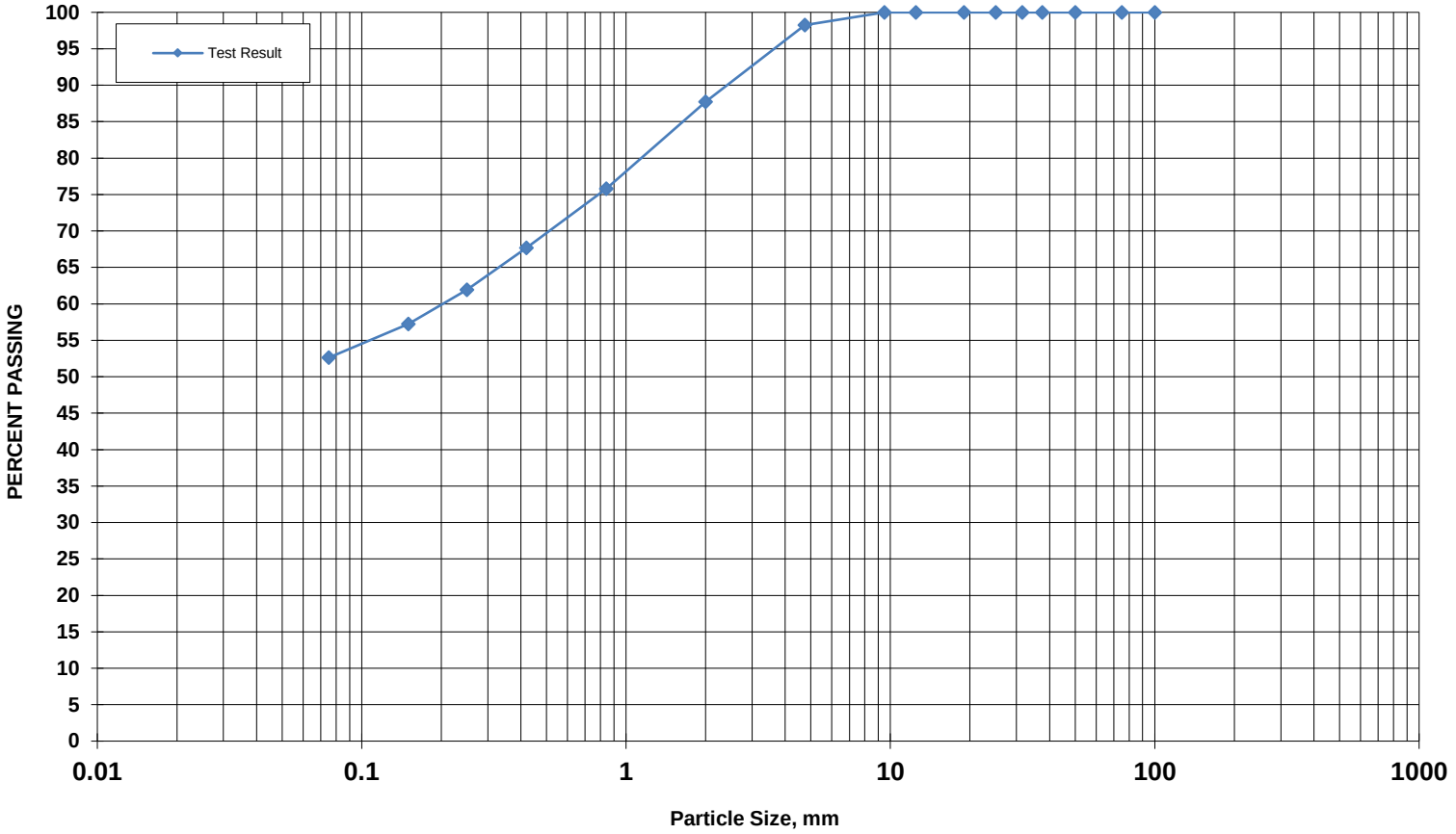
Comment:

MON-00248797-A0

N/A

exp Services Inc. - ASTM/USCS Sieve Analysis

Inkerman Bridge



TEST DATA	
Sieve Size (mm)	Percent Passing (%)
75	100.0
50	100.0
37.5	100.0
31.5	100.0
25	100.0
19	100.0
12.5	100.0
9.5	100.0
4.75	98.3
2	87.7
0.841	75.8
0.42	67.7
0.25	61.9
0.15	57.2
0.075	52.6

Client: NBDTI

Sample: BH6 SS6

Soil Type: Soils

USCS Soil Name: Sandy Elastic Silt

Comment: MON 2020-005

Gravel (%): 1.7

Sand (%): 45.6

Fines (%): 52.6

USCS Symbol: MH

C_u:

C_c:

$W_{content}$(%): 53.7

Test By: RC

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