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Our File No.: 313-21-C
September 15, 2022

**Draft Environmental Impact
Assessment**

Homes by the Bay Residential Development
Pocologan, NB



Prepared for:

Badrock Studio Inc.
2380 Wycroft Road, Unit 3a
Oakville, ON L6L 6W1

Prepared by:





September 15, 2022

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Our File No.: 313-21-C¹

Dear K. Isaias:

**Subject: Draft Environmental Impact Assessment
Homes by the Bay Residential Development, Pocologan, NB**

We are pleased to present this DRAFT report for the aforementioned subject.

We appreciate the opportunity to assist your firm in this project 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 Burt, EP
Environmental Specialist

JB/sl

Enc.:

¹ Ref.: (Y:)313-21(C) 313-21 EIA DRAFT Report – 6September2022.docx





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EXECUTIVE SUMMARY

Badrock Studio Inc, an architectural and urban planning firm, has been contracted to design a proposed 16-lot residential development at 1424 NB Route 175, Charlotte County, located on the shore of Maces Bay in the Bay of Fundy.

The proposed residential development consists of 16 single-family dwelling units connected to a communal wastewater treatment system and serviced by individual private wells. The project will require the demolition of the existing motel and restaurant, grading and levelling of the site, construction of access roads, dwelling units, and the installation of a communal wastewater collection and treatment system. If sale of the initial 16 lots is successful, an additional 3 lots may also be subdivided and sold as a second development phase.

Roy Consultants initiated an Environmental Impact Assessment for the proposed project on behalf of Badrock Studio, as per item (n) of Schedule A of the New Brunswick *Environmental Impact Assessment Regulation* for “all sewage disposal or sewage treatment facilities, other than domestic, on-site facilities”. This assessment will also include a Water Supply Source Assessment for 19 individual domestic water supplies and additional archaeological testing.

Figure A: Artist Rendering





1 PROPONENT

1.1 Name of Proponent

The proponent is Badrock Studio Inc.

1.2 Proponent Address

2380 Wycroft Road, Unit 3A
Oakville, ON L6L 6W1

1.3 Principal Contact Persons

For Badrock Studio Inc:

Mr. Kleo Isaias
Principal

For Roy Consultants (EIA)

Jonathan Burtt, B.Sc.F, EP
Senior Environmental Specialist

1.4 Property Ownership

The project is located on private property. The proposed development is a partnership between the landowner and Badrock Studio Inc.





2 UNDERTAKING

2.1 Name of Undertaking

The name of the undertaking is “Homes by the Bay Residential Development”.

2.2 Background

The proposed project is a privately-owned site located on the shore of Maces Bay, an embayment of the Bay of Fundy. Due to its scenic location, it is an excellent site for a residential development. Due to the limited size of the parcel and number of proposed units, the proponent is proposing a communal wastewater treatment system, rather than conventional septic systems for each unit. Per the *Environmental Impact Assessment Regulation*, Schedule A, Item (n) requires that “all sewage disposal or sewage treatment facilities, other than domestic, on-site facilities” must be registered. By using a non-conventional system, the number of proposed units on the site can be maximized.

The units will be serviced with individual potable wells; therefore, per the DELG Water Supply Source Assessment Guidelines, a pump test to determine available potable water at the site will also be conducted.

The property owner and Badrock Studio Inc. have commissioned Roy Consultants to complete an Environmental Impact Assessment registration document and public consultation program.





Figure B: Project Location (ArcGIS)

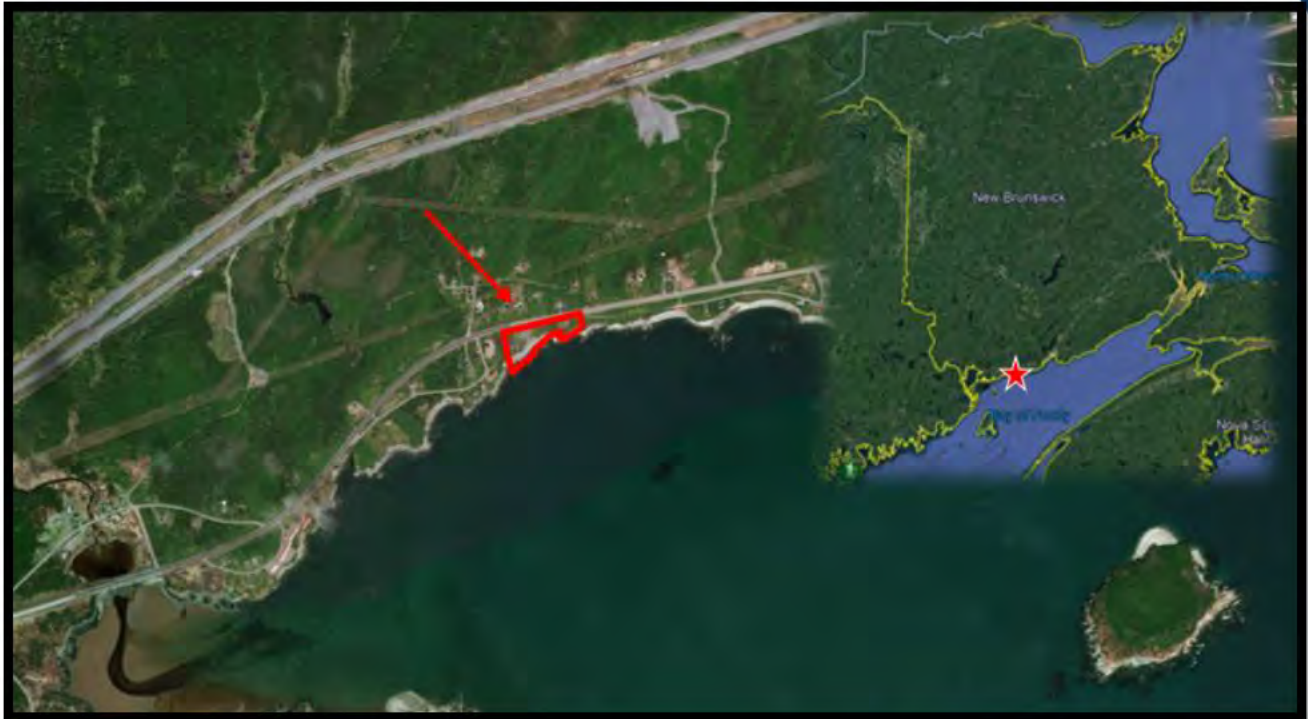


Figure C: Aerial View of Subject Site (ArcGIS, 2019)





2.3 Overview

Badrock Studio Inc. commissioned an Environmental Impact Assessment (EIA) as required by the NB *Environmental Impact Assessment Regulation* for the construction of a 16-lot residential development in Pocologan, NB. The project includes the removal (or demolition) of the existing BayBreeze Motel and Restaurant, the construction of 16 detached dwelling units, construction of individual potable wells, installation of a communal wastewater treatment and collection system, and construction of an access road. The proposed wastewater treatment system would be installed and commissioned by the manufacturer and will discharge to Maces Bay. If the first 16-lot phase (orange blocks in figure D) is successful, an additional 3 lots may also be developed (grey blocks, figure D).

Figure D: Proposed Residential Development Site Plan (Badrock Studio Inc.)



2.4 Purpose/Rationale/Need for the Undertaking

The proposed project is a business venture by the landowner. The proposed project would provide revenue for the landowner, as well as direct and indirect tourist revenue for nearby businesses, and tax revenue for the Province of New Brunswick.

The proponent has invested in the design and planning for the proposed development, therefore the null, or “do-nothing” alternative is not considered feasible.

2.5 Location

The proposed project is located at civic address no. 1424, Route 175 in the Regional Municipality of Pocologan, NB (Charlotte County). The current property consists of four (4) parcels owned by the proponent, identified by Service New Brunswick (SNB) as PID Nos. 15206840, 15077985,





01212406, 15080765 and 01214253. Per SNB Planet, the total area of the subject site is ~1.41 hectares in area.

The subject site is located within the Parish of Pennfield/Lepreau, Charlotte County and is zoned both Mixed Use and Commercial/Light Industrial, per the Lepreau-Musquash planning area.

The centre of the site is geo-referenced at LAT 45°07'42.62"N, LONG 66°34'15.97"W.

The subject site is bordered to the north by Route 175. Ocean View Camping and two (2) private residences are located north of Route 175. Pocologan School Road and two (2) private residences are located to the west of the subject site, and a vacant lot is located to the east. Maces Bay borders the southern portion of the subject site.

In general, the site slopes gradually to the south; however the western portion also slopes to a gully on the western property boundary, and the eastern portion slopes towards a drainage ditch which crosses the site. The southern property boundary is a steep slope ledge which drops to the Maces Bay shoreline. Surface and groundwater are assumed to follow these slopes.

There are no regulated, provincially significant or unmapped wetlands located on the subject property or within 30m of the subject site. Maces Bay in the Bay of Fundy is located directly to the south of the subject site, and an unnamed brook is located approximately 180 metres west of the subject site. The nearest unmapped watercourse is a highway drainage ditch located on the eastern portion of the property.

2.6 Siting Considerations

The project site has a number of favourable elements:

- A. The subject property is owned by the proponent;
- B. There are no terrestrial sensitive environmental features located on the subject site;
- C. Wastewater collection can be done by gravity;
- D. The site is within a short distance to Saint John, and is near New River Beach and other Bay of Fundy tourist attractions;
- E. The site is a desirable property (waterfront), and
- F. The property is correctly zoned for the intended use.

2.7 Physical Components of the Undertaking

The proposed development would include the following components:

- A. 16 residential units: 16 single-family detached dwelling units on individual ¼ - acre;
- B. A communal wastewater treatment system (WWTS): a wastewater treatment system that will treat and discharge the waste from the 16 residential units;
- C. Wastewater collection system: each unit will be connected to a communal wastewater collection system. This will consist of collection pipes connected to an approximately



350mm septic forcemain located under the gravel access road/street, and flow west by gravity to the WWTS. A submerged pipe in the bay would discharge the treated effluent;

- D. Potable Water Wells: Each unit will obtain potable water from individual water wells, and
- E. Access Road/Driveways: The development would include an updated entrance from route 175, and a gravel access road running east-west along the length of the property, with gravel driveways for each unit.

Photo No. 1: Project Site (all Buildings to be Removed or Demolished)



2.8 Construction, Operation and Maintenance

2.8.1 Building Removal or Demolition

The proposed project would require the sale and removal of the existing structures. If necessary, these structures will be demolished, to make room for proposed lots as well as the western-most gravel access road. If sale is not possible within the project development schedule, the demolition of the buildings will involve the following sequence:

1. Removal of all remaining mobile equipment, material to be sold, recycled, etc.;
2. Demolition and disposal of existing structures;
3. Removal of concrete slabs, concrete basement, asphalt and existing septic system;
4. Levelling and grading of area, and
5. Removal of material for disposal at an approved disposal or recycling facility.



Photo No. 2: View of Site from Maces Bay (low tide)



2.8.2 Site Preparation

Upon completion of the demolition, site preparation for construction will be initiated. Site preparation will proceed in the following sequence, upon obtaining all necessary permits:


1. Site survey: A legal survey of each parcel, dwelling unit, gravel access roads and infrastructure will be completed;
2. Removal of vegetation as necessary;
3. Importation and levelling of fill material;
4. Construction of gravel access roads;
5. Installation of wastewater collection system (including construction of effluent discharge pipe), and
6. Preparation of gravel pad for wastewater system.

2.8.3 Construction

Dwelling units will be constructed using standard construction practices per the requirements of the *Canada Building Code* (latest version) and will include:

1. Excavation and pouring of 4' concrete frost walls, footings, slabs and underground pipe installation for each dwelling;



- 
2. Construction of dwellings – wood framed structures with metal or asphalt roofs with metal or vinyl siding (standard construction methods);
 3. Installation of, and connection to, the wastewater collection system;
 4. Drilling of potable wells, and
 5. Final landscaping.

The proposed wastewater treatment system will be installed concurrent with the above construction, subject to scheduling and availability of systems, and will include the installation of a weighted and submerged effluent pipe below the lowest low water mark.

Due to the nature of the site, minor vegetation removal will be required for construction, consisting primarily of removing shrubs or grass (lawn). Upon completion of the project, native vegetation will be re-established on the site – it is the proponent's intent to include a covenant on the properties to allow only native vegetation (i.e. no lawns).

2.8.4 Installation of Communal Wastewater Treatment System

A communal wastewater treatment system will be installed on site to collect and treat all wastewater from the proposed residential development. Treated effluent will then be discharged to Maces Bay via a submerged discharge pipe, located below the lowest low water mark. The wastewater system will include both under- and aboveground components. The detailed site plan for the system will be included with the application for the Approval to Operate.

2.8.5 Operation of Communal Wastewater Treatment System

The proposed wastewater collection system will collect and convey sewage and grey water from each unit to the WWTS. This will be a gravity-fed system and will not require lift stations or pumps. The detailed engineering design will be submitted with the Approval to Operate application.

The WWTS consists of a Moving Bed Biofilm Reactor (MBBR), which has been designed to treat 11 m³/day, and for influent raw wastewater characteristics equal to or less than 300 mg/L BOD₅, 300 mg/l TSS, and 100 mg N/L TKN. The system will be designed to meet effluent quality criteria of CBOD₅ ≤ 10 mg/L, TSS ≤ 10 mg/L, total ammonia nitrogen ≤ 1.25 mg N/L, and 200 CFU/100 ml on a monthly average basis.

Wastewater treatment will consist of the following process:

1. Equalization of Inflow – ensures constant flowrate of raw wastewater
2. Pre-treatment – sludge storage and primary clarifier to remove coarse and fine solids
3. Biological Treatment – Bioreactor 1 and 2 (the Moving Bed Biofilm Reactor)
4. Final Clarifier – removal of biomass from MBBR process
5. Ultraviolet disinfection – UV disinfection via 3 Salcor UV systems
6. Final Pump Tank & Discharge Pipe

The wastewater treatment system will be operated on a continuous discharge basis, and will be operational at full capacity prior to occupation of the first home.





Solids (sludge) will be removed periodically by a licensed septic hauler, as needed.

Refer to Appendix D for detailed information on the wastewater treatment system provided by the supplier.

The detailed engineering for the effluent pipe installation has not been finalized; however, it is anticipated that the pipe will extend to the bottom of the slope, and then below the lowest low water mark to ensure that the end-of-pipe is constantly submerged. If necessary and depending on the suitability of the beach portion of the intertidal area, the pipe may extend over the rock outcropping before being anchored. The end-of-pipe will be submerged and anchored with the installation of a concrete collar.

Figure E: Approximate Discharge Pipe Location



The actual length of the pipe and location of the collar will be determined through the detailed design process, and will depend on the exact location and the depth of the water at the site.

Sludge will be stored in the Sludge Storage Tank, and pumped out via a local septic hauler when the storage tank reaches 50% of its capacity. An alarm will automatically alert the Certified Operator when this occurs as part of the system's PLC.

The system will be equipped with a PLC system with a remote monitoring IOT Gateway. This allows the Certified Operator to remotely connect to the system via wireless connection. In case of a





mechanical failure, the PLC will automatically and immediately send an alarm to the operator via text and email.

During an abrupt power outage, the system will cease to operate and an alarm message will be automatically sent from the PLC via cellular signal, to the operator. In the event of an extended power outage, a local septic hauler will be contracted to pump out the system as needed.

The system will operate for the exclusive use of the Homes by the Bay, and will not accept waste from outside sources.

An Approval to Operate the WWTS will be obtained from the DELG concurrent with the EIA review.

2.8.6 Decommissioning

At this time, there are no plans for the decommissioning or abandonment of the site or infrastructure.

2.8.7 Schedule

Project construction is anticipated to begin in April, 2023 upon receipt of all applicable approvals.

2.9 Regulatory Approvals

- i. Item (n), Schedule A of the Environmental Impact Assessment (EIA) Regulation states: “all sewage disposal or sewage treatment facilities, other than domestic, on-site facilities”. The installation and operation of a communal wastewater treatment system requires registration and review under the EIA process. As this project also involves more than 10 subdivided lots, a Water Supply Source Assessment must also be conducted as part of the EIA (Gerard Souma, DELG, Pers. Comm).
- ii. An *Approval to Operate* the wastewater treatment system will be required from the Department of Environment and Local Government. An application will be submitted under separate cover, concurrent with the EIA review.
- iii. A *Development Permit* from the Southwest Regional Service Commission for the subdivision of the lot and construction of the dwelling units will be required.
- iv. A *License of Occupation* from the Department of Natural Resources and Energy Development for the submerged effluent pipe.
- v. A *Fisheries Act Authorization* may be required for the installation of the discharge pipe and operation of the wastewater treatment system.

3 DESCRIPTION OF THE ENVIRONMENT

3.1 Physical and Natural Features

3.1.1 General

The subject site consists of parcels PID 01212406, 01214253, 15200363, 15175714, 15080765, 15077985, and 15200298. The subject site contains the BayBreeze Motel and Restaurant, as well





as a vegetated area to the east and bordering Maces Bay, a gravel parking lot, and a small, paved strip in front of the motel (a portion of the former coastal highway).

The subject site is located within the Fundy Coast Ecoregion which spans the entire southern coastline of New Brunswick, and ranges from flat-lying salt marshes to high cliffs. “This ecoregion has the largest number of officially protected areas in New Brunswick, including the Fundy National Park, two (2) conservative areas, four (4) nature preserves, one (1) nature park, one (1) ecological reserve, and three (3) bird sanctuaries. Other significant attributes that the Fundy Coast Ecoregion possesses are the world’s highest tides, a unique type of raised bog, a number of pristine gorges, and a maritime climate.

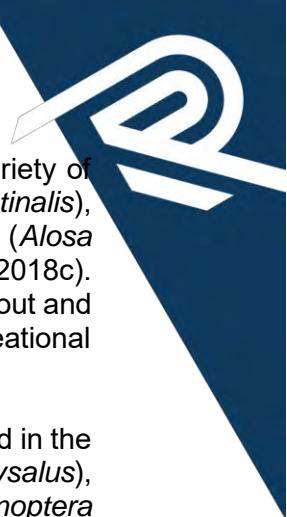
“The cool, moist climate has led to coniferous forests dominating in this region. Mainly red spruce together with balsam fir, black spruce, white spruce, and tamarack can be found. The most common hardwoods that can be found are white birch, mountain ash, red maple, and some yellow birch. During the cool, damp summers, the understorey of these forests can support boreal-type species such as rock cranberry on dry sites and cloudberry in peatlands. In some locations, coniferous forests will dominate at lower elevations and mixed or deciduous forests will cover the warmer inland terrain.

“The Fundy Coast Ecoregion has a rich diversity of wetland types, including raised coastal bogs. The most distinguishing features of Fundy bogs are their morphology and surface features. Generally, these bogs form in deep depressions that are topographically restricted, and have a limited number of small surface pools. Another unique feature of these bogs is their extensive scirpus lawns. These lawns are composed of vibrant carpets of red mosses covered with the sedge *Scirpus caespitosus*, the lichen *Cladina terrae-novae*, or dwarfed shrubs such as leatherleaf or bog rosemary. Another wetland type that can be found in this region is coastal marshlands. These marshlands are unique in that they contain significant areas of both low and high salt marsh. Low salt marsh lies below the mean high-water mark, are flooded daily by the tides, and are dominated by salt-water cord-grass. High salt marsh lies above the mean high-water mark, are flooded only during the highest tides, and contain salt-meadow grass and black grass as dominant vegetation.” (DNR, 2007)

The site is located on the shore of Maces Bay, an embayment of the Bay of Fundy. The Bay of Fundy ecosystem provides habitat to over 100 fish species, including a variety of commercial, recreational, and Aboriginal fisheries. Common commercial fish species include (DFO 2018a-b):

- Atlantic Cod (*Gadus morhua*)
- Haddock (*Melanogrammus aeglefinus*)
- Atlantic Halibut (*Pollachius virens*)
- Winter Flounder (*Hippoglossus hippoglossus*)
- Alewife (*Alosa pseudoharengus*)
- American Shad (*Alosa sapidissima*)
- Blueback Herring (*Alosaestivalis*)
- Atlantic Herring (*Clupea harengus*)
- Atlantic Mackerel (*Scomber scombrus*)
- Spiny Dogfish (*Squalus acanthias*)
- American Lobster (*Homarus americanus*)
- Deep-sea Scallop (*Placopecten magellanicus*)
- Green Sea Urchin (*Strongylocentrotus droebachiensis*)





In addition to the commercial species listed above, the Bay of Fundy is also home to a variety of diadromous fish species, including Atlantic Salmon (*Salmo salar*), Brook Trout (*Salvelinus fontinalis*), Striped Bass (*Morone saxatilis*), Rainbow Smelt (*Osmerus mordax*), Gaspereau (*Alosa pseudoharengus*, also fished commercially), and American Eel (*Anguilla rostrata*) (DFO 2018c). There are recreational fisheries for several of these species in freshwater, including Brook Trout and Striped Bass. Historically, Atlantic Salmon were also fished recreationally, however, the recreational fishery has been closed due to conservation concerns (DFO 2018d).

A variety of marine mammals can be found in the Bay of Fundy. Baleen whales that are found in the area include North Atlantic Right Whales (*Eubalaena glacialis*), Fin Whales (*Balaenoptera physalus*), Humpback Whales (*Megaptera novaeangliae*), and Common Minke Whales (*Balaenoptera acutorostrata acutorostrata*). Toothed whales found in the area include Harbour Porpoise (*Phocoena phocoena*) and Atlantic White-sided Dolphins (*Lagenorhynchus acutus*). Harbour Seals (*Phoca vitulina vitulina*) are also frequently observed.

In addition to its biodiversity, the Bay also provides industrial and commercial shipping functions for a number of large ports in New Brunswick and Nova Scotia, the nearest of which is the Saint John industrial park and the Port of Saint John, which regularly accepts cruise ships, large container ships, and petroleum tanker vessels.

3.1.2 Archaeological Resources

The Department of Tourism, Heritage and Culture's Heritage and Archaeological Services Branch (HASB) provided the archaeological probability mapping for the subject site. Two mapped pre-contact archaeological sites, BgDp-1 and BgDp-2 were identified approximately 700 and 750 m (respectively) from the subject site. No known archaeological or heritage resources were identified for the subject site, and slope values range from 60 – 89%.

Based on the high potential for archaeological resources at this location, the proponent commissioned an archaeological impact assessment of the site. Refer to the results in Appendix F and Section 4 for additional discussion on assessment and mitigation of archaeological resources.

3.1.3 Aquatic Wildlife and Habitat

Per the Department of Fisheries' Aquatic Species at Risk website, Maces Bay does not contain critical habitat for any aquatic Species at Risk (<http://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html>).

The proponent commissioned an Underwater Benthic Habitat Survey (UBHS) for the nearshore aquatic habitat, to identify baseline aquatic habitat conditions and aquatic wildlife present. Species identified during this survey included Northern Rock Barnacle (*Semibalanus balanoides*), Periwinkle (*Littorina littorea*), Smooth Periwinkle (*Littorina obtusata*), Sand Dollars (*Echinarachnius parma*) and one occurrence of a Moon Snail (*Euspira heros*) and Hermit Crab was observed.

Aquatic flora species observed during the survey include Rockweed (*Ascophyllum nodosum*), Bladderwrack (*Fucus visiculosus*), Soft Feather Weed (*Plumaria plumose*), Sugar Kelp (*Saccharina latissima*), Sea Lettuce (*Ulva lactuca*), Eelgrass, and Spiny Sour Weed (*Desmarestia aculeate*).





The aquatic habitat adjacent to the subject site is comprised of a hard bottom substrate and sand barrens. The hard bottom is comprised of bedrock ledge or boulder, and supports a high cover of various algal species. The sand barrens are largely devoid of flora or fauna, with limited vegetation such as thin eelgrass patches and debris. The intertidal zone is a mixture of covered bedrock ledge and sand/gravel areas. Refer to the UBHS Report in Appendix E.

3.1.4 Atmospheric

The subject site is located in the Southern Air Zone, which includes the City of Saint John, home to the highest density of industrial emitters in New Brunswick. Saint John is approximately 40 kilometres east of the subject site. The nearest industrial sources are the JD Irving Lake Utopia Pulp Mill, approximately 15 km west of the site, and the Coleson Cove Generating Station operated by New Brunswick Power Corporation (NB Power), located approximately 28 km east of the site.

Although air emissions from the aforementioned sources may impact Pocologan, other air impacts will occur from the proximity of the coast (odours), use of firewood for heating, or emissions from internal combustion engines (volatile organic carbon, particulate matter). Odours can create a nuisance through the decay of aquatic vegetation present in the intertidal zone during low tide.

The wind rose diagram for the St. George/Bay of Fundy zone (windfinder.com) shows that there is generally no prevailing wind direction for the coast along the Bay of Fundy. Wind speeds and direction are spread out relatively evenly throughout the year.

Given the distance to the nearest industrial emitters in the region, baseline air quality at the subject site is considered acceptable.

3.1.5 Environmentally Significant Areas

A review of the Nature Trust NB Environmentally Significant Area (ESA) database found three (3) ESAs within a 5-km radius of the subject site:

ESA #850 Pocologan River: Flows into Bay of Fundy at the west end of Maces Bay. A river with moderate Salmon run and rearing areas. Low water may concentrate the fish near the mouth in a tidal basin, prohibiting upstream passage. Roadcuts along Highway 1 and shoreline exposures are mostly in highly deformed Precambrian granitic rocks. Well-developed cleavage gives these rocks a slaty appearance. Based on the distance from the proposed project, no interaction between the project and this site is anticipated.

ESA #846 New River (beach) & Barnaby Headland: Flows into the Bay of Fundy at the east end of Maces Bay. The river contains Salmon spawning and nursery areas, but cascades and falls at the mouth of the river allowing Salmon passage only when the water is high. There is highly deformed Precambrian granitic rocks are exposed along the highway. Granitic texture is obliterated by deformation except locally in the stream outcrops below the New River Bridge. The Barnaby Head Nature Trail originates at the fine sandy beach where Sanderlings feed during fall migration. It displays the features of the Bay of Fundy, with headlands, rocky beaches, pebble beaches, sandy coves and forest only a few feet from the sea, all on a relatively remote and undisturbed peninsula. Based on the distance from the proposed project, no interaction between the project and this site is anticipated.





ESA #843 Maces Bay & Ledges: Located in the Bay of Fundy, between Pocologan and Haggertys Cove. Per the database: “Maces Bay supports moderate numbers (approximately 5,000-14,000 birds in 1975-77) and an interesting diversity (16 species) of shorebirds during autumn migration. The extensive rocky intertidal zone is an important wintering site for Purple Sandpipers (525+ birds). The area is also among the most important locations in the Maritimes for Semipalmated Plover, Least Sandpiper and Ruddy Turnstone. The Maces Bay ledges, on the east side of the bay, are one of the most important intertidal areas on the Bay of Fundy, incorporating rich salt pools and dry ledges and supporting a wide variety of marine plants and organisms. The area is therefore very important for shorebirds, ducks, spawning fish, and for large numbers of Brant and Eider in summer. The coast from Maces Bay to Blacks Harbour is important for waterfowl, where for example thousands of Brant can be seen during spring migration. Large granite boulders can be seen in the steeply dipping Triassic redbeds exposed in the cliffs north of the wharf at Maces Bay settlement, on the east side of the bay”. Based on the nature of the project, its minimal footprint in the intertidal zone, and its low potential environmental impacts, no impacts on this ESA are anticipated.

Figure F: ESA Locations Within 5-km Radius. Subject site is shown in red (GeoNB, 2019).



3.1.6 Geology

The subject site is underlain by Cambrian-aged rocks comprised of the Golden Grove Plutonic Suite and Pocologan Harbour Granitoid consisting of variably mylonitic, grey to dark grey, dioritic to granitic rocks with abundant metamorphic biotite and muscovite (McLeod et al., 2005). Surficial geology of the site is comprised of Late Wisconsinan and/or Early Holocene-aged marine sediments, deposited as blankets and plains. Sediments consist of sand, silt, some gravel and clay; generally 0.5 m to 3 m thick (Rampton, 1984).





3.1.7 Groundwater

No municipal groundwater supplies are located in the area, and a search of the NBDELG's Online Well Log System (OWLS) identified 15 wells within a 1,500m radius of the site. 14 of these wells were domestic wells, and 1 was classified as agricultural. From a review of available well logs, well depths range between 165 and 500 feet. Well yields ranged from 0 IGPM to 12 IGPM. Commercial and residential buildings in the area obtain their potable water from private wells. For additional information, refer to the Step 1 WSSA application in Appendix A.

3.1.8 Heritage Sites

A review of information provided by www.Historicplaces.ca and the New Brunswick Register of Historic Sites' Website shows there are no heritage sites in proximity to the proposed project.

3.1.9 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 located within IBA NB020, Point Lepreau/Maces Bay. Per the IBA Canada Website description:

"Point Lepreau and Maces Bay are located along the northern coast of the Bay of Fundy, about 30 km southwest of Saint John. The point forms the eastern border of Maces Bay, Welch Cove, and Little Lepreau Basin, which make up the marine areas of the site. These marine areas contain intertidal reef ledges bordered by mud flats, and a few shallow inlets. Several islands are also present including New River Island, and The Brothers (Salkeld Islands). Intertidal reefs and waters extend about 10 km south from the point into the Bay of Fundy. The shoreline is low and rises gradually, with low cliffs and reefs exposed at low tide. The tidal range is 6 to 8 m (not as dramatic as the tides of the upper bay)."

"The intertidal ledges of Maces Bay are recognized as an important spring staging area for migrating Brant. As many as 2,000 birds have been recorded staging here, although the numbers recorded are generally in the range of 1,000 (about 1% of the estimated eastern North American ssp. hrota population).

"Data collected during the late 1970s and early 1980s suggests that the site is especially important for Semipalmated Plovers (possibly as much as 6.6% of the world's estimated population) and Least Sandpipers (over 3% of the world's estimated population). Other shorebirds that concentrate at this site during the fall migration include Semipalmated Sandpiper, Short-billed Dowitcher, Black-bellied Plover, Sanderling, White-rumped Sandpiper, and Greater Yellowlegs. Large numbers of wintering Purple Sandpipers have also been recorded at this site with some estimates being in excess of 500 birds (just over 5% of the eastern North American wintering population).

"In addition to this site's importance for staging geese and shorebirds, Point Lepreau functions as a major concentration point for thousands of migrating waterfowl that travel along the north coast of the Bay Fundy during the spring. Systematic coverage from April 11 to May 5, 1996 yielded the following estimates: Red-throated Loon (3,222); Common Eider (10,143); Oldsquaw (1,305); Black Scoter (35,037); Surf Scoter (15,389); and White-winged Scoter (617). In total, over 65,000 sea ducks migrated past the point, with the number of Black Scoters being particularly interesting (from 17.5 to possibly as much as 44% of the estimated eastern North American population). Wintering





Harlequin Ducks from the eastern population (designated as nationally endangered) have also recorded at this site with estimates of ten or more birds being present.

“The islands in Maces Bay (New River and The Brothers [Salkeld] islands) support a large colony of about 1,000 pairs of nesting Common Eider (just over 1% of the Atlantic ssp. *dresseri* population).”

Based on the scope of work, the small spatial extent of the project, and the minimal anticipated impacts, the proposed project is not anticipated to adversely impact this Important Bird Area.

3.1.10 Land Use

The subject site is private land owned by the proponent.

Neighbouring land uses are primarily residential or forested, with the exception of Ocean View Camping located north of the site, across NB Route 175. Pocologan School Road and two (2) residences are located to the west of the subject site, and a vacant lot is located to the east. Maces Bay is located immediately south of the subject site.

The subject site is located within the Lepreau-Musquash zoning area, under the Southwest Regional Service Planning Commission, and is classified as “MU – Mixed Use”. The proposed residential development is a permitted use in this area. Refer to the zoning map in the WSSA Initial Application in Appendix A.

3.1.11 Migratory Birds

Environment Canada regulates the protection of migratory birds through the *Migratory Birds Convention Act* (MBCA), which protects migratory birds, their eggs, nests and their 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 land birds (birds with principally terrestrial life cycles). Most of these birds are specifically named in the Environment Canada publication, *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 majority of migratory birds in this ecodistrict nest between April 15 and August 31, according to Bird Studies Canada’s Nesting Calendar Query Tool (with the exception of some early-nesting raptor and woodpecker species).

The subject site consists of an active commercial site with no large trees; vegetation consists mostly of low forbs and shrubs. No migratory bird nests were identified within the eaves of the buildings on site, and no cavities were observed along the shoreline embankment. Shorebirds and waterfowl are assumed to forage along the shoreline for food, although no birds were observed on site during site visits.

3.1.12 Population and Economy

According to the 2016 Statistics Canada census data, the population of Lepreau Parish, which includes Pocologan, is 705 with a median age of 53. The employment rate is 46.9% with 355 people employed. Within the population of employed residents, the main categories of employment are sales and service, trades, transport and equipment operators, and natural resources and agriculture.

The proposed project is not anticipated to contribute significantly to long-term employment in the area; however, construction of the project will result in temporary employment, and occupants of the dwelling units will contribute directly and indirectly to the economy of the area.

3.1.13 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. 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.

A request for Species at Risk Information was submitted to the Atlantic Canada Conservation Data Centre (ACCDC). Table 1 identifies the S-Rank and Rarity Definitions described in the ACCDC report (Appendix G).

The ACCDC provided a list of rare or uncommon plant and wildlife species within a 5-km buffer zone of the subject site. All species were cross-referenced with Schedule 1 of the *Species at Risk Act* (SARA), the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and the Schedule A prohibitions of the New Brunswick *Species at Risk Act* (Prohibitions Regulation – Species at Risk Act 2013).





Six (6) legally listed species of fauna, one (1) legally listed species of flora and three (3) location-sensitive species were identified by the ACCDC scan as being present within a 5-km radius of the project site: Evening Grosbeak (*Coccothraustes vespertinus*), Harbour Porpoise – Northwest Atlantic Population (*Phocoena phocoena*), Horned Grebe (*Podiceps auritus*), Easter Cougar (*Puma concolor* pop. 1), Long-finned Pilot Whale (*Globicephala melas*), Red-necked Grebe (*Podiceps grisegena*), Ghost Antler Lichen (*Pseudevernia cladonia*), Snapping Turtle (*Chelydra serpentina*), Bald Eagle (*Haliaeetus leucocephalus*), and Peregrine Falcon- anatum/tundris population (*Falco peregrinus* pop. 1).

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. |
| 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. |
| SNR | Unranked - Provincial conservation status not yet assessed. |
| 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). |
| 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. |

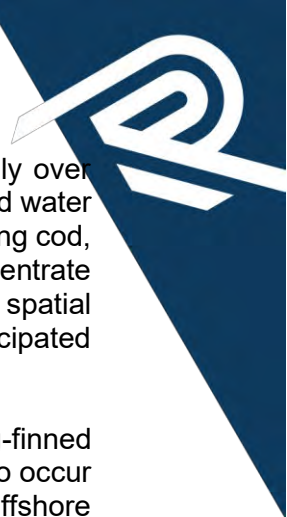


| | |
|--|--|
| M | Migrant - Migrant species occurring regularly on migration at particular staging areas or concentration spots where the species might warrant conservation attention. Conservation status refers to the aggregating transient population of the species in the province. |
| ? | Inexact or uncertain: Denotes inexact or uncertain numeric rank. |
| 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. |
| NBERD 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 | |
| Extinct (X) | A Wildlife Species that no longer exists. |
| Extirpated (XT) | A Wildlife Species that no longer exists in the wild in Canada but exists elsewhere. |
| Endangered (E) | A Wildlife Species facing imminent extirpation or extinction. |
| Threatened (T) | A Wildlife Species that is likely to become an 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. |
| Data Deficient (DD) | A category that applies when the available information is insufficient (a) to resolve a Wildlife Species' eligibility for assessment or (b) to permit an assessment of the Wildlife Species' risk of extinction. |
| Not at Risk (NAR) | A Wildlife Species that has been evaluated and found to be not at risk of extinction given the current circumstances. |

Evening Grosbeak (*Coccothraustes vespertinus*) has a COSEWIC status of Threatened. These birds breed in open, mature mixedwood forests, where fir and spruce trees dominate, and spruce budworm is abundant. Taking into account the scope of work and the temporal and spatial extent of the project, as well as the habitat requirements of this species, the project is not anticipated to adversely impact this species.

Harbour Porpoise – Northwest Atlantic Population (*Phocoena phocoena*) has a COSEWIC status of Special Concern, and a SARA status of Threatened. Harbour porpoises are found in the shallower





coastal areas of the ocean, generally within 250 km of shore. Although they occur primarily over continental shelves, they can also be found in deeper waters. They are well adapted to cold water and are rarely found in waters warmer than 16 °C. They feed on a variety of small fish including cod, herring, and capelin, and are often found where physiographic features may help them concentrate prey and facilitate prey capture. Taking into account the scope of work and the temporal and spatial extent of the project, as well as the habitat requirements of this species, the project is not anticipated to adversely impact this species.

Long-finned Pilot Whale (*Globicephala melas*) has a COSEWIC status of Not At Risk. Long-finned Pilot Whales prefer deep temperate to subpolar oceanic waters, but have also been known to occur in coastal waters in some areas. In the winter and spring, they are more likely to occur in offshore oceanic waters or on the continental slope. In the summer and autumn, they generally follow their food farther inshore and on to the continental shelf. Most feeding occurs at night in deep waters between depths of 650 and 1,650 feet. Taking into account the scope of work and the temporal and spatial extent of the project, as well as the habitat requirements of this species, the project is not anticipated to adversely impact this species.

Red-necked Grebe (*Podiceps grisegena*) has a COSEWIC status of Not At Risk. In North America, this species breeds mainly in Canada and Alaska, mostly on shallow freshwater lakes in lowland areas. Some pairs will also nest in small lakes, bogs, ponds, large ditches or borrow pits, and wetlands of montane valleys at higher elevations. Migrants can be found on almost any body of water in the spring and fall, though most appear on larger lakes. In the winter, this species can be found in cold, shallow waters along ocean coastlines. Along the coasts, these species tend to forage more actively for fish and occasionally shrimp during higher tides. Taking into account the scope of work and the temporal and spatial extent of the project, as well as the habitat requirements of this species, the project is not anticipated to adversely impact this species.

Horned Grebe (*Podiceps auritus*) has a COSEWIC and Provincial status of Special Concern. Horned Grebe generally winter in marine habitats, mainly estuaries and bays. They can be found in great numbers in coastal habitats, including areas that offer some degree of protection. Some birds will winter on inland lakes and rivers in areas where the minimum temperature in January is higher than -1°C. This species primarily breeds in the Prairies and Parkland Canada, but can also be found in more boreal and subarctic zones. They generally nest in freshwater, and occasionally in brackish water on small ponds, marshes, and shallow bays on lake borders. Taking into account the scope of work and the temporal and spatial extent of the project, as well as the habitat requirements of this species, the project is not anticipated to adversely impact this species.

Eastern Cougar (*Puma concolor* pop. 1) has a COSEWIC status of Data Deficient and a Provincial status of Endangered. The existence of Eastern Cougar in New Brunswick is anecdotal, and habitat preference for this species is therefore not known. This project is not anticipated to adversely impact this species.

Ghost Antler Lichen (*Pseudevernia cladonia*) has a COSEWIC status of Not At Risk. In Canada, Ghost Antler Lichen can be found in high-elevation, humid montane or coastal coniferous forests dominated by red spruce and/or balsam fir. On the coasts, this species tends to inhabit humid forest interiors. This lichen can be found growing on balsam fir, red spruce, and in some poorly drained sites, black spruce. It occurs mainly on the twigs and branches of these tree species, or on woody debris on the forest floor. Taking into account the scope of work and the temporal and spatial extent





of the project, as well as the habitat requirements of this species, the project is not anticipated to adversely impact this species.

Location-Sensitive Species: The ACCDC report also identified location-sensitive species which are known to occur within a 100km radius of the project site:

Snapping Turtle (*Chelydra serpentina*) is a location sensitive species that has a SARA and Provincial Status of Special Concern. Snapping Turtles can be found in almost every kind of freshwater habitat, and occasionally can be found in brackish coastal waters. They prefer slow-moving water with a soft mud bottom and dense aquatic vegetation. Populations are usually located in ponds, sloughs, shallow bays or river edges, slow streams, or areas combining several types of wetland habitat. Female Snapping Turtles generally nest on sand and gravel banks along waterways. Hatchling Snapping Turtles usually move to water and bury themselves under leaf litter or debris. Taking into account the scope of work and the temporal and spatial extent of the project, as well as the habitat requirements of this species, the project is not anticipated to adversely impact this species.

Bald Eagle (*Haliaeetus leucocephalus*) has a provincial status of Endangered. Bald Eagles build nests made of sticks and plant material in the top of tall trees – often a large white pine. They prefer sites near open water where they have access to an abundant source of fish. Breeding occurs in April through mid-May. Disturbances during this sensitive period should be avoided as it may cause the bird and its mate to abandon their nest. Coastal islands in New Brunswick provide suitable habitat for the Bald Eagle and are used as common nesting sites. In the winter, they are frequently found in the southwestern portion of the province. Taking into account the scope of work and the temporal and spatial extent of the project, as well as the habitat requirements of this species, the project is not anticipated to adversely impact this species.

Peregrine Falcon - anatum tundris population (*Falco peregrinus* pop. 1) has a SARA status of Special Concern, and a Provincial status of Endangered. The Peregrine Falcon anatum/tundrus breeds in habitats that range from Arctic tundra to coastal islands and major urban centres. This species generally nests on cliff ledges or crevices. Cliffs ranging from 50 to 200 meters in height are preferred, however, this species is highly adaptable in nest site selection. It can nest on escarpments, in quarries, in trees, nest boxes, and on various anthropogenic structures. Since this species feeds primarily on birds captured in the air, it prefers sites located near seabird colonies, shorebird and waterfowl staging or nesting areas, or sites with large numbers of pigeons or songbirds. Taking into account the scope of work and the temporal and spatial extent of the project, as well as the habitat requirements of this species, the project is not anticipated to adversely impact this species.

No SAR or their critical habitats were observed on or near the subject site during the completion of this assessment, therefore no interaction between the proposed project and SAR is anticipated.

3.1.14 Surface Water – Watercourses

The subject site is located on the shore of Maces Bay within the Bay of Fundy. The mouth of the Pocologan River is located 1.8 kilometers southwest of the subject site, an unnamed brook is located 180 meters to the west. A highway drainage ditch crosses the eastern portion of the property, which will require installation of a culvert for the proposed access road.



Figure G: Toporama © Map of the Region



3.1.15 Terrestrial Wildlife and Habitat

The subject site is a commercial site with minimal vegetation (lawn) along the coastline, and native shrub and grass species in the eastern portion of the property. Terrestrial wildlife habitat is limited to the vegetated area on the eastern portion of the property and along the shoreline. Small common wildlife species are anticipated to inhabit the eastern vegetated area, and primarily to traverse the site along the top of the shoreline. The majority of the site is disturbed and an active restaurant and hotel, and is therefore considered marginal wildlife habitat. No sign of wildlife was encountered during visits to the site.



Photo No.3: Route 113 Looking West Towards Subject Site



3.1.16 Topography

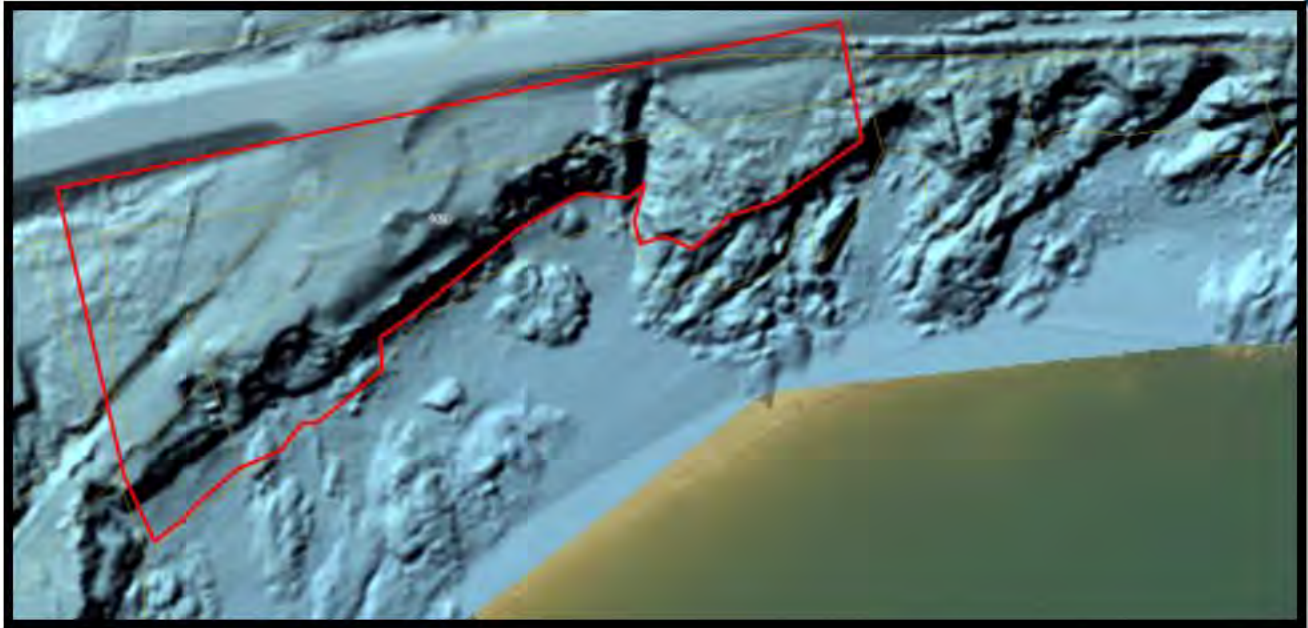
The subject site slopes southward from Route 175 to the mowed grass and vegetated portions of the subject site, as well as to the west. The area containing the motel, restaurant, driveway and mowed grass is relatively flat, with a slight slope toward Maces Bay. Along the property line to the south, there is a moderate and then sharp increase in slope. Along the southeast edge of the property a steep rock overhand is present. Surface and groundwater on the property is assumed to flow south toward Maces Bay. Refer to Figure H for the site surface topography.

3.1.17 Transportation

The project site is located on Route 175, a provincial collector highway with an annual average daily traffic of 760 (NB DTI Traffic Map, 2015) and a speed limit of 90 km/h. No significant increase in traffic is anticipated as a result of the project.



Figure H: Site Topography (GeoNB MapViewer LIDAR – Approx. Project Footprint in Red)



3.1.18 Vegetation

The proposed site is presently a commercial site, containing the BayBreeze restaurant and hotel buildings, paved and gravel surfaces, vegetated areas (mowed lawn and shrubs), and a steep embankment leading to the rocky shoreline. The eastern and western portions of the site consists mostly of common shrub, wildflower and grass species, with juvenile White Birch (*Betula papyrifera*) scattered along the top of the embankment. The central portion of the site consists mostly of mowed grass, with a few shrubs in the vicinity of the buildings and driveway.

No flora species at risk were identified in the ACCDC report. Flora species observed on site included Black Spruce (*Picea glauca*), White Birch (*Betula papyrifera*), Speckled Alder (*Alnus rugosa*), Pin Cherry (*Prunus pensylvanica*), Wild Rose (*Rosa* spp.), Common Daisy (*Bellis perennis*), Buttercup (*Ranunculus* L.), goldenrod spp., clover spp., Interrupted Fern (*Osmunda claytoniana*) and common grass spp.





Photo No. 4: Eastern Portion of Property (Looking West)



Photo No. 5: Coastline from Route 1



3.1.19 Wetlands

No wetlands (mapped or unmapped) are located on or within thirty metres of the subject property.

As shown in Figure I, two (2) regulated wetlands are located approximately 500 metres to the northwest of the subject property. No Provincially Significant Wetlands (PSW) or unmapped wetlands are located in proximity of the subject site. Due to the nature of the project and the distance to any wetland, no interaction between the project and wetlands is anticipated.

Figure I: Regulated Wetlands in Proximity of the Project Site (in Red)





4 ENVIRONMENTAL ASSESSMENT

The environmental impact assessment methodology used herein focuses on those Valued Environmental Components (VECs) 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 biophysical characteristics of the environment, the following potential VECs were identified and assessed for the proposed project:

- a) Archaeological Resources;
- b) Atmospheric Quality;
- c) Groundwater (Quality and Quantity);
- d) Marine Water Quality, and
- e) Migratory Birds

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 anticipated interaction, a rationale is provided and the issue is not discussed further in the present report. Potential project-environment interactions are presented in Table 2.

Table 2: Potential Project-Environment Interactions Matrix

| Activities → ↓ VEC | Construction/ Installation of Physical Work | Operation/ Maintenance of Physical Work | Decommissioning/ Abandonment of the Physical Work | Accidents and Unplanned Events |
|-------------------------|---|---|---|---|
| Biophysical | | | | |
| Archaeology | X | | | |
| Atmospheric | X | X | | X |
| Groundwater Quality | X | X | | X |
| Marine Water Quality | X | X | | X |
| Migratory Birds | X | | | |





4.1 Archaeological Resources

Existing Conditions:

The subject site consists of properties located within the 50- and 80m zones of high potential for archaeological resources. Additionally, there are two important mapped archaeological sites in the region, making the proposed site an area of high potential for unmapped archaeological resources. A portion of the site has been infilled, while other areas have been disturbed by past excavation; however, a portion of the site appears to be undisturbed, original ground.

Project – VEC Interactions, Potential Environmental Effects:

The proposed development is within an area of high potential for the discovery of archaeological resources.

Potential Environmental Impact – Construction Excavation (and Drilling):

Project-related excavation associated with the construction and installation of the wastewater treatment plant tanks, collection pipes for the wastewater system, and the drilling of 16+3 individual water wells will require excavation into undisturbed, original soil. This could adversely impact pre-contact archaeological resources.

Recommended Mitigation:

Mitigation 1: Roy Consultants contracted a qualified archaeological consultant to conduct a surface archaeological survey of the site, and conducted limited test pitting of the sites of the proposed water wells for the pump test. No archaeological resources were identified, refer to Appendix F.

Mitigation 2: The proponent will avoid, to the extent possible, excavating into original ground (not imported material). Where original ground is present, clean fill will be imported and levelled on the site, and the structures and infrastructure will be built up, above the level of the original ground, to avoid disturbing archaeological resources.

Mitigation 3: Upon completion of the pump test, and if it is determined that there is sufficient water to support the development, any areas where excavation or drilling will extend into original ground will first undergo a test pit program by a qualified archaeologist per the requirements of the *NB Heritage Conservation Act* and the Heritage and Archaeological Services Branch (HASB). The results of this test pit program will be submitted to the HASB for review, and the proponent will adhere to any additional mitigation recommended by the archaeologist in coordination with the HASB, prior to construction.

Mitigation 4: In the event a suspected archaeological artifact is uncovered during soil disturbance activities, all work shall immediately cease and the Heritage and Archaeological Services Branch, Department of Tourism, Heritage and Culture shall be contacted at (506) 444-5760 for further instructions.

Significance of Impact:

Significance of the impacts on archaeological resources will be determined upon completion of the project test pit program.





4.2 Atmospheric

Existing Conditions:

The subject site consists of a restaurant and hotel located in a residential area. The nearest industrial emitter is located approximately 15km from the site. Local air quality impacts are minimal, primarily from the decay of aquatic vegetation along the shoreline, and motor vehicle emissions.

Project – VEC Interactions, Potential Environmental Effects:

The proposed wastewater treatment system may cause localized odours.

Potential Environmental Impact – Odours:

The proposed wastewater treatment system may create localized odours if a system malfunction occurs.

Recommended Mitigation:

Mitigation 1: The proposed wastewater treatment system is an enclosed system; significant odours are not anticipated to escape the system during regular operation.

Mitigation 2: Air injection is included in the waste treatment process, which will prevent putrefaction and therefore the formation of odour-causing compounds.

Mitigation 3: The proposed system design includes automatic, continuous system monitoring – in the event of an unplanned shut-down, the Certified System Operator will be advised and corrective action taken immediately.

Potential Environmental Impact – Construction Noise and Dust:

During construction, noise from motorized equipment and dust will increase temporarily.

Recommended Mitigation:

Mitigation 1: Construction activities will take place during normal working hours, subject to local noise bylaws.

Mitigation 2: During dry periods, dust suppression by the application of water only will be employed, as required.

Significance of Impact:

Potential impacts to atmospheric quality are considered unlikely, of low magnitude, reversible, of small geographic extent, and short duration and frequency. Based on these factors, potential atmospheric impacts are considered not significant.

4.3 Groundwater

Existing Conditions:

Residential and commercial properties in the area obtain their potable water from private wells. A search of the NBDELG's Online Well Log System (OWLS) identified 15 wells within a 1,500m radius of the site. 14 of these wells were domestic wells, and 1 was classified as agricultural. Based on available information, the local aquifer is comprised of granite and fractured grey slate bedrock. Well depths range between 165 and 500 feet, and well yields range from 0 IGPM to 12 IGPM. The





majority of the 15 wells have well depths greater than 250 feet and driller estimated well yields less than or equal to 4 IGPM. At present, the subject site contains two potable wells which supply water to the restaurant and motel.

Seven (7) water quality records were available from the OWLS search. Parameters exceeding New Brunswick Drinking Water Guidelines (NBDWG) were identified in several wells. Two (2) wells exceeded the NBDWG guideline for arsenic of 10 µg/L. One well exceeded the NBDWG guidelines for chloride of 250 mg/L and sodium of 200 mg/L. Three (3) wells exceeded the NBDWG guideline of 0.3 mg/L for iron. Four (4) wells exceeded the NBDWG for manganese of 0.05 mg/L. One (1) well exceeded the NBDWG guideline for antimony of 6 µg/L, for selenium of 10 µg/L and for uranium (20 µg/L). Three (3) wells exceeded the NBDWG guideline for turbidity of 1 NTU. Three (3) wells had counts of total coliforms above the NBDWG guideline of none detectable per 100 mL. Two (2) wells had counts of Escherichia coli above the NBDWG guideline of none detectable per 100 mL.

Project – VEC Interactions, Potential Environmental Effect 1:

The proposed development would require the installation of individual potable water wells to supply drinking water.

Potential Environmental Impact 1 – Groundwater Quantity and Quality Impacts from the Development of Private Wells

The installation and operation of additional wells could adversely impact nearby private water supplies, or draw salt water into the aquifer.

Recommended Mitigation:

The proponent will conduct a hydrogeological investigation of the site, per the NB Water Supply Source Assessment Guidelines and the recommendations of the NB Department of Environment and Local Government, to determine if there is adequate groundwater quantity and quality for the proposed residential development.

The hydrogeological investigation will provide recommendations for the project that will mitigate potential impacts on the aquifer. Refer to Appendix A for the Initial WSSA Application. The pump test report will be provided to the Technical Review Committee upon completion.

Significance of Potential Impact 1:

Significance of the development on groundwater will be determined upon completion of the pump test.

4.4 Marine Water Quality and Habitat

The proposed subdivision development includes a communal wastewater treatment system, which will discharge the treated effluent into Maces Bay.

Existing Conditions:

At present, there are no effluent discharge pipes in the vicinity of the subject site. The Bay of Fundy is an important aquatic habitat for a variety of wildlife, and New River Beach, a public recreational beach is located approximately 2.75 km east of the proposed project.





Project – VEC Interactions, Potential Environmental Effects:

The proposed effluent discharge may adversely impact marine water quality in the vicinity of the discharge pipe.

Potential Environmental Impact 1:

Wastewater can create localized, adverse environmental impacts if the end-of-pipe is not properly located and regular flushing of the mixing zone does not occur. These can include floral/faunal changes, low-oxygen conditions, nutrient loading and bacterial growth.

Recommended Mitigation 1:

1. The proposed development will include the installation and operation of a wastewater treatment plant, which will include Primary Clarification, Flow Equalization, Biological Treatment, before effluent is discharged to the environment.
2. The wastewater treatment plant will be designed to exceed provincial water quality guideline requirements for a sewage treatment discharge.
3. The wastewater treatment system will include automated monitoring and alarm systems to continually monitor water quality before it discharges to the Bay.
4. The wastewater treatment system will operate per the requirements of a Department of Environment and Local Government Approval to Operate (CoA). The CoA will impose regular sampling and reporting requirements on the system, which must be met in order to construct and operate the system.
5. The proponent will commission a local environmental consultant to monitor, maintain and operate the wastewater treatment system on their behalf. This consultant will be a qualified environmental consultant and a certified wastewater plant operator per the provincial requirements.
6. In the event of a sudden power outage, the wastewater treatment system will include safeguards to automatically cease functioning and will not discharge untreated waste until power is restored.
7. The proponent completed an underwater benthic habitat survey to identify any potential aquatic Species at Risk or critical habitat near the proposed development.
8. Installation of the pipe and collar will be completed by a qualified contractor, and all appropriate sediment and erosion control measures will be employed during its installation (no excavation is anticipated) per the requirements of DFO and/or NB Natural Resources and Energy Development;
9. If necessary, the proponent will obtain, and adhere to, a Fisheries Act Authorization from the Department of Fisheries and Oceans.

Significance of Potential Impacts

Based on the level of treatment, and the projected effluent water quality, the inclusion of a dedicated system operator, automated monitoring and given the results of the Underwater Benthic Habitat Survey, potential impacts to marine water quality and aquatic habitat would be unlikely, of low magnitude, reversible, of small geographic extent, and moderate duration and frequency. Based on these factors, potential impacts to marine water quality and habitat are considered not significant.





4.5 Migratory Birds

Existing Conditions:

Vegetation on the site is a mixture of shrub and low vegetation.

Project – VEC Interactions, Potential Environmental Effects:

A portion of the site is suitable migratory bird nesting habitat.

Potential Environmental Impact:

Removal of shrub vegetation could disturb or destroy nesting migratory birds.

Recommended Mitigation:

Vegetation clearing will be conducted outside of the breeding bird nesting season, i.e. prior to April 15th for the majority of migratory birds in this zone.

Significance of Potential Impacts

Based on the proposed mitigation and the small area to be affected, impacts to migratory birds are anticipated to be unlikely, of low magnitude, reversible, of small geographic extent, and moderate duration and frequency. Based on these factors, potential impacts to migratory birds are considered not significant.





5 ACCIDENTS AND UNPLANNED EVENTS

Accidents can occur during the operation of motorized equipment on site, demolition activities, and construction activities or during the drilling of wells. Accidents involving motorized equipment can often result in an unplanned release of hydrocarbons into the environment, which can impact soil, surface and groundwater. Construction accidents can result in physical harm to employees on site.

Existing Conditions

The development of the site, including the drilling of wells and importing fill will require the use of motorized equipment, using hydraulic oil and other petroleum products.

Project – VEC Interactions, Potential Environmental Effects:

Motorized equipment can leak petroleum products into the ground, contaminating soil and potentially groundwater if left unchecked.

Potential Environmental Impact – Soil

Petroleum contamination of soil can impact soil biota and productivity.

Potential Environmental Impact – Groundwater

Large spills can result in petroleum contamination of the groundwater aquifer, rendering the water non-potable.


Potential Environmental Impact – Water Quality:

Construction accidents can result in physical harm or death to workers.

Recommended Mitigation

1. Petroleum storage tanks will not be permitted on site.
2. Refueling of equipment will not be permitted on site.
3. Contractors will be required to maintain adequate spill kits on site in case of a leak or spill.
4. Contractor personnel will be trained in the use of petroleum product spill kits.
5. Drilling of the wells will be performed by an experienced, licensed water well driller.
6. All motorized equipment will be visually inspected for leaks prior to beginning work on site.
7. In the event of an unplanned release, drilling or construction operations will cease, the leak will be stopped and the petroleum product cleaned up using a spill kit. Any contaminated soil shall be properly disposed of at an approved disposal facility.
8. The Saint John Department of Environment and Local Government will be contacted and advised of the spill, regardless of the volume spilled; the office can be reached at 506-658-2558. In the event that the spill occurs after normal business hours, the 24-hour emergency reporting number will be called at 1-800-565-1633.
9. All contractors on site shall be properly trained, qualified and insured.
10. All contractor personnel shall wear appropriate Personal Protective Equipment.





11. Contractors will be provided copies of all permits and shall be responsible for adhering to all conditions therein.

Significance of Potential Impacts

Taking into account the potential impacts from a standard residential construction, potential impacts from accidents and unplanned events are considered of low magnitude, reversible, of small geographic extent, and short duration and frequency. Based on these factors, potential impacts are considered not significant.





6 CUMULATIVE EFFECTS

Per CEAA, cumulative effects are “changes to the environment that are caused by an action in combination with other past, present and future human actions”. In other words, what will be the overall environmental impact of a project, in combination with existing or foreseeable future projects within the same spatial context? Roy Consultants reviewed potential impacts to marine water quality and groundwater on the scale of Maces Bay and the local aquifer, respectively.

Marine Water Quality: There are no known industrial or municipal wastewater effluent discharges to Maces Bay. Mixing and flushing is anticipated to be significant, given the magnitude of the tides (“world’s highest tides”) and the fact that Maces Bay is relatively open to the Bay of Fundy proper. Effluent water quality is anticipated to meet and exceed NB effluent quality guidelines, and the wastewater treatment system will be maintained and monitored by a qualified, certified operator. Given the size of Maces Bay (over 7,400 ha), dilution of effluent will be more than adequate.

Based on the minimal anticipated impacts to the Bay’s water quality and the lack of other existing inputs, significant cumulative effects to the water quality in Maces Bay are not anticipated as a result of this project.

Groundwater Impacts: The WSSA will establish a sustainable pumping rate for the proposed development’s wells, taking into account potential impacts to the aquifer from over pumping (saltwater intrusion) and potential quantity impacts to nearby domestic wells. As such, cumulative effects on the aquifer will therefore be considered in the recommendations of the WSSA pump test report.





7 MITIGATION SUMMARY TABLE

| Valued Ecosystem/ Social Component (VEC/VSC) | Description of Potential Project Interaction with VEC/VSC | Required Mitigation |
|--|--|---|
| Archaeological and Heritage Resources | Potential disruption or disturbance of archaeological resources during construction. | <ul style="list-style-type: none">• Roy Consultants contracted a qualified archaeological consultant to conduct a surface archaeological survey of the site, as well as test pitting at the proposed locations of wells for the pump test. The report also identified areas where additional testing is recommended for the overall project.• The proponent will avoid, to the extent possible, excavating into original ground.• Any areas where excavation will extend into original ground will first undergo a test pit program by a qualified archaeologist per the requirements of the NB <i>Heritage Conservation Act</i> and the Heritage and Archaeological Services Branch (HASB). This program will be completed once the pump test has determined there is a sufficient water supply for the development. The proponent will adhere to any additional mitigation recommended by the archaeologist in coordination with the HASB.• In the event a suspected archaeological artefact is uncovered during soil disturbance activities, all work shall immediately cease and the Heritage and Archaeological Services Branch, Department of Tourism, Heritage and Culture shall be contacted at (506) 444-5760 for further instructions. |





| | | |
|----------------------------|--|--|
| Atmospheric Quality | <p>The operation of a wastewater treatment system may cause localized odours (in proximity to the plant).</p> <p>During construction, noise and dust may increase temporarily.</p> | <ul style="list-style-type: none">• The design of the wastewater treatment system is enclosed; significant odours are not anticipated to escape the system during regular operation.• Air injection is included in the waste treatment process, which will prevent putrefaction and therefore the formation of odour-causing compounds.• The proposed system design includes automatic, continuous system monitoring – in the event of an unplanned shut-down, the Certified System Operator will be advised and corrective action taken immediately.• Construction activities will take place during normal working hours, subject to local noise bylaws.• Motorized equipment will be in good working order and properly muffled;• Dust suppression on site will be employed, using <u>water only</u>, as required. |
| Groundwater | <p>Potential groundwater quality (and quantity) impacts on the aquifer from the installation and operation of 19 (16+3 lots) new private wells.</p> | <ul style="list-style-type: none">• The proponent will conduct a hydrogeological investigation of the site, per the NB Water Supply Source Assessment Guidelines and the recommendations of the NB Department of Environment and Local Government, to determine that there is adequate groundwater quantity and quality for the proposed residential development.• The hydrogeological investigation will provide recommendations for the development that will mitigate potential impacts on the groundwater aquifer as necessary. Refer to Appendix A for the Initial WSSA Application. The pump test report will be provided to the Technical Review Committee upon completion. |



Marine Water Quality

Marine water quality may be adversely impacted by the discharge of wastewater effluent to Maces Bay.

- The proposed development will include the installation and operation of a wastewater treatment plant, which will include Primary Clarification, Flow Equalization, Biological Treatment, before effluent is discharged to the environment;
- The wastewater treatment plant will be designed to exceed provincial water quality design requirements for a sewage treatment discharge;
- The wastewater treatment system will include automated monitoring and alarm systems to continually monitor water quality before discharge to the Bay;
- In the event of a sudden loss of power, the wastewater treatment system will cease to operate and will not discharge untreated water to the Bay;
- The wastewater treatment system will operate per the requirements of a Department of Environment and Local Government Approval to Operate (CoA) – Water Quality. The CoA will impose regular sampling and reporting requirements on the system, which must be met in order to continue operating the system;
- The proponent has commissioned a local environmental consultant to monitor, maintain and operate the wastewater treatment system on their behalf. This consultant is a qualified environmental consultant and is a certified wastewater plant operator per the provincial requirements;
- The proponent completed an underwater benthic habitat survey to identify any potential aquatic Species at Risk or critical habitat near the proposed development. No SAR were identified (refer to attached report);
- Installation of the pipe and collar will be completed by a qualified contractor, and all appropriate sediment and erosion control measures will be employed during its installation (no excavation is anticipated) per the requirements of DFO and/or NB Natural Resources and Energy Development;
- The proponent will obtain, and adhere to, a Fisheries Act Authorization from the Department of Fisheries and Oceans, if necessary.





**Accidents
Unplanned
Events**

and

Spills or leaks of petroleum may adversely impact soil, groundwater or surface water.

- Petroleum storage tanks will not be permitted on site.
- Refueling of equipment will not be permitted on site.
- Contractors will be required to maintain adequate spill kits on site in case of a leak or spill.
- Contractor personnel will be trained in the use of petroleum product spill kits.
- Drilling of the wells will be performed by an experienced, licensed water well driller.
- All motorized equipment will be visually inspected for leaks prior to beginning work on site.
- In the event of an unplanned release, drilling or construction operations will cease, the leak will be stopped and the petroleum product cleaned up using a spill kit. Any contaminated soil shall be properly disposed of at an approved disposal facility.
- The Saint John Department of Environment and Local Government will be contacted and advised of the spill, regardless of the volume spilled; the office can be reached at 506-658-2558. In the event that the spill occurs after normal business hours, the 24-hour emergency reporting number will be called at 1-800-565-1633.

Workplace accidents may occur during construction and use of heavy equipment which could impact the health and safety of contractor employees.

- All contractors on site shall be properly trained, qualified and insured.
- All contractor personnel shall wear appropriate Personal Protective Equipment (PPE).
- Contractors shall ensure all motorized equipment is in proper working order and operated safely.
- Contractors will be provided copies of all permits and shall be responsible for adhering to all conditions therein.





8 PUBLIC INVOLVEMENT

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 public involvement activities, based on a program approved by the DELG project manager:

1. The proponent shall communicate directly with elected officials (i.e. the MLA and mayor), local service districts, community groups, environmental groups, 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 within a 500m radius from the subject site. The notification will include the following:
 - a. A brief description of the proposed project;
 - b. Information on how to view the Registration Document;
 - c. A description of 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 that people can ask questions or raise concerns with the proponent regarding the environmental impacts; Proponent contact information (name, address, phone number, E-mail); and
 - f. The date by which comments must be received (See Section 6.0 of the Registration Guide).
3. Once the EIA report is completed, it will be submitted to DELG and placed on the DELG Website at <http://www.gnb.ca/0009/0377/0002/0016-e.pdf> 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, NB.
4. The proponent shall make copies of the project 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 and shall deposit a copy of this document along with any subsequent revision with the Saint John DELG regional office and the Southwest New Brunswick Service Commission, where it will be available for public review.
5. 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.





9 INDIGENOUS PEOPLES

The proponent and contractors involved in this proposed project acknowledge and respect that the subject site is located within the traditional territory of the Wolastoqiyik, Mi'gmaq and Peskotomuhkati Indigenous peoples.

The nearest First Nation is located at Oromocto, approximately 80 km north of the project site; however, many First Nations in New Brunswick have historically, and continue to, access the Bay of Fundy for commercial and sustainable fisheries. Important species include lobster, scallop, clam, sea urchin, groundfish, herring, eel, and the Inner Bay of Fundy Atlantic Salmon.

As Rightsholders, First Nations are advised by the DELG of proposed projects through the EIA review process. However, as part of the above-noted outreach program and to request their input, a project description will be sent to representatives of the following First Nations and Indigenous Organizations:

- Wolastoqey Nation in New Brunswick (WNNB)
- Pillick (Kingsclear)
- Welamukotuk (Oromocto)
- Sitansisk (Saint Mary's)
- Neqotkuk (Tobique)
- Wotstak (Woodstock), and
- Peskotomuhkati at Skutik (Passamaquoddy)





10 FUNDING

The project is a privately-funded venture by the proponent.





11 CLOSING STATEMENT

This report identifies Valued Environmental Components, which may potentially be impacted by the construction and operation of the proposed residential development in Pocologan, New Brunswick. Where possible, impacts have been avoided in the project design. Where avoidance is not feasible, generally-accepted and effective mitigation measures are proposed. Significance of impacts was then 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.





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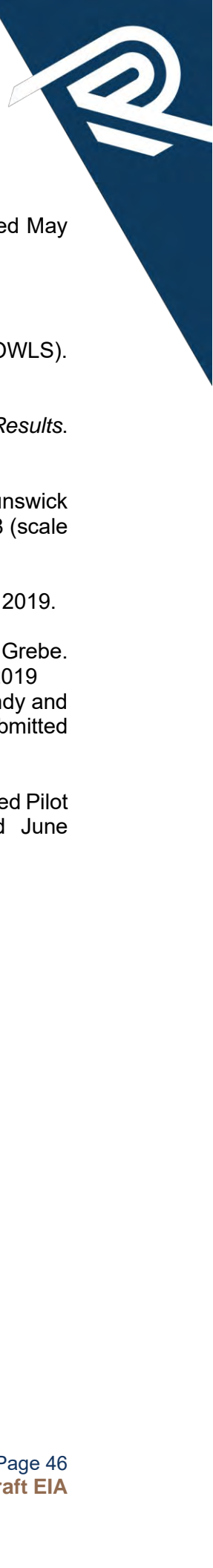
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APPENDICES



APPENDIX A

Water Supply Source Assessment Initial
Application



**ROY
CONSULTANTS**

**ENGINEERING
SERVICES
D'INGÉNIERIE**

Our File No.: 313-21-C
September 30, 2022

Homes by the Bay Residential Development
Pocologan, NB

**Water Supply Source
Assessment
Initial Application**



Prepared by:



30 September 2022



Mr. Pierre Doucet
Project Manager
NB Environment and Local Government
PO Box 6000, Fredericton NB E3B 5H1
✉ pierre.doucet@gnb.ca

Our File No.: 313-21-C

**Subject: Water Supply Source Assessment Initial Application
Homes by the Bay Residential Development, Pocologan, NB.**

We are pleased to present you with this Initial Application for the aforementioned subject studied.

Should you have any questions or comments, or should you require further information, please do not hesitate to contact the undersigned.

Yours truly,

Jon Burtt, EP
Environmental Specialist

JB/gb

Cc- Gina Burtt

Enc.:



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1. Proponent

The projection proponent is :

Badrock Studio Inc.
Mr. Kleo Isaias, Principal
2380 Wyecroft Road, Unit 3a
Oakville, ON L6L 6W1

kleo@badrockstudio.ca

2. Location of Drill Targets

The proposed residential development will be located on SNB Parcel Identification numbers (PIDs) 01212406, 01214253, 15077985, 15080765 and 15206840, at civic address no. 1424, Route 175 in Pocologan, Charlotte County, NB.

Figure A: Approximate Location of Proposed Development (red star)





The proposed observation well (OW1) will be located on PID 15206840 (Lat. 45.128368 Long. -66.572922) (proposed Lot 16 on Figure B), and the proposed pumping well PW1 will be located on PID 01212406 (Lat. 45.128531 Long. -66.57126) (proposed Lot 7 on Figure B).

Figure B: Proposed Subdivision Layout and Proposed Well Locations



3. Required Water Quantity

The proposed development will consist of sixteen (16) lots. Based on discussions with the NBDELG, a water usage of 0.06874 Imperial Gallons Per Minute (IGPM) per person is recommended. Based on 5-person occupancy per lot and 16 lots, the estimated water requirement is 5.50 IGPM (50,000 Litres Per Day (LPD)). However, a 3-lot second phase of development may be undertaken, based on the success of the project, therefore the recommended pumping rate will be for a 19-lot subdivision of **6.53 IGPM**.





4. Alternate Water Sources

The proposed development is located in an unserved rural area. The nearest groundwater supplies are all domestic private water wells. The nearest municipal Wellfield Protected Area is located at Pennfield, approximately 13 km west of the subject site, and the nearest designated surface watershed protected area is located approximately 13 km northeast of the subject site (Musquash).

5. Area Hydrogeology

The subject site is underlain by Cambrian-aged rocks of the Pocologan Harbour Granitoid Suite consisting of dioritic to granitic rocks (McLeod et al, 2005). Based on a well log search of the area within 1500 metres of PID 01212406, the local aquifer is comprised predominantly of fractured granite bedrock. From a review of fifteen (15) well logs, well depths range between 165 and 500 feet. Well yields ranged from 0.5 to 5 l/gpm (3.3 to 32.7 m³/day). Refer to attached well log search results (within 1500m of PID No. 01212406).

6. Proposed Hydrogeological Test

It is proposed that the pumping well and observation be drilled in the fall of 2022, followed by completion of the pump test. A three-step step test, 24-hour pump test with 12-hour recovery period is proposed for November 2022. The production well will be pumped at a rate equal to or greater than 6.53 IGPM (the estimated water requirement of the development). During the pumping portion of the test, discharged water will be directed to the bay, located within 15 m and downgradient of the production well. The beach area is primarily boulder/cobble and exposed rock slab. A pump test report is anticipated for submission by the end of January 2023.

7. Existing Hazards Within 500m

There are no known existing hazards of contamination within 500m of the subject site. There are no Land Gazette notices on the Service New Brunswick website for petroleum storage and contaminated sites on properties located within 500 m of the subject site. No existing contamination has been identified within 500 m of the proposed well locations. Surrounding land use is cottage/residential buildings. Potential contamination hazards include private septic systems, residential heating oil tanks and household quantities of petroleum and chemical products.

8. Existing Groundwater Use Issues

No existing groundwater issues are known at this time. A review of well water quality data from five (5) wells within 1500 m of the subject site was completed. Several parameters were noted to exceed New Brunswick Drinking Water Guidelines (NBDWG) and are summarized in the table below.





Table 1 : Water Quality Record Results

| Parameter | NBDWG | Exceedances |
|-----------------|----------------------|---|
| Arsenic | 10 µg/L (MAC) | 2 records (13 µg/L) |
| Chloride | 250 mg/L (AO) | 1 record (850 mg/L) |
| Iron | 0.3 mg/L (AO) | 3 records (0.0407, 1.22 and 4.8 mg/L) |
| Manganese | 0.05 mg/L (AO) | 4 records (0.11, 0.84, 0.92 and 2.1 mg/L) |
| Sodium | 200 mg/L (AO) | 1 record (494 mg/L) |
| Antimony | 6 µg/L (MAC) | 1 record (8.7 µg/L) |
| Selenium | 10 µg/L (MAC) | 1 record (16 µg/L) |
| Total Coliforms | Absent | 1 record (Present) |
| Turbidity | 0.1 to 1.0 NTU (MAC) | 3 records (1.2, 2 and 6.8 NTU) |
| Uranium | 20 µg/L (MAC) | 1 record (25 µg/L) |

AO = Aesthetic Objective
MAC = Maximum Acceptable Concentration

Chloride, iron, manganese and sodium exceed NBDWG aesthetic objectives and are not considered to pose a health risk. Aesthetic objectives are established for parameters that may impair the taste, smell, or colour of water; or which may interfere with the supply of good quality water. They do not cause adverse health effects. Commercial treatment systems may be installed to reduce iron and manganese to within acceptable levels. Treatment systems may also reduce chloride and sodium concentrations but may not be able to achieve levels that meet applicable AOs.

Arsenic, antimony, selenium, total coliforms, turbidity and uranium exceed NBDWG maximum acceptable concentrations. A MAC is a level that has been established for certain substances that are known or suspected to cause adverse health effects. The presence of total coliforms may be localized to a specific well and is typically addressed through well disinfection and re-sampling. Elevated turbidity may be related to new well construction and is a parameter that is expected to decrease with increased well use. Commercial treatment systems may be installed to reduce arsenic, antimony, selenium and uranium to within acceptable levels.

Based on the water quality records, there are potential issues with groundwater quality. There is a likelihood that water treatment systems will be required for each individual well of the proposed residential development in order to meet aesthetic objectives and maximum acceptable concentrations. The potential for saltwater intrusion (sodium and chloride content in drinking water) will require assessment as part of the WSSA.

Refer to Appendix A: Well log search results within 1500 m of PID 01212406.

9. Watercourses

The subject site is within 60m of Mace's Bay, an embayment of the Bay of Fundy.

There are no mapped watercourses or wetlands on the subject properties. The nearest mapped surface water feature is an unnamed watercourse located 180 m west of the subject site. An unmapped highway drainage ditch is located 90m east of the PW1 proposed location.





The nearest regulated wetland is located approximately 400 m west-northwest of the subject site.

Figure C: GeoNB Regulated Wetland and Mapped Watercourse



10. Site Supervisors

The proposed pump test will be conducted under the supervision of Roy Consultants. Gina Burt, P.Eng., P.Geo. (Hydrogeologist) will be on site to supervise the step test. Danny Cormier, P.Tech (senior environmental technologist), will be on site for the duration of the pump test. Sullivan's Well Drilling will be contracted to drill the wells and complete the pump test.





11. Figure

Figure D: Proposed Drill Target Locations and Project Development Area (Blue Outline)

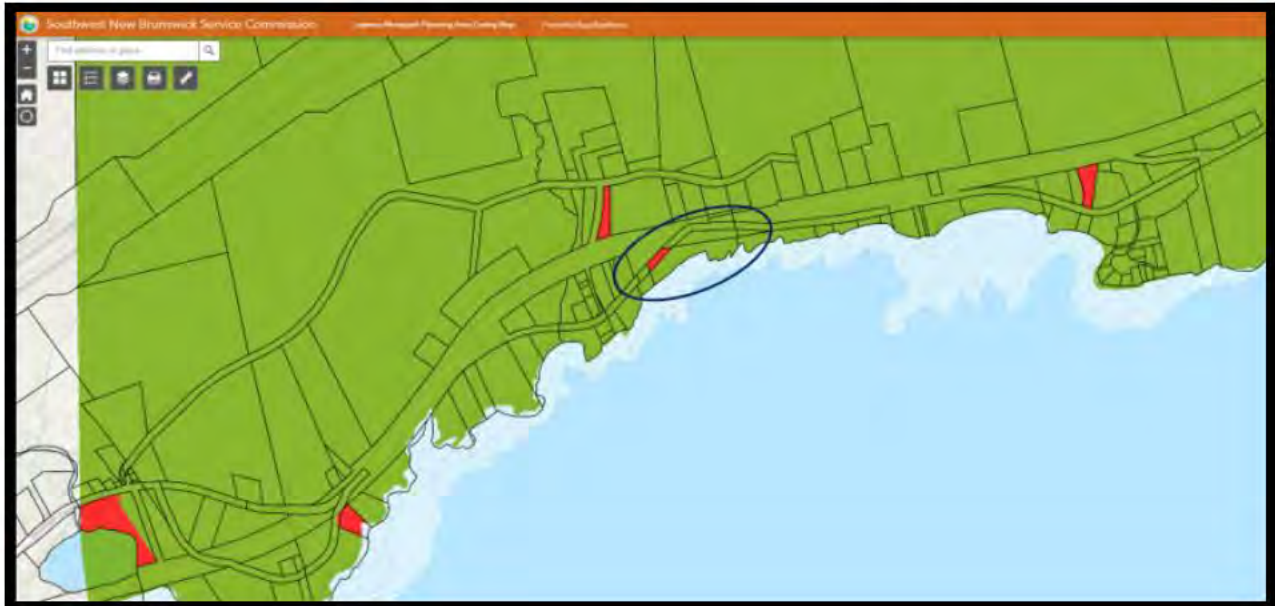




12. Land Use/Zoning Map

The proposed development would be located on multiple PIDs, which presently are zoned “Mixed Use” and Commercial/Light Industrial. They presently contain the Baybreeze Restaurant and Hotel.

Figure E: Zoning Map Lepreau-Musquash Planning Area (source: Southwest New Brunswick Service Commission interactive online map – red denotes Commercial/Light Industrial, green denotes Mixed Use)(Project Site = Blue Circle)





APPENDICES



APPENDIX A
Well Log Search Results

Well Driller's Report

Date printed **2019/08/16**

| | | | |
|---|-----------------|-------------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Cable Tool | 09/04/2003 |

| | | | | | |
|--------------------|---------------------|------------------|------------|-------------|----------|
| Casing Information | Casing above ground | Drive Shoe Used? | | | |
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 7163 | Steel | 6 inch | 0ft | 20ft | |

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

| | | | |
|---------------------------------------|----------------------|-----------------|--------------------------------------|
| Well Grouting | Drilling Fluids Used | Disinfectant | Pump Installed |
| There is no Grout information. | None | N/A | Submersible |
| | | Qty 0 ig | Intake Setting (BTC) 300ft |

| | | | | | |
|---------------|------------|--------------|--------------|--------------|--------------------|
| Driller's Log | | | | | Overall Well Depth |
| Well Log | From | End | Colour | Rock Type | 420ft |
| 7163 | 0ft | 1ft | Brown | Earth | Bedrock Level |
| 7163 | 1ft | 420ft | Grey | Rock | 1ft |

| |
|---|
| Water Bearing Fracture Zone |
| There is no water bearing fracture zone information. |

| | | |
|-------------|-------------|-------------------------------------|
| Setbacks | | |
| Well Log | Distance | Setback From |
| 7163 | 90ft | Right of any Public Way Road |

Well Driller's Report

Date printed **2019/08/16**

| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | Deepened | Rotary | 06/07/2004 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 9685 | Steel | 6 inch | 0ft | 20ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|-----------------|------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 20ft | 2.5 igpm | 1hr | 20ft | 2 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| | | | |
|---------------------------------------|----------------------|-----------------------|--------------------------------------|
| Well Grouting | Drilling Fluids Used | Disinfectant | Pump Installed |
| There is no Grout information. | None | Bleach (Javex) | Submersible |
| | | Qty 0 ig | Intake Setting (BTC) 180ft |

| Driller's Log | | | | | Overall Well Depth 210ft |
|---------------|-------------|--------------|--------------|--------------|------------------------------------|
| Well Log | From | End | Colour | Rock Type | |
| 9685 | 0ft | 11ft | Brown | Till | Bedrock Level 11ft |
| 9685 | 11ft | 210ft | Grey | Slate | |

| Water Bearing Fracture Zone | | |
|-----------------------------|--------------|-----------------|
| Well Log | Depth | Rate |
| 9685 | 85ft | 2 igpm |
| 9685 | 115ft | 0.5 igpm |

| Setbacks | | |
|-------------|-------------|--------------------|
| Well Log | Distance | Setback From |
| 9685 | 55ft | Septic Tank |
| 9685 | 75ft | Leach Field |

Well Driller's Report

Date printed **2019/08/16**

| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 07/23/2008 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 13972 | Steel | 6 inch | 0ft | 20ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|-----------------|------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 18ft | 1.5 igpm | 1hr | 18ft | 1.5 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| |
|---------------------------------------|
| Well Grouting |
| There is no Grout information. |

| | | |
|----------------------|-----------------------|--------------------------------------|
| Drilling Fluids Used | Disinfectant | Pump Installed |
| None | Bleach (Javex) | Submersible |
| | Qty 0 ig | Intake Setting (BTC) 240ft |

| Driller's Log | | | | |
|---------------|--------------|--------------|--------------|----------------|
| Well Log | From | End | Colour | Rock Type |
| 13972 | 0ft | 2ft | Brown | Till |
| 13972 | 2ft | 130ft | Grey | Granite |
| 13972 | 130ft | 290ft | Grey | Slate |

Overall Well Depth
290ft

Bedrock Level
2ft

| Water Bearing Fracture Zone | | |
|-----------------------------|--------------|-----------------|
| Well Log | Depth | Rate |
| 13972 | 135ft | 1.5 igpm |

| Setbacks | | |
|--------------|--------------|-------------------------------------|
| Well Log | Distance | Setback From |
| 13972 | 55ft | Septic Tank |
| 13972 | 75ft | Leach Field |
| 13972 | 200ft | Right of any Public Way Road |

Well Driller's Report

Date printed **2019/08/16**

| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 05/18/2009 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 17782 | Steel | 6 inch | 0ft | 20ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|-----------------|------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 18ft | 1.5 igpm | 1hr | 18ft | 12 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| |
|---------------------------------------|
| Well Grouting |
| There is no Grout information. |

| | | |
|----------------------|-----------------------|--------------------------------------|
| Drilling Fluids Used | Disinfectant | Pump Installed |
| None | Bleach (Javex) | Submersible |
| | Qty 0 ig | Intake Setting (BTC) 270ft |

| Driller's Log | | | | |
|---------------|--------------|--------------|-----------------------|------------------|
| Well Log | From | End | Colour | Rock Type |
| 17782 | 270ft | 280ft | Brown and grey | Sandstone |
| 17782 | 0ft | 3ft | Brown | Till |
| 17782 | 3ft | 270ft | Grey | Granite |
| 17782 | 280ft | 290ft | Grey | Granite |

Overall Well Depth
290ft

Bedrock Level
3ft

| Water Bearing Fracture Zone | | |
|-----------------------------|--------------|-----------------|
| Well Log | Depth | Rate |
| 17782 | 265ft | 1.5 igpm |

| Setbacks | | |
|--------------|-------------|-------------------------------------|
| Well Log | Distance | Setback From |
| 17782 | 55ft | Septic Tank |
| 17782 | 85ft | Leach Field |
| 17782 | 70ft | Right of any Public Way Road |

Well Driller's Report

Date printed **2019/08/16**

| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Farm | New Well | Rotary | 06/12/2008 |

| | | |
|---------------------------------|---------------------|------------------|
| Casing Information | Casing above ground | Drive Shoe Used? |
| There is no casing information. | | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|-----------------|------------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 20ft | 0.5 igpm | 1hr 30min | 242ft | 0.5 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| | | | |
|--|----------------------|-----------------|------------------------------------|
| Well Grouting There is no Grout information. | Drilling Fluids Used | Disinfectant | Pump Installed |
| | None | N/A | N/A |
| | | Qty 0 ig | Intake Setting (BTC) 0ft |

| Driller's Log | | | | | Overall Well Depth 242ft |
|---------------|------------|--------------|--------------|---------------|------------------------------------|
| Well Log | From | End | Colour | Rock Type | |
| 18061 | 0ft | 2ft | Brown | Gravel | Bedrock Level 2ft |
| 18061 | 2ft | 242ft | Grey | Rock | |

| Water Bearing Fracture Zone | | |
|-----------------------------|--------------|-----------------|
| Well Log | Depth | Rate |
| 18061 | 225ft | 0.5 igpm |

| Setbacks | | |
|--------------|--------------|-------------------------------------|
| Well Log | Distance | Setback From |
| 18061 | 55ft | Septic Tank |
| 18061 | 80ft | Leach Field |
| 18061 | 300ft | Right of any Public Way Road |

Well Driller's Report

Date printed **2019/08/16**

| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 09/04/2006 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 18683 | Steel | 6 inch | 0ft | 20ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|---------------|------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 18ft | 1 igpm | 1hr | 18ft | 1 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| |
|---------------------------------------|
| Well Grouting |
| There is no Grout information. |

| | | |
|----------------------|-----------------------|--------------------------------------|
| Drilling Fluids Used | Disinfectant | Pump Installed |
| None | Bleach (Javex) | Submersible |
| | Qty 0 ig | Intake Setting (BTC) 180ft |

| Driller's Log | | | | |
|---------------|-------------|--------------|--------------|------------------|
| Well Log | From | End | Colour | Rock Type |
| 18683 | 0ft | 4ft | Brown | Till |
| 18683 | 4ft | 75ft | Brown | Sandstone |
| 18683 | 75ft | 230ft | Grey | Slate |

Overall Well Depth
230ft

Bedrock Level
4ft

| Water Bearing Fracture Zone | | |
|-----------------------------|--------------|---------------|
| Well Log | Depth | Rate |
| 18683 | 160ft | 1 igpm |

| Setbacks | | |
|--------------|--------------|-------------------------------------|
| Well Log | Distance | Setback From |
| 18683 | 55ft | Septic Tank |
| 18683 | 75ft | Leach Field |
| 18683 | 120ft | Right of any Public Way Road |

Well Driller's Report

Date printed **2019/08/16**

| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 07/09/2009 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 26855 | Steel | 6 inch | 0ft | 20ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|------------------|-------------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 500ft | 0.75 igpm | 3hrs 03min | 21ft | 0.5 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| |
|---------------------------------------|
| Well Grouting |
| There is no Grout information. |

| | | |
|----------------------|-----------------------|------------------------------------|
| Drilling Fluids Used | Disinfectant | Pump Installed |
| None | Bleach (Javex) | N/A |
| | Qty 0 ig | Intake Setting (BTC) 0ft |

| Driller's Log | | | | |
|---------------|----------------|----------------|--------------|----------------|
| Well Log | From | End | Colour | Rock Type |
| 26855 | 116ft | 122ft | Pink | Granite |
| 26855 | 0ft | 2ft 6in | Brown | Gravel |
| 26855 | 2ft 6in | 116ft | Grey | Granite |
| 26855 | 122ft | 500ft | Grey | Granite |

Overall Well Depth
500ft
Bedrock Level
2ft 6in

| Water Bearing Fracture Zone | | |
|-----------------------------|--------------|-----------------|
| Well Log | Depth | Rate |
| 26855 | 470ft | 0.5 igpm |
| 26855 | 400ft | 0.1 igpm |

| Setbacks | | |
|--------------|--------------|-------------------------------------|
| Well Log | Distance | Setback From |
| 26855 | 140ft | Right of any Public Way Road |
| 26855 | 60ft | Septic Tank |
| 26855 | 85ft | Leach Field |

Well Driller's Report

Date printed **2019/08/16**

| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 08/04/2017 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 36172 | Steel | 6 inch | 0ft | 40ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|---------------|------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 18ft | 1 igpm | 1hr | 18ft | 2 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| | | | |
|---------------------------------------|----------------------|-----------------------|--------------------------------------|
| Well Grouting | Drilling Fluids Used | Disinfectant | Pump Installed |
| There is no Grout information. | None | Bleach (Javex) | Submersible |
| | | Qty 0 ig | Intake Setting (BTC) 265ft |

| Driller's Log | | | | | Overall Well Depth |
|---------------|--------------|--------------|--------------|--------------------|-------------------------------------|
| Well Log | From | End | Colour | Rock Type | 290ft |
| 36172 | 0ft | 10ft | Brown | Till | Bedrock Level 39ft |
| 36172 | 10ft | 35ft | Grey | Clay | |
| 36172 | 35ft | 39ft | Grey | Broken Rock | |
| 36172 | 39ft | 255ft | Grey | Granite | |
| 36172 | 255ft | 270ft | Red | Granite | |
| 36172 | 270ft | 290ft | Grey | Granite | |

| Water Bearing Fracture Zone | | |
|-----------------------------|--------------|---------------|
| Well Log | Depth | Rate |
| 36172 | 255ft | 1 igpm |

| Setbacks | | |
|--------------|--------------|-------------------------------------|
| Well Log | Distance | Setback From |
| 36172 | 80ft | Septic Tank |
| 36172 | 90ft | Leach Field |
| 36172 | 200ft | Right of any Public Way Road |

| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 08/04/2017 |

| | | | | | |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Casing Information | | Casing above ground | | | Drive Shoe Used? |
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 36172 | Steel | 6 inch | 0ft | 40ft | |

| | | | | | | | |
|------------------------------------|---------------------------|---------------|------------|-------------------------|----------------------|---------------|---------------|
| Aquifer Test/Yield | | | | | | | |
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 18ft | 1 igpm | 1hr | 18ft | 2 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| | | | |
|---------------------------------------|----------------------|-----------------------|--------------------------------------|
| Well Grouting | Drilling Fluids Used | Disinfectant | Pump Installed |
| There is no Grout information. | None | Bleach (Javex) | Submersible |
| | | Qty 0 ig | Intake Setting (BTC) 265ft |

| | | | | | |
|---------------|--------------|--------------|--------------|--------------------|--------------------|
| Driller's Log | | | | | Overall Well Depth |
| Well Log | From | End | Colour | Rock Type | 290ft |
| 36172 | 0ft | 10ft | Brown | Till | |
| 36172 | 10ft | 35ft | Grey | Clay | |
| 36172 | 35ft | 39ft | Grey | Broken Rock | Bedrock Level |
| 36172 | 39ft | 255ft | Grey | Granite | 39ft |
| 36172 | 255ft | 270ft | Red | Granite | |
| 36172 | 270ft | 290ft | Grey | Granite | |

| | | |
|-----------------------------|--------------|---------------|
| Water Bearing Fracture Zone | | |
| Well Log | Depth | Rate |
| 36172 | 255ft | 1 igpm |

| | | |
|--------------|--------------|-------------------------------------|
| Setbacks | | |
| Well Log | Distance | Setback From |
| 36172 | 80ft | Septic Tank |
| 36172 | 90ft | Leach Field |
| 36172 | 200ft | Right of any Public Way Road |



Well Driller's Report

Date printed **2019/08/16**

| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 04/19/2018 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 36794 | Steel | 6 inch | 0ft | 20ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|-----------------|------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 18ft | 0.5 igpm | 1hr | 18ft | 2 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| |
|---------------------------------------|
| Well Grouting |
| There is no Grout information. |

| | | |
|----------------------|-----------------------|--------------------------------------|
| Drilling Fluids Used | Disinfectant | Pump Installed |
| None | Bleach (Javex) | Submersible |
| | Qty 0 ig | Intake Setting (BTC) 340ft |

| Driller's Log | | | | |
|---------------|------------|--------------|-----------------------|----------------|
| Well Log | From | End | Colour | Rock Type |
| 36794 | 0ft | 2ft | Brown | Till |
| 36794 | 2ft | 390ft | Grey and black | Granite |

Overall Well Depth
390ft

Bedrock Level
2ft

| Water Bearing Fracture Zone | | |
|-----------------------------|--------------|-----------------|
| Well Log | Depth | Rate |
| 36794 | 280ft | 0.5 igpm |

| Setbacks | | |
|--------------|--------------|-------------------------------------|
| Well Log | Distance | Setback From |
| 36794 | 100ft | Septic Tank |
| 36794 | 110ft | Leach Field |
| 36794 | 200ft | Right of any Public Way Road |

Well Driller's Report

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| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 04/19/2018 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 36795 | Steel | 6 inch | 0ft | 20ft | |

| Aquifer Test/Yield | | | | | | |
|------------------------------------|---------------------------|---------------|------------|-------------------------|----------------------|--------------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? Rate |
| Air | 18ft | 3 igpm | 1hr | 18ft | 4 igpm | No 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | |

| | | | |
|---------------------------------------|----------------------|-----------------------|--------------------------------------|
| Well Grouting | Drilling Fluids Used | Disinfectant | Pump Installed |
| There is no Grout information. | None | Bleach (Javex) | Submersible |
| | | Qty 0 ig | Intake Setting (BTC) 270ft |

| Driller's Log | | | | | Overall Well Depth |
|---------------|-------------|--------------|-----------------------|----------------|------------------------------|
| Well Log | From | End | Colour | Rock Type | |
| 36795 | 0ft | 14ft | Brown | Till | 310ft |
| 36795 | 14ft | 310ft | Grey and black | Granite | Bedrock Level 14ft |

| Water Bearing Fracture Zone | | |
|-----------------------------|--------------|---------------|
| Well Log | Depth | Rate |
| 36795 | 210ft | 3 igpm |

| Setbacks | | |
|--------------|-------------|-------------------------------------|
| Well Log | Distance | Setback From |
| 36795 | 80ft | Septic Tank |
| 36795 | 95ft | Leach Field |
| 36795 | 70ft | Right of any Public Way Road |



Well Driller's Report

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| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 04/19/2018 |

| | | |
|---------------------------------|---------------------|------------------|
| Casing Information | Casing above ground | Drive Shoe Used? |
| There is no casing information. | | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|---------------|------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 18ft | 3 igpm | 1hr | 18ft | 4 igpm | No | 0 igpm |
| <i>(BTC - Below top of casina)</i> | | | | | | | |

| |
|--------------------------------|
| Well Grouting |
| There is no Grout information. |

| | | |
|----------------------|-----------------------|--------------------------------------|
| Drilling Fluids Used | Disinfectant | Pump Installed |
| None | Bleach (Javex) | Submersible |
| | Qty 0 ig | Intake Setting (BTC) 270ft |

| |
|-------------------------------------|
| Driller's Log |
| There is no rock layer information. |

Overall Well Depth
310ft

Bedrock Level
14ft

| |
|--|
| Water Bearing Fracture Zone |
| There is no water bearing fracture zone information. |

| |
|----------------------------------|
| Setbacks |
| There is no Setback information. |

Well Driller's Report

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| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 11/18/2016 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 37943 | Steel | 6 inch | 0ft | 60ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|---------------|------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 18ft | 3 igpm | 1hr | 18ft | 5 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| |
|---------------------------------------|
| Well Grouting |
| There is no Grout information. |

| | | |
|----------------------|-----------------------|--------------------------------------|
| Drilling Fluids Used | Disinfectant | Pump Installed |
| None | Bleach (Javex) | Submersible |
| | Qty 0 ig | Intake Setting (BTC) 200ft |

| Driller's Log | | | | |
|---------------|------------|--------------|--------------|--------------|
| Well Log | From | End | Colour | Rock Type |
| 37943 | 0ft | 3ft | Brown | Till |
| 37943 | 3ft | 240ft | Grey | Slate |

Overall Well Depth
240ft

Bedrock Level
3ft

| Water Bearing Fracture Zone | | |
|-----------------------------|-------------|---------------|
| Well Log | Depth | Rate |
| 37943 | 78ft | 3 igpm |

| Setbacks | | |
|--------------|--------------|-------------------------------------|
| Well Log | Distance | Setback From |
| 37943 | 60ft | Septic Tank |
| 37943 | 76ft | Leach Field |
| 37943 | 500ft | Right of any Public Way Road |

Well Driller's Report

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| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 05/31/2016 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 38668 | Steel | 6 inch | 0ft | 20ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|---------------|------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 18ft | 4 igpm | 1hr | 18ft | 4 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| |
|---------------------------------------|
| Well Grouting |
| There is no Grout information. |

| | | |
|----------------------|-----------------------|--------------------------------------|
| Drilling Fluids Used | Disinfectant | Pump Installed |
| None | Bleach (Javex) | Submersible |
| | Qty 0 ig | Intake Setting (BTC) 135ft |

| Driller's Log | | | | | |
|---------------|-------------|--------------|--------------|----------------|--|
| Well Log | From | End | Colour | Rock Type | |
| 38668 | 0ft | 12ft | Brown | Sand | |
| 38668 | 12ft | 15ft | Brown | Clay | |
| 38668 | 15ft | 165ft | Grey | Granite | |

Overall Well Depth
165ft

Bedrock Level
0ft

| Water Bearing Fracture Zone | | |
|-----------------------------|--------------|-----------------|
| Well Log | Depth | Rate |
| 38668 | 85ft | 1.5 igpm |
| 38668 | 100ft | 2.5 igpm |

| Setbacks | | |
|---|-------------|-------------------------------------|
| Well Log | Distance | Setback From |
| 38668 | 70ft | Right of any Public Way Road |
| <i>Setbacks measured (new construction)</i> | | |
| 38668 | 80ft | Septic Tank |
| 38668 | 90ft | Leach Field |



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| | | | | |
|------------|---------------------------------|-----------------|---------------|-------------------|
| Drilled by | Well Use | Work Type | Drill Method | Work Completed |
| | Drinking Water, Domestic | New Well | Rotary | 08/27/2015 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|--------------|---------------------|------------|-------------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 40044 | Steel | 6 inch | 0ft | 40ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|---------------|------------|-------------------------|----------------------|---------------|---------------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 25ft | 4 igpm | 1hr | 20ft | 4 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| |
|---------------------------------------|
| Well Grouting |
| There is no Grout information. |

| | | |
|----------------------|-----------------------|--------------------------------------|
| Drilling Fluids Used | Disinfectant | Pump Installed |
| None | Bleach (Javex) | Submersible |
| | Qty 0 ig | Intake Setting (BTC) 210ft |

| Driller's Log | | | | |
|---------------|-------------|--------------|--------------|----------------|
| Well Log | From | End | Colour | Rock Type |
| 40044 | 0ft | 39ft | Brown | Clay |
| 40044 | 39ft | 250ft | Black | Granite |

Overall Well Depth
250ft

Bedrock Level
39ft

| Water Bearing Fracture Zone | | |
|-----------------------------|--------------|---------------|
| Well Log | Depth | Rate |
| 40044 | 78ft | 1 igpm |
| 40044 | 180ft | 3 igpm |

| Setbacks | | |
|--------------|-------------|-------------------------------------|
| Well Log | Distance | Setback From |
| 40044 | 20ft | Right of any Public Way Road |

Well Driller's Report

Date printed **2019/08/16**

| | | | |
|---|-----------------|---------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Rotary | 05/19/2015 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|-------------|---------------------|------|------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 40200 | Steel | 6 inch | 0ft | 20ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|--------------|----------|-------------------------|----------------------|---------------|--------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 18ft | 4 igpm | 1hr | 18ft | 4 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| |
|---------------------------------------|
| Well Grouting |
| There is no Grout information. |

| | | |
|----------------------|-----------------------|--------------------------------------|
| Drilling Fluids Used | Disinfectant | Pump Installed |
| None | Bleach (Javex) | Submersible |
| | Qty 0 ig | Intake Setting (BTC) 250ft |

| Driller's Log | | | | |
|---------------|------|-------|--------|-----------|
| Well Log | From | End | Colour | Rock Type |
| 40200 | 0ft | 4ft | Black | Mud |
| 40200 | 4ft | 270ft | Black | Slate |

Overall Well Depth
270ft

Bedrock Level
4ft

| Water Bearing Fracture Zone | | |
|-----------------------------|-------|--------|
| Well Log | Depth | Rate |
| 40200 | 115ft | 1 igpm |
| 40200 | 260ft | 3 igpm |

| Setbacks | | |
|----------|----------|------------------------------|
| Well Log | Distance | Setback From |
| 40200 | 70ft | Septic Tank |
| 40200 | 80ft | Leach Field |
| 40200 | 100ft | Right of any Public Way Road |

Well Driller's Report

Date printed **2019/08/16**

| | | | |
|---|-----------------|-------------------|-------------------|
| Drilled by | Work Type | Drill Method | Work Completed |
| Well Use Drinking Water, Domestic | New Well | Cable Tool | 09/06/2001 |

| Casing Information | | Casing above ground | | | Drive Shoe Used? |
|--------------------|-------------|---------------------|------|------|------------------|
| Well Log | Casing Type | Diameter | From | End | Slotted? |
| 90023661 | Steel | 6 inch | 0ft | 28ft | |

| Aquifer Test/Yield | | | | | | | |
|------------------------------------|---------------------------|--------------|----------|-------------------------|----------------------|---------------|--------|
| Method | Initial Water Level (BTC) | Pumping Rate | Duration | Final Water Level (BTC) | Estimated Safe Yield | Flowing Well? | Rate |
| Air | 0ft | 4 igpm | 1hr | 0ft | 4 igpm | No | 0 igpm |
| <i>(BTC - Below top of casing)</i> | | | | | | | |

| | | | |
|--------------------------------|----------------------|----------------|-------------------------------|
| Well Grouting | Drilling Fluids Used | Disinfectant | Pump Installed |
| There is no Grout information. | None | Bleach (Javex) | Submersible |
| | | Qty 1.0 ig | Intake Setting (BTC) 160ft |

| Driller's Log | | | | | Overall Well Depth |
|---------------|------|-------|--------|-----------|-----------------------|
| Well Log | From | End | Colour | Rock Type | |
| 90023661 | 0ft | 23ft | Brown | Till | 185ft |
| 90023661 | 23ft | 185ft | Grey | Granite | Bedrock Level 23ft |

| Water Bearing Fracture Zone | | |
|-----------------------------|-------|--------|
| Well Log | Depth | Rate |
| 90023661 | 63ft | 2 igpm |

| Setbacks |
|----------------------------------|
| There is no Setback information. |



APPENDIX B

Figures



LEGEND

- SPOT ELEVATION
- SANITARY MANHOLE
- STORM MANHOLE
- STORM MANHOLE-CB Frame & Grate
- CATCH BASIN
- UNDEFINED MANHOLE
- GATE VALVE with BOX
- GATE VALVE with CHAMBER
- HYDRANT
- CURB STOP
- UTILITY POLE and GUY
- LIGHT POLE
- TRAFFIC SIGNAL BASE
- SIGN
- PROPERTY PIN
- BORE HOLE
- TEST PIT
- CONTROL POINT
- BENCHMARK
- N.B. MONUMENT
- INDIVIDUAL TREES
- SANITARY SEWER
- WATER MAIN
- STORM SEWER
- CULVERT
- SANITARY FORCE MAIN
- OVERHEAD POWER
- UNDERGROUND POWER
- BOTTOM of SLOPE
- TOP of SLOPE
- CURB
- SIDEWALK
- FENCE LINE (TYPICAL)
- GRADE RAIL
- CENTRE DITCH
- RETAINING WALL
- BUILDING
- WATERCOURSE CENTRELINE
(brooks, streams, rivers etc.)
- EDGE OF WATER
- CONTOUR
(elevation in metres)
- CENTRELINE
- STREET R.O.W.
- PROPERTY LINE
- EASEMENT LINE

ABBREVIATIONS

| | |
|---------------------|-------|
| SANITARY SEWER | SA |
| SANITARY FORCE MAIN | SAFM |
| STORM SEWER | ST |
| WATER MAIN | W |
| DRIVEWAY | D/W |
| ASBESTOS CEMENT | AC |
| CONCRETE | Conc. |
| REINFORCED CONCRETE | RC |
| CAST IRON | CI |
| DUCTILE IRON | DI |

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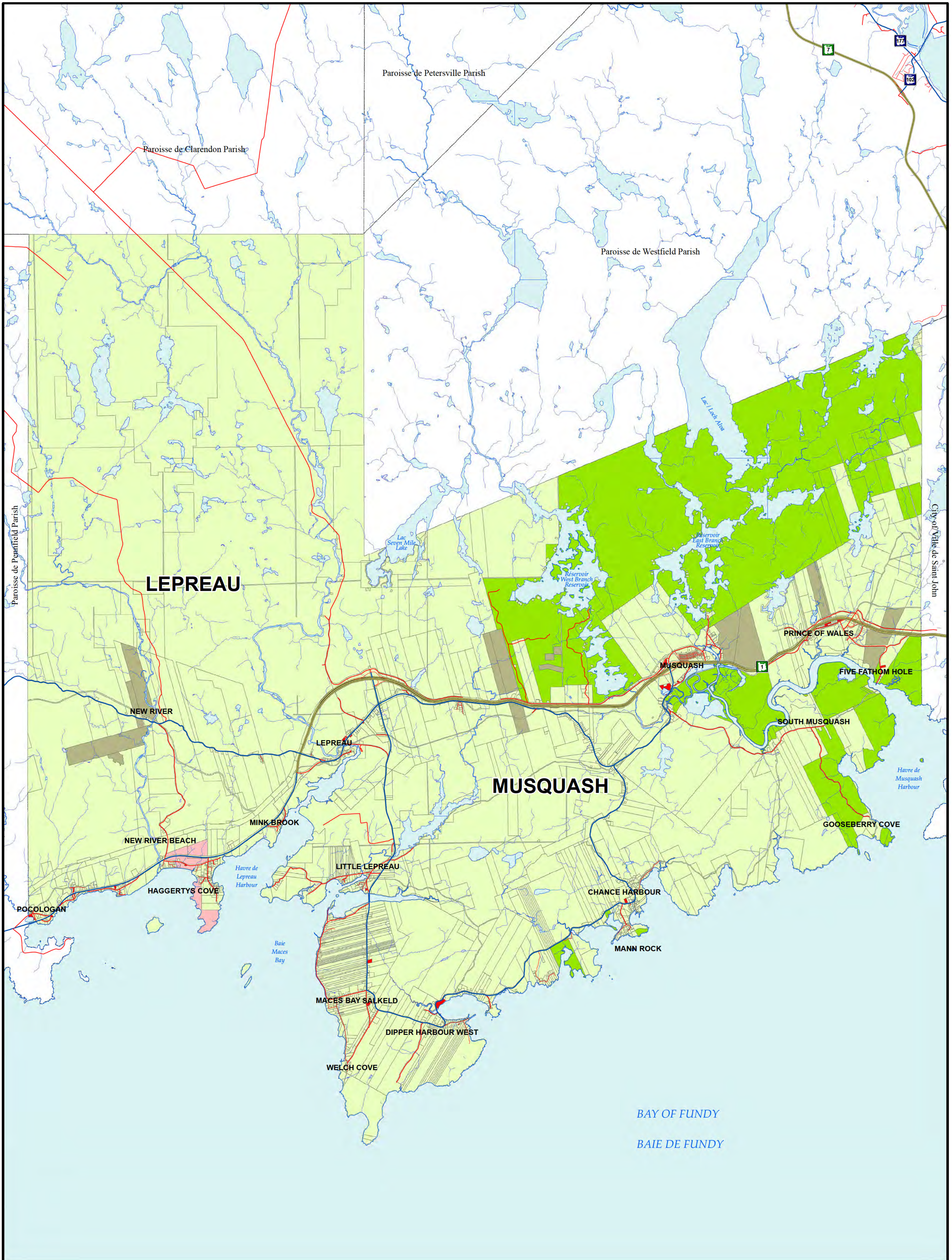
SITE PLAN


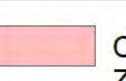




HOMES BY THE BAY

POCOLOGAN, NEW BRUNSWICK

SITE PLAN
 June 21, 2022
SP1
 SCALE: NTS

**Schedule A / Annexe A
Lepreau-Musquash Planning Area Zoning Map
Carte de zonage du secteur d'aménagement de Lepreau-Musquash**



| | |
|---|--|
|  R - Residential Zone Zone résidentielle («R») |  CR - Commercial Recreational Zone Zone à usage commercial et récréatif («CR») |
|  MU - Mixed Use Zone Zone d'usages mixtes («UM») |  R&A - Resource and Aggregate Extraction Zone Zone d'extraction de ressources et d'agrégats («R et A») |
|  C&LI - Commercial and Light Industrial Zone Zone à usage commercial ou affectée à l'industrie légère («C et IL») |  C - Conservation Zone Zone de conservation («C») |



kilomètres 0 1 2 3 4 kilomètres
1: 55,000



LET'S COLLECTIVELY BUILD
OUR REGIONS!

in f 

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APPENDIX B

Site Photos



Photo No. 1: Subject Site and Route 113



Photo No. 2: Subject Site Entrance



Photo No.3: Subject Site and Maces Bay



Photo No. 4: Subject Site



Photo No. 5: Rear of Restaurant



Photo No. 6: Motel



Photo No. 7: Subject Site Looking West from Motel Towards Proposed Site of Wastewater Treatment System



Photo No. 8: Subject Site (West) from Maces Bay and Intertidal Zone



Photo No. 11: Subject Site (East) from Maces Bay and Intertidal Zone



Photo No. 12: Restaurant and Shoreline

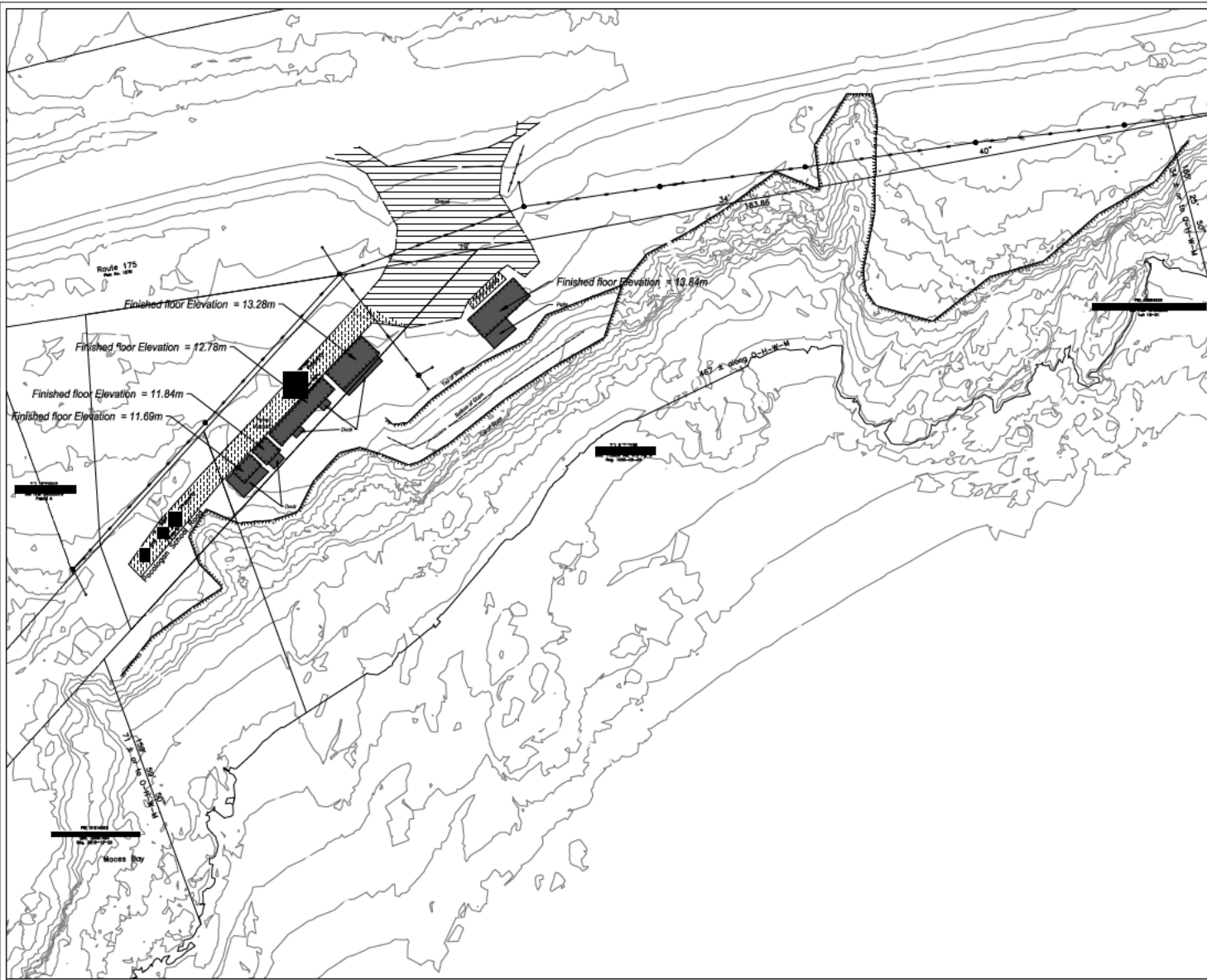


Photo No. 13: Shoreline at Base of Subject Site



APPENDIX C

Figures



LEGEND

- SPOT ELEVATION
- SANITARY MANHOLE
- STORM MANHOLE
- STORM MANHOLE-CB Frame & Grate
- CATCH BASIN
- UNDEFINED MANHOLE
- GATE VALVE with BOX
- GATE VALVE with CHAMBER
- HYDRANT
- CURB STOP
- UTILITY POLE and GUY
- LIGHT POLE
- TRAFFIC SIGNAL BASE
- SIGN
- PROPERTY PIN
- BORE HOLE
- TEST PIT
- CONTROL POINT
- BENCHMARK
- N.B. MONUMENT
- INDIVIDUAL TREES
- SANITARY SEWER
- WATER MAIN
- STORM SEWER
- CULVERT
- SANITARY FORCE MAIN
- OVER-HEAD POWER
- UNDERGROUND POWER
- BOTTOM of SLOPE
- TOP of SLOPE
- CURB
- SIDEWALK
- FENCE LINE (TYPICAL)
- GUIDE RAIL
- CENTRE DITCH
- RETAINING WALL
- BUILDING
- WATERCOURSE CENTRELINE
(brooks, streams, rivers etc.)
- EDGE OF WATER
- CONTOUR
(elevation in metres)
- CENTRELINE
- STREET R.O.W.
- PROPERTY LINE
- EASEMENT LINE

ABBREVIATIONS

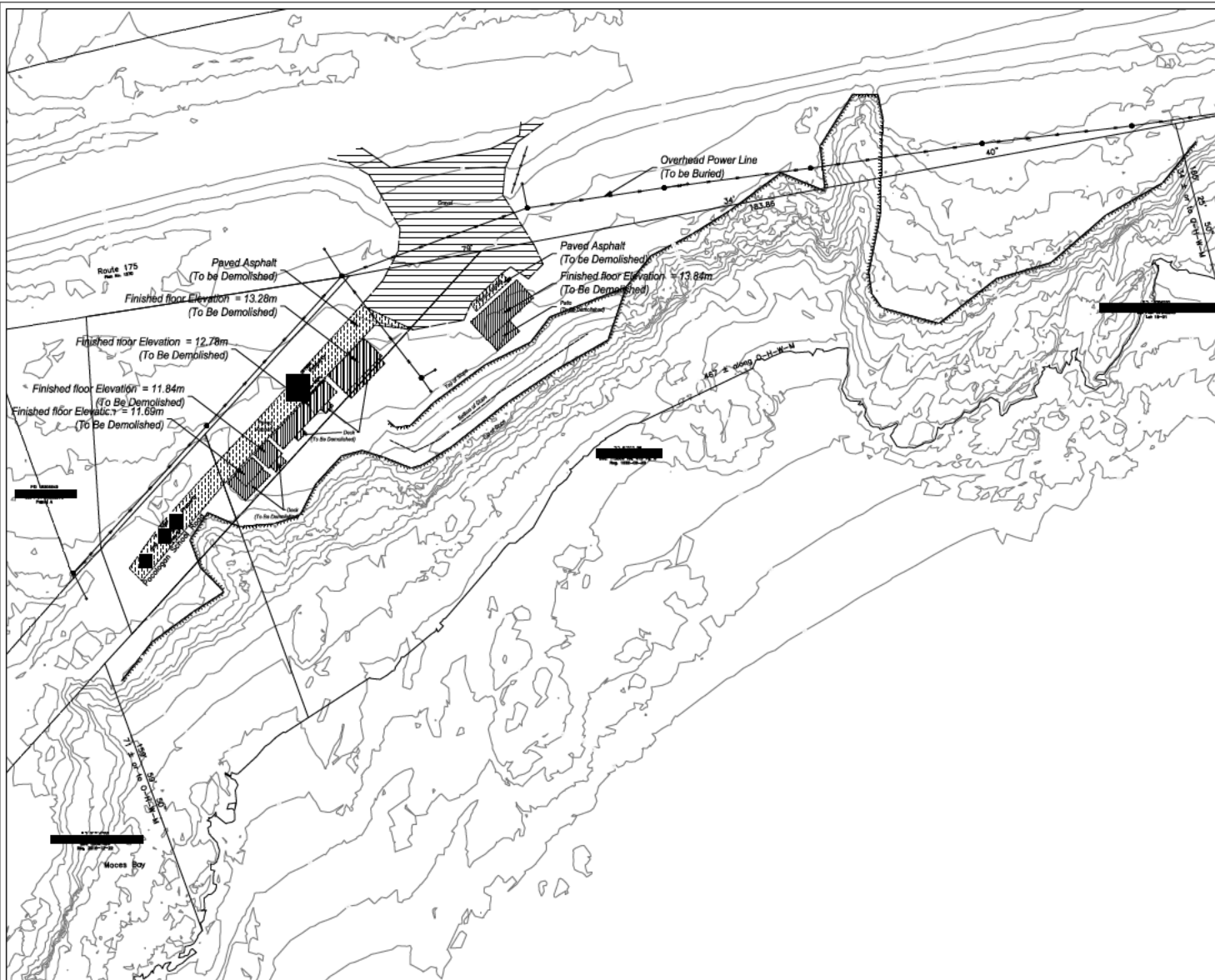
| | |
|---------------------|-------|
| SANITARY SEWER | SA |
| SANITARY FORCE MAIN | SAFM |
| STORM SEWER | ST |
| WATER MAIN | W |
| DRIVEWAY | D/W |
| ASBESTOS CEMENT | AC |
| CONCRETE | Conc. |
| REINFORCED CONCRETE | RC |
| CAST IRON | CI |
| DUCTILE IRON | DI |

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EXISTING SITE PLAN

HOMES BY THE BAY
 POCOLOGAN, NEW BRUNSWICK

SITE PLAN
 June 23, 2022
SP1
 SCALE: NTS



LEGEND

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- CATCH BASIN
- UNDEFINED MANHOLE
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DEMOLITION PLAN

HOMES BY THE BAY
 POCOLOGAN, NEW BRUNSWICK

SITE PLAN
 June 23, 2022
SP1
 SCALE: NTS



LEGEND

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- HYDRANT
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ABBREVIATIONS

| | |
|---------------------|-------|
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| SANITARY FORCE MAIN | SAFM |
| STORM SEWER | ST |
| WATER MAIN | W |
| DRIVEWAY | D/W |
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SITE PLAN

HOMES BY THE BAY
 POCOLOGAN, NEW BRUNSWICK

SITE PLAN
 June 21, 2022
SP1
 SCALE: NTS

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APPENDIX D

Wastewater Treatment Technical
Specifications



1. Process Description

As specified by Roy Consultants, the design flow for the treatment plant is 11 m³/d, and the influent raw wastewater characteristics are equal or less than 300 mg/L BOD₅, 300 mg/L TSS, and 100 mg N/L TKN. Our proposed system is designed to meet effluent quality criteria of CBOD₅ ≤ 10 mg/L, TSS ≤ 10 mg/L, total ammonia nitrogen ≤ 1.25 mg N/L, and 200 CFU/100 mL on a monthly average basis.

Note

(1) It was assumed that the facility is not seasonal and active during wintertime. Therefore, the treatment plant is design to meet the treatment objectives under any water temperature above 8°C. Consequently, if the water temperature reaches less than 8°C, exceedance from treatment objectives will be expected.

(2) It is the responsibility of the client to ensure that these flow parameters and influent wastewater characteristics are realistic. RH2O does not take responsibility for wastewater flow characteristics falling outside of the above parameters.

Equalization of maximum daily inflow of up to 11 m³/d will be provided using one (1) 2,000 IG Holding tank (9.1 m³ approximate total working volume, one (1) 2,000 IG Holding Tank, by A&P Concrete Products Inc) equipped with non-clog submersible wastewater pumps. Wastewater will travel from the flow Equalization Tank at a time dose rate of up to 458 L/h into the pre-treatment stage.

Pre-treatment of incoming wastewater will be performed in two stages: Online Sludge Storage and Primary Clarification. Raw water from the Equalization Tank will enter one (2/3) compartment of a 3,000 IG Online Sludge Storage tank (8.2 m³ approximate working volume, (2/3) compartment of one (1) 3,000 IG Septic Tank, by A&P Concrete Products Inc), followed by one (1/3) compartment as the Primary Clarifier tank (4.1 m³ approximate working volume, (1/3) compartment of one (1) 3,000 IG Septic Tank, by A&P Concrete Products Inc). The Sludge Storage section will allow primary solids from raw wastewater to settle and be stored, and the Primary Clarifier section will provide some additional settling and conditioning of the wastewater. The separation of primary solids and coarse particles protects system equipment further upstream (pumps, media) from unnecessary wear and tear. In addition, the Sludge Storage and the Primary Clarifier sections provide an anoxic zone which is suitable for pre-denitrification process and the removal of nitrate/nitrite from wastewater through automated recirculation.

Biological treatment will be accomplished through the RH2O system which utilizes a moving bed biofilm process. The biological stage will consist of two bioreactors containing specially designed plastic carrier media having a specific surface area of 500 m²/m³. Microorganisms will be immobilized in the form of biofilm on the surface of media and consume the organic material from the wastewater. Oxygen is needed for the treatment process and will be supplied by compressors and distributed in the biological stage by fine bubble diffusers. The blowers can be made to run based on a fixed time interval or automated, based on readings obtained from a DO sensor (see Provisional Items below).

The Bioreactor #1, where BOD removal process takes place, will be housed in one (1) 1,000 IG tank (3.7 m³ approximate total working volumes, one (1) 1,000 IG tank, by A&P Concrete Products Inc). The second Bioreactor (#2) is allocated for nitrification process which converts ammonia to nitrate and nitrite, and will be installed in two (2) 1,000 IG tanks (7.4 m³ approximate total working volume, two (2) 1,000 IG Tanks, by A&P Concrete Products Inc). All the bioreactors will be installed in series.

A Final Clarifier, installed in one (1) 1,000 IG tank (2.2 m³ approximate working volume, one (1) 1,000 Holding Tank, by A&P Concrete Products Inc) equipped with two (2) sloped wall hoppers, will be allocated to collect wastewater discharged from Bioreactors. Biomass in the form of fine particles will settle to the bottom of the hoppers and return to the Sludge Storage tank. Two (2) self-adjusting skimmer pumps will also be used to remove any floating sludge.



Treated wastewater will travel by gravity from Final Clarifier and passes through three (3) disinfection Salcor UV systems, installed in series.

Disinfected effluent will be discharged to one (1) 2,000 IG Effluent Pump Tank (9.1 m³ approximate working volume, one (1) 2,000 IG Holding Tank, by A&P Concrete Products Inc) equipped with duplex (2) effluent pumps (to be determined, not included in the base price).

Six (6) linear blowers will be used to provide air for the bioreactors. A PLC system will control all mechanical components and include remote monitoring module with current sensing on each output. Data logging will be available on the effluent and flow equalization pumps based on pump run time. Detailed construction drawings will be provided on placement of the order.

For more information regarding the details of process design, please refer to "Appendix 3 - Process Calculation Sheets".



2. Scope of Work

| | Qty | Model / Nominal Volume (IG) | Description |
|--------------------------------------|-----|-----------------------------|--|
| Tanks | 1 | 2,000 IG Holding | Equalization Tanks c/w (2) vortex Sewage pumps (BJM model SV400, 120 VAC, 1/2 HP), dual level floats, discharge piping assemblies, (2) 6" bottom interconnections, (1) 4" vent connection, and (1) carbon vented lid |
| | 1 | 3,000 IG Septic | Sludge Storage & Primary Clarifier Tank |
| | 3 | 1,000 IG Septic | Bioreactor #1 and #2 |
| | 1 | 1,000 Holding | Final Clarifier Tank |
| | 1 | 2,000 Holding | Final Pump Tank (FPT) c/w (2) effluent pumps (to be determined, not included in the base price) |
| RH2O System Equipment Package | lot | | 4.5 m ³ of carrier media, (18) RH2O-1000 fine bubble diffusers, (6) 3-port aeration distributors, (1) 2-port aeration distributors, aeration piping, (5) 6" media retention screens, (1) 6" flap-check valve, and (3) carbon vent filters for Bioreactors |
| | 2 | | Sludge return pumps (Goulds model LSP0311F, 120 VAC) |
| | 2 | | Self-adjusting surface skimmer assembly and pump (Goulds model LSP0311F, 120 VAC) |
| | 1 | | Nitrate recirculation pump (Goulds model LSP0311F, 120 VAC) w/6" media retention screen |
| | 2 | | Clarifier double hoppers |
| | 1 | | Custom effluent weir assembly |
| | 6 | | Linear air compressors (Hiblow, Model HP-200, 1-phase, 115V, A, 0.25 KW), air filter, valve, and piping assembly for bioreactor |
| | 3 | | Salcor 3G UV Units (40W) |
| | 1 | | A PLC control panel with remote monitoring to operate the treatment plant, equalization pumps, and effluent pumps |
| | lot | | Internal and interconnecting PVC piping and fittings within the treatment system envelope (excludes areas in customer scope as shown in layout drawing) |
| Additional Scope | | | All tanks placed in contractors prepared excavations with our crane truck where access permits |
| | | | All access risers installed to grade (includes 24" of access riser) |
| | | | Installation and Operation Manual |
| | | | Installation assistance, startup and Training for Maintenance Staff (1 trip, 5 days, 2 technicians) |

3. Price Breakdown

| Item Description | Price (\$) |
|---|------------|
| Tankage & Risers | |
| Equipment Package | |
| Equipment Installation / Startup Labour | |
| Transportation | |
| Service | |
| TOTAL | |



Availability: Estimated 10 - 12 weeks from deposit receipt subject to production backlog.
Terms: 50% Deposit, 40% on delivery, remaining 10% Net 30 OAC. Subject to credit application. This price is valid until for 90 days from the date of this proposal.

4. Exclusions to Scope of Work

- Any excavation or backfill (we are not responsible for any settling of pipes etc., due to improper backfill and compaction around tanks).
- Any grading to ensure surface water runoff around treatment plant area.
- Any insulation, anchoring, tank wrapping, or additional measures for high water table.
- Any water-tightness or leakage testing of tanks.
- Any electrical works including power supply, electrical connections, wiring, or conduit.
- Any inspections, permits, fees or locates.
- Any plumbing hook-ups outside of treatment system area.
- Building for controls and blowers (see Provisional Items below).
- Any additional tankage or equipment not included in this scope of work, i.e., leaching bed components (may be provided on request), etc.

5. Provisional Items

| Item | Item Description | Price |
|------|--|-------|
| 1 | Control Building: Supply and install (1) suitably-sized concrete shed, delivered and placed at site. (Electrical and lighting are by others). | |
| 2 | Flow Meter: Supply and install (1) 50 mm electromagnetic flow meter on the raw sewage or effluent line within the control shed (Endress & Hauser model 10D50 or equivalent). | |
| 3 | Level Transducers Supply and install (2) SensorTechnics level transducers, one for the Equalization Tank, and one for the Effluent Pump Tank. | |
| 4 | DO Sensor Supply and install (1) Optical DO sensor integrated into PLC Control panel *recommended* | |



6. Construction Requirements

To complete the installation of our product, subcontractors would be required for all excavation, tank placement and electrical works. We provide delivery of the tankage to the jobsite while the installing contractor is responsible for offloading and placement in the prepared excavation. Our installation team will install all of the technical equipment inside of the tanks and provide supervision on the tank installation. All of the equipment inside of the tank and related piping would be provided as noted in our scope of work.

Additional Installing Contractor Responsibilities:

- **Site tank setting plan must be prepared and submitted a MINIMUM of two (2) weeks in advance of delivery.** This is to include the order of tanks to be delivered and plan for placement, staging area, turning radius for trucks, etc.
- Project delivery schedule(s) must be requested a MINIMUM of five (5) business days in advance. Tanks will be shipped via flatbed over the course of 2-3 days depending on the approved setting plan.
- All excavation and electrical works including power supply, electrical connections, wiring and conduit, etc.
- Determination of soil compressive strength/suitability for placement and delivery of tanks
- Seasonal axle weight restriction; the contractor is responsible for any extra costs and revised scheduling associated with this limitation.
- RH2O North America will provide tankage delivery to the jobsite; Contractor shall provide an accessible, level, and stable surface to accommodate the vehicle(s) and the span of crane truck stabilizers/outriggers.
- Provided crane truck by RH2O North America may set tankage in to prepared excavation where possible within the rated load and crane reach capacity for the equipment.
- Hiring a longer reaching / crane to offload and place tankage, additional permits, and/or re-ordering the delivery is the responsibility of the purchaser, and is at the purchaser's extra cost.
- Notice of Project to the Ministry of Labour as required; Supply, placement, maintenance and removal of all construction signage, delineators, flashers, barriers, fencing, flagmen, lane closures.
- All pipping between tankage must be installed on properly compacted stable material to prevent settlement; RH2O North America is not responsible for pipe damage/misalignment due to insufficient base preparation.
- Restoration of all affected existing surfaces by others; RH2O North America is not responsible for driveway/roadway damage due to machine/material delivery weigh.
- Mud mat and road clean up.
- Confined space work that may be required is not included in this pricing
- Any Changes and/or Additions to the Scope of Work and the price to be charged for same shall be made in writing.
- The individual signing this contract warrants that they are the owner of the property or an authorized agent of the owner

7. Maintenance Costs

The RH2O system is a cost effective and easy to operate system. The maintenance provider does not have to clean any part of the system. In basic terms, the owner of the system must ensure that all mechanical equipment are working (i.e., no alarms) while the maintenance provider is to ensure the system is working properly.

Basic routine maintenance on the system will take approximately 1.5 hours onsite. We recommend for a commercial application that the system be maintained on at least a quarterly basis. One day of training is included in the purchase price of the system.



8. Electrical Requirements

The required electrical power supply to the control building is 120-240 VAC/1-phase/60 Hz. An Electrical detail will be provided on acceptable of our quote and must be accepted before ordering of our electrical equipment.

9. Options –Remote Monitoring Module

The RH2O control panel, which is an industrial class PLC system, comes with a remote monitoring module that allows the maintenance provider to remotely connect to the control panel via wireless connection. This also allows for the control panel to instantly send information to the maintenance provider in case of an alarm or problem should arise with the treatment plant (i.e., power outage, mechanical failure, etc.). Through remote monitoring module and the operation of the treatment plant, the amount of scheduled maintenance visits can be reduced as well as provide assurance of 24/7 round the clock operation. The initial cost for the module is included in the purchase price of the panel and includes one year of data monitoring fee.

10. Advantages of RH2O Treatment System

RH2O systems offer a custom designed solution which can be installed in a small footprint and offer low energy and operating costs. The process can be retrofitted in existing tanks or designed for new construction and upgrades of existing systems.

One of the unique benefits to the fluidized floating bed biofilm process is the ease of operating the system. The bio-media in the system is completely self-cleaning, does not clog and never has to be replaced. The process is designed for intermittent aeration allowing flexible operation and rest settings with minimum energy consumption. This allows for operational flexibility should influent strengths or flow increases, the operator can simply increase aeration times in the bioreactors or additional media should any problems arise from increased organic loading. The operation cycle of the sludge return pump is designed so that the final clarifier is completely clean of secondary sludge. As a result of denitrification, the formation of floating sludge may occur in the final clarifier. This material is removed through a floating skimmer and returned to the sludge storage chamber.

The two most common situations that cause failure in other wastewater process are overload and under-load conditions. Overloading occurs during concentrated periods of water usage in a short time while under-loading occurs during periods of inactiveness. These conditions in other biological processes cause the treatment performance to stop functioning. These problems are minimized in the RH2O process and unlike activated sludge processes, secondary sludge is not returned to the bioreactors in order to maintain the bacterial culture.

RH2O has developed a unique control unit for the electrical supply and automatic control of the system. Each control panel comes standard with GPRS remote monitoring and data logging. This allows for instant notification of alarms and also allows the operator to change settings remotely. Each output also monitors current (amperage) instead of relying on floats or pressure sensors alone for mechanical failures. Current sensors can allow for issues to be detected before major problems occur. The control panel also has analog inputs for additional sensors should they be required on any project (i.e., turbidity, dissolved oxygen, etc.). A battery backup is provided for the panel to ensure that notifications are still sent during power outages.

In summary, the RH2O system is a robust cost-effective wastewater treatment process that takes up a small footprint while providing optimal performance. The system allows for significant operational flexibility and provides peace of mind in cases where influent strengths and flows may vary from anticipated design.



Appendix 1

Process Flow Diagram



PROJECT: Pocologan NB
 QUOTATION NUMBER: 3155-SR

PROCESS FLOW SCHEMATIC



| | EQUALIZATION TANK (EQ) | ONLINE SLUDGE STORAGE (ON-SS) | PRIMARY CLARIFIER (PC) | BOD REMOVAL (BR#1) | NITRIFICATION (BR#2) | FINAL CLARIFIER (FCL) | DISINFECTION | FINAL PUMPTANK (FPT) |
|---|------------------------|-------------------------------|------------------------|----------------------|----------------------------------|---------------------------|----------------|----------------------|
| TANK(S) | 2 000 IG H-A&P | 3 000 IG S-A&P 2/3 | 3 000 IG S-A&P 1/3 | 1 000 IG H-A&P | 1 000 IG H-A&P 1 000 IG H-A&P | 1 000 IG H-A&P | | 2 000 IG H-A&P |
| TOTAL EFFECTIVE VOLUME (m ³) | 9 10 | 8 19 | 4 09 | 3 69 | 7 38 | 2 21 | | 9 10 |
| TOTAL EFFECTIVE SURFACE (m ²) | 5 90 | 4 35 | 2 18 | 3 03 | 6 07 | 3 03 | | 5 90 |
| AVERAGE WATER DEPTH (m) | 1 54 | 1 88 | 1 88 | 1 22 | 1 22 | 1 22 | | 1 54 |
| HYDRAULIC RETENTION TIME (Hr) | 19 85 | 3 7 Min 7 4 Max | 3 14 Min 3 7 Max | 3 34 | 6 67 | 3 80 | | 19 85 |
| OVERFLOW RATE (m ³ /m ² .d) | | 6 10 | 12 20 | | | 4 61 | | |
| MEDIA (m ³) | | | | 1 50 MBBR Carrier | 3 00 MBBR Carrier | | | |
| PUMPS | 2x8JM SV400 Duplex | | | | 1xGoulds LSP03 Simplex | 4xGoulds LSP03 Simplex | | 2xTBD Duplex |
| DOSING CHEMICAL | | | | | | | | |
| BLOWERS | | | | 2xHP-200 Simplex | 4xHP-200 Simplex | | | |
| TUBE DIFFUSER (m) | | | | RH2O-1000 6 | RH2O-1000 12 | | | |
| DISINFECTION | | | | | | | 3 x Salcor 40W | |



Appendix 2

Tank List and Dimensions



PROJECT NAME: Pocologan NB
QUOTATION NUMBER: 3155-SR

| | Qty | OUTER DIMENSIONS | | |
|--------------------------------------|-----|------------------|-----------|------------|
| | | Length (m) | Width (m) | Height (m) |
| EQUALIZATION TANK (EQ) | | | | |
| 2,000 IG H-A&P | 1 | 3.658 | 1.956 | 2.134 |
| ONLINE SLUDGE STORAGE (ON-SS) | | | | |
| PRIMARY CLARIFIER (PC) | | | | |
| 3,000 IG S-A&P | 1 | 3.391 | 2.394 | 2.388 |
| BOD REMOVAL (BR#1) | | | | |
| 1,000 IG H-A&P | 1 | 2.59 | 1.473 | 1.727 |
| NITRIFICATION (BR#2) | | | | |
| 1,000 IG S-A&P | 2 | 2.59 | 1.473 | 1.727 |
| FINAL CLARIFIER (FCL) | | | | |
| 1,000 IG H-A&P | 1 | 2.59 | 1.473 | 1.727 |
| FINAL PUMP TANK (FPT) | | | | |
| 2,000 IG H-A&P | 1 | 3.658 | 1.956 | 2.134 |



Appendix 3

Process Calculation Sheets



DESIGN CRITERIA

Design Basis

Wastewater Characteristics

| Parameter | Value | Unit |
|------------------|-------|-------------------------|
| BOD ₅ | < 300 | mg/L |
| TSS | < 300 | mg/L |
| TKN | < 100 | mg N/L |
| TP | N/A | mg P/L |
| Alk | N/A | mg CaCO ₃ /L |
| FOG | N/A | mg/L |

Requested Effluent Characteristics

| Parameter | Value | Unit |
|-------------------|--------|-------------------------|
| CBOD ₅ | < 10 | mg/L |
| TSS | < 10 | mg/L |
| NH ₃ | < 1.25 | mg N/L |
| NO _x | N/A | mg N/L |
| TP | N/A | mg P/L |
| Alk | N/A | mg CaCO ₃ /L |
| E-Coli | < 200 | CFU/100 mL |

Hydraulic Criteria

| Parameter | Value | Unit |
|---------------------|--------|-------------------|
| Q _{design} | 11 | m ³ /d |
| Q _{Max} | N/A | m ³ /d |
| Q _{Min} | N/A | m ³ /d |
| Q _{Ave} | 458.40 | L/Hr |

Additional Design Criteria

| Description | Value | Unit |
|---|-------|------|
| Pre-Denitrification Influence on BOD Removal | 0 | % |
| Maximum Nitrate Concentration after Pre-Denitrification | 45 | mg/L |
| Minimum BOD in Influent of Bioreactor #1 | 300 | mg/L |
| Sludge Production Influence on N Removal | 20 | % |

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DISCLAIMER

The calculations contained in this document were developed by RH2O North America Inc. according to the initial design parameters (influent hydraulic flow and raw wastewater characteristics such as BOD, TSS, TKN, TP, ALK, etc) obtained from 'Roy Consultants' intended solely for the project of 'Pocologan NB'. In no event shall the client(s) copy or use any of the design documents, including but not limited to concepts, plans, drawings, specifications, designs, models, reports, graphs, calculations, construction, processes, and other data produced by RH2O North America Inc. for any purpose other than 'Pocologan NB' project without the prior written permission from RH2O North America Inc. The design documents are made available for client review for informational purposes, regardless of completeness of initial design parameters obtained from client. RH2O North America Inc. is not liable or responsible for the validity of the 'initial design parameters'. Please note that the design parameters disclosed within this 'Process Calculation Sheet' reflect our most up-to-date knowledge and experience. RH2O North America is constantly striving to improve the design and performance of its wastewater treatment plants. Calculated values may be revised as more detailed field data and emerging advanced treatment technologies are made available, and as a result, these parameters are subject to change without notice.

10/4/2021

RH2O North America Inc. 268 Woolwich St S, Breslau, ON N0B 1M0. T: (519) 648-3475 F: (519) 648-3585



PROJECT NAME: Pocologan NB
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PROPOSED PROCESS DESIGN

| Parameter | Selected/ Calculated | Unit | Acceptable Range |
|--|-------------------------|-----------------------------------|---------------------|
| EQUALIZATION TANK (EQ) | | | |
| Availability of Historical Flow Rate Data? | NO | | |
| Effective Tank Volume | 9.1 | m ³ | |
| Balanced Flow Rate | 458.4 | L/Hr | |
| Total Balancing Capacity | 19.9 | Hr | |
| ONLINE SLUDGE STORAGE (ON-SS) | | | |
| Effective Tank Volume | 8.2 | m ³ | |
| Maximum Hydraulic Retention Time (Empty tank) | 7.4 | Hr | |
| Minimum Hydraulic Retention Time (Full tank) | 3.7 | Hr | |
| Overflow Rate | 6.1 | m ³ /m ² .d | |
| Dry Sludge Accumulation Rate | 4.8 | Kg SS/d | |
| Sludge Storage Capacity | 0.83 | month(s) | 1 to 4 |
| Stored Sludge Dry Solids | 2.5 | % | 1.5 to 4, Ave 2.5 |
| Max Sludge Level before Sludge Pump-Out | 50 | % | |
| PRIMARY CLARIFIER (PC) | | | |
| Effective Tank Volume | 4.1 | m ³ | |
| Maximum Hydraulic Retention Time (Empty Tank) | 3.7 | Hr | |
| Minimum Hydraulic Retention Time (Full Tank) | 3.1 | Hr | |
| Overflow Rate | 12.2 | m ³ /m ² .d | |
| Max Sludge Level before Sludge Pump-Out | 15 | % | |
| PRE-DENITRIFICATION (PRE-DN) | | | |
| External Carbon Addition Needed? | NO | | |
| Chemical Dosing System Recommended? | NO | | |
| BOD REMOVAL (BR#1) | | | |
| Effective Tank Volume | 3.7 | m ³ | |
| Hydraulic Retention Time | 3.3 | Hr | |
| Carrier Volume | 1.5 | m ³ | |
| Surface Area Removal Rates (SARRs) in Reactor(s) | 4.02 | g BOD/m ² .d | |
| Bulk Specific Surface Area of Carrier | 500 | m ² /m ³ | |
| Fill of Carrier | 40 | % | 30 to 50 |
| Dissolved Oxygen | 3.5 | mg/L | 2 to 4 |
| Temperature | 8 | °C | |
| Biomass Production Rate | 1.5 | kg VSS/d | |

NITRIFICATION (BR#2)

| | | | |
|--|----------|--|----------|
| Effective Tank Volume | 7.4 | m ³ | |
| Hydraulic Retention Time | 6.7 | Hr | |
| Carrier Volume | 3.0 | m ³ | |
| Surface Area Removal Rates (SARRs) in Reactor(s) | 0.9, 0.6 | g NH ₃ -N/m ² .d | |
| Bulk Specific Surface Area of Carrier | 500 | m ² /m ³ | |
| Fill of Carrier | 40 | % | 30 to 50 |
| Dissolved Oxygen | 5 | mg/L | 4 to 6 |
| Temperature | 8 | °C | |
| Biomass Production Rate | 0.09 | kg VSS/d | |
| Possible Required Alkalinity (as Na ₂ CO ₃) | 0.9 | Kg/d | |

FINAL CLARIFIER (FCL)

| | | | |
|--------------------------|-------|-----------------------------------|-------------|
| Effective Tank Volume | 2.2 | m ³ | |
| Total Surface Area | 3.0 | m ² | |
| Hydraulic Retention Time | 3.8 | Hr | |
| Overflow Rate | 4.6 | m ³ /m ² .d | 1 to 16 (8) |
| Solids Loading | 0.026 | kg/m ² .h | < 1 |

DISINFECTION (DIS)

| | | | |
|----------------------------|----------------------|--------------------|--|
| Disinfection Method | UV | | |
| Selected Model | Salcor 40W | | |
| Number of UV Systems | 3 | | |
| UV "Installation Feature" | Simplex | | |
| Total Number of UV Unit(s) | 3 | | |
| Maximum Flow Rate | 33.00 | L/min | |
| UV Dose | 55.00 | mJ/cm ² | |
| UV Transmittance (Water) | - | UVT | |
| Maximum Hardness-Iron | - | mg/L | |
| UV lamps | Low Pressure Mercury | | |
| Power | 120.00 | W | |

FINAL PUMP TANK (FPT)

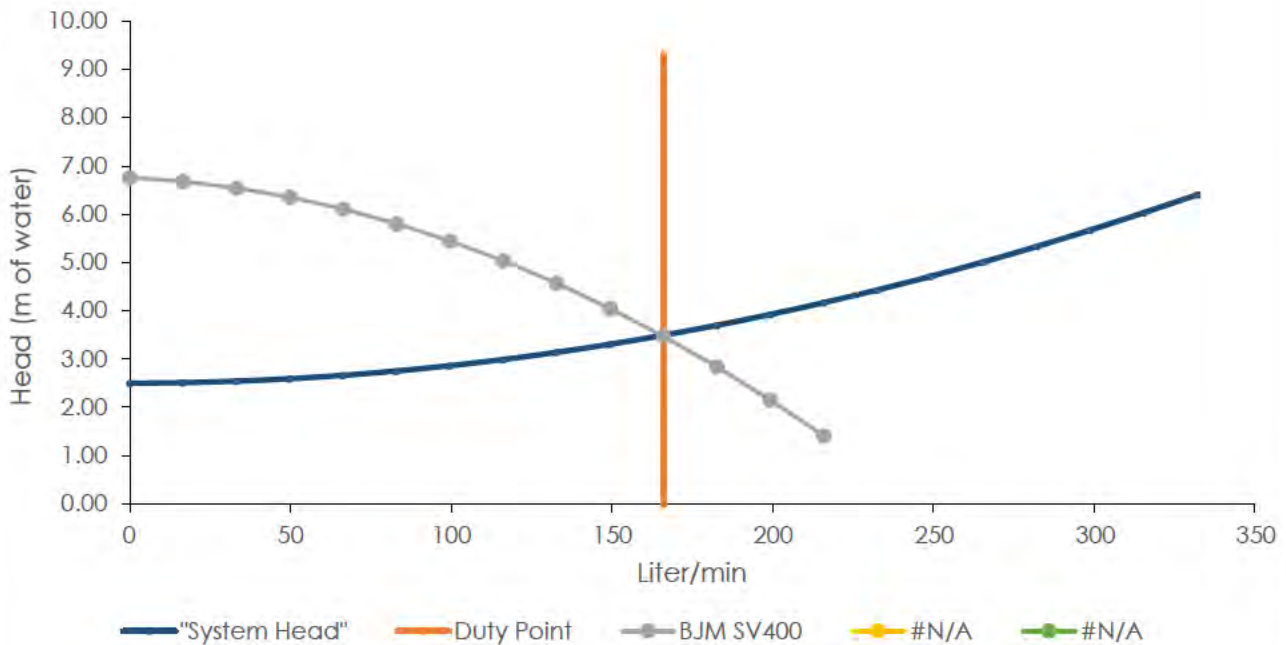
| | | | |
|--------------------------|-------|----------------|--|
| Effective Tank Volume | 9.1 | m ³ | |
| Received Flow Rate | 458.4 | L/Hr | |
| Total Balancing Capacity | 19.9 | Hr | |



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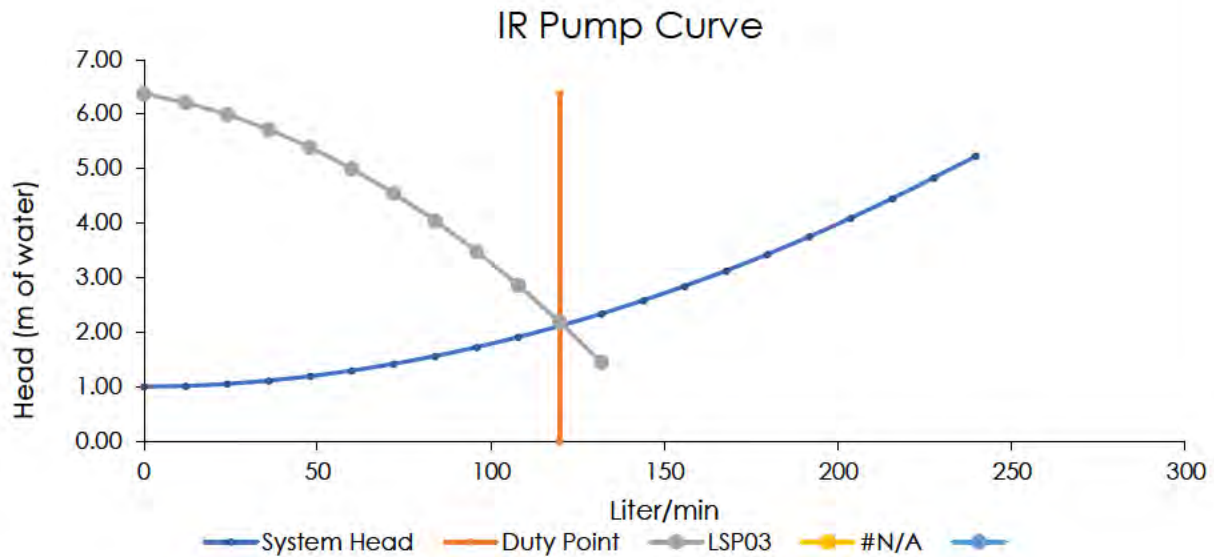
PUMP DESIGN

| Parameter | Selected/ Calculated | Unit | |
|--|-------------------------|------------------------------|-----|
| Equalization (EQ) Pump(s) | | | |
| Model of Pump(s) | BJM SV400 | | |
| Pump "Installation Feature" | Duplex | | |
| Number of Pump(s) in Each "Installation Feature" | 1 | Number | |
| Total Number of Pump(s) | 2 | Number | |
| Total Head (Approximate) | 3.5 | Meter(s) of H ₂ O | |
| Pump's Flow Rate | 166.1 | L/min | |
| ON Time | 0.0 | d/d | 0-1 |
| Cycle Period | 15.0 | min | |
| Average Flow Rate | 458.4 | L/Hr | |



| | | |
|---|--------------|------------------------------|
| Internal Recirculation (IR) Pump(s) for Pre-Denitrification (Pre-DN) | | |
| Model of Pump(s) | Goolds LSP03 | |
| Pump "Installation Feature" | Simplex | |
| Number of Pump(s) in Each "Installation Feature" | 1 | Number |
| Total Number of Pump(s) | 1 | Number |
| Total Head (Approximate) | 2.1 | Meter(s) of H ₂ O |

| | | | |
|-------------------|-------|-------|-----|
| Pump's Flow Rate | 119.9 | L/min | |
| ON Time | 0.073 | d/d | 0-1 |
| Cycle Period | 15.0 | min | |
| Average Flow Rate | 525.0 | L/Hr | |



Pre-Denitrification (Pre-DN) External Carbon Dosing Pump

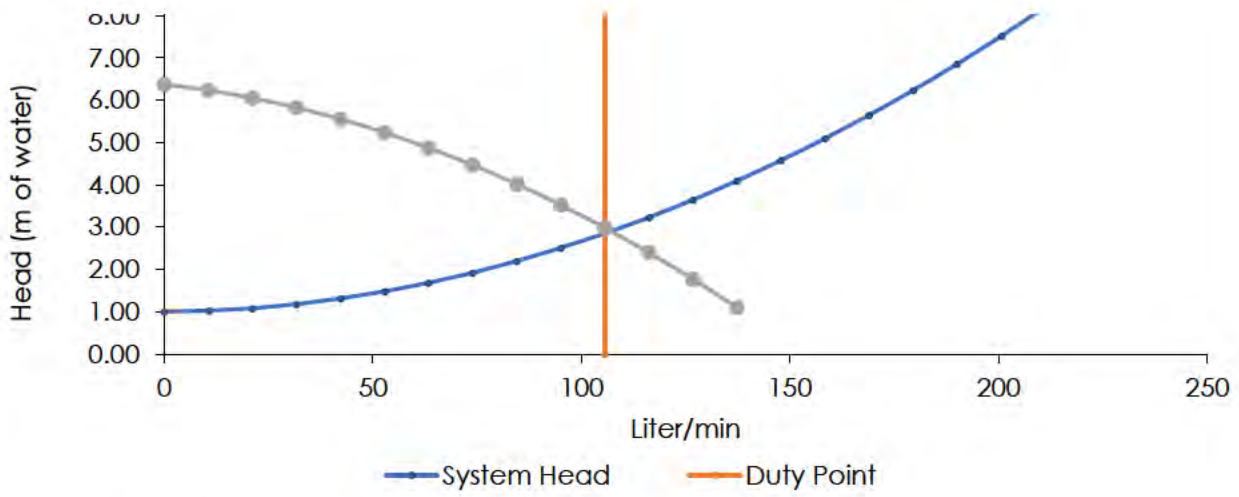
| | |
|-------------------------------------|-------------|
| External Carbon Addition Needed? | NO |
| Chemical Dosing System Recommended? | NO |
| Model of Pump | CNPb-0705 |
| Number of Pump | 0 |
| External Carbon Source | MicroC 2000 |
| External Carbon Usage (Approximate) | 0.00 L/Year |

Final Clarifier (FCL) Pumps

| | |
|--|-----------------------------------|
| Model of Pump(s) | Goolds LSP03 |
| Pump "Installation Feature" | Simplex |
| Number of Pump(s) in Each "Installation Feature" | 1 Number |
| Total Number of Pump(s) | 4 Number |
| Total Head (Approximate) | 2.85 Meter(s) of H ₂ O |
| Flow Velocity in Pump's Pipe | 1.82 m/s |
| Flow Velocity in Transportation Pipe | 3.25 m/s |
| ON Time | 0.0049 d/d 0-1 |
| Cycle Period | 15.0 min |
| Average Flow Rate | 2.07 L/min |

FCL Sludge Pump Curve

9.00
8.00



Final Pump Tank (FPT) Pump Design

| | | |
|--|--------|--------|
| Selected Pump | TBD | |
| Pump "Installation Feature" | Duplex | |
| Number of Pump(s) in Each "Installation Feature" | 1 | Number |
| Total Number of Pump(s) | 2 | Number |
| Base for Pump(s) | NO | |



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AERATION DESIGN

| Parameter | Selected/ Calculated | Unit | |
|--|-------------------------|---------------------|-------------|
| General Aeration Parameters | | | |
| α (Correction Factor) | 0.60 | | 0.4 to 0.8 |
| β (Correction Factor) | 0.95 | | 0.7 to 0.98 |
| Altitude from mean sea level (H) | 10 | m | |
| O_t (Oxygen concentration leaving tank) | 20 | % | 18 to 20 |
| F (Fouling Factor) | 0.90 | | 0.65 to 0.9 |
| Maximum Temperature | 20 | °C | |
| Minimum Temperature | 10 | °C | |
| Diffuser distance from the bottom of tank | 0.08 | m | |
| AERATION FOR BIOREACTOR #1 (AR#1) | | | |
| Diffuser Length | 6 | m | |
| Selected Air Flow Rate (Q_{air}) | 23.0 | Nm ³ /hr | |
| Total Head | 183.8 | mbar | |
| Aeration ON Time | 0.50 | d/d | |
| Aeration Pipe Length (L) | 5 | m | |
| Aeration Pipe Diameter | 25 | mm | |
| Selected Blower | HP-200 | Hiblow | |
| Number of Blowers per "Installation Feature" | 2 | | |
| Installation Feature | Simplex | | |
| AERATION FOR BIOREACTOR #2 (AR#2) | | | |
| Diffuser Length | 12 | m | |
| Selected Air Flow Rate (Q_{air}) | 46.0 | Nm ³ /hr | |
| Total Head | 179.5 | mbar | |
| Aeration ON Time | 0.70 | d/d | |
| Aeration Pipe Length (L) | 1 | m | |
| Aeration Pipe Diameter | 25 | mm | |
| Selected Blower | HP-200 | Hiblow | |
| Number of Blowers per "Installation Feature" | 4 | | |
| Installation Feature | Simplex | | |



Appendix 4

Standard Terms and Conditions

RH2O AMERICA INC. - GENERAL TERMS AND CONDITIONS OF SALE (Domestic)

The following terms and conditions of sale ("Terms") shall apply and incorporated by reference into all transactions between the parties to any sale of goods ("Products") and/or services ("Services") by RH2O North America Inc. ("RH2O") to the purchaser ("Purchaser"). By placing an order, Purchasers accept or shall be deemed to have full knowledge of the Terms herein and agree to RH2O's Terms, including the Limited Warranty, which are subject to change from time to time without prior notice.

1) **GENERAL:** In the event of any conflict or inconsistency between these Terms and the terms and conditions contained in Purchaser's order or in any other form issued by Purchaser, whether or not any such form has been acknowledged or accepted by RH2O, these Terms & Conditions of Sale shall prevail. No waiver, alteration or modification of these Terms shall be binding upon RH2O unless made in writing and signed by a duly authorized representative of RH2O.

2) **ORDER ACCEPTANCE & CONFIRMATION:** All orders are subject to acceptance by RH2O; any errors and omissions are subject to correction. RH2O reserves the right to modify unordered Products from time to time, including the right to discontinue the Products.

3) **QUOTATIONS & ESTIMATES:** Unless waived or otherwise stated, RH2O quotations and/or estimates shall be null and void unless accepted by Purchaser within thirty (30) days from the date of quotation or estimate.

4) **TAXES:** All prices do not include sales taxes. Applicable Canadian Federal or Provincial taxes will be added and billed at the rate in effect at the time of shipment. Payment of taxes is the sole responsibility of Purchaser unless Purchaser provides RH2O with a valid exemption certificate acceptable to the applicable taxing authority.

5) **PRICES | COST OF TRANSPORTATION:** RH2O's prevailing prices for Products and Services at the time of shipment will apply, except as otherwise provided in a written quotation or contract. RH2O may, in its sole discretion, require advance payment or a deposit for Products and Services. Unless otherwise stated, all prices are in Canadian Dollars F.O.B. shipping point.

6) **DELIVERY SCHEDULES:** RH2O makes every effort to meet delivery schedules as requested. Delivery shall depend on the prompt receipt by RH2O of the information required to meet production schedules. Delivery schedules (including time for shipment) are approximate and are based on conditions at the time of RH2O's quotation or estimate and acceptance of Purchaser's order.

a) RH2O cannot guarantee and Purchaser expressly releases RH2O from any liability for any loss or damage resulting from a failure to deliver or delays in delivery caused by any conditions related to, or caused by, failure to process or inaccurate processing of time-sensitive information and/or mechanisms. RH2O may extend delivery schedules or may, at its option, cancel Purchaser's order in full or in part without liability other than to return any deposit which is unearned by reason of the cancellation.

b) RH2O reserves the right to make partial shipments and to submit invoices for partial shipments.

7) **SITE DELIVERIES – CONCRETE PRODUCTS:** RH2O may sub-contract concrete product deliveries via 3rd party crane truck within the rated load and crane reach capacity for the equipment. Product/s will be set in to prepared excavation at the prevailing prices at the time of shipment, subject to equipment availability.

a) Purchaser is responsible for providing an accessible, level, and stable surface sturdy enough to accommodate the vehicle and the span of the crane stabilizers/outriggers; RH2O is not responsible for driveway or other surface damage due to

machine/material delivery weight; Restoration of all affected existing surfaces shall be by others.

b) CRANE TRUCK OPERATORS WILL NOT ATTEMPT ANY OPERATION THAT MAY INVOLVE ANY PERSONAL SAFETY HAZARD, CONTRAVENE APPLICABLE LEGISLATION, OR JEOPARDIZE EQUIPMENT.

c) Any additional 3rd-Party on site delivery requirements shall be observed.

d) RH2O does not assume any liability for delay or non-delivery caused by failure of transportation facilities, accident, or any other unforeseen cause/s beyond our control.

e) If pre-arranged crane equipment is unable to safely offset at a site due to adverse soil conditions or any other site condition or conditions/s beyond our control, the driver will either unload on the ground or return to the supplier plant as instructed by the Purchaser and/or their agent and/or RH2O. HIRING A LONGER REACHING CRANE, ADDITIONAL PERMITS, AND/OR RE-ORDERING THE DELIVERY IS THE RESPONSIBILITY OF THE PURCHASER, AND IS AT THE PURCHASER'S EXTRA COST.

f) Special methods of transportation will be used upon Purchaser's request and at Purchaser's own additional expense.

8) **INSTALLATION:** Unless otherwise expressly stipulated, the Products shall be installed by and at the risk and expense of Purchaser. If RH2O is requested to supervise such installation, or parts thereof, RH2O's responsibility shall be limited to exercising that degree of skill customary in the trade in supervising installations of a similar type. Purchaser shall remain responsible for all other aspects of the work including compliance with the local regulations. Responsibility for site safety and construction means and methods remain with Purchaser and/or its agents.

9) **WASTEWATER TREATMENT SYSTEMS:**

Wastewater treatment systems must be installed, commissioned and serviced by certified contractors at recommended intervals. Owners of treatment systems are required to operate their system according to manufacturer's requirements and government regulations.

a) Manufacturers and service providers do not, and cannot control the effluent that enters the Owner's system; It is the responsibility of the Owner, as the Operator, to ensure their treatment system meets government standards for operation.

10) **CHANGES & CANCELLATION:** Orders accepted by RH2O are not subject to changes or cancellation by Purchaser without prior written consent. In such cases where RH2O authorizes changes or cancellation, RH2O reserves the right to charge Purchaser reasonable costs based upon expenses already incurred and commitments made by RH2O, including, without limitation, any labour done, material(s) purchased, RH2O's usual overhead and reasonable profit and cancellation charges from its' suppliers.

11) **ACKNOWLEDGMENTS:** Purchaser expressly acknowledges and agrees that Purchaser has accepted the product information and/or drawings, terms and conditions and the necessary installation requirements, suitability for use, and regulatory compliance. The purchaser shall rely entirely on its own inspection and knowledge of the goods being purchased, there being no

representations, conditions, warranties or collateral contracts made by or on behalf of RH2O other than as set out herein.

a) Products will be quoted and shipped according to information and specifications provided by Purchaser. Purchaser is responsible to verify all specifications and quantities of Products prior to finalizing and submitting its order;

b) Purchaser is solely responsible for the proper installation and/or intended use of the Products.

12) **NO COPYING OR REVERSE ENGINEERING:** No copyrights, patents, trademarks or any other intellectual property rights are assigned to Purchaser hereunder. Purchaser is expressly prohibited and shall not copy, analyze or create derivative works, decompile, or reverse engineer or cause a third party to copy, analyze or create derivative works, decompile or reverse engineer any confidential information, product designs, or other intellectual property for any purpose. Purchaser acknowledges that its failure to comply with the provisions of this section may cause irreparable harm to RH2O which cannot be adequately compensated for in damages, and accordingly acknowledges that RH2O will be entitled to claim, in addition to any other remedies available to it, interlocutory and permanent injunctive relief to restrain any anticipated, present or continuing breach of this Section.

13) **FORCE MAJEURE:** RH2O will not be responsible for any failure or delay in its performance due to causes beyond its reasonable control, including, but not limited to, labor disputes, strikes, lockouts, shortages or inability to obtain labor, energy, raw materials or supplies, war, terrorism, riot, natural disasters or governmental action. The acceptance of delivery of Products by Purchaser shall constitute a waiver of all claims for loss or damage due to any delay whatsoever.

14) **EXPORT CONTROL LAWS:** RH2O will not be the exporter under any circumstances. It is the sole responsibility of Purchaser at its own expense to satisfy all legal requirements for the export and use of the Products from Canada.

15) **TITLE:** Title and ownership of the products, goods or equipment shall remain with RH2O and shall not pass to the Purchaser until all amounts owing by the Purchaser have been paid in full. Purchaser grants to RH2O a security interest in such products, goods and equipment and in all other personal property owned by it.

16) **TERMS OF PAYMENT:** Unless otherwise stated in a quotation, invoices on approved credit accounts are due and payable within thirty (30) days of invoice date. Where credit is not established, payment is due at time of purchase through cash, cheque, Interac Debit, Visa or MasterCard, or other methods that may become available from time to time. All payments must be in Canadian dollars. Unless specifically provided in an invoice, no cash discount shall be available to Purchaser.

a) PAYMENT IN FULL IS NOT SUBJECT TO HOLDBACKS EXCEPT BY WRITTEN AGREEMENT AT TIME OF ORDER, AND, IN NO CASE IS PAYMENT CONTINGENT ON THE PURCHASER RECEIVING PAYMENT FROM PURCHASER'S CUSTOMER.

b) Should payment not be made to RH2O when due, RH2O reserves the right to suspend all future delivery or other performance with respect to Purchaser

without liability or penalty; Purchaser agrees that RH2O may retain all payments which have been made on account of the purchase price as liquidated damages,

17) **CREDIT:** Credit requests are subject to the completion and submission of the prevailing RH2O Credit Application & Agreement by the Purchaser. Credit approval is at RH2O's sole discretion. The applicable terms and conditions of the RH2O Credit Agreement shall prevail at the sole discretion of RH2O. Charging of interest shall not be construed as RH2O granting any extension of time in the terms of payment.

18) **NO SET-OFF:** Purchaser may not set-off any amounts due to Purchaser against any amount due to RH2O in connection with any transaction. Purchaser may not make any deduction from any payment due hereunder by reason of loss or damage to Products in transit.

19) **WARRANTY:** RH2O sub-contracts concrete Products designed for use at maximum one (1) Meter burial depth in non-traffic areas unless otherwise stated. RH2O concrete Products are covered by a twelve (12) month limited warranty (the "Limited Warranty") against defects in material and workmanship from the date of delivery to Purchaser unless otherwise stipulated in writing by RH2O.

a) RH2O nor its' supplier will be responsible or liable under the Limited Warranty for (i) any defects attributed to improper backfilling, normal wear and tear or failure of any part or parts from external forces, including without limitation corrosive effluents, corrosive soils, vehicular or other impact, frost heave, vandalism, earthquake or other Force Majeure; (ii) Products not installed and/or maintained according to applicable laws, codes and RH2O's instructions (iii) use of the Products with incompatible goods or unintended use; (iv) defects in any portion or part of the Products manufactured and/or installed by others.

b) Purchaser shall give RH2O an opportunity to investigate any alleged defects; RH2O will make every good faith effort to repair, or at its sole option, replace at no charge any Products found to be defective during the Limited Warranty period.

c) The Limited Warranty specifically excludes other on-site service time and materials.

d) For components not supplied by RH2O, the warranty is determined by the original equipment manufacturer and/or supplier. Any components found to be defective must be offered at, or shipped freight prepaid to the RH2O facility for inspection and examination. RH2O's obligation under the manufacturer or supplier warranty is limited to repair or replacement.

e) Manufacturer's warranties specifically exclude other on-site service time & materials.

20) **SERVICES:** RH2O may provide Services pursuant to the specifications, assumptions and such other information set out in a quotation or estimate. Unless otherwise set out in the applicable quotation or estimate, Purchaser will pay all labour time and materials, and usual and customary fees incurred by RH2O and its personnel during the performance of the Services. RH2O may, in its sole discretion, subcontract or otherwise provide the Services (or parts thereof) through third parties. PURCHASER SHALL REMAIN RESPONSIBLE FOR ALL OTHER ASPECTS OF THE WORK INCLUDING COMPLIANCE WITH THE LOCAL REGULATIONS. RESPONSIBILITY FOR SITE SAFETY AND CONSTRUCTION MEANS AND METHODS REMAIN WITH PURCHASER AND/OR ITS AGENTS.

a) Services will be performed in a professional manner consistent with applicable industry standards. Except as otherwise provided in a

quotation or contract, RH2O will, within the period of one-hundred & twenty (120) days following the date of installation of Products, repair any defective workmanship in Services. THIS WARRANTY IS EXCLUSIVE. RH2O EXPRESSLY DISCLAIMS, AND PURCHASER EXPRESSLY WAIVES, ALL OTHER WARRANTIES, REPRESENTATIONS AND GUARANTEES, WHETHER ORAL OR WRITTEN, IMPLIED OR STATUTORY IN RESPECT OF SERVICES OR ANY PORTION THEREOF, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

21) **WARRANTY DISCLAIMER:** RH2O makes every effort to accurately describe Product information and/or drawings and its Services. Such descriptions are for identification purposes only and do not express or imply a warranty or condition that the Products are appropriate for a particular purpose. No warranty or condition, express or implied, other than as set forth in the Limited Warranty above is made or authorized by RH2O.

22) **LIMITATION OF LIABILITY AND TIME FOR CLAIMS:** Any liability for indirect, special, exemplary, punitive, consequential or incidental damages is expressly disclaimed by RH2O. RH2O's liability in all events for all damages, losses and causes of action (whether in contract, tort or otherwise) shall be limited in the aggregate to, and shall not exceed, the purchase price paid by the Purchaser for the Product in question. Any claims against RH2O must be brought within one (1) year after the cause of action arises, notwithstanding any applicable statute of limitations.

23) **PRODUCT RETURNS:** Any cancellation or return must be approved by RH2O (in its discretion), be accompanied by proof of purchase, and may be subject to restocking and other charges. In the event of approval of a return request, (a) all returns must be shipped freight prepaid at Purchaser's expense; and (b) only Products of current manufacture in salable for condition will be accepted for credit.

24) **INDEMNITY:** Purchaser hereby assumes and agrees to indemnify, defend, and hold harmless RH2O, each of its affiliates and/or all of their respective agents, directors, officers, employees, subcontractors, suppliers and invitees from and against any and all sums, losses, damages, claims, costs, duties, suits, actions, causes of action, liabilities, demands and expenses (including legal fees and other legal expenses on a full indemnity basis) of whatsoever kind and nature arising out of (a) Purchaser's purchase, use, possession, ownership, operation, condition, resale, transfer, import, export, transportation, disposal, operation of the Product or otherwise relating to, connected with in any way, arising out of, or on account of Products, Services or these Terms; and/or (b) Purchaser's violation or alleged violation of any foreign, federal, provincial, county, municipal or local laws or regulation. This indemnity will survive termination of the Terms.

25) **CONFIDENTIALITY:** Except as required by law or with the express written consent of RH2O, Purchaser agrees to receive and maintain all information received from RH2O, including without limitation, pricing and specifications, in confidence, using the same degree of care which Purchaser employs with its own confidential information, provided this is no less than a reasonable standard of care, and Purchaser will not disclose to any person or entity or make public or authorize the disclosure of any such information and will not use such information for any purpose, except as expressly agreed to by RH2O in writing or in another applicable agreement between RH2O and Purchaser. Purchaser acknowledges that its failure to comply with the provisions of this section may cause irreparable harm to RH2O which cannot be adequately compensated for in damages, and accordingly acknowledges that RH2O will

be entitled to claim, in addition to any other remedies available to it, interlocutory and permanent injunctive relief to restrain any anticipated, present or continuing breach of this Section.

26) **WAIVER:** RH2O's failure to insist on strict performance of these Terms or to enforce a default upon the occurrence of any single, repeated, or continuing violation of any particular term or condition hereof, shall not be considered a waiver of RH2O's right to insist on strict performance of these Terms or to enforce a default with respect to the violation of any other term or condition or, at any later time or upon any subsequent occurrence, with respect to that particular term or condition.

27) **SEVERABILITY:** If any provision of the Terms and Conditions is held to be void, null, unlawful or otherwise unenforceable, that provision shall be treated as a separate and independent clause. The remainder of the Terms and Conditions will continue to be in full force and effect.

28) **GOVERNING LAW:** These terms and conditions will be governed by, and interpreted and enforced in accordance with, the laws in force in the Province of Ontario and shall be treated in all respects as an Ontario Contract.

29) **ENTIRE AGREEMENT:** These Terms, and any quotation or estimate that incorporates these Terms by reference, are the complete and exclusive agreement between the parties and supersedes all provisions and concurrent agreements, understanding, negotiations and discussions, whether oral or written of the parties and there are no warranties, representations or other agreements between the parties in connection with its subject matter except as specifically set forth in these Terms.

30) **MISCELLANEOUS:** These Terms are binding upon and inure to the benefit of the parties hereto and their respective successors, permitted assigns and transferees. Each Party's obligations which by their nature are intended to survive beyond the termination, cancellation or expiration of these Terms, shall survive including without limitation, Purchaser's payment obligations, confidentiality obligations, indemnifications, any disclaimer of warranties, limitations of liability and time for claims, severability, governing law, dispute resolution, entire agreement and this Section 30). Purchaser may not assign these Terms or any rights or obligations hereunder without RH2O's prior written consent.



Appendix 5

RH2O Brochure



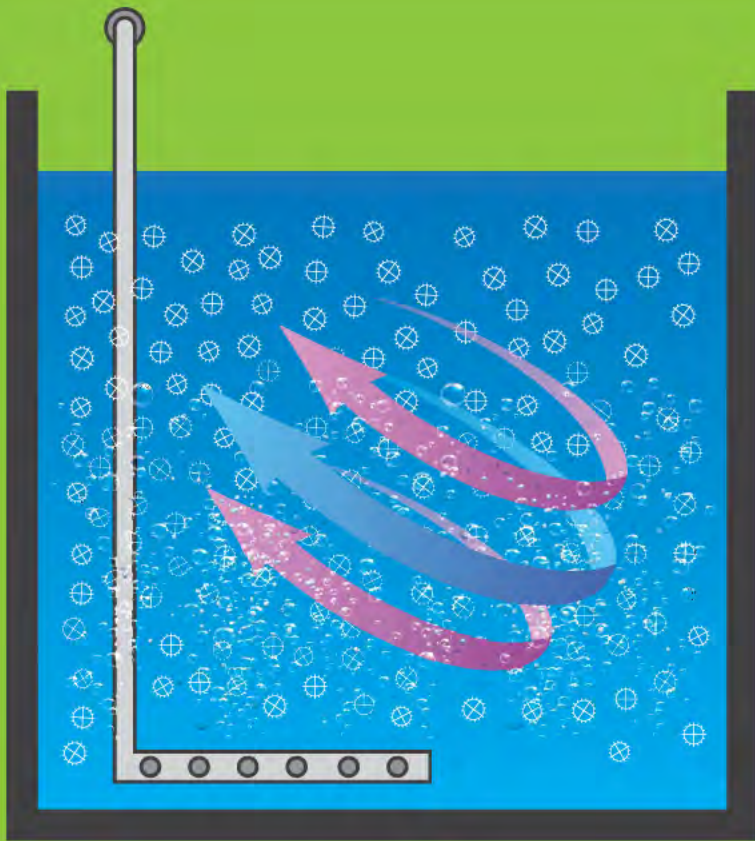
Advanced Wastewater Treatment Solutions

Exceptional Performance. Proven Reliability.

Options for:

- + High Strength Wastewater
- + Nitrogen Removal
- + Phosphorus Reduction
- + Wastewater Reuse





The Moving Bed Biofilm Reactor (MBBR)

The Moving Bed Biofilm Reactor (MBBR), originally invented at the Norwegian University of Science and Technology, incorporates the combined benefits of Activated Sludge and Attached Growth wastewater treatment processes. RH2O® North America adopted and professionally tailored MBBR technology to guarantee performance in the unique Canadian climate and meet specific regulatory and project requirements.



Self-cleaning media at the core of the process

The core of the process is the specially designed biofilm carrier media made from High-Density Polyethylene (HDPE). The media provides a high surface area for optimal biofilm growth to treat the wastewater. The aeration system completely mixes the media inside the biological reactor providing access to oxygen. The media design and mixing process ensures that the media is self-cleaning, will not clog, and does not require replacement.



Applications for RH2O®

Every RH2O® system is uniquely designed and tailored to the needs of each project, from new construction to retrofit or replacement of existing installations. Our systems are flexible and can be constructed from concrete, fiberglass, or polyethylene reducing capital investment using locally manufactured tanks.



EXAMPLES OF APPLICATIONS:



Campgrounds, RV, and Mobile Home Communities



Commercial Plazas and Malls



Communal Subdivisions/Rural Communities



Resorts and Marinas



Restaurants, Rest Areas, and Truck Stops



Schools Institutional Facilities



Wineries, Breweries and Industrial Wastewaters

RH20[®] Advantages



RH20[®] Design Software provides process simulation and proactive troubleshooting to ensure each project performs to the most stringent of effluent requirements.



Moving Bed Biofilm Reactor (MBBR) optimized to efficiently remove carbon and ammonia in the smallest footprint even at low wastewater temperatures.



PLC Control System with remote monitoring provides industrial-grade automation with full monitoring and management of control equipment.



The cloud server acts as a real-time, 24-7 virtual operator, proactively monitoring vital data collected from the control panel.



Self-cleaning media doesn't clog or need replacement and is resilient against hydraulic and organic shock loads.



Dissolved Oxygen (DO) Sensor simplifies aeration control to maintain consistent and optimal performance and reduce energy costs.



Our systems can be designed as a complete stand-alone process or may be retrofitted/upgraded to assist other technologies meet performance requirements.



Retrofit/Upgrade Other Treatment Systems

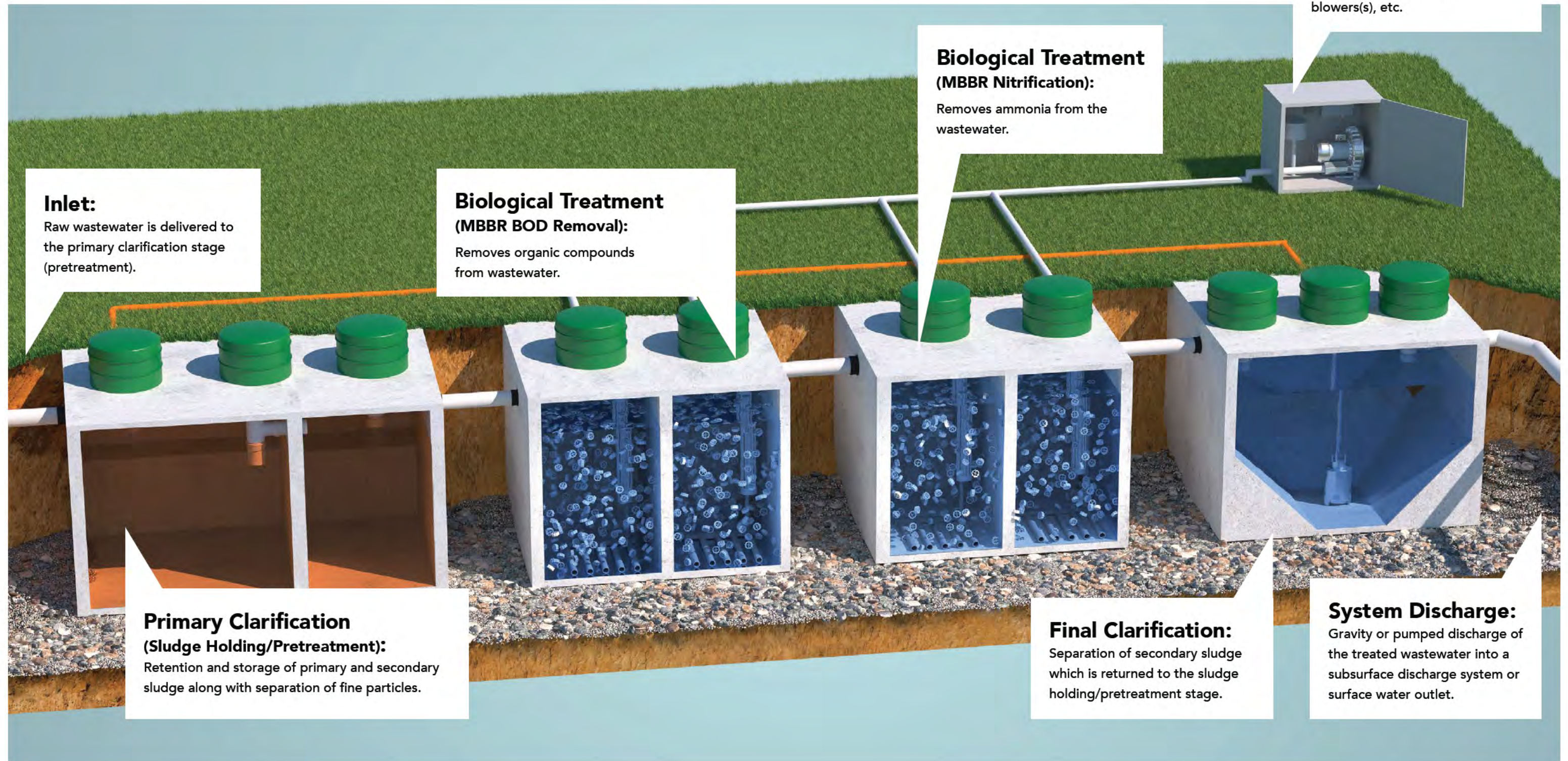
The benefits of our MBBR system can be used for upgrading or expanding existing wastewater treatment plants. From ammonia removal (nitrification) to assistance with high strength wastewater BOD removal, our system can be easily retrofitted in an economical package to help meet increasing regulatory standards.



Automated Aeration Control eliminates complexity of operation and reduces maintenance inspections.



RH20[®] Treatment Process



Inlet:
Raw wastewater is delivered to the primary clarification stage (pretreatment).

Biological Treatment (MBBR BOD Removal):
Removes organic compounds from wastewater.

Biological Treatment (MBBR Nitrification):
Removes ammonia from the wastewater.

Control Unit:
PLC Control system with remote monitoring provides operational control of mechanical components including pump(s), and blowers(s), etc.

Primary Clarification (Sludge Holding/Pretreatment):
Retention and storage of primary and secondary sludge along with separation of fine particles.

Final Clarification:
Separation of secondary sludge which is returned to the sludge holding/pretreatment stage.

System Discharge:
Gravity or pumped discharge of the treated wastewater into a subsurface discharge system or surface water outlet.

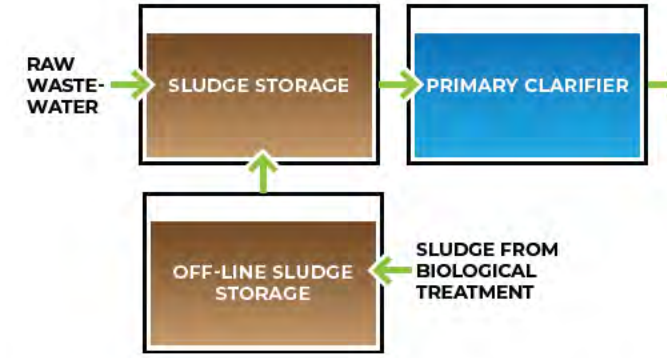
Modular Process

RH2O® provides a range of flexible treatment modules and process concepts as effluent discharge standards become more stringent, especially for nitrogen and phosphorus removal, as well as disinfection of the wastewater. These modules can be easily retrofitted to an existing installation or expanded for tertiary wastewater treatment in new projects. RH2O® also specializes in high strength wastewater applications with installations across the Canada.

Innovative Hybrid Flow Design

RH2O® has never settled down when it comes to innovation. We have developed a hybrid flow regime to combine the advantages of both plug and mixed flows in our bioreactors. The use of partitioned walls in our bioreactors protects from short circuiting and skyrockets the reliability and performance of our treatment systems.

Off-line Sludge Storage

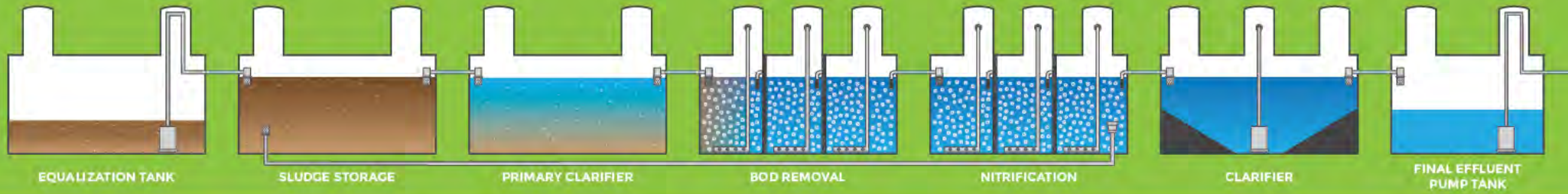


Off-line Sludge Storage is an optional add-on that further protects the system from various hydraulic, PH and toxic chemical shocks.

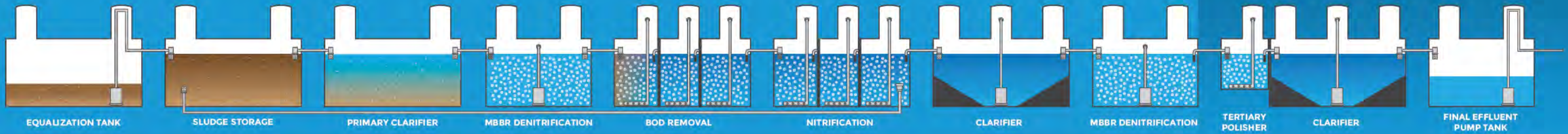
Effluent Discharge Quality:

- CBOD < 10 mg/l
- TSS < 10 mg/l
- Total Ammonia Nitrogen (NH₄-N) < 1 mg/l
- Total Inorganic Nitrogen (N_{tot}):
 - Standard Process 30 – 50% Reduction
 - Standard Process with Recirculation ≤ 80%
 - Enhanced Denitrification (Pre-DN and Post-DN) up to ≤ 2.5 mg/l
- E.Coli / Fecal Coliform:
 - ≤ 200 CFU/100 mL (with UV)
 - ≤ 2.2 CFU/100 mL (with filter and UV)
- Phosphorus (P_{tot}):
 - Upstream of Final Clarification ≤ 1 mg/l
 - Separate Flocculation Reactor ≤ 0.5 mg/l

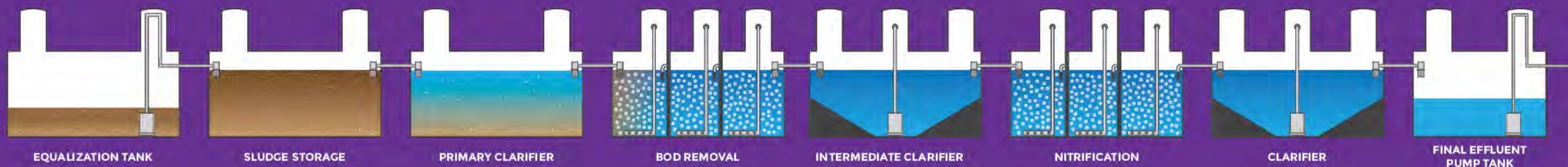
Standard Configuration with Nitrogen Removal



Standard Configuration with Enhanced Nitrogen Removal



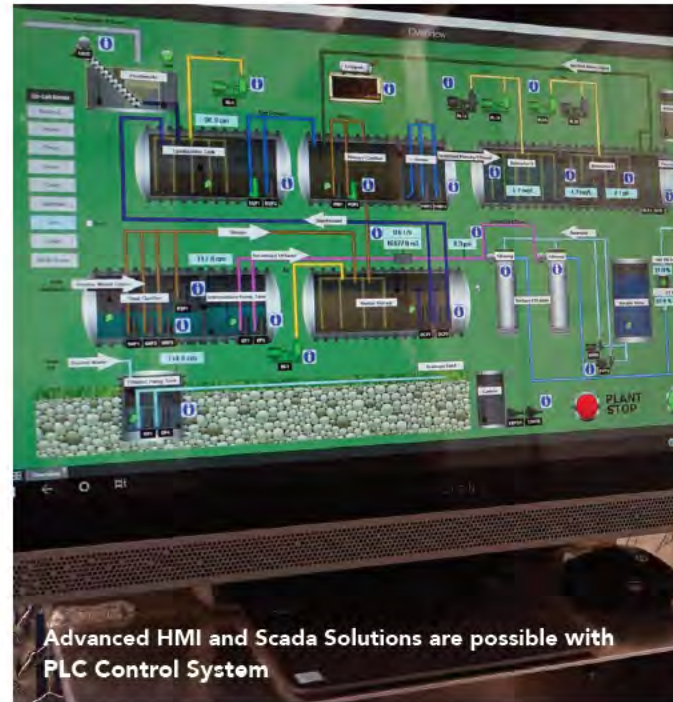
High Strength Wastewater



Municipal technology for cost-effective commercial onsite wastewater systems

A specially designed optical Dissolved Oxygen (DO) sensor integrates with the RH2O® Control System to form an innovative automated aeration control system. The sensor will simplify aeration control to maintain consistent oxygen levels for optimal performance and reduce energy costs. The DO sensor is installed inside of the Moving Bed Biofilm Reactor (MBBR) where the carrier media self-cleans the sensor to prevent fouling.

RH2O® Aeration Control System brings Municipal treatment-like technology to small commercial onsite wastewater treatment systems as an affordable cost-effective package. In many cases the sensor will pay for itself in less than a year in terms of energy savings and reduced maintenance visits while ensuring constant around the clock performance. The Automated Aeration Control eliminates any complexity or tuning the system that previously could only be done through a site visit.



Advanced HMI and Scada Solutions are possible with PLC Control System

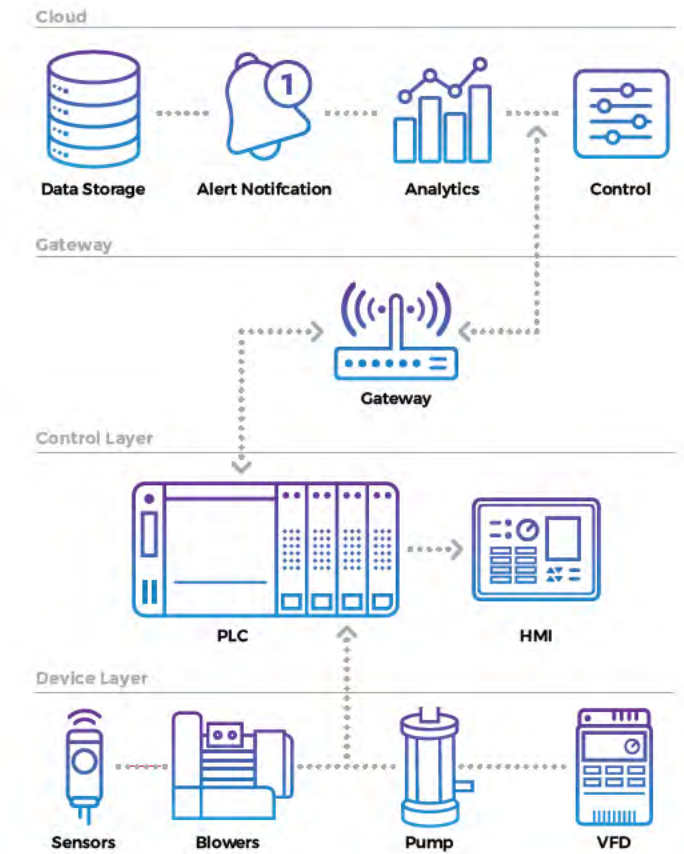
Remote management = peace of mind

Our control system uses a Program Logic Controller (PLC) with touch display screen (HMI) for reliable onsite operation.

The PLC controls and communicates with the local devices connected to the control system (i.e. blowers, pumps, DO sensor, etc).

Our Industrial Internet of Things (IIoT) gateway connects to the PLC to securely transmit data to our cloud server. The cloud server provides full operational surveillance of each system with alarm notification via email and SMS along with full data storage and analytics.

Operators can remote monitor and control the PLC through the cloud server.



Add-ons for Nitrogen Reduction and Filtration

Continuous improvement is part of our culture

Our team is dedicated in finding you the best solution. Feedback from operation and maintenance providers has been key for development and continuous improvement of our products. RH2O® operates numerous residential and commercial wastewater treatment plants to provide continuous feedback to our Engineering/Design Team. We have gathered a wealth of experience which is put to use for each new project.



RH2O® is a leading manufacturer of onsite wastewater treatment systems for commercial applications across Canada.

With decades of expertise as our foundation, we are looking to the future and developing better, more effective solutions while maintaining our excellence in world-class service.

Visit our website for case studies and for more information. Our professional engineering team is ready to help size and design a system to meet your requirements.



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Email: info@rh2o.com

wastewater.ca



APPENDIX E

Wood PLC Underwater Benthic Habitat
Report



**POCOLOGAN HARBOUR
UNDERWATER BENTHIC HABITAT SURVEY
Pocologan, 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

TAE1986501



19 July 2019

TAE1986501

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

Dear Mr. Burt

Re: Underwater Benthic Habitat Survey, Pocologan Harbour, Pocologan, 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 proposed location of an effluent pipeline in Pocologan Harbour, 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**



Bruce Moore, B.Sc.
Project Manager
Direct Tel.: 506-652-4559
Direct Fax: 506-652-9517
E-mail: bruce.moore@woodplc.com

BM/



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UBHS_Pocologan_19July2019



Figure 9 Macrofloral Cover along T4 8

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Appendix B Species List
Appendix C Photo Log
Appendix D Lab Certificates



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 installation of an effluent pipeline in Pocologan Harbour, New Brunswick (NB) (Figure 1).

2.0 SCOPE AND METHODOLOGY

Qualitative and quantitative observations were obtained around the proposed location of an effluent pipeline in Pocologan Harbour, NB. Pocologan Harbour is an embayment of Maces Bay in southwest NB. Video survey techniques were used to map substrate types and document presence and abundance of macrofaunal and macrofloral species. Wood contracted Subsea Global Solutions (SGS) to complete the video collection on June 13, 2019.

Video footage was collected using a Deep Trekker Remotely Operated Vehicle (ROV). A total of 435 m of video surveillance was divided into five transects within the study area. There were issues with the video file for the fifth transect. The habitat described in the document is based on observations made in the field. All transects are described from point “a” to “b” as illustrated in Figure 1. Observations of substrate type, flora, and fauna along the video transect were made for each 5 m segment.

Mid-column water samples were collected using a Kemmerer sampler and submitted to RPC for analysis. In-situ water quality parameters were collected mid-column using a YSI multimeter.

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.

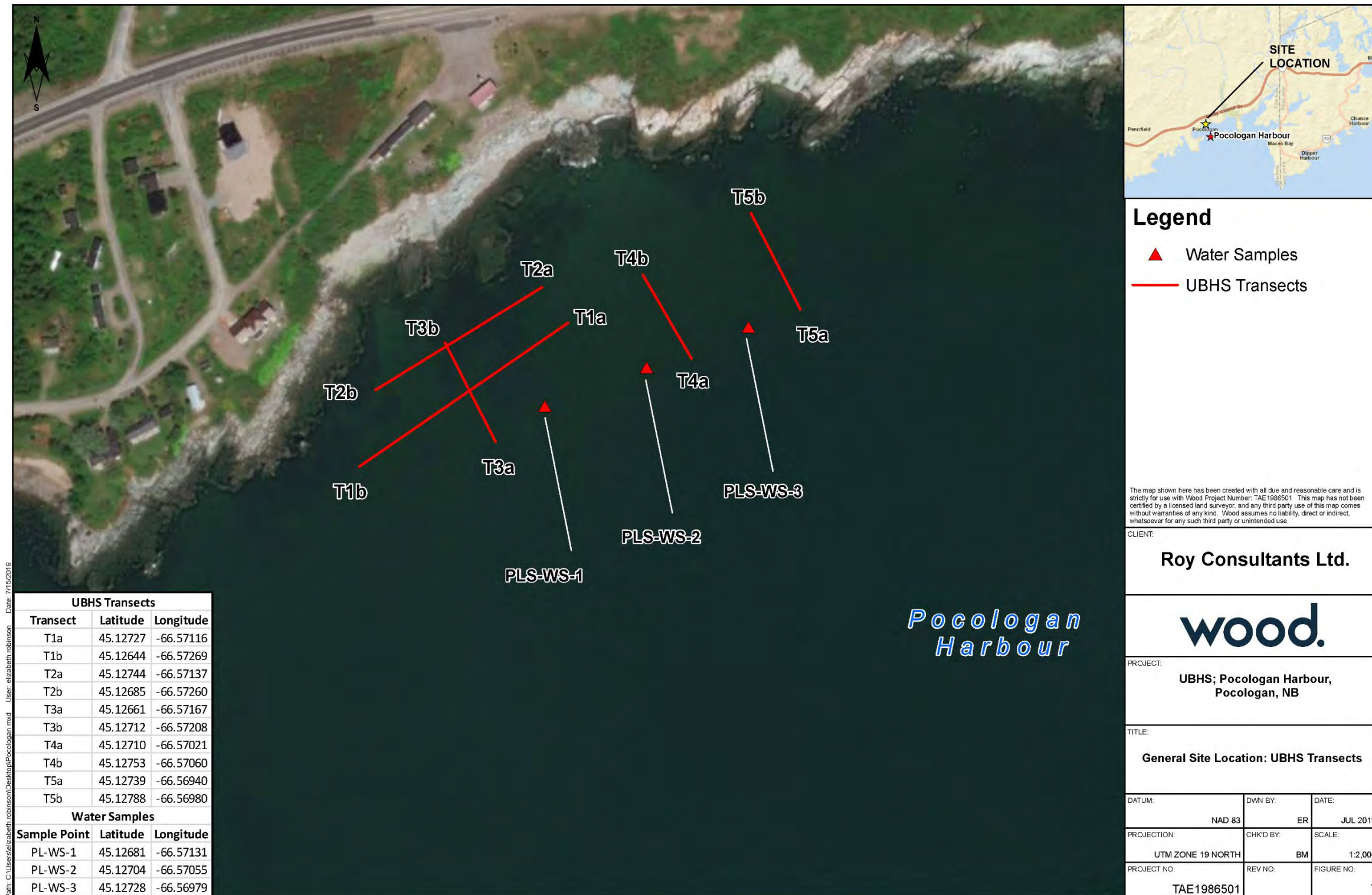
Table 2.1 Marine Substrate Classification Categories

| 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, Pocologan Harbour, Pocologan, 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.4 (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 150 m long and ran in an approximate northeast to southwest orientation.

Substrate:

The substrate was predominantly sand with the exception of two areas of hard bottom. Boulder was dominant between 10 and 40 m and again between 55 and 70 m (Figure 2).



Macrofauna:

Common occurrences of northern rock barnacle (*Semibalanus balanoides*) were noted where hard bottom was observed. Common occurrence of periwinkles (*Littorina littorea*) were noted in one segment and occasional occurrences of periwinkles were noted in three segments. A single observation of a hermit crab was noted in the first segment of the transect. Shell hash was noted sporadically throughout the transect.

Macroflora:

Observations of macrofloral life were restricted to those segments which featured hard bottom. In those instances, soft feather weed (*Plumaria plumosa*) was the dominant species with cover ranging between 25 and 50%. Sugar kelp (*Saccharina latissima*) was also present with cover ranging between 10 and 15%. Sea lettuce (*Ulva lactuca*) was noted in one segment with a cover of 5% and eelgrass was noted in the last segment with a cover less than 5% (Figure 3). Macrofloral debris with cover ranging between <5% and 15% was noted throughout the transect.

Figure 2 Substrate Composition along T1

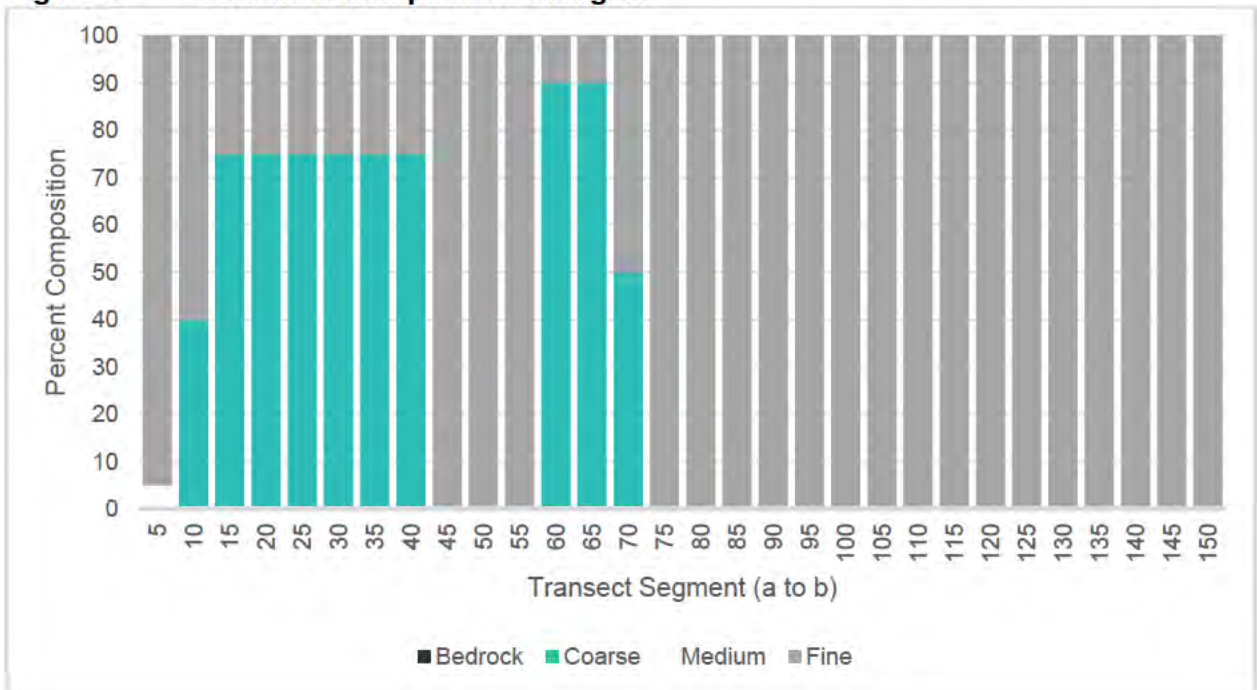
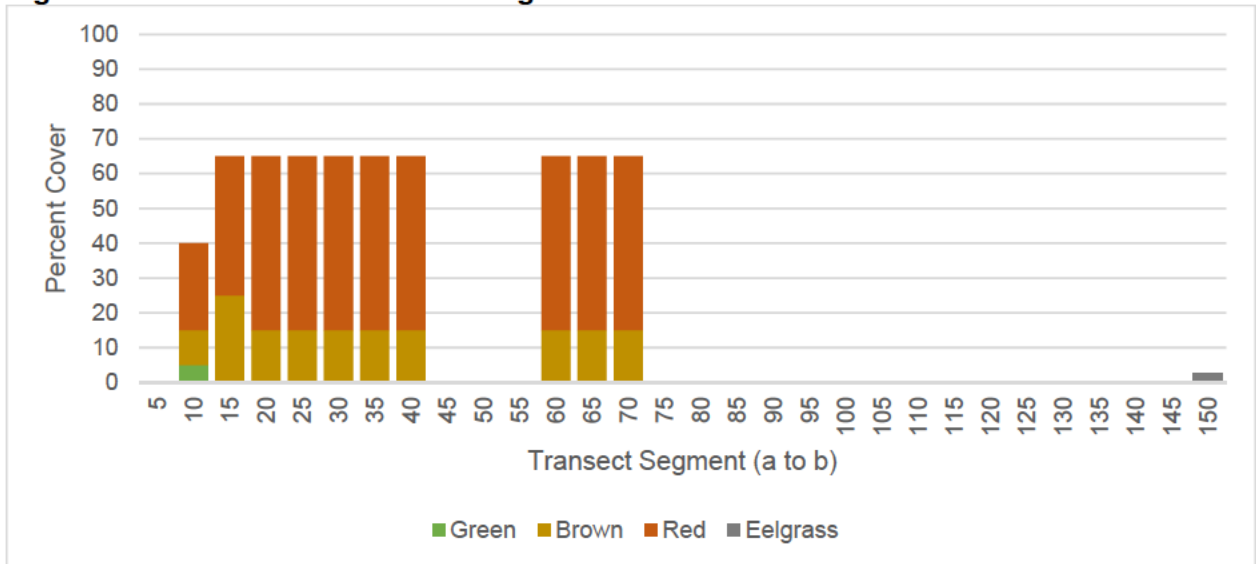


Figure 3 Macrofloral Cover along T1



3.2 Transect 2 (T2)

Transect 2 (T2) was 120 m long and ran in an approximate northeast to southwest orientation. Video was collected in two orientations. The first 80 m was collected moving northeast to southwest, however the last 40 m was collected from the end (T2b) back to the 80 m mark.

Substrate:

The first 10 m of the transect was predominantly rock with lesser amounts of sand and then transitioned to a bedrock ledge for the 70 m. At the end of the ledge the substrate was a mix of gravel and sand that over the remaining length of the transect became predominantly sand. Two segments (95-100 and 110-115) featured large boulders that encompassed much of the segment (Figure 4).

Macrofauna:

Macrofaunal life was uncommon along the length of the transect. Common occurrences of northern rock barnacle were noted along the bedrock ledge. Uncommon and occasional occurrences of common periwinkles (*Littorina littorea*) were noted in two segments and an uncommon occurrence of smooth periwinkle (*Littorina obtusata*) was noted in one segment. There is likely a much higher number of fauna living below the thick cover of algae on the bedrock ledge. A common occurrence of northern rock barnacles was also noted on the boulder in the 110-115 segment. Shell hash was noted from the 80 m mark to the end of the transect.

Macroflora:

Macrofloral cover, consisting of rockweed (*Ascophyllum nodosum*) and bladderwrack (*Fucus vesiculosus*), along the bedrock ledge was extensive ranging between 50% and 100%. The two instances of boulder toward the end of transect support rockweed cover of 40-70% with minimal



cover of bladderwrack and sea lettuce (Figure 5). Macrofloral debris was noted through the last 35 m of the transect with a cover no greater than 10%.

Figure 4 Substrate Composition along T2

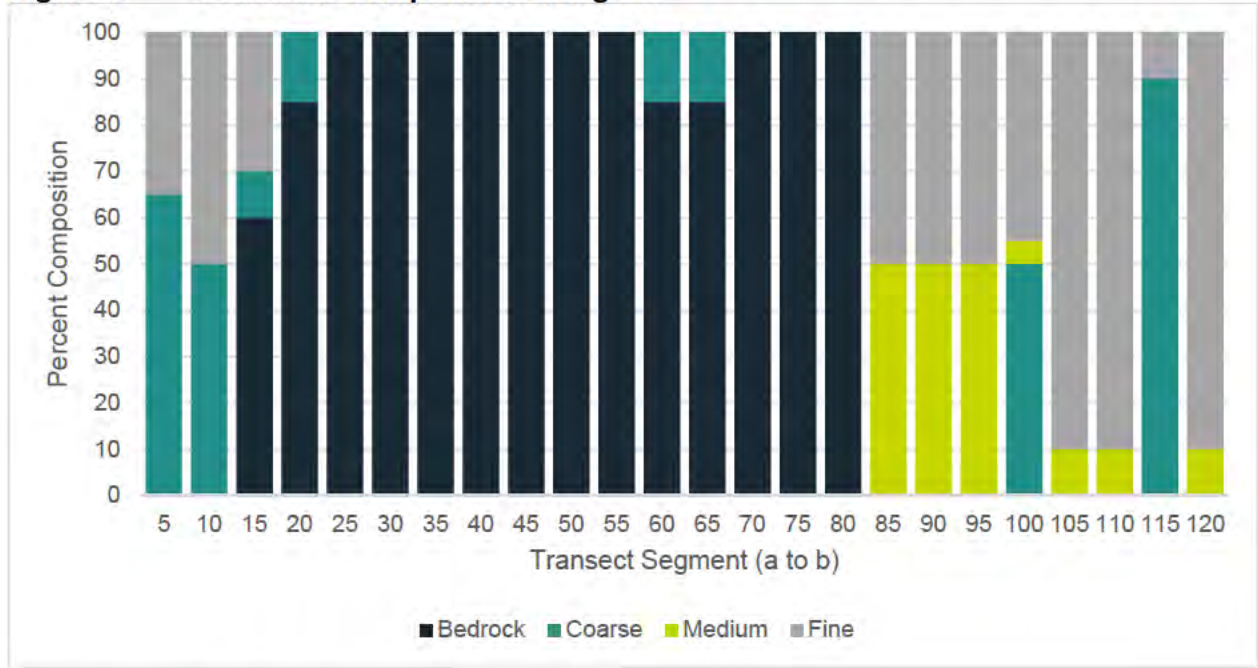
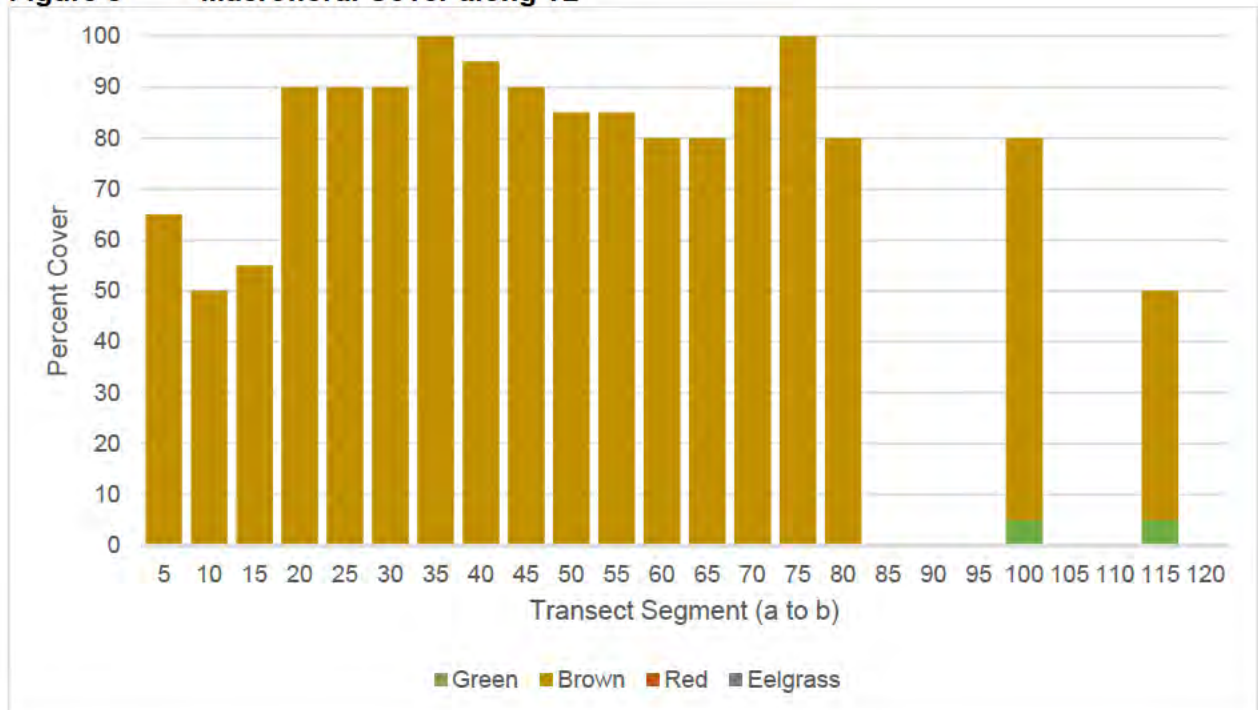


Figure 5 Macrofloral Cover along T2



3.3 Transect 3 (T3)

Transect 3 (T3) was 65 m long and ran in an approximate south to north orientation.

Substrate:

The substrate was sand throughout the first 45 m of the transect. The transect then crossed large boulders with some sand for the last 20 m of the transect (Figure 6).

Macrofauna:

Uncommon occurrences of sand dollars (*Echinarachnius parma*) were noted in the first 25 m of the transect. A single occurrence of a moon snail (*Euspira heros*) was noted in the 0-5 m segment and a moon snail collar was noted in the 40-45 m segment. Common occurrence of northern rock barnacle and occasional occurrence of common periwinkles were noted in the last 10 m of the transect.

Macroflora:

Small patches of eelgrass with a cover of 5% or less were noted in the first 45 m of the transect. The boulder substrate in the last 20 m of the transect support cover of sugar kelp, spiny sour weed (*Desmarestia aculeata*), soft feather weed and sea lettuce (Figure 7). Macrofloral debris with a cover of 25-45% was noted along the first 45 m of the transect.

Figure 6 Substrate Composition along T3

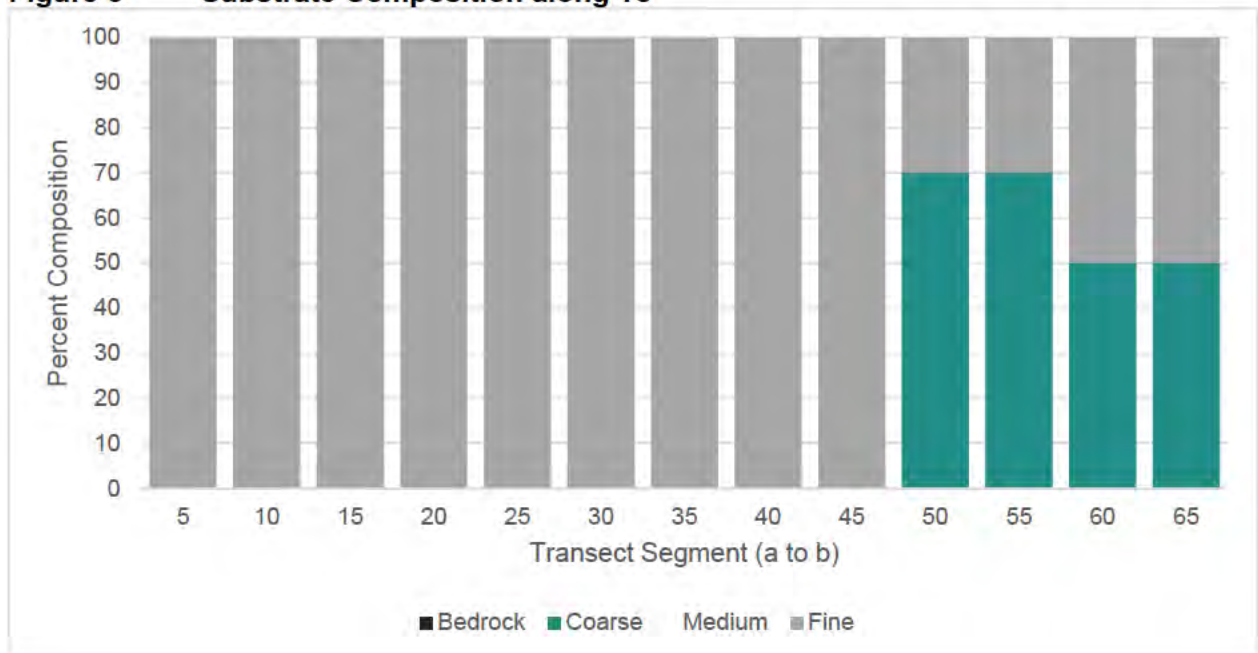
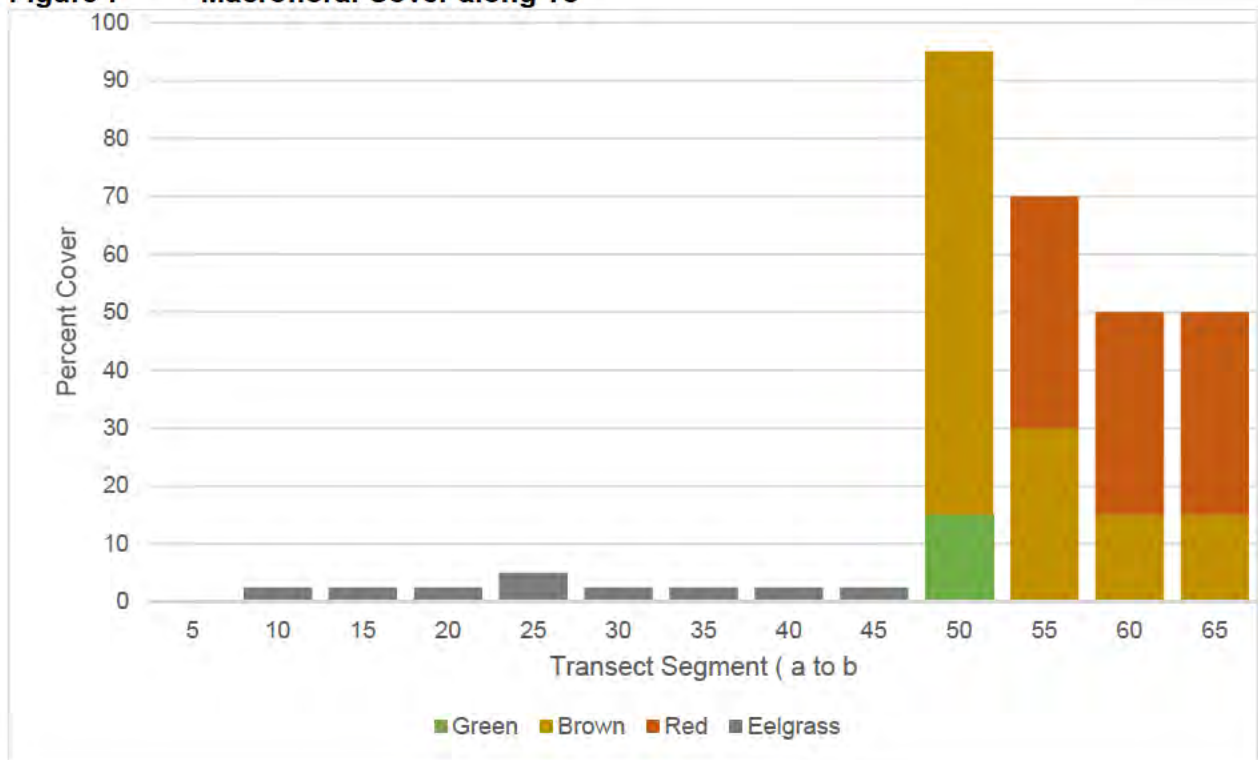


Figure 7 Macrofloral Cover along T3



3.4 Transect 4 (T4)

Transect 4 (T4) was 50 m long and ran in an approximate south to north orientation.

Substrate:

The substrate was sand throughout the length of the transect (Figure 8).

Macrofauna:

Uncommon and occasional occurrences of sand dollars were noted in all but two segments of the transect. No other fauna or shell hash was noted.

Macroflora:

Small patches of eelgrass with a cover of 5% or less were noted in 6 of the 9 segments in the transect (Figure 9). Macrofloral debris with a cover of 10-40% was noted throughout the transect.



Figure 8 Substrate Composition along T4

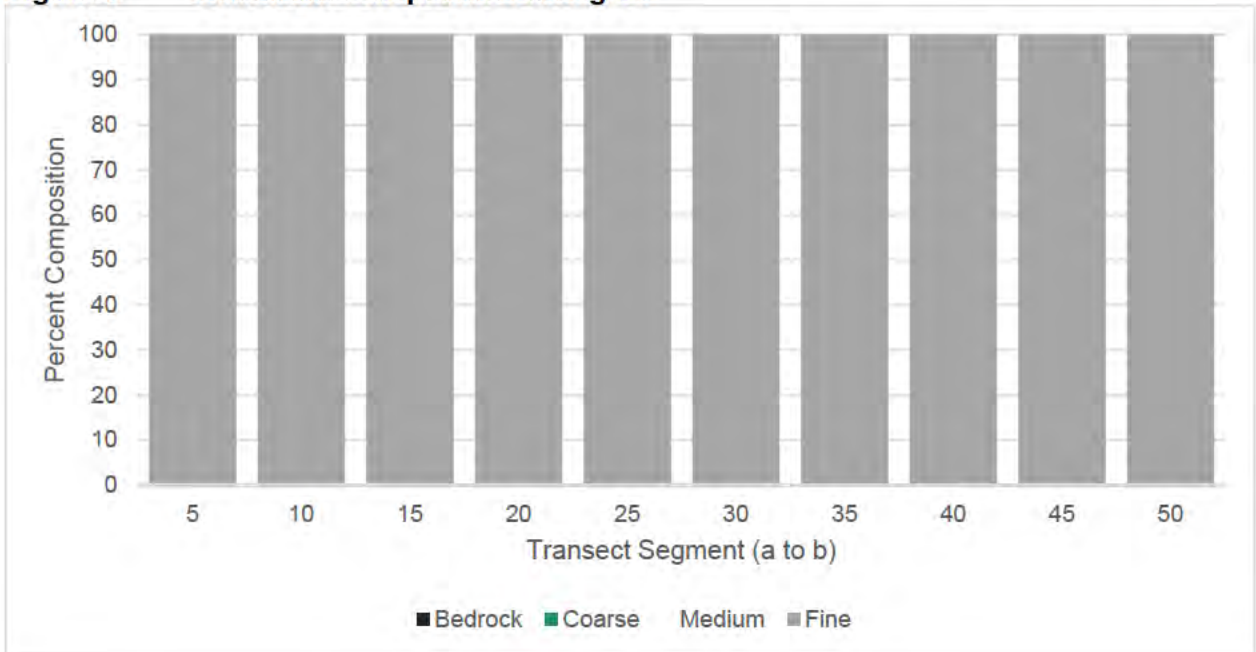
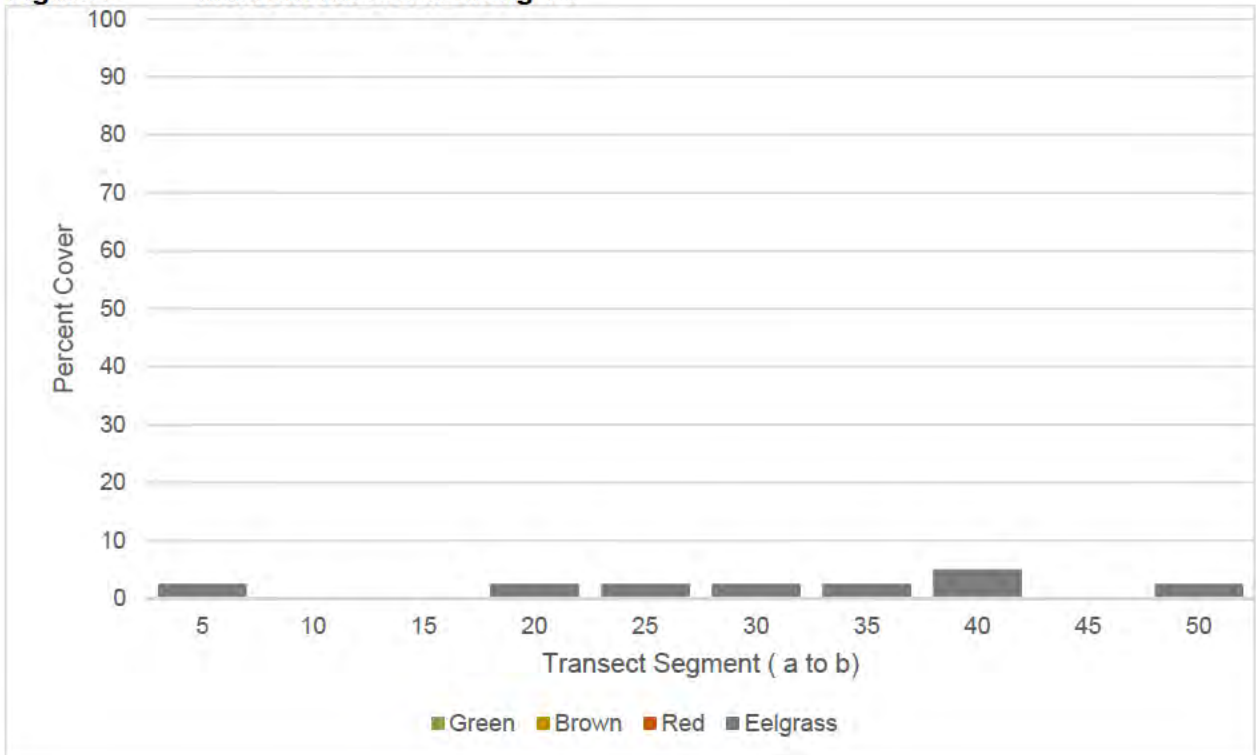


Figure 9 Macrofloral Cover along T4



3.5 Transect 5 (T5)

Transect 5 (T5) was 50 m and ran in an approximate south to north orientation. As previously noted, the video file was not available to be characterized. Due to the shallow water at the time of the survey the seabed could be seen from the boat. A summary of the observed habitat is provided below.

T5 ran parallel to T4, approximately 65 m further east. The habitat of T5 mirrored that of T4.

Substrate:

The substrate was predominantly, if not solely comprised of sand, throughout the length of the transect.

Macrofauna:

Sand dollars were observed throughout the length of the transect.

Macroflora:

Because there was no hard-bottom, algae was absent and there was little eelgrass noted.

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.

- Hard bottom comprised of bedrock ledge or boulder. The substrate supported a high cover of various algal species. This included common intertidal seaweeds, rockweed and bladderwrack and subtidal species including sugar kelp, and soft feather weed.
- Sand barrens largely devoid of flora or fauna. Vegetation was limited to sporadic instances of thin eelgrass patches and macrofloral debris. Fauna observed included limited instances of periwinkles and sand dollars with single observations of a moon snail and a hermit crab.

The intertidal zone was not included in the video survey, however, photos have been included in Appendix C. The intertidal zone was a mix of algal covered bedrock ledge similar to that observed in Transect 2 and sand / gravel areas devoid of vegetation.

5.0 WATER QUALITY

Water samples were collected in three locations within the study area (Figure 1) and analyzed for general chemistry and metals. Results were compared to the Canadian Council of Ministers of the Environment (CCME) Water Quality Guidelines for the Protection of Marine Aquatic Life (MAL). There were limited guidelines for the analyses completed, however two metals had applicable guidelines. Arsenic and cadmium were not detected in the analysis, however, the minimum detection limit exceeded the MAL for the two metals. Laboratory results have been attached in Appendix D.



In-situ water quality parameters were collected at the same three sites and are summarized in Table 5-1.

Table 5.1 In-Situ Water Quality Parameters

| Parameter | PL-WS-1 | PL-WS-2 | PL-WS-3 |
|-------------------------------|---------|---------|---------|
| Temperature (°C) | 12.1 | 11.7 | 11.0 |
| Dissolved oxygen (mg/L) | 10.61 | 10.53 | 10.26 |
| Conductivity (µg/L) | 35,951 | 35,991 | 36,687 |
| Salinity (PPT) | 30.94 | 31.49 | 32.78 |
| Total Dissolved Solids (mg/L) | 956 | 1458 | 2704 |
| pH | 7.73 | 7.84 | 7.87 |
| ORP | 73.6 | 64.4 | 67.1 |

6.0 SUMMARY

Characterization of the substrate and benthic communities along five transects within the area of a proposed effluent pipeline in Pocologan Harbour in Pocologan, NB was completed using an underwater video survey and on-site observations.

Transects 1, 3, 4, and 5 were predominantly sand with some boulder substrate noted in T1. T2 was predominantly bedrock ledge with a portion of sandy substrate at either end of the ledge.

Observations of fauna were limited. Periwinkles were the most common species noted, although northern rock barnacle were found at any location that featured hard bottom. Sand dollars were prevalent in T4 and T5. A single occurrence of a hermit crab and a moon snail were noted in T1 and T3 respectively.

All transects had a degree of macrofloral cover. Parts of T1 and much of T2 has considerable algal cover. Transects T1, T3, T4, and T5 which were predominantly sand, featured sporadic observations of thin eelgrass patches.



7.0 REFERENCES

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- Kelly, J., Power, R., Noble, L., Meade, J., Reid, K., Kuehnemund, S., Varley, C., Grant, C., Roberge, M., Lee, E., and M. Teasdale. 2009. A System for Characterizing and Quantifying Coastal Marine Habitat in Newfoundland. Draft.
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- Watling, L., Fegley, J., and Moring, J. 2003. *Life Between the Tides, Marine Plants and Animals of the Northeast*. ISBN 0-88448-253-7
- Wentworth, C.K. 1922. A scale of grade and class terms for clastic sediments. *The Journal of Geology*. 377-392.



8.0 CLOSING

This Report has been prepared for the sole benefit of Roy Consultants Ltd. The Report may not be used by any other person or entity without the express written consent of Wood, and Roy Consultants Ltd. Any use which a third party makes of this Report, or any reliance upon decisions made based upon it, is the responsibility of such third parties. With respect to third parties, Wood has no liability or responsibility for losses of any kind whatsoever, including direct or consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

The Report is based on data and information collected during the Survey activities conducted by Wood. It is based solely on the conditions of the Site in the reviewed video. Except as otherwise specified, Wood disclaims any obligation to update this Report for events taking place, or with respect to information that becomes available to Wood after the survey has been completed.

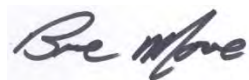
Wood makes no representation or warranty with respect to this Report, other than ensuring the work was undertaken by trained professional and technical staff in accordance with generally accepted engineering and scientific practices current at the time the work was performed. Any information or facts provided by others and referred to or utilized in the preparation of this Report was assumed by Wood to be accurate. Conclusions presented in this Report should not be construed as legal advice. The Report cannot be used or applied under any circumstances to another location or situation or for any other purpose without further evaluation of the data and related limitations.

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, Bruce Moore, B.Sc. and reviewed by Kimberlea Green, P.Geo., M.Sc, EP.

Respectfully submitted,

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

Prepared by:



Bruce Moore, B.Sc.
Aquatic Biologist

Reviewed by:



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Environmental Sciences Lead – NS



APPENDIX A
Transcript of Video and Onsite Observations



Table A.1 150 m Survey – Transect T1, 13 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) | 145-150 | Sand (95%); Cobble (5%) | Common periwinkles (O : 5-10 individuals); Hermit crab (U : 1 individual) | Macrofloral debris (<5%) |
| 5-10 | 140-145 | Sand (60%); Boulder (40%) | No life observed | Soft feather weed (25%); Sugar kelp (10%); Sea lettuce (5%); Macrofloral debris (<5%) |
| 10-15 | 135-140 | Boulder (75%); Sand (25%) | Northern rock barnacle (C) | Soft feather weed (40%); Sugar kelp (25%); Macrofloral debris (<5%) |
| 15-20 | 130-135 | Boulder (75%); Sand (25%) | Northern rock barnacle (C) | Soft feather weed (50%); Sugar kelp (15%) |
| 20-25 | 125-130 | Boulder (75%); Sand (25%) | Northern rock barnacle (C) | Soft feather weed (50%); Sugar kelp (15%) |
| 25-30 | 120-125 | Boulder (75%); Sand (25%) | Northern rock barnacle (C) | Soft feather weed (50%); Sugar kelp (15%) |
| 30-35 | 115-120 | Boulder (75%); Sand (25%) | Northern rock barnacle (C) | Soft feather weed (50%); Sugar kelp (15%) |
| 35-40 | 110-115 | Boulder (70%); Sand (30%) | Northern rock barnacle (C) | Soft feather weed (50%); Sugar kelp (15%) |
| 40-45 | 105-110 | Sand (100%) | No life observed | Macrofloral debris (<5%) |
| 45-50 | 100-105 | Sand (100%) | No life observed | Macrofloral debris (<5%) |
| 50-55 | 95-100 | Sand (100%) | No life observed | Macrofloral debris (10%) |
| 55-60 | 90-95 | Boulder (90%); Sand (10%) | Northern rock barnacle (C) | Soft feather weed (50%); Sugar kelp (15%) |
| 60-65 | 85-90 | Boulder (90%); Sand (10%) | Northern rock barnacle (C) | Soft feather weed (50%); Sugar kelp (15%) |
| 65-70 | 80-85 | Boulder (50%); Sand (50%) | Northern rock barnacle (C) | Soft feather weed (35%); Sugar kelp (10%) |
| 70-75 | 75-80 | Sand (100%) | No life observed | Macrofloral debris (15%) |
| 75-80 | 70-75 | Sand (100%) | No life observed | Macrofloral debris (15%) |
| 80-85 | 65-70 | Sand (100%) | No life observed | Macrofloral debris (15%) |
| 85-90 | 60-65 | Sand (100%) | No life observed | Macrofloral debris (15%) |
| 90-95 | 55-60 | Sand (100%) | No life observed | Macrofloral debris (15%) |
| 95-100 | 50-55 | Sand (100%) | No life observed | Macrofloral debris (15%) |
| 100-105 | 45-50 | Sand (100%) | Shell hash | Macrofloral debris (10%) |
| 105-110 | 40-45 | Sand (100%) | Shell hash | Macrofloral debris (10%) |
| 110-115 | 35-40 | Sand (100%) | Shell hash | Macrofloral debris (10%) |
| 115-120 | 30-35 | Sand (100%) | Shell hash | Macrofloral debris (10%) |
| 120-125 | 25-30 | Sand (100%) | Common periwinkles (O : 5-10 individuals); Shell hash | Macrofloral debris (15%) |
| 125-130 | 20-25 | Sand (100%) | Common periwinkles (C) | Macrofloral debris (15%) |
| 130-135 | 15-20 | Sand (100%) | No life observed | Macrofloral debris (15%) |
| 135-140 | 10-15 | Sand (100%) | Common periwinkles (O : 15-20 individuals); | Macrofloral debris (15%) |
| 140-145 | 5-10 | Sand (100%) | No life observed | Macrofloral debris (15%) |
| 145-150 T1 End (b) | 0-5 | Sand (100%) | No life observed | Eelgrass (<5%); Macrofloral debris (15%) |

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

Table A.2 120 m Survey – Transect T2, 13 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) | 115-120 | Rock (65); Sand (35%) | No Life observed | Bladderwrack (65%) |
| 5-10 | 110-115 | Rock (50); Sand (50%) | Northern rock barnacle (C) | Bladderwrack (50%) |
| 10-15 | 105-110 | Bedrock (60%); Sand (30%); Rock (10%) | Northern rock barnacle (C); Common periwinkle (U : 2 individuals) | Bladderwrack (50%); Rockweed (5%) |
| 15-20 | 100-105 | Bedrock (85%); Rock (15%) | Northern rock barnacle (C); Common periwinkle (O : 20-25 individuals) | Bladderwrack (70%); Rockweed (20%) |
| 20-25 | 95-100 | Bedrock (100%) | Northern rock barnacle (C) | Rockweed (65%); Bladderwrack (25%) |
| 25-30 | 90-95 | Bedrock (100%) | Northern rock barnacle (C) | Rockweed (70%); Bladderwrack (20%) |
| 30-35 | 85-90 | Bedrock (100%) | No Life observed | Rockweed (80%); Bladderwrack (20%) |
| 35-40 | 80-85 | Bedrock (100%) | Smooth periwinkle (U : 2 individuals) | Rockweed (95%) |
| 40-45 | 75-80 | Bedrock (100%) | No Life observed | Rockweed (90%) |
| 45-50 | 70-75 | Bedrock (100%) | No Life observed | Rockweed (70%); Bladderwrack (15%) |
| 50-55 | 65-70 | Bedrock (100%) | No Life observed | Rockweed (70%); Bladderwrack (15%) |
| 55-60 | 60-65 | Bedrock (85%); Rock (10%); Sand (5) | No Life observed | Rockweed (40%); Bladderwrack (40%) |
| 60-65 | 55-60 | Bedrock (85%); Rock (15%) | No Life observed | Rockweed (40%); Bladderwrack (40%) |
| 65-70 | 50-55 | Bedrock (100%) | No Life observed | Rockweed (45%); Bladderwrack (45%) |
| 70-75 | 45-50 | Bedrock (100%) | No Life observed | Rockweed (50%); Bladderwrack (50%) |
| 75-80 | 40-45 | Bedrock (100%) | No Life observed | Rockweed (40%); Bladderwrack (40%) |
| 80-85 | 35-40 | Gravel (50%); Sand (50%) | Shell hash | Macrofloral debris (10%) |
| 85-90 | 30-35 | Gravel (50%); Sand (50%) | Shell hash | Macrofloral debris (10%) |
| 90-95 | 25-30 | Gravel (50%); Sand (50%) | Shell hash | Macrofloral debris (10%) |
| 95-100 | 20-25 | Boulder (50%); Sand (45%); Gravel (5%) | Shell hash | Rockweed (70%); Sea lettuce (5%) |
| 100-105 | 15-20 | Sand (90%); Gravel (10%) | Shell hash | Macrofloral debris (10%) |
| 105-110 | 10-15 | Sand (90%); Gravel (10%) | Shell hash | Macrofloral debris (10%) |
| 110-115 | 5-10 | Boulder (90%); Sand (10%) | Northern rock barnacle (C) | Rockweed (40%); Bladderwrack (5%); Sea lettuce (5%) |
| 115-120 T2 End (b) | 0-5 | Sand (90%); Gravel (10%) | Shell hash | Macrofloral debris (10%) |

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

Table A.3 65 m Survey – Transect T3, 13 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) | 60-65 | Sand (100%) | Sand dollar (U : 4 individuals); Moon snail (U : 1 individual) | Macrofloral debris (25%) |
| 5-10 | 55-60 | Sand (100%) | Sand dollar (U : 2 individuals) | Eelgrass (<5%); Macrofloral debris (45%) |
| 10-15 | 50-55 | Sand (100%) | Sand dollar (U : 2 individuals) | Eelgrass (<5%); Macrofloral debris (45%) |
| 15-20 | 45-50 | Sand (100%) | Sand dollar (U : 2 individuals) | Eelgrass (<5%); Macrofloral debris (40%) |
| 20-25 | 40-45 | Sand (100%) | Sand dollar (U : 3 individuals) | Eelgrass (5%); Macrofloral debris (40%) |
| 25-30 | 35-40 | Sand (100%) | No life observed | Eelgrass (<5%); Macrofloral debris (40%) |
| 30-35 | 30-35 | Sand (100%) | No life observed | Eelgrass (<5%); Macrofloral debris (40%) |
| 35-40 | 25-30 | Sand (100%) | No life observed | Eelgrass (<5%); Macrofloral debris (40%) |
| 40-45 | 20-25 | Sand (100%) | Moon snail collar | Eelgrass (<5%); Macrofloral debris (40%) |
| 45-50 | 15-20 | Boulder (85%); Sand (15%) | No life observed | Sugar kelp (70%); Sea lettuce (15%); Spiny sour weed (10%) |
| 50-55 | 10-15 | Boulder (70%); Sand (30%) | Northern rock barnacle (C) | Soft feather weed (40%); Sugar kelp (30%) |
| 55-60 | 5-10 | Boulder (50%); Sand (50%) | Common periwinkle (O : 20-25 individuals) | Soft feather weed (35%); Sugar kelp (15%) |
| 60-65 T3 End (b) | 0-5 | Boulder (50%); Sand (50%) | Northern rock barnacle (C); Common periwinkle (O : 20-25 individuals) | Soft feather weed (35%); Sugar kelp (15%); Macrofloral debris (15%) |

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

Table A.4 50 m Survey – Transect T4, 13 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 (100%) | No life observed | Eelgrass (<5%); Macrofloral debris (40%) |
| 5-10 | 5-10 | Sand (100%) | Sand dollars (O : 10-15 individuals) | Macrofloral debris (40%) |
| 10-15 | 10-15 | Sand (100%) | Sand dollars (O : 10-15 individuals) | Macrofloral debris (40%) |
| 15-20 | 15-20 | Sand (100%) | Sand dollars (O : 5-10 individuals) | Eelgrass (<5%); Macrofloral debris (25%) |
| 20-25 | 20-25 | Sand (100%) | Sand dollars (O : 5-10 individuals) | Eelgrass (<5%); Macrofloral debris (25%) |
| 25-30 | 25-30 | Sand (100%) | Sand dollars (O : 5-10 individuals) | Eelgrass (<5%); Macrofloral debris (25%) |
| 30-35 | 30-35 | Sand (100%) | Sand dollars (O : 5-10 individuals) | Eelgrass (<5%); Macrofloral debris (25%) |
| 35-40 | 35-40 | Sand (100%) | Sand dollars (O : 5-10 individuals) | Eelgrass (5%); Macrofloral debris (15%) |
| 40-45 | 40-45 | Sand (100%) | Sand dollars (U : 4 individuals) | Macrofloral debris (10%) |
| 45-50 T4 End (b) | 45-50 | Sand (55%); Gravel (45%) | No life observed | Eelgrass (<5%) |

*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

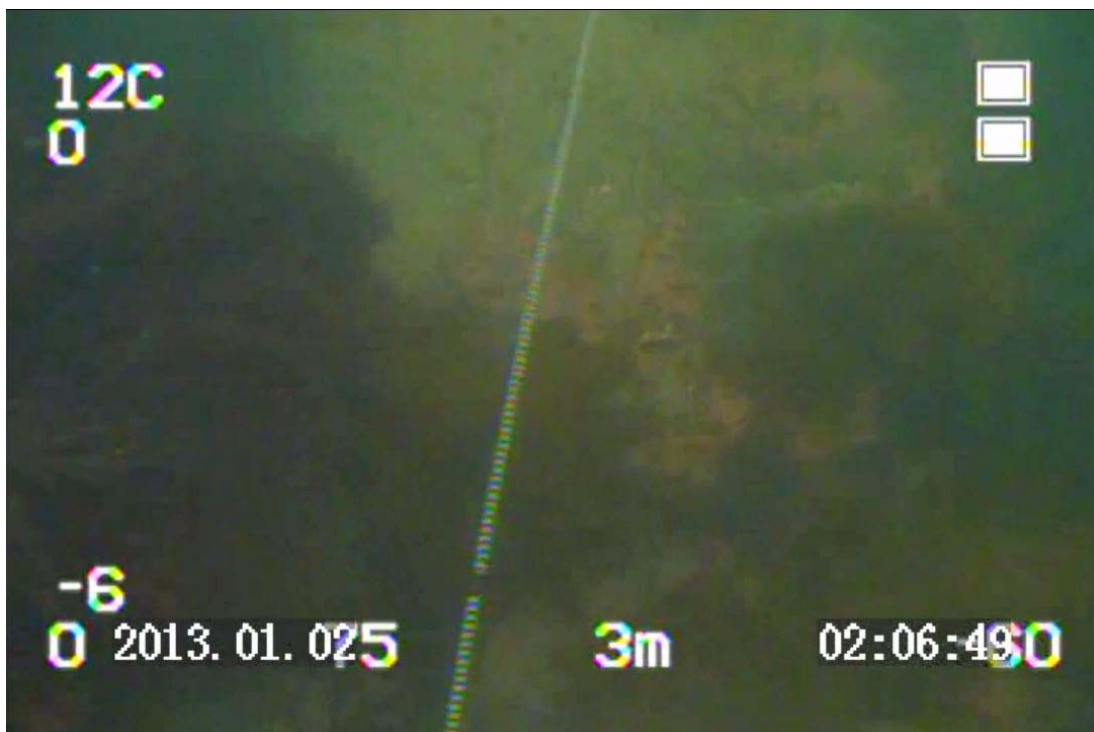
| Classification | Common Name | Scientific Name |
|-------------------|------------------------|-------------------------------|
| Macrofauna | | |
| Arthropoda | Northern rock barnacle | <i>Semibalanus balanoides</i> |
| | Hermit crab | <i>Pagurus acadianus</i> |
| Echinodermata | Sand dollar | <i>Echinarachnius parma</i> |
| Mollusca | Common periwinkle | <i>Littorina littorea</i> |
| | Smooth periwinkle | <i>Littorina obtusata</i> |
| | Moon snail | <i>Euspira heros</i> |
| Macroflora | | |
| Angiosperms | Eelgrass | <i>Zostera marina</i> |
| Phaeophyta | Rockweed | <i>Ascophyllum nodosum</i> |
| | Bladderwrack | <i>Fucus vesiculosus</i> |
| | Sugar kelp | <i>Saccharina latissima</i> |
| | Spiny sour weed | <i>Desmarestia aculeata</i> |
| Rhodophyta | Soft feather weed | <i>Plumaria plumosa</i> |
| Chlorophyta | Sea lettuce | <i>Ulva lactuca</i> |

APPENDIX C
Photo Log





T1: Substrate in the 0-5 m segment



T1: Algal cover in the 10-15 m segment



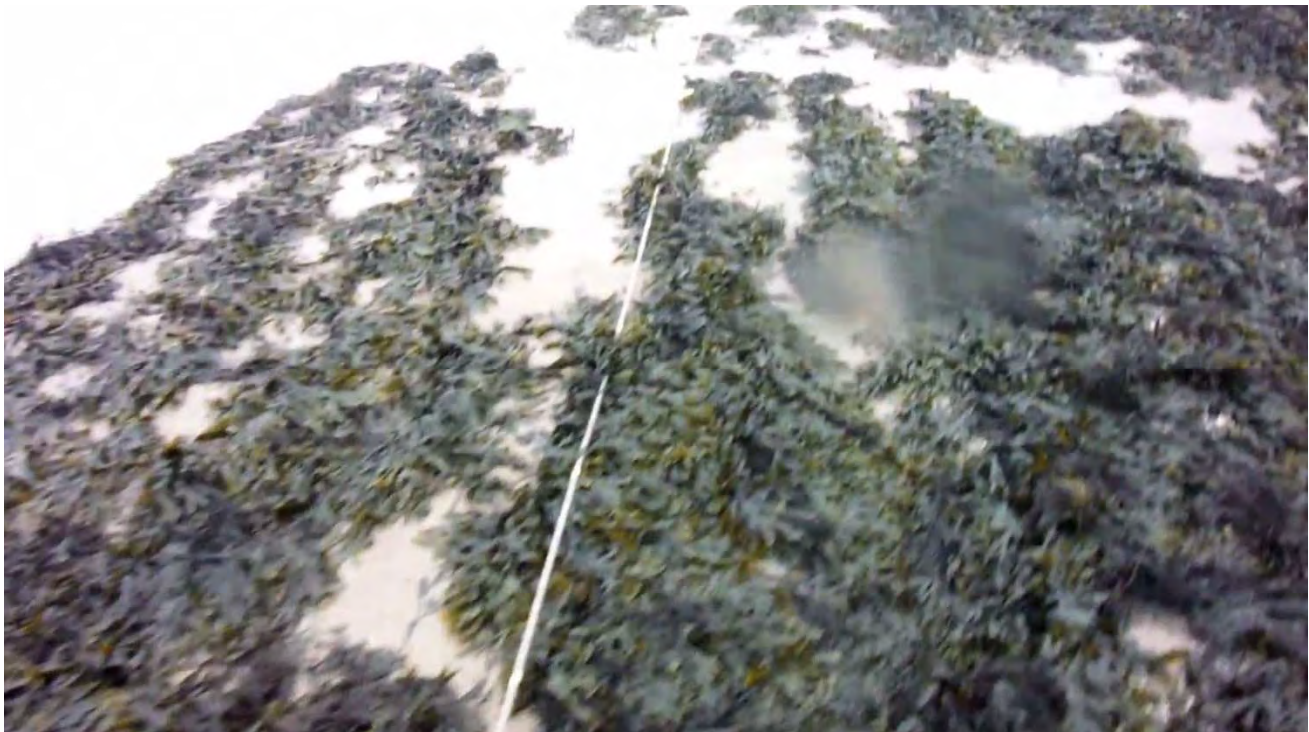
T1: Algal cover in the 45-50 m segment



T1: Sand and macrofloral debris in the 90-95 m segment



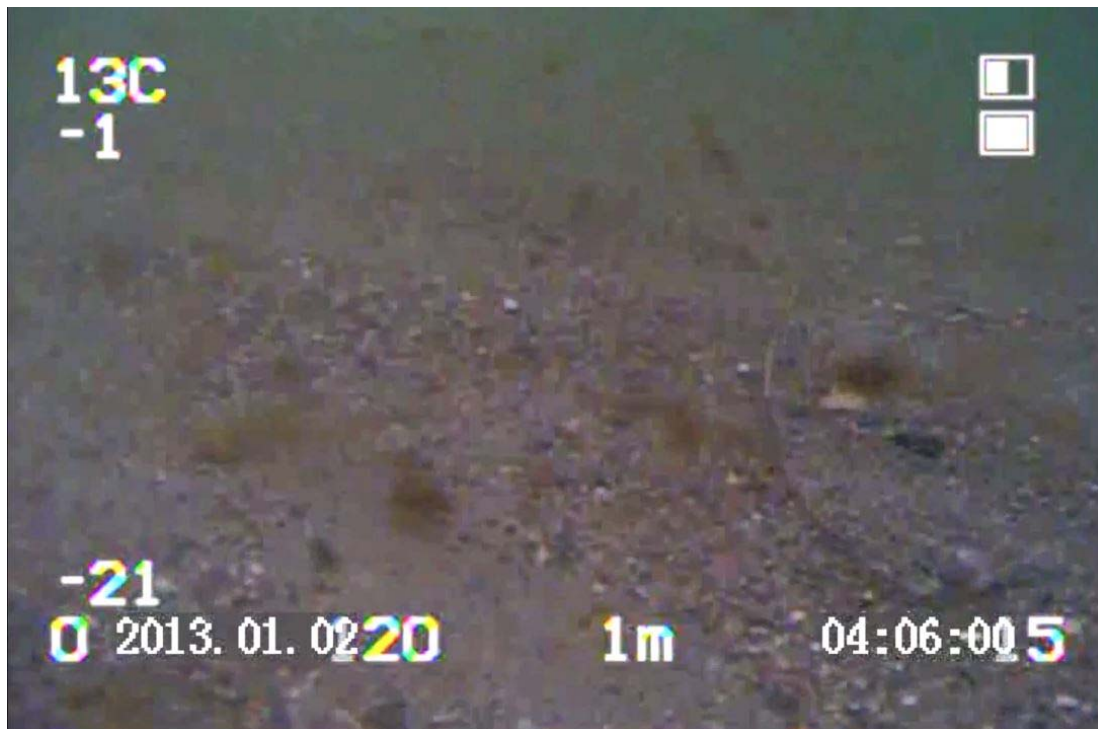
T1: Sand and sprigs of eelgrass in the 145-150 m segment



T2: Sand and algal covered rock in the 0-5 m segment



T2: Algal covered ledge typical of the habitat along much of T2



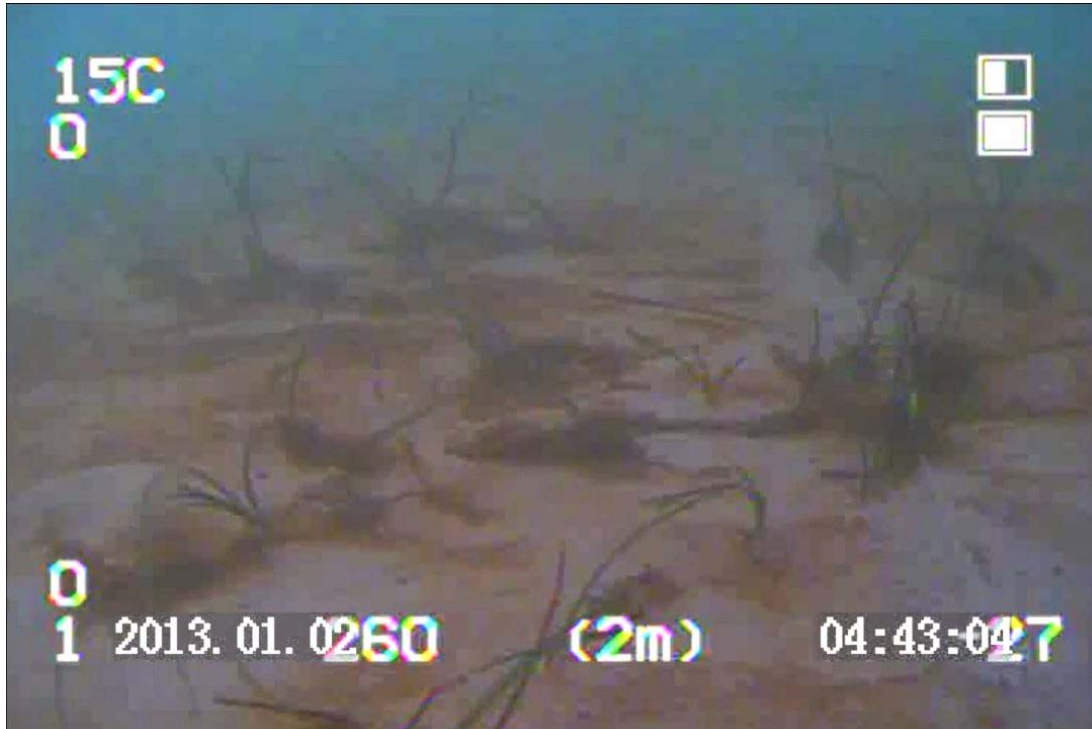
T2: Sand and gravel substrate with sparse macrofloral debris in the 80-85 m segment



T2: Sand substrate with sparse macrofloral debris in the 100-105 m segment



T3: Sand substrate with moon snail in the 0-5 m segment



T3: Sand substrate with thin patches of eelgrass in the 10-20 m segment



T3: Algal covered boulder in the 40-45 m segment



T4: Sand substrate with macrofloral debris and sand dollars in the 5-10 m segment



T4: Sand substrate and sparse eelgrass 35-40 m segment



T4: Sand and gravel substrate in the 45-50 m segment.



Intertidal habitat at east end of the property



Intertidal habitat in the central portion of the property



Intertidal habitat at the west end of the property



Bedrock ledge characterized in T2

APPENDIX D
Lab Certificates



Report ID: 317621-IAS
 Report Date: 28-Jun-19
 Date Received: 14-Jun-19

CERTIFICATE OF ANALYSIS

for
 Roy Consultants Group
 416 York Street, Suite 220
 Fredericton, NB E3B 3P7



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

Attention: Jon Burr

Project #: 148-19

Location: Pocologan

Analysis of Water

| RPC Sample ID: | | | 317621-1 | 317621-2 | 317621-3 |
|-------------------------------------|-------|-------|-----------|-----------|-----------|
| Client Sample ID: | | | PL-WS-1 | PL-WS-2 | PL-WS-3 |
| Date Sampled: | | | 13-Jun-19 | 13-Jun-19 | 13-Jun-19 |
| Analytes | Units | RL | | | |
| Sodium | mg/L | 0.05 | 9900 | 9880 | 9830 |
| Potassium | mg/L | 0.02 | 380 | 384 | 378 |
| Calcium | mg/L | 0.05 | 375 | 373 | 368 |
| Magnesium | mg/L | 0.01 | 1130 | 1130 | 1110 |
| Iron | mg/L | 0.02 | 1 | 1 | < 1 |
| Manganese | mg/L | 0.001 | < 0.05 | < 0.05 | < 0.05 |
| Copper | mg/L | 0.001 | < 0.05 | 0.05 | < 0.05 |
| Zinc | mg/L | 0.001 | < 0.05 | 0.06 | < 0.05 |
| Ammonia (as N) | mg/L | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| pH | units | - | 8.0 | 7.9 | 7.8 |
| Alkalinity (as CaCO ₃) | mg/L | 2 | 102 | 100 | 102 |
| Chloride | mg/L | 0.5 | 16100 | 16000 | 15900 |
| Sulfate | mg/L | 1 | 2400 | 2400 | 2300 |
| Nitrate + Nitrite (as N) | mg/L | 0.05 | < 0.05 | < 0.05 | < 0.05 |
| o-Phosphate (as P) | mg/L | 0.01 | < 0.01 | < 0.01 | < 0.01 |
| r-Silica (as SiO ₂) | mg/L | 0.1 | 0.2 | 0.2 | 0.2 |
| Carbon - Total Organic | mg/L | 0.5 | 1.8 | 1.9 | 1.6 |
| BOD ₅ | mg/L | 6 | < 6 | < 6 | < 6 |
| Turbidity | NTU | 0.1 | 0.6 | 0.4 | 0.4 |
| Conductivity | µS/cm | 1 | 65800 | 58400 | 57800 |
| Calculated Parameters | | | | | |
| Bicarbonate (as CaCO ₃) | mg/L | - | 101. | 99.2 | 101. |
| Carbonate (as CaCO ₃) | mg/L | - | 0.949 | 0.741 | 0.601 |
| Hydroxide (as CaCO ₃) | mg/L | - | 0.050 | 0.040 | 0.032 |
| Cation Sum | meq/L | - | 552. | 551. | 547. |
| Anion Sum | meq/L | - | 506. | 503. | 498. |
| Percent Difference | % | - | 4.34 | 4.55 | 4.64 |
| Theoretical Conductivity | µS/cm | - | 37300 | 37100 | 36700 |
| Hardness (as CaCO ₃) | mg/L | 0.2 | 5590 | 5580 | 5490 |
| Ion Sum | mg/L | - | 30300 | 30200 | 29900 |
| Saturation pH (5°C) | units | - | 7.1 | 7.1 | 7.1 |
| Langelier Index (5°C) | - | - | 0.95 | 0.84 | 0.73 |

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit; Organic Carbon and ion chemistries for turbid samples are determined on filtered aliquots.

Ross Kean
 Department Head
 Inorganic Analytical Chemistry

WATER CHEMISTRY
 Page 1 of 3

Peter Crowhurst
 Analytical Chemist
 Inorganic Analytical Chemistry

Report ID: 317621-IAS
 Report Date: 28-Jun-19
 Date Received: 14-Jun-19

CERTIFICATE OF ANALYSIS

for
 Roy Consultants Group
 416 York Street, Suite 220
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Attention: Jon Burt

Project #: 148-19

Location: Pocologan

Analysis of Metals in Water

| | | | | | |
|-------------------|--------------|-----------|-----------|-----------|-----------|
| RPC Sample ID: | | | 317621-1 | 317621-2 | 317621-3 |
| Client Sample ID: | | | PL-WS-1 | PL-WS-2 | PL-WS-3 |
| Date Sampled: | | | 13-Jun-19 | 13-Jun-19 | 13-Jun-19 |
| Analytes | Units | RL | | | |
| Aluminum | µg/L | 1 | < 50 | < 50 | < 50 |
| Antimony | µg/L | 0.1 | < 5 | < 5 | < 5 |
| Arsenic | µg/L | 1 | < 50 | < 50 | < 50 |
| Barium | µg/L | 1 | < 50 | < 50 | < 50 |
| Beryllium | µg/L | 0.1 | < 5 | < 5 | < 5 |
| Bismuth | µg/L | 1 | < 50 | < 50 | < 50 |
| Boron | µg/L | 1 | 4180 | 4210 | 4160 |
| Cadmium | µg/L | 0.01 | < 0.5 | < 0.5 | < 0.5 |
| Calcium | µg/L | 50 | 375000 | 373000 | 368000 |
| Chromium | µg/L | 1 | < 50 | < 50 | < 50 |
| Cobalt | µg/L | 0.1 | < 5 | < 5 | < 5 |
| Copper | µg/L | 1 | < 50 | 50 | < 50 |
| Iron | µg/L | 20 | 1200 | 1000 | < 1000 |
| Lead | µg/L | 0.1 | < 5 | 13 | < 5 |
| Lithium | µg/L | 0.1 | 158 | 162 | 156 |
| Magnesium | µg/L | 10 | 1130000 | 1130000 | 1110000 |
| Manganese | µg/L | 1 | < 50 | < 50 | < 50 |
| Molybdenum | µg/L | 1 | 13 | 12 | 12 |
| Nickel | µg/L | 1 | < 50 | < 50 | < 50 |
| Potassium | µg/L | 20 | 380000 | 384000 | 378000 |
| Rubidium | µg/L | 0.1 | 102 | 103 | 103 |
| Selenium | µg/L | 1 | < 50 | < 50 | < 50 |
| Silver | µg/L | 0.1 | < 5 | < 5 | < 5 |
| Sodium | µg/L | 50 | 9900000 | 9880000 | 9830000 |
| Strontium | µg/L | 1 | 7540 | 7540 | 7460 |
| Tellurium | µg/L | 0.1 | < 5 | < 5 | < 5 |
| Thallium | µg/L | 0.1 | < 5 | < 5 | < 5 |
| Tin | µg/L | 0.1 | < 5 | < 5 | < 5 |
| Uranium | µg/L | 0.1 | < 5 | < 5 | < 5 |
| Vanadium | µg/L | 1 | < 50 | < 50 | < 50 |
| Zinc | µg/L | 1 | < 50 | 60 | < 50 |

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Methods

| <u>Analyte</u> | <u>RPC SOP #</u> | <u>Method Reference</u> | <u>Method Principle</u> |
|------------------------------------|------------------|-----------------------------|--|
| Ammonia | 4.M47 | APHA 4500-NH ₃ G | Phenate Colourimetry |
| pH | 4.M03 | APHA 4500-H ⁺ B | pH Electrode - Electrometric |
| Alkalinity (as CaCO ₃) | 4.M43 | EPA 310.2 | Methyl Orange Colourimetry |
| Chloride | 4.M44 | APHA 4500-CL E | Ferricyanide Colourimetry |
| Sulfate | 4.M45 | APHA 4500-SO ₄ E | Turbidimetry |
| Nitrate + Nitrite (as N) | 4.M48 | APHA 4500-NO ₃ H | Hydrazine Red., Derivatization, Colourimetry |
| o-Phosphate (as P) | 4.M50 | APHA 4500-P F | Molybdate/Ascorbic Acid Colourimetry |
| r-Silica (as SiO ₂) | 4.M46 | APHA 4500-SI F | Heteropoly Blue Colourimetry |
| Carbon - Total Organic | 4.M38 | APHA 5310 C | UV-Persulfate Digestion, NDIR Detection |
| BOD ₅ | 4.M07 | APHA 5210 B | Seeding, Incubation, DO measurement (meter) |
| Turbidity | 4.M06 | APHA 2130 B | Nephelometry |
| Conductivity | 4.M04 | APHA 2510 B | Conductivity Meter - Electrode |
| Trace Metals | 4.M01/4.M29 | EPA 200.8/EPA 200.7 | ICP-MS/ICP-ES |



APPENDIX F

Archaeological Survey Report

Archaeological Impact Assessment for Pocologan Residential Development, Charlotte County

1.0 INTRODUCTION

The former BayBreeze motel and restaurant is changing hands and the new owner plans a development including 22 residential units for the property. This Archaeological Impact Assessment is being done as part of the overall EIA, to prevent unintentional destruction of archaeological resources on the property during development. All work done under this permit conforms with provincial guidelines for consulting archaeologists as set out by Heritage and Archaeological Services Branch (2012).

Known Indigenous archaeological sites BgDp-1 and BgDp-2 occupy similar coastal settings less than a kilometer southwest of the study area, as seen in the predictive modeling provided by provincial authorities (Figure 6). Based on this and other archaeological occurrences in nearby Pennfield (Figure 7) this project area holds high potential for Indigenous archaeological occurrences.

The project development area (PDA) includes seven PIDs: 01212406, 15200363, 15204530, 15206840, 15077985, 01214253, and 15080765 (Figures 1 and 2). The entire parcel is within an archaeological buffer zone that extends 80 m inland from the cliff edge. Provincial guidelines (AHB 2012) state that, depending on Phase 1 observations and extent of ground disturbance, standard test pits (50 cm x 50 cm) must be excavated on a 5 m grid within 50 m of the shoreline, and on a 10 m grid between 50 m and 80 m from the shoreline in areas that will be impacted by construction.

The proponent plans to install residential dwellings and a septic treatment system on the property (Figure 3). After evaluating their options, the proponent has decided to bring in fill and build on the existing ground surface. Rather than digging trenches for utilities, they plan to lay them on the existing ground surface and cover them with fill to the requisite depth. The exception to this may be the septic tank, and further mitigation may be required in that sector if excavation is required. The proponent understands the need to avoid impacting heritage resources.

2.0 HISTORY AND ARCHAEOLOGY

The project development area (PDA) is in traditional lands of the Peskotomuhkati, which includes the coast of the Bay of Fundy from the Maine border to the Lepreau Peninsula

(Erickson 1978). The PDA is 55 km east of the Peskotomuhkati Nation at Skutik, in a coastal setting within the Traditional Ancestral Territory of the Peskotomuhkati. Although in the early colonial period, the residents of the PDA were known as Etchemins, they later became known as Passamaquoddy, an English derivation of the Indigenous name for the bay they occupied at the mouth of the St Croix River, or “Rivière des Etchemins” as Champlain called it (Denys 1908). The residents took their name from the abundant pollock (*peskoto*) stocks in the bay (Peskotomuhkati Nation at Skutik 2022).

Linguistically, the Peskotomuhkati language is so closely related to Wolastoqey that they are classified as two dialects of one language (Erickson 1978). Both belong to the Eastern Algonquian language family which includes their neighbours in Wabanakia, the Mi'kmaq and Penobscot.

In 1524, under the auspices of the King of France, Giovanni da Verrazzano captained a ship to search for a route to the Pacific Ocean through eastern North America (Marsh and James-Abra 2017). Preceding Jacques Cartier in this goal by a decade, he sailed from the Carolinas shore to the Gulf of Maine, where he probably brushed the western end of Peskotomuhkati territory, before crossing the Gulf of Maine and skirting the south shore of Nova Scotia (Trigger 1985:123).

The first colonial settlement in Canada was on an island in the heart of the Peskotomuhkati homeland and it was they who suggested the botanical cure for scurvy that saved some of the ill-fated expedition led by Samuel de Champlain that overwintered in 1603-1604.

Existence of Indigenous people in the Peskotomuhkati homeland is documented as far back as 12,000 years ago, based on artifact style and radiocarbon dates from Pennfield, as dates procured by the provincial archaeological offices demonstrate. It may be that a coastal route from the Gulf of Maine along the north shore of the Bay of Fundy, to the Minas Basin site at Debert, just before the Younger Dryas cold spell that started 12,800 calendar years ago and lasted until 11,600 years ago, was the way the first people entered Wabanakia.

Settlement of Pocologan by Europeans began before Canadian confederation, but after New Brunswick separated from Nova Scotia in 1784. A section of the cadastral map (PANB 2022a) shows land grantees for the PDA: Ira Holland and William Boggs (Figure 9). An online search of the provincial archives leads to the Index to Land Petitions: Original Series, 1783 – 1918 (RS108), where William Boggs received land title in Charlotte County in 1852 (PANB 2022b). His western neighbour, John Holland, was

granted land in 1785, also in Charlotte County (PANB 2022c). Presumably these are the two Pocologan settlers named on the cadastral map.

The archives (PANB 2022a) state that five families were living in Pocologan in 1866. A post office existed from 1883 to 1898 and again from 1927. The etymology of the place name is Wolastoqey, according to Ganong (1896:263), who lists it as Popelogan Brook, in Charlotte County, noting the existence of the same place name “in Maine and on the Upsalquitch.” He indicates it may be the Wolastoqey word for stopping place. On an 1816 map it is spelled Pocologan. Ganong (1914) delves further into the etymology of the word as a place name in various locations in Wabanakia.

Air photos from 1945, 1951 and 1965 (Figures 10, 11, and 12) show a cluster of four cottage-sized buildings arranged along the shore in the western sector of the PDA. There is another line of three smaller buildings to the east and north of them, plus a larger building east of that. This appears to represent the same kind of seasonal tourism-based enterprise that still exists, although the original cottages are absent. An abandoned wooden staircase to the beach from the vicinity of the original cottage cluster is boarded off, but still standing, as seen in the distance in Figure 34.

3.0 PHYSIOGRAPHY

The surface geology of the PDA is mapped in Figure 5. It shows that there are marine sediments capping the geological sequence, resulting from the post-glacial submergence of the coastal land between 14,000 and 13,000 years ago. The earth’s crust was deformed from the glacial mass but quickly rebounded to approximately its current elevation in time for the first Indigenous arrivals (Shaw et al. 2002).

Accordingly, the surface geology map shows: “Wb: Late Pleistocene and/or Early Holocene marine sediments (sand, silt, some gravel and clay), generally 0.5 to 3 m thick, deposited in blankets and plains in shallow marine water that submerged coastal areas and sections of many valleys during and following Late Wisconsinian deglaciation” (SNB 2021).

A long-time local resident spoke with me as I was preparing to excavate the first test pits. They told me that clay was commonly found under the sod on their property nearby.

Bedrock outcrops are visible on the shore (Figures 24 to 26). They are some of the oldest rocks on the planet, dating to the Neoproterozoic era to Cambrian period, between 500 million and one billion years ago (SNB 2022). The bedrock may be directly under the Late Pleistocene and Early Holocene sediments, or there may be intervening layers, this cannot be determined without drilling geotechnical boreholes.

A thick bed of clay is exposed in the eroding cliff face at the western end of the PDA (Figure 27). I encountered the same clay, just below the sod, in test pits north of the clay in the cliff face. This clay deposit matches the description for what to expect in the surface geology map for the area.

The eastern test pit, PP-6, was sod over a compact, reddish, sandy, pebbly, till-like deposit. The pebbles are rounded but unsorted. If it is a sediment of glaciomarine origin, it may have been deposited at once in a significant flood event. That would explain the lack of sorting. But it is also very compact, which suggests direct glacial force after deposition. If the PDA was reglaciaded during the Younger Dryas (12,900 to 11,600 BP), the till-like compact, pebbly sediment may be till that was pushed into the PDA, covering the slightly older glaciomarine clay. Or, if it is flood-deposited glaciomarine sediment, the re-glaciation may have seen ice form or move in from higher elevations, covering and compacting the sediment. Borehole data might help resolve the matter.

The reddish pebbly deposit is visible in an exposed cut made by the stream that emerges from a culvert under the Pocologan Road (Figure 14). In two of the test pits in the southeastern sector, above the clay layer, the same stony matrix was present and it was compact, but not as compact as in PP-6. In that southwestern corner, it might be redeposited as a thin layer of fill, being within metres of a deeper deposit of fill, about 60 to 80 cm deep, just north of the testing area on a ledge above the clay deposit. The abandoned Pocologan School Road is still visible and is portrayed on current maps. For example, it can be seen cutting through the western corner of the PDA in the archaeological predictive modeling (Figure 6).

The exposed clay in the western end of the PDA is not visible elsewhere in the PDA. However, the dense shrubbery meets the bedrock on a slope too steep to scale, and no large erosion features are visible. Some of the underlying sediment may have been washed out by high tide allowing the root mat to collapse, concealing the substrate from view.

The clay deposit may be deepest in the western part of the PDA, and absent east of the restaurant. There, the only test pit revealed the compact pebbly matrix, like that exposed in the washout at the culvert outflow. The elevation is higher east of the restaurant than west of it, and it may be that the clay is confined to a trough in the bedrock west of the restaurant. East of that, at higher elevation, a deposit of Late Wisconsinian glacial till may have survived the Late Pleistocene inundation with minimal disturbance but by processes outlined above, could have become more compact, and rests directly on the bedrock. No clay or pebbly sediment can be seen in the shoreline east of the restaurant, due to root mat slumping.

There is some evidence of surface modification of the pebble layer for possibly bicycle jumps in the eastern area, but indications of large-scale human modification in this sector is absent in the air photos. Modern satellite imagery shows some surface disturbance due to human action near the old Pocologan Road but other undulations in the eastern sector may be natural rills caused by storm runoff. With dense, eye-high grasses abundant at the time of survey, it was difficult to be sure.

4.0 METHODS AND OBSERVATIONS

The field work comprised two phases and was carried during four site visits. September 15 was the main survey, with a follow up on a PID in the northwest sector of the PDA on November 11. Subsurface testing included a line of four test pits in the southwestern sector by the shoreline on November 13. On November 17, two more test pits were dug at the locations for drilling test wells for water sources, to mitigate their impact.

After completing the surface inspection, I met with the proponent and general consultant online on October 6. After evaluating the options, the proponent decided to bring in fill to raise the property and build on that rather than dig into the subsoil and trigger the need for archaeological mitigation. The sole exception to this avoidance plan is in the southwest sector, where I dug the four test pits. A wastewater disposal tank is placed there in conceptual plans, so the test pits provided some evidence of what to expect there.

4.1 Surface Inspection

I parked east of the restaurant and spoke briefly with the proprietor before I began pedestrian survey of the PDA on September 15, 2021. The route I walked is depicted in Figure 13 and the waypoints where I recorded fieldnotes and photographs are shown in

Figure 14. The following text describes the surface inspection findings in sequence with the waypoints.

On September 15, I parked at the restaurant (Figure 16) and after speaking briefly with the proprietor, I walked east to waypoint 167, where I noticed a north-south buried drainage feature, based on the waterlogged soil and richer vegetation (Figures 17 and 18). The next photo, Figure 19, faces east from waypoint 167 to the location where I later dug PP-6 at a location chosen for a test water well.

After inspecting the lawn east of the restaurant, I descended the rough path to the beach (Figure 20). Armour stone has been added to the eroding shoreline bank in front (south of) the restaurant (Figure 21). The ancient bedrock outcrops on the beach, where sandy and shingle beaches are to be found (Figure 22).

At waypoint 169, a watercourse emerges from the bank and flows down onto the beach where it disappears into the sand (Figures 23, 24, and 25).

Towards the western end of the PDA, a thick bed of clay is revealed in the eroding shoreline profile (Figures 27, 28, and 29). A metal pipe appears to be associated but it is a recent feature, transported by slumping of the sod layer after the clay bank was undercut by wave action. The pipe may be a relic of the former cabins, seen in the early air photos.

At the western end of the PDA, a buried stream emerges onto the beach from a V-shaped ravine that is south of a culvert under the old Pocologan School Road (Figures 30, 31). The views east and west from this location are shown in Figures 32 and 33.

I ascended the bank and recorded a waypoint on a narrow ledge between the top of the bank and the edge of a fill zone extending south from the former road (Figures 34, 35, and 36). An old wooden staircase and railing visible in Figure 34 are abandoned and are probably associated with the former cottage cluster.

Waypoint 174 is just north of the Pocologan School Road, where an exposure of the pebbly layer is found. This could be more fill associated with the former road (Figures 37, 38, and 39).

Figures 40 and 41 are taken from waypoint 189, in the far northwest corner of the PDA, looking south and west.

After completing the sector west of the restaurant, I returned to the eastern sector, where I took photographs at the edge of the mowed section (waypoint 175), and at the extreme tip of level land (waypoint 176). Facing east to the rough, undeveloped sector of the PDA.

Figures 45, 46, and 47 are taken from waypoint 177, at the far eastern end of the PDA. The undeveloped land is covered with dense grasses that grow two metres high.

Having completed the surface inspection and background research, I prepared a map illustrating the zone of archaeological concern and the mitigation requirements, as per provincial guidelines (HASB 2012) if sub-surface excavation was part of the construction plan (Figure 48). The proponent decided to avoid the cost and risk of archaeological mitigation by avoiding ground disturbance where possible. This is to be accomplished by trucking in fill to build the residential units on. The primary exception to this approach is a planned wastewater treatment tank in the southwest corner of the PDA, which will require excavation to install. After consulting with Heritage and Archaeological Services Branch, I excavated standard shovel test pits (50 cm x 50 cm) in the associated sector, as described below.

4.2 Sub-surface excavation

Since the developer plans to avoid sub-surface excavation except where the wastewater tank is planned, I confined mitigative test excavations to that sector and excavated four test pits there on November 13 (PP-1 to PP-4). Subsequently, I excavated two more 50 cm x 50 cm shovel test pits at locations in the west and east sectors of the property where test wells for water were to be drilled (PP-5 and PP-6).

In PP-1, loose sandy soil supports the tall grass that covers the location. A discontinuous grey clay layer from 17 cm to 23 cm below surface covered a 10 cm to 20 cm layer of sand and pebbles. Beneath that was compact red clay (Figures 49 and 50).

The surface layer in PP-2 was loose sand, but at 10 cm the dense, compact sandy matrix with embedded rounded pebbles became too difficult to dig through with shovel and trowel (Figure 51).

The third test pit setting is shown in Figure 52, and the results are in Figure 53. A sandy, pebbly matrix extended seven cm under the sod surface. This transitioned into a lighter-

coloured sandy layer with nodules of clay, similar to the layer in PP-1. Under that was very compact sand with embedded rounded pebbles (Figure 53).

Test pit PP-4 was farther east and about 50 cm lower elevation than the first three excavate. It revealed pure red clay directly beneath the surface (Figure 54). The surface vegetation there was short grass and thistle (Figure 55), not the tall grass growing over the section of ledge where PP-1, PP-2, and PP-3 were excavated (Figure 56).

The fifth test pit was excavated in the lawn northwest of the proprietor's dwelling, at waypoint 203 (Figure 57). Like PP-4, PP-5 was red clay directly beneath the surface grasses (Figure 58). After backfilling, I marked the spot with flagging tape so the well drillers could easily locate the spot for drilling (Figure 59).

The final test pit of this phase of the mitigation was on the lawn about five metres south and five metres east of the utility pole, as depicted in Figure 19. In it, I encountered the compact sandy matrix with embedded rounded pebbles immediately below the thin sod (Figure 60).

No artifacts, either recent or ancient, were recovered from test pits PP-1 through PP-6.

5.0 DISCUSSION

The entire PDA is within the 80 m archaeological buffer zone for mitigation if sub-surface excavation is planned as part of construction, as mandated by HASB (2012). Accordingly, the proponent plans to limit excavation to the southwest sector of the PDA, where wastewater disposal infrastructure is to be installed. Elsewhere, building will take place from the ground surface up, with the installation of fill over the existing ground surface. Shrubs and grasses will be cut short and covered. If construction plans change, the proponent is aware that subsurface excavation anywhere on the property must be preceded by archaeological test pits, as per provincial guidelines.

The four test pits excavated in the southwest sector, plus the well test pit at waypoint 203, suggest that the red clay exposed in the shoreline extends northward in the western sector. Test pits PP-1 to PP-3 show layers above the clay that are probably derivative of natural sediment redistributed as fill. This is likely a consequence of being 10 to 15 metres south of the Pocologan School Road, now abandoned, that is still usable in this sector of the PDA.

Test pits PP-4 and PP-5 were directly on massive clay, like the clay exposed in the shoreline erosion face directly south of them. No intervening layers of fill were evident.

The final test pit, PP-6, suggests the presence of a different sort of surface geological deposit. This one is similar in colour to the red clay but is composed of sand, with abundant rounded pebbles embedded in a dense, compact layer. The same sort of material appears in layers above the clay in the western sector, but probably as incidental fill related to nearby roadwork. In contrast, the compact pebbly red layer directly beneath the thin sod in PP-6 may extend all the way to bedrock, without any intervening clay. A deep deposit of this material is exposed in the erosive cut below the outfall of a culvert, marked on Figure 14. The eastern sector is uniformly covered in shrubs and tall grasses, suggesting a similar substrate. Based on these admittedly sparse sub-surface observations, it appears that the PDA surface geology is mainly clay west of the restaurant and till (of Late Pleistocene glacio-marine origin, or Early Holocene Younger Dryas modification) east of it.

In either case, aerial photography suggests minimal subsurface disturbance, with the western sector being used for summer cottages and the eastern sector left wild for the most part. Therefore, if any Indigenous archaeological deposits exist in the PDA, they are probably buried under fill or still in primary context within the top 50 cm.

Consequently, sub-surface excavation by the proponent should be mitigated by a permitted archaeologist. As of writing, the only planned excavation relates to the wastewater treatment infrastructure in the southwest sector. Testing suggests a clay substrate there, under sandy, pebbly fill in the vicinity of the old road. Elsewhere in the western sector, clay directly beneath surface vegetation is the norm. This is not a typically preferred substrate for Indigenous activity areas in summer, but winter use cannot be ruled out, especially with a nearby freshwater stream and access to sea-mammal hunting.

East of the restaurant, a compact, sandy, pebbly layer may be the surficial geological layer. The eastern sector of the PDA is also at higher elevation and appears to be better drained, making it more suitable for summer habitation sites.

This apparent divide in terms of surface geology does not impact the archaeological rules in place, as the entire PDA is subject to mitigation because of its proximity to a waterbody.

6.0 RECOMMENDATIONS

In accordance with provincial guidelines to consultants (HASB 2012), I recommend that any subsurface excavation within 80 m of the shoreline be preceded by archaeological mitigation. Test pits can be excavated in most of the PDA (Figure 48). Where an obvious layer of fill exists, the old road, for example, monitoring may be acceptable to the Regulator. A combination of both testing and monitoring may be necessary in a mitigation plan, depending on the final plan for the wastewater infrastructure.

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Figure 1. Location of PDA in Pocologan.

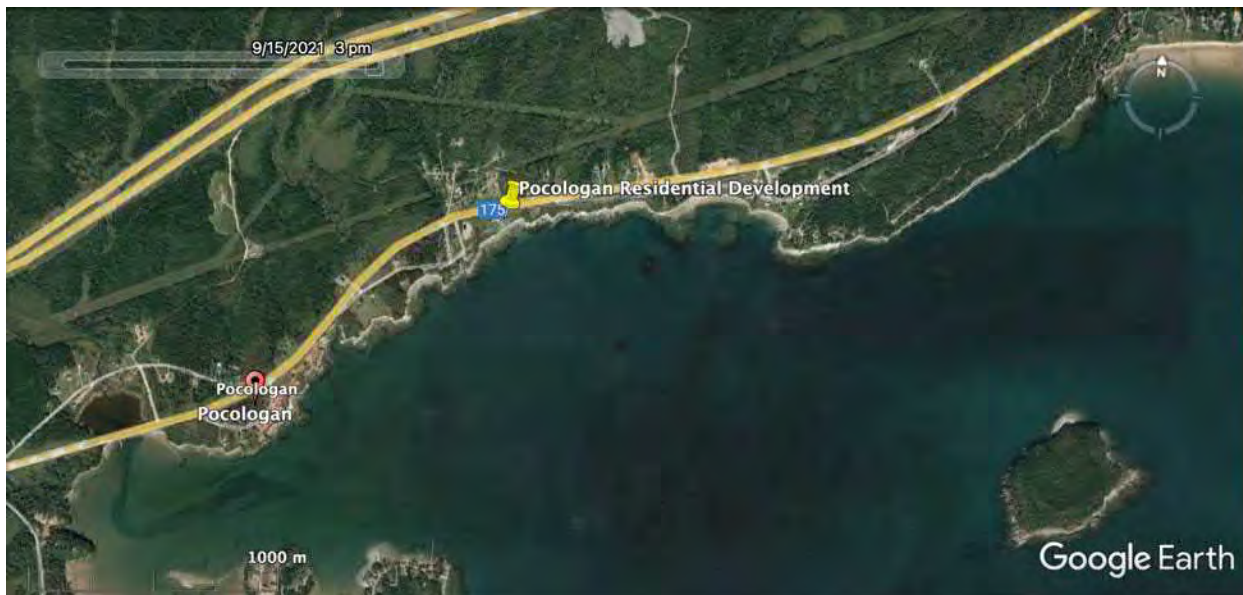


Figure 2. Location of PDA in Pocologan at larger scale.



Figure 3. Provincial online map of PDA in Pocologan (<http://geonb.snb.ca/geonb/>).

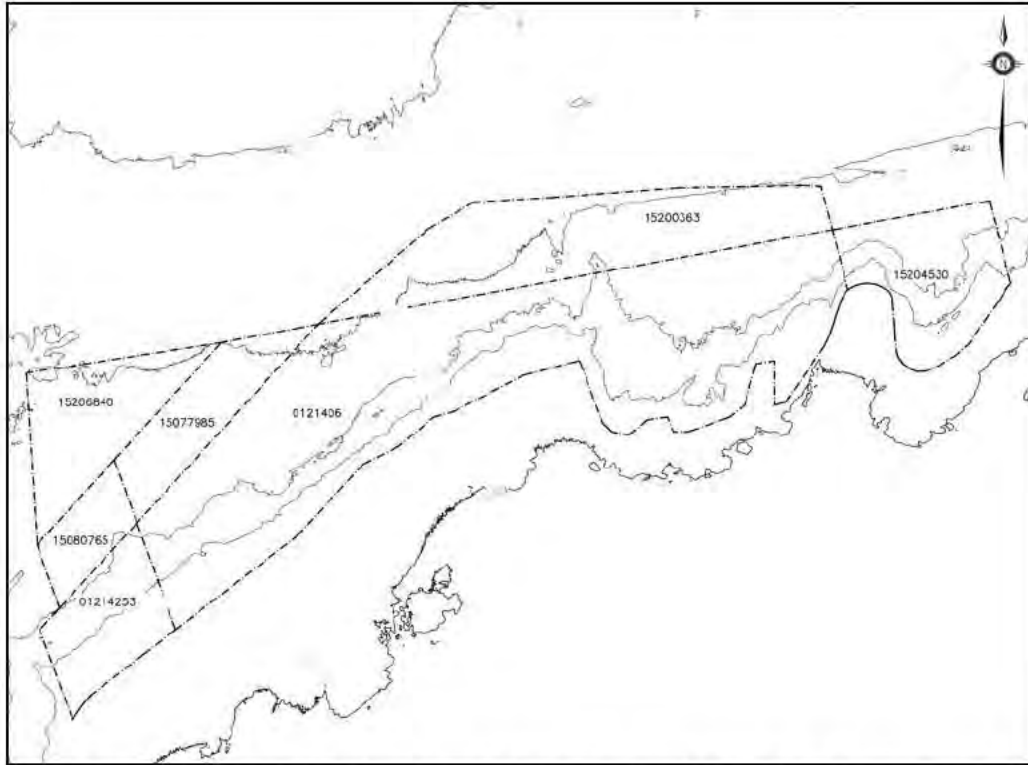


Figure 4. Property Identifier Numbers (PIDs) for the PDA (Roy Consultants 2021).



Figure 5. Conceptual design, draft only.

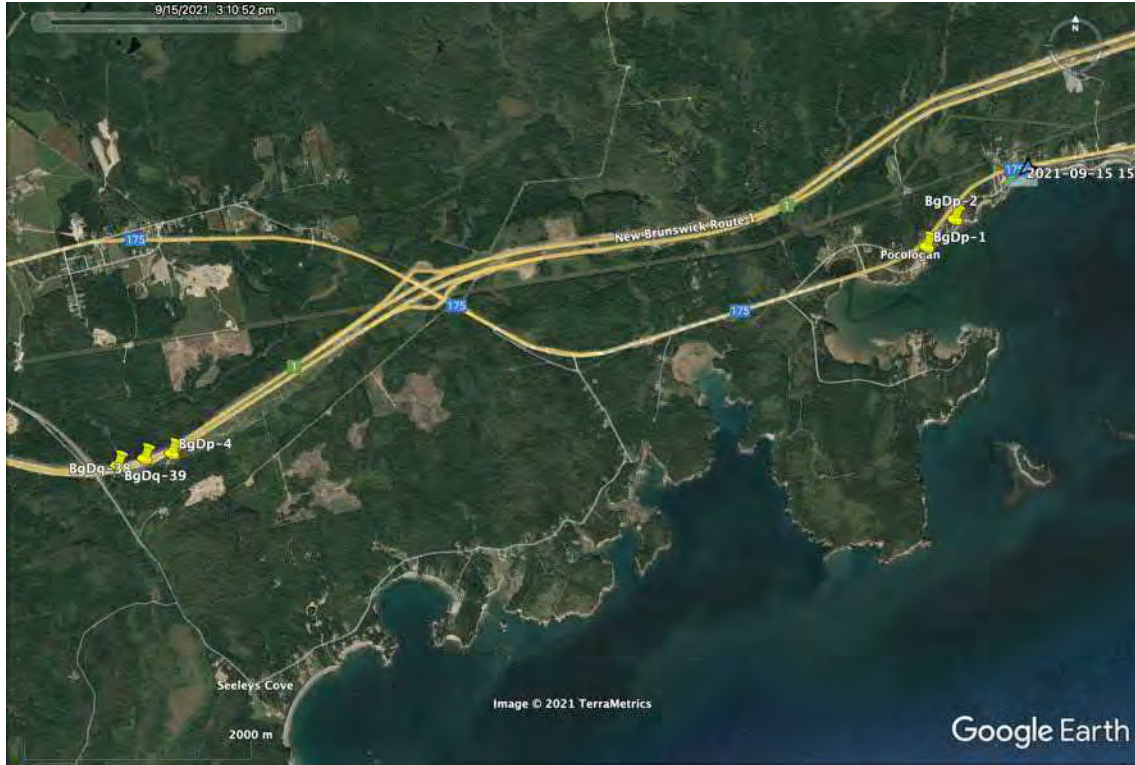


Figure 7. Indigenous archaeological sites near the PDA.



Figure 8. Recent satellite image of the PDA.



Figure 9. Cadastral (land grant) with PDA outlined in red (PANB 2022a).



Figure 10. Air photo of PDA in 1945 (1945-8370-025).



Figure 11. Air photo of PDA in 1951 (1951-2268-030).



Figure 12. Air photo of PDA in 1962 (1962-0502-135).



Figure 13. Surface inspection transects in the PDA recorded as GPS tracks.



Figure 14. Waypoints recorded in PDA surface inspection and sub-surface testing.



Figure 15. View of waypoints in southwest sector where most testing occurred.



Figure 16. Baybreeze Restaurant in foreground, facing west from waypoint 167.



Figure 17. Drainage feature east of restaurant, facing north from waypoint 167.



Figure 18. Drainage feature east of restaurant, facing south from waypoint 167.



Figure 19. Facing east from waypoint 167, with location of STP PP-6 indicated.

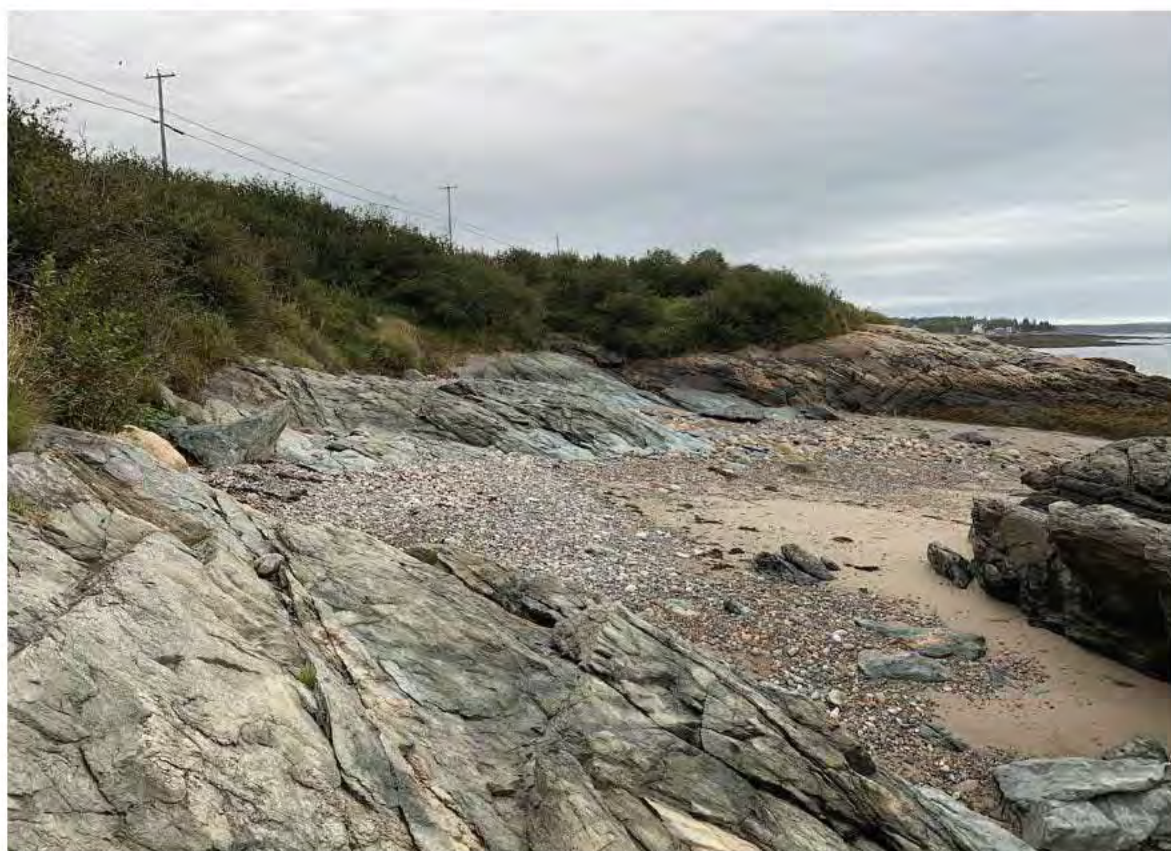


Figure 20. Bedrock outcrops and beach, facing east from waypoint 168.



Figure 21. Facing upslope from waypoint 168, armour stone installed by owner.



Figure 22. bedrock outcrop on beach, facing south from waypoint 168.



Figure 23. View west from small stream outlet, waypoint 169.



Figure 24. Small stream outlet at waypoint 169. Facing north.



Figure 25. Small stream outflow at low tide, facing north from waypoint 170.



Figure 26. Facing northwest from waypoint 170. Restaurant is center-right.



Figure 27. Massive clay bed eroding at waypoint 171, facing east.



Figure 28. Clay bed with pipe on surface slump. Facing west at waypoint 171.



Figure 29. Clay bed with pipe on surface slump. Facing north at waypoint 171.



Figure 30. Buried stream emerging on beach. Facing west at waypoint 172.



Figure 31. Stream emerging from bank at southwestern corner of PDA. Facing north at waypoint 172.



Figure 32. Facing east along shingle beach from stream at waypoint 172.



Figure 33. Facing west from waypoint 172.



Figure 34. On ledge above clay bed, facing northeast from waypoint 173. Note railing for abandoned stairway to beach.



Figure 35. Fill edge on narrow ledge above clay, facing north from waypoint 173.



Figure 36. Narrow ledge above clay bank, facing west from waypoint 173.



Figure 37. Facing west from waypoint 174, north of old Pocologan School Road.



Figure 38. Facing east from waypoint 174.



Figure 39. Facing south from waypoint 174



Figure 40. Facing south from waypoint 189.



Figure 41. Facing west from waypoint 189.



Figure 42. Facing west from waypoint 175, southeast corner of lawn.



Figure 43. Facing east from waypoint 175, steep, 5 m bank to drainage channel for culvert under roadway.



Figure 44. Facing north from waypoint 176, at end of level surface.



Figure 45. Facing southeast from waypoint 177.



Figure 46. Facing west from waypoint 177, with restaurant in distance.



Figure 47. Facing south, ten metres south of waypoint 177.



Figure 48. Mitigation model for project development area (PDA), if construction plans include sub-surface disturbance. Red outline is 50 m buffer zone, requiring 5 m testing grid for Standard Test Pits (STPs). PDA is in east and west sections. Blue line is surface inspection GPS tracks. Green lines enclose areas where test excavation is not feasible/warranted: old road = 1061 sq m; fill SW = 425 sq m; restaurant and parking lot = 1721 sq m, total 3207 sq m. Pocologan West = 6391 sq m; Pocologan East = 5412 m; Total = 11,803 – 3207 = 8596 sq m testable on 5 m grid. 8596 sq m divided by 25 sq m (5 m x 5 m grid unit) = 343 STPs plus about 7 on 10 m grid = 350 STPs total estimate.



Figure 49. Shovel test pit at waypoint 190.



Figure 50. STP PP-1, archaeological bottom at clay layer, 40 to 50 cm below surface



Figure 51. Shovel test pit at waypoint 191. Dense, compacted stony layer at 10 cm below surface.



Figure 52. Setting for STP PP-3.



Figure 53. Profile of PP-3 at waypoint 193. Archaeological bottom is very compact sand with pebble inclusions.



Figure 54. Pure red clay immediately beneath sod in PP-4, at waypoint 193.



Figure 55. Shovel handle at location of PP-4.



Figure 56. Ledge in southwest sector of PDA where PP-1 to PP-3 excavated.



Figure 57. Location of PP-5, facing southeast from waypoint 203.



Figure 58. STP PP-5 located at waypoint 203. Clay immediately under sod.



Figure 59. Location of PP-5 marked with flagging tape. Test wells to be drilled at this location and at PP-6.



Figure 60. Compact, stony layer immediately below sod at PP-6.



APPENDIX G

Atlantic Canada Conservation Data
Centre Report No. 6437

DATA REPORT 6437: Pocologan, NB

Prepared 26 June 2019

by J. Churchill, Data Manager

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5.1 Source Bibliography



Map 1. A 100 km buffer around the study area

1.0 PREFACE

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

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

1.1 DATA LIST

Included datasets:

| Filename | Contents |
|-----------------------------|--|
| PocologanNB_6437ob.xls | All Rare and legally protected <i>Flora and Fauna</i> in your study area |
| PocologanNB_6437ob100km.xls | A list of Rare and legally protected <i>Flora and Fauna</i> within 100 km of your study area |
| PocologanNB_6437ma.xls | All <i>Managed Areas</i> in your study area |
| PocologanNB_6437sa.xls | All <i>Significant Natural Areas</i> in your study area |
| PocologanNB_6437ff.xls | Rare and common <i>Freshwater Fish</i> in your study area (DFO database) |

1.2 RESTRICTIONS

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

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

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

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

Plants, Lichens, Ranking Methods, All other Inquiries

Sean Blaney, Senior Scientist, Executive Director
Tel: (506) 364-2658
sean.blaney@accdc.ca

Animals (Fauna)

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

Plant Communities

Sarah Robinson, Community Ecologist
Tel: (506) 364-2664
sarah.robinson@accdc.ca

Data Management, GIS

James Churchill, Data Manager
Tel: (902) 679-6146
james.churchill@accdc.ca

Billing

Jean Breau
Tel: (506) 364-2657
jean.breau@accdc.ca

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

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

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

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

2.0 RARE AND ENDANGERED SPECIES

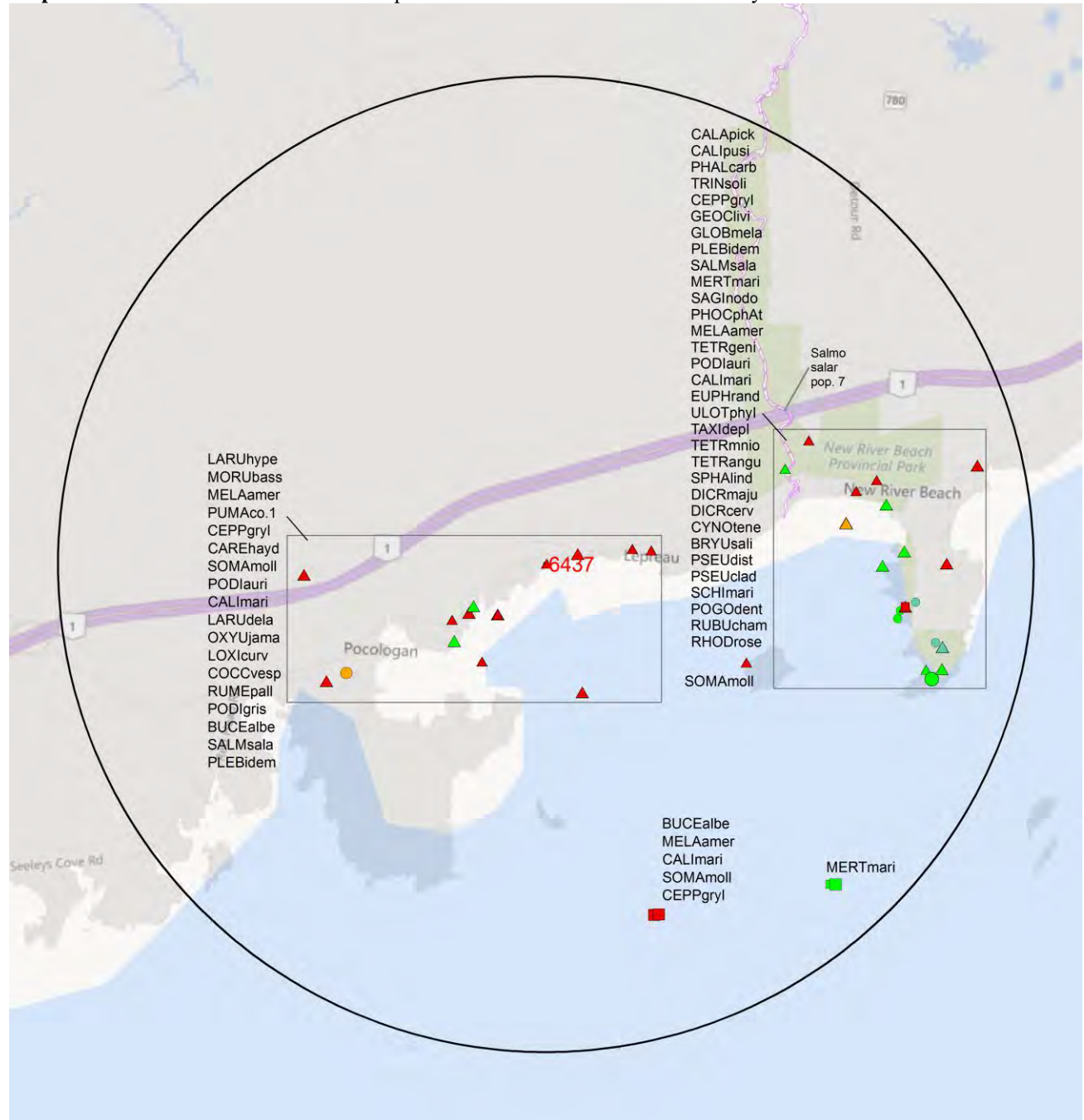
2.1 FLORA

The study area contains 14 records of 9 vascular, 17 records of 14 nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 88 records of 20 vertebrate, 2 records of 1 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

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



RESOLUTION

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

HIGHER TAXON

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

3.0 SPECIAL AREAS

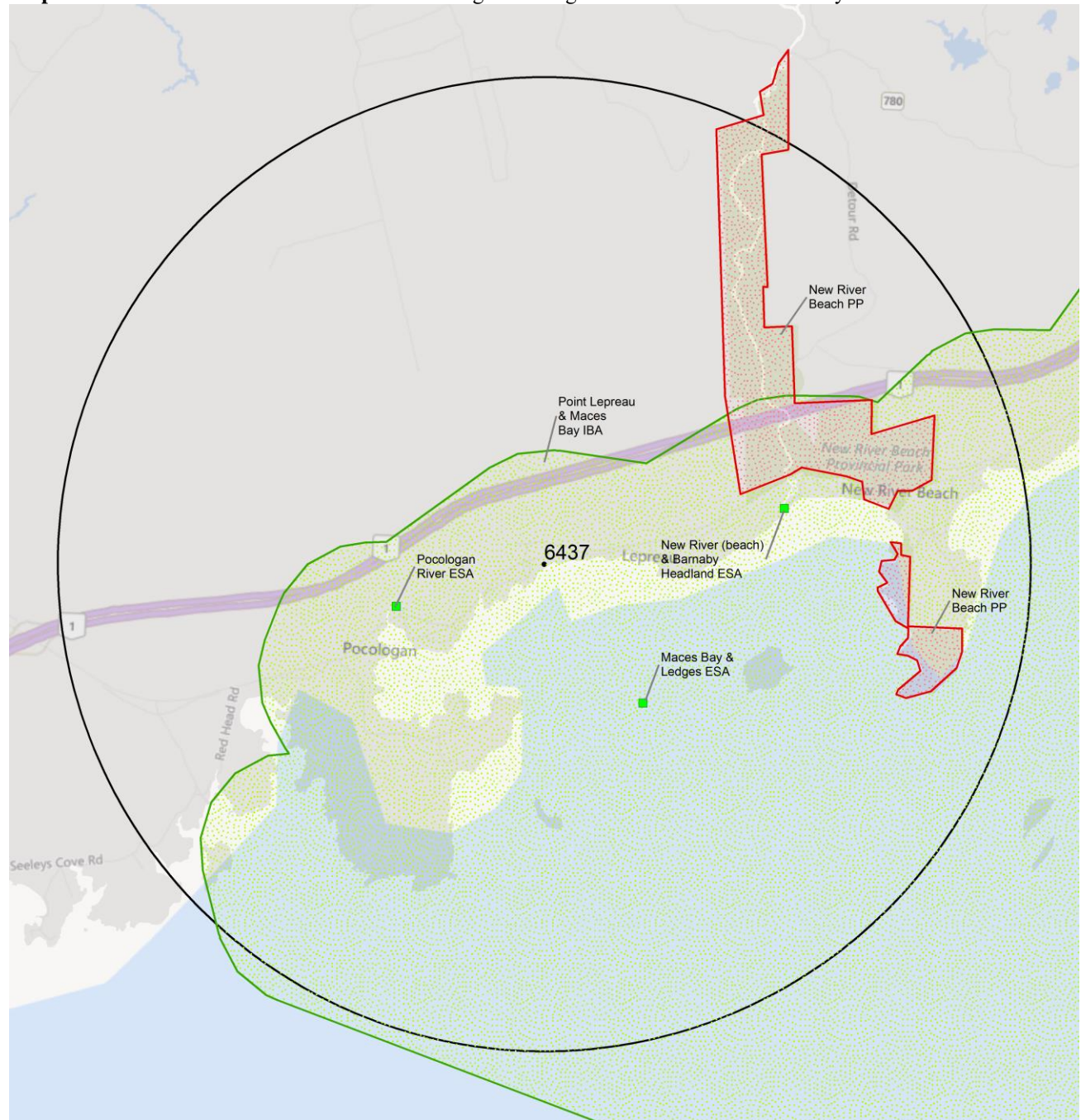
3.1 MANAGED AREAS

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 4 biologically significant sites in the vicinity of the study area (Map 3 and attached file: *sa*.xls).

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



MANAGED AREAS SIGNIFICANT AREAS

-  boundary
-  boundary
-  approximate
-  approximate
-  point location

4.0 RARE SPECIES LISTS

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

4.1 FLORA

| | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) |
|---|---------------------------------------|------------------------------|-------------|------|-----------------|------------------|------------------|--------|---------------|
| N | <i>Pseudevernia cladonia</i> | Ghost Antler Lichen | Not At Risk | | | S2S3 | 5 Undetermined | 1 | 4.1 \pm 0.0 |
| N | <i>Bryum salinum</i> | a Moss | | | | S1S2 | 2 May Be At Risk | 1 | 4.2 \pm 1.0 |
| N | <i>Pseudotaxiphyllum distichaceum</i> | a Moss | | | | S1S2 | 2 May Be At Risk | 1 | 4.2 \pm 1.0 |
| N | <i>Sphagnum lindbergii</i> | Lindberg's Peat Moss | | | | S2 | 3 Sensitive | 1 | 4.2 \pm 1.0 |
| N | <i>Tetraplodon mnioides</i> | Entire-leaved Nitrogen Moss | | | | S2 | 3 Sensitive | 2 | 4.2 \pm 1.0 |
| N | <i>Ulota phyllantha</i> | a Moss | | | | S2 | 3 Sensitive | 1 | 4.2 \pm 1.0 |
| N | <i>Taxiphyllum deplanatum</i> | Imbricate Yew-leaved Moss | | | | S2S3 | 3 Sensitive | 1 | 4.2 \pm 1.0 |
| N | <i>Cynodontium tenellum</i> | Delicate Dogtooth Moss | | | | S3 | 3 Sensitive | 1 | 4.2 \pm 1.0 |
| N | <i>Schistidium maritimum</i> | a Moss | | | | S3 | 4 Secure | 1 | 4.2 \pm 1.0 |
| N | <i>Dicranella cerviculata</i> | a Moss | | | | S3S4 | 3 Sensitive | 2 | 4.2 \pm 1.0 |
| N | <i>Dicranum majus</i> | Greater Broom Moss | | | | S3S4 | 4 Secure | 1 | 4.2 \pm 1.0 |
| N | <i>Pogonatum dentatum</i> | Mountain Hair Moss | | | | S3S4 | 4 Secure | 1 | 4.2 \pm 1.0 |
| N | <i>Tetraphis geniculata</i> | Geniculate Four-tooth Moss | | | | S3S4 | 4 Secure | 2 | 3.8 \pm 0.0 |
| N | <i>Tetraplodon angustatus</i> | Toothed-leaved Nitrogen Moss | | | | S3S4 | 4 Secure | 1 | 4.2 \pm 1.0 |
| P | <i>Sagina nodosa</i> | Knotted Pearlwort | | | | S2 | 3 Sensitive | 1 | 3.5 \pm 1.0 |
| P | <i>Euphrasia randii</i> | Rand's Eyebright | | | | S2 | 2 May Be At Risk | 2 | 3.7 \pm 0.0 |
| P | <i>Rumex pallidus</i> | Seabeach Dock | | | | S2S3 | 3 Sensitive | 1 | 1.2 \pm 1.0 |
| P | <i>Rhodiola rosea</i> | Roseroot | | | | S3 | 4 Secure | 1 | 4.0 \pm 0.0 |
| P | <i>Carex haydenii</i> | Hayden's Sedge | | | | S3 | 4 Secure | 1 | 0.9 \pm 1.0 |
| P | <i>Calamagrostis pickeringii</i> | Pickering's Reed Grass | | | | S3 | 4 Secure | 1 | 2.6 \pm 0.0 |
| P | <i>Mertensia maritima</i> | Sea Lungwort | | | | S3S4 | 4 Secure | 3 | 3.7 \pm 1.0 |
| P | <i>Rubus chamaemorus</i> | Cloudberry | | | | S3S4 | 4 Secure | 3 | 4.1 \pm 0.0 |
| P | <i>Geocaldon lividum</i> | Northern Comandra | | | | S3S4 | 4 Secure | 1 | 3.5 \pm 1.0 |

4.2 FAUNA

| | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) |
|---|---|--|-----------------|------------|-----------------|------------------|------------------|--------|---------------|
| A | <i>Coccythraustes vespertinus</i> | Evening Grosbeak | Special Concern | | | S3B,S3S4N,SUM | 3 Sensitive | 1 | 1.1 \pm 0.0 |
| A | <i>Phocoena phocoena</i> (NW Atlantic pop.) | Harbour Porpoise - Northwest Atlantic pop. | Special Concern | Threatened | | S4 | | 1 | 4.1 \pm 1.0 |
| A | <i>Podiceps auritus</i> | Horned Grebe | Special Concern | | Special Concern | S4N,S4M | 4 Secure | 3 | 0.7 \pm 0.0 |
| A | <i>Globicephala melas</i> | Long-finned Pilot Whale | Not At Risk | | | S2S3 | | 1 | 3.1 \pm 1.0 |
| A | <i>Podiceps grisegena</i> | Red-necked Grebe | Not At Risk | | | S3M,S2N | 3 Sensitive | 1 | 1.2 \pm 0.0 |
| A | <i>Puma concolor</i> pop. 1 | Eastern Cougar | Data Deficient | | Endangered | SNA | 5 Undetermined | 1 | 2.5 \pm 1.0 |
| A | <i>Oxyura jamaicensis</i> | Ruddy Duck | | | | S1B,S2S3M | 4 Secure | 1 | 0.7 \pm 0.0 |
| A | <i>Tringa solitaria</i> | Solitary Sandpiper | | | | S2B,S5M | 4 Secure | 1 | 4.5 \pm 3.0 |
| A | <i>Phalacrocorax carbo</i> | Great Cormorant | | | | S2N,S2M | 4 Secure | 2 | 4.5 \pm 3.0 |
| A | <i>Larus hyperboreus</i> | Glaucous Gull | | | | S2N,S2M | 4 Secure | 1 | 0.9 \pm 0.0 |
| A | <i>Salmo salar</i> | Atlantic Salmon | | | | S2S3 | 2 May Be At Risk | 2 | 2.5 \pm 1.0 |
| A | <i>Cephus grylle</i> | Black Guillemot | | | | S3 | 4 Secure | 6 | 0.0 \pm 0.0 |
| A | <i>Loxia curvirostra</i> | Red Crossbill | | | | S3 | 4 Secure | 1 | 1.1 \pm 0.0 |
| A | <i>Somateria mollissima</i> | Common Eider | | | | S3B,S4M,S3N | 4 Secure | 33 | 0.3 \pm 2.0 |
| A | <i>Melanitta americana</i> | Black Scoter | | | | S3M,S1S2N | 3 Sensitive | 16 | 0.0 \pm 0.0 |
| A | <i>Bucephala albeola</i> | Bufflehead | | | | S3M,S2N | 3 Sensitive | 8 | 0.7 \pm 0.0 |
| A | <i>Calidris maritima</i> | Purple Sandpiper | | | | S3M,S3N | 4 Secure | 6 | 0.9 \pm 1.0 |
| A | <i>Larus delawarensis</i> | Ring-billed Gull | | | | S3S4B,S5M | 4 Secure | 1 | 0.7 \pm 0.0 |

| | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) |
|---|------------------------------|------------------------|---------|------|-----------------|------------------|--------------|--------|---------------|
| A | <i>Calidris pusilla</i> | Semipalmated Sandpiper | | | | S3S4M | 4 Secure | 1 | 4.5 ± 3.0 |
| A | <i>Morus bassanus</i> | Northern Gannet | | | | SHB,S5M | 4 Secure | 1 | 1.1 ± 0.0 |
| I | <i>Plebejus idas empetri</i> | Crowberry Blue | | | | S3 | 4 Secure | 2 | 2.3 ± 0.0 |

4.3 LOCATION SENSITIVE SPECIES

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

New Brunswick

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

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

4.4 SOURCE BIBLIOGRAPHY

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

| # recs | CITATION |
|--------|--|
| 41 | eBird. 2014. eBird Basic Dataset. Version: EBD_relNov-2014. Ithaca, New York. Nov 2014. Cornell Lab of Ornithology, 25036 recs. |
| 34 | Hicks, Andrew. 2009. Coastal Waterfowl Surveys Database, 2000-08. Canadian Wildlife Service, Sackville, 46488 recs (11149 non-zero). |
| 13 | Belland, R.J. Maritimes moss records from various herbarium databases. 2014. |
| 6 | Bateman, M.C. 2001. Coastal Waterfowl Surveys Database, 1965-2001. Canadian Wildlife Service, Sackville, 667 recs. |
| 3 | Bagnell, B.A. 2001. New Brunswick Bryophyte Occurrences. B&B Botanical, Sussex, 478 recs. |
| 3 | Benedict, B. Connell Herbarium Specimens (Data). University New Brunswick, Fredericton. 2003. |
| 3 | Clayden, S.R. 1998. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, 19759 recs. |
| 3 | Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs. |
| 3 | Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc. |
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| 2 | Sollows, M.C., 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs. |
| 1 | Benedict, B. Connell Herbarium Specimen Database Download 2004. Connell Memorial Herbarium, University of New Brunswick. 2004. |
| 1 | Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2003. |
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| 1 | Clayden, S.R. 2007. NBM Science Collections databases: vascular plants. New Brunswick Museum, Saint John NB, download Mar. 2007, 6914 recs. |
| 1 | Cowie, F. 2007. Electrofishing Population Estimates 1979-98. Canadian Rivers Institute, 2698 recs. |
| 1 | Edsall, J. 2001. Lepidopteran records in New Brunswick, 1997-99. , Pers. comm. to K.A. Bredin. 91 recs. |
| 1 | EMR Place Names |
| 1 | Hinds, H.R. 1986. Notes on New Brunswick plant collections. Connell Memorial Herbarium, unpubl, 739 recs. |
| 1 | Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre. |
| 1 | Scott, Fred W. 1998. Updated Status Report on the Cougar (<i>Puma Concolor cougar</i>) [Eastern population]. Committee on the Status of Endangered Wildlife in Canada, 298 recs. |
| 1 | Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs). |

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 33575 records of 145 vertebrate and 1294 records of 76 invertebrate fauna; 6311 records of 348 vascular, 321 records of 119 nonvascular flora (attached: *ob100km.xls).

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

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|--|---|-----------------|-----------------|-----------------|------------------|------------------|--------|-----------------|------|
| A | <i>Myotis lucifugus</i> | Little Brown Myotis | Endangered | Endangered | Endangered | S1 | 1 At Risk | 66 | 36.0 \pm 1.0 | NB |
| A | <i>Myotis septentrionalis</i> | Northern Long-eared Myotis | Endangered | Endangered | Endangered | S1 | 1 At Risk | 15 | 35.0 \pm 1.0 | NB |
| A | <i>Perimyotis subflavus</i> | Eastern Pipistrelle | Endangered | Endangered | Endangered | S1 | 1 At Risk | 7 | 38.5 \pm 0.0 | NB |
| A | <i>Eubalaena glacialis</i> | North Atlantic Right Whale | Endangered | Endangered | Endangered | S1 | 1 At Risk | 7 | 33.5 \pm 1.0 | NB |
| A | <i>Sterna dougallii</i> | Roseate Tern | Endangered | Endangered | Endangered | S1?B,S1?M | 1 At Risk | 35 | 31.3 \pm 0.0 | NB |
| A | <i>Charadrius melodus melodus</i> | Piping Plover melodus ssp | Endangered | Endangered | Endangered | S1B,S1M | 1 At Risk | 24 | 8.2 \pm 0.0 | NB |
| A | <i>Dermodochelys coriacea</i> (Atlantic pop.) | Leatherback Sea Turtle - Atlantic pop. | Endangered | Endangered | Endangered | S1S2N | 1 At Risk | 4 | 15.8 \pm 0.0 | NB |
| A | <i>Salmo salar</i> pop. 1 | Atlantic Salmon - Inner Bay of Fundy pop. | Endangered | Endangered | Endangered | S2 | 2 May Be At Risk | 13 | 6.9 \pm 0.0 | NB |
| A | <i>Calidris canutus rufa</i> | Red Knot rufa ssp | Endangered | Endangered | Endangered | S2M | 1 At Risk | 379 | 8.2 \pm 0.0 | NB |
| A | <i>Rangifer tarandus</i> pop. 2 | Woodland Caribou (Atlantic- Gasp -rsie pop.) | Endangered | Endangered | Extirpated | SX | 0.1 Extirpated | 4 | 50.5 \pm 1.0 | NB |
| A | <i>Sturnella magna</i> | Eastern Meadowlark | Threatened | Threatened | Threatened | S1B,S1M | 2 May Be At Risk | 35 | 33.8 \pm 7.0 | NB |
| A | <i>Ixobrychus exilis</i> | Least Bittern | Threatened | Threatened | Threatened | S1S2B,S1S2M | 1 At Risk | 29 | 16.7 \pm 7.0 | NB |
| A | <i>Hylocichla mustelina</i> | Wood Thrush | Threatened | Threatened | Threatened | S1S2B,S1S2M | 2 May Be At Risk | 165 | 7.7 \pm 7.0 | NB |
| A | <i>Antrostomus vociferus</i> | Eastern Whip-Poor-Will | Threatened | Threatened | Threatened | S2B,S2M | 1 At Risk | 71 | 7.7 \pm 7.0 | NB |
| A | <i>Hirundo rustica</i> | Barn Swallow | Threatened | Threatened | Threatened | S2B,S2M | 3 Sensitive | 1138 | 6.4 \pm 7.0 | NB |
| A | <i>Catharus bicknelli</i> | Bicknell's Thrush | Threatened | Special Concern | Threatened | S2B,S2M | 1 At Risk | 21 | 16.7 \pm 7.0 | NB |
| A | <i>Glyptemys insculpta</i> | Wood Turtle | Threatened | Threatened | Threatened | S2S3 | 1 At Risk | 924 | 23.6 \pm 0.0 | NB |
| A | <i>Chaetura pelagica</i> | Chimney Swift | Threatened | Threatened | Threatened | S2S3B,S2M | 1 At Risk | 292 | 16.7 \pm 7.0 | NB |
| A | <i>Riparia riparia</i> | Bank Swallow | Threatened | Threatened | Threatened | S2S3B,S2S3M | 3 Sensitive | 391 | 6.4 \pm 7.0 | NB |
| A | <i>Acipenser oxyrinchus</i> | Atlantic Sturgeon | Threatened | Threatened | Threatened | S3 | 4 Secure | 1 | 55.9 \pm 1.0 | NB |
| A | <i>Cardellina canadensis</i> | Canada Warbler | Threatened | Threatened | Threatened | S3B,S3M | 1 At Risk | 732 | 6.4 \pm 7.0 | NB |
| A | <i>Dolichonyx oryzivorus</i> | Bobolink | Threatened | Threatened | Threatened | S3B,S3M | 3 Sensitive | 941 | 7.7 \pm 7.0 | NB |
| A | <i>Limosa haemastica</i> | Hudsonian Godwit | Threatened | Threatened | Threatened | S3S4M | 4 Secure | 92 | 21.1 \pm 0.0 | NB |
| A | <i>Anguilla rostrata</i> | American Eel | Threatened | Threatened | Threatened | S4 | 4 Secure | 54 | 14.7 \pm 0.0 | NB |
| A | <i>Osmerus mordax</i> pop. 2 | Lake Utopia Smelt large- bodied pop. | Threatened | Threatened | Threatened | | | 2 | 17.7 \pm 10.0 | NB |
| A | <i>Coturnicops noveboracensis</i> | Yellow Rail | Special Concern | Special Concern | Special Concern | S1?B,SUM | 2 May Be At Risk | 3 | 82.3 \pm 7.0 | NB |
| A | <i>Histrionicus histrionicus</i> pop. 1 | Harlequin Duck - Eastern pop. | Special Concern | Special Concern | Endangered | S1B,S1S2N,S2M | 1 At Risk | 207 | 7.8 \pm 0.0 | NB |
| A | <i>Falco peregrinus</i> pop. 1 | Peregrine Falcon - anatum/tundrius | Special Concern | Special Concern | Endangered | S1B,S3M | 1 At Risk | 576 | 3.5 \pm 0.0 | NB |
| A | <i>Asio flammeus</i> | Short-eared Owl | Special Concern | Special Concern | Special Concern | S2B,S2M | 3 Sensitive | 17 | 45.1 \pm 7.0 | NB |
| A | <i>Bucephala islandica</i> (Eastern pop.) | Barrow's Goldeneye - Eastern pop. | Special Concern | Special Concern | Special Concern | S2M,S2N | 3 Sensitive | 56 | 7.4 \pm 2.0 | NB |
| A | <i>Acipenser brevirostrum</i> | Shortnose Sturgeon | Special Concern | Special Concern | Special Concern | S3 | 3 Sensitive | 8 | 38.0 \pm 10.0 | NB |
| A | <i>Chelydra serpentina</i> | Snapping Turtle | Special Concern | Special Concern | Special Concern | S3 | 3 Sensitive | 32 | 1.0 \pm 1.0 | NB |
| A | <i>Euphagus carolinus</i> | Rusty Blackbird | Special Concern | Special Concern | Special Concern | S3B,S3M | 2 May Be At Risk | 108 | 7.7 \pm 7.0 | NB |
| A | <i>Contopus cooperi</i> | Olive-sided Flycatcher | Special Concern | Threatened | Threatened | S3B,S3M | 1 At Risk | 256 | 6.4 \pm 7.0 | NB |
| A | <i>Coccothraustes vespertinus</i> | Evening Grosbeak | Special Concern | Threatened | Threatened | S3B,S3S4N,SUM | 3 Sensitive | 188 | 1.1 \pm 0.0 | NB |
| A | <i>Chordeiles minor</i> | Common Nighthawk | Special Concern | Threatened | Threatened | S3B,S4M | 1 At Risk | 282 | 6.4 \pm 7.0 | NB |
| A | <i>Phalaropus lobatus</i> | Red-necked Phalarope | Special Concern | Threatened | Threatened | S3M | 3 Sensitive | 223 | 8.2 \pm 0.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|---|--|-----------------|-----------------|-----------------|------------------|------------------|--------|---------------|------|
| A | <i>Phocoena phocoena</i> (NW Atlantic pop) | Harbour Porpoise - Northwest Atlantic pop. | Special Concern | Threatened | | S4 | | 232 | 4.1 ± 1.0 | NB |
| A | <i>Chrysemys picta picta</i> | Eastern Painted Turtle | Special Concern | | | S4 | 4 Secure | 34 | 22.8 ± 0.0 | NB |
| A | <i>Contopus virens</i> | Eastern Wood-Pewee | Special Concern | Special Concern | Special Concern | S4B,S4M | 4 Secure | 519 | 6.4 ± 7.0 | NB |
| A | <i>Podiceps auritus</i> | Horned Grebe | Special Concern | | Special Concern | S4N,S4M | 4 Secure | 269 | 0.7 ± 0.0 | NB |
| A | <i>Bubo scandiacus</i> | Snowy Owl | Not At Risk | | | S1N,S2S3M | 4 Secure | 30 | 40.2 ± 3.0 | NB |
| A | <i>Accipiter cooperii</i> | Cooper's Hawk | Not At Risk | | | S1S2B,S1S2M | 2 May Be At Risk | 19 | 56.6 ± 1.0 | NB |
| A | <i>Fulica americana</i> | American Coot | Not At Risk | | | S1S2B,S1S2M | 3 Sensitive | 9 | 16.7 ± 7.0 | NB |
| A | <i>Aegolius funereus</i> | Boreal Owl | Not At Risk | | | S1S2B,SUM | 2 May Be At Risk | 5 | 46.7 ± 1.0 | NB |
| A | <i>Sorex dispar</i> | Long-tailed Shrew | Not At Risk | Special Concern | | S2 | 3 Sensitive | 2 | 49.1 ± 1.0 | NB |
| A | <i>Buteo lineatus</i> | Red-shouldered Hawk | Not At Risk | Special Concern | | S2B,S2M | 2 May Be At Risk | 50 | 25.3 ± 0.0 | NB |
| A | <i>Chlidonias niger</i> | Black Tern | Not At Risk | | | S2B,S2M | 3 Sensitive | 136 | 59.4 ± 4.0 | NB |
| A | <i>Globicephala melas</i> | Long-finned Pilot Whale | Not At Risk | | | S2S3 | | 3 | 3.1 ± 1.0 | NB |
| A | <i>Lynx canadensis</i> | Canadian Lynx | Not At Risk | | Endangered | S3 | 1 At Risk | 7 | 29.8 ± 50.0 | NB |
| A | <i>Desmognathus fuscus</i> | Northern Dusky Salamander | Not At Risk | | | S3 | 3 Sensitive | 57 | 33.8 ± 1.0 | NB |
| A | <i>Megaptera novaeangliae</i> | Humpback Whale (NW Atlantic pop) | Not At Risk | Special Concern | | S3 | | 4 | 33.5 ± 5.0 | NB |
| A | <i>Sterna hirundo</i> | Common Tern | Not At Risk | | | S3B,SUM | 3 Sensitive | 315 | 25.6 ± 7.0 | NB |
| A | <i>Podiceps grisegena</i> | Red-necked Grebe | Not At Risk | | | S3M,S2N | 3 Sensitive | 681 | 1.2 ± 0.0 | NB |
| A | <i>Lagenorhynchus acutus</i> | Atlantic White-sided Dolphin | Not At Risk | | | S3S4 | | 1 | 45.7 ± 1.0 | NB |
| A | <i>Haliaeetus leucocephalus</i> | Bald Eagle | Not At Risk | | Endangered | S4 | 1 At Risk | 1428 | 0.0 ± 0.0 | NB |
| A | <i>Canis lupus</i> | Gray Wolf | Not At Risk | | Extirpated | SX | 0.1 Extirpated | 3 | 32.1 ± 1.0 | NB |
| A | <i>Puma concolor pop. 1</i> | Eastern Cougar | Data Deficient | | Endangered | SNA | 5 Undetermined | 46 | 2.5 ± 1.0 | NB |
| A | <i>Morone saxatilis</i> | Striped Bass | E,E,SC | | | S3 | 2 May Be At Risk | 10 | 41.9 ± 1.0 | NB |
| A | <i>Vireo flavifrons</i> | Yellow-throated Vireo | | | | S1?B,S1?M | 8 Accidental | 16 | 30.2 ± 0.0 | NB |
| A | <i>Tringa melanoleuca</i> | Greater Yellowlegs | | | | S1?B,S5M | 4 Secure | 966 | 8.2 ± 0.0 | NB |
| A | <i>Aythya americana</i> | Redhead | | | | S1B,S1M | 8 Accidental | 4 | 21.3 ± 0.0 | NB |
| A | <i>Gallinula galeata</i> | Common Gallinule | | | | S1B,S1M | 3 Sensitive | 19 | 20.3 ± 5.0 | NB |
| A | <i>Antigone canadensis</i> | Sandhill Crane | | | | S1B,S1M | 8 Accidental | 7 | 9.5 ± 0.0 | NB |
| A | <i>Bartramia longicauda</i> | Upland Sandpiper | | | | S1B,S1M | 3 Sensitive | 49 | 5.4 ± 0.0 | NB |
| A | <i>Phalaropus tricolor</i> | Wilson's Phalarope | | | | S1B,S1M | 3 Sensitive | 58 | 22.9 ± 7.0 | NB |
| A | <i>Leucophaeus atricilla</i> | Laughing Gull | | | | S1B,S1M | 3 Sensitive | 89 | 20.4 ± 0.0 | NB |
| A | <i>Progne subis</i> | Purple Martin | | | | S1B,S1M | 2 May Be At Risk | 204 | 34.7 ± 7.0 | NB |
| A | <i>Thryothorus ludovicianus</i> | Carolina Wren | | | | S1B,S1M | 8 Accidental | 35 | 24.6 ± 7.0 | NB |
| A | <i>Oxyura jamaicensis</i> | Ruddy Duck | | | | S1B,S2S3M | 4 Secure | 52 | 0.7 ± 0.0 | NB |
| A | <i>Uria aalge</i> | Common Murre | | | | S1B,S3N,S3M | 4 Secure | 145 | 23.0 ± 4.0 | NB |
| A | <i>Aythya affinis</i> | Lesser Scaup | | | | S1B,S4M | 4 Secure | 203 | 7.4 ± 2.0 | NB |
| A | <i>Aythya marila</i> | Greater Scaup | | | | S1B,S4M,S2N | 4 Secure | 36 | 8.2 ± 2.0 | NB |
| A | <i>Eremophila alpestris</i> | Horned Lark | | | | S1B,S4N,S5M | 2 May Be At Risk | 26 | 6.4 ± 7.0 | NB |
| A | <i>Sterna paradisaea</i> | Arctic Tern | | | | S1B,SUM | 2 May Be At Risk | 161 | 21.0 ± 1.0 | NB |
| A | <i>Fratercula arctica</i> | Atlantic Puffin | | | | S1B,SUN,SUM | 3 Sensitive | 186 | 21.0 ± 1.0 | NB |
| A | <i>Branta bernicla</i> | Brant | | | | S1N, S2S3M | 4 Secure | 546 | 7.0 ± 10.0 | NB |
| A | <i>Chroicocephalus ridibundus</i> | Black-headed Gull | | | | S1N,S2M | 3 Sensitive | 42 | 20.0 ± 0.0 | NB |
| A | <i>Butorides virescens</i> | Green Heron | | | | S1S2B,S1S2M | 3 Sensitive | 22 | 36.1 ± 7.0 | NB |
| A | <i>Nycticorax nycticorax</i> | Black-crowned Night-heron | | | | S1S2B,S1S2M | 3 Sensitive | 63 | 20.2 ± 0.0 | NB |
| A | <i>Empidonax traillii</i> | Willow Flycatcher | | | | S1S2B,S1S2M | 3 Sensitive | 87 | 9.9 ± 2.0 | NB |
| A | <i>Stelgidopteryx serripennis</i> | Northern Rough-winged Swallow | | | | S1S2B,S1S2M | 2 May Be At Risk | 24 | 12.5 ± 7.0 | NB |
| A | <i>Troglodytes aedon</i> | House Wren | | | | S1S2B,S1S2M | 5 Undetermined | 31 | 24.9 ± 0.0 | NB |
| A | <i>Rissa tridactyla</i> | Black-legged Kittiwake | | | | S1S2B,S4N,S5M | 4 Secure | 48 | 6.5 ± 7.0 | NB |
| A | <i>Calidris bairdii</i> | Baird's Sandpiper | | | | S1S2M | 3 Sensitive | 106 | 35.6 ± 1.0 | NB |
| A | <i>Cistothorus palustris</i> | Marsh Wren | | | | S2B,S2M | 3 Sensitive | 87 | 20.1 ± 0.0 | NB |
| A | <i>Mimus polyglottos</i> | Northern Mockingbird | | | | S2B,S2M | 3 Sensitive | 150 | 7.8 ± 7.0 | NB |
| A | <i>Toxostoma rufum</i> | Brown Thrasher | | | | S2B,S2M | 3 Sensitive | 76 | 7.7 ± 10.0 | NB |
| A | <i>Poocetes gramineus</i> | Vesper Sparrow | | | | S2B,S2M | 2 May Be At Risk | 66 | 7.4 ± 0.0 | NB |
| A | <i>Mareca strepera</i> | Gadwall | | | | S2B,S3M | 4 Secure | 118 | 14.9 ± 7.0 | NB |
| A | <i>Alca torda</i> | Razorbill | | | | S2B,S3N,S3M | 4 Secure | 181 | 12.7 ± 2.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|---|--------------------------------|---------|------|-----------------|------------------|------------------|--------|---------------|------|
| A | <i>Pinicola enucleator</i> | Pine Grosbeak | | | | S2B,S4S5N,S4S5M | 3 Sensitive | 27 | 25.6 ± 7.0 | NB |
| A | <i>Tringa solitaria</i> | Solitary Sandpiper | | | | S2B,S5M | 4 Secure | 256 | 4.5 ± 3.0 | NB |
| A | <i>Oceanodroma leucorhoa</i> | Leach's Storm-Petrel | | | | S2B,SUM | 3 Sensitive | 139 | 20.0 ± 0.0 | NB |
| A | <i>Anser caerulescens</i> | Snow Goose | | | | S2M | 4 Secure | 7 | 37.2 ± 1.0 | NB |
| A | <i>Phalacrocorax carbo</i> | Great Cormorant | | | | S2N,S2M | 4 Secure | 318 | 4.5 ± 3.0 | NB |
| A | <i>Somateria spectabilis</i> | King Eider | | | | S2N,S2M | 4 Secure | 56 | 13.0 ± 12.0 | NB |
| A | <i>Larus hyperboreus</i> | Glaucous Gull | | | | S2N,S2M | 4 Secure | 156 | 0.9 ± 0.0 | NB |
| A | <i>Asio otus</i> | Long-eared Owl | | | | S2S3 | 5 Undetermined | 20 | 11.4 ± 6.0 | NB |
| A | <i>Picoides dorsalis</i> | American Three-toed Woodpecker | | | | S2S3 | 3 Sensitive | 10 | 27.1 ± 7.0 | NB |
| A | <i>Salmo salar</i> | Atlantic Salmon | | | | S2S3 | 2 May Be At Risk | 38 | 2.5 ± 1.0 | NB |
| A | <i>Spatula clypeata</i> | Northern Shoveler | | | | S2S3B,S2S3M | 4 Secure | 93 | 19.6 ± 4.0 | NB |
| A | <i>Myiarchus crinitus</i> | Great Crested Flycatcher | | | | S2S3B,S2S3M | 3 Sensitive | 218 | 7.7 ± 7.0 | NB |
| A | <i>Petrochelidon pyrrhonota</i> | Cliff Swallow | | | | S2S3B,S2S3M | 3 Sensitive | 454 | 6.4 ± 7.0 | NB |
| A | <i>Pluvialis dominica</i> | American Golden-Plover | | | | S2S3M | 3 Sensitive | 269 | 8.2 ± 0.0 | NB |
| A | <i>Calcarius lapponicus</i> | Lapland Longspur | | | | S2S3N,SUM | 3 Sensitive | 38 | 33.3 ± 1.0 | NB |
| A | <i>Cephus grylle</i> | Black Guillemot | | | | S3 | 4 Secure | 789 | 0.0 ± 0.0 | NB |
| A | <i>Loxia curvirostra</i> | Red Crossbill | | | | S3 | 4 Secure | 109 | 1.1 ± 0.0 | NB |
| A | <i>Spinus pinus</i> | Pine Siskin | | | | S3 | 4 Secure | 217 | 6.4 ± 7.0 | NB |
| A | <i>Prosopium cylindraceum</i> | Round Whitefish | | | | S3 | 4 Secure | 2 | 80.0 ± 10.0 | NB |
| A | <i>Salvelinus namaycush</i> | Lake Trout | | | | S3 | 3 Sensitive | 4 | 26.1 ± 0.0 | NB |
| A | <i>Sorex maritimensis</i> | Maritime Shrew | | | | S3 | 4 Secure | 2 | 96.9 ± 1.0 | NB |
| A | <i>Eptesicus fuscus</i> | Big Brown Bat | | | | S3 | 3 Sensitive | 47 | 18.8 ± 1.0 | NB |
| A | <i>Cathartes aura</i> | Turkey Vulture | | | | S3B,S3M | 4 Secure | 279 | 10.9 ± 0.0 | NB |
| A | <i>Rallus limicola</i> | Virginia Rail | | | | S3B,S3M | 3 Sensitive | 118 | 16.7 ± 7.0 | NB |
| A | <i>Charadrius vociferus</i> | Killdeer | | | | S3B,S3M | 3 Sensitive | 746 | 6.4 ± 7.0 | NB |
| A | <i>Tringa semipalmata</i> | Willet | | | | S3B,S3M | 3 Sensitive | 185 | 8.2 ± 0.0 | NB |
| A | <i>Coccyzus erythrophthalmus</i> | Black-billed Cuckoo | | | | S3B,S3M | 4 Secure | 166 | 7.7 ± 7.0 | NB |
| A | <i>Vireo gilvus</i> | Warbling Vireo | | | | S3B,S3M | 4 Secure | 210 | 7.7 ± 7.0 | NB |
| A | <i>Piranga olivacea</i> | Scarlet Tanager | | | | S3B,S3M | 4 Secure | 123 | 16.7 ± 7.0 | NB |
| A | <i>Passerina cyanea</i> | Indigo Bunting | | | | S3B,S3M | 4 Secure | 100 | 6.5 ± 7.0 | NB |
| A | <i>Molothrus ater</i> | Brown-headed Cowbird | | | | S3B,S3M | 2 May Be At Risk | 241 | 14.9 ± 7.0 | NB |
| A | <i>Icterus galbula</i> | Baltimore Oriole | | | | S3B,S3M | 4 Secure | 168 | 16.7 ± 7.0 | NB |
| A | <i>Somateria mollissima</i> | Common Eider | | | | S3B,S4M,S3N | 4 Secure | 1981 | 0.3 ± 2.0 | NB |
| A | <i>Setophaga tigrina</i> | Cape May Warbler | | | | S3B,S4S5M | 4 Secure | 113 | 6.4 ± 7.0 | NB |
| A | <i>Anas acuta</i> | Northern Pintail | | | | S3B,S5M | 3 Sensitive | 50 | 20.8 ± 1.0 | NB |
| A | <i>Mergus serrator</i> | Red-breasted Merganser | | | | S3B,S5M,S4S5N | 4 Secure | 375 | 6.4 ± 7.0 | NB |
| A | <i>Arenaria interpres</i> | Ruddy Turnstone | | | | S3M | 4 Secure | 710 | 8.2 ± 0.0 | NB |
| A | <i>Phalaropus fulicarius</i> | Red Phalarope | | | | S3M | 3 Sensitive | 126 | 27.8 ± 0.0 | NB |
| A | <i>Melanitta americana</i> | Black Scoter | | | | S3M,S1S2N | 3 Sensitive | 806 | 0.0 ± 0.0 | NB |
| A | <i>Bucephala albeola</i> | Bufflehead | | | | S3M,S2N | 3 Sensitive | 1116 | 0.7 ± 0.0 | NB |
| A | <i>Calidris maritima</i> | Purple Sandpiper | | | | S3M,S3N | 4 Secure | 271 | 0.9 ± 1.0 | NB |
| A | <i>Uria lomvia</i> | Thick-billed Murre | | | | S3N,S3M | 5 Undetermined | 67 | 12.2 ± 1.0 | NB |
| A | <i>Synaptomys cooperi</i> | Southern Bog Lemming | | | | S3S4 | 4 Secure | 18 | 51.0 ± 1.0 | NB |
| A | <i>Tyrannus tyrannus</i> | Eastern Kingbird | | | | S3S4B,S3S4M | 3 Sensitive | 450 | 7.7 ± 7.0 | NB |
| A | <i>Actitis macularius</i> | Spotted Sandpiper | | | | S3S4B,S5M | 4 Secure | 892 | 6.4 ± 0.0 | NB |
| A | <i>Gallinago delicata</i> | Wilson's Snipe | | | | S3S4B,S5M | 4 Secure | 582 | 16.2 ± 5.0 | NB |
| A | <i>Larus delawarensis</i> | Ring-billed Gull | | | | S3S4B,S5M | 4 Secure | 236 | 0.7 ± 0.0 | NB |
| A | <i>Setophaga striata</i> | Blackpoll Warbler | | | | S3S4B,S5M | 4 Secure | 92 | 7.8 ± 7.0 | NB |
| A | <i>Pluvialis squatarola</i> | Black-bellied Plover | | | | S3S4M | 4 Secure | 850 | 8.2 ± 0.0 | NB |
| A | <i>Calidris pusilla</i> | Semipalmated Sandpiper | | | | S3S4M | 4 Secure | 2067 | 4.5 ± 3.0 | NB |
| A | <i>Calidris melanotos</i> | Pectoral Sandpiper | | | | S3S4M | 4 Secure | 313 | 11.8 ± 0.0 | NB |
| A | <i>Calidris alba</i> | Sanderling | | | | S3S4M,S1N | 3 Sensitive | 853 | 8.2 ± 0.0 | NB |
| A | <i>Morus bassanus</i> | Northern Gannet | | | | SHB,S5M | 4 Secure | 840 | 1.1 ± 0.0 | NB |
| A | <i>Lanius ludovicianus</i> | Loggerhead Shrike | | | | SXB,SXM | 1 At Risk | 1 | 56.6 ± 1.0 | NB |
| C | <i>Quercus macrocarpa</i> - <i>Acer</i> | Bur Oak - Red Maple / | | | | S2 | | 1 | 88.8 ± 0.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|--|---|-----------------|-----------------|-----------------|------------------|------------------|--------|---------------|------|
| | <i>rubrum</i> / <i>Onoclea sensibilis</i> - | Sensitive Fern - Northern | | | | | | | | |
| | <i>Carex arcta</i> Forest | Clustered Sedge Forest | | | | | | | | |
| C | <i>Acer saccharinum</i> / <i>Onoclea sensibilis</i> - <i>Lysimachia terrestris</i> Forest | Silver Maple / Sensitive Fern - Swamp Yellow Loosestrife Forest | | | | S3 | | 1 | 60.7 ± 0.0 | NB |
| C | <i>Acer saccharum</i> - <i>Fraxinus americana</i> / <i>Polystichum acrostichoides</i> Forest | Sugar Maple - White Ash / Christmas Fern Forest | | | | S3S4 | | 1 | 65.5 ± 0.0 | NB |
| I | <i>Cicindela marginipennis</i> | Cobblestone Tiger Beetle | Endangered | Endangered | Endangered | S1 | 1 At Risk | 29 | 87.9 ± 0.0 | NB |
| I | <i>Gomphus ventricosus</i> | Skillet Clubtail | Endangered | | Endangered | S1S2 | 2 May Be At Risk | 48 | 79.2 ± 0.0 | NB |
| I | <i>Danaus plexippus</i> | Monarch | Endangered | Special Concern | Special Concern | S3B,S3M | 3 Sensitive | 158 | 6.4 ± 7.0 | NB |
| I | <i>Ophiogomphus howei</i> | Pygmy Snaketail | Special Concern | Special Concern | Special Concern | S2 | 2 May Be At Risk | 17 | 23.6 ± 0.0 | NB |
| I | <i>Alasmidonta varicosa</i> | Brook Floater | Special Concern | | Special Concern | S2 | 3 Sensitive | 1 | 73.6 ± 0.0 | NB |
| I | <i>Lampsilis cariosa</i> | Yellow Lampmussel | Special Concern | Special Concern | Special Concern | S2 | 3 Sensitive | 81 | 59.8 ± 1.0 | NB |
| I | <i>Bombus terricola</i> | Yellow-banded Bumblebee | Special Concern | | | S3? | 3 Sensitive | 19 | 37.3 ± 0.0 | NB |
| I | <i>Coccinella transversoguttata richardsoni</i> | Transverse Lady Beetle | Special Concern | | | SH | 2 May Be At Risk | 2 | 36.5 ± 0.0 | NB |
| I | <i>Appalachina sayana</i> | Spike-lip Crater | Not At Risk | | | S3? | | 1 | 49.2 ± 1.0 | NB |
| I | <i>Haematopota rara</i> | Shy Cleg | | | | S1 | 5 Undetermined | 1 | 89.9 ± 1.0 | NB |
| I | <i>Lycaena dorcas</i> | Dorcas Copper | | | | S1 | 2 May Be At Risk | 1 | 51.3 ± 0.0 | NB |
| I | <i>Erora laeta</i> | Early Hairstreak | | | | S1 | 2 May Be At Risk | 6 | 74.3 ± 7.0 | NB |
| I | <i>Somatochlora septentrionalis</i> | Muskeg Emerald | | | | S1 | 2 May Be At Risk | 1 | 95.3 ± 1.0 | NB |
| I | <i>Arigomphus furcifer</i> | Lilypad Clubtail | | | | S1 | 5 Undetermined | 9 | 69.0 ± 0.0 | NB |
| I | <i>Polites origenes</i> | Crossline Skipper | | | | S1? | 5 Undetermined | 8 | 74.4 ± 0.0 | NB |
| I | <i>Plebejus saepiolus</i> | Greenish Blue | | | | S1S2 | 4 Secure | 4 | 21.5 ± 0.0 | NB |
| I | <i>Ophiogomphus colubrinus</i> | Boreal Snaketail | | | | S1S2 | 2 May Be At Risk | 36 | 8.6 ± 1.0 | NB |
| I | <i>Encyclops caerulea</i> | a Longhorned Beetle | | | | S2 | | 1 | 92.1 ± 0.0 | NB |
| I | <i>Brachyleptura circumdata</i> | a Longhorned Beetle | | | | S2 | | 6 | 86.4 ± 0.0 | NB |
| I | <i>Satyrium calanus</i> | Banded Hairstreak | | | | S2 | 3 Sensitive | 25 | 37.4 ± 0.0 | NB |
| I | <i>Satyrium calanus falacer</i> | Banded Hairstreak | | | | S2 | 4 Secure | 1 | 91.5 ± 1.0 | NB |
| I | <i>Strymon melinus</i> | Grey Hairstreak | | | | S2 | 4 Secure | 6 | 19.8 ± 2.0 | NB |
| I | <i>Aeshna clepsydra</i> | Mottled Darner | | | | S2 | 3 Sensitive | 8 | 36.7 ± 1.0 | NB |
| I | <i>Somatochlora tenebrosa</i> | Clamp-Tipped Emerald | | | | S2 | 5 Undetermined | 4 | 63.2 ± 1.0 | NB |
| I | <i>Ladona exusta</i> | White Corporal | | | | S2 | 5 Undetermined | 10 | 29.6 ± 0.0 | NB |
| I | <i>Hetaerina americana</i> | American Rubyspot | | | | S2 | 3 Sensitive | 2 | 73.5 ± 0.0 | NB |
| I | <i>Ischnura posita</i> | Fragile Forktail | | | | S2 | 2 May Be At Risk | 15 | 21.3 ± 0.0 | NB |
| I | <i>Calophrys henrici</i> | Henry's Elfin | | | | S2S3 | 4 Secure | 17 | 60.3 ± 2.0 | NB |
| I | <i>Celithemis martha</i> | Martha's Pennant | | | | S2S3 | 5 Undetermined | 3 | 30.0 ± 0.0 | NB |
| I | <i>Sphaeroderus nitidicollis</i> | a Ground Beetle | | | | S3 | 4 Secure | 1 | 88.5 ± 0.0 | NB |
| I | <i>Lepturoopsis biforis</i> | a Longhorned Beetle | | | | S3 | | 1 | 44.4 ± 1.0 | NB |
| I | <i>Orthosoma brunneum</i> | a Longhorned Beetle | | | | S3 | | 1 | 91.9 ± 5.0 | NB |
| I | <i>Elaphrus americanus</i> | a Ground Beetle | | | | S3 | 4 Secure | 1 | 86.5 ± 0.0 | NB |
| I | <i>Desmocerus palliatus</i> | Elderberry Borer | | | | S3 | | 4 | 44.4 ± 1.0 | NB |
| I | <i>Agonum excavatum</i> | a Ground Beetle | | | | S3 | 4 Secure | 1 | 86.5 ± 0.0 | NB |
| I | <i>Civina americana</i> | a Ground Beetle | | | | S3 | 4 Secure | 1 | 86.5 ± 0.0 | NB |
| I | <i>Olisthopus parmatus</i> | a Ground Beetle | | | | S3 | 4 Secure | 1 | 88.5 ± 0.0 | NB |
| I | <i>Paratachys scitulus</i> | a Ground Beetle | | | | S3 | 5 Undetermined | 1 | 86.5 ± 0.0 | NB |
| I | <i>Coccinella hieroglyphica kirbyi</i> | a Ladybird Beetle | | | | S3 | 4 Secure | 1 | 44.4 ± 1.0 | NB |
| I | <i>Hippodamia parenthesis</i> | Parenthesis Lady Beetle | | | | S3 | 4 Secure | 2 | 44.4 ± 1.0 | NB |
| I | <i>Stenocorus vittigera</i> | a Longhorned Beetle | | | | S3 | | 1 | 86.5 ± 0.0 | NB |
| I | <i>Gnathacmaeops pratensis</i> | a Longhorned Beetle | | | | S3 | | 5 | 44.4 ± 1.0 | NB |
| I | <i>Pogonocherus mixtus</i> | a Longhorned Beetle | | | | S3 | | 1 | 44.4 ± 1.0 | NB |
| I | <i>Badister neopulchellus</i> | a Ground Beetle | | | | S3 | 4 Secure | 1 | 86.5 ± 0.0 | NB |
| I | <i>Saperda lateralis</i> | a Longhorned Beetle | | | | S3 | | 2 | 34.4 ± 0.0 | NB |
| I | <i>Hesperia sassacus</i> | Indian Skipper | | | | S3 | 4 Secure | 19 | 19.4 ± 1.0 | NB |
| I | <i>Euphyes bimacula</i> | Two-spotted Skipper | | | | S3 | 4 Secure | 21 | 11.1 ± 0.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|--|------------------------------------|-----------------|-----------------|-----------------|------------------|------------------|--------|---------------|------|
| I | <i>Lycaena hyllus</i> | Bronze Copper | | | | S3 | 3 Sensitive | 24 | 20.1 ± 0.0 | NB |
| I | <i>Satyrium acadica</i> | Acadian Hairstreak | | | | S3 | 4 Secure | 17 | 37.1 ± 2.0 | NB |
| I | <i>Callophrys polios</i> | Hoary Elfin | | | | S3 | 4 Secure | 21 | 37.7 ± 7.0 | NB |
| I | <i>Plebejus idas empetri</i> | Crowberry Blue | | | | S3 | 4 Secure | 24 | 2.3 ± 0.0 | NB |
| I | <i>Speyeria aphrodite</i> | Aphrodite Fritillary | | | | S3 | 4 Secure | 27 | 11.1 ± 0.0 | NB |
| I | <i>Boloria bellona</i> | Meadow Fritillary | | | | S3 | 4 Secure | 59 | 21.6 ± 4.0 | NB |
| I | <i>Polygonia satyrus</i> | Satyr Comma | | | | S3 | 4 Secure | 18 | 36.8 ± 2.0 | NB |
| I | <i>Polygonia gracilis</i> | Hoary Comma | | | | S3 | 4 Secure | 4 | 34.4 ± 7.0 | NB |
| I | <i>Nymphalis l-album</i> | Compton Tortoiseshell | | | | S3 | 4 Secure | 26 | 33.7 ± 2.0 | NB |
| I | <i>Gomphus vastus</i> | Cobra Clubtail | | | | S3 | 3 Sensitive | 56 | 66.8 ± 0.0 | NB |
| I | <i>Gomphus abbreviatus</i> | Spine-crowned Clubtail | | | | S3 | 4 Secure | 24 | 37.6 ± 0.0 | NB |
| I | <i>Gomphaeschna furcillata</i> | Harlequin Darner | | | | S3 | 5 Undetermined | 10 | 60.3 ± 1.0 | NB |
| I | <i>Dorocordulia lepida</i> | Petite Emerald | | | | S3 | 4 Secure | 23 | 36.1 ± 1.0 | NB |
| I | <i>Somatochlora cingulata</i> | Lake Emerald | | | | S3 | 4 Secure | 9 | 36.3 ± 1.0 | NB |
| I | <i>Somatochlora forcipata</i> | Forcipate Emerald | | | | S3 | 4 Secure | 18 | 36.6 ± 1.0 | NB |
| I | <i>Williamsonia fletcheri</i> | Ebony Boghaunter | | | | S3 | 4 Secure | 13 | 60.3 ± 1.0 | NB |
| I | <i>Lestes eurinus</i> | Amber-Winged Spreadwing | | | | S3 | 4 Secure | 8 | 27.3 ± 1.0 | NB |
| I | <i>Lestes vigilax</i> | Swamp Spreadwing | | | | S3 | 3 Sensitive | 36 | 21.3 ± 0.0 | NB |
| I | <i>Enallagma geminatum</i> | Skimming Bluet | | | | S3 | 5 Undetermined | 12 | 36.7 ± 1.0 | NB |
| I | <i>Enallagma signatum</i> | Orange Bluet | | | | S3 | 4 Secure | 15 | 16.9 ± 0.0 | NB |
| I | <i>Stylurus scudderii</i> | Zebra Clubtail | | | | S3 | 4 Secure | 71 | 23.4 ± 0.0 | NB |
| I | <i>Alasmidonta undulata</i> | Triangle Floater | | | | S3 | 3 Sensitive | 27 | 36.9 ± 1.0 | NB |
| I | <i>Leptodea ochracea</i> | Tidewater Mucket | | | | S3 | 4 Secure | 58 | 38.1 ± 1.0 | NB |
| I | <i>Striatura ferrea</i> | Black Striate | | | | S3 | | 1 | 89.8 ± 1.0 | NB |
| I | <i>Neohelix albolabris</i> | Whitelip | | | | S3 | | 2 | 89.8 ± 1.0 | NB |
| I | <i>Spurwinkia salsa</i> | Saltmarsh Hydrobe | | | | S3 | | 34 | 36.8 ± 0.0 | NB |
| I | <i>Pantala hymenaea</i> | Spot-Winged Glider | | | | S3B,S3M | 4 Secure | 6 | 9.3 ± 0.0 | NB |
| I | <i>Satyrium liparops</i> | Striped Hairstreak | | | | S3S4 | 4 Secure | 14 | 38.3 ± 2.0 | NB |
| I | <i>Cupido comyntas</i> | Eastern Tailed Blue | | | | S3S4 | 4 Secure | 52 | 13.7 ± 0.0 | NB |
| N | <i>Erioderma pedicellatum</i> (Atlantic pop.) | Boreal Felt Lichen - Atlantic pop. | Endangered | Endangered | Endangered | SH | 1 At Risk | 1 | 38.8 ± 1.0 | NB |
| N | <i>Fuscopannaria leucosticta</i> | Rimmed Shingles Lichen | Threatened | | | S2 | 2 May Be At Risk | 29 | 51.9 ± 13.0 | NB |
| N | <i>Pectenia plumbea</i> | Blue Felt Lichen | Special Concern | Special Concern | Special Concern | S1 | 2 May Be At Risk | 8 | 37.7 ± 5.0 | NB |
| N | <i>Pseudevernia cladonia</i> | Ghost Antler Lichen | Not At Risk | | | S2S3 | 5 Undetermined | 17 | 4.1 ± 0.0 | NB |
| N | <i>Bryum muehlenbeckii</i> | Muehlenbeck's Bryum Moss | | | | S1 | 2 May Be At Risk | 1 | 39.2 ± 1.0 | NB |
| N | <i>Sphagnum macrophyllum</i> | Sphagnum | | | | S1 | 2 May Be At Risk | 4 | 26.0 ± 0.0 | NB |
| N | <i>Coscinodon cribrosus</i> | Sieve-Toothed Moss | | | | S1 | 2 May Be At Risk | 1 | 41.3 ± 0.0 | NB |
| N | <i>Peltigera collina</i> | Tree Pelt Lichen | | | | S1 | 2 May Be At Risk | 1 | 51.4 ± 10.0 | NB |
| N | <i>Atrichum angustatum</i> | Lesser Smoothcap Moss | | | | S1? | 2 May Be At Risk | 1 | 89.6 ± 3.0 | NS |
| N | <i>Calliergon trifarium</i> | Three-ranked Moss | | | | S1? | 2 May Be At Risk | 1 | 32.2 ± 0.0 | NB |
| N | <i>Dichelyma falcatum</i> | a Moss | | | | S1? | 2 May Be At Risk | 2 | 41.0 ± 1.0 | NB |
| N | <i>Dicranum bonjeanii</i> | Bonjean's Broom Moss | | | | S1? | 2 May Be At Risk | 1 | 91.6 ± 1.0 | NB |
| N | <i>Eurhynchium hians</i> | Light Beaked Moss | | | | S1? | 2 May Be At Risk | 2 | 93.4 ± 1.0 | NB |
| N | <i>Plagiothecium latebricola</i> | Alder Silk Moss | | | | S1? | 2 May Be At Risk | 1 | 37.4 ± 0.0 | NB |
| N | <i>Racomitrium ericoides</i> | a Moss | | | | S1? | 2 May Be At Risk | 1 | 69.5 ± 3.0 | NB |
| N | <i>Splachnum pennsylvanicum</i> | Southern Dung Moss | | | | S1? | 2 May Be At Risk | 1 | 94.3 ± 0.0 | NB |
| N | <i>Platylomella lescurii</i> | a Moss | | | | S1? | 5 Undetermined | 1 | 43.7 ± 1.0 | NB |
| N | <i>Jungermannia obovata</i> | Egg Flapwort | | | | S1S2 | 6 Not Assessed | 1 | 52.9 ± 0.0 | NB |
| N | <i>Pallavicinia lyellii</i> | Lyell's Ribbonwort | | | | S1S2 | 6 Not Assessed | 1 | 53.8 ± 1.0 | NB |
| N | <i>Reboulia hemisphaerica</i> | Purple-margined Liverwort | | | | S1S2 | 6 Not Assessed | 1 | 44.1 ± 1.0 | NB |
| N | <i>Brachythecium acuminatum</i> | Acuminate Ragged Moss | | | | S1S2 | 5 Undetermined | 4 | 89.6 ± 3.0 | NS |
| N | <i>Bryum salinum</i> | a Moss | | | | S1S2 | 2 May Be At Risk | 1 | 4.2 ± 1.0 | NB |
| N | <i>Campyllum radicale</i> | Long-stalked Fine Wet Moss | | | | S1S2 | 5 Undetermined | 1 | 93.4 ± 1.0 | NB |
| N | <i>Tortula obtusifolia</i> | a Moss | | | | S1S2 | 2 May Be At Risk | 1 | 86.3 ± 0.0 | NB |
| N | <i>Ditrichum pallidum</i> | Pale Cow-hair Moss | | | | S1S2 | 2 May Be At Risk | 2 | 88.0 ± 1.0 | NB |
| N | <i>Sphagnum platyphyllum</i> | Flat-leaved Peat Moss | | | | S1S2 | 5 Undetermined | 2 | 71.4 ± 0.0 | NB |
| N | <i>Timmia norvegica</i> | a moss | | | | S1S2 | 2 May Be At Risk | 1 | 94.3 ± 0.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|---------------------------------------|-------------------------------|---------|------|-----------------|------------------|------------------|--------|---------------|------|
| N | <i>Tomentypnum falcifolium</i> | Sickle-leaved Golden Moss | | | | S1S2 | 2 May Be At Risk | 1 | 13.6 ± 1.0 | NB |
| N | <i>Pseudotaxiphyllum distichaceum</i> | a Moss | | | | S1S2 | 2 May Be At Risk | 2 | 4.2 ± 1.0 | NB |
| N | <i>Hamatocaulis vernicosus</i> | a Moss | | | | S1S2 | 2 May Be At Risk | 1 | 67.0 ± 100.0 | NB |
| N | <i>Bryohaplocladium microphyllum</i> | Tiny-leaved Haplocladium Moss | | | | S1S2 | 2 May Be At Risk | 1 | 95.3 ± 3.0 | NS |
| N | <i>Calypogeia neesiana</i> | Nees' Pouchwort | | | | S1S3 | 6 Not Assessed | 1 | 64.9 ± 1.0 | NB |
| N | <i>Cephaloziella elachista</i> | Spurred Threadwort | | | | S1S3 | 6 Not Assessed | 1 | 32.0 ± 5.0 | NB |
| N | <i>Porella pinnata</i> | Pinnate Scalewort | | | | S1S3 | 6 Not Assessed | 2 | 70.2 ± 1.0 | NB |
| N | <i>Amphidium mougeotii</i> | a Moss | | | | S2 | 3 Sensitive | 2 | 45.0 ± 8.0 | NB |
| N | <i>Anomodon viticulosus</i> | a Moss | | | | S2 | 2 May Be At Risk | 4 | 40.8 ± 1.0 | NB |
| N | <i>Cynodontium strumiferum</i> | Strumose Dogtooth Moss | | | | S2 | 3 Sensitive | 1 | 45.0 ± 8.0 | NB |
| N | <i>Dicranella palustris</i> | Drooping-Leaved Fork Moss | | | | S2 | 3 Sensitive | 3 | 85.4 ± 100.0 | NB |
| N | <i>Didymodon ferrugineus</i> | a moss | | | | S2 | 3 Sensitive | 1 | 63.9 ± 1.0 | NB |
| N | <i>Anomodon tristis</i> | a Moss | | | | S2 | 2 May Be At Risk | 1 | 66.1 ± 1.0 | NB |
| N | <i>Hypnum pratense</i> | Meadow Plait Moss | | | | S2 | 3 Sensitive | 1 | 35.4 ± 0.0 | NB |
| N | <i>Meesia triquetra</i> | Three-ranked Cold Moss | | | | S2 | 2 May Be At Risk | 1 | 91.6 ± 100.0 | NB |
| N | <i>Physcomitrium immersum</i> | a Moss | | | | S2 | 3 Sensitive | 7 | 70.2 ± 1.0 | NB |
| N | <i>Sphagnum centrale</i> | Central Peat Moss | | | | S2 | 3 Sensitive | 2 | 69.9 ± 0.0 | NB |
| N | <i>Sphagnum lindbergii</i> | Lindberg's Peat Moss | | | | S2 | 3 Sensitive | 8 | 4.2 ± 1.0 | NB |
| N | <i>Tayloria serrata</i> | Serrate Trumpet Moss | | | | S2 | 3 Sensitive | 1 | 73.7 ± 1.0 | NB |
| N | <i>Tetraplodon mnioides</i> | Entire-leaved Nitrogen Moss | | | | S2 | 3 Sensitive | 3 | 4.2 ± 1.0 | NB |
| N | <i>Thamnobryum alleghaniense</i> | a Moss | | | | S2 | 3 Sensitive | 1 | 94.3 ± 0.0 | NB |
| N | <i>Tortula mucronifolia</i> | Mucronate Screw Moss | | | | S2 | 3 Sensitive | 1 | 41.0 ± 0.0 | NB |
| N | <i>Ulota phyllantha</i> | a Moss | | | | S2 | 3 Sensitive | 6 | 4.2 ± 1.0 | NB |
| N | <i>Anomobryum filiforme</i> | a moss | | | | S2 | 5 Undetermined | 2 | 93.2 ± 0.0 | NB |
| N | <i>Leptogium corticola</i> | Blistered Jellyskin Lichen | | | | S2 | 2 May Be At Risk | 2 | 91.2 ± 0.0 | NS |
| N | <i>Nephroma laevigatum</i> | Mustard Kidney Lichen | | | | S2 | 2 May Be At Risk | 2 | 51.4 ± 10.0 | NB |
| N | <i>Andreaea rothii</i> | a Moss | | | | S2? | 3 Sensitive | 1 | 61.4 ± 0.0 | NB |
| N | <i>Brachythecium digastrum</i> | a Moss | | | | S2? | 3 Sensitive | 2 | 80.5 ± 0.0 | NB |
| N | <i>Bryum pallescens</i> | Pale Bryum Moss | | | | S2? | 5 Undetermined | 2 | 41.4 ± 1.0 | NB |
| N | <i>Dichelyma capillaceum</i> | Hairlike Dichelyma Moss | | | | S2? | 3 Sensitive | 1 | 88.3 ± 4.0 | NB |
| N | <i>Dicranum spurium</i> | Spurred Broom Moss | | | | S2? | 3 Sensitive | 2 | 18.7 ± 0.0 | NB |
| N | <i>Schistostega pennata</i> | Luminous Moss | | | | S2? | 3 Sensitive | 2 | 85.4 ± 100.0 | NB |
| N | <i>Seligeria campylopoda</i> | a Moss | | | | S2? | 3 Sensitive | 1 | 67.0 ± 100.0 | NB |
| N | <i>Seligeria diversifolia</i> | a Moss | | | | S2? | 3 Sensitive | 2 | 90.6 ± 0.0 | NB |
| N | <i>Sphagnum angermanicum</i> | a Peatmoss | | | | S2? | 3 Sensitive | 2 | 16.2 ± 10.0 | NB |
| N | <i>Plagiomnium rostratum</i> | Long-beaked Leafy Moss | | | | S2? | 3 Sensitive | 2 | 94.2 ± 0.0 | NB |
| N | <i>Physcia subtilis</i> | Slender Rosette Lichen | | | | S2? | 5 Undetermined | 1 | 91.0 ± 0.0 | NB |
| N | <i>Bryum uliginosum</i> | a Moss | | | | S2S3 | 3 Sensitive | 1 | 64.3 ± 4.0 | NB |
| N | <i>Buxbaumia aphylla</i> | Brown Shield Moss | | | | S2S3 | 3 Sensitive | 2 | 45.0 ± 8.0 | NB |
| N | <i>Calliergonella cuspidata</i> | Common Large Wetland Moss | | | | S2S3 | 3 Sensitive | 6 | 34.2 ± 10.0 | NB |
| N | <i>Campylium polygamum</i> | a Moss | | | | S2S3 | 3 Sensitive | 1 | 85.6 ± 1.0 | NB |
| N | <i>Didymodon rigidulus</i> | Rigid Screw Moss | | | | S2S3 | 3 Sensitive | 1 | 83.6 ± 8.0 | NB |
| N | <i>Ephemerum serratum</i> | a Moss | | | | S2S3 | 3 Sensitive | 1 | 99.1 ± 0.0 | NB |
| N | <i>Fissidens bushii</i> | Bush's Pocket Moss | | | | S2S3 | 3 Sensitive | 2 | 89.6 ± 3.0 | NS |
| N | <i>Orthotrichum speciosum</i> | Showy Bristle Moss | | | | S2S3 | 5 Undetermined | 3 | 31.5 ± 2.0 | NB |
| N | <i>Racomitrium fasciculare</i> | a Moss | | | | S2S3 | 3 Sensitive | 1 | 37.5 ± 0.0 | NB |
| N | <i>Scorpidium scorpioides</i> | Hooked Scorpion Moss | | | | S2S3 | 3 Sensitive | 4 | 32.2 ± 0.0 | NB |
| N | <i>Sphagnum subfulvum</i> | a Peatmoss | | | | S2S3 | 2 May Be At Risk | 4 | 13.6 ± 1.0 | NB |
| N | <i>Taxiphyllum deplanatum</i> | Imbricate Yew-leaved Moss | | | | S2S3 | 3 Sensitive | 1 | 4.2 ± 1.0 | NB |
| N | <i>Zygodon viridissimus</i> | a Moss | | | | S2S3 | 2 May Be At Risk | 3 | 38.2 ± 3.0 | NB |
| N | <i>Schistidium agassizii</i> | Elf Bloom Moss | | | | S2S3 | 3 Sensitive | 2 | 31.5 ± 2.0 | NB |
| N | <i>Loeskeobryum brevirostre</i> | a Moss | | | | S2S3 | 3 Sensitive | 5 | 77.8 ± 3.0 | NS |
| N | <i>Cynodontium tenellum</i> | Delicate Dogtooth Moss | | | | S3 | 3 Sensitive | 1 | 4.2 ± 1.0 | NB |
| N | <i>Hypnum curvifolium</i> | Curved-leaved Plait Moss | | | | S3 | 3 Sensitive | 4 | 41.3 ± 5.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|---|--------------------------------|-----------------|-----------------|-----------------|------------------|------------------|--------|---------------|------|
| N | <i>Schistidium maritimum</i> | a Moss | | | | S3 | 4 Secure | 4 | 4.2 ± 1.0 | NB |
| N | <i>Cladonia strepsilis</i> | Olive Cladonia Lichen | | | | S3 | 4 Secure | 1 | 71.0 ± 0.0 | NB |
| N | <i>Usnea strigosa</i> | Bushy Beard Lichen | | | | S3 | 5 Undetermined | 1 | 90.7 ± 0.0 | NS |
| N | <i>Aulacomnium androgynum</i> | Little Groove Moss | | | | S3? | 4 Secure | 5 | 41.3 ± 5.0 | NB |
| N | <i>Dicranella rufescens</i> | Red Forklet Moss | | | | S3? | 5 Undetermined | 2 | 92.2 ± 4.0 | NB |
| N | <i>Rhytidiadelphus loreus</i> | Lanky Moss | | | | S3? | 2 May Be At Risk | 2 | 62.3 ± 10.0 | NB |
| N | <i>Sphagnum lescurii</i> | a Peatmoss | | | | S3? | 5 Undetermined | 2 | 54.3 ± 0.0 | NB |
| N | <i>Leptogium subtile</i> | Appressed Jellyskin Lichen | | | | S3? | 5 Undetermined | 2 | 99.5 ± 0.0 | NB |
| N | <i>Anomodon rugelii</i> | Rugel's Anomodon Moss | | | | S3S4 | 3 Sensitive | 1 | 89.6 ± 3.0 | NS |
| N | <i>Barbula convoluta</i> | Lesser Bird's-claw Beard Moss | | | | S3S4 | 4 Secure | 1 | 83.6 ± 8.0 | NB |
| N | <i>Brachythecium velutinum</i> | Velvet Ragged Moss | | | | S3S4 | 4 Secure | 3 | 39.6 ± 0.0 | NB |
| N | <i>Dicranella cerviculata</i> | a Moss | | | | S3S4 | 3 Sensitive | 3 | 4.2 ± 1.0 | NB |
| N | <i>Dicranum majus</i> | Greater Broom Moss | | | | S3S4 | 4 Secure | 6 | 4.2 ± 1.0 | NB |
| N | <i>Fissidens bryoides</i> | Lesser Pocket Moss | | | | S3S4 | 4 Secure | 3 | 63.8 ± 5.0 | NB |
| N | <i>Heterocladium dimorphum</i> | Dimorphous Tangle Moss | | | | S3S4 | 4 Secure | 1 | 31.5 ± 2.0 | NB |
| N | <i>Isopterygiopsis muelleriana</i> | a Moss | | | | S3S4 | 4 Secure | 6 | 39.6 ± 0.0 | NB |
| N | <i>Myurella julacea</i> | Small Mouse-tail Moss | | | | S3S4 | 4 Secure | 1 | 45.0 ± 8.0 | NB |
| N | <i>Physcomitrium pyriforme</i> | Pear-shaped Urn Moss | | | | S3S4 | 3 Sensitive | 5 | 84.7 ± 0.0 | NB |
| N | <i>Pogonatum dentatum</i> | Mountain Hair Moss | | | | S3S4 | 4 Secure | 1 | 4.2 ± 1.0 | NB |
| N | <i>Sphagnum torreyanum</i> | a Peatmoss | | | | S3S4 | 4 Secure | 4 | 27.7 ± 0.0 | NB |
| N | <i>Sphagnum austinii</i> | Austin's Peat Moss | | | | S3S4 | 4 Secure | 1 | 27.8 ± 1.0 | NB |
| N | <i>Sphagnum contortum</i> | Twisted Peat Moss | | | | S3S4 | 4 Secure | 1 | 51.2 ± 0.0 | NB |
| N | <i>Splachnum rubrum</i> | Red Collar Moss | | | | S3S4 | 4 Secure | 1 | 67.5 ± 1.0 | NB |
| N | <i>Tetraphis geniculata</i> | Geniculate Four-tooth Moss | | | | S3S4 | 4 Secure | 4 | 3.8 ± 0.0 | NB |
| N | <i>Tetraplodon angustatus</i> | Toothed-leaved Nitrogen Moss | | | | S3S4 | 4 Secure | 2 | 4.2 ± 1.0 | NB |
| N | <i>Weissia controversa</i> | Green-Cushioned Weissia | | | | S3S4 | 4 Secure | 3 | 94.2 ± 0.0 | NS |
| N | <i>Trichostomum tenuirostre</i> | Acid-Soil Moss | | | | S3S4 | 4 Secure | 3 | 39.6 ± 0.0 | NB |
| N | <i>Cladonia floerkeana</i> | Gritty British Soldiers Lichen | | | | S3S4 | 4 Secure | 1 | 71.0 ± 0.0 | NB |
| N | <i>Vahlia leucophaea</i> | Shelter Shingle Lichen | | | | S3S4 | 5 Undetermined | 1 | 99.9 ± 0.0 | NB |
| N | <i>Nephroma parile</i> | Powdery Kidney Lichen | | | | S3S4 | 4 Secure | 1 | 74.0 ± 0.0 | NB |
| N | <i>Protopannaria pezizoides</i> | Brown-gray Moss-shingle Lichen | | | | S3S4 | 4 Secure | 1 | 64.3 ± 0.0 | NB |
| N | <i>Pseudocyphellaria holarctica</i> | Yellow Specklebelly Lichen | | | | S3S4 | 3 Sensitive | 15 | 61.3 ± 0.0 | NB |
| N | <i>Pannaria conoplea</i> | Mealy-rimmed Shingle Lichen | | | | S3S4 | 3 Sensitive | 7 | 61.4 ± 0.0 | NB |
| N | <i>Dermatocarpon luridum</i> | Brookside Stippleback Lichen | | | | S3S4 | 4 Secure | 11 | 47.7 ± 0.0 | NB |
| N | <i>Grimmia anodon</i> | Toothless Grimmiid Moss | | | | SH | 5 Undetermined | 2 | 43.1 ± 10.0 | NB |
| N | <i>Leucodon brachypus</i> | a Moss | | | | SH | 2 May Be At Risk | 3 | 35.6 ± 100.0 | NB |
| N | <i>Thelia hirtella</i> | a Moss | | | | SH | 2 May Be At Risk | 2 | 89.6 ± 3.0 | NS |
| N | <i>Pseudocyphellaria perpetua</i> | Gilded Specklebelly Lichen | | | | SNA | 3 Sensitive | 2 | 90.9 ± 0.0 | NS |
| P | <i>Juglans cinerea</i> | Butternut | Endangered | Endangered | Endangered | S1 | 1 At Risk | 60 | 51.0 ± 1.0 | NB |
| P | <i>Polemonium vanbruntiae</i> | Van Brunt's Jacob's-ladder | Threatened | Threatened | Threatened | S1 | 1 At Risk | 72 | 9.2 ± 1.0 | NB |
| P | <i>Symphyotrichum anticostense</i> | Anticosti Aster | Threatened | Threatened | Endangered | S2S3 | 1 At Risk | 4 | 95.4 ± 0.0 | NB |
| P | <i>Isoetes prototypus</i> | Prototype Quillwort | Special Concern | Special Concern | Endangered | S2 | 1 At Risk | 23 | 44.8 ± 0.0 | NB |
| P | <i>Pterospora andromedea</i> | Woodland Pinedrops | | | Endangered | S1 | 1 At Risk | 11 | 95.4 ± 0.0 | NB |
| P | <i>Sanicula trifoliata</i> | Large-Fruited Sanicle | | | | S1 | 2 May Be At Risk | 1 | 73.6 ± 5.0 | NB |
| P | <i>Antennaria parlinii</i> | a Pussytoes | | | | S1 | 2 May Be At Risk | 7 | 53.7 ± 0.0 | NB |
| P | <i>Antennaria howellii</i> ssp. <i>petaloidea</i> | Pussy-Toes | | | | S1 | 2 May Be At Risk | 4 | 37.1 ± 1.0 | NB |
| P | <i>Bidens discoidea</i> | Swamp Beggarticks | | | | S1 | 2 May Be At Risk | 3 | 88.0 ± 0.0 | NB |
| P | <i>Helianthus decapetalus</i> | Ten-rayed Sunflower | | | | S1 | 2 May Be At Risk | 13 | 95.1 ± 1.0 | NB |
| P | <i>Hieracium paniculatum</i> | Panicled Hawkweed | | | | S1 | 2 May Be At Risk | 15 | 76.8 ± 1.0 | NB |
| P | <i>Senecio pseudoamica</i> | Seabeach Ragwort | | | | S1 | 2 May Be At Risk | 14 | 53.3 ± 0.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|---|--------------------------------------|---------|------|-----------------|------------------|------------------|--------|---------------|------|
| P | <i>Betula michauxii</i> | Michaux's Dwarf Birch | | | | S1 | 2 May Be At Risk | 12 | 98.6 ± 0.0 | NS |
| P | <i>Cardamine parviflora</i> | Small-flowered Bittercress | | | | S1 | 2 May Be At Risk | 13 | 30.1 ± 1.0 | NB |
| P | <i>Cardamine concatenata</i> | Cut-leaved Toothwort | | | | S1 | 2 May Be At Risk | 1 | 88.7 ± 1.0 | NB |
| P | <i>Draba arabisans</i> | Rock Whi low-Grass | | | | S1 | 2 May Be At Risk | 7 | 42.2 ± 0.0 | NB |
| P | <i>Draba cana</i> | Lance-leaved Draba | | | | S1 | 2 May Be At Risk | 10 | 99.6 ± 0.0 | NB |
| P | <i>Draba glabella</i> | Rock Whi low-Grass | | | | S1 | 2 May Be At Risk | 7 | 40.4 ± 1.0 | NB |
| P | <i>Mononeuria groenlandica</i> | Greenland Stitchwort | | | | S1 | 2 May Be At Risk | 4 | 29.0 ± 0.0 | NB |
| P | <i>Chenopodium simplex</i> | Maple-leaved Goosefoot | | | | S1 | 2 May Be At Risk | 8 | 60.1 ± 1.0 | NB |
| P | <i>Blitum capitatum</i> | strawberry-blite | | | | S1 | 2 May Be At Risk | 4 | 43.9 ± 1.0 | NB |
| P | <i>Callitriche terrestris</i> | Terrestrial Water-Starwort | | | | S1 | 5 Undetermined | 1 | 71.9 ± 0.0 | NB |
| P | <i>Hypericum virginicum</i> | Virginia St. John's-wort | | | | S1 | 2 May Be At Risk | 5 | 44.4 ± 0.0 | NB |
| P | <i>Viburnum acerifolium</i> | Maple-leaved Viburnum | | | | S1 | 2 May Be At Risk | 10 | 62.4 ± 0.0 | NB |
| P | <i>Corema conradii</i> | Broom Crowberry | | | | S1 | 2 May Be At Risk | 1 | 41.6 ± 10.0 | NB |
| P | <i>Vaccinium boreale</i> | Northern Blueberry | | | | S1 | 2 May Be At Risk | 1 | 14.0 ± 0.0 | NB |
| P | <i>Vaccinium corymbosum</i> | Highbush Blueberry | | | | S1 | 3 Sensitive | 6 | 52.8 ± 5.0 | NB |
| P | <i>Vaccinium uliginosum</i> | Alpine Bilberry | | | | S1 | 2 May Be At Risk | 3 | 98.8 ± 0.0 | NS |
| P | <i>Euphorbia polygonifolia</i> | Seaside Spurge | | | | S1 | 2 May Be At Risk | 8 | 49.3 ± 0.0 | NB |
| P | <i>Hylodesmum glutinosum</i> | Large Tick-trefoil | | | | S1 | 2 May Be At Risk | 1 | 65.4 ± 1.0 | NB |
| P | <i>Lespedeza capitata</i> | Round-headed Bush-clover | | | | S1 | 2 May Be At Risk | 10 | 93.1 ± 0.0 | NB |
| P | <i>Gentiana rubricaulis</i> | Purple-stemmed Gentian | | | | S1 | 2 May Be At Risk | 14 | 25.8 ± 0.0 | NB |
| P | <i>Lomatogonium rotatum</i> | Marsh Felwort | | | | S1 | 2 May Be At Risk | 2 | 24.7 ± 0.0 | NB |
| P | <i>Proserpinaca pectinata</i> | Comb-leaved Mermaidweed | | | | S1 | 2 May Be At Risk | 3 | 10.6 ± 0.0 | NB |
| P | <i>Pycnanthemum virginianum</i> | Virginia Mountain Mint | | | | S1 | 2 May Be At Risk | 4 | 70.4 ± 0.0 | NB |
| P | <i>Lysimachia hybrida</i> | Lowland Yellow Loosestrife | | | | S1 | 2 May Be At Risk | 15 | 58.7 ± 0.0 | NB |
| P | <i>Lysimachia quadrifolia</i> | Whorled Yellow Loosestrife | | | | S1 | 2 May Be At Risk | 16 | 37.0 ± 1.0 | NB |
| P | <i>Primula laurentiana</i> | Laurentian Primrose | | | | S1 | 2 May Be At Risk | 10 | 78.9 ± 1.0 | NS |
| P | <i>Ranunculus sceleratus</i> | Cursed Buttercup | | | | S1 | 2 May Be At Risk | 6 | 37.2 ± 0.0 | NB |
| P | <i>Crataegus jonesiae</i> | Jones' Hawthorn | | | | S1 | 2 May Be At Risk | 5 | 37.5 ± 0.0 | NB |
| P | <i>Galium brevipes</i> | Limestone Swamp Bedstraw | | | | S1 | 2 May Be At Risk | 3 | 53.4 ± 5.0 | NB |
| P | <i>Saxifraga paniculata</i> ssp. <i>laestadii</i> | Laestadius' Saxifrage | | | | S1 | 2 May Be At Risk | 7 | 52.6 ± 10.0 | NB |
| P | <i>Agalinis tenuifolia</i> | Slender Agalinis | | | | S1 | 2 May Be At Risk | 6 | 88.6 ± 0.0 | NB |
| P | <i>Agalinis purpurea</i> var. <i>parviflora</i> | Small-flowered Purple False Foxglove | | | | S1 | 2 May Be At Risk | 8 | 62.8 ± 1.0 | NB |
| P | <i>Gratiola lutea</i> | Golden Hedge-hyssop | | | | S1 | 3 Sensitive | 3 | 24.2 ± 5.0 | NB |
| P | <i>Pedicularis canadensis</i> | Canada Lousewort | | | | S1 | 2 May Be At Risk | 20 | 33.1 ± 0.0 | NB |
| P | <i>Viola sagittata</i> var. <i>ovata</i> | Arrow-Leaved Violet | | | | S1 | 2 May Be At Risk | 30 | 47.0 ± 0.0 | NB |
| P | <i>Alisma subcordatum</i> | Southern Water Plantain | | | | S1 | 5 Undetermined | 6 | 67.2 ± 5.0 | NB |
| P | <i>Carex atlantica</i> ssp. <i>atlantica</i> | Atlantic Sedge | | | | S1 | 2 May Be At Risk | 1 | 98.6 ± 0.0 | NS |
| P | <i>Carex backii</i> | Rocky Mountain Sedge | | | | S1 | 2 May Be At Risk | 5 | 99.2 ± 1.0 | NB |
| P | <i>Carex cephaloidea</i> | Thin-leaved Sedge | | | | S1 | 2 May Be At Risk | 2 | 94.5 ± 0.0 | NB |
| P | <i>Carex merritt-fermaldii</i> | Merritt Fernald's Sedge | | | | S1 | 2 May Be At Risk | 2 | 40.2 ± 0.0 | NB |
| P | <i>Carex sterilis</i> | Sterile Sedge | | | | S1 | 2 May Be At Risk | 1 | 95.9 ± 0.0 | NB |
| P | <i>Carex grisea</i> | Inflated Narrow-leaved Sedge | | | | S1 | 2 May Be At Risk | 11 | 75.2 ± 0.0 | NB |
| P | <i>Carex saxatilis</i> | Russet Sedge | | | | S1 | 2 May Be At Risk | 14 | 41.0 ± 10.0 | NB |
| P | <i>Cyperus diandrus</i> | Low Flatsedge | | | | S1 | 2 May Be At Risk | 7 | 88.4 ± 1.0 | NB |
| P | <i>Cyperus lupulinus</i> | Hop Flatsedge | | | | S1 | 2 May Be At Risk | 15 | 88.4 ± 0.0 | NB |
| P | <i>Cyperus lupulinus</i> ssp. <i>macilentus</i> | Hop Flatsedge | | | | S1 | 2 May Be At Risk | 15 | 87.9 ± 0.0 | NB |
| P | <i>Eleocharis flavescens</i> var. <i>olivacea</i> | Bright-green Spikerush | | | | S1 | 2 May Be At Risk | 4 | 60.0 ± 1.0 | NB |
| P | <i>Rhynchospora capillacea</i> | Slender Beakrush | | | | S1 | 2 May Be At Risk | 3 | 95.2 ± 0.0 | NB |
| P | <i>Sisyrinchium angustifolium</i> | Narrow-leaved Blue-eyed-grass | | | | S1 | 2 May Be At Risk | 9 | 42.7 ± 1.0 | NB |
| P | <i>Juncus greenei</i> | Greene's Rush | | | | S1 | 2 May Be At Risk | 1 | 7.4 ± 0.0 | NB |
| P | <i>Juncus subtilis</i> | Creeping Rush | | | | S1 | 2 May Be At Risk | 1 | 72.2 ± 5.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|---|------------------------------------|---------|------|-----------------|------------------|------------------|--------|---------------|------|
| P | <i>Allium canadense</i> | Canada Garlic | | | | S1 | 2 May Be At Risk | 11 | 70.4 ± 0.0 | NB |
| P | <i>Goodyera pubescens</i> | Downy Rattlesnake-Plantain | | | | S1 | 2 May Be At Risk | 1 | 92.4 ± 0.0 | NB |
| P | <i>Malaxis monophyllos</i> var. <i>brachypoda</i> | North American White Adder's-mouth | | | | S1 | 2 May Be At Risk | 3 | 50.8 ± 10.0 | NB |
| P | <i>Platanthera flava</i> var. <i>herbiola</i> | Pale Green Orchid | | | | S1 | 2 May Be At Risk | 12 | 38.4 ± 0.0 | NB |
| P | <i>Platanthera macrophylla</i> | Large Round-Leaved Orchid | | | | S1 | 2 May Be At Risk | 1 | 92.0 ± 1.0 | NB |
| P | <i>Spiranthes casei</i> | Case's Ladies'-Tresses | | | | S1 | 2 May Be At Risk | 6 | 96.1 ± 0.0 | NB |
| P | <i>Bromus pubescens</i> | Hairy Wood Brome Grass | | | | S1 | 5 Undetermined | 6 | 88.6 ± 0.0 | NB |
| P | <i>Cinna arundinacea</i> | Sweet Wood Reed Grass | | | | S1 | 2 May Be At Risk | 22 | 56.8 ± 0.0 | NB |
| P | <i>Danthonia compressa</i> | Flattened Oat Grass | | | | S1 | 2 May Be At Risk | 6 | 86.6 ± 0.0 | NS |
| P | <i>Dichanthelium dichotomum</i> | Forked Panic Grass | | | | S1 | 2 May Be At Risk | 19 | 56.9 ± 0.0 | NB |
| P | <i>Glyceria obtusa</i> | Atlantic Manna Grass | | | | S1 | 2 May Be At Risk | 6 | 25.3 ± 0.0 | NB |
| P | <i>Sporobolus compositus</i> | Rough Dropseed | | | | S1 | 2 May Be At Risk | 17 | 94.7 ± 0.0 | NB |
| P | <i>Potamogeton friesii</i> | Fries' Pondweed | | | | S1 | 2 May Be At Risk | 6 | 36.5 ± 5.0 | NB |
| P | <i>Potamogeton nodosus</i> | Long-leaved Pondweed | | | | S1 | 2 May Be At Risk | 4 | 86.4 ± 0.0 | NB |
| P | <i>Potamogeton strictifolius</i> | Straight-leaved Pondweed | | | | S1 | 2 May Be At Risk | 2 | 58.8 ± 0.0 | NB |
| P | <i>Xyris difformis</i> | Bog Yellow-eyed-grass | | | | S1 | 5 Undetermined | 3 | 44.4 ± 0.0 | NB |
| P | <i>Asplenium ruta-muraria</i> var. <i>cryptolepis</i> | Wallrue Spleenwort | | | | S1 | 2 May Be At Risk | 3 | 52.1 ± 0.0 | NB |
| P | <i>Huperzia selago</i> | Northern Firmoss | | | | S1 | 2 May Be At Risk | 3 | 99.7 ± 5.0 | NS |
| P | <i>Sceptridium oneidense</i> | Blunt-lobed Moonwort | | | | S1 | 2 May Be At Risk | 4 | 59.4 ± 0.0 | NB |
| P | <i>Sceptridium rugulosum</i> | Rugulose Grapefern | | | | S1 | 2 May Be At Risk | 1 | 56.7 ± 1.0 | NB |
| P | <i>Schizaea pusilla</i> | Little Curlygrass Fern | | | | S1 | 2 May Be At Risk | 22 | 16.0 ± 0.0 | NB |
| P | <i>Cuscuta campestris</i> | Field Dodder | | | | S1? | 2 May Be At Risk | 3 | 95.4 ± 10.0 | NB |
| P | <i>Polygonum aviculare</i> ssp. <i>neglectum</i> | Narrow-leaved Knotweed | | | | S1? | 5 Undetermined | 6 | 54.7 ± 0.0 | NB |
| P | <i>Carex laxiflora</i> | Loose-Flowered Sedge | | | | S1? | 5 Undetermined | 1 | 93.0 ± 5.0 | NS |
| P | <i>Wolffia columbiana</i> | Columbian Watermeal | | | | S1? | 2 May Be At Risk | 5 | 82.2 ± 0.0 | NB |
| P | <i>Micranthes virginienensis</i> | Early Saxifrage | | | | S1S2 | 2 May Be At Risk | 14 | 91.7 ± 0.0 | NB |
| P | <i>Potamogeton bicupulatus</i> | Snailseed Pondweed | | | | S1S2 | 2 May Be At Risk | 5 | 21.5 ± 0.0 | NB |
| P | <i>Selaginella rupestris</i> | Rock Spikemoss | | | | S1S2 | 2 May Be At Risk | 21 | 76.0 ± 7.0 | NS |
| P | <i>Thelypteris simulata</i> | Bog Fern | | | | S1S2 | 2 May Be At Risk | 6 | 89.6 ± 0.0 | NB |
| P | <i>Cuscuta cephalanthi</i> | Buttonbush Dodder | | | | S1S3 | 2 May Be At Risk | 2 | 40.7 ± 1.0 | NB |
| P | <i>Neottia bifolia</i> | Southern Twayblade | | | Endangered | S2 | 1 At Risk | 11 | 77.7 ± 0.0 | NB |
| P | <i>Osmorhiza longistylis</i> | Smooth Sweet Cicely | | | | S2 | 3 Sensitive | 1 | 40.4 ± 0.0 | NB |
| P | <i>Solidago racemosa</i> | Racemose Goldenrod | | | | S2 | 2 May Be At Risk | 12 | 94.3 ± 1.0 | NB |
| P | <i>Ionactis linariifolia</i> | Flax-leaved Aster | | | | S2 | 3 Sensitive | 1 | 96.6 ± 0.0 | NB |
| P | <i>Symphotrichum racemosum</i> | Small White Aster | | | | S2 | 3 Sensitive | 12 | 71.0 ± 0.0 | NB |
| P | <i>Pseudognaphalium macounii</i> | Macoun's Cudweed | | | | S2 | 3 Sensitive | 9 | 41.3 ± 0.0 | NB |
| P | <i>Alnus serrulata</i> | Smooth Alder | | | | S2 | 3 Sensitive | 35 | 60.1 ± 0.0 | NB |
| P | <i>Boechera stricta</i> | Drummond's Rockcress | | | | S2 | 3 Sensitive | 10 | 41.0 ± 1.0 | NB |
| P | <i>Sagina nodosa</i> | Knotted Pearlwort | | | | S2 | 3 Sensitive | 24 | 3.5 ± 1.0 | NB |
| P | <i>Sagina nodosa</i> ssp. <i>borealis</i> | Knotted Pearlwort | | | | S2 | 3 Sensitive | 2 | 25.3 ± 0.0 | NB |
| P | <i>Stellaria longifolia</i> | Long-leaved Starwort | | | | S2 | 3 Sensitive | 5 | 41.4 ± 10.0 | NB |
| P | <i>Atriplex glabriuscula</i> var. <i>franktonii</i> | Frankton's Saltbush | | | | S2 | 4 Secure | 3 | 36.4 ± 1.0 | NB |
| P | <i>Oxybasis rubra</i> | Red Goosefoot | | | | S2 | 3 Sensitive | 4 | 39.1 ± 0.0 | NB |
| P | <i>Hypericum x dissimulatum</i> | Disguised St. John's-wort | | | | S2 | 3 Sensitive | 6 | 13.5 ± 1.0 | NB |
| P | <i>Triosteum aurantiacum</i> | Orange-fruited Tinker's Weed | | | | S2 | 3 Sensitive | 6 | 94.2 ± 0.0 | NB |
| P | <i>Viburnum lentago</i> | Nannyberry | | | | S2 | 4 Secure | 89 | 57.2 ± 0.0 | NB |
| P | <i>Viburnum recognitum</i> | Northern Arrow-Wood | | | | S2 | 4 Secure | 167 | 19.8 ± 0.0 | NB |
| P | <i>Astragalus eucosmus</i> | Elegant Milk-vetch | | | | S2 | 2 May Be At Risk | 10 | 63.8 ± 0.0 | NB |
| P | <i>Oxytropis campestris</i> var. <i>johannensis</i> | Field Locoweed | | | | S2 | 3 Sensitive | 7 | 51.8 ± 50.0 | NB |
| P | <i>Quercus macrocarpa</i> | Bur Oak | | | | S2 | 2 May Be At Risk | 57 | 39.2 ± 1.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|--|-----------------------------|---------|------|-----------------|------------------|------------------|--------|---------------|------|
| P | <i>Gentiana linearis</i> | Narrow-Leaved Gentian | | | | S2 | 3 Sensitive | 5 | 93.2 ± 5.0 | NB |
| P | <i>Myriophyllum humile</i> | Low Water Milfoil | | | | S2 | 3 Sensitive | 7 | 71.1 ± 1.0 | NB |
| P | <i>Proserpinaca palustris</i> | Marsh Mermaidweed | | | | S2 | 3 Sensitive | 25 | 16.1 ± 0.0 | NB |
| P | <i>Hedeoma pulegioides</i> | American False Pennyroyal | | | | S2 | 4 Secure | 61 | 38.6 ± 0.0 | NB |
| P | <i>Nuphar x rubrodiscalis</i> | Red-disk Yellow Pond-lily | | | | S2 | 3 Sensitive | 9 | 37.3 ± 1.0 | NB |
| P | <i>Aphyllon uniflorum</i> | One-flowered Broomrape | | | | S2 | 3 Sensitive | 13 | 13.6 ± 0.0 | NB |
| P | <i>Polygaloides paucifolia</i> | Fringed Milkwort | | | | S2 | 3 Sensitive | 12 | 22.5 ± 1.0 | NB |
| P | <i>Polygala senega</i> | Seneca Snakeroot | | | | S2 | 3 Sensitive | 2 | 94.9 ± 1.0 | NB |
| P | <i>Persicaria amphibia</i> var. <i>emersa</i> | Long-root Smartweed | | | | S2 | 3 Sensitive | 37 | 19.4 ± 0.0 | NB |
| P | <i>Persicaria careyi</i> | Carey's Smartweed | | | | S2 | 3 Sensitive | 11 | 32.2 ± 10.0 | NB |
| P | <i>Podostemum ceratophyllum</i> | Horn-leaved Riverweed | | | | S2 | 3 Sensitive | 22 | 45.3 ± 0.0 | NB |
| P | <i>Anemone multifida</i> | Cut-leaved Anemone | | | | S2 | 3 Sensitive | 1 | 95.0 ± 0.0 | NB |
| P | <i>Hepatica americana</i> | Round-lobed Hepatica | | | | S2 | 3 Sensitive | 34 | 45.4 ± 1.0 | NB |
| P | <i>Ranunculus flabellaris</i> | Yellow Water Buttercup | | | | S2 | 4 Secure | 19 | 64.2 ± 0.0 | NB |
| P | <i>Crataegus scabrada</i> | Rough Hawthorn | | | | S2 | 3 Sensitive | 5 | 52.1 ± 0.0 | NB |
| P | <i>Crataegus succulenta</i> | Fleshy Hawthorn | | | | S2 | 3 Sensitive | 1 | 93.4 ± 5.0 | NB |
| P | <i>Cephalanthus occidentalis</i> | Common Buttonbush | | | | S2 | 3 Sensitive | 64 | 57.0 ± 0.0 | NB |
| P | <i>Salix candida</i> | Sage Willow | | | | S2 | 3 Sensitive | 2 | 89.8 ± 1.0 | NB |
| P | <i>Agalinis neoscotica</i> | Nova Scotia Agalinis | | | | S2 | 3 Sensitive | 47 | 40.8 ± 0.0 | NB |
| P | <i>Euphrasia randii</i> | Rand's Eyebright | | | | S2 | 2 May Be At Risk | 25 | 3.7 ± 0.0 | NB |
| P | <i>Scrophularia lanceolata</i> | Lance-leaved Figwort | | | | S2 | 3 Sensitive | 3 | 62.2 ± 5.0 | NB |
| P | <i>Dirca palustris</i> | Eastern Leatherwood | | | | S2 | 2 May Be At Risk | 5 | 95.9 ± 1.0 | NB |
| P | <i>Phryma leptostachya</i> | American Lopseed | | | | S2 | 3 Sensitive | 1 | 99.1 ± 1.0 | NB |
| P | <i>Verbena urticifolia</i> | White Vervain | | | | S2 | 2 May Be At Risk | 12 | 94.5 ± 1.0 | NB |
| P | <i>Viola novae-angliae</i> | New England Violet | | | | S2 | 3 Sensitive | 5 | 16.9 ± 1.0 | NB |
| P | <i>Symlocarpus foetidus</i> | Eastern Skunk Cabbage | | | | S2 | 3 Sensitive | 103 | 16.0 ± 0.0 | NB |
| P | <i>Carex comosa</i> | Bearded Sedge | | | | S2 | 2 May Be At Risk | 5 | 88.0 ± 0.0 | NS |
| P | <i>Carex granularis</i> | Limestone Meadow Sedge | | | | S2 | 3 Sensitive | 7 | 64.2 ± 0.0 | NB |
| P | <i>Carex gynocrates</i> | Northern Bog Sedge | | | | S2 | 3 Sensitive | 4 | 63.3 ± 0.0 | NB |
| P | <i>Carex hirtifolia</i> | Pubescent Sedge | | | | S2 | 3 Sensitive | 3 | 78.5 ± 0.0 | NB |
| P | <i>Carex livida</i> | Livid Sedge | | | | S2 | 3 Sensitive | 2 | 41.3 ± 2.0 | NB |
| P | <i>Carex plantaginea</i> | Plantain-Leaved Sedge | | | | S2 | 3 Sensitive | 1 | 88.7 ± 0.0 | NB |
| P | <i>Carex prairea</i> | Prairie Sedge | | | | S2 | 3 Sensitive | 1 | 78.1 ± 5.0 | NS |
| P | <i>Carex rostrata</i> | Narrow-leaved Beaked Sedge | | | | S2 | 3 Sensitive | 1 | 45.9 ± 0.0 | NB |
| P | <i>Carex salina</i> | Saltmarsh Sedge | | | | S2 | 3 Sensitive | 2 | 39.6 ± 1.0 | NB |
| P | <i>Carex sprengei</i> | Longbeak Sedge | | | | S2 | 3 Sensitive | 1 | 95.7 ± 0.0 | NB |
| P | <i>Carex tenuiflora</i> | Sparse-Flowered Sedge | | | | S2 | 2 May Be At Risk | 16 | 53.1 ± 0.0 | NB |
| P | <i>Carex albicans</i> var. <i>emmonsii</i> | White-tinged Sedge | | | | S2 | 3 Sensitive | 4 | 48.2 ± 0.0 | NB |
| P | <i>Cyperus squarrosus</i> | Awned Flatsedge | | | | S2 | 3 Sensitive | 32 | 70.5 ± 0.0 | NB |
| P | <i>Eriophorum gracile</i> | Slender Cottongrass | | | | S2 | 2 May Be At Risk | 7 | 86.4 ± 0.0 | NS |
| P | <i>Blysmopsis rufa</i> | Red Bulrush | | | | S2 | 3 Sensitive | 3 | 47.3 ± 0.0 | NB |
| P | <i>Elodea nuttallii</i> | Nuttall's Waterweed | | | | S2 | 3 Sensitive | 9 | 60.5 ± 0.0 | NB |
| P | <i>Allium tricoccum</i> | Wild Leek | | | | S2 | 2 May Be At Risk | 27 | 64.9 ± 0.0 | NB |
| P | <i>Najas gracillima</i> | Thread-Like Naiad | | | | S2 | 3 Sensitive | 11 | 18.0 ± 0.0 | NB |
| P | <i>Calypso bulbosa</i> var. <i>americana</i> | Calypso | | | | S2 | 2 May Be At Risk | 3 | 48.1 ± 0.0 | NB |
| P | <i>Coeloglossum viride</i> | Long-bracted Frog Orchid | | | | S2 | 2 May Be At Risk | 5 | 76.2 ± 5.0 | NB |
| P | <i>Cypripedium parviflorum</i> var. <i>makasin</i> | Small Yellow Lady's-Slipper | | | | S2 | 2 May Be At Risk | 5 | 36.6 ± 1.0 | NB |
| P | <i>Spiranthes lucida</i> | Shining Ladies'-Tresses | | | | S2 | 3 Sensitive | 11 | 48.7 ± 1.0 | NB |
| P | <i>Spiranthes ochroleuca</i> | Yellow Ladies'-tresses | | | | S2 | 2 May Be At Risk | 11 | 48.4 ± 0.0 | NB |
| P | <i>Dichanthelium linearifolium</i> | Narrow-leaved Panic Grass | | | | S2 | 3 Sensitive | 9 | 45.5 ± 0.0 | NB |
| P | <i>Elymus canadensis</i> | Canada Wild Rye | | | | S2 | 2 May Be At Risk | 14 | 82.9 ± 1.0 | NB |
| P | <i>Leersia virginica</i> | White Cut Grass | | | | S2 | 2 May Be At Risk | 42 | 71.6 ± 0.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|--|--------------------------|---------|------|-----------------|------------------|------------------|--------|---------------|------|
| P | <i>Piptatheropsis canadensis</i> | Canada Ricegrass | | | | S2 | 3 Sensitive | 5 | 61.2 ± 0.0 | NB |
| P | <i>Poa glauca</i> | Glaucous Blue Grass | | | | S2 | 4 Secure | 1 | 41.3 ± 2.0 | NB |
| P | <i>Puccinellia phryganodes</i> ssp. <i>neoarctica</i> | Creeping Alkali Grass | | | | S2 | 3 Sensitive | 15 | 12.6 ± 0.0 | NB |
| P | <i>Schizachyrium scoparium</i> | Little Bluestem | | | | S2 | 3 Sensitive | 24 | 62.1 ± 0.0 | NB |
| P | <i>Zizania aquatica</i> var. <i>aquatica</i> | Eastern Wild Rice | | | | S2 | 5 Undetermined | 4 | 80.1 ± 0.0 | NB |
| P | <i>Potamogeton vaseyi</i> | Vasey's Pondweed | | | | S2 | 3 Sensitive | 4 | 36.6 ± 1.0 | NB |
| P | <i>Asplenium trichomanes</i> | Maidenhair Spleenwort | | | | S2 | 3 Sensitive | 11 | 39.2 ± 0.0 | NB |
| P | <i>Anchistea virginica</i> | Virginia chain fern | | | | S2 | 3 Sensitive | 18 | 65.6 ± 1.0 | NB |
| P | <i>Woodsia alpina</i> | Alpine Cliff Fern | | | | S2 | 3 Sensitive | 5 | 52.7 ± 0.0 | NB |
| P | <i>Selaginella selaginoides</i> | Low Spikemoss | | | | S2 | 3 Sensitive | 6 | 13.9 ± 0.0 | NB |
| P | <i>Toxicodendron radicans</i> var. <i>radicans</i> | Eastern Poison Ivy | | | | S2? | 3 Sensitive | 11 | 60.4 ± 0.0 | NB |
| P | <i>Symphotrichum novi-belgii</i> var. <i>crenifolium</i> | New York Aster | | | | S2? | 5 Undetermined | 9 | 29.2 ± 0.0 | NB |
| P | <i>Humulus lupulus</i> var. <i>lupuloides</i> | Common Hop | | | | S2? | 3 Sensitive | 4 | 87.2 ± 0.0 | NB |
| P | <i>Rubus x recurvicaulis</i> | arching dewberry | | | | S2? | 4 Secure | 5 | 48.8 ± 1.0 | NB |
| P | <i>Galium obtusum</i> | Blunt-leaved Bedstraw | | | | S2? | 4 Secure | 4 | 80.2 ± 1.0 | NB |
| P | <i>Salix myricoides</i> | Bayberry Willow | | | | S2? | 3 Sensitive | 7 | 38.2 ± 0.0 | NB |
| P | <i>Carex vacillans</i> | Estuarine Sedge | | | | S2? | 3 Sensitive | 4 | 29.2 ± 1.0 | NB |
| P | <i>Platanthera huronensis</i> | Fragrant Green Orchid | | | | S2? | 5 Undetermined | 2 | 64.8 ± 1.0 | NB |
| P | <i>Solidago altissima</i> | Tall Goldenrod | | | | S2S3 | 4 Secure | 6 | 63.2 ± 1.0 | NB |
| P | <i>Callitriche hermaphroditica</i> | Northern Water-starwort | | | | S2S3 | 4 Secure | 6 | 45.8 ± 0.0 | NB |
| P | <i>Lonicera oblongifolia</i> | Swamp Fly Honeysuckle | | | | S2S3 | 3 Sensitive | 22 | 23.8 ± 6.0 | NB |
| P | <i>Elatine americana</i> | American Waterwort | | | | S2S3 | 3 Sensitive | 8 | 36.6 ± 1.0 | NB |
| P | <i>Bartonia paniculata</i> ssp. <i>iodandra</i> | Branched Bartonia | | | | S2S3 | 3 Sensitive | 18 | 9.5 ± 1.0 | NB |
| P | <i>Geranium robertianum</i> | Herb Robert | | | | S2S3 | 4 Secure | 25 | 32.5 ± 0.0 | NB |
| P | <i>Myriophyllum quitense</i> | Andean Water Milfoil | | | | S2S3 | 4 Secure | 71 | 36.8 ± 0.0 | NB |
| P | <i>Epilobium coloratum</i> | Purple-veined Willowherb | | | | S2S3 | 3 Sensitive | 10 | 43.8 ± 1.0 | NB |
| P | <i>Rumex pallidus</i> | Seabeach Dock | | | | S2S3 | 3 Sensitive | 7 | 1.2 ± 1.0 | NB |
| P | <i>Rumex occidentalis</i> | Western Dock | | | | S2S3 | 2 May Be At Risk | 1 | 84.4 ± 1.0 | NB |
| P | <i>Rubus pensilvanicus</i> | Pennsylvania Blackberry | | | | S2S3 | 4 Secure | 17 | 39.4 ± 3.0 | NB |
| P | <i>Galium labradoricum</i> | Labrador Bedstraw | | | | S2S3 | 3 Sensitive | 17 | 19.8 ± 1.0 | NB |
| P | <i>Valeriana uliginosa</i> | Swamp Valerian | | | | S2S3 | 3 Sensitive | 1 | 56.4 ± 1.0 | NB |
| P | <i>Carex adusta</i> | Lesser Brown Sedge | | | | S2S3 | 4 Secure | 4 | 39.3 ± 1.0 | NB |
| P | <i>Corallorhiza maculata</i> var. <i>occidentalis</i> | Spotted Coralroot | | | | S2S3 | 3 Sensitive | 4 | 40.2 ± 0.0 | NB |
| P | <i>Corallorhiza maculata</i> var. <i>maculata</i> | Spotted Coralroot | | | | S2S3 | 3 Sensitive | 2 | 90.8 ± 1.0 | NB |
| P | <i>Neottia auriculata</i> | Auricled Twayblade | | | | S2S3 | 3 Sensitive | 9 | 35.9 ± 1.0 | NB |
| P | <i>Spiranthes cernua</i> | Nodding Ladies'-Tresses | | | | S2S3 | 3 Sensitive | 26 | 7.4 ± 0.0 | NB |
| P | <i>Eragrostis pectinacea</i> | Tufted Love Grass | | | | S2S3 | 4 Secure | 14 | 37.7 ± 0.0 | NB |
| P | <i>Stuckenia filiformis</i> | Thread-leaved Pondweed | | | | S2S3 | 3 Sensitive | 6 | 41.3 ± 2.0 | NB |
| P | <i>Potamogeton praelongus</i> | White-stemmed Pondweed | | | | S2S3 | 4 Secure | 12 | 41.3 ± 1.0 | NB |
| P | <i>Isoetes acadensis</i> | Acadian Quillwort | | | | S2S3 | 3 Sensitive | 9 | 24.3 ± 0.0 | NB |
| P | <i>Botrychium tenebrosum</i> | Swamp Moonwort | | | | S2S3 | 3 Sensitive | 1 | 62.0 ± 0.0 | NB |
| P | <i>Ophioglossum pusillum</i> | Northern Adder's-tongue | | | | S2S3 | 3 Sensitive | 7 | 39.1 ± 1.0 | NB |
| P | <i>Panax trifolius</i> | Dwarf Ginseng | | | | S3 | 3 Sensitive | 6 | 40.0 ± 0.0 | NB |
| P | <i>Artemisia campestris</i> ssp. <i>caudata</i> | Tall Wormwood | | | | S3 | 4 Secure | 70 | 51.3 ± 0.0 | NB |
| P | <i>Artemisia campestris</i> | Field Wormwood | | | | S3 | 4 Secure | 7 | 87.3 ± 0.0 | NB |
| P | <i>Erigeron hyssopifolius</i> | Hyssop-leaved Fleabane | | | | S3 | 4 Secure | 6 | 44.9 ± 0.0 | NB |
| P | <i>Nabalus racemosus</i> | Glaucous Rattlesnakeroot | | | | S3 | 4 Secure | 72 | 37.8 ± 1.0 | NB |
| P | <i>Tanacetum bipinnatum</i> ssp. | Lake Huron Tansy | | | | S3 | 4 Secure | 25 | 49.7 ± 1.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|---|-------------------------------|---------|------|-----------------|------------------|--------------|--------|---------------|------|
| P | <i>huronense</i> | | | | | | | | | |
| P | <i>Symphyotrichum boreale</i> | Boreal Aster | | | | S3 | 3 Sensitive | 16 | 18.6 ± 0.0 | NB |
| P | <i>Betula pumila</i> | Bog Birch | | | | S3 | 4 Secure | 21 | 54.0 ± 0.0 | NB |
| P | <i>Arabis pycnocarpa</i> | Cream-flowered Rockcress | | | | S3 | 4 Secure | 13 | 41.0 ± 0.0 | NB |
| P | <i>Cardamine maxima</i> | Large Toothwort | | | | S3 | 4 Secure | 24 | 44.9 ± 0.0 | NB |
| P | <i>Subularia aquatica</i> ssp. <i>americana</i> | American Water Awlwort | | | | S3 | 4 Secure | 12 | 19.7 ± 0.0 | NB |
| P | <i>Lobelia cardinalis</i> | Cardinal Flower | | | | S3 | 4 Secure | 365 | 18.8 ± 0.0 | NB |
| P | <i>Stellaria humifusa</i> | Saltmarsh Starwort | | | | S3 | 4 Secure | 6 | 16.6 ± 1.0 | NB |
| P | <i>Ceratophyllum echinatum</i> | Prickly Hornwort | | | | S3 | 3 Sensitive | 16 | 54.5 ± 1.0 | NB |
| P | <i>Hudsonia tomentosa</i> | Woolly Beach-heath | | | | S3 | 4 Secure | 3 | 23.7 ± 0.0 | NB |
| P | <i>Cornus obliqua</i> | Silky Dogwood | | | | S3 | 3 Sensitive | 188 | 56.7 ± 0.0 | NB |
| P | <i>Crassula aquatica</i> | Water Pygmyweed | | | | S3 | 4 Secure | 10 | 53.9 ± 0.0 | NB |
| P | <i>Rhodiola rosea</i> | Roseroot | | | | S3 | 4 Secure | 44 | 4.0 ± 0.0 | NB |
| P | <i>Penthorum sedoides</i> | Ditch Stonecrop | | | | S3 | 4 Secure | 68 | 18.9 ± 0.0 | NB |
| P | <i>Elatine minima</i> | Small Waterwort | | | | S3 | 4 Secure | 30 | 17.1 ± 0.0 | NB |
| P | <i>Astragalus alpinus</i> var. <i>brunetianus</i> | Alpine Milk-Vetch | | | | S3 | 4 Secure | 3 | 91.7 ± 0.0 | NB |
| P | <i>Hedysarum americanum</i> | Alpine Hedysarum | | | | S3 | 4 Secure | 2 | 64.3 ± 0.0 | NB |
| P | <i>Gentianella amarella</i> ssp. <i>acuta</i> | Northern Gentian | | | | S3 | 4 Secure | 7 | 40.8 ± 5.0 | NB |
| P | <i>Geranium bicknellii</i> | Bicknell's Crane's-bill | | | | S3 | 4 Secure | 7 | 35.0 ± 5.0 | NB |
| P | <i>Myriophyllum farwellii</i> | Farwell's Water Milfoil | | | | S3 | 4 Secure | 22 | 18.4 ± 0.0 | NB |
| P | <i>Myriophyllum heterophyllum</i> | Variable-leaved Water Milfoil | | | | S3 | 4 Secure | 40 | 37.0 ± 0.0 | NB |
| P | <i>Myriophyllum verticillatum</i> | Whorled Water Milfoil | | | | S3 | 4 Secure | 18 | 16.2 ± 0.0 | NB |
| P | <i>Teucrium canadense</i> | Canada Germander | | | | S3 | 3 Sensitive | 5 | 51.2 ± 1.0 | NB |
| P | <i>Stachys hispida</i> | Smooth Hedge-Nettle | | | | S3 | 3 Sensitive | 12 | 64.4 ± 0.0 | NB |
| P | <i>Utricularia radiata</i> | Little Floating Bladderwort | | | | S3 | 4 Secure | 38 | 8.4 ± 0.0 | NB |
| P | <i>Nuphar microphylla</i> | Small Yellow Pond-lily | | | | S3 | 4 Secure | 15 | 41.3 ± 0.0 | NB |
| P | <i>Epilobium homemannii</i> | Homemann's Willowherb | | | | S3 | 4 Secure | 3 | 9.7 ± 0.0 | NB |
| P | <i>Epilobium strictum</i> | Downy Willowherb | | | | S3 | 4 Secure | 25 | 27.2 ± 1.0 | NB |
| P | <i>Polygala sanguinea</i> | Blood Milkwort | | | | S3 | 3 Sensitive | 9 | 71.4 ± 0.0 | NB |
| P | <i>Persicaria arifolia</i> | Halberd-leaved Tearthumb | | | | S3 | 4 Secure | 14 | 60.6 ± 0.0 | NB |
| P | <i>Persicaria punctata</i> | Dotted Smartweed | | | | S3 | 4 Secure | 16 | 40.1 ± 1.0 | NB |
| P | <i>Fallopia scandens</i> | Climbing False Buckwheat | | | | S3 | 4 Secure | 31 | 23.5 ± 0.0 | NB |
| P | <i>Littorella americana</i> | American Shoreweed | | | | S3 | 4 Secure | 25 | 17.2 ± 5.0 | NB |
| P | <i>Primula mistassinica</i> | Mistassini Primrose | | | | S3 | 4 Secure | 12 | 34.8 ± 1.0 | NB |
| P | <i>Pyrola minor</i> | Lesser Pyrola | | | | S3 | 4 Secure | 3 | 9.1 ± 0.0 | NB |
| P | <i>Clematis occidentalis</i> | Purple Clematis | | | | S3 | 4 Secure | 19 | 44.6 ± 0.0 | NB |
| P | <i>Ranunculus gmelinii</i> | Gmelin's Water Buttercup | | | | S3 | 4 Secure | 10 | 80.0 ± 0.0 | NB |
| P | <i>Thalictrum confine</i> | Northern Meadow-rue | | | | S3 | 4 Secure | 80 | 31.2 ± 0.0 | NB |
| P | <i>Amelanchier canadensis</i> | Canada Serviceberry | | | | S3 | 4 Secure | 15 | 12.7 ± 1.0 | NB |
| P | <i>Rosa palustris</i> | Swamp Rose | | | | S3 | 4 Secure | 42 | 15.8 ± 0.0 | NB |
| P | <i>Rubus occidentalis</i> | Black Raspberry | | | | S3 | 4 Secure | 20 | 81.0 ± 0.0 | NB |
| P | <i>Galium boreale</i> | Northern Bedstraw | | | | S3 | 4 Secure | 5 | 45.2 ± 0.0 | NB |
| P | <i>Salix nigra</i> | Black Willow | | | | S3 | 3 Sensitive | 95 | 37.0 ± 1.0 | NB |
| P | <i>Salix pedicellaris</i> | Bog Willow | | | | S3 | 4 Secure | 48 | 15.7 ± 0.0 | NB |
| P | <i>Salix interior</i> | Sandbar Willow | | | | S3 | 4 Secure | 27 | 80.6 ± 1.0 | NB |
| P | <i>Comandra umbellata</i> | Bastard's Toadflax | | | | S3 | 4 Secure | 1 | 98.4 ± 10.0 | NB |
| P | <i>Parnassia glauca</i> | Fen Grass-of-Parnassus | | | | S3 | 4 Secure | 1 | 88.5 ± 10.0 | NB |
| P | <i>Limosella australis</i> | Southern Mudwort | | | | S3 | 4 Secure | 11 | 50.6 ± 0.0 | NB |
| P | <i>Boehmeria cylindrica</i> | Small-spike False-nettle | | | | S3 | 3 Sensitive | 129 | 22.7 ± 0.0 | NB |
| P | <i>Pilea pumila</i> | Dwarf Clearweed | | | | S3 | 4 Secure | 24 | 71.6 ± 0.0 | NB |
| P | <i>Viola adunca</i> | Hooked Violet | | | | S3 | 4 Secure | 5 | 31.5 ± 1.0 | NB |
| P | <i>Viola nephrophylla</i> | Northern Bog Violet | | | | S3 | 4 Secure | 10 | 38.5 ± 0.0 | NB |
| P | <i>Carex arcta</i> | Northern Clustered Sedge | | | | S3 | 4 Secure | 48 | 59.5 ± 0.0 | NB |
| P | <i>Carex capillaris</i> | Hairlike Sedge | | | | S3 | 4 Secure | 5 | 41.3 ± 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 | <i>Carex chordorrhiza</i> | Creeping Sedge | | | | S3 | 4 Secure | 20 | 29.2 ± 1.0 | NB |
| P | <i>Carex conoidea</i> | Field Sedge | | | | S3 | 4 Secure | 31 | 27.2 ± 1.0 | NB |
| P | <i>Carex exilis</i> | Coastal Sedge | | | | S3 | 4 Secure | 105 | 8.4 ± 0.0 | NB |
| P | <i>Carex garberi</i> | Garber's Sedge | | | | S3 | 3 Sensitive | 2 | 48.7 ± 1.0 | NB |
| P | <i>Carex haydenii</i> | Hayden's Sedge | | | | S3 | 4 Secure | 41 | 0.9 ± 1.0 | NB |
| P | <i>Carex lupulina</i> | Hop Sedge | | | | S3 | 4 Secure | 107 | 57.0 ± 1.0 | NB |
| P | <i>Carex michauxiana</i> | Michaux's Sedge | | | | S3 | 4 Secure | 56 | 14.3 ± 0.0 | NB |
| P | <i>Carex ormostachya</i> | Necklace Spike Sedge | | | | S3 | 4 Secure | 7 | 71.7 ± 0.0 | NB |
| P | <i>Carex rosea</i> | Rosy Sedge | | | | S3 | 4 Secure | 25 | 62.5 ± 0.0 | NB |
| P | <i>Carex tenera</i> | Tender Sedge | | | | S3 | 4 Secure | 47 | 39.9 ± 1.0 | NB |
| P | <i>Carex tuckermanii</i> | Tuckerman's Sedge | | | | S3 | 4 Secure | 78 | 43.8 ± 0.0 | NB |
| P | <i>Carex vaginata</i> | Sheathed Sedge | | | | S3 | 3 Sensitive | 10 | 59.4 ± 6.0 | NB |
| P | <i>Carex wiegandii</i> | Wiegand's Sedge | | | | S3 | 4 Secure | 35 | 7.6 ± 0.0 | NB |
| P | <i>Carex recta</i> | Estuary Sedge | | | | S3 | 4 Secure | 7 | 24.7 ± 1.0 | NB |
| P | <i>Carex atratiformis</i> | Scabrous Black Sedge | | | | S3 | 4 Secure | 1 | 41.3 ± 0.0 | NB |
| P | <i>Cyperus dentatus</i> | Toothed Flatsedge | | | | S3 | 4 Secure | 88 | 18.0 ± 0.0 | NB |
| P | <i>Cyperus esculentus</i> | Perennial Yellow Nutsedge | | | | S3 | 4 Secure | 10 | 90.7 ± 0.0 | NB |
| P | <i>Cyperus esculentus var. leptostachyus</i> | Perennial Yellow Nutsedge | | | | S3 | 4 Secure | 41 | 72.5 ± 0.0 | NB |
| P | <i>Eleocharis intermedia</i> | Matted Spikerush | | | | S3 | 4 Secure | 2 | 69.0 ± 0.0 | NB |
| P | <i>Eleocharis quinqueflora</i> | Few-flowered Spikerush | | | | S3 | 4 Secure | 10 | 51.1 ± 0.0 | NB |
| P | <i>Rhynchospora capitellata</i> | Small-headed Beakrush | | | | S3 | 4 Secure | 20 | 47.8 ± 0.0 | NB |
| P | <i>Rhynchospora fusca</i> | Brown Beakrush | | | | S3 | 4 Secure | 34 | 14.8 ± 0.0 | NB |
| P | <i>Trichophorum clintonii</i> | Clinton's Clubrush | | | | S3 | 4 Secure | 7 | 17.5 ± 5.0 | NB |
| P | <i>Bolboschoenus fluviatilis</i> | River Bulrush | | | | S3 | 3 Sensitive | 58 | 37.4 ± 0.0 | NB |
| P | <i>Schoenoplectus torreyi</i> | Torrey's Bulrush | | | | S3 | 4 Secure | 30 | 10.6 ± 0.0 | NB |
| P | <i>Lemna trisulca</i> | Star Duckweed | | | | S3 | 4 Secure | 22 | 54.0 ± 1.0 | NB |
| P | <i>Triantha glutinosa</i> | Sticky False-Asphodel | | | | S3 | 4 Secure | 9 | 63.3 ± 0.0 | NB |
| P | <i>Cypripedium reginae</i> | Showy Lady's-Slipper | | | | S3 | 3 Sensitive | 21 | 35.9 ± 0.0 | NB |
| P | <i>Liparis loeselii</i> | Loesel's Twayblade | | | | S3 | 4 Secure | 18 | 14.6 ± 0.0 | NB |
| P | <i>Platanthera blephariglottis</i> | White Fringed Orchid | | | | S3 | 4 Secure | 31 | 66.3 ± 1.0 | NB |
| P | <i>Platanthera grandiflora</i> | Large Purple Fringed Orchid | | | | S3 | 3 Sensitive | 37 | 11.6 ± 0.0 | NB |
| P | <i>Bromus latiglumis</i> | Broad-Grummed Brome | | | | S3 | 3 Sensitive | 2 | 52.7 ± 0.0 | NB |
| P | <i>Calamagrostis pickeringii</i> | Pickering's Reed Grass | | | | S3 | 4 Secure | 107 | 2.6 ± 0.0 | NB |
| P | <i>Dichanthelium depauperatum</i> | Starved Panic Grass | | | | S3 | 4 Secure | 15 | 52.6 ± 0.0 | NB |
| P | <i>Muhlenbergia richardsonis</i> | Mat Muhly | | | | S3 | 4 Secure | 9 | 94.9 ± 0.0 | NB |
| P | <i>Heteranthera dubia</i> | Water Stargrass | | | | S3 | 4 Secure | 58 | 41.4 ± 0.0 | NB |
| P | <i>Potamogeton obtusifolius</i> | Blunt-leaved Pondweed | | | | S3 | 4 Secure | 14 | 35.0 ± 0.0 | NB |
| P | <i>Potamogeton richardsonii</i> | Richardson's Pondweed | | | | S3 | 3 Sensitive | 15 | 41.3 ± 1.0 | NB |
| P | <i>Xyris montana</i> | Northern Yellow-Eyed-Grass | | | | S3 | 4 Secure | 24 | 10.2 ± 0.0 | NB |
| P | <i>Zannichellia palustris</i> | Horned Pondweed | | | | S3 | 4 Secure | 5 | 36.3 ± 0.0 | NB |
| P | <i>Adiantum pedatum</i> | Northern Maidenhair Fern | | | | S3 | 4 Secure | 8 | 35.7 ± 1.0 | NB |
| P | <i>Cryptogramma stelleri</i> | Steller's Rockbrake | | | | S3 | 4 Secure | 2 | 61.9 ± 1.0 | NB |
| P | <i>Asplenium viride</i> | Green Spleenwort | | | | S3 | 4 Secure | 15 | 34.9 ± 1.0 | NB |
| P | <i>Dryopteris fragrans</i> | Fragrant Wood Fern | | | | S3 | 4 Secure | 3 | 39.2 ± 0.0 | NB |
| P | <i>Dryopteris goldiana</i> | Goldie's Woodfern | | | | S3 | 3 Sensitive | 4 | 98.9 ± 5.0 | NB |
| P | <i>Woodsia glabella</i> | Smooth Cliff Fern | | | | S3 | 4 Secure | 1 | 71.0 ± 1.0 | NB |
| P | <i>Equisetum palustre</i> | Marsh Horsetail | | | | S3 | 4 Secure | 7 | 47.6 ± 0.0 | NB |
| P | <i>Isoetes tuckermanii</i> | Tuckerman's Quillwort | | | | S3 | 4 Secure | 22 | 13.8 ± 0.0 | NB |
| P | <i>Diphasiastrum x sabinifolium</i> | Savin-leaved Ground-cedar | | | | S3 | 4 Secure | 7 | 36.1 ± 1.0 | NB |
| P | <i>Huperzia appressa</i> | Mountain Firmoss | | | | S3 | 3 Sensitive | 3 | 43.6 ± 1.0 | NB |
| P | <i>Sceptridium dissectum</i> | Dissected Moonwort | | | | S3 | 4 Secure | 28 | 36.2 ± 5.0 | NB |
| P | <i>Botrychium lanceolatum ssp. angustisegmentum</i> | Narrow Triangle Moonwort | | | | S3 | 3 Sensitive | 7 | 38.9 ± 0.0 | NB |
| P | <i>Botrychium simplex</i> | Least Moonwort | | | | S3 | 4 Secure | 9 | 42.5 ± 0.0 | NB |
| P | <i>Polypodium appalachianum</i> | Appalachian Polypody | | | | S3 | 4 Secure | 9 | 30.1 ± 0.0 | NB |
| P | <i>Utricularia resupinata</i> | Inverted Bladderwort | | | | S3? | 4 Secure | 19 | 15.4 ± 0.0 | NB |

| Taxonomic Group | Scientific Name | Common Name | COSEWIC | SARA | Prov Legal Prot | Prov Rarity Rank | Prov GS Rank | # recs | Distance (km) | Prov |
|-----------------|---------------------------------------|------------------------------|---------|------|-----------------|------------------|------------------|--------|---------------|------|
| P | <i>Crataegus submollis</i> | Quebec Hawthorn | | | | S3? | 3 Sensitive | 18 | 37.3 ± 0.0 | NB |
| P | <i>Mertensia maritima</i> | Sea Lungwort | | | | S3S4 | 4 Secure | 29 | 3.7 ± 1.0 | NB |
| P | <i>Lobelia kalmii</i> | Brook Lobelia | | | | S3S4 | 4 Secure | 19 | 37.4 ± 0.0 | NB |
| P | <i>Suaeda calceoliformis</i> | Horned Sea-blite | | | | S3S4 | 4 Secure | 7 | 33.2 ± 1.0 | NB |
| P | <i>Myriophyllum sibiricum</i> | Siberian Water Milfoil | | | | S3S4 | 4 Secure | 27 | 36.3 ± 0.0 | NB |
| P | <i>Stachys pilosa</i> | Hairy Hedge-Nettle | | | | S3S4 | 5 Undetermined | 6 | 47.7 ± 0.0 | NB |
| P | <i>Utricularia gibba</i> | Humped Bladderwort | | | | S3S4 | 4 Secure | 35 | 15.4 ± 0.0 | NB |
| P | <i>Rumex fueginus</i> | Tierra del Fuego Dock | | | | S3S4 | 4 Secure | 2 | 36.1 ± 1.0 | NB |
| P | <i>Drymocallis arguta</i> | Tall Wood Beauty | | | | S3S4 | 4 Secure | 33 | 31.9 ± 1.0 | NB |
| P | <i>Rubus chamaemorus</i> | Cloudberry | | | | S3S4 | 4 Secure | 76 | 4.1 ± 0.0 | NB |
| P | <i>Geocaulon lividum</i> | Northern Comandra | | | | S3S4 | 4 Secure | 12 | 3.5 ± 1.0 | NB |
| P | <i>Juniperus horizontalis</i> | Creeping Juniper | | | | S3S4 | 4 Secure | 26 | 31.5 ± 1.0 | NB |
| P | <i>Cladium mariscoides</i> | Smooth Twigrush | | | | S3S4 | 4 Secure | 41 | 10.1 ± 0.0 | NB |
| P | <i>Eriophorum russeolum</i> | Russet Cottongrass | | | | S3S4 | 4 Secure | 3 | 31.6 ± 1.0 | NB |
| P | <i>Triglochin gaspensis</i> | Gasp Arrowgrass | | | | S3S4 | 4 Secure | 16 | 14.9 ± 0.0 | NB |
| P | <i>Spirodela polyrhiza</i> | great duckweed | | | | S3S4 | 4 Secure | 36 | 58.8 ± 0.0 | NB |
| P | <i>Corallorhiza maculata</i> | Spotted Coralroot | | | | S3S4 | 3 Sensitive | 10 | 19.5 ± 0.0 | NB |
| P | <i>Calamagrostis stricta</i> | Slim-stemmed Reed Grass | | | | S3S4 | 4 Secure | 2 | 37.1 ± 2.0 | NB |
| P | <i>Potamogeton oakesianus</i> | Oakes' Pondweed | | | | S3S4 | 4 Secure | 40 | 15.4 ± 0.0 | NB |
| P | <i>Toxicodendron radicans</i> | Poison Ivy | | | | S5 | 4 Secure | 4 | 60.9 ± 0.0 | NB |
| P | <i>Polygonum oxyspermum ssp. raii</i> | Ray's Knotweed | | | | SH | 0.1 Extirpated | 1 | 98.2 ± 5.0 | NS |
| P | <i>Montia fontana</i> | Water Blinks | | | | SH | 2 May Be At Risk | 4 | 21.3 ± 1.0 | NB |
| P | <i>Barbarea orthoceras</i> | American Yellow Rocket | | | | SNA | | 3 | 49.4 ± 10.0 | NB |
| P | <i>Ranunculus longirostris</i> | Eastern White Water-Crowfoot | | | | SU | | 4 | 33.7 ± 1.0 | NB |
| P | <i>Solidago caesia</i> | Blue-stemmed Goldenrod | | | | SX | 0.1 Extirpated | 2 | 43.9 ± 1.0 | NB |
| P | <i>Celastrus scandens</i> | Climbing Bittersweet | | | | SX | 0.1 Extirpated | 2 | 88.5 ± 100.0 | NB |
| P | <i>Carex swanii</i> | Swan's Sedge | | | | SX | 0.1 Extirpated | 57 | 52.6 ± 1.0 | NB |

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