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NB Department of Tourism, Heritage and Culture

PARLEE BEACH PROVINCIAL PARK TIDAL INLET DREDGING EIA REGISTRATION DOCUMENT

March 2022

Consultant Project #2106010

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Property and Confidentiality

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REGISTRATION FORM

PURSUANT TO SECTION 5 (2) OF

THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATION 87-83

CLEAN ENVIRONMENT ACT

1 The Proponent

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Property Ownership

The site is located on land presently owned by the NB Department of Tourism, Heritage and Culture (THC).

2 The Undertaking

2.1 Name of the Undertaking:

"Tidal Inlet Dredging and Environmental Impact Assessment. Parlee Beach Provincial Park, Pointe-du-Chêne, New Brunswick".

2.2 Project Overview:

The project area consists of a tidal inlet, lagoons and channel located within a Provincially Significant Wetland (PSW) near the southern boundary of Parlee Beach Provincial Park. Due to sand migration that has worsened over recent years, the mouth of the inlet has narrowed to a point where tidal waters and storm runoff can no longer sufficiently drain within a tidal cycle. As a result, water quality within the channel and lagoons appears to be declining and the stormwater retention capacity is diminishing, causing the parking lots surrounding the eastern end of the lagoon to flood following even moderate precipitation events.

The current undertaking includes the proposed dredging of the inlet, lagoons and channel to facilitate regular tidal flushing and prevent flooding of the adjacent parking lots.

The project area is located near the site of an ongoing maintenance dredging/nourishment program where sand at the extreme western end of the beach is dredged and transported to other areas of the beach to replenish sand lost over previous years. The current dredging program takes place once every couple of years, or more frequently depending on erosion/damage caused by winter storms. As part of the current undertaking, the existing nourishment program would be modified to keep the mouth of the tidal inlet open. The remaining project area (channel and lagoons) would be dredged initially, but would not become part a regular part of the existing nourishment program.

As indicated on the Figures in Appendix B, the proposed project site is located at Parlee Beach Provincial Park, Pointe-de-Chêne, New Brunswick. Figure 1 shows the Site with respect to its location in the Province of New Brunswick and Figure 2 is an aerial overview with features of the Site and neighbouring community. Appendix A includes Site photos.

Several Figures have been included in the EIA Registration Document and they are as follows:

- Figure 3 is a detailed site plan, showing areas of various assessments conducted at the site including the site boundaries, the proposed project site and its components (tidal inlet, channel and lagoons), and the existing dredge and beach nourishment areas of Parlee Beach.
- Figure 4 shows the wetland delineation completed at the site.
- Figure 5 shows the proposed work plan.
- Figure 6 shows Parlee Beach Provincial Park in relation to the Significant Natural Areas and Managed Areas reported within 5 km of the site.
- Figure 7 shows the marine sediment sampling and video review locations throughout the proposed dredge area.

Englobe provided the NB Department of THC with recommendations and strategies to add dredging of the tidal inlet and lagoon to the current existing dredge program while ensuring the dredging activities do not adversely impact the PSW. These strategies were developed following the completion of the work outlined below.

- Wetland Delineation in accordance with *Protocol for Wetland Delineation in New Brunswick* to confirm the boundaries of the mapped PWS.
- Wetland Functional Assessment in accordance with the Wetland Ecosystem Services Protocol – Atlantic Canada (WESP-AC), to evaluate the functionality of the wetland and to develop baseline conditions in the wetland.

- Wetland Monitoring Plan Development to ensure dredging does not adversely impact the wetland functionality. The monitoring plan will be carried out annually following dredging, details of the monitoring plan is presented in Section 2.8 and the monitoring locations are presented on Figure 4, attached.
- Species at Risk and Migratory/Nesting Bird Survey to ensure the project is in compliance with the Federal and Provincial *Species at Risk Acts* and the *Migratory Bird Convention Act*.
- Drone survey to determine current topography; the drone survey included the tidal inlet and lagoon, and the beach immediately surrounding the area.
- Bathymetry of the tidal inlet and lagoon to establish the current locations of high points and to determine appropriate dredging grades.
- Environmental characterization of sediment within the tidal inlet to determine potential disposal options of the dredge sediments.
- Archaeological Documentary Research at the site to evaluate the potential presence of artifacts of historical significance of the tidal inlet and lagoon. The Archaeological assessment included subcontracting technical experts to complete Archaeological Predictive Modeling, requests for records from THC, research and completing a preliminary field examination, consisting of a visual walkover survey under permit from the NB Department of THC.
- Hydrodynamic evaluation to predict sediment transport within and west of the inlet. Historical bathymetry data was also reviewed as part of this assessment to evaluate the evolution of the inlet/lagoon overtime, to establish characteristic water levels and tide ranges at Parlee Beach using both Pointe-Sapin (1963-1975) and Lower-Escuminac (1973-2021) station data. This evaluation also included parametric evaluation of the lagoon hydrodynamics (simplified method – 2021 situation), and determining the high points within the inlet to determine effective dredge depths and volumes.

For simplicity, reports containing background information for this EIA have been included as appendices. These are:

- (a) Marine Sediment Sampling Program, Tidal Inlet Dredging and Environmental Impact Assessment. Parlee Beach Provincial Park, Pointe-du-Chêne, New Brunswick. Prepared by Englobe Corp. (Englobe), 215 Horseman Road, Unit 4, Moncton, NB E1E 0A2. Appendix C.
- (b) Species at Risk, Wetland Delineation and Wetland Functional Assessment, Tidal Inlet Dredging and Environmental Impact Assessment. Parlee Beach Provincial Park, Pointe-du-Chêne, New Brunswick. Prepared by Englobe Corp. (Englobe), 215 Horseman Road, Unit 4, Moncton, NB E1E 0A2. Appendix D.
- (c) Parlee Beach Lagoon Hydrodynamics. Prepared by Consultants Ropars Inc., 3643 Chemin Saint-Louis, Quebec G1W 1T2. Appendix E.
- (d) Preliminary Investigation Final Technical Report, Parlee Beach Dredging, Westmorland County. Preliminary Field Examination Completed Under Archaeological Field Research Permit Number 2021 NB 88. Prepared by Stratus Consulting Inc., 115-527 Dundonald Street, Fredericton, NB E3B 1X5. Appendix F.
- (e) Underwater Benthic Habitat Assessment, Parlee Beach Provincial Park, Pointe-du-Chêne, New Brunswick. Prepared by Englobe Corp. (Englobe), 215 Horseman Road, Unit 4, Moncton, NB E1E 0A2. Appendix G.

2.3 Purpose / Rationale / Need for the Undertaking:

The Parlee Beach inlet and lagoon is prone to sedimentation and declining water quality due to the size of the inlet and lagoon, and the minimal tidal water exchanges between the lagoon and the Shediac Bay. Furthermore, stormwater runoff from the surrounding area accumulates in the lagoon at the eastern end of the channel and cannot sufficient discharge to the Bay due to the narrowing inlet and sediment accumulation at select locations along the channel (ie. high spots) which causes significant flooding of the surrounding parking areas following precipitation events. Therefore, dredging the tidal inlet and lagoon is required to facilitate regular tidal flushing and improve the water and sediment quality and reduce likelihood of future flooding.

If the tidal inlet, lagoon and channel are not dredged, the beach will continue to migrate westward closing off the inlet and isolating the channel and lagoons from the Bay, creating a risk for increased flooding events and decreased habitat quality in the watercourse and wetland.

The tidal inlet and channel are within the PSW, and the later stages of the proposed dredging includes dredging a ~0.4 hectare area of wetland within the lagoon at the eastern end of the channel. The overall wetland is greater than 6 hectares, and therefore disturbance to the wetland triggers this Environmental Impact Assessment (EIA).

2.4 Project Location:

The proposed project is located within Parlee Beach Provincial Park in Pointe-du-Chêne, Westmorland County, New Brunswick. The site is situated along the Shediac Bay, in the southeast portion of the Province of New Brunswick roughly 30 km northeast of the City of Moncton. The site is located to the east of the Town of Shediac, on Parlee Beach Road, off of Route 133 (Figure 1, Appendix B). Specifically, the proposed dredging is to be conducted within the tidal inlet and lagoon located along the southern boundary of the Parlee Beach Provincial Park. The inlet and lagoon are bounded by residential parcels to the south and paved parking areas located within the Provincial Park to the east. The tidal inlet and lagoon are bound by PID Nos. 01053404, 70464888, 70207790, 01052208, 70287461, 70236682, 01049980, 01050012, 01053396, 01049998, 70341003, 00861765, 70216429, 01052554, 70180773.

The site survey area and surrounding land use is shown on the attached Figure 2, and a detailed site plan showing the tidal inlet, channel and lagoons is presented on Figure 3 (Appendix B). The coordinates for the site are:

Latitude : 46.239946°

Longitude: -64.513085°

Easting: 383346.37 m E

Northing: 5121820.31 m N

2.5 Siting Considerations:

GENERAL SITE CONSIDERATIONS

It is proposed that dredging take place outside of the tourism season, as well as outside of the migratory/nesting bird season as per the *Migratory Birds Convention Act* (MBCA). Phase 1 of

the dredging, which includes the inlet at the western end of the channel, may take place during nesting season, as there is less favorable habitat in the immediately surrounding area, however an ornithologist would be onsite prior to and during work to identify potential nest and ensure proposed mitigation measures are effective.

Dredge techniques that minimize impacts to the surrounding environment will be implemented (See section 2.7, below).

Mitigative measures will be put in place to protect the wetland while dredging, and to ensure the sediments are properly stored until their removal offsite to an approved disposal facility. If any archaeologically significant artifacts are uncovered during dredging activities, all work will stop and an archaeologist will be brought on site.

WETLANDS AND WATERCOURSES

As shown on Figure 4 in Appendix B, the proposed dredge site is located within a PSW (salt marsh). Englobe ground truthed and delineated its boundaries and the wetland will be discussed further in Section 3.0. The proposed EIA for this project will include a wetland monitoring program that will be executed on an annual basis if the proposed maintenance dredging of the inlet at the western end of the channel is added to the current existing dredge and beach nourishment program.

Disturbance to wetland itself will be limited to ~0.4 hectares within the lagoon at the eastern end of the channel, if required. Dredging of the eastern lagoon is proposed only if dredging the inlet, channel and western lagoon does not adequately resolve the drainage issues. Dredging at the inlet at the western end will consist of widening the channel which will include minor infringement upon the wetland buffer, but is not expected to impact the wetland itself. All other dredging work will occur in the tidal inlet and lagoon(s) and consist only of deepening the existing channel. Dredged sand from the inlet at the western end will be used to replenish the onsite beach volleyball courts, while the remaining sediments will be stored in an onsite temporary containment cell, where the sediments will be held until sufficiently dry to be transported offsite for disposal at ECO360 in Moncton (for use as cover). Depending on the geotechnical suitability of the sediments, it is possible that some could also be used in the construction of a proposed roadway south of the volleyball courts and north of the delineated wetland.

Watercourse and Wetland Alteration (WAWA) Permits will be obtained for such work and any conditions will be adhered to during the dredging process. The dredging will likely be completed by an amphibious boat and floating pipes to avoid impacting the PSW. However, it is important to note that the width of the channel will only be altered at the mouth of the inlet, which is currently narrowing due to migrating sand.

2.6 Physical Components and Dimensions of the Project:

Figure 3 (Appendix B) also shows the overall location of the various components of Parlee Beach Provincial Park and the tidal inlet and lagoon site.

2.7 Dredging Details:

The proposed dredging of the tidal inlet and lagoon has gone through considerable assessment and evaluation. The proposed project has also gone through careful planning in order to

implement it in the most efficient and appropriate manner, and in a way that ensures that potential impacts to the PSW are mitigated, and that the dredging activities will improve the overall function of the tidal inlet and lagoon by increasing tidal fluctuations. A bathymetric survey of the project area was completed, the data from this survey was included in the hydrodynamic evaluation of the inlet and lagoons which is present in Appendix E.

Some of the information presented previously in this Registration Document has described certain aspects of the dredging process.

A phased scheduled is proposed for the initial dredging, which includes dredging the tidal inlet to an elevation of 0.3 m (Mean Sea Level (MSL)), and a width of 8 m and dredging the inner and outer lagoons as well as select locations throughout the channel (high points) to an elevation of 0.3 m. No additional widening (beyond the inlet) of the channel or lagoons is proposed. The proposed phasing is outlined below.

The first two phases of the work will include the tidal inlet to the pedestrian bridge located near the middle of the channel and will be conducted via amphibious boat. This dredging technique will use an excavator arm equipped with a pump, which pumps the dredged material through floating pipes which will minimize any impact on the surrounding environment. Select high spots in the remainder of the channel, from the pedestrian bridge to the culvert (road), and the inner lagoon will be dredged using a land-based method, with a long reach excavator and extended boom.

The sandy dredged material from the tidal inlet (Phase 1) will be placed in the beach volleyball court at Parlee Beach Provincial Park. A temporary containment cell (approximately 20m x 20m) will be constructed north of the outer lagoon to hold the remaining dredged sediment until sufficiently dried and then transported offsite to ECO360, where it will be used for cover material on their cells. A gravel roadway to the containment cell from the western most parking lots will also be required and will become a permanent feature to better facilitate access to the existing maintenance dredge location at the western end of the beach. The proposed alignment immediately south of the volleyball courts and north of the delineated wetland, within the PSW buffer. Locations of the containment cell and roadway are outlined on Figure 5.

It is proposed to complete the proposed initial dredging of the tidal inlet, lagoon and channel in Phases in order to have manageable quantities of dredged sediments in the containment cell at a time and to save on costs. The proposed Phases are shown on Figure 5 and are as follows:

- Phase 1: Tidal inlet and a sandy portion of the channel (approximately 350 m east of the inlet). The inlet will be widened to a width of 8m and both the inlet and the western end of the channel will be dredged to a depth of 0.3m (MSL) with a maximum dredge depth of approximately 0.4-0.5m below current top of sediment. Total volume of sediments to be displaced during Phase 1 is approximately 1120m^3. Dredging is to be completed via amphibious boat and take place as soon as possible to provide drainage relief to the channel and lagoons.
- Phase 2: Outer Lagoon (western lagoon) and high points within the channel. Both the lagoon and channel will be dredge to 0.3m (MSL) with the majority of the dredge depth being approximately 0.3-0.4m below current top of sediment and approximately 1100m^3 of sediments being displaced. The lagoon will be dredged via amphibious boat and the channel will be dredged via a combination of amphibious boat and land-based excavator. The construction of the containment cell, roadway to the containment cell and Phase 2 dredging is tentatively scheduled for late fall 2022.

- Phase 3: Inner lagoon. Dredging the inner lagoon will include the loss of 0.4 hectares of wetland within the lagoon but will only be carried out if Phases 1 and 2 do not provide sufficient drainage improvements. If required, the dredging will be conducted via land-based excavator and is anticipated to displaced approximate 2200m^3 of sediments. Phase 3 is tentatively scheduled for fall of 2023/winter of 2024.

Following the initial Phases of the dredging program, it is proposed that dredging the tidal inlet be added to the ongoing maintenance dredging/beach nourishment program that exists north of the inlet. The tidal inlet is more prone to sedimentation due to the light sandy substrates that accumulate here. The site will be evaluated prior to any future dredging to ensure it is required to maintain efficient tidal flushing of the site, and sediment samples will be collected for physiochemical characterization to ensure proper disposal locations.

At the tidal inlet and within the outer lagoon, sediment depths have been measured at depths greater than +0.7m MSL. Based on the Shediac Bay water level data, the water level at Parlee exceeds +0.7m MSL approximately only 25% of the time, indicating that 75% of the time, tidal waters cannot enter or exit the channel. The target dredge depth of +0.3m MSL will create a scenario where water levels are above sediment depths approximately 70% of the time.

This program will benefit the site by improving water and sediment quality within the tidal inlet, lagoons and channel and reducing flooding in the parking lots by increasing retention capacity.

The following equipment is anticipated to be used for the project procedures:

- Dredging: Amphibious boat for pump dredging, long reach excavator with extended boom, dump truck (for transport to disposal facility).
- Temporary containment cell: excavator, low-permeability materials (clay, surge).

Potential sources of pollutants during the dredging period are anticipated to include:

- Exhaust and other emissions from construction equipment.
- Noise from construction equipment.
- Increase in turbidity and suspended sediments during dredge activities.
- Runoff and silt from the temporary containment cell during wet weather events.
- Petroleum hydrocarbons from possible leaks, spills or accidents from construction equipment and vehicles.
- Imported materials will include the materials required to construct the temporary containment cell, only clean clay and rock will be used. No other imported materials will be required for the proposed project.

2.8 Future Monitoring:

2.8.1 Wetland Monitoring

Based on the proposed project activities, dredging and the construction of a gravel roadway will take place within 30 m of an existing coastal marsh wetland. NBDELG requires preparation and implementation of a monitoring plan to assess the PSW that exists at the site prior to, during and following the proposed dredging activities within the tidal inlet at the Parlee Beach Provincial Park. The main purpose of this monitoring is to:

- establish a baseline of conditions, extent and functionality of the wetlands;

- detect change; and
- characterize trends over time.

New Brunswick uses WESP-AC for functional assessments.

An initial functionality assessment was completed in the summer of 2021 and will serve as the baseline for future monitoring. As the proposed dredging is proposed to occur in phases over the next several years, annual wetland monitoring will be required at a minimum for the duration of the program, and for at least five years following final dredging activities. The wetland delineation report and initial functional assessment is provided in Appendix D.

On this basis, we propose that a simplified monitoring program be implemented in the undisturbed areas of the wetland to document if the dredging activities affect the hydrology of the wetland. The Monitoring Plan will consist of the following:

- Water Levels: 4 piezometers will be manually installed at the locations identified in the attached figure (Figure 4). We will install continuous water level recorders in the piezometer. Water levels will be collected pre-dredging, during dredging, and after dredging annually over a 5-year monitoring period and the data will be assessed for any significant changes from baseline conditions (i.e. water level trends over time).
- Assessment: 4 vegetation plots (2m x 2m) will be created in the wetland, near the piezometer locations. Baseline and post dredging conditions will be documented by a combination of vegetation survey at the plot and photographic records. Vegetation species and percent cover will be recorded. Visual observation of any occurrences of rare or invasive species, as well as damage both natural and anthropogenic in nature to vegetation within the site, will be documented. The border will also be transverse yearly to document any changes.
- Sediment monitoring will also be conducted within the tidal inlet to monitor sediment quality following the completion of the initial phases of dredging activities (i.e. once all locations within the inlet and lagoons have been dredged at least once). Samples will be collected at 1, 3 and 5-year intervals (following all three Phases of dredging) and will be analyzed for select chemical parameters and compared to the results of sediment sampling conducted in August, 2021. The 2021 sediment sampling results are provided in Appendix C.
- Annual salinity readings will be collected from the 4 piezometers.
- Reporting: Monitoring reports complete with photographs will be submitted to NBDELG for the baseline event, and at 1, 3 and 5-year intervals over a 5-year monitoring period.

These monitoring locations are shown in Figure 4. Water level data will be collected continuously, the field monitoring will be conducted by a certified wetland specialist during the recognized wetland "season", typically between June 1st through September 30 h.

The WESP-AC assessments and monitoring reports will be submitted to the Source and Surface Water Management Branch, NBDELG for provincial records, review, and a potential audit and will conform to the requirements outlined by WESP-AC.

2.8.2 Future Dredging

As regular maintenance dredging of the western end of the inlet will be required to maintain the opening to the channel, additional sediment characterization will be completed prior to future dredging to determine suitable disposal options.

2.9 Project-Related Documents

The main documents that relate to this project (are appended) and include:

(a) Marine Sediment Sampling Program, Tidal Inlet Dredging and Environmental Impact Assessment. Parlee Beach Provincial Park, Pointe-du-Chêne, New Brunswick. Prepared by Englobe Corp. (Englobe), 215 Horseman Road, Unit 4, Moncton, NB E1E 0A2. Appendix C.

(b) Species at Risk, Wetland Delineation and Wetland Functional Assessment, Tidal Inlet Dredging and Environmental Impact Assessment. Parlee Beach Provincial Park, Pointe-du-Chêne, New Brunswick. Prepared by Englobe Corp. (Englobe), 215 Horseman Road, Unit 4, Moncton, NB E1E 0A2. Appendix D.

(c) Parlee Beach Lagoon Hydrodynamics. Prepared by Consultants Ropars Inc., 3643 Chemin Saint-Louis, Quebec G1W 1T2. Appendix E.

(d) Preliminary Investigation Final Technical Report, Parlee Beach Dredging, Westmorland County. Preliminary Field Examination Completed Under Archaeological Field Research Permit Number 2021 NB 88. Prepared by Stratus Consulting Inc., 115-527 Dundonald Street, Fredericton, NB E3B 1X5. Appendix F.

(e) Underwater Benthic Habitat Assessment, Parlee Beach Provincial Park, Pointe-du-Chêne, New Brunswick. Prepared by Englobe Corp. (Englobe), 215 Horseman Road, Unit 4, Moncton, NB E1E 0A2. Appendix G.

It does not appear that the existing Parlee Beach Provincial Park was subject to any prior EIA assessments.

3 Description of the Existing Environment

3.1 Physical and Natural Features

Site Topography and General Surface Drainage Regime:

The location of the proposed dredge program is shown as the proposed project site on Figure 3 (Appendix B). The entire project will be located within the limits of the tidal inlet, channel and lagoon, that opens into the Shediac Bay, with the surrounding lands owned by the NB Department of THC. No additional land outside the tidal inlet and lagoon will be disturbed during the dredge program. A rock retaining wall is located near the channel inlet. Dredging activities will be north of the retaining wall and are not anticipated to undermine or otherwise impact the integrity of the structure. However, if any incidental disturbance to the wall occurs, it will be restored.

As part of the Species at Risk, Wetland Delineation and Wetland Functional Assessment (Appendix D), wetland delineation and habitat assessments were carried out which included site reconnaissance to ground truth the boundaries of the PSW in accordance with NBDELG's *Protocol for Wetland Delineation in New Brunswick (May 2020)*. Numerous test pits were advanced to confirm soil and hydrology conditions, the locations of these test pits are presented on Figure 4 of Appendix B, Wetland Delineation forms were produced to represent the

conditions observed at these locations and can be found in the report mentioned above (Appendix D).

These test pits indicate that the saturated soils, sparsely vegetated concave surfaces and aquatic fauna were the primary indicators of wetland hydrology, manual auger probes identified sand (10 YR 5/2) in the top 30 cm with redox features that satisfied the hydric soil indicator, indicating a depleted matrix. The dominant hydrophytic vegetation observed includes herb stratum comprising of *Spartina alterniflora* (50% coverage) and *Solidago sempervirens* (30% coverage). The upland portion of the site lacked any hydrology indicators and comprised of sand (10 YR 4/4) in the top 30 cm which does not satisfy the hydric soil indicator. The vegetation was determined to be non-hydrophytic and was dominated by Grass sp. (60% coverage) and Trifolium repens (10% coverage). Based on the obvious change in field conditions (hydrology and vegetation changes), Englobe delineated the coastal marsh wetland and acquired the boundaries with a hand-held GPS.

The sediments within the tidal inlet and lagoon were characterized as slightly gravelly sand and slightly gravely muddy sand. The bedrock at the site is sandstone and the surficial geology consists of older tidal marshes under the contemporary beach sand, indicating that the strandline of the Northumberland Strait has transgressed.

The wetland receives water primarily from the tidal inlet and lagoon as well as from precipitation and surface drainage. The source of water to this wetland is mainly brackish tidal water from the Shediac Bay. Precipitation and runoff from the surrounding terrain also contribute but are not considered significant sources. The wetland and the tidal inlet and lagoon discharge into the Shediac Bay.

3.2 Cultural Features

Stratis Consulting Inc. (“Stratis”) completed a Preliminary Investigation (i.e. Documentary Research and Preliminary Field Examination) for the project area, including the proposed dredge areas. The Documentary Research included a request for information to Archaeology and Heritage Branch (AHB) of the Department of THC and other activities. The Preliminary Field Examination consisted of a walkover and flyover visual survey, conducted by Stratis under an Archaeological Field Research Permit (AFRP 2021 NB 76). The Field Examination was undertaken at low tide so Stratis could see as much dry land as possible in the project area. Some parts of the tidal inlet and lagoon were very shallow and the submerged bottom could be viewed during the Preliminary Field Examination.

The Investigation revealed that the area around Shediac has been inhabited by Indigenous people for millennia. The British Crown granted land in the project area during the first third of the 19th century. This included land to the Madras School and glebe to St. Martin in the Woods. The church is not in the project area. Research did not determine what activities the church or school undertook in the Project Area. EuroCanadian settlers were well established extensively in the Shediac area by the mid 1850s, with earlier settlement. A railway from Saint John to Shediac was completed by 1860, and what is now Parlee Beach Provincial Park was a recreational destination since at least that time. The area was previously known as Belliveau Beach and Gould’s Beach, after families that ran pavilions and canteens on the area that is now the provincial park.

An archaeological object, a stone tool, was found at Parlee Beach in the 1980s at a location that is over 200 m outside the project area. Another archaeological object find location is along

the southern bank of the tidal inlet near its outfall. This location yielded late 19th and early 20th century refuse. No archaeological objects were observed or collected in the Project Area during the Preliminary Investigation.

Based on the Documentary Research and Preliminary Field Examination (visual surveys), the dredging areas are mostly consistent with areas of low archaeological potential.

Dredging is anticipated to take place in the tidal inlet channel in areas that have infilled since the 20th century. One exception of elevated archaeological potential any area within 100 m of the 19th century refuse, which has been registered by THC as Borden Number CbDd-24, which is a national cataloging system. The refuse appears to have been collected from the south bank near Dredging Area A, near the western end of the project area. It is recommended that ground disturbance atop the bank in this area be avoided.

Proceeding to Field Evaluation (e.g., archaeological shovel testing) is not supported by the findings of the Preliminary Investigation. That is, shovel testing is not typically done in wetlands or in tidal inlet channels. Stratis made no determination in respect of the utility of monitoring dredging since monitoring for the Project would not be allowed by THC *Guidelines*.

The potential for the Project to accidentally encounter unknown archaeological sites or archaeological objects is considered low. There is potential to encounter additional 19th century refuse near CbDd024; however archaeological monitoring in 2019 along St. John Street, found nothing. As with any project, anywhere in New Brunswick, if archaeological objects are accidentally encountered, notification of THC is required by law. THC's statutory and policy requirements should be followed during the project.

No additional archaeological objects or features were found in the areas that were visually surveyed during this Preliminary Investigation. With the Preliminary Field Examination completed, the work under AFRP 2021 NB 88 is concluded.

Considering the available evidence, the anticipated activity areas for dredging are mostly consistent with areas of low archaeological potential with the exception of the area near CbDd-24. That is, most of the dredging will take place in the tidal inlet channel and remove material that has washed in as the dune complex north of Dredging Area A and B formed during the latter part of the 20th century. The project area is mostly wetland, which is considered low archaeological potential by THC. The southern bank of the tidal inlet, near CbDd-24 may contain additional 19th and 20th century refuse and it is recommended that the top of bank within 100 m of CbDd-24 be avoided.

The Preliminary Investigation did not identify new archaeological features, sites, or objects in the project areas. The potential to encounter unknown heritage resources during construction is considered low. Archaeological objects could be accidentally encountered if ground is disturbed near CbDd-24, so this area is recommended for avoidance. The channel itself cannot be avoided since the Project will dredge in this area. Since archaeological testing of the channel is not practical or perhaps not possible, archaeological monitoring during dredging cannot be recommended. This is because Guidelines do not allow monitoring unless shovel testing has been undertaken first.

Besides the channel near CbDd-24, where 19th century refuse may have eroded in or been placed in the past, it is not anticipated that areas of elevated archaeological potential will be disturbed by the Project. Proceeding to Field Evaluation (e.g., shovel testing) is not supported by the findings of the Preliminary Investigation since the banks of the tidal inlet, which could be

considered to have elevated archaeological potential, are not anticipated to be disturbed by project-related activities.

A Site Alteration Permit, related to CbDd-24 was submitted to the THC and has been approved. The approved Permit is presented in Appendix F. All conditions of the permit will be adhered to during the project.

Parlee Beach Provincial Park is a recreational site that attracts tourism. The beach frequented by recreational users is located approximately 120m north of the project area, the asphalt parking lot used by tourists and beach goers is located adjacent to the project area, with commercial tourism buildings located approximately 30m north of the project area.

3.3 Existing and Historic Land Uses

As mentioned above, a railway from Saint John to Shediac was completed by 1860, and what is now Parlee Beach Provincial Park was a recreational destination since at least that time. The area was previously known as Belliveau Beach and Gould's Beach, after families that ran pavilions and canteens on the area that is now the provincial park.

The Archaeological assessment conducted by Stratis revealed the dredging area is within crown property. Surrounding areas are a mix of a publicly owned provincial park and private property. Some past land use practices are known from aerial photographs and from Zelazny (2007 [2003]). In terms of Indigenous use, Zelazny states the Ecodistrict is part of the traditional Mi'kmaq territory of Sigenigteoag, in which "many important villages or burial grounds were located at the mouths of rivers such as the Scoudouc, Buctouche, Richibucto, Black, Aldouin, and on Shediac Island" (Zelazny 2007[2003]:301). Zelazny further indicates that the Northumberland coastline was one of the earliest parts of New Brunswick settled by Euro-Canadians, with nearby Shediac well established by the 1850s. Further, Zelazny states that a railway was completed between Saint John and Shediac in 1860. All possible past land use practices are not known. Twentieth century aerial photographs indicate that the Project Area had been a beach, marsh, and wetland since the 1930s. The sand dunes to the north of Dredging Areas A and B formed in the later 20th century. In general, the area has been a recreational attraction for over 100 years.

Aerial photography of the site from 1953 shows the tidal inlet, channel and inner lagoon are present, the outer lagoon is absent and Parlee Beach is much shorter than present day along the west side of the beach. The 1976 aerial photograph shows a new road that crosses the inner lagoon, the tidal inlet does not look as efficient as it did in 1953. The 2001 configuration of the beach shows a westward extension of the beach and the development of parking areas. In 2012 and 2017, the westward extension of the beach increased, and the outer lagoon is present. Based on the 2019 and 2021 arial imagery, the tidal inlet is being squeezed between a stone embankment along the south and the progressing sand dune along the north side of the inlet.

The land in, and adjacent to, the dredging area has been modified by erosional contact, tidal water flow, infilling, extensive construction, and other activities. The sand dunes to the north of Dredging Area A have formed since the mid-to late-20th century. The tidal inlet has silted or otherwise filled in during that time, since the western end of the Project Area was formerly open, albeit probably shallow, water. The land within the provincial park has been modified through construction and infilling since the 1980s. Prior to that, other recreational businesses were present in the park area, but outside the dredging locations (Stratis, 2021).

As noted, this project will improve the efficiency of the existing inlet and lagoon, and the project activities will not negatively impact the surrounding land use. Dredging will increase tidal fluctuations within the inlet and lagoon, improving the water and sediment quality. Figure 2 (Appendix B) shows that adjacent properties are residential in nature to the south and east, with commercial and recreational buildings associated with Parlee Beach Provincial Park to the north. Based on the archaeological assessment conducted at the site, there are no known previous developments on this site that may have been of cultural or historic interest. However, if during dredging activities any artifacts are uncovered, project activities will halt and an archaeologist will be brought on site.

Watercourses, Wetlands and Species at Risk (SAR):

As noted in the previous Sections, the proposed project site is within a tidal inlet and lagoon and is bound by a PSW in all directions.

A formal wetland review/delineation completed in 2021 and a report summarizing the findings are included in Species at Risk, Wetland Delineation and Wetland Functional Assessment report in Appendix D.

A background investigation was conducted to determine previous records of species at risk (SAR) in the project area. As part of this investigation, a request was made to the ACCDC who provided a report of the flora and fauna in the area.

The ACCDC report was queried for all rare fauna and flora identified within 5 km radius of the project site. For the purposes of this assessment, SAR are defined as only those species which meet one or more of the following criteria:

- Species listed as 'Endangered', 'Threatened', 'Vulnerable' or 'Special Concern' under the *Federal Species at Risk Act* (SARA), *New Brunswick Species at Risk Act* (NBSARA) or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).
- Species provincially ranked as "S1" (Critically Imperiled) or "S2" (Imperiled).

In addition to the above-mentioned protections, protection for individual and populations of birds and their nests against harm or destruction is also provided under the *Migratory Birds Convention Act* (MBCA).

A SAR field survey was conducted between July 16 to 18th, 2021, at which time the site was visually inspected for unique biophysical and terrestrial features, and surveys conducted for wildlife, vegetation and migratory birds in the project area.

Five (5) vascular flora plants were listed within a 5km radius of the subject property including one (1) species listed as 'Threatened' under COSEWIC. Thirty-seven (37) vertebrate fauna were listed within a 5km radius of the subject property including thirteen (13) species listed as 'Endangered', 'Threatened' or 'Special Concern' under COSEWIC, SARA, or NB SARA.

At the time of the field survey on July 16-18, 2021, no SAR or Migratory Birds were observed in the project area and the only at-risk species observed was a transient bald eagle seen flying at a distance. No other at-risk species or critical habitat was observed. Field observations revealed that the site is composed of a tidal inlet, lagoon and coastal marsh wetland. Mitigation measures will be implemented to ensure that disturbance to migratory birds does not occur during the project.

Results of the assessment is included in the Species at Risk Assessment, this Species at Risk, Wetland Delineation and Wetland Functional Assessment is provided in Appendix D.

The wetland will require a WAWA permit for dredge activities.

Protected Watersheds and Wellfields:

The site is located within the Shediac Bay Watershed. Project activities are not anticipated to affect the watershed.

There are no protected watersheds or wellfields within the project area. Existing houses have their own well for potable water. Project activities will be limited to the tidal inlet and lagoon; therefore the work is not anticipated to impact nearby potable water sources.

Significant Natural Areas and Managed Areas

There is one (1) Environmentally Sensitive Area (ESA) identified by ACCDC within 5 km of the Site.

- Shediac Island

Shediac Island is located approximately 1 kilometer (km) offshore in the Shediac Bay, located at the mouth of the Shediac River. The Island is classified as an ESA because it has supported two Great Blue Heron colonies since at least 1974. The northern colony was comprised of 38 nests in 1981; and the southern colony was comprised of 105 Great Blue Heron nests in 1984.

The project activities will not impact Shediac Island due to the scope of the project, and the distance of the island from the project area.

There are two (2) managed areas identified by ACCDC as within 5 km of the site.

- Parlee Beach Provincial Park
- Ducks Unlimited Canada Conservation Lands

Project activities will take place within the Parlee Beach Provincial Park managed area. The Ducks Unlimited Canada Conservation Lands are located approximately 3.8 km southwest of the site; therefore the project activities will not impact this managed area. No additional information was reported on the ACCDC report, however, these areas are known to attract birds.

These areas in relation to the site can be seen on Figure 6, Appendix B.

4 Summary of Environmental Impacts and Mitigation

The primary purpose of this project is to enhance the tidal flushing and drainage within the tidal inlet and lagoon to improve the water and sediment quality and to reduce the flooding that is occurring in the parking lots at the eastern end of the lagoon. It is also necessary to improve the odours coming from the lagoon for tourists and local residents in the area, and to eliminate possible human and ecological health concerns with the water and sediment quality.

This section will summarize possible impacts of the proposed work, and Section 5.0 will describe the measures that will be applied to eliminate or mitigate impacts. The attribute headings as contained in Appendix "B" of the EIA Guide will be used here.

In order to expedite the review of information presented in this Registration Document, the proposed mitigation measures for each of the possible impacts described below will be indicated immediately following.

4.1 Air Quality

- Dust: Excavation activities during the project have the potential for short term reduction in air quality due to dust generated during excavation work and an increase in emissions from the use of heavy machinery (excavators, trucks, etc.).
- Mitigation: The generation of dust during dredge activities is unlikely, however if dust is generated during project activities dust suppression by the application of water will be employed when required. The project authority shall determine locations where water is to be applied, the amount of water to be applied, and the times at which it shall be applied. Waste oil will not to be used for dust control under any circumstances.
- Odours: Excavation activities could generate some short-term odours (i.e. diesel exhaust), and the dredged sediment could generate organic odours.
- Mitigation: There are several residential properties within 150 m of the site (Figure 2, Appendix B), but any odours from truck or equipment exhaust, etc., will be controlled within working hours. Dredging activities will occur outside of the busy tourism season, therefore it is unlikely that Parlee Beach Provincial Park will be occupied by tourists or recreational users during project activities. Any sediments temporarily stored onsite will be placed in a containment cell and capped, reducing the likelihood of odours. These residential dwellings and the Park itself are the only "sensitive land uses" in the area.

  Regular dredging of the tidal inlet and lagoon will allow regular tidal flushing, reducing stagnant water and ultimately reducing odours that come from the tidal inlet and lagoon.

None of the other items under this category are applicable to this project.

4.2 Biology and Ecology (Aquatic)

- Inter-tidal marine habitat: Dredging the sediments within the tidal inlet and lagoon may cause fines and organic debris to enter nearby aquatic environments (Shediac Bay). Spills or leaks from project equipment/machinery and runoff water from the temporary containment cell could negatively impact marine surface water.
- Wetland habitat: Wetlands are present surrounding the inlet, channel and lagoons. The dredging plan has been designed to avoid wetland, with the except of an area within the inner lagoon. However, transporting sediments to the volleyball court and containment cell. And construction of a roadway along the northern boundary of the wetland, within the buffer could release sediments into the wetland. Spills or leaks from project equipment/machinery and runoff water from the temporary containment cell could negatively impact the coastal marsh.
- Mitigation: The proposed dredging activities will likely have an overall positive impact on the surface water quality as natural flushing of the inlet and lagoon will improve sediment and water quality and encourage increased plant and animal biodiversity. Activities will be

completed in such a way as to minimize fines and organic debris that may enter nearby aquatic environments.

A temporary increase in sedimentation is to be expected during dredging activities. Specifically, there is potential for increased turbidity and suspended solids to reach the Shediac Bay near the western end of the beach. An underwater benthic habitat survey was completed in the existing dredged zone in summer of 2021 (attached in Appendix G) which indicated no sensitive species or habitats (i.e. eel grass) are present. Furthermore, this subject area of the Bay is dredged on a regular basis, limiting the potential for establish communities. Silt curtains will be installed, where possible and as necessary, to reduce the transport of suspended sediments from the inlet/channel to the bay.

The temporary containment cell will be constructed with low-permeability materials (i.e. clay) to reduce potential for leaching and runoff originating from the cell. Furthermore, the area downgradient of the cell will be visually monitored, and if evidence of runoff is observed, additional protection including silt fencing, etc. will be installed. The cell will be constructed outside of the identified wetland and buffer.

The design for the roadway has not been completed but is anticipated to be constructed of imported surge rock and gravels. Appropriate erosion and sediment control devices (silt fences, etc.) will be installed to prevent sediment runoff Furthermore, the wetland will be visually monitored during construction and work will stop if sedimentation/runoff observed.

Phases 1 and 2 are not expected to adversely impact the adjacent wetland habitat. Phase 3 includes dredging approximately 0.40 hectares of wetland habitat within the inner lagoon at the eastern end of the channel. A wetland compensation plan has not yet been developed, but the THC accepts that a compensation at a 2:1 ratio will be required for any permanently lost habitat. Compensation options will be further explored in cooperation with DELG prior to any disturbance of the wetland (Phase 3 is likely to be conducted in fall/winter of 2023-24). Furthermore, a wetland monitoring plan will be implemented to continuously monitor the impacts of the dredging program (and gravel roadway construction) on the wetland habitat. Any additional loss of habitat or decreased functionality identified will be offset with additional compensation and the dredging plan will be modified (where possible) to reduce any further losses.

Dredged sediments will be pumped to the volleyball court and containment cell via floating pipes, reducing the potential for sedimentation within the wetland, and the wetland will be visually monitored during the work for leaks/releases from the pipes.

Weather conditions are to be assessed on a daily basis to determine the potential risk of weather on the project. Work will be scheduled to avoid periods of heavy precipitation.

Machinery will be checked for leakage of lubricants and fuel prior to beginning work each day. Basic petroleum spill clean-up equipment will be kept on site. All spills or leaks will be promptly contained, cleaned up, and reported to the 24-Hour Environmental Emergencies Report System (1-800-565-1633).

Hazardous materials (e.g., fuels, lubricants, hydraulic oil) and wastes (e.g., waste oil) will be managed so as to minimize the risk of chronic and/or accidental releases. A designated storage area for hazardous materials will be identified, and will be at least 30m from the watercourse and wetland.

A site specific refueling plan will be developed by the contracted dredgers prior beginning work. Refueling will occur in a manor to minimize potential impacts to the surrounding environment and spill kits will be kept onsite and on the amphibious boat.

- Spawning, feeding and breeding sites: Potential for disturbance of birds and their habitats. No other spawning, feeding or breeding areas are known within the site boundaries.
- Species at Risk and other species of conservation concern: Aquatic SAR reported for the site and surrounding area include the following endangered aquatic species, the Blue Whale, the Northern Atlantic Right Whale, Leatherback Sea Turtle and the White Shark. At the time of the field survey on July 16-18, 2021, no SAR or nesting or foraging Migratory Birds were observed in the project area and the only at-risk species observed was a transient bald eagle seen flying at a distance. No other at-risk species or critical habitat was observed. Mitigation measures to ensure no disturbance to any migratory birds are outlined below (Section 4.3)
- Populations/communities of aquatic species (including flora, fish, birds, marine mammals, etc.): The habitat within the tidal inlet and lagoon is limited, no fish species were observed during the habitat assessment and the dominant hydrophytic vegetation observed includes herb stratum compromising of Spartina alterniflora (50% coverage) and Solidago sempervirens (30% coverage). However, the mitigative measures below will be implemented regardless in the event that aquatic species are encountered during project activities.
- Mitigation: The proposed dredging activities will likely have a positive impact on the surface water quality as natural flushing of the lagoon occurs, which can thus increase plant and animal biodiversity.

  Dredging activities will be limited to the time between dawn and dusk to avoid using artificial lighting which can potentially affect bird and bat use of nearby habitats (Canada, 2017). If construction timing restrictions are not possible, Parks Canada National Best Management Practices for Migratory Birds will be followed.
- Cultural fisheries: The waters of the Shediac Bay have been used for traditional fishing. Based on Traditional Fisheries Knowledge (TFK 1997) there is a traditional fishing area for razor clam located to the west of Parlee Beach. The current project will include silt fencing during dredge activities within the tidal inlet and lagoon, therefore potential impacts to this known traditional fisheries area are unlikely to occur and it is our understanding that the Province of New Brunswick will make a decision during this EIA review process to determine if there is a duty to consult.
- Mitigation:

  During the SAR and habitat assessment at the site, no fish species were observed within the tidal inlet and lagoon, vegetation within the tidal inlet and lagoon was limited. The wetland will be monitored during and following the initial dredge. None of the other items under this category are applicable to this project.

4.3 Biology and Ecology (Terrestrial)

- Vegetative cover: The existing terrestrial vegetation (outside of the wetland boundaries) on the site was determined to be non-hydrophytic and was dominated by Grass sp. (60% coverage) and Trifolium repens (10% coverage). There is no timber growth on this Site.
- Mitigation: All work will be conducted within the tidal inlet, lagoon and channel, dredged material will be transported to the containment cell via floating pipes, this will minimize any impacts to the wetland and vegetation. Any vegetative cover disturbed during project activities will be replaced as part of the scope of the work.

- Migration routes/movement corridors: At the time of the field survey on July 16-18, 2021, no Migratory Birds were observed in the project area.
- Temporary (seasonal) habitat: Birds may occasionally occur on or near the site during migratory/bird season.
- Nesting, breeding, and feeding sites: At the time of the field survey on July 16-18, 2021, no nesting, breeding or feeding sites were observed in the project area and the only at-risk species observed was a transient bald eagle seen flying at a distance.
- Species at Risk and other species of conservation concern: The ACCDC returned a list of SAR reported within 5 km of the Parlee Beach Provincial Park. Five (5) vascular flora plants were listed within a 5km radius of the subject property including one (1) species listed as 'Threatened' under COSEWIC and Thirty-seven (37) vertebrate fauna were listed within a 5km radius of the subject property including thirteen (13) species listed as 'Endangered', 'Threatened' or 'Special Concern' under COSEWIC, SARA, or NB SARA. At the time of the field survey on July 16-18, 2021, no SAR or Migratory Birds were observed in the project area and the only at-risk species observed was a transient bald eagle seen flying at a distance. No other at-risk species or critical habitat was observed.
- Mitigation: All work is to be conducted in accordance with the *Migratory Birds Convention Act*, which outlines that no migratory bird nests or eggs will be moved or obstructed during project activities. Phase 1 of the dredging, at the western end of the channel may take place during nesting season, but there is less favorable habitat in the immediately surrounding area. An ornithologist would be onsite prior to and during Phase 1 work to identify potential nesting sites and ensure proposed mitigation measures are effective. Phases 2 and 3 will take place outside of nesting season.

  If bird breeding activity is identified during the dredging activities, work will stop immediately.

  All machinery should be well muffled. Contractors should avoid any sharp or loud noises (e.g., not blow horns or whistles). If necessary, trucks may be required to avoid the use of "hammer" braking along specific sections of the site, while radio communications should replace whistle blasts and horns.

  Dredging activities will be limited to the time between dawn and dusk to avoid using artificial lighting which can potentially affect bird and bat use of nearby habitats (Canada, 2017). If construction timing restrictions are not possible, Parks Canada National Best Management Practices for Migratory Birds will be followed.

  The temporary containment cell will be covered so that birds do not nest in the stockpiled dredge materials.

  Frequent surveys should be completed by a qualified environmental professional as breeding periods vary from species to species.

  The harassment of wildlife, littering and feeding of wildlife on the property during project activities is prohibited. Waste materials will not to be buried on site. Any construction debris will be disposed of in a provincially approved manner. Wildlife habitat features will be protected by appropriate setback distances (or buffer zones) where required. Clearing and equipment use/storage/cleaning in undisturbed areas within and adjacent to the Project footprint will be avoided.
- None of the other items under this category are applicable to this project.

4.4 Physical (Climate/Atmospheric):

- Precipitation Patterns: Heavy precipitation during project activities could cause some silt runoff from the temporary containment cell and during project activities.
- Mitigation: Runoff protection including silt fencing will be placed and maintained during temporary containment (i.e. adding berms to the perimeter of the temporary containment cell and raising the berms on the sides near wetland).

  Weather conditions are to be assessed on a daily basis to determine the potential risk of weather on the project. Work is to be scheduled to avoid periods of heavy precipitation.
- Noise: Project activities will result in noise caused by the use of machinery (excavator/trucks).

  Mitigation: Noise events will be of short duration, and project activities will be scheduled to be done during daytime hours. All machinery should be well muffled. Contractors should avoid any sharp or loud noises (e.g., not blow horns or whistles). If necessary, trucks may be required to avoid the use of "hammer" braking along specific sections of the site, while radio communications should replace whistle blasts and horns.
- None of the other items under this category are applicable to this project.

4.5 Physical (Geology)

The geology of the area will not be impacted by this work. The tidal inlet will be widened and accumulated sediments (high points) within the channel and lagoon will be dredged, but no work will be conducted outside of the tidal inlet and lagoon.

During the wetland delineation numerous test pits were advanced to confirm soil and hydrology conditions. Manual auger probes were advanced throughout the wetland to assess the soil and hydrology. The auger probes identified sand (10YR 5/2) in the top 30 cm with redox features (10YR 5/6) which satisfied the hydric soil indicator, indicating a depleted matrix (F3).

4.6 Physical (Geomorphology)

- Topography: The inlet is connecting the Bay to the outer lagoon and the channel is connecting the outer and inner lagoon at the site. The topography of the dunes, channel bottom and lagoon bottom were studied as part of the Parlee Beach Lagoon Hydrodynamics report provided in Appendix E. The topography of the site will not be negatively impacted by project activities.
- Slopes: The land immediately surrounding the site slope toward the tidal inlet, lagoon and channel. The surrounding area slopes toward the Shediac Bay.
- Mitigation: Dredging the tidal inlet and lagoon will positively impact the topography of the site by increasing tidal fluctuations within the channel. The hydrodynamics study completed for the site evaluated the physical components of the site to ensure this project will not negatively impact the sites geomorphology.

4.7 Physical (Groundwater)

- Quality: the project will not negatively impact groundwater conditions or quality.

4.8 Physical (Surface Water)

- Surface water quality: Dredging the sediments within the tidal inlet and lagoon may cause fines and organic debris to enter nearby aquatic environments (Shediac Bay). Spills or leaks from project equipment/machinery and runoff water from the temporary containment cell could negatively impact the wetland. The protection of this wetland during project activities has already been noted.
- Mitigation: The proposed dredging activities will likely have a positive impact on the surface water quality as natural flushing of the lagoon occurs, which can thus increase plan and animal biodiversity.

  A temporary increase in sedimentation is to be expected during dredging activities. Specifically, there is potential for increased turbidity and suspended solids to reach the Shediac Bay near the western end the beach. An underwater benthic habitat survey was completed in the existing dredged zone in summer of 2021 (attached in Appendix G) which indicated no sensitive species or habitats (i.e. eel grass) are present. Furthermore, this subject area of the Bay is dredged on a regular basis, limiting the potential for establish communities. Silt curtains will be installed, where possible, to reduce the transport of suspended sediments to from the inlet/channel to the bay.
- None of the other criteria under this category will be negatively impacted by this project.

4.9 Valued Spaces/Locations:

- Archaeological sites: Based on the Stratis report and investigation, an archaeological object, a stone tool, was found at Parlee Beach in the 1980s at a location that is over 200 m outside the project area. Another archaeological object find location is along the southern bank of the tidal inlet near its outfall. This location yielded late 19th and early 20th century refuse. No archaeological objects were observed or collected in the Project Area during the Preliminary Investigation. Based on the Documentary Research and Preliminary Field Examination (visual surveys), the dredging areas are mostly consistent with areas of low archaeological potential. A Site Alteration Permit has been approved for the proposed project (Permit No. 2022SAP-08) and is provided in Appendix F. All conditions of the permit will be adhered to during the project.
- Areas of special local significance (spiritual, cultural, ecological): The site is located within a PSW. Measures to protect this wetland are presented in the previous sections above.
- Mitigation: All dredging personnel will be responsible for reporting any unusual materials unearthed during dredge activities to the construction supervisor and Englobe. In those situations where the find is believed to be an archaeological resource, project activities will immediately stop work in the vicinity of the find and the NB Department of THC will be notified. Grant Aylesworth PhD, 1-506-999-0151 from Stratis Consulting Inc. will be contacted. Work can only resume in the vicinity of the find when authorized by the NB Department of THC. In the event of the discovery of human remains or evidence of burials, the excavation work will immediately cease and the nearest law enforcement agency will be contacted immediately by the NB Department of THC or the construction supervisor.
- Parks and reserves: The site is located within the Parlee Beach Provincial Park.

- Visual character: Over time, the visual characteristics of the tidal inlet and lagoon will improve if regular dredging is approved.
- Mitigation: Proposed dredging activities are likely to have a positive impact on the wetland as natural tidal flushing of the lagoon occurs which can improve surface water quality and increase plant and animal biodiversity thus becoming more aesthetically pleasing. Dredging activities will occur outside of the busy tourist season, therefore it is unlikely that Parlee Beach Provincial Park will be occupied by tourists or recreational users during project activities.
- The proposed project will not negatively impact any of the other criteria listed under this category.

4.10 Community Structure (Socio-economic)

- Public health: A reduction of nuisance odours caused by decaying vegetation caught within the channel and lagoon(s) is anticipated to improve public health.

4.11 Community Structure (Physical and Functional)

- Land Use Compatibility: the proposed project is compatible since it is the same purpose as the current land use, with improved function of the tidal inlet and lagoon.
- Access to the site and other properties will not be impacted by the proposed project.

4.12 Lifestyle and Quality of Life

- Quality of life: The proposed project will have an overall beneficial impact on the quality of life for the residents of and visitors to the Parlee Beach Provincial Park and area by improving the water quality within the tidal inlet and lagoon. Furthermore, a reduction of nuisance odours caused by decaying vegetation caught within the channel and lagoon(s) is anticipated.
- Community Noise Levels: Project activities will result in noise caused by the use of machinery (excavator/trucks).
- Mitigation: Noise events will be of short duration, and project activities will be scheduled to be done during daytime hours.
- The proposed dredging activities will not restrict access to existing recreational opportunities at the site.
- The proposed project will not negatively impact the other criteria under this category.

4.13 ADDITIONAL ENVIRONMENTAL CONSIDERTATIONS

In addition, standard environmental mitigation measures will be included such as silt fencing and erosion control structures as required. Furthermore, a Monitoring Plan will be developed and implemented in the undisturbed areas of the wetland to document if the dredging activities will affect the hydrology of the wetland. Details of this monitoring plan are provided in the

Species at Risk, Wetland Delineation and Wetland Functional Assessment report provided in Appendix D.

5 Summary of Proposed Mitigation

Mitigation measures proposed for possible environmental impacts were included in Section 4.0 in order to more conveniently connect the relationship of mitigation with possible impacts.

6 Public and First Nation Involvement

Englobe and the NB Department of THC will plan a public meeting or meetings in the near future in order to inform the public on the proposed plans to dredge the tidal inlet and lagoon. This will be structured as an "Open House" type of meeting, which will be informal in nature. The meeting will be publicly advertised in advance to enable any interested parties to attend. The public advertisements and direct communication with specific groups, such as Community elected officials, First Nations and individuals will be done as required under Appendix "C" of the "Guide to Environmental Impact Assessment in New Brunswick". This meeting or meetings will be done by video conferencing. A record will be kept of inquiries and responses from this meeting.

A copy of the public advertisement will be provided to the Planning and Impact Evaluation Branch of the DELG to place on their web site.

The meeting will be attended by the NB Department of THC representatives and by personnel from Englobe that have carried out the studies which has resulted in this recommended work. The meeting will include video display of several scale drawings showing the location and scope of the proposed works. Digital copies of the "EIA Registration Document" will be made available at the meeting and will be provided in advance to the regional DELG office in Hampton. Residents will have the opportunity to ask questions and to express any concerns they may have about the project.

Following the meeting, and the expiration of the 25-day time period allowed for follow-up, a detailed summary report will be prepared and submitted to the NBDELG in accordance with the requirements of Appendix "C" of the Guide. This will be submitted no later than 60 days following the public meeting.

7 Approval of Undertaking

The following technical approvals are anticipated as being required for this project:

- Approval under the EIA Legislation from the NBDELG.
- Approval under DFO's Request for Review.
- Approval under THC for the Archaeological Site Alteration Permit (Permit No. 2022SAP-08)
- WAWA Permit from the NBDELG for the work within a PSW.

8 References

DFO. 1997. Traditional Fisheries Knowledge for the Southern Gulf of St. Lawrence.

Marine Sediment Sampling Program, Tidal Inlet Dredging and Environmental Impact Assessment. Parlee Beach Provincial Park, Pointe-du-Chêne, New Brunswick. Prepared by Englobe Corp. (Englobe), 215 Horseman Road, Unit 4, Moncton, NB E1E 0A2.

Parlee Beach Lagoon Hydrodynamics. Prepared by Consultants Ropars Inc., 3643 Chemin Saint-Louis, Quebec G1W 1T2.

Preliminary Investigation Final Technical Report, Parlee Beach Dredging, Westmorland County. Preliminary Field Examination Completed Under Archaeological Field Research Permit Number 2021 NB 88. Prepared by Stratus Consulting Inc., 115-527 Dundonald Street, Fredericton, NB E3B 1X5.

Species at Risk, Wetland Delineation and Wetland Functional Assessment, Tidal Inlet Dredging and Environmental Impact Assessment. Parlee Beach Provincial Park, Pointe-du-Chêne, New Brunswick. Prepared by Englobe Corp. (Englobe), 215 Horseman Road, Unit 4, Moncton, NB E1E 0A2.

Underwater Benthic Habitat Assessment, Parlee Beach Provincial Park, Pointe-du-Chêne, New Brunswick. Prepared by Englobe Corp. (Englobe), 215 Horseman Road, Unit 4, Moncton, NB E1E 0A2.

9 Signature

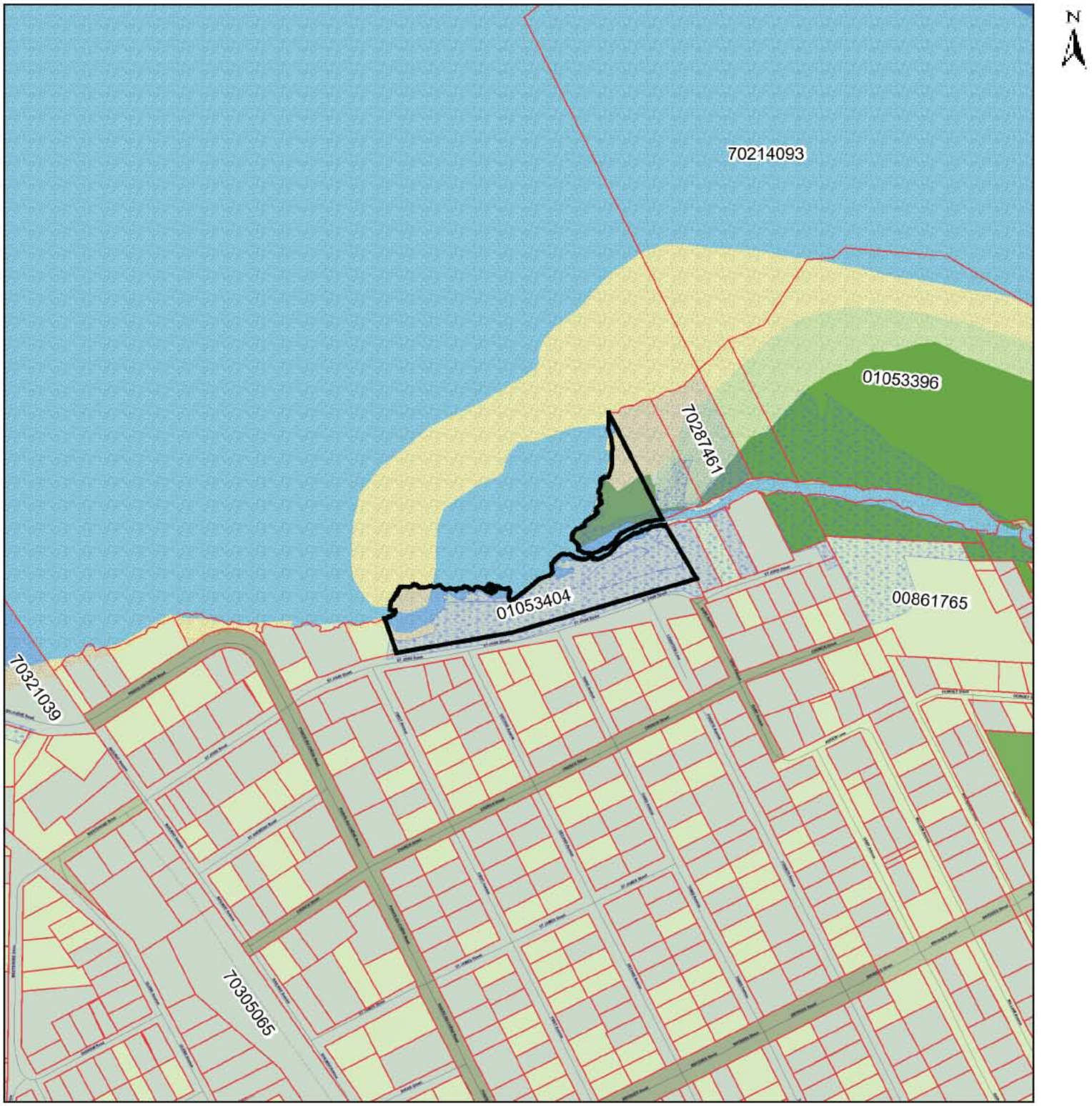
_____ _____

Date

Mr. Michel Mallet
Manager
New Brunswick Department of Tourism, Heritage and Culture

Appendix A Land Use and Site Photographs

Service New Brunswick **Service Nouveau-Brunswick**



Property Map Scale/Échelle 1:4300 Date: 2022/03/07 12:29:44

0 100.0 200.0 300.0 métres metres

While this map may not be free from error or omission, care has been taken to ensure the best possible quality. This map is a graphical representation of property boundaries which approximates the size, configuration and location of properties. It is not a survey and is not intended to be used for legal description or to calculate exact dimensions or area.

Même si cette carte n'est peut-être pas libre de toute erreur ou omission, toutes les précautions ont été prises pour en assurer la meilleure qualité possible. Cette carte est une représentation graphique approximative des terrains (limites, dimensions, configuration et emplacement). Elle n'a aucun caractère officiel et ne doit donc pas servir à la rédaction de la description officielle d'un terrain ni au calcul de ses dimensions exactes ou de sa superficie.

Parcel Information

PID:	1053404	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1970-01-01 01:01:01
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	1.1	**Area Unit:**	Hectares
Date Last Updated:	2021-11-03 10:03:55	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2021-09-15 15:02:34
Date of Last CRO:	2022-03-04 11:23:37	**Manner of Tenure:**	Not Applicable
Land Gazette Information:	NO		

Description of Tenure:

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
The Corporation of the Anglican Parish of Shediac		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
2134732		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	St John	Street		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
41777799	2021-09-15			3800	Land Titles First Notice
41777781	2021-09-15			3720	Land Titles First Order
41777682	2021-09-15			3900	Land Titles First Application
2393	1928-11-15	G	472	106	Crown Grant

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation

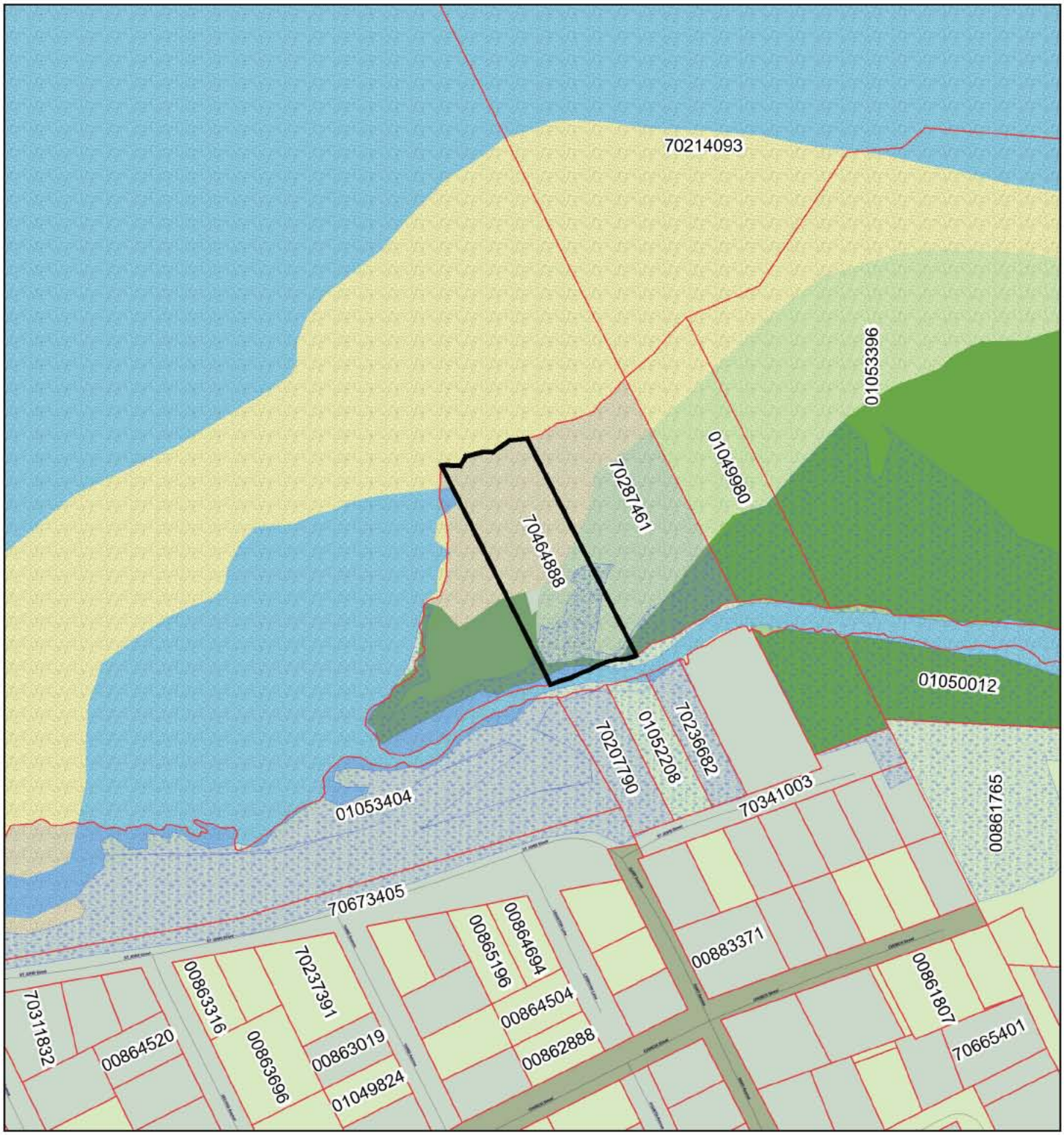
Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
41916355		2021-10-22	9050	Subdivision & Amalgamations		Provincial Grid

Parcel Relations

Related PID	Type Of Relation	Lot Information
70672837	Infant	Parcel 21-A

Service New Brunswick **Service Nouveau-Brunswick**



Property Map Scale/Échelle 1:2150 Date: 2022/03/07 12:32:14

0 50.0 100.0 150.0 mètres metres

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Parcel Information

PID:	70464888	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	2007-04-27 09:06:50
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	3259	**Area Unit:**	Square Metres
Date Last Updated:	2021-07-15 13:06:44	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2021-07-08 15:08:59
Date of Last CRO:	2021-07-15 13:07:40	**Manner of Tenure:**	Joint Tenants
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
[redacted]		Owner
		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
5173882		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	North of St John	Street		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
41516031	2021-07-12			1100	Deed/Transfer
41508152	2021-07-08			3800	Land Titles First Notice
41508145	2021-07-08			3720	Land Titles First Order
41507873	2021-07-08			3900	Land Titles First Application
11881837	2001-03-26	3178	7	1900	Deed of a Partial Interest

Date/Time: 2022-03-07 12:32:42

Plans

No Records Returned

Parcel Relations

Related PID	Type Of Relation	Lot Information
70287461	Parent	

Service New Brunswick **Service Nouveau-Brunswick**

Property Map Scale/Échelle 1:1075 Date: 2022/03/07 12:45:59

0 25.0 50.0 75.0 mètres metres

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Parcel Information

PID:	70180773	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1987-02-05 00:00:00
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	1100	**Area Unit:**	Square Metres
Date Last Updated:	1994-01-05 13:15:46	**Harmonization Status:**	Harmonized
Land Titles Status:	Not Land Titles	**Land Titles Date/Time:**	
Date of Last CRO:		**Manner of Tenure:**	Unknown
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
N.B.Economic Development and Tourism		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
3939020		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	Gould Extension	Street		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
485248	1987-01-01	1203	150	101	Deed
445259	1984-01-01	951	549	101	Deed

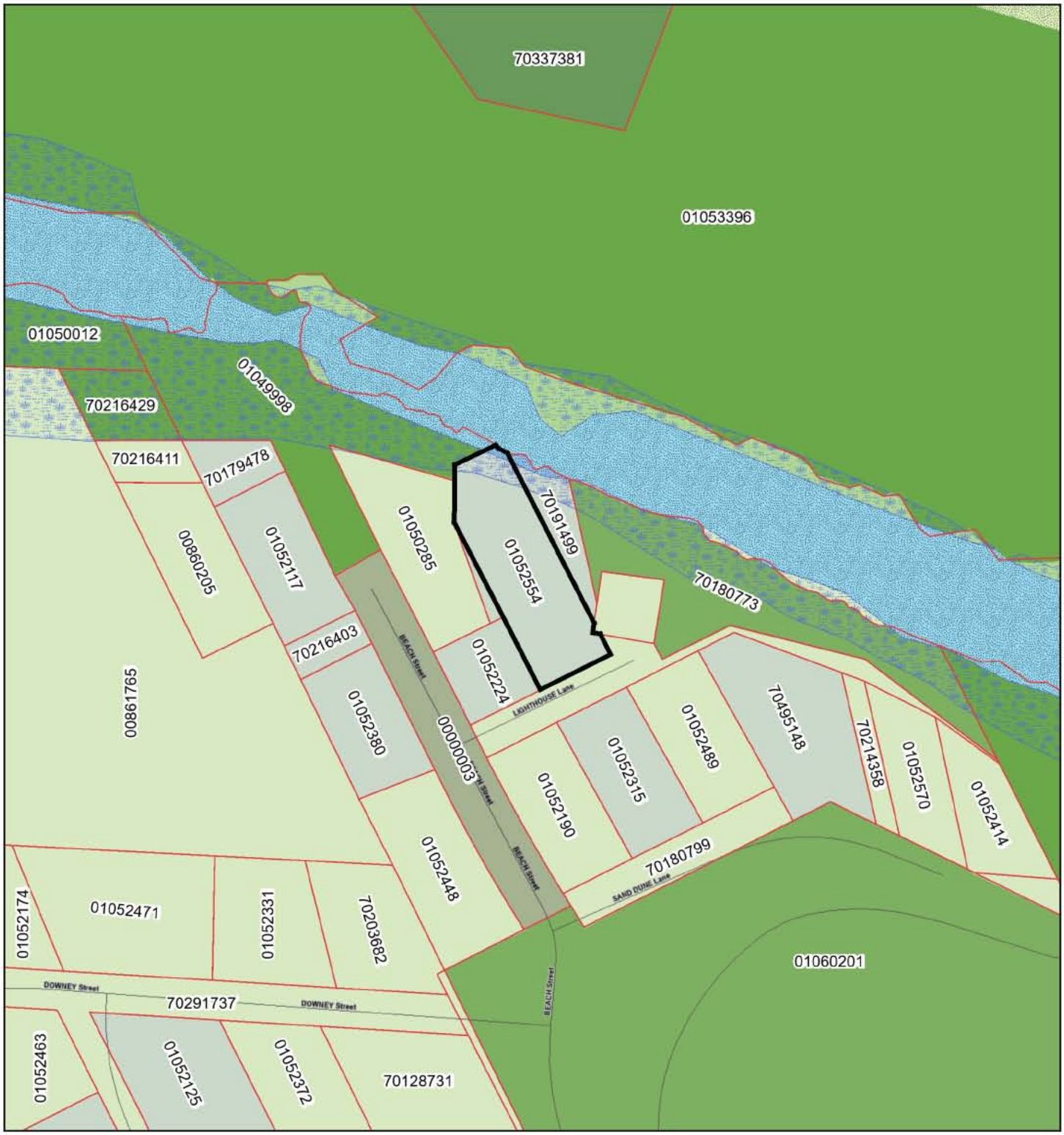
Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
15868		1987-01-19	9050	Subdivision & Amalgamations	Parcel 86-B	Provincial Grid

Parcel Relations

Related PID	Type Of Relation	Lot Information
1049998	Parent	Parcel 87-L

Service New Brunswick **Service Nouveau-Brunswick**



Property Map Scale/Échelle 1:1075 Date: 2022/03/07 12:53:40

0 25.0 50.0 75.0 metres
metres

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Parcel Information

PID:	1052554	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1970-01-01 01:01:01
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	673	**Area Unit:**	Square Metres
Date Last Updated:	2021-01-14 11:07:41	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2008-09-10 11:34:48
Date of Last CRO:	2021-01-14 11:08:14	**Manner of Tenure:**	Joint Tenants
Land Gazette Information:	YES		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
[redacted]		Owner
		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
2094990		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
4	Lighthouse	Lane		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
40880149	2021-01-14			6110	Discharge of Mortgage
40677834	2020-11-13			5100	Mortgage
31690283	2012-07-10			6110	Discharge of Mortgage
31659577	2012-06-29			5100	Mortgage
31659551	2012-06-29			1100	Deed/Transfer

Date/Time: 2022-03-07 12:53:02

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
26301623	2008-10-10			6110	Discharge of Mortgage
26154063	2008-09-15			5110	Collateral Mortgage
26130352	2008-09-10			3800	Land Titles First Notice
26130345	2008-09-10			3720	Land Titles First Order
26129172	2008-09-10			3900	Land Titles First Application
663796	1999-03-11	2881	79	107	Discharge
643037	1997-10-16	2674	527	107	Discharge
638956	1997-07-11	2635	116	104	Mortgage
598540	1994-09-21	2255	327	104	Mortgage
585344	1993-10-08	2139	270	104	Mortgage
585343	1993-10-08	2139	265	101	Deed
436378	1983-01-01	904	443	101	Deed
436377	1983-01-01	904	441	107	Discharge
411714	1981-01-01	778	537	119	Other
322425	1973-01-01	390	384	102	Lease
254331	1963-01-01	125	587	102	Lease

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
3348		1960-11-08	9050	Subdivision & Amalgamations	Lot 6	Magnetic
782		1936-11-09	9050	Subdivision & Amalgamations	Lot 6	Magnetic

Parcel Relations

Related PID	Type Of Relation	Lot Information
70191473	Infant	Parcel 87-K

Parcel Information

PID:	861765	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1970-01-01 01:01:01
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	1.09	**Area Unit:**	Hectares
Date Last Updated:	1998-12-03 13:07:32	**Harmonization Status:**	Harmonized
Land Titles Status:	Not Land Titles	**Land Titles Date/Time:**	
Date of Last CRO:		**Manner of Tenure:**	Unknown
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
[redacted]		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
2094500		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
46	MacKenzie	Road		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
658317	1998-10-20	2828	199	114	Agreement
530667	1989-12-29	1635	133	101	Deed
530664	1989-12-29	1635	117	119	Other
230886	1959-01-01	U19	544	101	Deed
129327	1928-01-01	W10	69	101	Deed

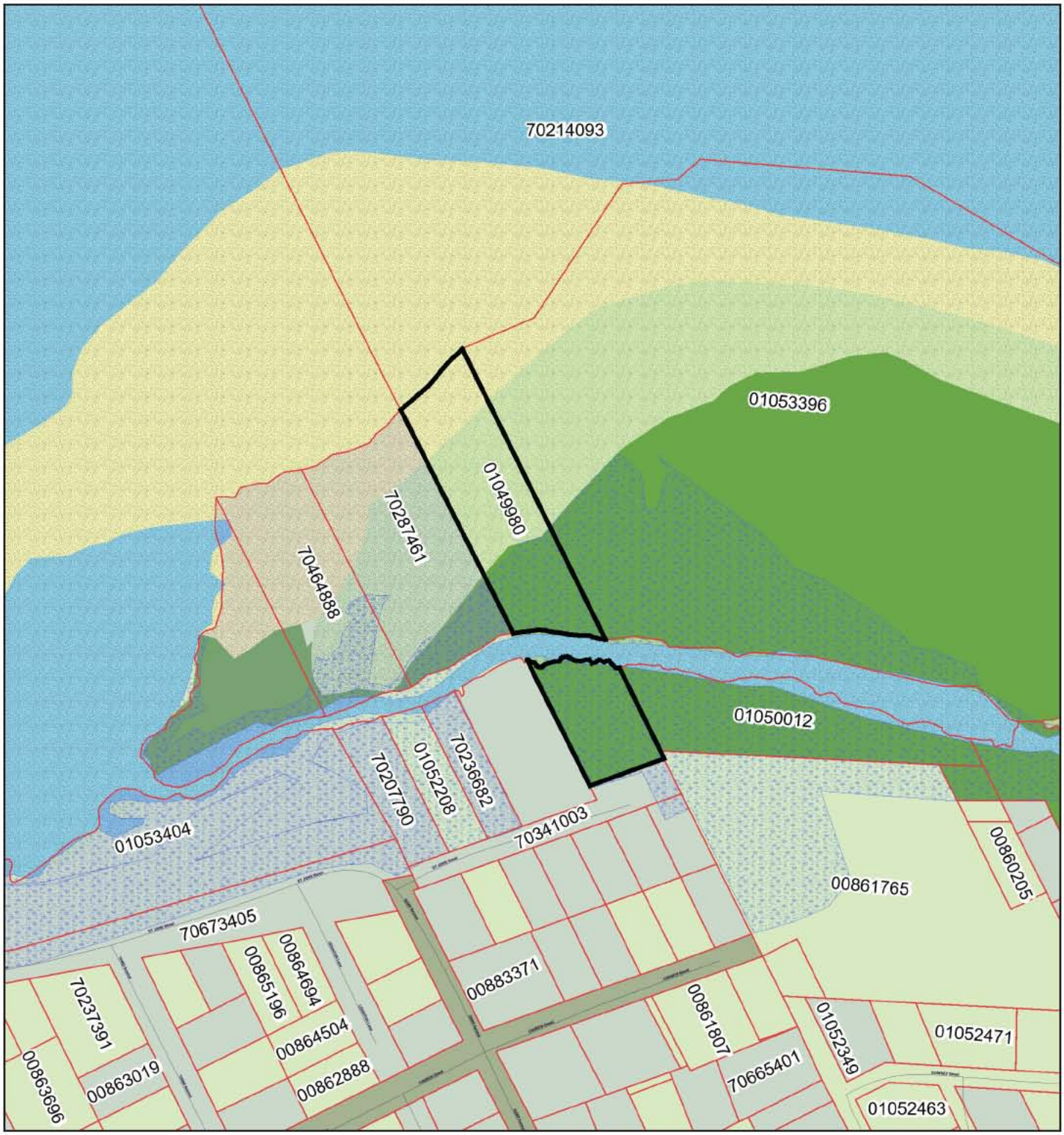
Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
202558		1998-10-20	9050	Subdivision & Amalgamations		Provincial Grid

Parcel Relations

Related PID	Type Of Relation	Lot Information
70216411	Infant	Parcel 89-M

Service New Brunswick **Service Nouveau-Brunswick**



Property Map Scale/Échelle 1:2150 Date: 2022/03/07 13:10:26

0 50.0 100.0 150.0 métres metres

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Parcel Information

PID:	1049980	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1970-01-01 01:01:01
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	3642	**Area Unit:**	Square Metres
Date Last Updated:	1997-09-29 10:06:20	**Harmonization Status:**	Harmonized
Land Titles Status:	Not Land Titles	**Land Titles Date/Time:**	
Date of Last CRO:		**Manner of Tenure:**	Unknown
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
N.B.Economic Development and Tourism		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
3939020		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	Saint John	Street		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
352229	1976-01-01	511	525	101	Deed

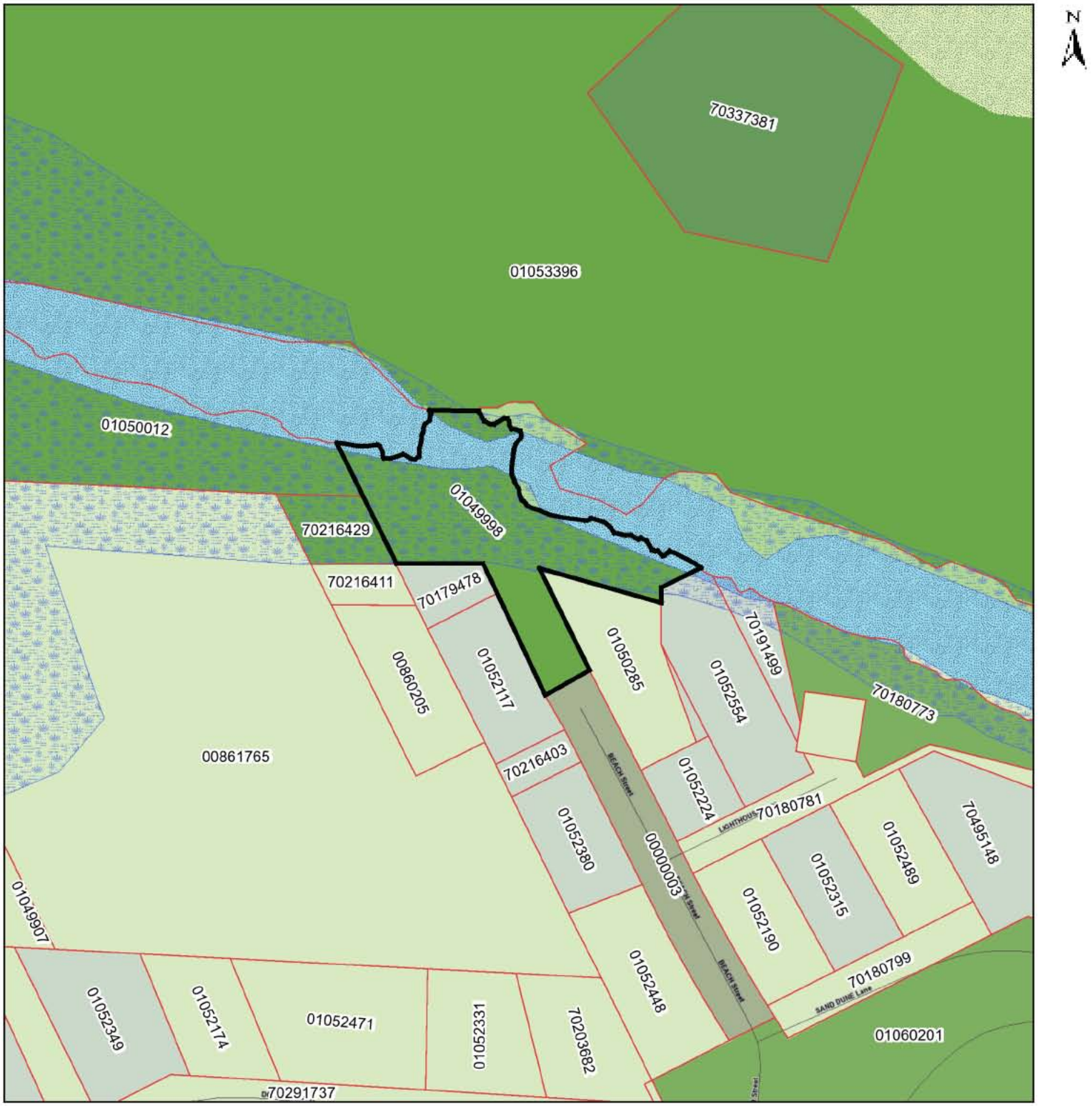
Plans

No Records Returned

Parcel Relations

No Records Returned

Service New Brunswick **Service Nouveau-Brunswick**



Property Map Scale/Échelle 1:1075 Date: 2022/03/07 13:27:02

0 25.0 50.0 75.0 mètres metres

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Parcel Information

PID:	1049998	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1970-01-01 01:01:01
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	1270	**Area Unit:**	Square Metres
Date Last Updated:	1989-02-07 00:00:00	**Harmonization Status:**	Harmonized
Land Titles Status:	Not Land Titles	**Land Titles Date/Time:**	
Date of Last CRO:		**Manner of Tenure:**	Unknown
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
N.B.Economic Development and Tourism		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
3939020		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	Gould Extension	Street		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
552039	1991-07-03	1839	516	114	Agreement
509749	1988-01-01	1417	64	101	Deed
485248	1987-01-01	1203	150	101	Deed
445259	1984-01-01	951	549	101	Deed
408627	1980-01-01	763	268	101	Deed

Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
18296		1991-07-03	9020	Easement or Right-of-Way	Parcel 87-L	Provincial Grid
16749		1988-08-25	9050	Subdivision & Amalgamations	Parcel 87-L	Provincial Grid
15868		1987-01-19	9050	Subdivision & Amalgamations	Parcel 87-L	Provincial Grid
782		1936-11-09	9050	Subdivision & Amalgamations	Parcel 87-L	Magnetic

Parcel Relations

Related PID	Type Of Relation	Lot Information
70179478	Infant	Parcel 86-A
70180773	Infant	Parcel 86-B
70180781	Infant	Parcel #2
70180799	Infant	

Service New Brunswick **Service Nouveau-Brunswick**

Property Map Scale/Échelle 1:1075 Date: 2022/03/07 13:23:09

0 25.0 50.0 75.0 mètres metres

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Parcel Information

PID:	1050012	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1970-01-01 01:01:01
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	2900	**Area Unit:**	Square Metres
Date Last Updated:	1997-08-15 11:03:17	**Harmonization Status:**	Harmonized
Land Titles Status:	Not Land Titles	**Land Titles Date/Time:**	
Date of Last CRO:		**Manner of Tenure:**	Unknown
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
N.B.Economic Development and Tourism		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
3939020		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	Tidal Creek			Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
496348	1987-01-01	1299	121	101	Deed

Plans

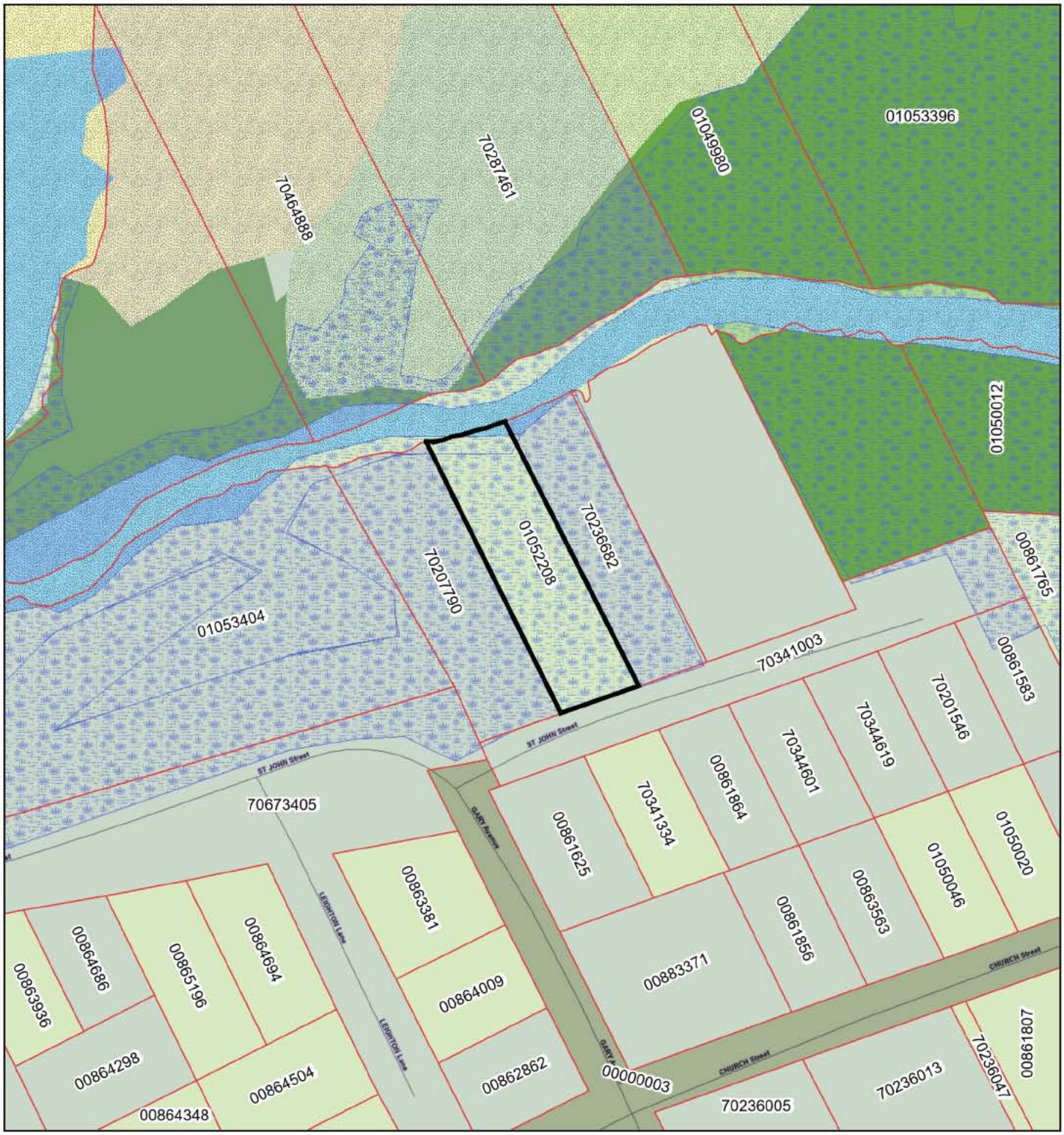
Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
16288		1987-10-06	9050	Subdivision & Amalgamations	Parcel 87-D	Provincial Grid

Date/Time: 2022-03-07 01:23:38

Parcel Relations

No Records Returned

Service New Brunswick **Service Nouveau-Brunswick**



Property Map Scale/Échelle 1:1075 Date: 2022/03/07 13:28:37

0 25.0 50.0 75.0 mètres metres

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Parcel Information

PID:	1052208	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1970-01-01 01:01:01
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	906	**Area Unit:**	Square Metres
Date Last Updated:	2020-03-31 16:03:58	**Harmonization Status:**	Harmonized
Land Titles Status:	Not Land Titles	**Land Titles Date/Time:**	
Date of Last CRO:		**Manner of Tenure:**	Unknown
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE
Lot size 50' + or - x 186' + or -

Parcel Interest Holders

Owner	Qualifier	Interest Type
[redacted]		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
2091308		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	St John	Street		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
264236	1965-01-01	166	851	101	Deed
228547	1959-01-01	O19	336	101	Deed
133829	1930-01-01	E11	413	101	Deed

Plans

No Records Returned

Parcel Relations

Related PID	Type Of Relation	Lot Information
70341334	Infant	

Service New Brunswick **Service Nouveau-Brunswick**

Property Map Scale/Échelle 1:8599 Date: 2022/03/07 13:38:14

0 250.0 500.0 750.0 mètres metres

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Parcel Information

PID:	1053396	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1970-01-01 01:01:01
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	16.89	**Area Unit:**	Hectares
Date Last Updated:	1999-07-05 14:55:18	**Harmonization Status:**	Harmonized
Land Titles Status:	Not Land Titles	**Land Titles Date/Time:**	
Date of Last CRO:		**Manner of Tenure:**	Unknown
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE 15V47NW 21I02Z4

Parcel Interest Holders

Owner	Qualifier	Interest Type
N.B.Economic Development and Tourism		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
2127361		630	L.S.D. of/D.S.L. de Pointe-Du-Chene
3939020		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	Parlee Beach			Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
547518	1991-03-07	1796	94	114	Agreement
273313	1967-01-01	200	302	101	Deed
273312	1967-01-01	200	300	101	Deed
229840	1959-07-29	R19	640	114	Agreement
229839	1959-07-29	R19	638	101	Deed

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
226295	1958-01-01	I19	45	101	Deed
218146	1957-01-01	M18	669	101	Deed
216392	1956-11-30	H18	324	101	Deed
216642	1956-01-01	I18	233	101	Deed
215586	1956-01-01	F18	237	101	Deed

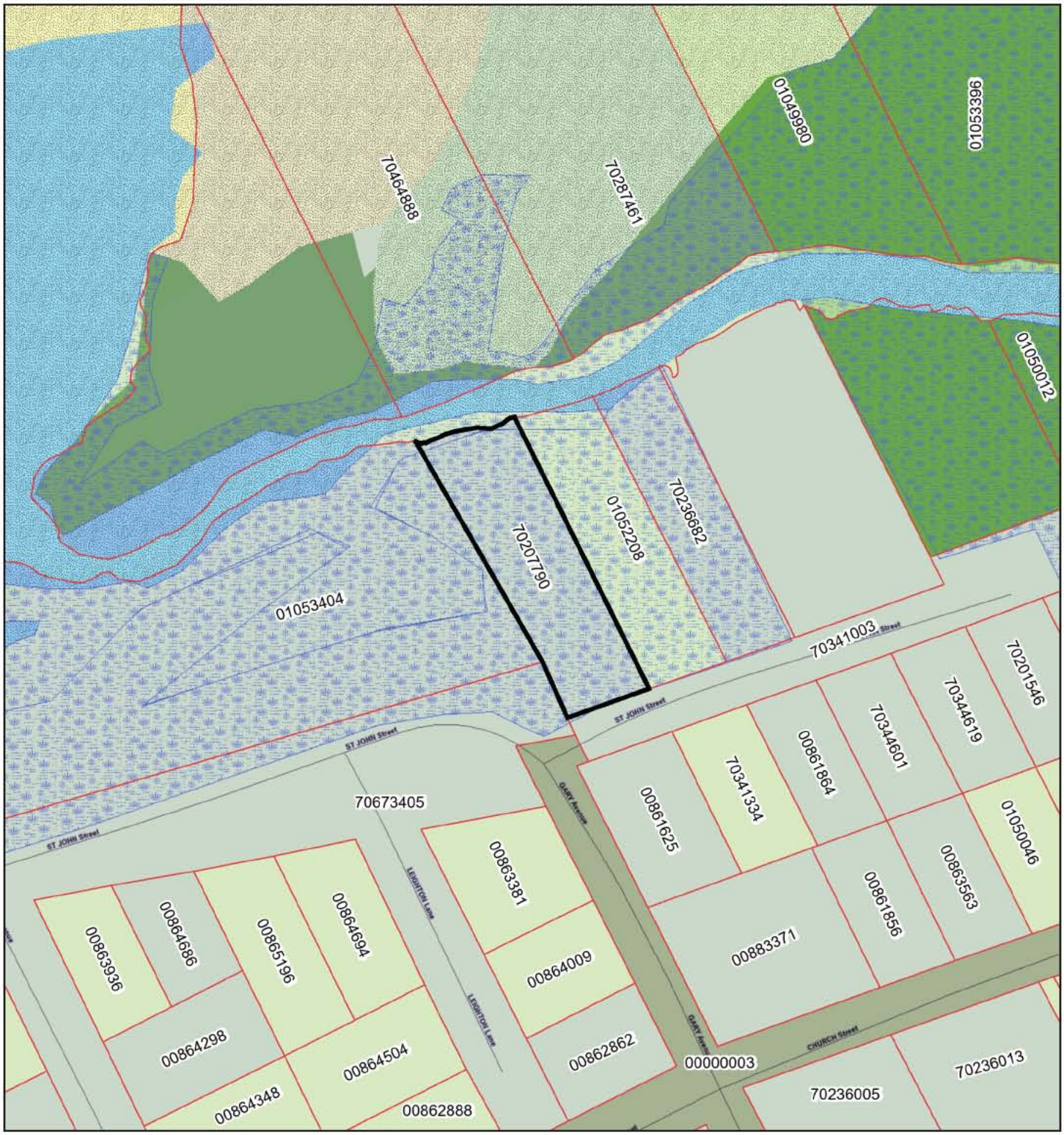
Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
202853		1999-06-16	9050	Subdivision & Amalgamations		Provincial Grid
202853		1999-06-16	9050	Subdivision & Amalgamations		Provincial Grid
2284		1956-11-27	9040	Retracement & Plan or Return of Survey		Undefined
2284		1956-11-27	9040	Retracement & Plan or Return of Survey		Undefined
2258		1956-09-22	9040	Retracement & Plan or Return of Survey		Magnetic
2258		1956-09-22	9040	Retracement & Plan or Return of Survey		Magnetic

Parcel Relations

Related PID	Type Of Relation	Lot Information
70337381	Infant	Lot 1-97

Service New Brunswick **Service Nouveau-Brunswick**



Property Map Scale/Échelle 1:1075 Date: 2022/03/07 14:21:04

0 25.0 50.0 75.0 metres
métres

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Parcel Information

PID:	70207790	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1989-02-15 00:00:00
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	1057	**Area Unit:**	Square Metres
Date Last Updated:	2008-08-20 13:56:47	**Harmonization Status:**	Not Attempted
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2004-05-04 16:12:30
Date of Last CRO:	2008-08-20 13:56:55	**Manner of Tenure:**	Not Applicable
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
[redacted]		Owner
		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
2093588		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	St John	Street		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
26023334	2008-08-20			6110	Discharge of Mortgage
25979361	2008-08-11			5110	Collateral Mortgage
24540289	2007-09-25			6110	Discharge of Mortgage
18659491	2004-07-06			6110	Discharge of Mortgage
18306838	2004-05-10			5100	Mortgage

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
18281429	2004-05-04			3800	Land Titles First Notice
18281411	2004-05-04			3720	Land Titles First Order
18280223	2004-05-04			3900	Land Titles First Application
613656	1995-10-31	2395	476	104	Mortgage
602891	1995-01-12	2294	276	104	Mortgage
602507	1994-12-28	2291	58	107	Discharge
599098	1994-10-04	2260	258	101	Deed
523818	1989-07-28	1563	203	107	Discharge
517744	1989-03-02	1497	481	104	Mortgage
517743	1989-03-02	1497	476	101	Deed
516120	1989-01-17	1481	258	104	Mortgage
516119	1989-01-17	1481	249	101	Deed
235186	1959-01-01	F20	462	101	Deed
138737	1933-01-01	O11	522	101	Deed

Plans

No Records Returned

Parcel Relations

No Records Returned

Service New Brunswick **Service Nouveau-Brunswick**

Property Map Scale/Échelle 1:1075 Date: 2022/03/07 14:29:45

0 25.0 50.0 75.0 métres metres

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Parcel Information

PID:	70216429	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1990-01-17 00:00:00
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	237	**Area Unit:**	Square Metres
Date Last Updated:	2019-05-13 12:42:25	**Harmonization Status:**	Harmonized
Land Titles Status:	Not Land Titles	**Land Titles Date/Time:**	
Date of Last CRO:		**Manner of Tenure:**	Unknown
Land Gazette Information:	YES		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
Tourism Recreation and Heritage		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
3939020		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
	Gould Extension	Street		Parlee Beach

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
530665	1989-12-29	1635	124	101	Deed

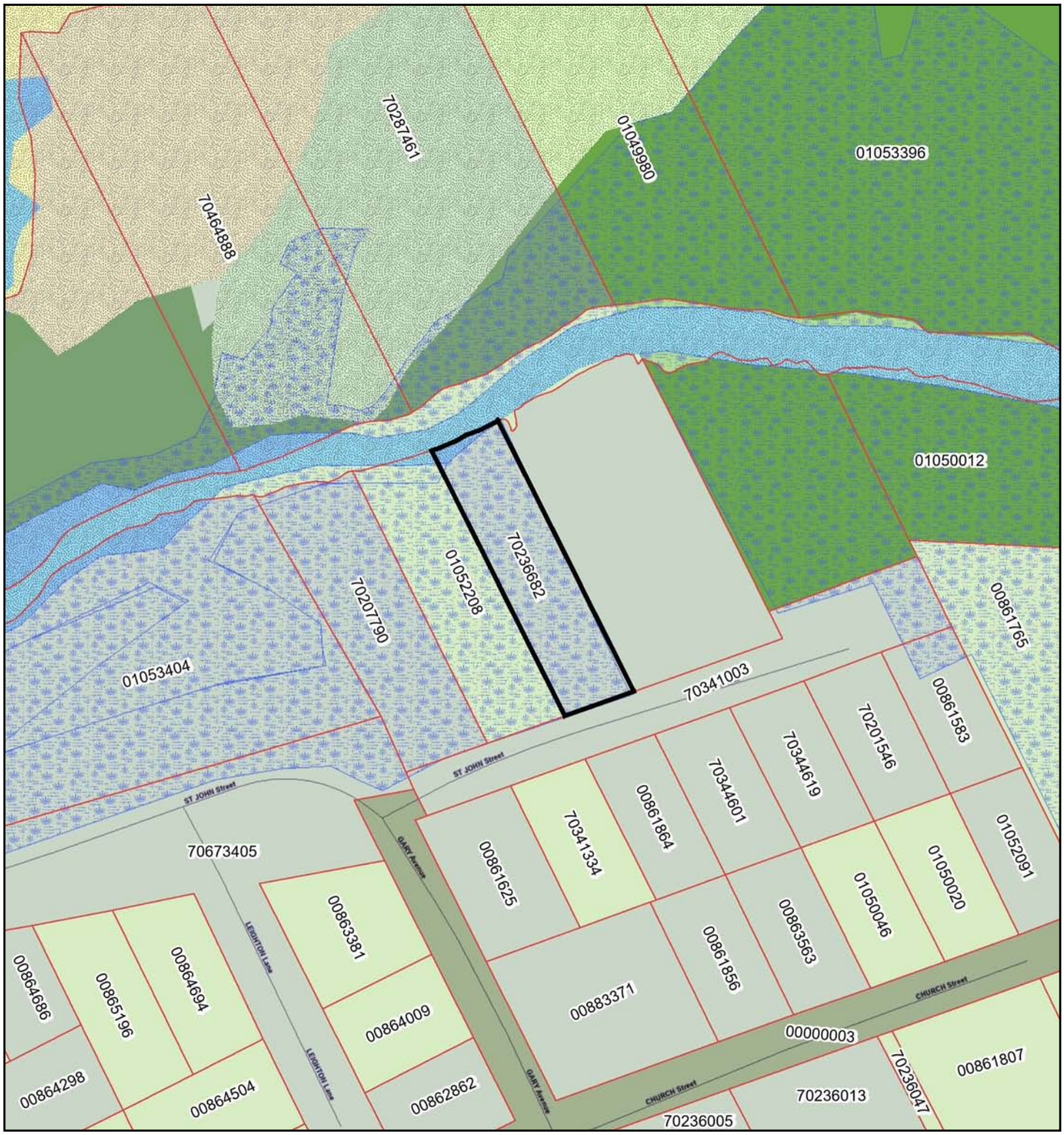
Plans

Number	Suffix	Registation Date	Code	Description	Lot Information	Orientation
17517		1989-12-29	9050	Subdivision & Amalgamations	Parcel 89-N	Provincial Grid

Parcel Relations

Related PID	Type Of Relation	Lot Information
860205	Parent	

Service New Brunswick **Service Nouveau-Brunswick**



Property Map Scale/Échelle 1:1075 Date: 2022/03/07 14:39:28

0 25.0 50.0 75.0 metres

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Parcel Information

PID:	70236682	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1991-11-22 13:51:31
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	864	**Area Unit:**	Square Metres
Date Last Updated:	2021-11-03 10:19:15	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2002-08-13 14:38:16
Date of Last CRO:	2021-11-03 10:19:25	**Manner of Tenure:**	Not Applicable
Land Gazette Information:	YES		

Description of Tenure:

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
[redacted]		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
6361462		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
118	St John	Street		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
41942500	2021-10-29			5100	Mortgage
41435604	2021-06-21			5110	Collateral Mortgage
41435554	2021-06-21			1100	Deed/Transfer
25963621	2008-08-07			6110	Discharge of Mortgage
14944459	2002-09-09			6110	Discharge of Mortgage
14800248	2002-08-15			5100	Mortgage

Date/Time: 2022-03-07 02:39:53

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
14800214	2002-08-15			1100	Deed/Transfer
14781273	2002-08-13			3800	Land Titles First Notice
14781265	2002-08-13			3720	Land Titles First Order
14779517	2002-08-13			3900	Land Titles First Application
14757547	2002-08-08			2200	Easement
657727	1998-10-05	2823	39	114	Agreement
656396	1998-09-08	2809	538	101	Deed
597539	1994-08-29	2246	386	107	Discharge
596678	1994-08-05	2238	552	104	Mortgage
566815	1992-07-09	1977	278	104	Mortgage
557414	1991-11-05	1891	46	101	Deed
556772	1991-10-22	1884	503	105	Will
316643	1973-03-28	365	839	114	Agreement
278123	1967-01-01	218	473	101	Deed

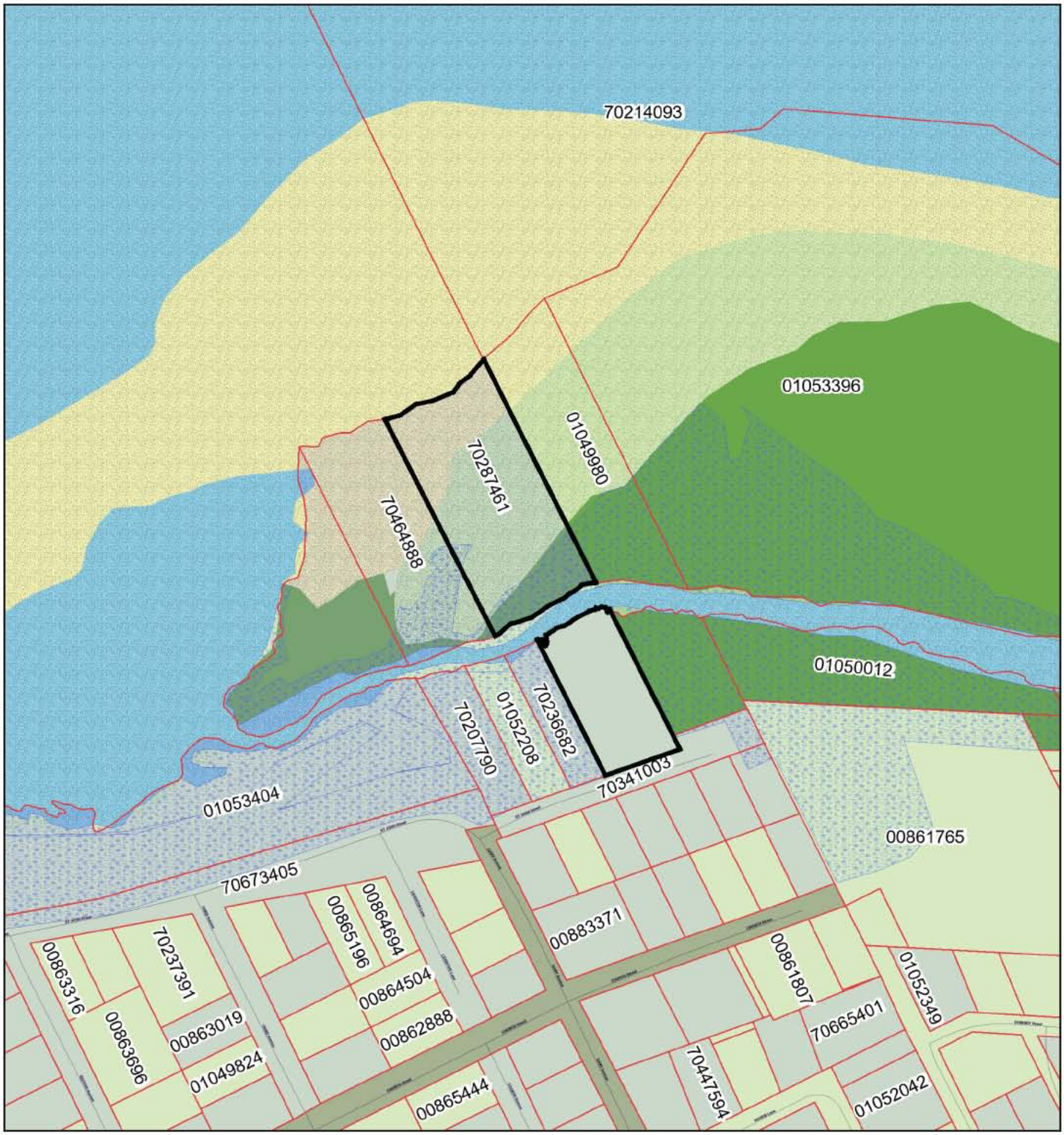
Plans

No Records Returned

Parcel Relations

No Records Returned

Service New Brunswick **Service Nouveau-Brunswick**



Property Map Scale/Échelle 1:2150 Date: 2022/03/07 14:45:14

0 50.0 100.0 150.0 métres metres

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Parcel Information

PID:	70287461	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1995-09-13 10:22:06
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	5993	**Area Unit:**	Square Metres
Date Last Updated:	2021-09-17 15:21:05	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2007-05-30 13:20:07
Date of Last CRO:	2021-09-17 15:21:16	**Manner of Tenure:**	Joint Tenants
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE
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Parcel Interest Holders

Owner	Qualifier	Interest Type
[redacted]		Owner
		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
5173882		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
122	St John	Street		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
41758401	2021-09-10			6110	Discharge of Mortgage
41516031	2021-07-12			1100	Deed/Transfer
24816564	2007-11-15			7800	Other Agreements
24681208	2007-10-22			5110	Collateral Mortgage

Date/Time: 2022-03-07 02:45:37

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
24022239	2007-06-21			6110	Discharge of Mortgage
23900146	2007-05-30			3800	Land Titles First Notice
23900138	2007-05-30			3720	Land Titles First Order
23899728	2007-05-30			3900	Land Titles First Application
654471	1998-07-27	2790	472	107	Discharge
653774	1998-07-13	2783	341	104	Mortgage
608997	1995-07-12	2349	585	104	Mortgage
608996	1995-07-12	2349	578	101	Deed
202607	1954-01-01	X16	189	101	Deed

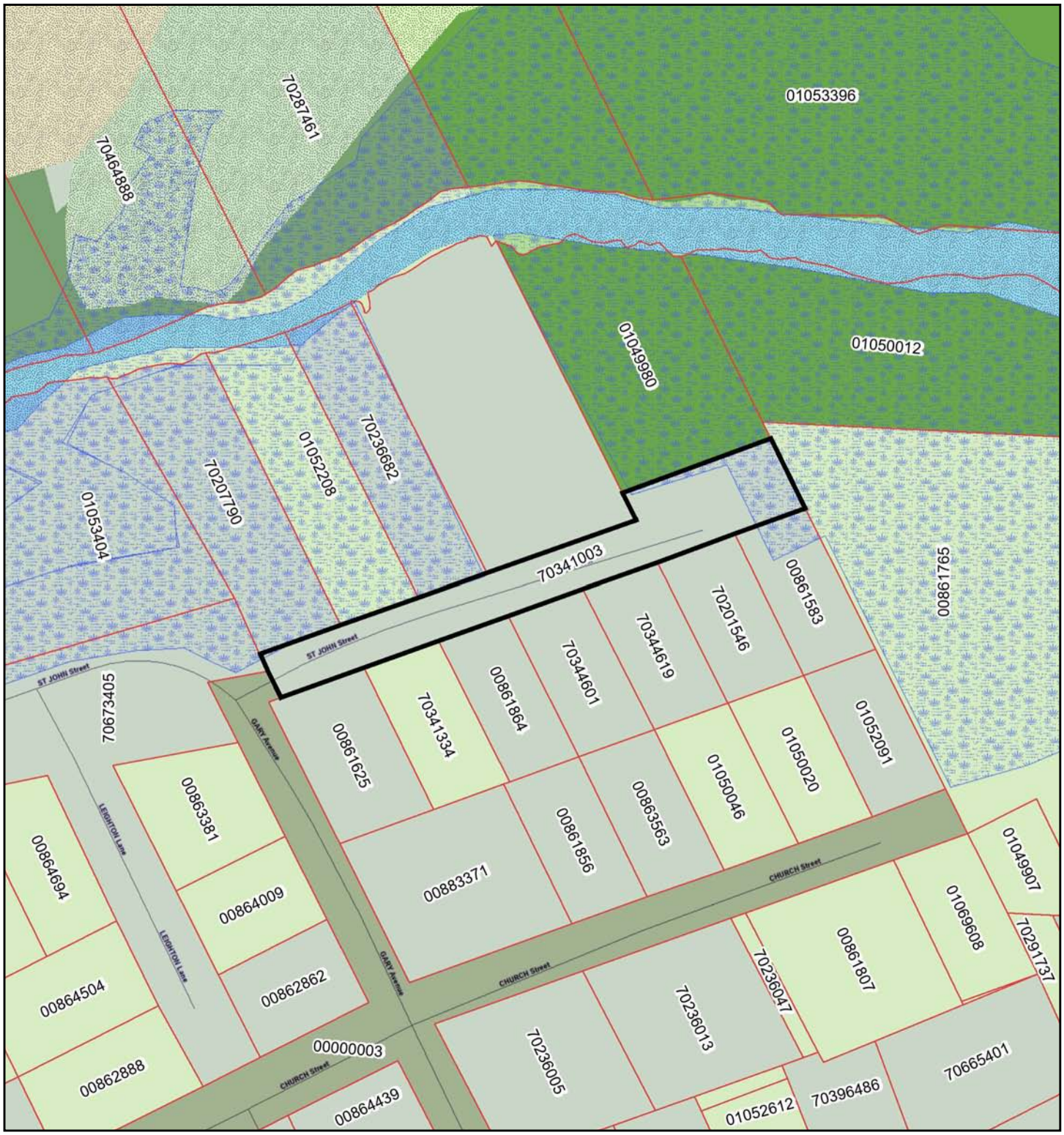
Plans

No Records Returned

Parcel Relations

Related PID	Type Of Relation	Lot Information
70464888	Infant	

Service New Brunswick **Service Nouveau-Brunswick**



Property Map Scale/Échelle 1:1075 Date: 2022/03/07 14:48:46

0 25.0 50.0 75.0 metres

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Parcel Information

PID:	70341003	**County:**	Westmorland
Status:	Active	**Active Date/Time:**	1999-10-06 12:37:19
Land Related Description:	Land	**Management Unit:**	NB1418
Area:	1195	**Area Unit:**	Square Metres
Date Last Updated:	2020-03-16 11:34:03	**Harmonization Status:**	Harmonized
Land Titles Status:	Land Titles	**Land Titles Date/Time:**	2011-10-20 11:52:24
Date of Last CRO:	2020-03-16 11:34:15	**Manner of Tenure:**	Joint Tenants
Land Gazette Information:	NO		
Description of Tenure:			

Public Comments:

MAP/CARTE 15V37NE

Parcel Interest Holders

Owner	Qualifier	Interest Type
[redacted]		Owner
		Owner

Assessment Reference

PAN	PAN Type	Taxing Authority Code	Taxing Authority
2093350		630	L.S.D. of/D.S.L. de Pointe-Du-Chene

Parcel Locations

Civic Number	Street Name	Street Type	Street Direction	Place Name
135	St John	Street		Pointe-du-Chêne

County Parish

County	Parish
Westmorland	Shediac

Documents

Number	Registration Date	Book	Page	Code	Description
39936548	2020-03-16			6110	Discharge of Mortgage
39859104	2020-02-13			5110	Collateral Mortgage
39859096	2020-02-13			1100	Deed/Transfer
30746383	2011-10-21			5110	Collateral Mortgage
30742473	2011-10-20			3800	Land Titles First Notice

Documents (cont.)

Number	Registration Date	Book	Page	Code	Description
30742465	2011-10-20			3720	Land Titles First Order
30741335	2011-10-20			3900	Land Titles First Application
24816531	2007-11-15			7800	Other Agreements
14757547	2002-08-08			2200	Easement
671441	1999-09-07	2959	65	101	Deed
325126	1973-12-12	401	447	114	Agreement
92410	1911-12-21	N8	163	101	Deed
91940	1911-09-16	M8	425	101	Deed

Plans

No Records Returned

Parcel Relations

No Records Returned

PHOTO 1 — View (looking north towards the parking lot) of tidal inlet (July 17-18, 2021).

PHOTO 2 — View (looking north) of tidal inlet facing Parlee Beach Restaurant building (July 17-18, 2021).

PHOTO 3 — View of walking bridge over wetland near main Parlee Beach building (July 17-18, 2021).

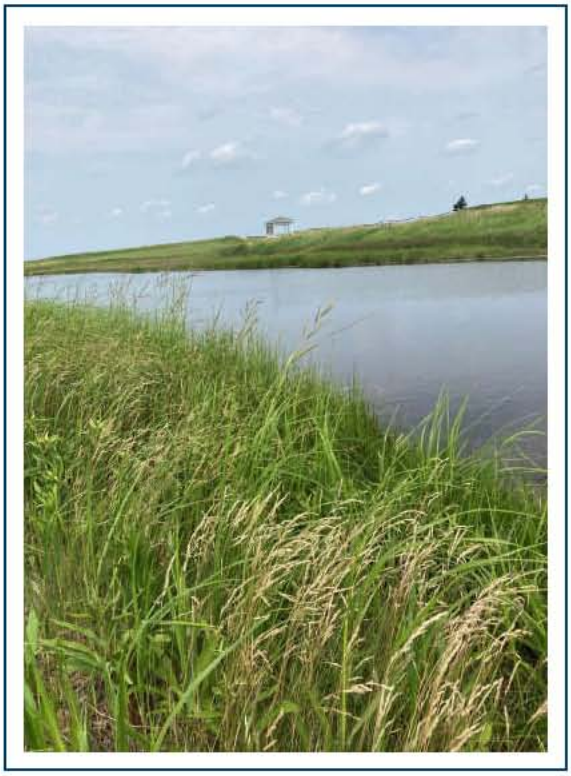


PHOTO 4 – View of channel (July 17-18, 2021).

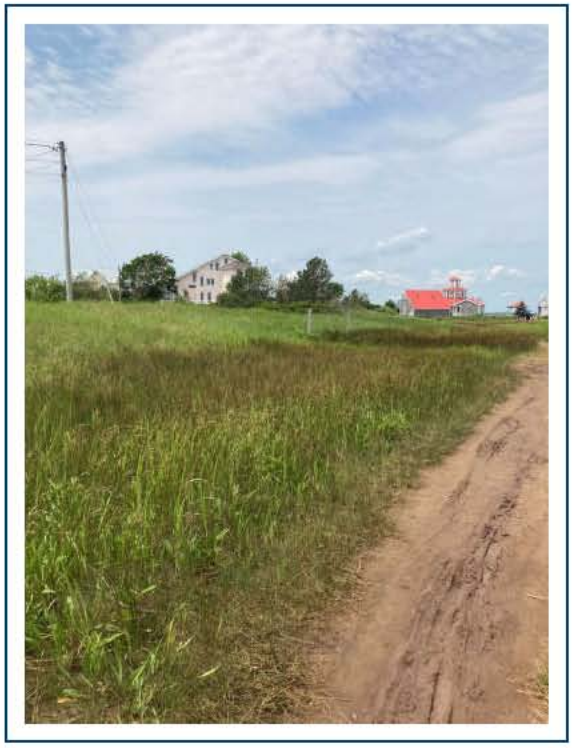


PHOTO 5 – View of upland area looking southwest (July 17-18, 2021).

PHOTO 6 – View of upland area looking south (July 17-18, 2021).

PHOTO 7 – View of tidal inlet looking west (July 17-18, 2021).

PHOTO 8 – View of lagoon looking east (July 16, 2021).

PHOTO 9 – View of tidal inlet and walking trail looking east (July 17-18, 2021).

PHOTO 10 – Another view of wetland and tidal inlet looking west (July 17-18, 2021).

PHOTO 11 – Tidal inlet near the western border (July 17-18, 2021).

PHOTO 12 – View of tidal water near the western border (July 17-18, 2021).

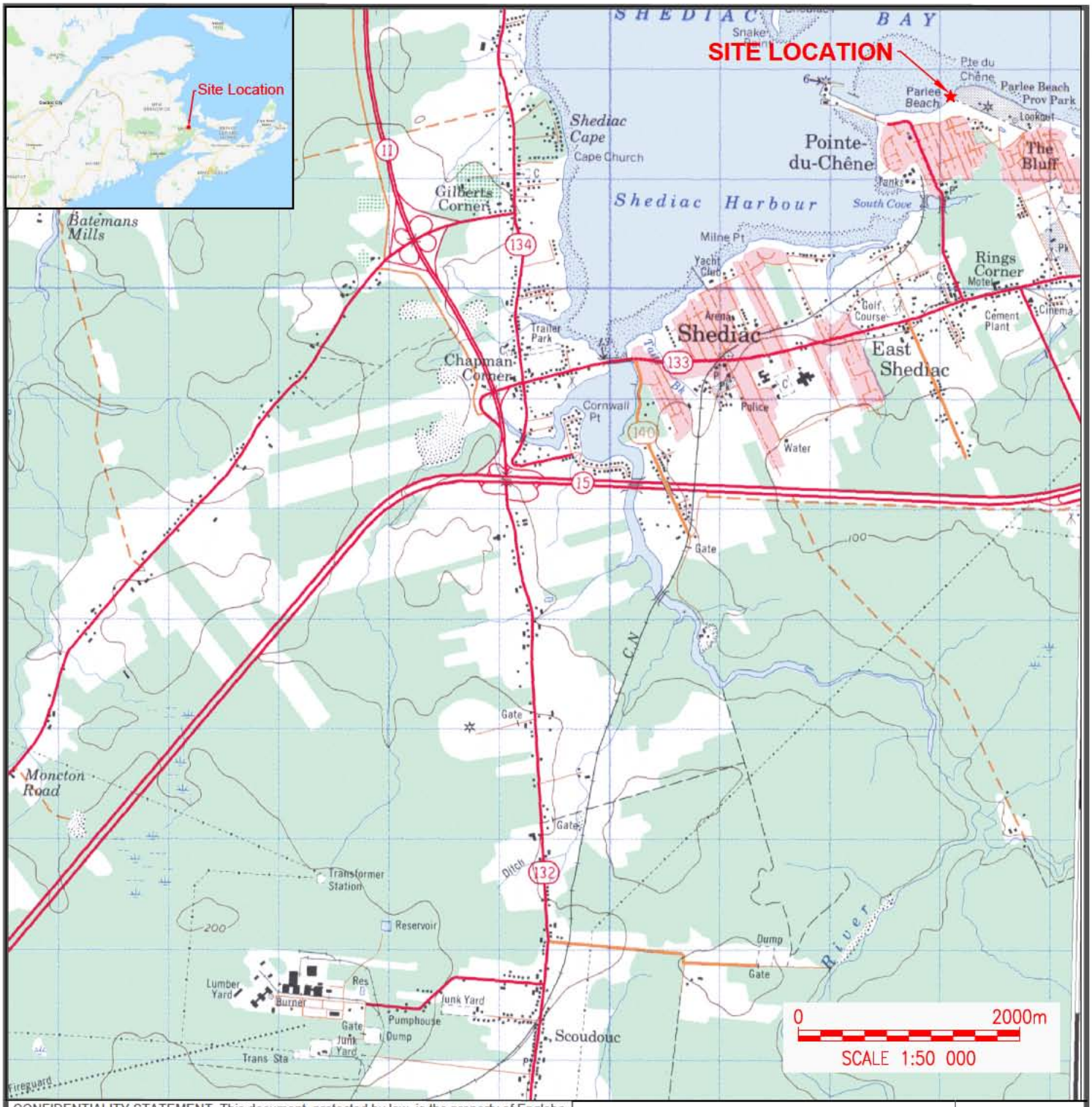
PHOTO 13 – View of upland near southwestern border (July 17-18, 2021).

PHOTO 14 – View of Parlee Beach (facing north) near western border (July 17-18, 2021).

PHOTO 15 – Closeup of tidal inlet water quality (July 17-18, 2021).

PHOTO 16 – View of boundaries (see vegetation change) (July 17-18, 2021).

Appendix B Figures



NB Department of Tourism, Heritage and Culture

Environmental Impact Assessment

Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Site Location Plan

Englobe
1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

Discipline: Environment		Prepare by: JM	Verify by: JM
Scale: 1: 50,000		Draw by: JJ	Approval by: SF
Date: March 2022		Figure no: 1	
Page setup: Figure 1	Paper size: Letter	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000	0 - - -	——	-

LEGEND:

- Site Survey Area

NB Department of Tourism, Heritage and Culture

0 50 100 150m

SCALE 1: 3000

Englobe

Englobe Corp.

1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

Environmental Impact Assessment

Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Site Survey Plan

No.	Version	Date	By	Verif	Appr.
		Mar. 2022	JJ	AS	SF

Discipline: Environment		Prepare by: AS	Verify by: AS
Scale: 1: 3000		Draw by: JJ	Approval by: SF
Date: March 2022		Figure no: 2	
Page setup: Fig. 2	Paper size: 11 x 17	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000			

LEGEND:

- **Approximate Boundaries (in Green) of Tidal Inlet and Lagoon Assessment (Wetland, Species at Risk, Bathymetry, Environmental Characterization of Sediment, Archeology, Hydrodynamic Evaluation)**
- **Existing Dredge Program Area**
- **Beach Nourishment Area**
- **Approximate Boundaries of Drone Survey**
- **Proposed Project Site**

NB Department of Tourism, Heritage and Culture

0 50 100 150 200 250m

SCALE 1: 5000

Englobe Corp.
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Environmental Impact Assessment

Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Detailed Site Plan

No.	Version	Date	By	Verif	Appr.
		Mar. 2022	JJ	AS	SF

Discipline: Environment		Prepare by: AS	Verify by: AS
Scale: 1: 5000		Draw by: JJ	Approval by: SF
Date: March 2022		Figure no: 3	
Page setup: Fig. 3	Paper size: 11 x 17	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000			

LEGEND:

- Assessment Area
- Field Delineated Wetland
- Provincial Significant Wetland
- Watercourse
- Coastal Wetland Confirmation Point
- Upland Confirmation Point
- Proposed Monitoring Point

NB Department of Tourism, Heritage and Culture

0 50 100 150m

SCALE 1: 3000

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Environmental Impact Assessment

Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Wetland Delieation Plan

No.	Version	Date	By	Verif	Appr.
		Mar. 2022	JJ	AS	SF

Discipline:	Environment	Prepare by: AS	Verify by: AS
Scale:	1: 3000	Draw by: JJ	Approval by: SF
Date:	March 2022	Figure no:	4
Page setup: Fig. 4	Paper size: 11 x 17	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000			

LEGEND:

- **Assessment Area**
- **Field Delineated Wetland**
- **Watercourse**
- **Proposed Phase 1 (1,120 m³ of Sediments)**
- **Proposed Phase 2 (1,100 m³ of Sediments)**
- **Proposed Phase 3 (2,200 m³ of Sediments)**

NB Department of Tourism, Heritage and Culture

0 50 100 150m

SCALE 1: 3000

Englobe

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Environmental Impact Assessment

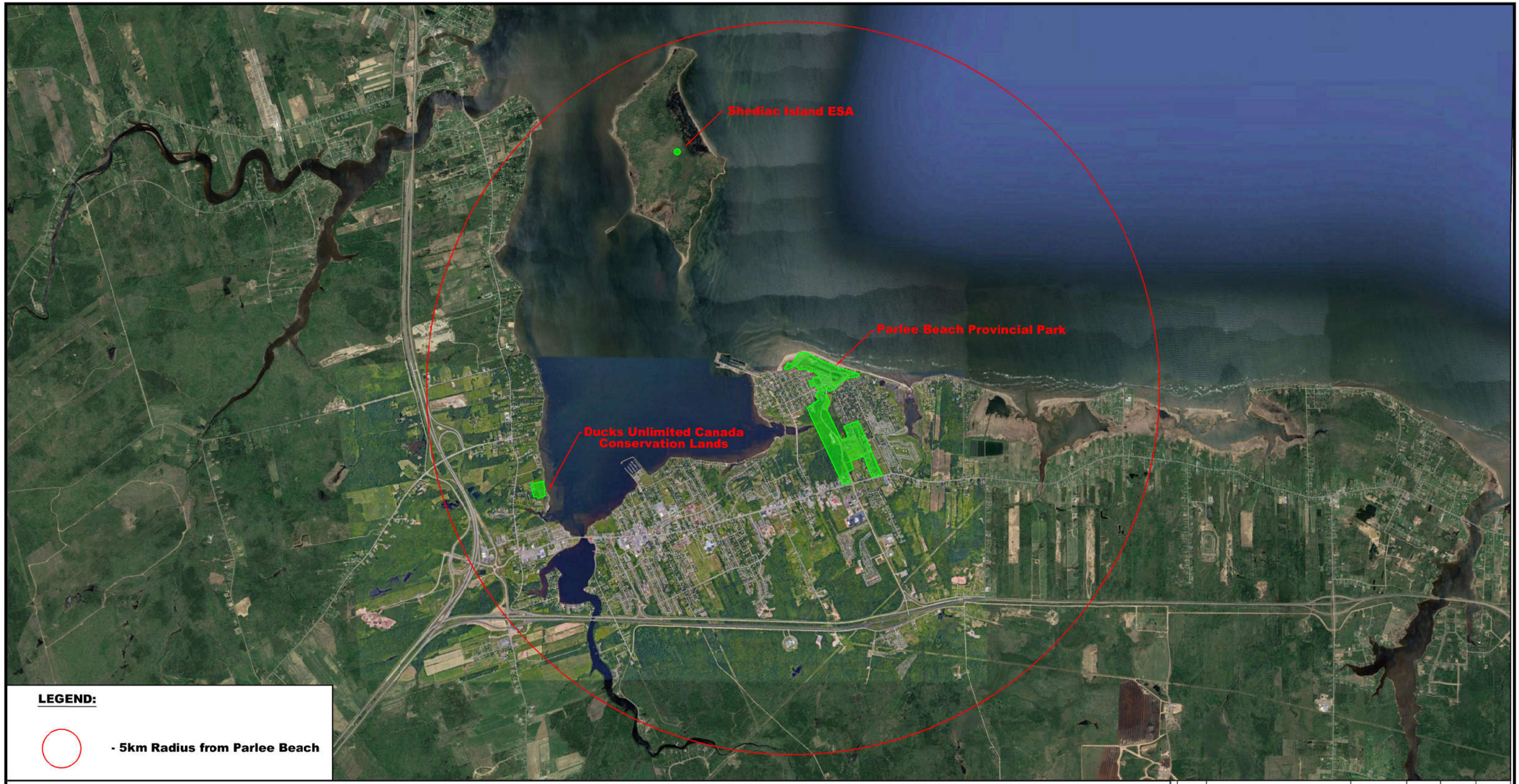
Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Proposed Dredge Plan

No.	Version	Date	By	Verif	Appr.
		Mar. 2022	JJ	AS	SF

Discipline: Environment		Prepare by: AS	Verify by: AS
Scale: 1: 3000		Draw by: JJ	Approval by: SF
Date: March 2022		Figure no: 5	
Page setup: Fig. 5	Paper size: 11 x 17	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000			



LEGEND:

- 5km Radius from Parlee Beach

NB Department of Tourism, Heritage and Culture

0 500 1000 1500 2000 2500m

SCALE 1: 50,000

Englobe Corp.
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Moncton, NB E1E 4C9
506-857-2777

Environmental Impact Assessment

Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Species at Risk Site Features Map

No.	Version	Date	By	Verif	Appr.
		Mar. 2022	JJ	TM	SF

Discipline:	Environment
Scale:	1: 50,000
Date:	March 2022
Page setup: Fig. 6	Paper size: 11 x 17
Prepare by:	TM
Verify by:	TM
Draw by:	JJ
Approval by:	SF
Figure no:	6
Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000			

LEGEND:

△ **- Sediment Sample Location**

NB Department of Tourism, Heritage and Culture

0 30 60 90 120 150m

SCALE 1: 3000

Englobe

Englobe Corp.

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506-857-2777

Environmental Impact Assessment

Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Marine Sediment Sample Location Plan

No.	Version	Date	By	Verif	Appr.
		Mar. 2022	JJ	TM	SF

Discipline:	Environment	Prepare by: TM	Verify by: TM
Scale:	1: 3000	Draw by: JJ	Approval by: SF
Date:	March 2022	Figure no:	7
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Appendix C Marine Sediment Sampling Program, 2021

Englobe
Soils Materials Environment

NB Department of Tourism, Heritage and Culture

PARLEE BEACH PROVINCIAL PARK
POINTE-DU-CHENE, NEW BRUNSWICK

November 2021

Marine Sediment Sampling Program
Tidal Inlet Dredging and Environmental Impact Assessment

2106010

FINAL REPORT

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Summary

Englobe Corp. (Englobe) was retained by NB Department of Tourism, Heritage and Culture (THC) to complete an Environmental Impact Assessment (EIA) to support dredging activities related to the ongoing beach nourishment program at the Parlee Beach Provincial Park site located in Pointe-du-Chêne, New Brunswick (the "site").

The Parlee Beach Provincial Park site consists of an existing dredge area located at the extreme western end of the beach where they are stockpiled over the winter and spread over the beach in the spring. The dredging takes place every couple of years. The NB Department of Tourism, Heritage and Culture (THC) is considering modifying the program to include dredging the mouth of the tidal inlet located south of the current dredge limits and high points within the inlet and lagoon in order to encourage regular tidal flushing of the lagoon. Therefore, a Marine Sediment Sampling Program (MSSP) was deemed required within the tidal inlet and lagoon in order to characterize the sediment to aid in determining potential disposal locations.

Seven sediment grab samples were collected from the tidal inlet and lagoon at the Parlee Beach Provincial Park. All samples were analyzed for grain size distribution, total petroleum hydrocarbons (BTEX/TPH), metals plus mercury and hexavalent chromium; polycyclic aromatic hydrocarbons (PAHs) including a creosote resemblance scan, polychlorinated biphenyls (PCBs), Dichlorodiphenyltrichloroethane (DDT) suite, total organic carbon/total inorganic carbon (TOC/TIC), pH, conductivity and sodium absorption ration (SAR). Results of the analytical testing were compared to the following guidelines (where applicable):

- Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines (SQGs) for the Protection of Human and Environmental Health for all land use applications;
- CCME Canada Wide Standards (CWS) for Petroleum Hydrocarbon Concentrations (PHCs);
- Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Version 4 Risk-Based Screening Levels (RBSLs) and Soil Ecological Screening Levels (ESLs); and
- Atlantic RBCA Human and Ecological Health-Based Tier I Environmental Quality Standards (EQS) for Soil – All Land Uses (July 2021).

A summary of the guideline exceedances is presented in Table 1. Substrate composition is described in Figure 1 below. This Figure illustrates the overall sediment composition from the samples collected at the site, expressed as percentages to show the average grain size distributions. Figures 2 shows the proportions of gravel, sand, and mud (silt and clay) for individual samples.

Table 1 - Summary of Exceedances, Parlee Beach Provincial Park

GUIDELINE / PARAMETER	SAMPLE ID						
	SED1	SED2	SED3	SED4	SED5	SED6	SED7
CCME Soil Quality Guidelines for the Protection of Environmental and Human Health							
PAH (IACR)	-	-	-	-	-	-	-
PAH (EH)	-	-	-	-	-	-	-
PAH B(a)P TPE	-	-	-	-	-	-	-
PAH B(a)P TPE (UF)	NR	NR	NR	NR	NR	NR	NR
Metals	-	X	X	X	X	X	X
BTEX	-	-	-	-	-	-	-

GUIDELINE / PARAMETER	SAMPLE ID						
	SED1	SED2	SED3	SED4	SED5	SED6	SED7
Total PCB	-	-	-	-	-	-	-
SAR	X	X	X	X	X	X	X
Conductivity	X	X	X	X	X	X	X
pH	X	X	X	-X	X	X	-
Atlantic RBCA Tier I EQS for the Protection of Human and Ecological Health							
PAH (HH)	-	-	-	-	-	-	-
PAH (IACR)	-	-	-	-	-	-	-
PAH B(a)P TPE	-	-	-	-	-	-	-
PAH (EH)	-	-	-	-	-	-	-
Metals	X	X	X	X	X	X	X
Total PCB							
Atlantic RBCA RBSLs and ESLs							
BTEX	-	-	-	-	-	-	-
F1 – F4	-	-	-	-	-	-	-
TPH	-	-	-	-	-	-	-
CWS							
BTEX	-	-	-	-	-	-	-
F1 – F4	-	-	-	-	-	-	-

Notes:
X = Exceedance of one or more parameter(s)
- = No exceedance
IACR = Index of Additive Cancer Risk of 10^{-5}

EH = Environmental Health
NR = Not Required
UF = Uncertainty Factory of 3

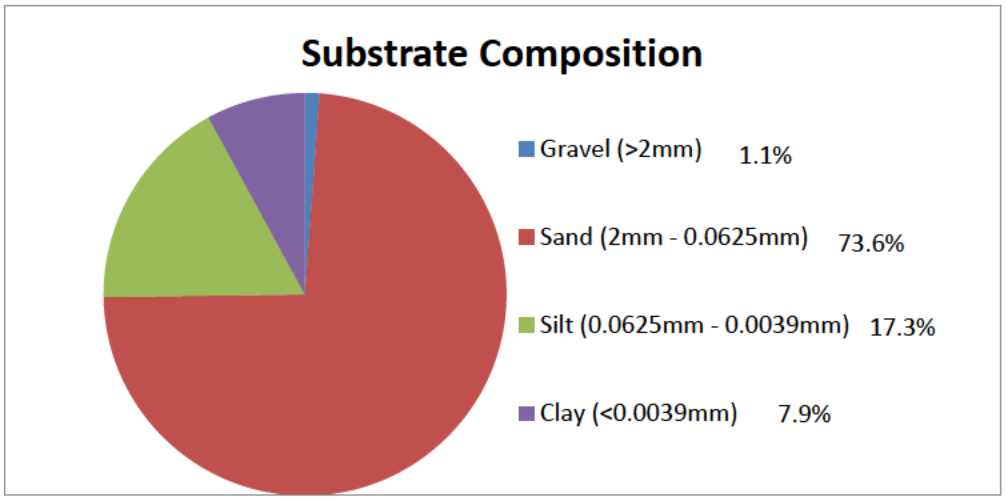

Figure 1– Average Substrate Composition of Individual Samples

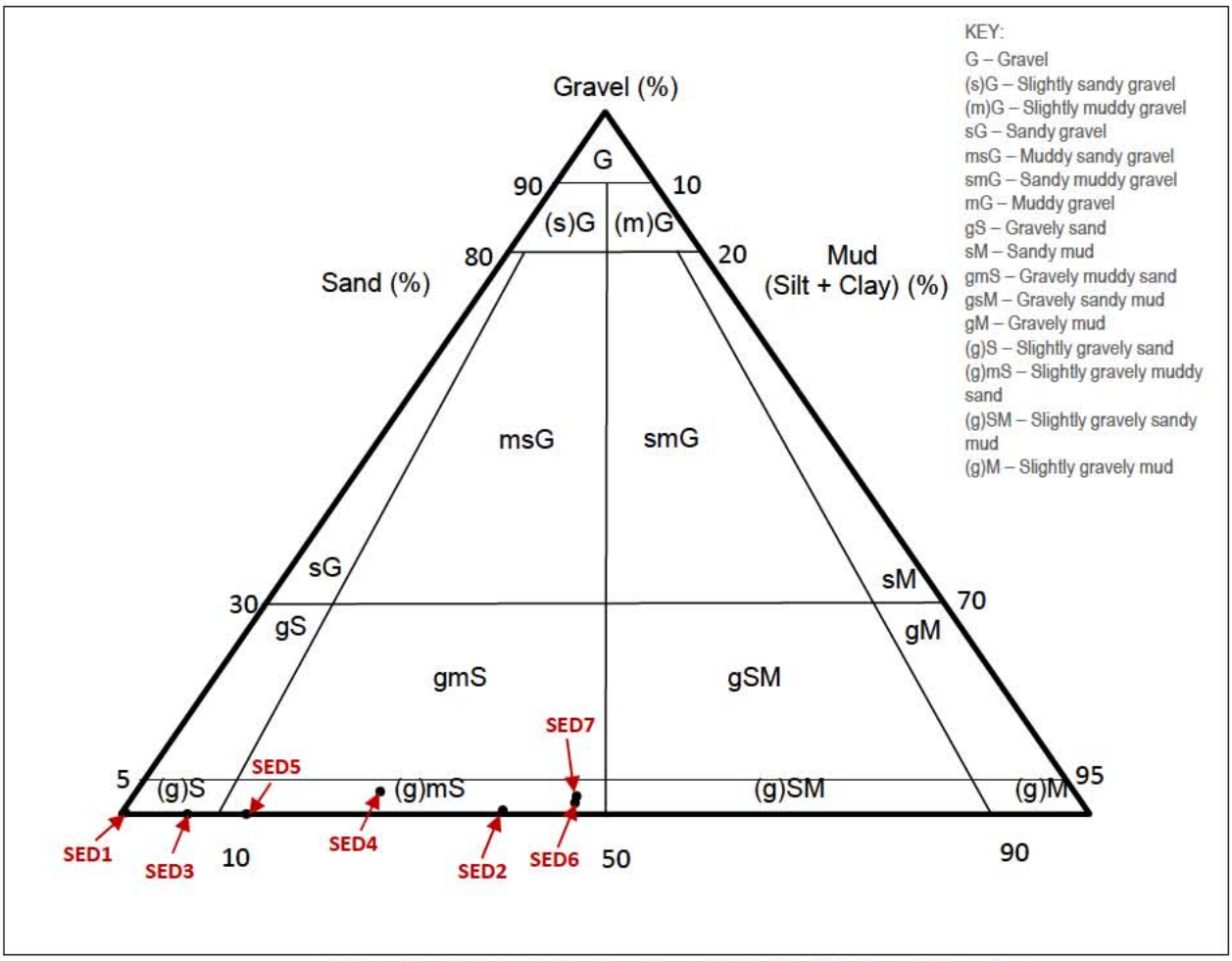

Figure 2 – Substrate Composition of Individual Sediment Samples

The primary substrate type in the sediments collected at SED1 and SED3 were characterized as slightly gravelly sand and the primary substrate type in the sediments collected at SED2, SED4, SED5, SED6 and SED7 were characterized as slightly gravelly muddy sand.

The TOC concentrations range from 0.03% to 7.31%; TIC concentrations range from <0.01% 0.01%.

Production Team

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Property and Confidentiality

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1 Introduction

Englobe Corp. (Englobe) was retained by NB Department of Tourism, Heritage and Culture (THC) to complete an Environmental Impact Assessment (EIA) to support dredging activities related to the ongoing beach nourishment program at the Parlee Beach Provincial Park site located in Pointe-du-Chêne, New Brunswick (the "site").

The Parlee Beach Provincial Park site consists of an existing dredge area located at the extreme western end of the beach where they are stockpiled over the winter and spread over the beach in the spring. The dredging takes place every couple of years, or more frequently depending on erosion/damage caused by winter storms. The NB Department of THC is considering modifying the program to include dredging the mouth of the tidal inlet located south of the current dredge limits and high points within the inlet and lagoon in order to encourage regular tidal flushing of the lagoon. Therefore, a Marine Sediment Sampling Program (MSSP) was required within the tidal inlet and lagoon in order to characterize the sediment to aid in determining potential disposal locations.

Refer to Appendix A for a site location plan (Figure 1).

2 Scope and Methodology

2.1 Site Plan

Seven spatially balanced grab samples were collected within the tidal inlet and lagoon located at the Parlee Beach Provincial Park site at the locations shown on Figure 2, Appendix A.

Sediment locations were recorded using a Garmin handheld global positioning system (GPS) unit using NAD83 and coordinates are listed in Table 2, below.

Table 2 – Sediment Sample Coordinates

Sample ID	Sample Coordinates Decimal Degrees	
	Latitude	Longitude
SED1	46.239519°	-64.519798°
SED2	46.239874°	-64.518061°
SED3	46.240310°	-64.515552°
SED4	46.239978°	-64.513100°
SED5	46.239554°	-64.511726°
SED6	46.239127°	-64.509852°
SED7	46.238465°	-64.509580°

2.2 Sample Collection

Englobe retained the services of a diving team/crew from Dominator Marine Services Inc. based in Carter's Point, NB. Under Englobe supervision, the divers navigated to each identified sample location using a handheld Global Positioning System (GPS), collected a GPS waypoint, collected sediment using a clean plastic bucket (underwater), put a lid on the bucket, brought the bucket up out of the water and to the shore, removed the lid, and poured off excess water. An Englobe representative then homogenized each individual grab samples by means of a clean nitrile glove-covered hand prior to the placement in clean laboratory supplied jars. The buckets used for collecting and homogenizing the samples were washed thoroughly in the water prior to processing the next sample.

At the time of sampling on August 26, 2021, the weather was sunny with light wind. The field program was completed as planned, in terms of sampling methodologies and locations.

A visual description of all samples and the presence of any sheen and/or odour was noted in the field. Sample locations were photographed for future reference. All equipment coming in contact with the sediments were properly cleaned following Environment Canada's recommendations (Guidance Document on Collection and Preparation of Sediments for Physiochemical Characterization and Biological Testing, 1994).

Site photographs and field data collection forms are included in Appendix B.

The field work and sampling was carried out in accordance with the following:

- Englobe's standard operating procedures (SOPs) for soil and sediment sampling;
- 2016 CCME Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment; and
- Guidelines defined by provincial Occupational Health and Safety Standards.

Each sediment sample was immediately placed in laboratory supplied containers, preserved where necessary, and stored in ice packed coolers prior to shipment to Research & Productivity Council (RPC), in Fredericton, New Brunswick.

RPC is accredited by the Standards Council of Canada (SCC) for the specified tests conducted in this program.

2.3 Laboratory Analysis

All seven sediment samples were analyzed for the following:

- Polycyclic Aromatic Hydrocarbons (PAHs) (including a scan for the presence of creosote).
- ICP 23 metals scan plus mercury and hexavalent chromium.
- Total Petroleum Hydrocarbons (TPHs) and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX).
- Total Polychlorinated biphenyls (PCBs) and Dichlorodiphenyltrichloroethane (DDT) suite.
- Total Organic Carbon/Total Inorganic Carbon (TOC/TIC).
- Grain Size Distribution.

- Sodium Adsorption Ratio (SAR), pH, and Conductivity.

In order to aid in determining disposal options, the sediment analytical sample results were compared to the following:

- Canadian Council of Ministers of the Environment (CCME) Soil Quality Guidelines (SQGs) for the Protection of Human and Environmental Health.
- CCME Canada Wide Standards (CWS) for Petroleum Hydrocarbon Concentrations (PHCs).
- Atlantic Risk-Based Corrective Action (RBCA) Tier 1 Version 3 Risk-Based Screening Levels (RBSLs) and Soil Ecological Screening Levels (ESLs).
- Atlantic RBCA Human and Ecological Health-Based Tier I Environmental Quality Standards (EQS) for Soil – All Land Uses (July 2021).

2.4 Quality Assurance and Quality Control

Englobe conducted the environmental sampling following standard operating procedures, including job procedures and safe work practices. The sampling was conducted in accordance with all pertinent acts, regulations, codes, guidelines and standard practices.

All sediment samples were logged by Englobe personnel and submitted under chain of custody to RPC. RPC conducts their own internal QA/QC programs consistent with relevant standards and requirements for laboratory certification. The measured values and recoveries are compared to acceptable lower and upper limits. RPC's QA/QC results were reviewed by Englobe and were found be within acceptable limits.

2.5 Underwater Video Analysis

Under the direction of Englobe, Dominator completed an underwater video survey at each sediment sampling location along the tidal inlet, lagoons and channel. The video/sampling locations were selected by Englobe. A GPS was used to locate the pre-determined video/sampling points, the video footage was collected prior to sampling by scanning to the right and left of the sample location to provide a wider view of habitats.

An Englobe representative was on-site to guide the dive crew in the event that an issue arose and to obtain supporting habitat and biological information.

Video footage was collected by the divers and Englobe reviewed the video provided by Dominator to describe flora/fauna and substrate conditions at the site. The results of the dive survey and video analysis are provided in Section 4.

The dive video provided by Dominator was reviewed by an experienced Englobe biologist to classify the marine substrate, flora, and fauna. The general findings at each sample location were summarized in a spreadsheet. Specifically, substrate/sediment type (and it's estimated % cover), flora (and it's estimated % cover) and fauna (and the number of individuals) as well as any debris (and the estimated number of pieces observed) were recorded. The analysis of the benthic videos taken at each location is based solely on visual interpretation and experienced visual estimates.

Classification of the substrate at the site was conducted in order to understand the impacts to the marine environment and determine the composition of the habitat at the site. Video data

was reviewed and characterized through five substrate types based on the Wentworth-Udden (Wentworth, 1922) classification summarized in Table 3.

Table 3 - Classification of Marine Substrates

Broad Substrate Category[1]	Detailed Substrate Category [1]	Definition
Bedrock	Bedrock	Continuous solid rock exposed by scouring forces.
Coarse	Boulder	Rocks greater than 250 mm in diameter.
	Rubble	Large rocks ranging from 130 mm – 250 mm in diameter.
Medium	Cobble	Rocks ranging from 30 mm – 130 mm.
	Gravel	Granule size or coarser, 2 mm – 30 mm.
Fine	Sand	Fine deposits ranging from 0.06 mm – 2 mm.
	Mud	Material encompassing both silt and clay <0.06 mm.
Organic	Organic/Detritus	Soft material 85% or more organic materials.
Shell	Shells	Calcareous remains of shellfish and other invertebrates.

Note [1]: Marine substrates as adapted from Wentworth-Udden (Kelly et al., 2009)

Classification of the fauna and flora at the site was conducted to identify any species at risk, species that could be important to food chain considerations and determine if the ecological conditions at the site could show evidence of stress that could be related to environmental or physiological conditions. Flora was expressed by a percentage of coverage at each sample location and sedentary and mobile fauna were listed where possible and categorized under a semi-quantitative abundance scale (Kelly et al. 2009) as defined in Table 4.

Table 4 - Macrofaunal Abundance Categories

Abundance Category	Code	Description
Abundant	A	Numerous observations made throughout the entire sampling area Occurs on >50% of the sampling area.
Common	C	Numerous observations made intermittently across the sampling area Occurs on 20 to 50% of the sampling area.
Occasional	O	Quantifiable observations made intermittently across the sampling area Occurs on 5 to 20% of the sampling area.
Rare	R	Quantifiable observations made infrequently across the sampling area Occurs on <5% of the sampling area.

3 Results

The analytical results for each sample are summarized and compared to their applicable guidelines in Tables C.1 to C.5 in Appendix C. The complete set of analytical results, including laboratory QA/QC and the Certificates of Analysis for all parameters tested, are provided in Appendix D.

3.1 Polycyclic Aromatic Hydrocarbons (PAHs)

PAH analytical results compared to their respective guideline(s) are summarized in Table C.1, Appendix C.

CCME stipulates values for the protection of human health (direct contact, potable water) for the individual PAH compounds; however, it should be noted that the individual values are not stand alone SQGs. Rather, each value has been incorporated into Benzo(a)pyrene Total Potency Equivalent (B(a)P TPE) and Index of Additive Cancer Risks (IACR) equations to account for the combined effects of individual PAHs in the mixture.

Guidance provided in the CCME SQGs for the Protection of Environmental and Human Health (2008) indicates that for soil contaminated by coal tar or creosote mixtures, the calculated benzo(a)pyrene total potency equivalent (TPE) concentration for soil samples should be multiplied by an uncertainty factor (UF) of 3 prior to comparison with the SQGs for the Protection of Human Health (Direct Contact) to account for carcinogenic potential of alkylated and other PAHs present for which a potency equivalency factor (PEF) does not currently exist, but which are likely to contribute to mixture carcinogenic potential. Since the samples did not resemble creosote or tar, the UF was not applied.

CCME SQGs for the Protection of Human Health (Potable Water and Direct Contact)

All sediment samples satisfied the applicable CCME SQGs for the Protection of Human Health (Potable Water) IACR and for the Protection of Human Health (Direct Contact) benzo(a)pyrene TPE for all land use applications.

The lab reported no resemblance to creosote or coal tar in any of the seven samples, therefore the uncertainty factor was not applied to the results prior to comparison with the calculated benzo(a)pyrene TPE criteria.

CCME SQGs for the Protection of Environmental Health (Soil Contact, Soil and Food Ingestion, and Freshwater Life)

All sediment samples reported PAH parameters satisfied the applicable CCME SQGs for the Protection of Environmental Health (Soil Contact, Soil and Food Ingestion and Freshwater Life) for all land use applications.

Atlantic RBCA Tier I EQS for Soil for the Protection of Human Health (Potable and Non-Potable Groundwater Conditions) and Ecological Health for All Land Use Settings

All sediment samples reported PAH parameters satisfied the applicable Atlantic RBCA soil Environmental Quality Standards (EQS) for the protection of Human and Ecological Health for all land use applications.

3.2 Metals

Metal analytical results compared to their respective guideline(s) are summarized in Table C.2, Appendix C.

CCME SQGs for the Protection of Human Health and Environmental Health Agricultural and Residential/Parkland Land Use

Sediment samples SED2 to SED7 exceeded the applicable CCME SQGs for Agricultural land use for boron.

Sediment samples SED2, SED4, SED6 and SED7 exceeded the applicable CCME SQGs for Agricultural land use for molybdenum.

Sediment samples SED6 and SED7 exceeded the CCME SQGs for Agricultural and Residential/Parkland land use for zinc.

The laboratory detection limit for hexavalent chromium in samples SED2 and SED4 to SED7 was above the CCME SQGs Agricultural and Residential/Parkland land use criteria, and therefore it cannot be stated with certainty that the value is within the guideline.

CCME SQGs for the Protection of Human Health and Environmental Health Commercial and Industrial Land Use

Sediment sample SED7 exceeded the CCME SQGs for Commercial and Industrial land use for zinc.

Atlantic RBCA Tier I EQS for Soil for the Protection of Human Health (Potable Groundwater Conditions) for All Land Use Settings

Sediment sample SED7 exceeded the Atlantic RBCA EQS for the Protection of Human Health (Potable Water) for Agricultural, Residential/Parkland and Commercial land use for beryllium.

Sediment samples SED2, SED4, SED5, SED6 and SED7 exceeded the Atlantic RBCA EQS for the Protection of Human Health (Potable Water) for Agricultural, Residential/Parkland and Commercial land use for iron.

Sediment samples SED6 and SED7 exceeded the Atlantic RBCA EQS for the Protection of Human Health (Potable Water) for Agricultural, Residential/Parkland and Commercial land use for manganese.

Sediment samples SED2 and SED7 exceeded the Atlantic RBCA EQS for the Protection of Human Health (Potable Water) for Agricultural, Residential/Parkland and Commercial and Industrial land use for sodium.

Sediment Sample SED7 exceeded the Atlantic RBCA EQS for the Protection of Human Health (Potable Water) for Agricultural, Residential/Parkland and Commercial land use for vanadium.

Sediment Samples SED6 and SED7 exceeded the Atlantic RBCA EQS for the Protection of Human Health (Potable Water) for Agricultural, Residential/Parkland and Commercial and Industrial land use for zinc.

Atlantic RBCA Tier I EQS for Soil for the Protection of Human Health (Non-Potable Groundwater Conditions) for All Land Use Settings

Sediment samples SED2, SED4, SED5, SED6 and SED7 exceeded the Atlantic RBCA EQS for the Protection of Human Health (Non-Potable Water) for Agricultural, Residential/Parkland and Commercial land use for iron.

Sediment samples SED6 and SED7 exceeded the Atlantic RBCA EQS for the Protection of Human Health (Non-Potable Water) for Agricultural, Residential/Parkland and Commercial land use for manganese.

Sediment sample SED7 exceeded the Atlantic RBCA EQS for the Protection of Human Health (Non-Potable Water) for Agricultural, Residential/Parkland and Commercial land use for vanadium.

Atlantic RBCA Tier I EQS for Soil for the Protection of Ecological Health for All Land Use Settings

Sediment sample SED2 exceeded the Atlantic RBCA EQS for the Protection of Ecological Health for all land use applications for boron.

Sediment sample SED6 exceeded the Atlantic RBCA EQS for the Protection of Ecological Health for Residential/Parkland land use for lead.

Sediment samples SED2, SED4, SED6 and SED7 exceeded the Atlantic RBCA EQS for the Protection of Ecological Health for Agricultural and Residential/Parkland land use for molybdenum.

All sediment samples exceeded the Atlantic RBCA EQS for the Protection of Ecological Health for all land use applications for sodium.

Sediment samples SED2, SED4, SED5, SED6 and SED7 exceeded the Atlantic RBCA EQS for the Protection of Ecological Health for all land use applications for vanadium.

Sediment samples SED6 and SED7 exceeded the Atlantic RBCA EQS for the Protection of Ecological Health for all land use applications for zinc.

The laboratory detection limit for hexavalent chromium in samples SED2 and SED4 to SED7 was above the CCME SQGs Commercial and Industrial land use criteria and the Atlantic RBCA EQS for the Protection of Ecological Health for all land use applications, and therefore it cannot be stated with certainty that the value is within the guideline.

3.3 Petroleum Hydrocarbons

BTEX/TPH analytical results compared to their respective guideline(s) are summarized in Table C.3, Appendix C.

BTEX, mTPH and F1-F4 concentrations in all sediment samples satisfy applicable Atlantic RBCA, CCME and CWS guidelines for all land use applications.

3.4 DDT and PCBs

DDT and PCB analytical results compared to their respective guideline(s) are summarized in Table C.4, Appendix C.

DDT and PCB concentrations in all sediment samples were reported below the laboratory detection limits and satisfy all applicable CCME SQGs and Atlantic RBCA Tier I EQS guidelines for all land use applications.

3.5 Grain Size Distribution

Sediment sample composition is described in Table 5 and Figure 3, below. Table 5 provides the primary to quaternary substrate distribution of the samples analyzed from the site. Figure 3

illustrates the overall sediment composition of the samples analyzed, expressed as percentages to show the average grain size distributions. Figure 4 shows the proportions of gravel, sand, and mud (silt and clay) for individual samples.

Refer to Table C-5 in Appendix C for grain size analytical results.

Table 5 - Dominant Sediment Types at Each Sample Location

Sample ID	Particle Size Distribution			
	1° Substrate	2° Substrate	3° Substrate	4° Substrate
SED1	Sand	Clay	Gravel	Silt
SED2	Sand	Silt	Clay	Gravel
SED3	Sand	Silt/Clay	Silt/Clay	Gravel
SED4	Sand	Silt	Clay	Gravel
SED5	Sand	Clay	Silt	Gravel
SED6	Sand	Silt	Clay	Gravel
SED7	Sand	Silt	Clay	Gravel

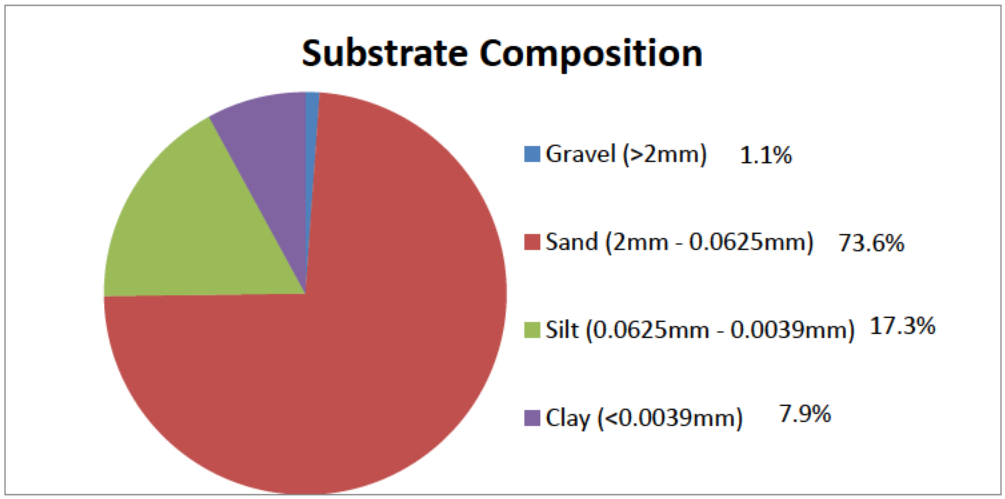


Figure 3 – Average Substrate Composition of Individual Samples

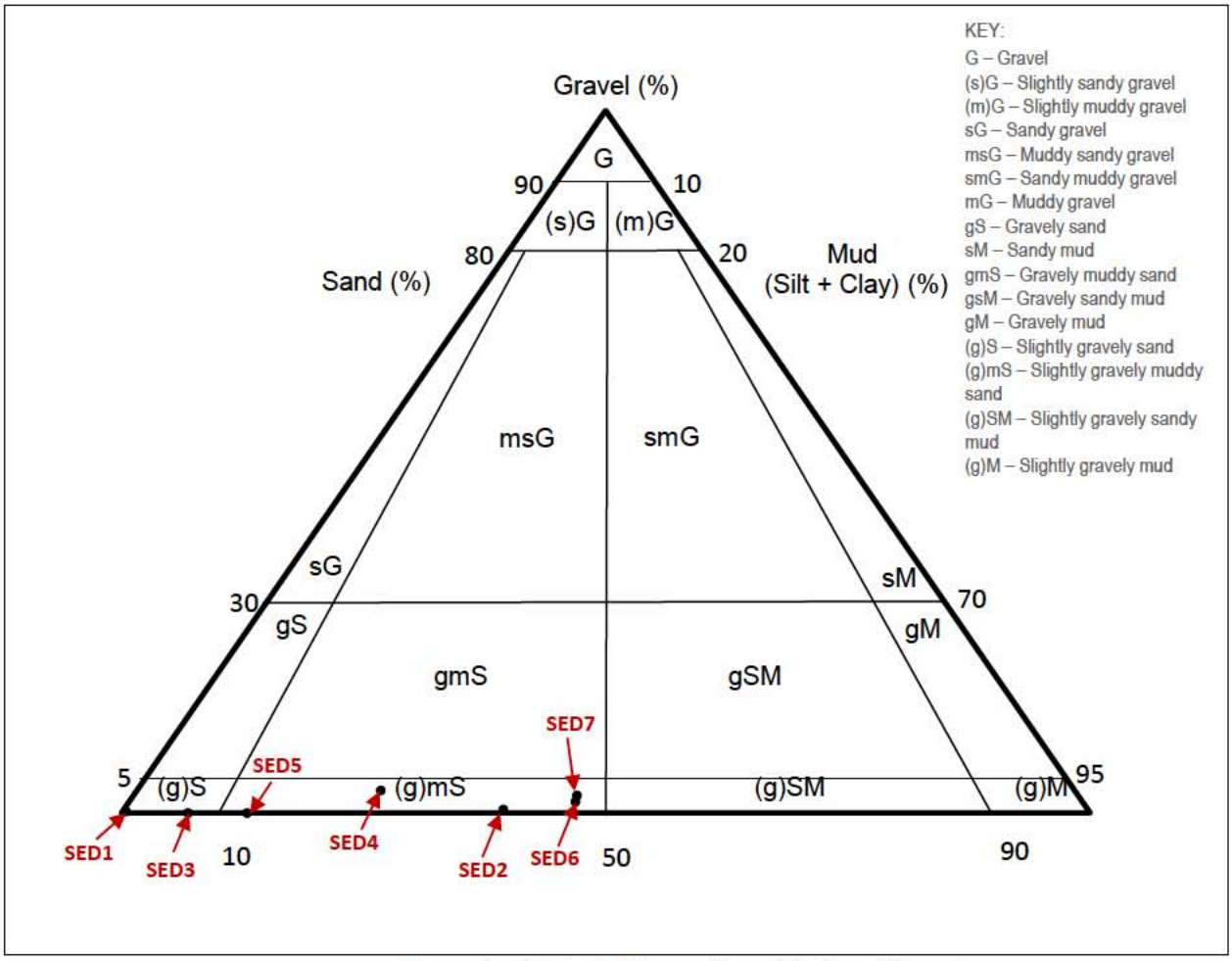


Figure 4 – Substrate Composition of Sediment Samples

3.6 TOC/TIC, SAR, Conductivity and pH

TOC/TIC, SAR, conductivity and pH results are summarized in Table C.5, Appendix C.

TOC concentrations range from 0.03% to 7.31%. TIC concentrations range from <0.01% 0.01%.

CCME Soil Quality Guidelines for the Protection of Human and Environmental Health for Agricultural and Residential/Parkland and Commercial/Industrial Land Use Settings

All sediment samples exceed the applicable CCME SQG for SAR and conductivity for all land use applications.

All sediment samples, with the exception of SED7, were reported outside the acceptable pH range for the CCME SQGs for all land use applications.

4 Underwater Benthic Habitat

4.1 Field Observations and Dive Survey

The habitat descriptions prepared by Englobe are included in Appendix E. Using a map of the proposed sample locations, the divers retrieved the required samples and data from the channel bed. The divers did not have difficulty collecting sediment at any of the proposed sample locations, therefore, samples were collected in the proposed locations. Sample location descriptions (as a compilation of observations including what was noted by field technicians and observed on the dive video) are summarized in Table 6. It should be noted that poor visibility was encountered at most sediment sample locations.

Video data was reviewed and characterized by detailed substrate type of up to five substrate types based on the Wentworth-Udden (Wentworth 1922) classification. However, due to the poor visibility in the dive videos, identification of the substrate and interpretation of the habitat was primarily conducted in the field.

4.2 Tidal Inlet, Channel and Lagoons

Within the proposed dredge site, the survey area defined by the tidal inlet, channel and lagoons is an intertidal zone to the west with substrates consisting of sand and silty sand. The east side of the site is less influenced by tidal action due to blockage from sediment built up, this portion of the site is also influenced by stormwater and runoff from the parking areas. The habitat within the site is limited, with decaying organic debris in the sediments and an algae mat observed over most of the site. No rare or endangered species were observed during the survey.

The channel bottom within the tidal inlet (SED1 and SED3) was predominantly sand. The outer lagoon, channel and inner lagoon consisted of silty sand. Some debris in the form of detached/floating seaweed were observed at the tidal inlet, which washed up from the Shediac Bay. An algae mat was observed covering sediments within the channel and lagoons. No other macrofloral life was identified within the site boundaries. No fauna were observed.

Table 6 Sediment Sample Descriptions

Sample ID	Bulk Sediment Description Flora Fauna Debris/Other
SED1	Brown Sand
	None
	None
	Detached seaweed debris
SED2	Brown Silty Sand
	Algae mat
	None
	Organic debris
SED3	Brown Sand
	Algae mat
	None
	None
SED4	Brown Silty Sand
	Algae mat
	None
	Organic debris
SED5	Brown Silty Sand
	Algae mat
	None
	Organic debris
SED6	Brown Silty Sand
	Algae mat
	None
	Organic debris
SED7	Brown Silty Sand
	Algae mat
	None
	Organic debris

5 Conclusions

The following conclusions are drawn from the results of the MSSP at the Parlee Beach Provincial Park tidal inlet and lagoon:

The primary substrate type in the sediments collected at SED1 and SED3 were characterized as slightly gravelly sand and the primary substrate type in the sediments collected at SED2, SED4, SED5, SED6 and SED7 were characterized as slightly gravelly muddy sand.

The TOC concentrations range from 0.03% to 7.31%; TIC concentrations range from <0.01% 0.01%.

The analytical results for the sediment samples collected from the tidal inlet and lagoon located at the site indicate the following guideline exceedances:

- CCME SQGs for the Protection of Human and Environmental Health for Agricultural and Residential/Parkland Land Use:
  - SED1: SAR, conductivity and pH.
  - SED2: Boron (agricultural only), molybdenum (agricultural only), SAR, conductivity and pH.
  - SED3: Boron (agricultural only), SAR, conductivity and pH.
  - SED4: Boron (agricultural only), molybdenum (agricultural only), SAR, conductivity and pH.
  - SED5: Boron (agricultural only), SAR, conductivity and pH.
  - SED6: Boron (agricultural only), molybdenum (agricultural only), zinc, SAR, conductivity and pH.
  - SED7: Boron (agricultural only), molybdenum (agricultural only), zinc, SAR, and conductivity.

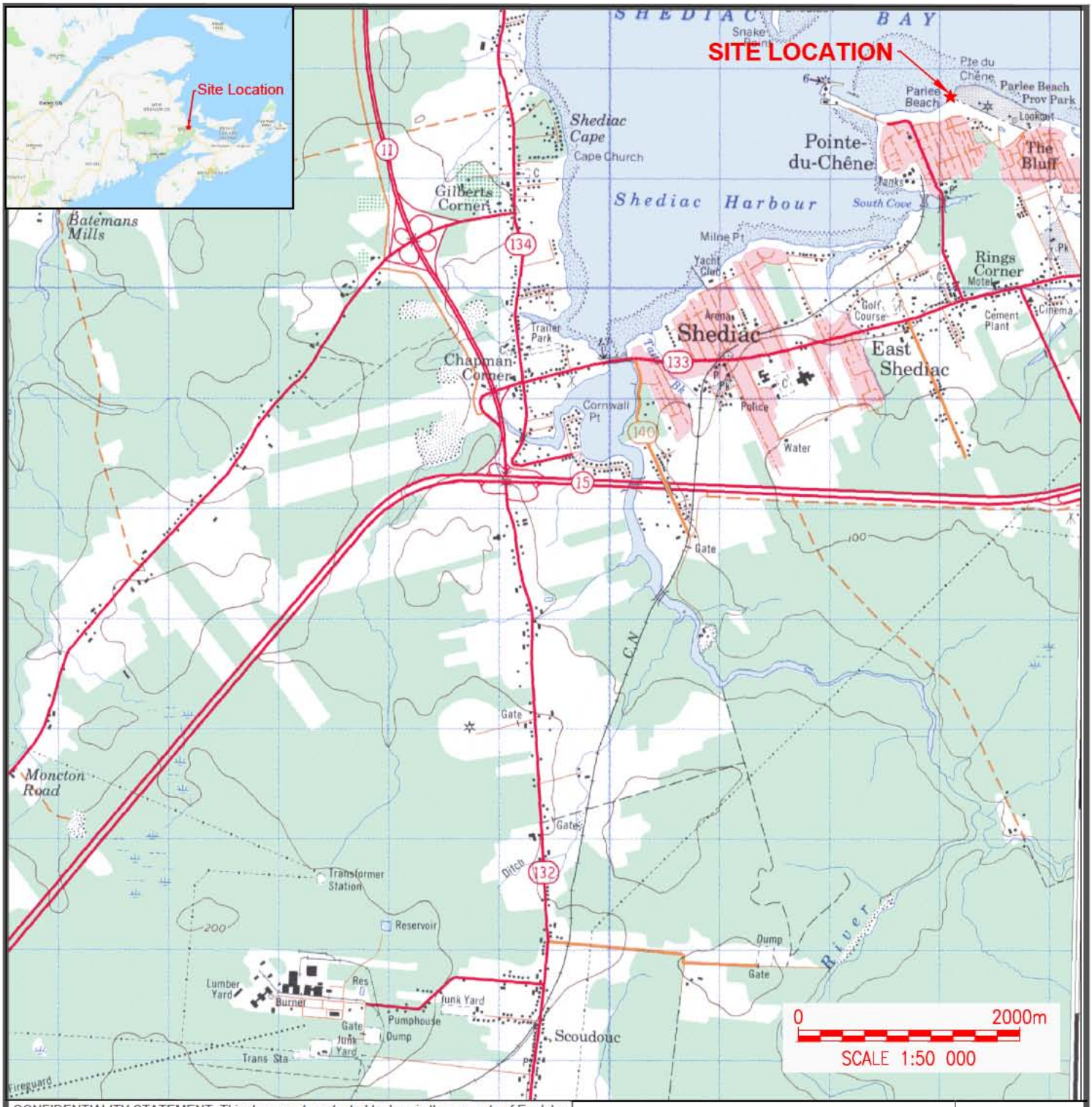
- CCME SQGs for the Protection of Human and Environmental Health for Commercial and Industrial Land Use:
  - SED1: SAR, conductivity and pH.
  - SED2: SAR, conductivity and pH.
  - SED3: SAR, conductivity and pH.
  - SED4: SAR, conductivity and pH.
  - SED5: SAR, conductivity and pH.
  - SED6: Zinc (commercial only), SAR, conductivity and pH.
  - SED7: Zinc, SAR, and conductivity.
- Atlantic RBCA Tier I EQS for Soil for the Protection of Human Health (Potable Groundwater Conditions) for Agricultural, Residential/Parkland and Commercial Land Use:
  - SED2: Iron and sodium.
  - SED4: Iron.
  - SED5: Iron.
  - SED6: Iron, manganese and zinc.
  - SED7: Beryllium, iron, manganese, sodium, vanadium and zinc.
- Atlantic RBCA Tier I EQS for Soil for the Protection of Human Health (Potable Groundwater Conditions) for Industrial Land Use:
  - SED2: Sodium.
  - SED6: Zinc.

  - SED7: Sodium and zinc.
- Atlantic RBCA Tier I EQS for Soil for the Protection of Human Health (Non-Potable Groundwater Conditions) for Agricultural, Residential/Parkland and Commercial Land Use:
  - SED2: Iron.
  - SED4: Iron.
  - SED5: Iron.
  - SED6: Iron and manganese.
  - SED7: Iron, manganese and vanadium.
- Atlantic RBCA Tier I EQS for Soil for the Protection of Ecological Health for All Land Use Settings:
  - SED1: Sodium.
  - SED2: Boron, molybdenum (Agricultural and Residential/Parkland only), sodium and vanadium.
  - SED3: Sodium.
  - SED4: Molybdenum (Agricultural and Residential/Parkland only), sodium and vanadium.
  - SED5: Sodium and vanadium.
  - SED6: Lead (Residential/Parkland only), molybdenum (Agricultural and Residential/Parkland only), sodium, vanadium and zinc.
  - SED7: Molybdenum (Agricultural and Residential/Parkland only), sodium, vanadium and zinc.

6 Report use and Conditions

This report was prepared for the exclusive use of NB THC and is based on data and information obtained during a site visit by Englobe on the subject property; and is based solely upon the condition of the property on the date of such inspection, supplemented by information obtained and described herein. The evaluation and conclusions contained in this report have been prepared in light of the expertise and experience of Englobe. Environmental conditions are dynamic in nature and changing circumstances in the environment and in the use of the property can alter radically the conclusions and information contained herein.

Appendix A Site and Sample Location Plans



NB Department of Tourism, Heritage and Culture

Marine Sediment Sampling Program

Parl e Bea h Provinci l Park
Pointe-du-Chên , N w Brunswick

Site Location Plan

Englobe
1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

Discipline: Environment		Prepare by: JM	Verify by: JM
Scale: 1: 50,000		Draw by: JJ	Approval by: SF
Date: October 2021		Figure no: 1	
Page setup: Figure 1	Paper size: Letter	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000	0 - - -	——	-

LEGEND:

△ **- Sediment Sample Location**

NB Department of Tourism, Heritage and Culture

0 30 60 90 120 150m

SCALE 1: 3000

Englobe

Englobe Corp.

1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

Marine Sediment Sampling Program

Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Sample Location Plan

No.	Version	Date	By	Verif	Appr.
XX	X	Oct. 2021	JJ	TM	SF

Discipline: Environment		Prepare by: TM	Verify by: TM
Scale: 1: 3000		Draw by: JJ	Approval by: SF
Date: October 2021		Figure no: 2	
Page setup: Fig. 2	Paper size: 11 x 17	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000			

Appendix B Field Data Collection Forms and Photos

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FIELD DATA COLLECTION FORM

Site: Parlee Beach Tidal Inlet/Lagoon	**Location:** Parlee Beach Provincial Park, Pointe-du-Chene, NB	**Date:** August 26, 2021
Sample Collector: Divers		**Time:** 9:00AM
Recorder: Garmin		**Average Water Temperature (°C):** 14°C
Collection Device: Grab Samples		**Type of Vessel:** N/A

Site Description:		
Air Temperature: 24°C	**Weather:** Sunny with clouds, light wind	**Photographs Taken:** Yes
Site Conditions: Normal, no human activity other than the sampling program		
Observations: NA		

Sample Data:

Sample ID	Sediment Description[1]	Odour[2]	Grab Depth (cm)	Flora/Fauna	Decimal Degrees	
SED1	Grey beige sand, dense	None	15	Some flora debris	46.239519°	-64.519798°
SED2	Grey beige sand with some organics, dense	None	15	Flora debris	46.239874°	-64.518061°
SED3	Grey beige sand with some organics, dense	Slight Organic	15	Some flora debris	46.240310°	-64.515552°
SED4	Black/grey beige sandy silt with organics, loose	Strong Organic	15	None	46.239978°	-64.513100°
SED5	Black/grey beige sandy silt with organics, loose	Strong Organic	15	None	46.239554°	-64.511726°
SED6	Black/grey beige sandy silt with organics, loose	Strong Organic	15	Some flora debris	46.239127°	-64.509852°
SED7	Black/grey beige sandy silt with organics, loose	Strong Organic	15	Some flora debris	46.238465°	-64.509580°

Additional Comments:
Poor visibilty at all sample locations

Notes:
1. Material type, texture and consistency, colour, presence of biota
2. Degree of odour (strong, slight, none)

PHOTO 1 — Photo of sediment sample location SED1 (August 26, 2021).

PHOTO 2 — Photo of sediment sample SED1 (August 26, 2021).

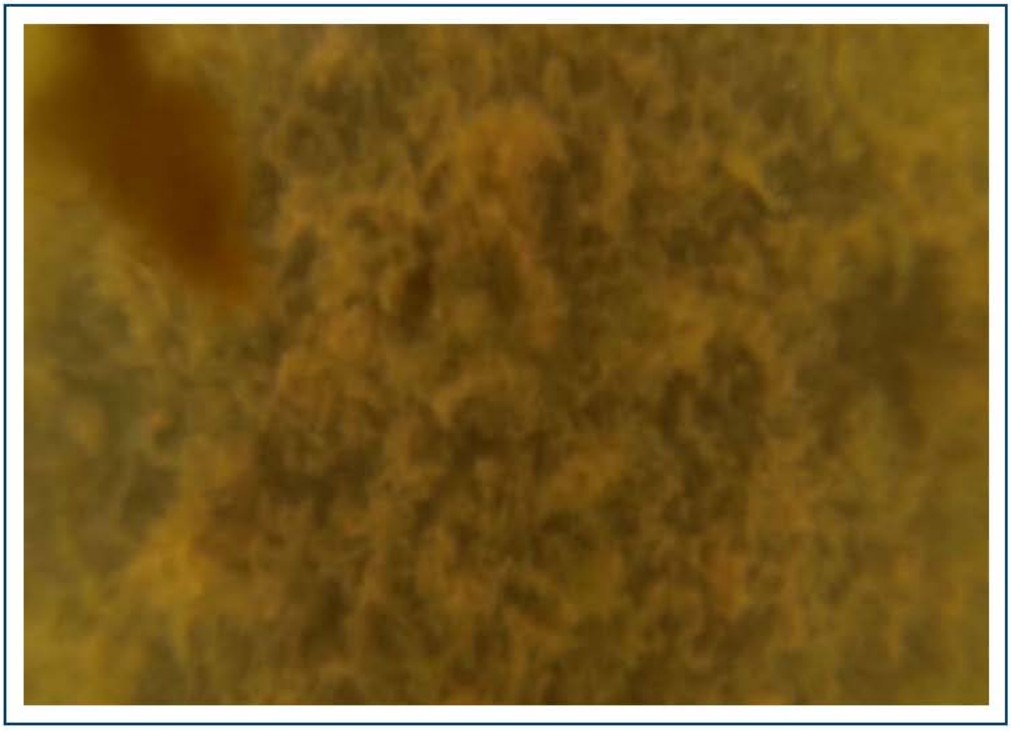

PHOTO 3 — Photo of sediment sample locaiton SED2 (August 26, 2021).

PHOTO 4 – Photo of sediment sample SED2 (August 26, 2021).

PHOTO 5 – Photo of sediment sample location SED3 (August 26, 2021).

PHOTO 6 – Photo of sediment sample SED3 (August 26, 2021).

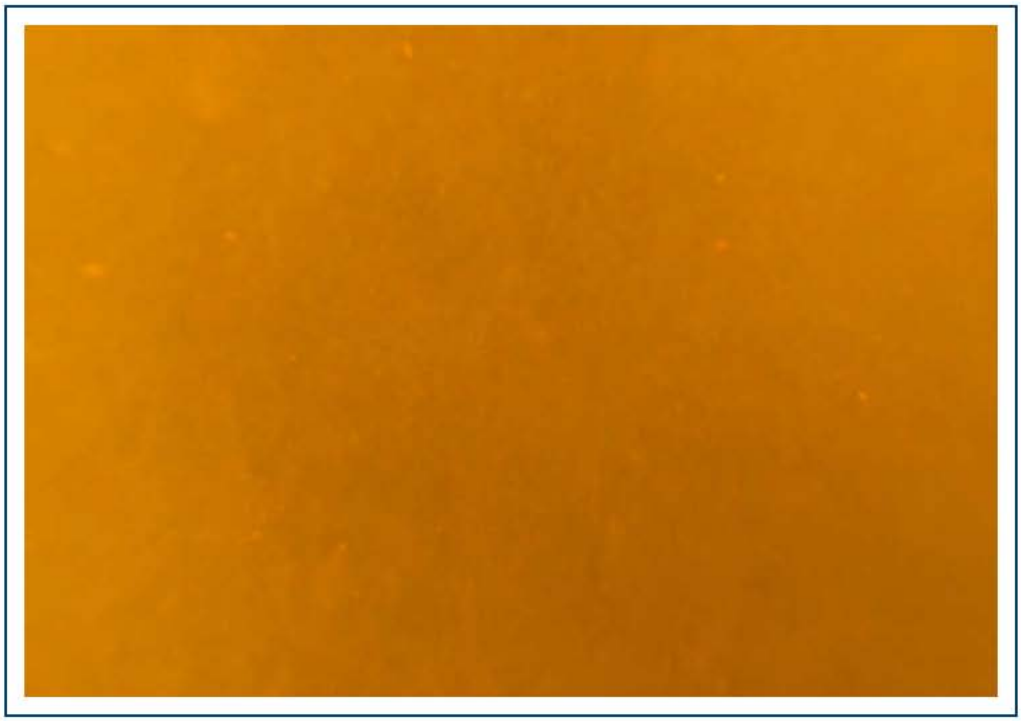

PHOTO 7 — Photo of sediment sample location SED4 (August 26, 2021).

PHOTO 8 — Photo of sediment sample SED4 (August 26, 2021).

PHOTO 9 — Photo of sediment sample location SED5 (August 26, 2021).

PHOTO 10 – Photo of sediment sample SED5 (August 26, 2021).

PHOTO 11 – Photo of sediment sample SED6 (August 26, 2021).

PHOTO 12 – Photo of sediment sample SED6 (August 26, 2021).

PHOTO 13 – Photo of sediment sample SED7 (August 26, 2021).

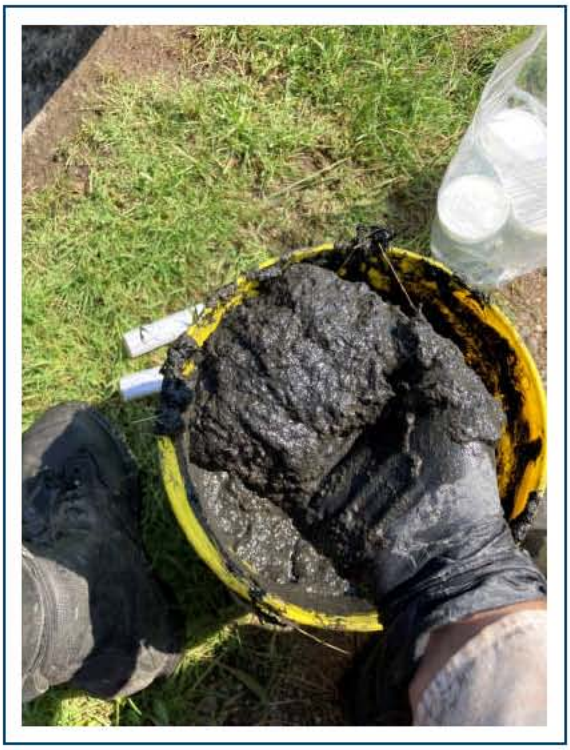

PHOTO 14 – Photo of sediment sample SED7 (August 26, 2021).

Appendix C Analytical Summary Tables

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Table C.1. PAH Results for Sediment Samples - Parlee Beach Provincial Park, NB

Parameter	RDL	Units	CCME Soil Quality Guidelines [1]						Atlantic RBCA Tier I EQS [2]						Sample ID and Date						
			Human Health		Environmental Health				Human Health				Ecological Health		SED1	SED2	SED3	SED4	SED5	SED6	SED7
			Potable Water	Direct Contact	Soil Contact		Soil and Food Ingestion	Freshwater Life	Potable Water		Non-Potable Water				26-Aug-21						
			Agricultural, Residential/ Parkland, Commercial and Industrial		Agricultural, Residential/ Parkland	Commercial/ Industrial	Agricultural, Residential/ Parkland	Agricultural, Residential/ Parkland, Commercial and Industrial	Agricultural, Residential/ Parkland	Commercial/ Industrial	Agricultural, Residential/ Parkland	Commercial/ Industrial	Agricultural, Residential/ Parkland	Commercial/ Industrial							
Polycyclic Aromatic Hydrocarbon (PAH) Results																					
Acenaphthene	0.01	mg/kg	-	-	-	-	21.5	0.28	3900	8000[a]/43,000[b]	3900	8,000[a]/43,000[b]	21.5	46,000	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	0.01		-	-	-	-	-	320	4.5	23	4.5	66	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Anthracene	0.01		-	-	2.5	32	61.5	-	24000	37,000[a]/300,000[b]	24,000	37,000[a]/300,000[b]	2.5	32	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Benzo(a)anthracene	0.01		-	-	-		6.2	-	12	12	-	-	0.5	1	< 0.01	0.02	< 0.01	0.02	< 0.01	0.03	0.02
Benzo(a)pyrene	0.01		-	-	20	72	0.6	8,800	14	14	-	-	0.6	72	< 0.01	0.03	< 0.01	0.02	< 0.01	0.04	0.03
Benzo(b+j)fluoranthene	0.01		-	-	-	-	-	-	-	-	-	-	-	-	< 0.01	0.04	0.01	0.03	0.01	0.05	0.07
Benzo(g,h,i)perylene	0.01		-	-	-	-	-	-	250	250	-	-	6.6	13	< 0.01	0.02	< 0.01	0.02	< 0.01	0.03	0.05
Benzo(k)fluoranthene	0.01		-	-	-	-	6.2	-			-	-	-	-	< 0.01	0.02	< 0.01	0.01	< 0.01	0.02	0.02
Chrysene	0.01		-	-	-	-	6.2	-	78	78	-	-	6.2	14	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02	0.03
Dibenz(a,h)anthracene	0.01		-	-	-	-	-	-	8.8	8.8	-	-	-	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	0.01		-	-	50	180	15.4	-	3500	5300[a]/50,000[b]	3,500	5,300[a]/50,000[b]	15.4	180	< 0.01	0.06	0.03	0.05	0.01	0.09	0.08
Fluorene	0.01		-	-	-	-	15.4	0.25	2700	4100[a]/39,000[b]	2,700	4,100[a]/39,000[b]	15.4	-	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Indeno(1,2,3-cd)pyrene	0.01		-	-	-	-	-	-	98	98	-	-	0.38	0.76	< 0.01	0.02	< 0.01	0.02	< 0.01	0.03	0.03
Naphthalene	0.01		-	-	-	-	8.8	0.013	2.2	25	2.2	25	0.6	22	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	0.01		-	-	-	-	43	0.046	17	17	-	-	6.2	12	< 0.01	0.01	< 0.01	0.01	< 0.01	0.04	0.03
Pyrene	0.01		-	-	-	-	7.7	-	2100	3,200[a]/30,000[b]	2,100	3,200[a]/30,000[b]	7.7	99,000	< 0.01	0.04	0.02	0.04	0.01	0.07	0.07
Index of Additive Cancer Risk (IACR)	Calculation	None	1	-	-	-	-	-	IACR<1.0	IACR<1.0	-	-	-	-	0.12	0.56	0.15	0.41	0.15	0.68	0.76
Benzo(a)pyrene TPE (10^{-5})	Calculation	mg/kg	-	5.3	-	-	-	-	5.3	5.3	5.3	5.3	-	-	0.01	0.05	0.01	0.03	0.01	0.06	0.05
Creosote or Coal Tar source suspected / known?	yes / no		-	-	-	-	-	-	-	-	-	-	-	-	NR	NR	NR	NR	NR	NR	NR
Uncertainty Factor (UF) Applied	yes / no (UF)		-	-	-	-	-	-	-	-	-	-	-	-	No	No	No	No	No	No	No
Benzo(a)pyrene TPE (10^{-5}) with UF	Calculation	mg/kg	-	5.3	-	-	-	-	-	-	-	-	-	-	0.01	0.05	0.01	0.03	0.01	0.06	0.05

Notes:

value [A] - guideline exceedance

NR = No Resemblance

Where a calculation requires the use of a value which was not detected, a value equal to half the laboratory reportable detection limit (RDL) is used in the equation.

[1] CCME Soil Quality Guidelines for the Protection of Human and Environmental Health (2021 online).

[2] Atlantic RBCA Human Health-Based Tier I Environmental Quality Standards for Soil, Coarse Grained Soil (a = commercial criteria, b = industrial criteria)

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Table C.2. Metals Results for Sediment Samples - Parlee Beach Provincial Park, NB

Parameter	RDL	Units	CCME Soil Quality Guidelines [1]				Atlantic RBCA Tier I EQS [2]						Sample ID and Date							
							Human Health				Ecological Health		SED1	SED1 Lab-Dup	SED2	SED3	SED4	SED5	SED6	SED7
							Potable Water		Non-Potable Water											
			Agricultural	Residential/ Parkland	Commercial	Industrial	Agricultural, Residential/ Parkland	Commercial [a]/ Industrial [b]	Agricultural[c], Residential/ Parkland [d]	Commercial [a]/ Industrial [b]	Agricultural[c], Residential /Parkland[d]	Commercial/ Industrial	26-Aug-21							
Aluminum	1		-	-	-	-	15,400	15,400	15,400	15,400[a]/220,000[b]	-	-	3,210	3,200	8,470	5,550	8,460	6,320	15,300	14,600
Antimony	0.1		20	20	40	40	7.5	7.5	7.5	7.5[a]/63[b]	20	40	< 0.1	< 0.1	0.2	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Arsenic	1		17	17	26	26	10	10	31	31	17.1	26	< 1	< 1	3	2	3	2	7	8
Barium	1		750	500	2,000	2,000	350	350	6,800	10,000[a]/96,000[b]	400[c]/390[d]	670	4	4	23	11	13	11	20	25
Beryllium	0.1		4	4	8	8	1	1	75	110[a]/1,100[b]	5	8	0.1	0.2	0.5	0.3	0.5	0.4	1	**1.1** [6, 7a]
Bismuth	1		-	-	-	-	-	-	-	-	-	-	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Boron	1		2	-	-	-	4300	4300[a]/24,000[b]	4,300	4,300[a]/24,000[b]	120	120	2	2	**477** [3, 10, 11]	**26** [3]	**67** [3]	**14** [3]	**11** [3]	**27** [3]
Cadmium	0.01		1.4	10	22	22	1	1	1.4[c]/14[d]	49[a]/192[b]	3.8[c]/1.9[d]	1.9	< 0.01	0.01	0.54	0.13	0.37	0.11	0.59	0.46
Calcium	50		-	-	-	-	-	-	-	-	-	-	460	370	4,070	780	4,800	1,150	1,660	3,220
Chromium	1		64	64	87	87	220	630[a]/2300[b]	220	630[a]/2,300[b]	64	87	5	4	14	9	14	10	24	24
Chromium - Hexavalent	0.4		0.4	0.4	1.4	1.4	60	60	160	160[a]/1,300[b]	0.4	1.4	< 0.4	-	**< 8** [3,4,5,10,11]	< 0.4	**< 8** [3,4,5,10,11]	**< 4** [3,4,5,10,11]	**< 8** [3,4,5,10,11]	**< 8** [3,4,5,10,11]
Cobalt	0.1		40	50	300	300	22	22[a]/25[b]	22	22[a]/250[b]	20	180	2.5	2.5	6.8	4.2	6.2	4.7	10.6	10.4
Copper	1		63	63	91	91	250	250	1,100	4,000[a]/16,000[b]	63	91	1	1	13	6	11	6	21	25
Iron	20		-	-	-	-	11,000	11,000[a]/164,000[b]	11,000	11,000[a]/164,000[b]	-	-	5,970	6,050	**15,300** [6,7a,8,9a]	10,200	**16,300** [6,7a,8,9a]	**12,400** [6,7a,8,9a]	**31,900** [6,7a,8,9a]	**42,200** [6,7a,8,9a]
Lead	0.1		70	140	260	600	120	120	140	260[a]/740[b]	70[c]/32[d]	32	1.6	1.6	12.4	5.6	9	5.8	**32.5** [10d,11]	29.5
Lithium	0.1		-	-	-	-	-	-	-	-	-	-	10.9	10.7	24.5	18.7	22.9	18.3	37.9	35.3
Magnesium	10	mg/kg	-	-	-	-	-	-	-	-	-	-	2,000	2,000	9,180	3,680	5,900	4,150	7,820	10,500
Manganese	1		-	-	-	-	360	360[a]/2000[b]	360	360[a]/5,200[b]	-	-	91	88	241	140	251	175	**515** [6, 7a, 8, 9a]	**1,080** [6, 7a, 8, 9a]
Mercury	0.01		6.6	6.6	24	50	6.6	24[a]/99[b]	6.6	24[a]/99[b]	12	20	< 0.01	< 0.01	0.02	< 0.01	0.02	< 0.01	0.05	0.06
Molybdenum	0.1		5	10	40	40	15	15	110	110[a]/1,200[b]	4	40	< 0.1	< 0.1	**11.6** [3, 10]	3.1	**7.1** [3, 10]	2.1	**6.3** [3, 10]	**5.6** [3, 10]
Nickel	1		45	45	89	89	70	70	200	310[a]/2,500[b]	45	89	5	5	15	9	14	10	23	19
Potassium	20		-	-	-	-	-	-	-	-	-	-	390	380	2,060	820	1,470	970	2,250	2,380
Rubidium	0.1		-	-	-	-	-	-	-	-	-	-	2.6	2.5	8.1	5	7.9	6	16	15.5
Selenium	1		1	1	2.9	2.9	1	1	80	125[a]/1,135[b]	1	2.9	< 1	< 1	1	< 1	< 1	< 1	1	1
Silver	0.1		20	20	40	40	77	77[a]/490[b]	77	77[a]/490[b]	20	40	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Sodium	50		-	-	-	-	15,000	15,000	>1,000,000	>1,000,000	200	1,000	**1090** [10, 11]	**1090** [10, 11]	**26,500** [6, 7, 10, 11]	**3810** [10, 11]	**9910** [10, 11]	**4260** [10, 11]	**4480** [10, 11]	**17,500** [6, 7, 10, 11]
Strontium	1		-	-	-	-	9400	9400[a]/140,000[b]	9,400	9,400[a]/140,000[b]	-	-	4	4	67	11	39	13	24	43
Tellurium	0.1		-	-	-	-	-	-	-	-	-	-	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Thallium	0.1		1	1	1	1	1	1	1	1	1[c]/1.4[d]	3.6	< 0.1	< 0.1	0.1	< 0.1	0.1	< 0.1	0.2	0.2
Tin	1		5	50	300	300	9400	9400[a]/140,000[b]	9,400	9,400a/140,000b	5	300	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Uranium	0.1		23	23	33	300	23	30	23	33[a]/300[b]	33	33	0.3	0.3	4.1	1.2	2	0.9	2.2	1.9
Vanadium	1		130	130	130	130	39	39[a]/100[b]	39	39[a]/160[b]	18	18	6	6	**30** [10, 11]	14	**25** [10, 11]	**20** [10, 11]	**39** [10, 11]	**50** [6, 7a, 8, 9a, 10, 11]
Zinc	1		250	250	410	410	200	200	10,000	16,000[a]/140,000[b]	200[c]/250[d]	340	18	16	60	35	72	45	**397** [3, 4, 5, 7, 10, 11]	**494** [3, 4, 5, 6, 7, 10, 11]

Notes:

value [X] - guideline exceedance

<value [X] - the laboratory reported detection limit (RDL) exceeds the guideline criteria and therefore it cannot be stated with certainty that the value is within the guideline.

[1] CCME Soil Quality Guidelines for the Protection of Human and Environmental Health (2021 online).

[2] Atlantic RBCA Human Health-Based Tier I Environmental Quality Standards for Soil, Coarse Grained Soil (a = commercial criteria, b = industrial criteria, c = agricultural, d = residential/parkland)

[3] Value exceeds the CCME Soil Quality Guideline for an Agricultural setting.

[4] Value exceeds the CCME Soil Quality Guideline for a Residential setting.

[5] Value exceeds the CCME Soil Quality Guideline for a Commercial and Industrial settings.

[6] Value exceeds the Atlantic RBCA Tier I EQS for the protection of Human Health (potable water) for Agricultural, Residential and Parkland settings

[7] Value exceeds the Atlantic RBCA Tier I EQS for the protection of Human Health (potable water) for Commercial and Industrial settings

[7a] Value exceeds the Atlantic RBCA Tier I EQS for the protection of Human Health (potable water) for Commercial settings

[7b] Value exceeds the Atlantic RBCA Tier I EQS for the protection of Human Health (potable water) for Industrial settings

[8] Value exceeds the Atlantic RBCA Tier I EQS for the protection of Human Health (non-potable water) for Agricultural, Residential and Parkland settings

[9a] Value exceeds the Atlantic RBCA Tier I EQS for the protection of Human Health (non-potable water) for Commercial settings

[10] Value exceeds the Atlantic RBCA Tier I EQS for the protection of Ecological Health for Agricultural, Residential and Parkland settings

[10d] Value exceeds the Atlantic RBCA Tier I EQS for the protection of Ecological Health for Parkland settings

[11] Value exceeds the Atlantic RBCA Tier I EQS for the protection of Ecological Health for Commercial and Industrial settings

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Table C.3. BTEX/TPH Results for Sediment Samples - Parlee Beach Provincial Park, NB

Sample ID		Date	Units	BTEX Concentrations				Petroleum Hydrocarbon Fraction Concentrations						Modified TPH (Less BTEX)	Reached Baseline at C32	Reached Baseline at C50	Resemblance
				Benzene	Toluene	Ethylbenzene	Xylenes	F1 (C6-C10 (Less BTEX))	F2 (>C10-C16)	>C16-C21	>C21-<C32	F3 (>C16-C32)	F4 (>C34-C50)				
SED1		26-Aug-21	mg/kg	<0.005	<0.05	<0.01	<0.05	<2.5	<12	<12	<12	<12	-	<21	Yes	-	ND
SED2				<0.02	<0.05	<0.02	<0.05	<5.0	<12	21	53	74	-	77	Yes	-	NR
SED3				<0.005	<0.05	<0.01	<0.05	<2.5	<12	<12	15	15	-	<21	Yes	-	ND
SED4				<0.02	<0.05	<0.02	<0.05	<5.0	<12	<12	39	39	-	39	Yes	-	NR
SED5				<0.005	<0.05	<0.01	<0.05	<2.5	<12	<12	38	38	-	38	Yes	-	NR
SED6				<0.005	<0.05	<0.01	<0.05	<2.5	<12	13	130	140	216	140	No	No	PLO
SED7				<0.02	<0.05	<0.02	<0.05	<5.0	<12	<12	170	190	909	190	No	No	PLO
RDL				0.02-0.005	0.05	0.01-0.02	0.05	2.5	12	12	12	12	6	21	-	-	-
Atlantic RBCA Tier I RBSLs for Soil [1]																	
Agricultural	Potable	Coarse-grained		0.021	0.35	0.043	0.73	-	-	-	-	-	-	75 Gas 320 Diesel 1 800 Lube O I	-	-	-
		Fine-grained		0.094	0.74	0.089	1.5	-	-	-	-	-		1 900 Gas 4 700 Diesel 10 000 Lube O I	-	-	-
	Non-potable	Coarse-grained		0.021	47	60	4.9	-	-	-	-	-	-	75 Gas 320 Diesel 1 800 Lube O I	-	-	-
		Fine-grained		0.49	900	2 000	120	-	-	-	-	-	-	10 000 Gas 8 600 Diesel 10 000 Lube O I	-	-	-
Residential	Potable	Coarse-grained		0.021	0.35	0.043	0.73	-	-	-	-	-	-	75 Gas 320 Diesel 1 800 Lube O I	-	-	-
		Fine-grained		0.094	0.74	0.089	1.5	-	-	-	-	-	-	1 900 Gas 4 700 Diesel 10 000 Lube O I	-	-	-
	Non-potable	Coarse-grained		0.021	47	60	4.9	-	-	-	-	-	-	75 Gas 320 Diesel 1 800 Lube O I	-	-	-
		Fine-grained		0.49	900	2 000	120	-	-	-	-	-	-	10 000 Gas 8 600 Diesel 10 000 Lube O I	-	-	-
Commercial	Potable	Coarse-grained		0.042	0.35	0.043	0.73	-	-	-	-	-	-	940 Gas 1 800 Diesel 10 000 Lube O I	-	-	-
		Fine-grained		0.094	0.74	0.089	1.5	-	-	-	-	-	-	1 900 Gas 4 700 Diesel 10 000 Lube O I	-	-	-
	Non-potable	Coarse-grained		0.52	1 400	3 100	60	-	-	-	-	-	-	2000 Gas 10 000 Diesel 10 000 Lube O I	-	-	-
		Fine-grained		6.9	1 400	3 100	1 800	-	-	-	-	-	-	10 000 Gas 10 000 Diesel 10 000 Lube O I	-	-	-
Industrial	Potable	Coarse-grained		0.042	0.35	0.043	0.73	-	-	-	-	-	-	940 Gas 1 800 Diesel 10 000 Lube O I	-	-	-
		Fine-grained		0.094	0.74	0.089	1.5	-	-	-	-	-	-	1 900 Gas 4 700 Diesel 10 000 Lube O I	-	-	-
	Non-potable	Coarse-grained		0.52	4 700	10 000	60	-	-	-	-	-	-	2 000 Gas 10 000 Diesel 10 000 Lube O I	-	-	-
		Fine-grained		6.9	4 700	10 000	6 300	-	-	-	-	-	-	10 000 Gas 10 000 Diesel 10 000 Lube O I	-	-	-
Atlantic RBCA Tier I ESLs [2]																	
Soil Ecological Screening Levels for the Protection of Plants and Soil Invertebrates - Direct Soil Contact and the Protection of W ldl fe and Lifestock; Soil Ingestion																	
Agricultural Land Use		Coarse-grained		18	75	55	95	210	150	-	-	300	-	-	-	-	-
		Fine-grained		18	110	120	65	210	150	-	-	1300	-	-	-	-	-
Residential Land Use		Coarse-grained		31	75	55	95	210	150	-	-	300	-	-	-	-	-
		Fine-grained		60	110	120	65	210	150	-	-	1300	-	-	-	-	-
Commercial Land Use		Coarse-grained		180	250	300	350	320	260	-	-	1700	-	-	-	-	-
		Fine-grained		310	330	430	230	320	260	-	-	2500	-	-	-	-	-
Industrial Land Use		Coarse-grained		180	250	300	350	320	260	-	-	1700	-	-	-	-	-
		Fine-grained		310	330	430	230	320	260	-	-	2500	-	-	-	-	-
CCME Soil Quality Guidelines [3]																	
Agricultural Land Use	Surface	Coarse Soi l		0.03	0.37	0.082	11	-	-	-	-	-	-	-	-	-	-
		Fine Soil		0.0068	0.08	0.018	2.4	-	-	-	-	-	-	-	-	-	-
	Subsoil	Coarse Soi l		0.03	0.37	0.082	11	-	-	-	-	-	-	-	-	-	-
		Fine Soil		0.0068	0.08	0.018	2.4	-	-	-	-	-	-	-	-	-	-
CWS for PHCs in Soil [4]																	
Agricultural/ Residential/Parkland Land Use	Surface	Coarse Soi l		0.03	0.37	0.082	11	30	150	-	-	300	2800	-	-	-	-
		Fine Soil		0.0068	0.08	0.018	2.4	210 (170 [5])	150	-	-	1300	5600	-	-	-	-
Commercial/Industrial Land Use	Surface	Coarse Soi l		0.03	0.37	0.082	11	320 (240 [5])	260	-	-	1700	3300	-	-	-	-
		Fine Soil		0.0068	0.08	0.018	2.4	320 (170 [5])	260 (230)	-	-	2500	6600	-	-	-	-

Notes

value [6] - guideline exceedance

ND = Not Detected

NR No Resemblance (not-petrogenic in orgin)

PLO Possible Lube O I Fraction

[1] Atlantic RBCA Version 4 Risk-Based Screening Levels (RBSLs) (July 2021).

[2] Atlantic RBCA Version 4 Ecological Screening Levels (ESLs) (July 2021).

[3] CCME So l Qua ity Guide ines for the Protection of Human and Environmental Heal h (2021 online).

[4] Canada Wide Standards (CWS) for Petroleum Hydrocarbons (PHCs) in Soil (January 2008).

[5] Where app icable for the protection of potable groundwater.

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Table C.4. DDT and PCB Results for Sediment Samples - Parlee Beach Provincial Park, NB

Parameter	RDL	Units	CCME Soil Quality Guidelines [1]			Atlantic RBCA Tier I EQS [2]						Sample ID and Date							
						Human Health				Ecological Health		SED1	SED2	SED3	SED4	SED5	SED6	SED7	SED7 Lab-Dup
						Potable Water		Non-Potable Water											
			Agricultural	Residential/ Parkland	Commercial and Industrial	Agricu tural, Residential/ Parkland	Commercial[a] /Industrial [b]	Agricultural, Residential[c] /Parkland [d]	Commercial[a] /Industrial[b]	Agricultural, Residential[c] /Parkland [d]	Commercial/ Industrial	26-Aug-21							
Polychlorinated Biphenyls (PCBs)																			
Total Polychlorinated Biphenyls	0.050	mg/kg	0.5	1.3	33	22	33[a]/160[b]	22	33[a]/160[b]	1.3	1.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Dichlorodiphenyltrichloroethane (DDT)																			
2,4'-DDE	0.01	mg/kg	-	-	-							< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4'-DDD	0.01		-	-	-							< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4'-DDT	0.01		-	-	-							< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4,4'-DDE	0.01		0.7	0.7	12							< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Notes:

value [x] - guideline exceedance

<value [x] - the laboratory reported detection limit (RDL) exceeds the guideline criteria and therefore it cannot be stated with certainty that the value is within the guideline.

[1] CCME Soil Quality Guidelines for the Protection of Human and Environmental Health (2021 online).

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Table C.5. Physical Analytical Results for Sediment Samples - Parlee Beach Provincial Park, NB

Parameter	RDL	Units	CCME Soil Quality Guidelines [1]		Sample ID and Date						
			Agricultural, Residential / Parkland	Commercial / Industrial	SED1	SED2	SED3	SED4	SED5	SED6	SED7
					26-Aug-21						
PHI -2 (4mm)	0.1	%	-	-	100	100	100	99.6	100	100	100
PHI -1 (2 mm)			-	-	99.8	99.5	100	96.8	100	98.4	97.5
PHI 0 (1 mm)			-	-	97.8	98.8	99	94.4	99.1	95.5	92.6
PHI 1 (0.5 mm)			-	-	70	90.8	83.6	88.7	94.8	92.3	87.4
PHI 2 (0.25 mm)			-	-	5.6	52.9	17.6	53.3	35.9	65.8	58.6
PHI 3 (0.125 mm)			-	-	0.4	42	8.2	30.3	16.2	53.2	50
PHI 4 (62.5 µm)			-	-	0.3	39.2	6.9	25.2	13	46.2	45.8
PHI 5 (31.25 µm)			-	-	0.2	36.1	6.5	23.3	12.2	43.3	42.8
PHI 6 (15.6 µm)			-	-	0.2	28.8	5.5	19.4	10.8	38.3	36.9
PHI 7 (7.8 µm)			-	-	0.4	19.7	4.4	14.1	8.7	14.8	17.3
PHI 8 (3.9 µm)			-	-	0.3	14.2	3.4	11.6	6.8	7.4	11.9
PHI 9 (1.9 µm)			-	-	0.3	5.8	1.9	7.6	4.5	2.1	6.8
Gravel			-	-	0.2	0.5	< 0.1	3.2	< 0.1	1.6	2.5
Sand			-	-	99.4	60.3	93.1	71.6	87	52.3	51.7
Silt			-	-	< 0.1	24.9	3.4	13.6	6.3	38.7	33.9
Clay			-	-	0.3	14.2	3.4	11.6	6.8	7.4	11.9
Other											
Total Organic Carbon (TOC)	0.01	%	-	-	0.03	7.31	0.77	3.13	1.42	2.5	6.75
Total Inorganic Carbon (TIC)	0.01	%	-	-	< 0.01	0.01	< 0.01	0.09	< 0.01	< 0.01	< 0.01
Sodium Adsorption Ratio Soluble (2:1)	NA	NA	5	12	**38.8** [2,3]	**40.6** [2,3]	**37.4** [2,3]	**40.5** [2,3]	**33** [2,3]	**25.5** [2,3]	**38** [2,3]
Conductivity	1	µS/cm	2000	4000	**9,830** [2,3]	**165,000** [2,3]	**22,300** [2,3]	**72,500** [2,3]	**37,400** [2,3]	**26,900** [2,3]	**83,000** [2,3]
pH	NA	pH	6 - 8	6 - 8	**8.8** [2,3]	**8.2** [2,3]	**8.2** [2,3]	**8.3** [2,3]	**8.1** [2,3]	**8.1** [2,3]	8

Notes:

value [X] - guideline exceedance

[1] CCME Soil Quality Guidelines for the Protection of Human and Environmental Health (2021 online).

[2] Value exceeds the CCME Soil Quality Guideline for the Protection of Human and Environmental Health for Agricultural and Residential/Parkland settings.

[3] Value exceeds the CCME Soil Quality Guideline for the Protection of Human and Environmental Health for a Commercial/Industrial setting.

Appendix D Laboratory Certificates of Analysis

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

CERTIFICATE OF ANALYSIS

for
Englobe
1077 St George Street, Suite 400
Moncton, NB E1E 4C9

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

Attention: Scott Fisher
Project #: 2106010.000
Location: Parlee

Hydrocarbon Analysis in Soil (Atlantic MUST)

RPC Sample ID:			410394-1	410394-2	410394-3	410394-4	410394-5	410394-6
Client Sample ID:			SED1	SED2	SED3	SED4	SED5	SED6
Date Sampled:			26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21
Matrix:			soil	soil	soil	soil	soil	soil
Analytes	Units	RL						
Benzene	mg/kg	0.005	< 0.005	< 0.02	< 0.005	< 0.02	< 0.005	< 0.005
Toluene	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Ethylbenzene	mg/kg	0.01	< 0.01	< 0.02	< 0.01	< 0.02	< 0.01	< 0.01
Xylenes	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
VPH C6-C10 (Less BTEX)	mg/kg	2.5	< 2.5	< 5.0	< 2.5	< 5.0	< 2.5	< 2.5
EPH >C10-C16	mg/kg	12	< 12	< 12	< 12	< 12	< 12	< 12
EPH >C16-C21	mg/kg	12	< 12	21	< 12	< 12	< 12	13
EPH >C21-C32	mg/kg	12	< 12	53	15	39	38	130
EPH (>C16-C32)	mg/kg	12	< 12	74	15	39	38	140
Modified TPH Tier 1	mg/kg	21	< 21	77	< 21	39	38	140
VPH Surrogate (IBB)	%		106	125	120	82	105	100
EPH Surrogate (IBB)	%		96	83	82	89	90	93
EPH Surrogate (C32)	%		104	102	103	101	107	99
Resemblance			ND	NR	ND	NR	NR	PLO
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	No
Moisture Content	%		21	84	43	70	52	67

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit; Soil results are expressed on a dry weight basis.

Bruce Phillips
Department Head
Organic Analytical Services

Angela Colford
Lab Supervisor
Organic Analytical Services

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

CERTIFICATE OF ANALYSIS

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

Attention: Scott Fisher
Project #: 2106010.000
Location: Parlee

Hydrocarbon Analysis in Soil (Atlantic MUST)

RPC Sample ID:			410394-7
Client Sample ID:			SED7
Date Sampled:			26-Aug-21
Matrix:			soil
Analytes	Units	RL	
Benzene	mg/kg	0.005	< 0.02
Toluene	mg/kg	0.05	< 0.05
Ethylbenzene	mg/kg	0.01	< 0.02
Xylenes	mg/kg	0.05	< 0.05
VPH C6-C10 (Less BTEX)	mg/kg	2.5	< 5.0
EPH >C10-C16	mg/kg	12	< 12
EPH >C16-C21	mg/kg	12	17
EPH >C21-C32	mg/kg	12	170
EPH (>C16-C32)	mg/kg	12	190
Modified TPH Tier 1	mg/kg	21	190
VPH Surrogate (IBB)	%		104
EPH Surrogate (IBB)	%		88
EPH Surrogate (C32)	%		97
Resemblance			PLO
Return to Baseline at C32			No
Moisture Content	%		76

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

CERTIFICATE OF ANALYSIS

for
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1077 St George Street, Suite 400
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rpc
921 College Hill Rd
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Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Scott Fisher
Project #: 2106010.000
Location: Parlee

DDT in Soil

RPC Sample ID:			410394-1	410394-1 Dup	410394-2	410394-3	410394-4	410394-5
Client Sample ID:			SED1	SED1	SED2	SED3	SED4	SED5
Date Sampled:			26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21
Matrix:			soil	soil	soil	soil	soil	soil
Analytes	Units	RL						
2,4'-DDE	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4'-DDD	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2,4'-DDT	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4,4'-DDE	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4,4'-DDD	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4,4'-DDT	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
OC Surrogate (DBOFB)	%		97	99	88	86	83	89
Moisture Content	%		21	21	84	43	70	52

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit; Soil results are expressed on a dry weight basis.

Karen Broad
Chemist
Organic Analytical Services

Nigel Skinner
Senior Technician
Organic Analytical Services

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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www.rpc.ca

Attention: Scott Fisher
Project #: 2106010.000
Location: Parlee

DDT in Soil

RPC Sample ID:			410394-6	410394-7
Client Sample ID:			SED6	SED7
Date Sampled:			26-Aug-21	26-Aug-21
Matrix:			soil	soil
Analytes	Units	RL		
2,4'-DDE	mg/kg	0.01	< 0.01	< 0.01
2,4'-DDD	mg/kg	0.01	< 0.01	< 0.01
2,4'-DDT	mg/kg	0.01	< 0.01	< 0.01
4,4'-DDE	mg/kg	0.01	< 0.01	< 0.01
4,4'-DDD	mg/kg	0.01	< 0.01	< 0.01
4,4'-DDT	mg/kg	0.01	< 0.01	< 0.01
OC Surrogate (DBOFB)	%		84	92
Moisture Content	%		67	76

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

CERTIFICATE OF ANALYSIS

for
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1077 St George Street, Suite 400
Moncton, NB E1E 4C9

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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Scott Fisher
Project #: 2106010.000
Location: Parlee

PAH in Soil

RPC Sample ID:			410394-1	410394-2	410394-3	410394-4	410394-5	410394-6
Client Sample ID:			SED1	SED2	SED3	SED4	SED5	SED6
Date Sampled:			26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21
Matrix:			soil	soil	soil	soil	soil	soil
Analytes	Units	RL						
Naphthalene	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthylene	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Acenaphthene	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluorene	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Phenanthrene	mg/kg	0.01	< 0.01	0.01	< 0.01	0.01	< 0.01	0.04
Anthracene	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Fluoranthene	mg/kg	0.01	< 0.01	0.06	0.03	0.05	0.01	0.09
Pyrene	mg/kg	0.01	< 0.01	0.04	0.02	0.04	0.01	0.07
Benz(a)anthracene	mg/kg	0.01	< 0.01	0.02	< 0.01	0.02	< 0.01	0.03
Chrysene/Triphenylene	mg/kg	0.01	< 0.01	0.02	< 0.01	0.02	< 0.01	0.02
Benzo(b+j)fluoranthene	mg/kg	0.01	< 0.01	0.04	0.01	0.03	0.01	0.05
Benzo(k)fluoranthene	mg/kg	0.01	< 0.01	0.02	< 0.01	0.01	< 0.01	0.02
Benzo(e)pyrene	mg/kg	0.01	< 0.01	0.02	< 0.01	0.02	< 0.01	0.03
Benzo(a)pyrene	mg/kg	0.01	< 0.01	0.03	< 0.01	0.02	< 0.01	0.04
Indeno(1,2,3-c,d)pyrene	mg/kg	0.01	< 0.01	0.02	< 0.01	0.02	< 0.01	0.03
Benzo(g,h,i)perylene	mg/kg	0.01	< 0.01	0.02	< 0.01	0.02	< 0.01	0.03
Dibenz(a,h)anthracene	mg/kg	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		88	104	104	101	106	100
p-terphenyl-d14 (surrogate)	%		104	108	109	103	107	108
Moisture Content	%		21	84	43	70	52	67

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit; Soil results are expressed on a dry weight basis.

Bruce Phillips
Department Head
Organic Analytical Services

Angela Colford
Lab Supervisor
Organic Analytical Services

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

CERTIFICATE OF ANALYSIS

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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Scott Fisher
Project #: 2106010.000
Location: Parlee

PAH in Soil

RPC Sample ID:			410394-7
Client Sample ID:			SED7
Date Sampled:			26-Aug-21
Matrix:			soil
Analytes	Units	RL	
Naphthalene	mg/kg	0.01	< 0.01
Acenaphthylene	mg/kg	0.01	< 0.01
Acenaphthene	mg/kg	0.01	< 0.01
Fluorene	mg/kg	0.01	< 0.01
Phenanthrene	mg/kg	0.01	0.03
Anthracene	mg/kg	0.01	< 0.01
Fluoranthene	mg/kg	0.01	0.08
Pyrene	mg/kg	0.01	0.07
Benz(a)anthracene	mg/kg	0.01	0.02
Chrysene/Triphenylene	mg/kg	0.01	0.03
Benzo(b+j)fluoranthene	mg/kg	0.01	0.07
Benzo(k)fluoranthene	mg/kg	0.01	0.02
Benzo(e)pyrene	mg/kg	0.01	0.04
Benzo(a)pyrene	mg/kg	0.01	0.03
Indeno(1,2,3-c,d)pyrene	mg/kg	0.01	0.03
Benzo(g,h,i)perylene	mg/kg	0.01	0.05
Dibenz(a,h)anthracene	mg/kg	0.01	< 0.01
2-fluorobiphenyl (surrogate)	%		99
p-terphenyl-d14 (surrogate)	%		107
Moisture Content	%		76

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

CERTIFICATE OF ANALYSIS

for
Englobe
1077 St George Street, Suite 400
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rpc
921 College Hill Rd
Fredericton NB
Canada E3B 6Z9
Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Scott Fisher
Project #: 2106010.000
Location: Parlee

PCB's in Soil

RPC Sample ID:			410394-1	410394-2	410394-3	410394-4	410394-5	410394-6
Client Sample ID:			SED1	SED2	SED3	SED4	SED5	SED6
Date Sampled:			26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21	26-Aug-21
Matrix:			soil	soil	soil	soil	soil	soil
Analytes	Units	RL						
Total PCB	mg/kg	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
PCB Surrogate (DCB)	%		113	106	95	109	107	108
Resemblance			ND	ND	ND	ND	ND	ND
Moisture Content	%		21	84	43	70	52	67

This report relates only to the sample(s) and information provided to the laboratory.
RL = Reporting Limit; Soil results are expressed on a dry weight basis.

Karen Broad
Chemist
Organic Analytical Services

Nigel Skinner
Senior Technician
Organic Analytical Services

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

CERTIFICATE OF ANALYSIS

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Tel: 506.452.1212
Fax: 506.452.0594
www.rpc.ca

Attention: Scott Fisher
Project #: 2106010.000
Location: Parlee

PCB's in Soil

RPC Sample ID:			410394-7	410394-7 Dup
Client Sample ID:			SED7	SED7
Date Sampled:			26-Aug-21	26-Aug-21
Matrix:			soil	soil
Analytes	Units	RL		
Total PCB	mg/kg	0.05	< 0.05	< 0.05
PCB Surrogate (DCB)	%		105	121
Resemblance			ND	ND
Moisture Content	%		76	76

CERTIFICATE OF ANALYSIS

for
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Method Summary

OAS-HC03:The Determination of Petroleum Hydrocarbons (Atlantic MUST) in Soil (VPH)
OAS-HC03: Determination of Petroleum Hydrocarbons (Atlantic MUST) in Soil (EPH)
OAS-HC06:The Determination of Polynuclear Aromatic Hydrocarbons in Soil
The Determination of Polychlorinated biphenyls in Soil. (Solvent extraction, followed by GC-ECD analysis; based on USEPA 3570/8082.)

Resemblance Legend

Resemblance Code	Resemblance
ARO1242/54	Mix of Aroclors 1242,1254.
ARO1242/60	Mix of Aroclors 1242,1260.
ARO1254/60	Mix of Aroclors 1254, 1260.
ARO.1016	Aroclor 1016
ARO.1242	Aroclor 1242
ARO.1248	Aroclor 1248.
ARO.1254	Aroclor 1254
ARO.1260	Aroclor 1260
COMMENT	See General Report Comments
FO	Fuel Oil Fraction
FO.LO	Fuel Oil and Lube Oil Fraction
G	Gasoline Fraction
LO	Lube Oil Fraction
MIXTURE	Mix of Aroclors 1242, 1254 and 1260.

Resemblance Code	Resemblance
ND	Not Detected
NR	No Resemblance (not-petrogenic in origin)
NRLR	No Resemblance in the lube oil range (>C21-C32).
OP	One Product (unidentified)
PAH	Possible PAHs Detected
PG	Possible Gasoline Fraction
PLO	Possible Lube Oil Fraction
PWFO	Possible Weathered Fuel Oil Fraction
PWG	Possible Weathered Gasoline Fraction
TO	Transformer Oil
UP	Unknown Peaks
WFO	Weathered Fuel Oil Fraction
WG	Weathered Gasoline Fraction

General Report Comments

EPH extracts were treated with silica gel to remove polar interferences.
Elevated VPH RL's due to the high moisture content of the samples.
Return to Baseline: Samples are considered to have returned to baseline if the area from C32-C36 is less than 10% of the area from C10-C32.

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

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Project #: 2106010.000
Location: Parlee
QA/QC Report

RPC Sample ID:			BLANKD1626	BLANKD1633	SPIKED1624	SPIKED1631
Type:			VPH	EPH	VPH	EPH
Matrix:			soil	soil	soil	soil
Analytes	Units	RL			% Recovery	% Recovery
Benzene	mg/kg	0.005	< 0.005	-	114%	-
Toluene	mg/kg	0.05	< 0.05	-	115%	-
Ethylbenzene	mg/kg	0.01	< 0.01	-	118%	-
Xylenes	mg/kg	0.05	< 0.05	-	115%	-
VPH C6-C10 (Less BTEX)	mg/kg	2.5	< 2.5	-	103%	-
EPH >C10-C16	mg/kg	12	-	< 12	-	-
EPH >C16-C21	mg/kg	12	-	< 12	-	-
EPH >C21-C32	mg/kg	12	-	< 12	-	-
EPH >C10-C32	mg/kg	21	-	-	-	94%

RL = Reporting Limit

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

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Project #: 2106010.000
Location: Parlee
QA/QC Report

RPC Sample ID:			BLANKD1669	SPIKED1666
Matrix:			soil	soil
Analytes	Units	RL		% Recovery
2,4'-DDE	mg/kg	0.01	< 0.01	74%
2,4'-DDD	mg/kg	0.01	< 0.01	76%
2,4'-DDT	mg/kg	0.01	< 0.01	71%
4,4'-DDE	mg/kg	0.01	< 0.01	74%
4,4'-DDD	mg/kg	0.01	< 0.01	76%
4,4'-DDT	mg/kg	0.01	< 0.01	72%

RL = Reporting Limit

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

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Project #: 2106010.000
Location: Parlee
QA/QC Report

RPC Sample ID:			BLANKD1677	SPIKED1674
Matrix:			soil	soil
Analytes	Units	RL		% Recovery
Naphthalene	mg/kg	0.01	< 0.01	107%
Acenaphthylene	mg/kg	0.01	< 0.01	102%
Acenaphthene	mg/kg	0.01	< 0.01	101%
Fluorene	mg/kg	0.01	< 0.01	102%
Phenanthrene	mg/kg	0.01	< 0.01	102%
Anthracene	mg/kg	0.01	< 0.01	94%
Fluoranthene	mg/kg	0.01	< 0.01	98%
Pyrene	mg/kg	0.01	< 0.01	102%
Benz(a)anthracene	mg/kg	0.01	< 0.01	90%
Chrysene/Triphenylene	mg/kg	0.01	< 0.01	102%
Benzo(b+j)fluoranthene	mg/kg	0.01	< 0.01	83%
Benzo(k)fluoranthene	mg/kg	0.01	< 0.01	92%
Benzo(e)pyrene	mg/kg	0.01	< 0.01	94%
Benzo(a)pyrene	mg/kg	0.01	< 0.01	94%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.01	< 0.01	68%
Benzo(g,h,i)perylene	mg/kg	0.01	< 0.01	78%
Dibenz(a,h)anthracene	mg/kg	0.01	< 0.01	77%

RL = Reporting Limit

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

CERTIFICATE OF ANALYSIS

for
Englobe
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Tel: 506.452.1212
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Project #: 2106010.000
Location: Parlee
QA/QC Report

RPC Sample ID:			BLANKD1634	SPIKED1632
Matrix:			soil	soil
Analytes	Units	RL		% Recovery
Total PCB	mg/kg	0.05	< 0.05	80%

RL = Reporting Limit

Report ID: 410394-OAS
Report Date: 09-Sep-21
Date Received: 26-Aug-21

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Project #: 2106010.000

Summary of Date Analyzed

	VPH		EPH		OC PESTICIDES	
RPC Sample ID	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**
410394-1	30-Aug-21	31-Aug-21	30-Aug-21	31-Aug-21	3-Sep-21	3-Sep-21
410394-1 Dup	-	-	-	-	3-Sep-21	3-Sep-21
410394-2	30-Aug-21	31-Aug-21	30-Aug-21	31-Aug-21	3-Sep-21	4-Sep-21
410394-3	30-Aug-21	31-Aug-21	30-Aug-21	31-Aug-21	3-Sep-21	4-Sep-21
410394-4	30-Aug-21	31-Aug-21	30-Aug-21	1-Sep-21	3-Sep-21	4-Sep-21
410394-5	30-Aug-21	31-Aug-21	30-Aug-21	1-Sep-21	3-Sep-21	4-Sep-21
410394-6	30-Aug-21	31-Aug-21	30-Aug-21	1-Sep-21	3-Sep-21	4-Sep-21
410394-7	30-Aug-21	31-Aug-21	30-Aug-21	1-Sep-21	3-Sep-21	4-Sep-21
410394-7 Dup	-	-	-	-	-	-

CERTIFICATE OF ANALYSIS

for
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Tel: 506.452.1212
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Project #: 2106010.000

Summary of Date Analyzed

	PAH		PCB	
RPC Sample ID	**Extracted**	**Analyzed**	**Extracted**	**Analyzed**
410394-1	1-Sep-21	3-Sep-21	31-Aug-21	1-Sep-21
410394-1 Dup	-	-	-	-
410394-2	1-Sep-21	3-Sep-21	31-Aug-21	1-Sep-21
410394-3	1-Sep-21	3-Sep-21	31-Aug-21	1-Sep-21
410394-4	1-Sep-21	3-Sep-21	31-Aug-21	1-Sep-21
410394-5	1-Sep-21	3-Sep-21	31-Aug-21	1-Sep-21
410394-6	1-Sep-21	3-Sep-21	31-Aug-21	1-Sep-21
410394-7	1-Sep-21	3-Sep-21	31-Aug-21	1-Sep-21
410394-7 Dup	-	-	31-Aug-21	1-Sep-21

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Certificate of Analysis

RPC

921 College Hill Road
Fredericton, NB E3B 6Z9
Attn: Bruce Phillips

Client PO: PO-010273
Project:
Custody:

Report Date: 30-Sep-2021
Order Date: 24-Sep-2021

Order #: 2139571

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Paracel ID	Client ID
2139571-01	410394-6 (SED6)
2139571-02	410394-7 (SED7)

Approved By:

Dale Robertson, BSc
Laboratory Director

Certificate of Analysis
Client: RPC
Client PO: PO-010273

Report Date: 30-Sep-2021
Order Date: 24-Sep-2021
Project Description:

Analysis Summary Table

Analysis	Method Reference/Description	Extraction Date	Analysis Date
BTEX by P&T GC-MS	EPA 8260 - P&T GC-MS	27-Sep-21	28-Sep-21
PHC F1	CWS Tier 1 - P&T GC-FID	27-Sep-21	28-Sep-21
PHCs F2 to F4	CWS Tier 1 - GC-FID, extraction	28-Sep-21	30-Sep-21
Solids, %	Gravimetric, calculation	28-Sep-21	29-Sep-21

Certificate of Analysis

Report Date: 30-Sep-2021

Client: RPC

Order Date: 24-Sep-2021

Client PO: PO-010273

Project Description:

	Client ID:	410394-6 (SED6)	410394-7 (SED7)	-	-
	Sample Date:	26-Aug-21 09:00	26-Aug-21 09:00	-	-
	Sample ID:	2139571-01	2139571-02	-	-
	MDL/Units	Soil	Soil	-	-
Physical Characteristics					
% Solids	0.1 % by Wt.	36.4	27.9	-	-
Volatiles					
Benzene	0.02 mg/kg dry	<0.03	<0.03	-	-
Ethylbenzene	0.05 mg/kg dry	<0.07	<0.07	-	-
Toluene	0.05 mg/kg dry	<0.07	<0.07	-	-
m,p-Xylenes	0.05 mg/kg dry	<0.07	<0.07	-	-
o-Xylene	0.05 mg/kg dry	<0.07	<0.07	-	-
Xylenes, total	0.05 mg/kg dry	<0.07	<0.07	-	-
Toluene-d8	Surrogate	128%	132%	-	-
Hydrocarbons					
F1 PHCs (C6-C10)	7 mg/kg dry	<7	<7	-	-
F2 PHCs (C10-C16)	4 mg/kg dry	<40 [1] [4]	<40 [1] [4]	-	-
F3 PHCs (C16-C34)	8 mg/kg dry	176 [4]	470 [4]	-	-
F4 PHCs (C34-C50)	6 mg/kg dry	216 [3] [4]	909 [3] [4]	-	-

Certificate of Analysis
Client: RPC
Client PO: PO-010273

Report Date: 30-Sep-2021
Order Date: 24-Sep-2021
Project Description:

Method Quality Control: Blank

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	mg/kg						
F2 PHCs (C10-C16)	ND	4	mg/kg						
F3 PHCs (C16-C34)	ND	8	mg/kg						
F4 PHCs (C34-C50)	ND	6	mg/kg						
Volatiles									
Benzene	ND	0.02	mg/kg						
Ethylbenzene	ND	0.05	mg/kg						
Toluene	ND	0.05	mg/kg						
m,p-Xylenes	ND	0.05	mg/kg						
o-Xylene	ND	0.05	mg/kg						
Xylenes, total	ND	0.05	mg/kg						
Surrogate: Toluene-d8	*7.52*		*mg/kg*		*94.0*	*50-140*			

Certificate of Analysis

Client: RPC

Client PO: PO-010273

Report Date: 30-Sep-2021

Order Date: 24-Sep-2021

Project Description:

Method Quality Control: Duplicate

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	ND	7	mg/kg dry	ND			NC	40	
F2 PHCs (C10-C16)	ND	4	mg/kg dry	ND			NC	30	
F3 PHCs (C16-C34)	ND	8	mg/kg dry	35			NC	30	
F4 PHCs (C34-C50)	ND	6	mg/kg dry	65			NC	30	
Physical Characteristics									
% Solids	84.0	0.1	% by Wt.	84.7			0.8	25	
Volatiles									
Benzene	ND	0.02	mg/kg dry	ND			NC	50	
Ethylbenzene	ND	0.05	mg/kg dry	ND			NC	50	
Toluene	ND	0.05	mg/kg dry	ND			NC	50	
m,p-Xylenes	ND	0.05	mg/kg dry	ND			NC	50	
o-Xylene	ND	0.05	mg/kg dry	ND			NC	50	
Surrogate: Toluene-d8	*10.0*		*mg/kg dry*		*104*	*50-140*			

Certificate of Analysis
Client: RPC
Client PO: PO-010273

Report Date: 30-Sep-2021
Order Date: 24-Sep-2021
Project Description:

Method Quality Control: Spike

Analyte	Result	Reporting Limit	Units	Source Result	%REC	%REC Limit	RPD	RPD Limit	Notes
Hydrocarbons									
F1 PHCs (C6-C10)	216	7	mg/kg	ND	108	80-120			
F2 PHCs (C10-C16)	77	4	mg/kg	ND	80.0	60-140			
F3 PHCs (C16-C34)	227	8	mg/kg	35	81.2	60-140			
F4 PHCs (C34-C50)	179	6	mg/kg	65	76.6	60-140			
Volatiles									
Benzene	3.21	0.02	mg/kg	ND	80.2	60-130			
Ethylbenzene	3.30	0.05	mg/kg	ND	82.6	60-130			
Toluene	3.28	0.05	mg/kg	ND	82.1	60-130			
m,p-Xylenes	6.92	0.05	mg/kg	ND	86.5	60-130			
o-Xylene	3.53	0.05	mg/kg	ND	88.3	60-130			
Surrogate: Toluene-d8	*7.27*		*mg/kg*		*90.9*	*50-140*			

Certificate of Analysis
Client: RPC
Client PO: PO-010273

Report Date: 30-Sep-2021
Order Date: 24-Sep-2021
Project Description:

Qualifier Notes:

Login Qualifiers :

Sample - One or more parameter received past hold time - PHCs F2-F4

Applies to samples: 410394-6 (SED6), 410394-7 (SED7)

Sample Qualifiers :

1 : Elevated detection limits due to the nature of the sample matrix.

3 : GC-FID signal did not return to baseline by C50

4 : Moisture content >50%, sample air dried prior to extraction.

Sample Data Revisions

None

Work Order Revisions / Comments:

None

Other Report Notes:

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.
NC: Not Calculated

Soil results are reported on a dry weight basis when the units are denoted with 'dry'.
Where %Solids is reported, moisture loss includes the loss of volatile hydrocarbons.

CCME PHC additional information:

- The method for the analysis of PHCs complies with the Reference Method for the CWS PHC and is validated for use in the laboratory. All prescr bed quality criteria identified in the method has been met.
- F1 range corrected for BTEX.
- F2 to F3 ranges corrected for appropriate PAHs where available.
- The gravimetric heavy hydrocarbons (F4G) are not to be added to C6 to C50 hydrocarbons.
- In the case where F4 and F4G are both reported, the greater of the two results is to be used for comparison to CWS PHC criteria.
- When reported, data for F4G has been processed using a silica gel cleanup.

Appendix E Habitat Description

Table E.1 Habitat Descriptions (August 26, 2021) - Parlee Beach Provincial Park, Pointe-du-Chene, NB

Sample Location	Substrate (Estimated % Coverage*[1])	Macrofaunal Life Observed (Estimated Abundances*[2])	Macrofloral Life Observed (Estimated % Coverage)
SED1	Sand 100%	-	Detached seaweed debris (5%);
SED2	Silty sand[1] 100%	-	Filamentous algae mat (100%)[2]
SED3	Sand[1] 100%	-	Filamentous algae mat (100%)[2]
SED4	Silty sand[1] 100%	-	Filamentous algae mat (100%)[2]
SED5	Silty sand[1] 100%	-	Filamentous algae mat (100%)[2]
SED6	Silty sand[1] 100%	-	Filamentous algae mat (100%)[2]
SED7	Silty sand[1] 100%	-	Filamentous algae mat (100%)[2]

Notes:

[1] Poor visibility

[2] Micro organisms colonies covering the entire substrate. Filamentous algae is suspected but would have to be tested to confirm.

" - " = None Observed

*[1] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).

*[2] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).

A = Abundant; Numerous (not quantifiable) observations made throughout the 360° video.

C = Common; Numerous (not quantifiable) observations made intermittently during the 360° video.

O = Occasional; Quantifiable observations made intermittently during the 360° video.

U = Uncommon; Quantifiable observations made infrequently during the 360° video.

Appendix D Species at Risk, Wetland Delineation and Wetland Functional Assessment, 2021

Englobe
Soils Materials Environment

NB Department of Tourism, Heritage and Culture

PARLEE BEACH PROVINCIAL PARK
POINTE-DU-CHENE, NEW BRUNSWICK

November 2021

Species at Risk, Wetland Delineation and Wetland Functional Assessment

2106010

FINAL REPORT

Englobe

Prepared by:

Taylor McGregor, EIT
Engineer in Training
Environmental Engineering

Verified by:

Alexandra Stevenson, B.Sc. Env.
Environmental Professional
Environmental Engineering

Approved by:

Scott Fisher, P. Eng.
Senior Project Professional
Environmental Engineering

Production Team

Client

NB Department of Tourism, Heritage and Culture	Martin MacMullin, Asset Management Branch

Englobe Corp.

Site Assessor	Alexis Robitaille, B.Sc.
Report Preparation	Taylor McGregor, EIT
Report Reviewer	Alexandra Stevenson, B.Sc. Env.
Project Manager	Scott Fisher, P.Eng

Revision and Publication Register		
Revision N°	**Date**	**Modification and/or Publication Details**
00	2021-11-30	Final Report Issued

Property and Confidentiality

Table of Contents

Appendices

1 Introduction

Englobe Corp. (Englobe) was retained by NB Department of Tourism, Heritage and Culture (THC) to complete an Environmental Impact Assessment (EIA) to support dredging activities related to the ongoing beach nourishment program at the Parlee Beach Provincial Park site located in Pointe-Du-Chêne, New Brunswick.

The current nourishment program at Parlee Beach Provincial Park consists of dredging an area at the extreme western end of the beach and transporting the dredged materials to the beach where they are stockpiled over the winter and then spread over the beach in spring. The dredging currently takes place once every couple of years, or more frequently depending on erosion/damage caused by winter storms.

The NB Department of THC is considering modifying the program to include dredging the mouth of a tidal inlet located south of the current dredge limits which is located within a six-hectare Provincially Significant Wetland (PSW). Based on previous bathymetry work, dredging at select locations (i.e. high points) within the inlet and lagoon will also likely be required to encourage regular tidal flushing of the lagoon. Based on the size of the PSW, any disturbance to the PSW will require an EIA. As such, Wetland Delineation, Wetland Functional Assessment, Wetland Monitoring Development Plan and a Species at Risk/Migratory Bird Survey were completed at the site in order to evaluate the environmental impact of the dredging activities on the PSW.

1.1 Regulatory Framework

New Brunswick's wetlands and watercourses are protected under the Watercourse and Alternation Regulation [90-80] of the New Brunswick *Clean Water Act*. Any proposed alternations within wetlands greater than 100m^2, watercourses, or 30m of the wetland and watercourse buffer zone will require a Wetland and Watercourse Alteration (WAWA) permit through the New Brunswick Department of Environment and Local Government (NBDELG). Generally, any project that has the potential to impact a wetland that is greater than 2 hectares (ha) in size, and/or its regulated 30m buffer will require to be registered through the Environmental Impact Assessment Regulation [87-83] under the New Brunswick *Clean Environment Act*. New Brunswick's fish-bearing wetlands and watercourses are afforded additional protection under Section 35(2) of the *Fisheries Act,* administered by the Department of Fisheries and Oceans (DFO), through Harmful Alteration, Disruption or Destruction (HADD) of fish habitat. It is the proponent's responsibility to ensure that these features are adhered through due diligence investigations and that all necessary permits and authorizations are obtained prior to any disturbance. Failure to do so could result in fines and remediation if a wetland and/or watercourse is impacted without the proper approvals.

A no-net-loss approach to wetlands has been adopted by New Brunswick, however, acknowledges that alterations will continue to occur, both naturally and through necessary human activities. New Brunswick's wetland approach does not consider project economics and applies to all wetlands greater than 100m^2 and strives to preserve wetland functions and its benefits. Avoidance of wetlands is the preferred approach while, minimization is the reduction of adverse effects to wetland functions and must always be undertaken when impacting a wetland. Compensation, which accounts for unavoidable wetland loss or damage, is always required. The compensation ratios are established by NBDELG and a wetland functional analysis may also be required to determine wetland functions and benefits.

PSWs cannot be impacted without approval from NBDELG and a wetland functional assessment is required in order to make a determination on an allowable impact.

1.2 Site Description

The proposed dredging site is located within the Shediac Bay, at Parlee Beach Provincial Park and is partially on PID No. 1053396 which is presently owned by N.B Economic Development and Tourism. The site is situated in Pointe-du-Chêne, New Brunswick (the "site"). Refer to Figure 1, Appendix B.

Neighboring properties include:

- South: Residential properties, asphalt paved parking lots and a portion of the mapped PSW.
- West: Residential properties and the Shediac Bay.
- North: Parlee Beach Provincial Park commercial buildings and asphalt paved parking lots, beach and the Shediac Bay.
- East: Asphalt parking lots, commercial and residential properties and the Shediac Bay.

Development at the site and surrounding area has increased since 2012, including residential development (construction of dwellings and driveways) to the south/southeast/southwest of the PSW.

The mapped PSW is presented on GeoNB, and is visible in aerial photography and Google Earth imagery and based on the vegetation types, this wetland is mostly distinguishable from adjacent upland vegetation. The boundaries of the wetland (as ground truthed by Englobe) differ slightly from the mapped PSW, details of the survey can be found in Section 3, and the boundaries are presented on Figure 2 (Appendix B).

1.3 Scope of Work

The scope of work included the following:

- Carrying out field reconnaissance to ground truth the presence of the PSW and watercourses based on vegetation, hydrology and hydric soil indications in accordance with NBDELG *Protocol for Wetland Delineation in New Brunswick (2020)*.
- Complete a Wetland Functional Assessment in accordance with NBDELG *Wetland Ecosystem Services Protocol – Atlantic Canada (WESP-AC)*, to evaluate the functionality of the wetland and to develop baseline conditions in the wetland.
- Complete a Species at Risk and Migratory/Nesting Bird Survey to ensure the project will be in compliance with the federal and provincial *Species at Risk Act* and the *Migratory Bird Convention Act*.
- Wetland Monitoring Plan Development to ensure dredging does not adversely impact the wetland functionality. The monitoring plan will be carried out annually following dredging.

1.4 Expertise and Resources

Englobe has coordinated and compiled this report. The wetland boundaries in the area of the proposed project were delineated by a qualified wetland delineator, Alexis Robitaille, B. Sc. whom preformed the functional assessment. Rare flora and fauna surveys were prepared in support of the EIA. The Atlantic Canada Conservation Data Centre (ACCDC) was contacted with respect to information on rare flora and fauna.

2 Methodology

2.1 WESP-AC Model

NBDELG requires that a functional assessment be conducted using the *Wetland Ecosystem Services Protocol – Atlantic Canada (WESP-AC),* which is a standardised method for assessing wetland functions for all types of wetlands in Atlantic Canada. It has been regionally adapted from the *WESP (Wetland Ecosystem Services Protocol)* that has been used in other areas like Alberta, Alaska, and Oregon and is consistent with other methodologies across various jurisdictions. WESP-AC is a package that consists of a manual and its appendices, three data forms, and an Excel spreadsheet calculator. The WESP-AC Calculator itself contains formulas that use science-based logic models to automatically produce scores which are intended to quantify wetland functions and benefits. This is a standardised desktop and field evaluation method. In summary, it generates a series of normalized scores (i.e. 0 to 10), and rates the wetland (Lower, Moderate, and Higher) for wetlands functions and benefits and does so in a consistent and transparent manner. The scores and ratings are then used by the Regulator(s) to aid in their decisions regarding avoidance, minimization, and replacement.

The wetland functional assessment was carried out in accordance with the *Manual for Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC) for Tidal* (April 2018) and the associated Supplemental Information and the most recent NB WESP-AC Tidal Model Calculator from April 2019. The Tidal model was chosen as the wetland is a coastal marsh wetland (and is a mapped PSW) and is adjacent to a tidal inlet and lagoon. The supplementary data contained in the "*SuppInfo_Tidal_WESP-AC*" document was also used for this assessment which lists the rare tidal plants, water birds, songbirds, raptors, fish and other species.

Tidal wetlands are those predominately vegetated by vascular plants that experience surface water flooding by tides at least once annually, regardless of salinity. Normally, their vegetation is predominantly herbaceous.

After completing a desktop assessment and field assessment, input data is used by the logic models programmed within the WESP-AC Excel spreadsheets which calculate normalized scores and ratings for the wetland. Table 1, below which describes the wetland functions and attributes that the Tidal WESP-AC calculator examines.

Table 1 – WESP-AC Functions or Attributes

Function or Attribute	Definition	Potential Benefits
Storm Serge Reduction	The effectiveness for buffering surges of tidal water for short periods before they reach vulnerable uplands.	Flood control, protect shoreline structures and erosion
Water Purification	The effectiveness for intercepting and filtering suspended inorganic sediments thus allowing their deposition, as well as reducing energy of waves and currents, resisting excessive erosion, and stabilizing underlying sediments or soil	Maintain quality of coastal waters and protect shoreline structures from erosion
Organic Nutrient Export	The effectiveness for producing and subsequently exporting organic nutrients	Support food chains in coastal waters

	(mainly carbon), either particulate or dissolved	
Fish Habitat	The capacity to support an abundance and diversity of native fish (both anadromous and resident species)	Support recreational and ecological values
Waterbird Habitat	The capacity to support or contribute to an abundance or diversity of waterbirds, mainly those that migrate or winter in the region	Support hunting and ecological values
Songbird, Raptor, and Mammal Habitats	The capacity to support or contribute to an abundance or diversity of native songbird, raptor, and mammal species and functional groups, especially those that are most dependent on tidal wetlands or water	Support regional biodiversity and food webs
Biodiversity Support	The capacity to support or contribute to a diversity of native plant and animal species, communities, and/or functional groups	Maintain food webs and system stability
Wetland Stability	The potential for longterm persistence of a tidal wetland in the face of direct effects of sea level rise	Protection of the above functions and benefits
Public Use and Recognition*	Prior designation of the wetland, by a natural resource or environmental agency, as some type of special protected area; also, the potential and actual use of a wetland for low-intensity outdoor recreation, sustainable consumptive uses, education, or research	Commercial and social benefits of recreation and protection of prior public investments

Notes:
*A tidal wetland attribute that is not considered a function

2.1.1 Desktop Assessment

During the functional assessment, a desktop assessment is also completed where topography maps, Google Earth imagery, GeoNB mapping, ACCDC information, as well as associated WESP-AC User Manuals, Google Earth layers and other associated information were reviewed in order to answer the 28 questions related to the wetland.

2.1.2 Field Assessment

Once the desktop assessment is completed, the wetland is visited where field observations and information from the landowner (if available) is used to answer 18 specific questions related to the wetland.

2.1.3 Wetland Confirmation

Englobe's process for confirming and delineating a wetland and is based on the wetland delineation procedures followed the methods described in the *U.S. Army Corps of Engineers Wetlands Delineation Manual (1987)* and the NBDELG *Wetland Delineation Minimum Requirements Manual (2009)*. These methods incorporate a three-parameter approach using indicators established for vegetation, soils and hydrology to identify the presence of wetlands.

Wetland boundaries were initially identified through visual assessment of vegetation and hydrology. This visual boundary was then used to establish the locations of one wetland point and one upland point to verify the boundary through examination of dominant vegetation, soil properties and hydrology at each sample point.

The three criteria (hydrology, vegetation, and hydric soils) are not necessarily required to be present for an area to be deemed a wetland. For example, wetland hydrology may not be present during a drought, hydrophytic vegetation may not be present if it has been impacted by infilling, etc. However, the three criteria are generally present in typical conditions.

2.1.3.1 Hydrology

An area deemed as a wetland is required to have at least one primary hydrology indicator or two or more secondary indicators. Primary indicators include, but are not limited to; surface water, saturation, high water table, sediment deposits, hydrogen sulfide odor, water stained leaves, water marks, drift lines, etc. While secondary indicators include, but are not limited to; surface soil cracks, drainage patterns, geomorphic position, FAC-Neutral vegetation.

2.1.3.2 Hydric Soils

Hydric soils are defined as soil formed under conditions of saturation, flooding, or ponding long enough to develop anaerobic conditions in the upper soil layers. Primary indicators of hydric soil include, but are not limited to; histosol soils (peats and mucks); histic epipedons, hydrogen sulfide odors, stratified layers, sandy mucky mineral, sandy gleyed matrix, sandy redox, depleted matrix, etc.

Soil samples were collected using a Dutch auger to a minimum depth of 30 cm below ground. Soil profiles were recorded in standard format, with hues and chromas described using a *Munsell Soil Color Chart (Munsell Corporation, 2009)* and soil properties referenced against the Northeastern US Hydric Soil Indicators with the Probable Application Nova Scotia's document.

2.1.3.3 Hydrophytic Vegetation

Dominant vegetation in each stratum (tree canopy, shrub and herbaceous layers, if present) was identified using appropriate regional field guides and were assigned their appropriate wetland indicator status for this region. The vegetative communities of the wetland area were then categorized according to the *Canadian Wetland Classification System (1997)* and the *New Brunswick Wetland Classification System (2006),* typically using a Rapid Test, Dominance test or Prevalence test, however morphological adaptions or problematic hydrophytic vegetation could be used when problematic wetlands are encountered.

2.1.3.4 Boundaries

As the wetland boundaries were identified in the field using hydrological indicators, vegetation and hydric soils, the boundary points were recorded using a Global Positioning System (GPS) instrument with an accuracy of 5 m or less at approximately every 5 m interval. The unit generally provides sub meter accuracy, but accuracy can range from 1 to 5 m.

3 Wetland Delineation

A wetland and watercourse identification survey was conducted by Englobe between July 16-18, 2021, as GeoNB mapping has identified a PSW in the proposed dredging area. The mapping requires field verification to confirm the wetland boundaries.

The purpose of the survey was to conduct field verification of the wetland boundaries provided in order to aid in evaluating the Environmental Impact the dredging will have on the PSW. The findings of the survey are presented in this report. The scope of the wetland delineation was to review the WAWA mapping available online through GeoNB of the area and then carry out field reconnaissance to ground truth the boundaries of the PSW based on vegetation, hydric soil and hydrology indicators in accordance with NBDELG's *Protocol for Wetland Delineation in New Brunswick (May 2020)*. Englobe would delineate the features within the assessment area (AA), and provide a brief description of the wetland and biological habitat and provide an accurate map of the PSW identified.

3.1.1 Desktop Review

According to the GeoNB map viewer, a mapped PSW is present surrounding the tidal inlet and lagoon that is intended to be dredged. The tidal inlet and lagoon which appear to be identified as watercourses on GeoNB mapping. The mapped PSW and watercourses can be found on the GeoNB map viewer presented in Appendix A.

The mapped GeoNB PSW covers an area of approximately 6 hectares and is located to the north and south of the tidal inlet and surrounds the lagoon and is located on PID Nos. 01053404, 70464888, 70207790, 01052208, 70287461, 70236682, 01049980, 01050012, 01053396, 01049998, 70341003, 00861765, 70216429, 01052554, 70180773.

3.1.2 Field Investigation Results

After review of available background information, field reconnaissance to ground-truthing was conducted by Englobe on July 17 to 18, 2021, in order to confirm and verify the PSW boundaries and to delineate any other wetlands that were present within the project area or within 30 m of the project footprint. Wetland delineation was based on the three delineation criteria (vegetation, hydrology and soil).

At the time of the assessment, the weather was a mix of sun and cloud and 17°C and conditions were typical for the time of year. There was evidence of vegetation, soil and hydrology being significantly disturbed in the area due to landscaping (manicured grass and fill added) and channeling.

The field assessment confirmed the presence of the PSW and a **Coastal Marsh Wetland** was delineated. The wetland boundaries varied slightly from the mapped PSW on GeoNB. The coastal marsh wetland covers areas immediately surrounding the lagoon and trench outfall (within the proposed dredging area) to the north and south covering an area of approximately 6.43 hectares on PID Nos. 01053404, 70464888, 70207790, 01052208, 70287461, 70236682, 01049980, 01050012, 01053396, 01049998, 70341003, 00861765, 70216429, 01052554, 70180773. A wetland delineation map with the field delineated wetland is presented on Figure 2 in Appendix B.

The wetland receives water primarily from the tidal inlet and lagoon as well as from precipitation and surface drainage. The source of water to this wetland is mainly brackish tidal water from

the Shediac Bay. Precipitation and runoff from the surrounding terrain also contribute but are not considered significant sources. The wetland discharges into the Shediac Bay.

Numerous test pits were advanced to confirm soil and hydrology conditions. Wetland Delineation forms were produced for one confirmation station (one wetland and one upland station) to represent the conditions observed at these locations and can be found in Appendix C. The points were primarily chosen based on their representativity of the main ecotypes observed on site and in order to differentiate between any changes in ecotypes and includes detailed descriptions of the observed vegetation, soil and hydrology conditions. Site photographs are presented in Appendix D.

The three wetland criteria observed during the assessment are described below.

- Hydrology: Saturated soils, sparsely vegetated concave surfaces and aquatic fauna were the primary indicators of wetland hydrology observed.
- Hydric Soils: Manual auger probes were advanced throughout the wetland to assess the soil and hydrology. The auger probes identified sand (10YR 5/2) in the top 30 cm with redox features (10YR 5/6) which satisfied the hydric soil indicator, indicating a depleted matrix (F3).
- Hydrophytic Vegetation: The dominant hydrophytic vegetation observed includes herb stratum compromising of *Spartina alterniflora* (50% coverage) and *Solidago sempervirens* (30% coverage).

The upland lacked any hydrology indicators and comprised of sand (10YR 4/4) in the top 30 cm which does not satisfy the hydric soil indicator. The vegetation was determined to be non-hydrophytic and was dominated by *Grass sp.* (60% coverage) and *Trifolium repens* (10% coverage). Based on the obvious change in field conditions (hydrology and vegetation changes), Englobe delineated the coastal marsh wetland and acquired the boundaries with a hand-held GPS.

3.2 Species at Risk and Migratory Birds

A background investigation was conducted to determine previous records of species at risk (SAR) in the project area. As part of this investigation, a request was made to the ACCDC who provided a report of the flora and fauna in the area, the full ACCDC Data Report is included in Appendix E.

The ACCDC report was queried for all rare fauna and flora identified within 5 km radius of the project site. For the purposes of this assessment, SAR are defined as only those species which meet one or more of the following criteria:

- Species listed as ‘Endangered’, ‘Threatened’, ‘Vulnerable’ or ‘Special Concern’ under the *Federal Species at Risk Act* (SARA), *New Brunswick Species at Risk Act* (NBSARA) or by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).
- Species provincially ranked as “S1” (Critically Imperiled) or “S2” (Imperiled).

Species known to occur on the property which are not considered SAR as defined above, are not discussed in this document as they are considered outside the scope of this assessment.

In addition to the above-mentioned protections provided to the birds considered to be SAR, protection for individual and populations of birds and their nests against harm or destruction is also provided under the *Migratory Birds Convention Act* (MBCA).

The SAR survey was conducted between July 16 to 18th, 2021, at which time the site was visually inspected for unique biophysical and terrestrial features, and surveys conducted for wildlife, vegetation and migratory birds in the project area.

3.2.1 ACCDC Data Results

The ACCDC returned a list of SAR reported within 5 km of the Parlee Beach Provincial Park. As mentioned in Section 3.2, only those species listed under SARA, NB SARA, COSEWIC and species provincially ranked as "S1" and "S2" are considered a SAR for the purpose of this assessment. Therefore, species provincially ranked as "S3" are not included within our report but can be found in the full ACCDC Data Report found in Appendix E.

3.2.1.1 Flora

Five (5) vascular flora plants were listed within a 5km radius of the subject property including one (1) species listed as 'Threatened' under COSEWIC:

1. Black Ash (*Fraxinus nigra*)

The four (4) other species were provincially ranked as "S1" or "S2" and included:

2. Fleshy Stitchwort (*Stellaria crassifolia*)
3. Roland's Sea-Blite (*Suaeda rolandii*)
4. Buttonbush Dodder (*Cuscuta cephalanthi*)
5. Alaska Alkaligrass (*Puccinellia nutkaensis*)

Habitat descriptions for the identified SAR are included in Appendix F and a table of the vascular flora identified as SAR and associated statuses and proximity to the site can be found in the Table 1, Appendix G.

3.2.1.2 Fauna

Thirty-seven (37) vertebrate fauna were listed within a 5km radius of the subject property including thirteen (13) species listed as 'Endangered', 'Threatened' or 'Special Concern' under COSEWIC, SARA, or NB SARA and include:

1. Piping Plover melodus ssp (*Charadrius melodus melodus*)
2. Bank Swallow (*Riparia riparia*)
3. Bobolink (*Dolichonyx oryzivorus*)
4. Hudsonian Godwit (*Limosa haemastica*)
5. Lesser Yellowlegs (*Tringa flavipes*)
6. Barn Swallow (*Hirundo rustica*)
7. Barrow's Goldeneye-Eastern pop. (*Eucephala islandica (Eastern pop.)*)
8. Canada Warbler (*Cardellina canadensis*)
9. Eastern Wood-Pewee (*Contopus virens*)
10. Horned Grebe (*Podiceps auratus*)
11. Snowy Owl (*Bubo scandiacus*)
12. Red-necked Grebe (*Podiceps grisegena*)
13. Red Knot rufa subspecies (*Calidris canutus rufa)*

The twenty-four (24) other species were provincially ranked as "S1" or "S2" and are listed below:

14. Greater Yellowlegs (*Tringa melanoleuca*)
15. Sandhill Crane (*Antigone canadensis*)
16. Purple Martin (*Progne subis*)
17. Ruddy Duck (*Oxyura jamaicensis*)
18. Lesser Scaup (*Aythya affinis*)
19. Greater Scaup (*Aythya marila*)
20. Black-headed Gull (*Chroicocephalus ridibundus*)
21. Brant (*Branta bernicla*)
22. Black-crowned Night-heron (*Nycticorax nycticorax*)
23. Baird's Sandpiper (*Calidris bairdii*)
24. Northern Mockingbird (*Mimus polyglottos*)
25. Gadwall (*Mareca strepera*)
26. Solitary Sandpiper (*Tringasolitaria*)
27. Snow Goose (*Anser caerulescens*)
28. Great Cormorant (*Phalacrocorax carbo*)
29. King Eider (*Somateria spectabilis*)
30. Glaucous Gull (*Larus hyperboreus*)
31. Northern Shoveler (*Spatula clypeata*)
32. Great Crested Flycatcher (*Myiarchus crinitus*)
33. Cliff Swallow (*Petrochelidon pyrrhonota*)
34. American Golden-Plover (*Pluvialis dominica*)
35. Lapland Longspur (*Calcarius lapponicus*)
36. Black Scoter (*Melanitta americana*)
37. Sanderling (*Calidris alba*)

Habitat descriptions for the identified SAR are included in Appendix F and a table of the vascular fauna identified as SAR and associated statuses can be found in the Table 2 of Appendix G.

3.2.1.3 Location Sensitive Species

An additional two location sensitive species were listed 'Threatened' or 'Special Concern' and were identified as present within the study area. The ACCDC is not authorized to divulge precise locations of these records, in the interest of protecting the species and their habitat. The identified SAR species known within the study area include:

1. Bald Eagle (*Haliaeetus leucocephalus*)
2. Peregrine Falcon - anatum/tundrius pop. (*Falco peregrinus pop. 1*)

Habitat descriptions for the identified SAR are included in Appendix F and a table with the associated statuses can be found in Table 3, Appendix G.

3.2.1.4 Significant Natural Areas

There is one (1) Environmentally Sensitive Area (ESA) identified by ACCDC within 5 km of the Site.

- Shediac Island

Shediac Island is located approximately 1 kilometer (km) offshore in the Shediac Bay, located at the mouth of the Shediac River. The Island is classified as an ESA because it has supported two Great Blue Heron colonies since at least 1974. The northern colony was comprised of 38 nests in 1981; and the southern colony was comprised of 105 Great Blue Heron nests in 1984.

The project activities will not impact Shediac Island due to the scope of the project, and the distance of the island from the project area.

Shediac Island in relation to the subject property can be seen on Figure 3, Appendix B.

3.2.1.5 Managed Areas

There are two (2) managed areas identified by ACCDC as within 5 km of the site.

- Parlee Beach Provincial Park
- Ducks Unlimited Canada Conservation Lands

Project activities will take place within the Parlee Beach Provincial Park managed area. The Ducks Unlimited Canada Conservation Lands are located approximately 3.8 km southwest of the site; therefore the project activities will not impact this managed area. No additional information was reported on the ACCDC report, however, these areas are known to attract birds.

The two managed areas in relation to the site can be seen on Figure 3, Appendix B.

3.2.1.6 SAR Fish Habitat

The ACCDC Data Report did not note any known habitats for SAR fish within 5 km of the site. However, the tidal inlet and Shediac Bay likely provides habitat for fish.

3.2.1.7 Potential for SAR on the Subject Property

The potential for presence of the SAR identified by the ACCDC was analyzed, on the basis of habitat suitability (as determined by desktop interpretation) both on and near (i.e., < 5 km away) the site. There were two (2) flora and twenty-three (23) fauna SAR determined to have the potential to be present on site and are listed below:

Flora

1. Roland's Sea-Blite (*Suaeda rolandii*)
2. Alaska Alkaligrass (*Puccinellia nutkaensis*)

Fauna

1. Piping Plover melodus ssp (*Charadrius melodus melodus*)
2. Bank Swallow (*Riparia riparia*)
3. Bobolink (*Dolichonyx oryzivorus*)
4. Hudsonian Godwit (*Limosa haemastica*)
5. Lesser Yellowlegs (*Tringa flavipes*)
6. Barrow's Goldeneye-Eastern pop. (*Eucephala islandica (Eastern pop.)*)
7. Horned Grebe (*Podiceps auratus*)
8. Snowy Owl (*Bubo scandiacus*)
9. Red-necked Grebe (*Podiceps grisegena*)
10. Red Knot rufa subspecies (*Calidris canutus rufa)*
11. Greater Yellowlegs (*Tringa melanoleuca*)
12. Sandhill Crane (*Antigone canadensis*)
13. Ruddy Duck (*Oxyura jamaicensis*)
14. Lesser Scaup (*Aythya affinis*)
15. Greater Scaup (*Aythya marila*)

16. Black-headed Gull (*Chroicocephalus ridibundus*)
17. Brant (*Branta bernicla*)
18. Black-crowned Night-heron (*Nycticorax nycticorax*)
19. Snow Goose (*Anser caerulescens*)
20. Great Cormorant (*Phalacrocorax carbo*)
21. Glaucous Gull (*Larus hyperboreus*)
22. Northern Shoveler (*Spatula clypeata*)
23. Sanderling (*Calidris alba*)

3.2.2 SAR Field Survey Results

At the time of the field survey on July 16-18, 2021, no SAR or Migratory Birds were observed in the project area and the only at-risk species observed was a transient bald eagle seen flying at a distance. No other at-risk species or critical habitat was observed. Field observations revealed that the site is composed of a tidal inlet, lagoon and coastal marsh wetland. Mitigation measures will be implemented to ensure that disturbance of any migratory birds does not occur.

3.3 Management Considerations for SAR and Migratory Birds

The majority of SAR and Migratory Birds that could be present on the subject property are most likely to be associated with the wetland complexes, near the proposed dredging area. To ensure the SAR and Migratory Birds are protected during construction, a number of monitoring and management considerations are provided below.

- During the nesting period, a breeding activity survey must be conducted prior to work commencing. The survey must be completed by a qualified environmental professional such as an Ornithologist.
    - Should breeding activity be identified during the survey, the area will be left undisturbed with a suitable buffer zone established and maintained until the young have permanently left the vicinity of the nest. The size of the buffer will be species dependent and determined by appropriate Parks Canada staff in consultation with regulatory guidance (Canada, 2017).
- If bird breeding activity is identified during the dredging activities, work must stop immediately, the designated Parks Canada contact notified and an appropriate buffer zone established (Canada, 2017).
- All machinery (if required) should be well muffled. Contractors should avoid any sharp or loud noises (e.g., not blow horns or whistles). If necessary, trucks may be required to avoid the use of “hammer” braking along specific sections of the site, while radio communications should replace whistle blasts and horns.
- Limit dredging activities to the time between dawn and dusk to avoid using artificial lighting which can potentially affect bird and bat use of nearby habitats (Canada, 2017). If construction timing restrictions are not possible refer to the Parks Canada National Best Management Practices for Migratory Birds document.
- Covering fill piles so that birds do not nest in the piles (Canada, 2017).
- Avoiding vegetation clearing activities during the breeding bird season.
- Frequent inspections of areas considered good nesting habitats for birds such as roofs.
- Frequent surveys should be completed by a qualified environmental professional as breeding periods vary from species to species.

Other site-specific management techniques applicable to wild flora and fauna on the property are generally also applicable to SAR. These may include (but not be limited to):

- Proper management and mitigation of any accidental spills of hazardous materials on site. Machinery must be checked for leakage of lubricants and fuel. Basic petroleum spill clean-up equipment must be kept on site. All spills or leaks must be promptly contained, cleaned up, and reported to the 24-hour Environmental Emergencies Report System (1-800-565-1633).
- Prohibiting the harassment of wildlife on the property.
- Avoiding littering and properly managing on-site waste.
- Waste materials are not to be buried on site.
- Any construction debris must be disposed of in a provincially approved manner.
- Prohibiting the feeding of wildlife on the property.
- Protect wildlife habitat features, appropriate setback distances (or buffer zones) will be considered.
- Clearing and equipment use/storage/cleaning in undisturbed areas within and adjacent to the Project footprint will be avoided.
- Measures to control dust and other air emissions (i.e. watering of roads and use of dust suppressants, minimizing engine idling, etc.) within the project footprint will be implemented (if required) to minimize effects on adjacent wildlife habitats. The project authority shall determine locations where water is to be applied, the amount of water to be applied, and the times at which it shall be applied. Waste oil must not be used for dust control under any circumstances.
- Weather conditions are to be assessed on a daily basis to determine the potential risk of weather on the project. Work is to be scheduled to avoid periods of heavy precipitation.
- Erosion and sediment control structures (temporary matting, geotextile filter fabric, silt fencing, silt boom/curtain) are to be used, as appropriate, to prevent erosion and release of sediment and/or sediment laden water during the construction phase. These structures are to remain in place until vegetation is re-established (i.e. until the excavated area is sodded), all exposed soils are stabilized.
- Activities must be completed in such a way as to minimize the amount of fines and organic debris that may enter nearby aquatic environments (wetland, Shediac Bay).
- Any debris entering the marine or freshwater environments must be immediately retrieved when it is safe to do so.
- Refueling operations (if required) will take place at least 30 m from any watercourse and harbour, and the refueling will take place on a prepared impermeable surface with a collection system.

3.4 Required Actions if SAR are Detected on Site and May be Disturbed

Occasionally a situation may arise where disturbance of SAR may be necessary. However, Species at Risk Permits are only issued for the following purposes:

- The activity is scientific research relating to the conservation of the species and conducted by qualified persons;
- The activity benefits the species or is required to enhance its chance of survival in the wild; or
- Affecting the species is incidental to the carrying out of the activity.

Further information on ECCC's SAR permit process can be found at the Species at Risk Public Registry website, at https://www.registrelep-sararegistry.gc.ca/sar/permit/permits_e.cfm.

The majority of harm and/or disturbance to SAR can be avoided by simply rescheduling activities outside of the sensitive time periods for SAR (outside of the breeding bird season or active season for bats).

While it is possible to obtain a Species at Risk Permit from ECCC to engage in an activity which could potentially harm a SAR species, a proponent would be unlikely to obtain one for a non-critical activity that could simply be delayed to avoid disturbing or harming a SAR species.

3.5 Conclusions

Given the limited geographic extent, spatial and temporal footprints and limited scope of the proposed project, adverse residual effects are not anticipated to affect terrestrial SAR or other protected terrestrial wildlife species, or their critical habitats.

All work will follow the Terms and Conditions of any NBDELG WAWA Approvals, TRC letters of advice and any other provincial or federal letters of advice.

4 Functional Assessment

4.1 WESP-AC Model Results

As mentioned in Section 2.0, topography maps, Google Earth images, the GeoNB map viewer and ACCDC information, as well as associated WESP-AC User Manuals, Google Earth layers and other associated information were reviewed during our functional assessment. The PSW was assessed as one tidal wetland and the AA for the most part consisted of the entire PSW. During the delineation and additional desktop studies, Englobe carried out the functional assessments of the wetland during July 16-18, 2021.

The complete WESP-AC Model data sheets and scoring sheets for the identified Coastal Marsh Wetland is included in Appendix H. A summary of the functional assessment results is provided in Table 2, below. The following two functions/attributes received a “higher” rating:

- Biodiversity Maintenance (BM).
- Public Use & Recognition (PUR).

Table 2 — Summary of Functional Assessment Results

Function or Attribute	Normalized Score	Rating
Storm Serge Reduction	4.57	Moderate
Water Purification	1.45	Lower
Organic Nutrient Export	3.47	Lower
Fish Habitat	4.36	Moderate
Waterbird Habitat	2.46	Lower
Songbird, Raptor, and Mammal Habitats	5.85	Moderate
Biodiversity Support	10.00	Higher
Wetland Stability	2.83	Moderate
Public Use and Recognition	7.95	Higher

4.1.1 Biodiversity Support

The normalized score for the PSW was the highest possible (i.e., 10). The ACCDC showed several rare flora and fauna within 1km of the PSW and as noted in the *Manual for Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC): Tidal Wetlands (April 2018)* by NBDELG, a tidal wetland automatically gets the highest score for biodiversity if at least one of the rare flora or fauna tracked by ACCDC has been found within 1km.

During the field assessment, no SAR, including those identified within the ACCDC report, were identified. The wetland is dominated by secure species (*Spartina alterniflora* and *Solidago sempervirens*). During the proposed dredging activities, there will be minimal loss of wetland vegetation. The proposed dredging activities will likely have a positive impact on the surface water quality as natural flushing of the lagoon occurs, which can thus increase plant and animal biodiversity.

4.1.2 Public Use and Recognition

All tidal wetlands in New Brunswick are designated as PSWs due to their ecological importance. As described in the *Manual for Wetland Ecosystem Services Protocol for Atlantic Canada (WESP-AC): Tidal Wetlands (April 2018)* by NBDELG, tidal wetlands are considered important for public use and recognition because they provide expanse of open space that contributes aesthetically to the appeal of the region's coastal areas, helping boost ecotourism, as well as helping support commercially important seafood species, purifying coastal waters, and providing other ecosystem services valued by human.

This PSW is located within Parlee Beach Provincial Park and is located adjacent to Parlee Beach Road and associated commercial visitor buildings and parking lots for the park. It is also located close to the Pointe-du-Chêne Range Rear Lighthouse (DFRP #24452). It is likely people visit the area considering its location, however, the proposed dredging activities are likely to have a positive impact on the wetland as natural tidal flushing of the lagoon occurs which can improve surface water quality and increase plant and animal biodiversity thus becoming more aesthetically pleasing.

5 Monitoring Plan

NBDELG requires preparation and implementation of a monitoring plan to assess the PSW that exists at the site prior to, during and following the proposed dredging activities within the tidal inlet at the Parlee Beach Provincial Park (specifically annual monitoring and 1, 3 and 5 year monitoring reports at the initiation of the project activities). This work is part of the EIA that Englobe will submit for the proposed dredging activities. Based on the proposed project activities, dredging will take place within the tidal inlet which is within 30 m of an existing coastal marsh wetland. Additional work will be carried out within 30 m of certain areas of the wetlands. The main purpose of this monitoring is to:

- establish a baseline in wetlands extent, condition and function;
- detect change; and
- characterize trends over time.

New Brunswick uses WESP-AC for functional assessment. The field program is suitable for monitoring observed changes, but a field assessment will need to be done/updated at the prescribed intervals to determine if there are any functional changes to the wetland. This will be done at yearly intervals with monitoring reports at 1, 3 and 5-year intervals.

Conducting a WESP-AC assessment includes the following three general forms:

- Office Form – this is a desktop review. Aerial photos and various desktop tools are used to answer questions pertaining to wildlife access, land cover, water bodies and distance to nearby infrastructure.
- Field Form – This requires a field assessment. The assessor covers as much of the AA as possible to answer questions pertaining to extent of plant cover and species, hydrology, hydrological connectivity, and soil characteristics.
- Stressor Form - Requires a combination of desktop review and field assessment. Stressors to wetlands are represented by increased impacts by humans, proximity to roads, increased runoff, potential for contaminants or soil disturbance.

After the field forms are completed, the results are input into the WESP-AC Calculator. This generates the function and "benefit scores" for the wetland.

On this basis, we propose that a simplified monitoring program be implemented in the undisturbed areas to document if the dredging activities affect the hydrology of the wetland. We propose that the Monitoring Plan consist of the following:

- Water Levels: 4 piezometers will be manually installed at the locations identified in the attached figure. We will install continuous water level recorders in the piezometer. Water levels will be collected pre-dredging, during dredging, and after dredging annually over a 5-year monitoring period and the data will be assessed for any significant changes from baseline conditions (i.e. water level trends over time).
- Assessment: 4 vegetation plots (2m x 2m) will be created in the wetland, near the piezometer locations. Baseline and post dredging conditions will be documented by a combination of vegetation survey at the plot and photographic records. Vegetation monitoring will occur annually over a 5-year period. Vegetation species and percent cover will be recorded. Visual observation of any occurrences of rare or invasive species, as well as damage both natural and anthropogenic in nature to vegetation within the site, will be documented. The border will also be transverse yearly to document any changes.
- Sediment monitoring will also be conducted within the tidal inlet during dredging to determine if there are impacts from the dredging. Samples will be collected at 1, 3 and 5-year intervals and will be analyzed for select chemical analysis. Samples will be compared to the samples collected during the sediment sampling conducted in August, 2021.
- Annual salinity readings will be collected from the 4 piezometers.
- Reporting: Monitoring reports complete with photographs will be submitted to NBDELG for the baseline event, and at 1, 3 and 5-year intervals over a 5-year monitoring period.

These monitoring locations are shown in Figure 1. This work will be conducted by an experienced Englobe wetland specialist. The recognized period, or "season", for conducting wetland assessments in New Brunswick is June 1st through September 30th, of very year. A WESP-AC report is valid for a period of five years.

The WESP-AC reports need to be submitted to the Source and Surface Water Management Branch, NBDELG for provincial records, review, and a potential audit. The reports are required to be submitted in PDF or Word format with accompanying completed Excel spreadsheet.

The following must also be included in WESP-AC submission:

- Property identification number (PID) of all properties on which the WESP-AC was conducted;
- Applicant's contact information;
- Date of report and date of the WESP-AC assessment;
- Wetland consultant's name, company and contact information;
- Signature of the wetland consultant;
- Type of WESP-AC conducted (tidal and/or non-tidal); and
- Site description including the following:
    - A legible site location drawing or map clearly showing the location of the wetland surveyed on the property (use map legends as appropriate);
    - Aerial image of the site showing boundaries of the wetland and (if different) your assessment area (AA);
    - Weather conditions at the time of the site visit;
    - Current and historical land use of study area;
    - Watercourses observed on site;
    - Wetland type(s) and size;
    - Observed vegetation types, class heights and distribution; and
    - Observed surface water characteristics and ground and soil characteristics (i.e., hummocky, upland inclusions, texture, etc.).
- WESP-AC Excel spreadsheets as an appendix to the report;
- Site photographs must be included as an appendix to the report. Photographs are to be taken from several angles including surface water (if any) and dominant vegetation; and
- List of exotic floral species found within the wetland, in addition to halophytic vegetation for tidal WESP-AC The report is to also include a written statement summarizing the results of the WESP-AC scores, as well as an analysis of the results.

A monitoring program will be set up around the dredging activities throughout the wetland. The footprint through the wetland in the vicinity of where the dredging will occur will be walked as much as possible.

6 Conclusion

A wetland delineation, functional assessment and SAR/Migratory Bird Survey was conducted at the Parlee Beach Provincial park which confirmed a 6.43-hectare Coastal Marsh Wetland. At the time of the assessment, no SAR or Migratory Birds were observed within the wetland. The functional assessment completed using the WESP-AC for tidal wetland yielded two functions with normalizes scores higher than the referenced wetlands. Those functions included biodiversity support and public use and recognition. It is unlikely these functions will be impacted long-term as a result of the dredging actions.

Due to the wetland being greater than 2 hectare in size, any potential impact within the 30 m regulation buffer zone must be approved by undergoing an EIA review as per the *Environmental Impact Assessment Regulation [*87-83] of the New Brunswick *Clean Environment Act*.

7 Report Use and Conditions

This report was prepared for the exclusive use of the NB Department of THC. The report may not be relied upon by any other person or entity without the express written consent of Englobe.

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

The evaluation and conclusions contained in this report have been prepared in light of the expertise and experience of Englobe. The conclusions presented represent the best judgement of the assessors based on the observed site conditions. Due to the nature of the investigation, the assessors cannot warrant against undiscovered environmental conditions or liabilities.

Should additional information become available, Englobe requests that this information be brought to our attention so that we may re-assess the conclusions presented herein. Environmental conditions are dynamic in nature and changing circumstances in the environment and in the use of the property can alter radically the conclusions and information contained herein.

8 References

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Appendix A GeoNB Mapping

GeoNB Map Viewer

16/09/2021, 14:40:37

1:8,000

0 0.05 0.1 0.2 mi

0 0.1 0.2 0.4 km

parcels
Property Assessment
2
1
Buffer 30m
Water Bodies
Water Courses
Man Made Features - polygons
Boat Ramp
Breakwater
Breakwater in Ocean
Dam
Dock
Slip
Fish Ladder

Department of Environment & Local Government/Ministère de

GeoNB

Appendix B Figures

LEGEND:

- Site Survey Area

NB Department of Tourism, Heritage and Culture

0 30 60 90 120 150m

SCALE 1: 3000

Englobe Corp.
1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

Species at Risk, Wetland Delineation, Functional Assessment and Monitoring Plan

Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Site Survey Area

No.	Version	Date	By	Verif	Appr.
XX	X	Nov. 2021	JJ	TM	SF

Discipline:	Environment	Prepare by: TM	Verify by: TM
Scale:	1: 3000	Draw by: JJ	Approval by: SF
Date:	November 2021	Figure no:	1
Page setup: Fig. 1	Paper size: 11 x 17	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000			

LEGEND:

- Assessment Area
- Field Delineated Wetland
- Provincial Significant Wetland
- Watercourse
- Coastal Wetland Confirmation Point
- Upland Confirmation Point
- Proposed Monitoring Point

NB Department of Tourism, Heritage and Culture

0 50 100 150m

SCALE 1: 3000

Environmental Impact Assessment

Farlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

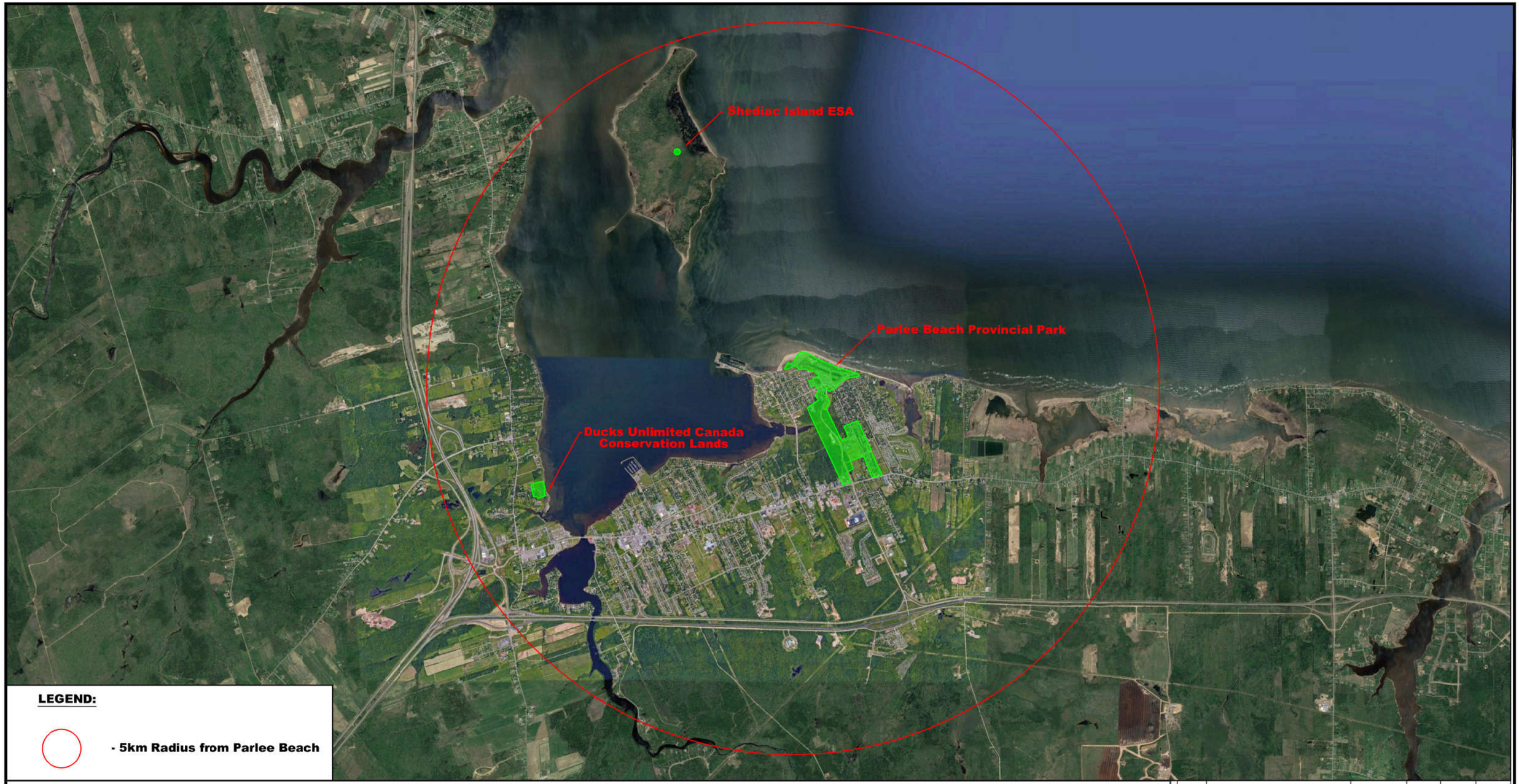
Wetland Delieation Plan

Englobe Corp.
1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

No.	Version	Date	By	Verif	Appr.
		Mar. 2022	JJ	AS	SF

Discipline:	Environment	Prepare by: AS	Verify by: AS
Scale:	1: 3000	Draw by: JJ	Approval by: SF
Date:	March 2022	Figure no:	2
Page setup: Fig. 2	Paper size: 11 x 17	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000			



LEGEND:

- 5km Radius from Parlee Beach

NB Department of Tourism, Heritage and Culture

0 500 1000 1500 2000 2500m

SCALE 1: 50,000

Englobe

Englobe Corp.

1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

Species at Risk, Wetland Delineation, Functional Assessment and Monitoring Plan

Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Site Features Map

No.	Version	Date	By	Verif	Appr.
XX	X	Nov. 2021	JJ	TM	SF

Discipline: Environment		Prepare by: TM	Verify by: TM
Scale: 1: 50,000		Draw by: JJ	Approval by: SF
Date: November 2021		Figure no: 3	
Page setup: Fig. 3	Paper size: 11 x 17	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000			

Appendix C Wetland Delineation Forms

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: 2106010 City/County: _____ Sampling Date: July 18, 2021

Applicant/Owner: Englobe Corp. State: _____ Sampling Point: WL 1

Investigator(s): Alexis Robitaille Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): _____ Lat: 46.2392468581723 Long: -64.51025168338449 Datum: Nad 83

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** Yes X No _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

- Landscapng, fill manicured grass and chanelling.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Vis ble on Aerial Imagery (B7)
- X Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- X Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 4

Wetland Hydrology Present? Yes X No _____

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

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: UL 1

Tree Stratum (Plot size: 10 m)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 5 m)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5 m)			
1. Solidago sempervirens		30	
2. Spartina alterniflora		50	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 5 m)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- [X] Rapid Test for Hydrophytic Vegetation
- [ ] Dominance Test is >50%
- [ ] Prevalence Index is ≤3.0[1]
- [ ] Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- [ ] Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WL 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/2	95	10YR 5/6	5	C	M	Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: 2106010 City/County: _____ Sampling Date: July 18, 2021

Applicant/Owner: Englobe Corp. State: _____ Sampling Point: WL 1

Investigator(s): Alexis Robitaille Section, Township, Range: _____

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): _____ Lat: 46.2392468581723 Long: -64.51025168338449 Datum: Nad 83

Soil Map Unit Name: _____ NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** Yes _____ No X
Hydric Soil Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes _____	No X	

Remarks: (Explain alternative procedures here or in a separate report.)

- Landscapng, fill manicured grass and chanelling.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Vis ble on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): 4

Wetland Hydrology Present? Yes _____ No X

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

Remarks:

VEGETATION – Use scientific names of plants. Sampling Point: UL 1

Tree Stratum (Plot size: 10 m)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 5 m)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5 m)			
1. Solidago sempervirens		30	
2. Spartina alterniflora		50	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: 5 m)			
1.			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

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

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WL 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/2	95	10YR 5/6	5	C	M	Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

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

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

Appendix D Site Photos

PHOTO 1 — View (looking north towards the parking lot) of tidal inlet (July 17-18, 2021).

PHOTO 2 — View (looking north) of tidal inlet facing Parlee Beach Restaurant building (July 17-18, 2021).

PHOTO 3 — View of walking bridge over wetland near main Parlee Beach building (July 17-18, 2021).

PHOTO 4 – Close up of plants in wetland (July 17-18, 2021).

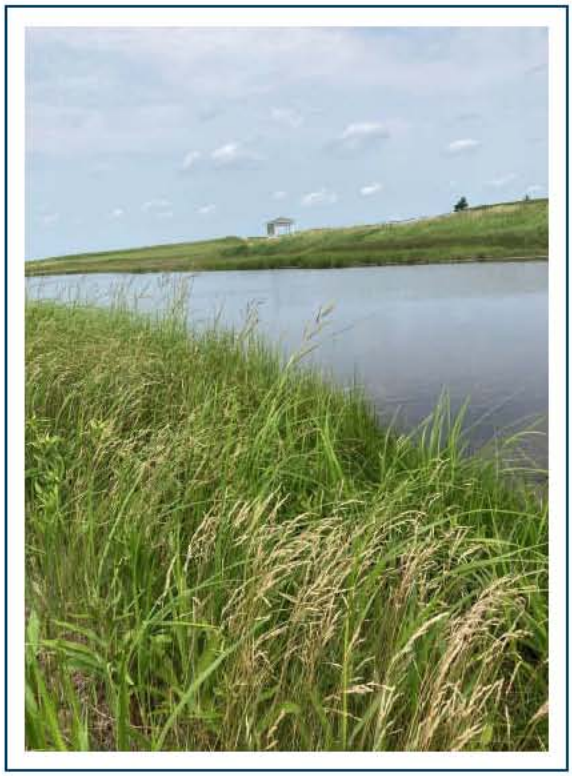


PHOTO 5 – Another view of plants and tidal inlet (July 17-18, 2021).

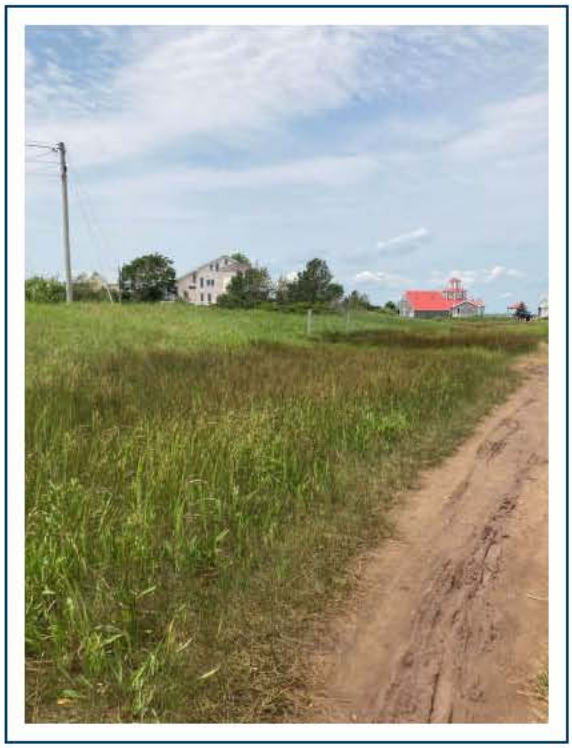


PHOTO 6 – View of upland area looking southwest (July 17-18, 2021).

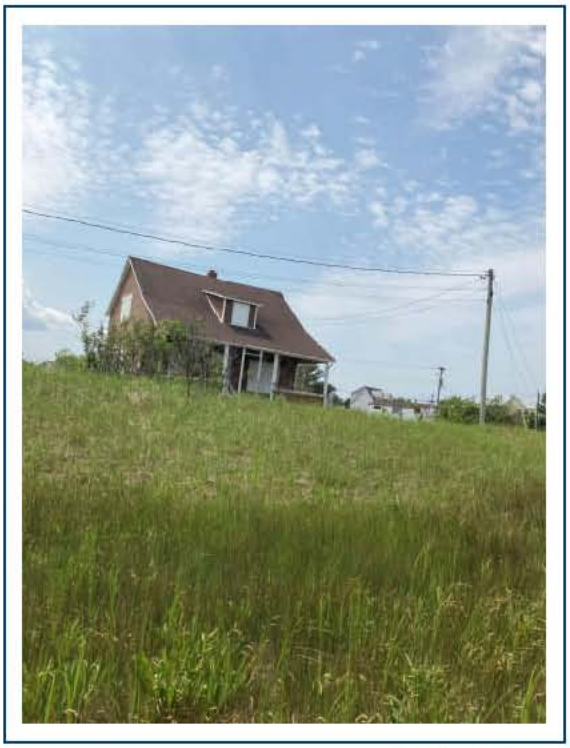


PHOTO 7 – View of upland area looking south (July 17-18, 2021).

PHOTO 8 – View of tidal inlet looking west (July 17-18, 2021).

PHOTO 9 – View of lagoon looking east (July 16, 2021).

PHOTO 10 – View of tidal inlet and walking trail looking east (July 17-18, 2021).

PHOTO 11 – Another view of wetland looking west (July 17-18, 2021).

PHOTO 12 – Closeup of wetland plants (July 17-18, 2021).

PHOTO 13 – Tidal inlet near the western border (July 17-18, 2021).

PHOTO 14 – View of tidal water near the western border (July 17-18, 2021).

PHOTO 15 – View of upland plants near southwestern border (July 17-18, 2021).

PHOTO 16 – Closeup of wetland plants near southwestern border (July 17-18, 2021).

PHOTO 17 – View of Parlee Beach (facing north) near western border (July 17-18, 2021).

PHOTO 18 – Closeup of tidal inlet water quality (July 17-18, 2021).

PHOTO 19 – Bald eagle flying over the site (July 17-18, 2021).

PHOTO 20 – CON1 wetland confirmation station (July 17-18, 2021).

PHOTO 21 – CON1 hydric soils (July 17-18, 2021).

PHOTO 22 – CON2 upland confirmation station (July 17-18, 2021).

PHOTO 23 – CON2 upland confirmation station non-hydric soils (July 17-18, 2021).

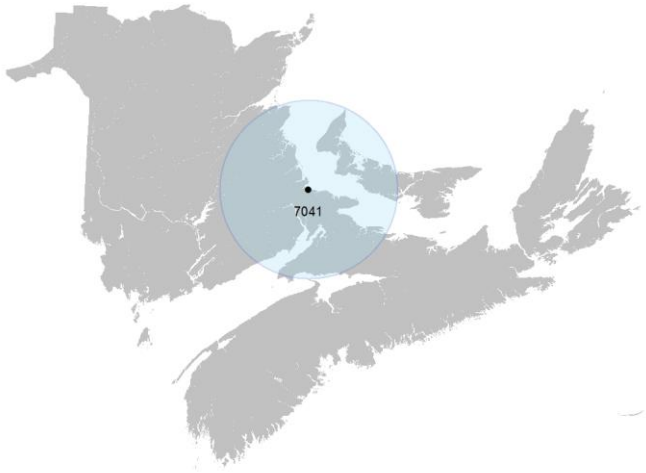
PHOTO 24 – View of boundaries (see vegetation change) (July 17-18, 2021).

Appendix E ACCDC Report

DATA REPORT 7041: Parlee Beach, NB

Prepared 12 August 2021
by J. Churchill, Data Manager

CONTENTS OF REPORT



Map 1. A 100 km buffer around the study area

1.0 PREFACE

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

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

1.1 DATA LIST

Included datasets:

Filename	Contents
ParleeBhNB_7041ob.xls	Rare or legally-protected Flora and Fauna in your study area
ParleeBhNB_7041ob100km.xls	A list of Rare and legally protected Flora and Fauna within 100 km of your study area
ParleeBhNB_7041msa xls	Managed and Biologically Significant Areas in your study area

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
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sarah robinson@accdc.ca

Data Management, GIS
James Churchill, Data Manager
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Billing
Jean Breau
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jean.breau@accdc.ca

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

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

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

Western: Emma Vost
(902) 670-8187
Emma.Vost@novascotia.ca

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

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

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

2.0 RARE AND ENDANGERED SPECIES

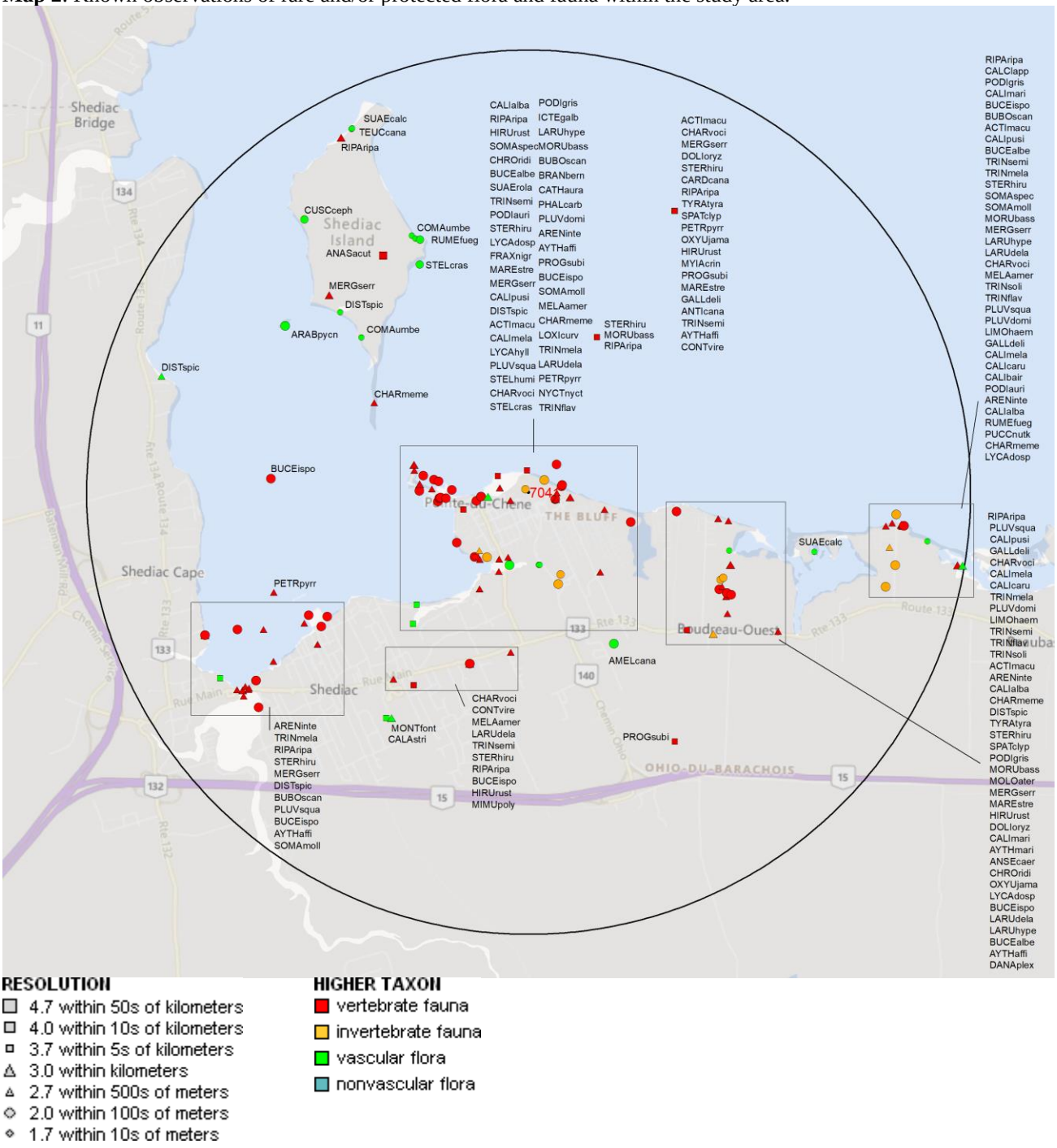
2.1 FLORA

The study area contains 26 records of 15 vascular, no records of nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 1334 records of 58 vertebrate, 18 records of 3 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

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



3.0 SPECIAL AREAS

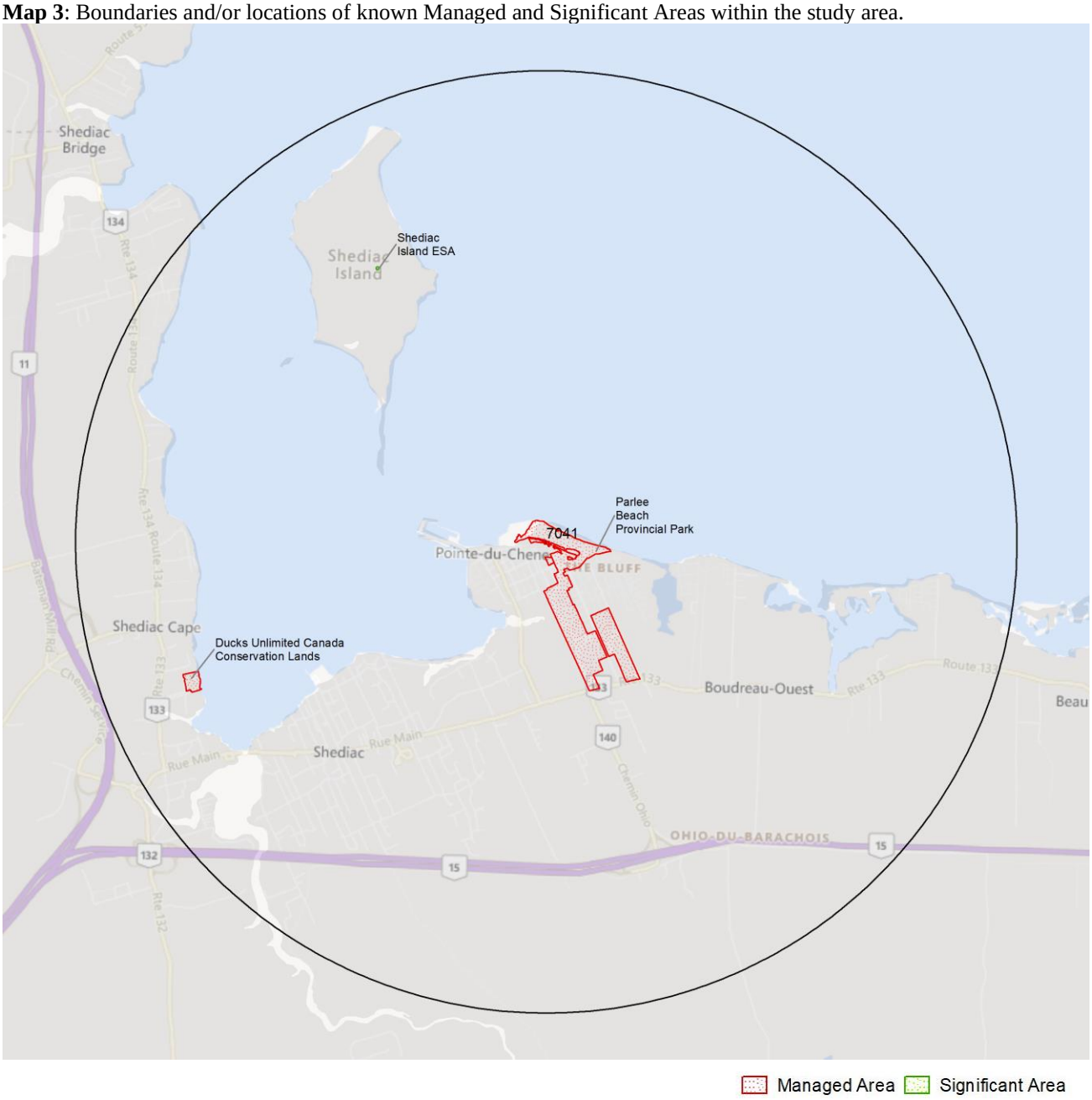
3.1 MANAGED AREAS

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

3.2 SIGNIFICANT AREAS

The GIS scan identified 1 biologically significant site in the vicinity of the study area (Map 3 and attached file: *msa.xls).

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



4.0 RARE SPECIES LISTS

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

4.1 FLORA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
P	*Fraxinus nigra*	Black Ash	Threatened			S4S5	2	0.8 ± 0.0
P	*Stellaria crassifolia*	Fleshy Stitchwort				S1	2	2.0 ± 5.0
P	*Suaeda rolandii*	Roland's Sea-Blite				S1	2	0.5 ± 0.0
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S1S3	1	4.0 ± 0.0
P	*Puccinellia nutkaensis*	Alaska Alkaligrass				S2	1	5.0 ± 1.0
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S3	1	3.3 ± 0.0
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	1	1.8 ± 5.0
P	*Teucrium canadense*	Canada Germander				S3	1	4.6 ± 0.0
P	*Amelanchier canadensis*	Canada Serviceberry				S3	1	2.0 ± 0.0
P	*Comandra umbellata*	Bastard's Toadflax				S3	3	2.6 ± 0.0
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	2	3.3 ± 0.0
P	*Rumex fueginus*	Tierra del Fuego Dock				S3S4	2	3.1 ± 0.0
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S3S4	1	3.0 ± 2.0
P	*Distichlis spicata*	Salt Grass				S3S4	5	0.9 ± 0.0
P	*Montia fontana*	Water Blinks				SH	1	3.0 ± 1.0

4.2 FAUNA

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	18	0.5 ± 0.0
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	42	0.3 ± 0.0
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	5	2.4 ± 1.0
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S3S4M	28	2.2 ± 0.0
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S4M	64	0.3 ± 0.0
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Threatened	S2B,S2M	6	0.3 ± 0.0
A	*Bucephala islandica (Eastern pop)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	44	1.3 ± 1.0
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Threatened	S3B,S3M	1	3.6 ± 7.0
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	3	2.1 ± 0.0
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern	Special Concern	S4N,S4M	21	0.2 ± 0.0
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	12	0.2 ± 0.0
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	68	0.3 ± 0.0
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S3M,S2N	24	1.3 ± 1.0
A	*Calidris canutus rufa*	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	2	2.2 ± 0.0
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S5M	97	0.3 ± 0.0
A	*Antigone canadensis*	Sandhill Crane				S1B,S1M	1	3.6 ± 7.0
A	*Progne subis*	Purple Martin				S1B,S1M	6	0.4 ± 7.0
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S2S3M	16	2.4 ± 1.0
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	52	1.3 ± 1.0
A	*Aythya marila*	Greater Scaup				S1B,S4M,S2N	2	2.4 ± 1.0
A	*Chroicocephalus ridibundus*	Black-headed Gull				S1N,S2M	3	0.5 ± 0.0
A	*Branta bernicla*	Brant				S1N,S2S3M	3	1.3 ± 1.0
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B,S1S2M	1	0.5 ± 0.0
A	*Calidris bairdii*	Baird's Sandpiper				S1S2M	1	4.2 ± 0.0
A	*Mimus polyglottos*	Northern Mockingbird				S2B,S2M	1	2.5 ± 5.0
A	*Mareca strepera*	Gadwall				S2B,S3M	4	1.0 ± 0.0

	Scientific *Name*	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	5	2.2 ± 0.0
A	*Anser caerulescens*	Snow Goose				S2M	2	2.4 ± 1.0
A	*Phalacrocorax carbo*	Great Cormorant				S2N,S2M	1	1.3 ± 1.0
A	*Somateria spectabilis*	King Eider				S2N,S2M	2	0.5 ± 0.0
A	*Larus hyperboreus*	Glaucous Gull				S2N,S2M	5	1.3 ± 1.0
A	*Spatula clypeata*	Northern Shoveler				S2S3B,S2S3M	4	2.4 ± 1.0
A	*Myiarchus crinitus*	Great Crested Flycatcher				S2S3B,S2S3M	1	3.6 ± 7.0
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B,S2S3M	4	0.5 ± 0.0
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	18	0.5 ± 0.0
A	*Calcarius lapponicus*	Lapland Longspur				S2S3N,SUM	1	4.2 ± 1.0
A	*Loxia curvirostra*	Red Crossbill				S3	1	0.3 ± 0.0
A	*Cathartes aura*	Turkey Vulture				S3B,S3M	1	1.3 ± 1.0
A	*Charadrius vociferus*	Killdeer				S3B,S3M	28	0.3 ± 0.0
A	*Tringa semipalmata*	Willet				S3B,S3M	142	0.2 ± 7.0
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	1	2.4 ± 1.0
A	*Icterus galbula*	Baltimore Oriole				S3B,S3M	1	1.3 ± 1.0
A	*Somateria mollissima*	Common Eider				S3B,S4M,S3N	11	0.5 ± 0.0
A	*Anas acuta*	Northern Pintail				S3B,S5M	1	3.1 ± 10.0
A	*Mergus serrator*	Red-breasted Merganser				S3B,S5M,S4S5N	16	0.5 ± 0.0
A	*Arenaria interpres*	Ruddy Turnstone				S3M	55	0.3 ± 0.0
A	*Melanitta americana*	Black Scoter				S3M,S1S2N	70	0.5 ± 0.0
A	*Bucephala albeola*	Bufflehead				S3M,S2N	21	0.5 ± 0.0
A	*Calidris maritima*	Purple Sandpiper				S3M,S3N	7	2.4 ± 1.0
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	5	2.4 ± 1.0
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	63	0.3 ± 0.0
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	8	2.2 ± 0.0
A	*Larus delawarensis*	Ring-billed Gull				S3S4B,S5M	63	0.4 ± 0.0
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	84	0.3 ± 0.0
A	*Calidris pusilla*	Semipalmated Sandpiper				S3S4M	86	0.3 ± 0.0
A	*Calidris melanotos*	Pectoral Sandpiper				S3S4M	19	1.2 ± 0.0
A	*Calidris alba*	Sanderling				S3S4M,S1N	51	0.3 ± 0.0
A	*Morus bassanus*	Northern Gannet				SHB,S5M	32	0.5 ± 0.0
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	1	2.6 ± 1.0
I	*Lycaena hyllus*	Bronze Copper				S3	5	0.0 ± 0.0
I	*Lycaena dospassosi*	Salt Marsh Copper				S3	12	0.2 ± 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?
Chrysemys picta picta	Eastern Painted Tur le			No
Chelydra serpentina	Snapping Turtle	Special Concern	Special Concern	No
Glyptemys insculpta	Wood Turtle	Threatened	Threatened	No
Haliaeetus leucocephalus	**Bald Eagle**		**Endangered**	**YES**
Falco peregrinus pop. 1	**Peregrine Falcon - anatum/tundrius pop.**	**Special Concern**	**Endangered**	**YES**
Cicindela marginipennis	Cobblestone Tiger Beetle	Endangered	Endangered	No
Coenonympha nipisiquit	Maritime Ringlet	Endangered	Endangered	No
Bat hibernaculum or bat species occurrence		[Endangered][1]	[Endangered][1]	No

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

4.4 SOURCE BIBLIOGRAPHY

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

# recs	CITATION
564	eBird. 2014. eBird Basic Dataset. Version: EBD_relNov-2014. Ithaca, New York. Nov 2014. Cornell Lab of Ornithology, 25036 recs.
483	Morrison, Guy. 2011. Maritime Shorebird Survey (MSS) database. Canadian Wildlife Service, Ottawa, 15939 surveys. 86171 recs.
134	Paquet, Julie. 2018. Atlantic Canada Shorebird Survey (ACSS) database 2012-2018. Environment Canada, Canadian Wildlife Service.
39	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
29	iNaturalist. 2020. iNaturalist Data Export 2020. iNaturalist.org and iNaturalist.ca, Web site: 128728 recs.
27	eBird. 2020. eBird Basic Dataset. Version: EBD_relNov-2019. Ithaca, New York. Nov 2019, Cape Breton Bras d'Or Lakes Watershed subset. Cornell Lab of Ornithology.
20	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
12	Amirault, D.L. & Stewart, J. 2007. Piping Plover Database 1894-2006. Canadian Wildlife Service, Sackville, 3344 recs, 1228 new.
11	Mazerolle, D.M. 2005. Bouctouche Irving Eco-Centre rare coastal plant fieldwork results 2004-05. Irving Eco-centre, la Dune du Bouctouche, 174 recs.
10	Berrigan, L. 2019. Maritimes Marsh Monitoring Project 2013, 2014, 2016, 2017, and 2018 data. Bird Studies Canada, Sackville, NB.
5	Paquet, Julie. 2019. Atlantic Canada Shorebird Survey ACSS database for 2019. Environment Canada, Canadian Wildlife Service.
5	Wilhelm, S.I. et al. 2011. Colonial Waterbird Database. Canadian Wildlife Service, Sackville, 2698 sites, 9718 recs (8192 obs).
4	Benedict, B. Connell Herbarium Specimens. University New Brunswick, Fredericton. 2003.
4	Tingley, S. (compiler). 2001. Butterflies of New Brunswick. , Web site: www.geocities.com/Yosemite/8425/buttrfly. 142 recs.
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3	NatureServe Canada. 2019. iNaturalist Maritimes Butterfly Records. iNaturalist.org and iNaturalist.ca.
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2	Blaney, C.S. 2017. Atlan ic Canada Conservation Data Centre Fieldwork 2017. Atlantic Canada Conservation Data Centre.
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5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 60451 records of 141 vertebrate and 1192 records of 73 invertebrate fauna; 8333 records of 291 vascular, 2023 records of 193 nonvascular flora (attached: *ob100km.xls).

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

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Myotis lucifugus*	Little Brown Myotis	Endangered	Endangered	Endangered	S1	62	35.2 ± 0.0	NB
A	*Myotis septentrionalis*	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	50	35.7 ± 1.0	NB
A	*Perimyotis subflavus*	Eastern Pipistrelle	Endangered	Endangered	Endangered	S1	12	40.0 ± 0.0	NB
A	*Charadrius melodus melodus*	Piping Plover melodus ssp	Endangered	Endangered	Endangered	S1B,S1M	2723	0 5 ± 0.0	NB
A	*Dermochelys coriacea (Atlantic pop)*	Leatherback Sea Turtle - Atlantic pop.	Endangered	Endangered	Endangered	S1S2N	5	27.0 ± 1.0	NB
A	*Salmo salar pop. 1*	Atlantic Salmon - Inner Bay of Fundy pop.	Endangered	Endangered	Endangered	S2	636	28.5 ± 1.0	NB
A	*Salmo salar pop. 7*	Atlantic Salmon - Outer Bay of Fundy pop.	Endangered		Endangered	SNR	395	43.0 ± 0.0	NB
A	*Rangifer tarandus pop. 2*	Woodland Caribou (Atlantic-Gasp ├⌐sie pop.)	Endangered	Endangered	Extirpated	SX	2	42.7 ± 1.0	NB
A	*Lanius ludovicianus*	Loggerhead Shrike	Endangered	Endangered		SXB,SXM	1	26.4 ± 0.0	NB
A	*Sturnella magna*	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B,S1M	33	25.0 ± 0.0	NB
A	*Ixobrychus exilis*	Least Bittern	Threatened	Threatened	Threatened	S1S2B,S1S2M	18	19.2 ± 0.0	NB
A	*Hylocichla mustelina*	Wood Thrush	Threatened	Threatened	Threatened	S1S2B,S1S2M	69	13.5 ± 7.0	NB
A	*Asio flammeus*	Short-eared Owl	Threatened	Special Concern	Special Concern	S2B,S2M	54	23.2 ± 64.0	NB
A	*Antrostomus vociferus*	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	22	23.6 ± 7.0	NB
A	*Catharus bicknelli*	Bicknell's Thrush	Threatened	Threatened	Threatened	S2B,S2M	8	21.2 ± 2.0	NB
A	*Oceanodroma leucorhoa*	Leach's Storm-Petrel	Threatened			S2B,SUM	1	10.3 ± 0.0	NB
A	*Glyptemys insculpta*	Wood Turtle	Threatened	Threatened	Threatened	S2S3	678	12.8 ± 0.0	NB
A	*Chaetura pelagica*	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	177	20.5 ± 7.0	NB
A	*Riparia riparia*	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	3032	0 3 ± 0.0	NB
A	*Acipenser oxyrinchus*	Atlantic Sturgeon	Threatened		Threatened	S3	1	45.9 ± 1.0	NB
A	*Dolichonyx oryzivorus*	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	2020	2.4 ± 1.0	NB
A	*Limosa haemastica*	Hudsonian Godwit	Threatened			S3S4M	564	2 2 ± 0.0	NB
A	*Anguilla rostrata*	American Eel	Threatened		Threatened	S4	6970	28.5 ± 1.0	NB
A	*Tringa flavipes*	Lesser Yellowlegs	Threatened			S4M	1819	0 3 ± 0.0	NB
A	*Coturnicops noveboracensis*	Yellow Rail	Special Concern	Special Concern	Special Concern	S1?B,SUM	5	34.3 ± 0.0	NB
A	*Histrionicus histrionicus pop. 1*	Harlequin Duck - Eastern pop.	Special Concern	Special Concern	Endangered	S1B,S1S2N,S2M	6	24.8 ± 0.0	NB
A	*Hirundo rustica*	Barn Swallow	Special Concern	Threatened	Threatened	S2B,S2M	1490	0 3 ± 0.0	NB
A	*Bucephala islandica (Eastern pop)*	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	117	1 3 ± 1.0	NB
A	*Salmo salar pop. 12*	Atlantic Salmon - Gaspe -	Special Concern		Special Concern	S2S3	16	34.1 ± 50.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
		Southern Gulf of St Lawrence pop.							
A	*Balaenoptera physalus*	Fin Whale	Special Concern	Special Concern		S2S3	1	72.7 ± 1.0	NB
A	*Chelydra serpentina*	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	4	19.6 ± 1.0	NB
A	*Euphagus carolinus*	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	118	12.4 ± 0.0	NB
A	*Contopus cooperi*	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B,S3M	561	7 0 ± 7.0	NB
A	*Cardellina canadensis*	Canada Warbler	Special Concern	Threatened	Threatened	S3B,S3M	615	3.6 ± 7.0	NB
A	*Coccothraustes vespertinus*	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	318	10.8 ± 7.0	NB
A	*Chordeiles minor*	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	205	13.6 ± 0.0	NB
A	*Phalaropus lobatus*	Red-necked Phalarope	Special Concern	Special Concern		S3M	24	18.7 ± 0.0	NB
A	*Phocoena phocoena*	Harbour Porpoise	Special Concern		Spec.Concern	S4	4	46.5 ± 0.0	NB
A	*Chrysemys picta picta*	Eastern Painted Tur le	Special Concern			S4	20	27.4 ± 0.0	NB
A	*Contopus virens*	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	756	2.1 ± 0.0	NB
A	*Podiceps auritus*	Horned Grebe	Special Concern	Special Concern	Special Concern	S4N,S4M	53	0 2 ± 0.0	NB
A	*Hemidactylium scutatum*	Four-toed Salamander	Not At Risk			S1?	5	86.7 ± 0.0	NB
A	*Falco peregrinus pop. 1*	Peregrine Falcon - anatum/tundrius	Not At Risk	Special Concern	Endangered	S1B,S3M	282	2.4 ± 1.0	NB
A	*Bubo scandiacus*	Snowy Owl	Not At Risk			S1N,S2S3M	53	0 2 ± 0.0	NB
A	*Accipiter cooperii*	Cooper's Hawk	Not At Risk			S1S2B,S1S2M	6	12.7 ± 5.0	NB
A	*Fulica americana*	American Coot	Not At Risk			S1S2B,S1S2M	62	24.8 ± 0.0	NB
A	*Aegolius funereus*	Boreal Owl	Not At Risk			S1S2B,SUM	11	32.3 ± 0.0	NB
A	*Sorex dispar*	Long-tailed Shrew	Not At Risk			S2	3	52.7 ± 1.0	NB
A	*Buteo lineatus*	Red-shouldered Hawk	Not At Risk			S2B,S2M	13	26.4 ± 0.0	NB
A	*Chlidonias niger*	Black Tern	Not At Risk			S2B,S2M	187	29.0 ± 1.0	NB
A	*Lynx canadensis*	Canadian Lynx	Not At Risk		Endangered	S3	21	41.9 ± 10.0	NB
A	*Desmognathus fuscus - Quebec / New Brunswick population*	Northern Dusky Salamander - Quebec / New Brunswick population	Not At Risk			S3	1	81.6 ± 0.0	NB
A	*Sterna hirundo*	Common Tern	Not At Risk			S3B,SUM	757	0 3 ± 0.0	NB
A	*Podiceps grisegena*	Red-necked Grebe	Not At Risk			S3M,S2N	51	1 3 ± 1.0	NB
A	*Lagenorhynchus acutus*	Atlantic White-sided Dolphin	Not At Risk			S3S4	3	43.4 ± 1.0	NB
A	*Haliaeetus leucocephalus*	Bald Eagle	Not At Risk		Endangered	S4	1380	0 5 ± 0.0	NB
A	*Canis lupus*	Gray Wolf	Not At Risk		Extirpated	SX	2	72.3 ± 100.0	NB
A	*Puma concolor pop. 1*	Eastern Cougar	Data Deficient		Endangered	SNA	114	13.8 ± 1.0	NB
A	*Calidris canutus rufa*	Red Knot rufa subspecies	E,SC	Endangered	Endangered	S2M	805	2 2 ± 0.0	NB
A	*Morone saxatilis*	Striped Bass	E,SC			S3	8640	45.9 ± 0.0	NB
A	*Thryothorus ludovicianus*	Carolina Wren				S1	13	6 8 ± 0.0	NB
A	*Salvelinus alpinus*	Arctic Char				S1	3	93.2 ± 1.0	NB
A	*Vireo flavifrons*	Yellow-throated Vireo				S1?B,S1?M	4	29.1 ± 0.0	NB
A	*Tringa melanoleuca*	Greater Yellowlegs				S1?B,S5M	2696	0 3 ± 0.0	NB
A	*Aythya americana*	Redhead				S1B,S1M	10	28.1 ± 7.0	NB
A	*Gallinula galeata*	Common Gallinule				S1B,S1M	53	32.2 ± 0.0	NB
A	*Antigone canadensis*	Sandhill Crane				S1B,S1M	24	3.6 ± 7.0	NB
A	*Bartramia longicauda*	Upland Sandpiper				S1B,S1M	53	18.6 ± 0.0	NB
A	*Phalaropus tricolor*	Wilson's Phalarope				S1B,S1M	33	28.4 ± 0.0	NB
A	*Leucophaeus atricilla*	Laughing Gull				S1B,S1M	9	8.4 ± 0.0	NB
A	*Progne subis*	Purple Martin				S1B,S1M	80	0.4 ± 7.0	NB
A	*Oxyura jamaicensis*	Ruddy Duck				S1B,S2S3M	110	2.4 ± 1.0	NB
A	*Aythya affinis*	Lesser Scaup				S1B,S4M	174	1 3 ± 1.0	NB
A	*Aythya marila*	Greater Scaup				S1B,S4M,S2N	15	2.4 ± 1.0	NB
A	*Eremophila alpestris*	Horned Lark				S1B,S4N,S5M	68	23.6 ± 7.0	NB
A	*Sterna paradisaea*	Arctic Tern				S1B,SUM	32	8 9 ± 7.0	NB
A	*Fratercula arctica*	Atlantic Puffin				S1B,SUN,SUM	3	63.3 ± 0.0	NB
A	*Chroicocephalus ridibundus*	Black-headed Gull				S1N,S2M	15	0 5 ± 0.0	NB
A	*Branta bernicla*	Brant				S1N,S2S3M	36	1 3 ± 1.0	NB
A	*Butorides virescens*	Green Heron				S1S2B,S1S2M	8	33.0 ± 7.0	NB
A	*Nycticorax nycticorax*	Black-crowned Night-heron				S1S2B,S1S2M	5	0 5 ± 0.0	NB
A	*Empidonax traillii*	Willow Flycatcher				S1S2B,S1S2M	73	22.6 ± 7.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Stelgidopteryx serripennis*	Northern Rough-winged Swallow				S1S2B,S1S2M	6	24.6 ± 0.0	NB
A	*Troglodytes aedon*	House Wren				S1S2B,S1S2M	12	8 9 ± 7.0	NB
A	*Rissa tridactyla*	Black-legged Kittiwake				S1S2B,S4N,S5M	2	20.9 ± 0.0	NB
A	*Calidris bairdii*	Baird's Sandpiper				S1S2M	53	4 2 ± 0.0	NB
A	*Cistothorus palustris*	Marsh Wren				S2B,S2M	82	19.7 ± 0.0	NB
A	*Mimus polyglottos*	Northern Mockingbird				S2B,S2M	140	2 5 ± 5.0	NB
A	*Toxostoma rufum*	Brown Thrasher				S2B,S2M	28	16.9 ± 7.0	NB
A	*Pooecetes gramineus*	Vesper Sparrow				S2B,S2M	127	13.3 ± 0.0	NB
A	*Mareca strepera*	Gadwall				S2B,S3M	411	1 0 ± 0.0	NB
A	*Pinicola enucleator*	Pine Grosbeak				S2B,S4S5N,S4S5M	42	8 9 ± 7.0	NB
A	*Tringa solitaria*	Solitary Sandpiper				S2B,S5M	184	2 2 ± 0.0	NB
A	*Anser caerulescens*	Snow Goose				S2M	24	2.4 ± 1.0	NB
A	*Phalacrocorax carbo*	Great Cormorant				S2N,S2M	163	1 3 ± 1.0	NB
A	*Somateria spectabilis*	King Eider				S2N,S2M	4	0 5 ± 0.0	NB
A	*Larus hyperboreus*	Glaucous Gull				S2N,S2M	94	1 3 ± 1.0	NB
A	*Asio otus*	Long-eared Owl				S2S3	29	23.3 ± 0.0	NB
A	*Picoides dorsalis*	American Three-toed Woodpecker				S2S3	20	51.2 ± 7.0	NB
A	*Spatula clypeata*	Northern Shoveler				S2S3B,S2S3M	469	2.4 ± 1.0	NB
A	*Myiarchus crinitus*	Great Crested Flycatcher				S2S3B,S2S3M	36	3.6 ± 7.0	NB
A	*Petrochelidon pyrrhonota*	Cliff Swallow				S2S3B,S2S3M	534	0 5 ± 0.0	NB
A	*Pluvialis dominica*	American Golden-Plover				S2S3M	246	0 5 ± 0.0	NB
A	*Calcarius lapponicus*	Lapland Longspur				S2S3N,SUM	43	4 2 ± 1.0	NB
A	*Cepphus grylle*	Black Guillemot				S3	56	34.3 ± 7.0	PE
A	*Loxia curvirostra*	Red Crossbill				S3	140	0 3 ± 0.0	NB
A	*Spinus pinus*	Pine Siskin				S3	401	8 9 ± 7.0	NB
A	*Salvelinus namaycush*	Lake Trout				S3	1	46.3 ± 0.0	NB
A	*Sorex maritimensis*	Maritime Shrew				S3	144	39.5 ± 1.0	NB
A	*Eptesicus fuscus*	Big Brown Bat				S3	11	26.0 ± 1.0	NB
A	*Cathartes aura*	Turkey Vulture				S3B,S3M	154	1 3 ± 1.0	NB
A	*Rallus limicola*	Virginia Rail				S3B,S3M	342	16.5 ± 0.0	NB
A	*Charadrius vociferus*	Killdeer				S3B,S3M	1002	0 3 ± 0.0	NB
A	*Tringa semipalmata*	Willet				S3B,S3M	1214	0 2 ± 7.0	NB
A	*Coccyzus erythropthalmus*	Black-billed Cuckoo				S3B,S3M	164	8 9 ± 7.0	NB
A	*Vireo gilvus*	Warbling Vireo				S3B,S3M	72	12.8 ± 0.0	NB
A	*Piranga olivacea*	Scarlet Tanager				S3B,S3M	44	24.9 ± 7.0	NB
A	*Passerina cyanea*	Indigo Bunting				S3B,S3M	43	29.2 ± 7.0	NB
A	*Molothrus ater*	Brown-headed Cowbird				S3B,S3M	294	2.4 ± 1.0	NB
A	*Icterus galbula*	Baltimore Oriole				S3B,S3M	107	1 3 ± 1.0	NB
A	*Somateria mollissima*	Common Eider				S3B,S4M,S3N	208	0 5 ± 0.0	NB
A	*Setophaga tigrina*	Cape May Warbler				S3B,S4S5M	322	7 0 ± 7.0	NB
A	*Anas acuta*	Northern Pintail				S3B,S5M	169	3.1 ± 10.0	NB
A	*Mergus serrator*	Red-breasted Merganser				S3B,S5M,S4S5N	327	0 5 ± 0.0	NB
A	*Arenaria interpres*	Ruddy Turnstone				S3M	1248	0 3 ± 0.0	NB
A	*Phalaropus fulicarius*	Red Phalarope				S3M	6	41.4 ± 0.0	NB
A	*Melanitta americana*	Black Scoter				S3M,S1S2N	285	0 5 ± 0.0	NB
A	*Bucephala albeola*	Bufflehead				S3M,S2N	122	0 5 ± 0.0	NB
A	*Calidris maritima*	Purple Sandpiper				S3M,S3N	103	2.4 ± 1.0	NB
A	*Uria lomvia*	Thick-billed Murre				S3N,S3M	1	90.9 ± 0.0	NS
A	*Synaptomys cooperi*	Southern Bog Lemming				S3S4	89	55.1 ± 0.0	NB
A	*Tyrannus tyrannus*	Eastern Kingbird				S3S4B,S3S4M	569	2.4 ± 1.0	NB
A	*Actitis macularius*	Spotted Sandpiper				S3S4B,S5M	1006	0.3 ± 0.0	NB
A	*Gallinago delicata*	Wilson's Snipe				S3S4B,S5M	1138	2 2 ± 0.0	NB
A	*Larus delawarensis*	Ring-billed Gull				S3S4B,S5M	447	0.4 ± 0.0	NB
A	*Setophaga striata*	Blackpoll Warbler				S3S4B,S5M	70	7 0 ± 7.0	NB
A	*Pluvialis squatarola*	Black-bellied Plover				S3S4M	2369	0 3 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	*Calidris pusilla*	Semipalmated Sandpiper				S3S4M	2857	0 3 ± 0.0	NB
A	*Calidris melanotos*	Pectoral Sandpiper				S3S4M	484	1 2 ± 0.0	NB
A	*Calidris alba*	Sanderling				S3S4M,S1N	1895	0 3 ± 0.0	NB
A	*Morus bassanus*	Northern Gannet				SHB,S5M	220	0 5 ± 0.0	NB
I	*Bombus (Psithyrus) bohemicus*	Gypsy Cuckoo Bumble Bee	Endangered	Endangered		S1	12	18.1 ± 5.0	NB
I	*Gomphus ventricosus*	Skillet Clubtail	Endangered	Endangered	Endangered	S1S2	1	81.8 ± 0.0	NB
I	*Danaus plexippus*	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	211	2.6 ± 1.0	NB
I	*Alasmidonta varicosa*	Brook Floater	Special Concern	Special Concern	Special Concern	S2	34	30.9 ± 0.0	NB
I	*Lampsilis cariosa*	Yellow Lampmussel	Special Concern	Special Concern	Special Concern	S2	4	92.7 ± 0.0	NB
I	*Bombus terricola*	Yellow-banded Bumblebee	Special Concern	Special Concern		S3?	151	18.5 ± 0.0	NB
I	*Coccinella transversoguttata richardsoni*	Transverse Lady Beetle	Special Concern			SH	30	5 5 ± 1.0	NB
I	*Erora laeta*	Early Hairstreak				S1	2	27.0 ± 1.0	NB
I	*Leucorrhinia patricia*	Canada Whiteface				S1	10	70.7 ± 1.0	NB
I	*Plebejus saepiolus*	Greenish Blue				S1S2	2	55.3 ± 7.0	NB
I	*Cicindela ancocisconensis*	Appalachian Tiger Beetle				S2	1	94.5 ± 0.0	NB
I	*Strymon melinus*	Grey Hairstreak				S2	1	35.3 ± 2.0	NB
I	*Somatochlora brevicincta*	Quebec Emerald				S2	2	35.6 ± 0.0	NB
I	*Somatochlora tenebrosa*	Clamp-Tipped Emerald				S2	8	7 8 ± 1.0	NB
I	*Ladona exusta*	White Corporal				S2	2	57.1 ± 0.0	NB
I	*Coenagrion interrogatum*	Subarctic Bluet				S2	3	86.6 ± 1.0	NB
I	*Ischnura posita*	Fragile Forktail				S2	5	19.4 ± 0.0	NB
I	*Chrysops delicatulus*	a Horse Fly				S2S3	1	86.9 ± 1.0	NB
I	*Callophrys henrici*	Henry's Elfin				S2S3	10	12.4 ± 0.0	NB
I	*Psyrassa unicolor*	a Longhorned Beetle				S3	1	18.5 ± 0.0	NB
I	*Elaphrus americanus*	a Ground Beetle				S3	1	62.5 ± 0.0	NB
I	*Agonum crenistriatum*	a Ground Beetle				S3	1	25.3 ± 1.0	NB
I	*Agonum consimile*	a Ground Beetle				S3	1	25.3 ± 1.0	NB
I	*Lachnocrepis parallela*	a Ground Beetle				S3	1	57.8 ± 0.0	NB
I	*Dyschirius setosus*	a Ground Beetle				S3	3	57.8 ± 0.0	NB
I	*Harpalus fulvilabris*	a Ground Beetle				S3	1	61.8 ± 0.0	NB
I	*Olisthopus parmatus*	a Ground Beetle				S3	1	16.0 ± 0.0	NB
I	*Amara pallipes*	a Ground Beetle				S3	2	25.3 ± 1.0	NB
I	*Carabus maeander*	a Ground Beetle				S3	1	25.3 ± 1.0	NB
I	*Carabus serratus*	a Ground Beetle				S3	1	30.7 ± 1.0	NB
I	*Hippodamia parenthesis*	Parenthesis Lady Beetle				S3	14	25.3 ± 1.0	NB
I	*Xylotrechus undulatus*	a Longhorned Beetle				S3	2	25.6 ± 1.0	NB
I	*Calathus gregarius*	a Ground Beetle				S3	1	80.5 ± 1.0	NB
I	*Gonioctena americana*	a Leaf Beetle				S3	1	58.6 ± 0.0	NB
I	*Naemia seriata*	a Ladybird beetle				S3	9	47.3 ± 0.0	NB
I	*Beckerus appressus*	A Click Bee le				S3	1	82.0 ± 0.0	NB
I	*Saperda lateralis*	a Longhorned Beetle				S3	1	51.5 ± 0.0	NS
I	*Trachysida aspera*	a Longhorned Beetle				S3	1	67.8 ± 0.0	NB
I	*Dicerca caudata*	Tailed Jewel Borer				S3	1	29.1 ± 0.0	NB
I	*Enoclerus muttkowskii*	a Checkered Beetle				S3	2	27.5 ± 0.0	NB
I	*Hesperia sassacus*	Indian Skipper				S3	4	69.1 ± 15.0	NB
I	*Euphyes bimacula*	Two-spotted Skipper				S3	16	21.4 ± 1.0	NB
I	*Papilio brevicauda bretonensis*	Short-tailed Swallowtail				S3	16	27.8 ± 0.0	NB
I	*Lycaena hyllus*	Bronze Copper				S3	164	0 0 ± 0.0	NB
I	*Lycaena dospassosi*	Salt Marsh Copper				S3	139	0 2 ± 0.0	NB
I	*Satyrium acadica*	Acadian Hairstreak				S3	19	7 0 ± 7.0	NB
I	*Callophrys polios*	Hoary Elfin				S3	10	9 9 ± 0.0	NB
I	*Plebejus idas*	Northern Blue				S3	10	89.1 ± 0.0	NS
I	*Plebejus idas empetri*	Crowberry Blue				S3	33	40.2 ± 0.0	NB
I	*Speyeria aphrodite*	Aphrodite Fritillary				S3	17	26.1 ± 0.0	NB
I	*Boloria chariclea*	Arctic Fritillary				S3	9	36.9 ± 7.0	NB

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I	*Polygonia satyrus*	Satyr Comma				S3	6	48.5 ± 0.0	NS
I	*Polygonia gracilis*	Hoary Comma				S3	2	68.4 ± 2.0	NB
I	*Nymphalis l-album*	Compton Tortoiseshell				S3	11	26.2 ± 10.0	NB
I	*Gomphus abbreviatus*	Spine-crowned Clubtail				S3	1	94.5 ± 0.0	NB
I	*Gomphaeschna furcillata*	Harlequin Darner				S3	6	22.8 ± 0.0	NB
I	*Dorocordulia lepida*	Petite Emerald				S3	3	67.8 ± 1.0	NB
I	*Somatochlora cingulata*	Lake Emerald				S3	4	77.2 ± 1.0	NB
I	*Somatochlora forcipata*	Forcipate Emerald				S3	8	28.2 ± 0.0	NB
I	*Williamsonia fletcheri*	Ebony Boghaunter				S3	23	21.1 ± 2.0	NB
I	*Lestes eurinus*	Amber-Winged Spreadwing				S3	33	35.3 ± 1.0	NB
I	*Lestes vigilax*	Swamp Spreadwing				S3	1	95.0 ± 0.0	NS
I	*Enallagma signatum*	Orange Bluet				S3	2	35.8 ± 0.0	NB
I	*Stylurus scudderi*	Zebra Clubtail				S3	7	26.2 ± 0.0	NB
I	*Alasmidonta undulata*	Triangle Floater				S3	29	46.2 ± 1.0	NB
I	*Leptodea ochracea*	Tidewater Mucket				S3	29	30.6 ± 1.0	NB
I	*Pantala hymenaea*	Spot-Winged Glider				S3B,S3M	6	12.6 ± 0.0	NB
I	*Collops vittatus*	Banded Soft-winged Flower Beetle				S3S4	1	32.8 ± 3.0	NB
I	*Hemicrepidius memnonius*	a Click Beetle				S3S4	3	18.5 ± 0.0	NB
I	*Bolitophagus corticola*	a Darkling Beetle				S3S4	1	18.5 ± 0.0	NB
I	*Satyrium liparops*	Striped Hairstreak				S3S4	35	7 2 ± 0.0	NB
I	*Satyrium liparops strigosum*	Striped Hairstreak				S3S4	4	27.0 ± 1.0	NB
I	*Cupido comyntas*	Eastern Tailed Blue				S3S4	3	58.4 ± 0.0	NB
N	*Erioderma mollissimum*	Graceful Felt Lichen	Endangered	Endangered	Endangered	SH	1	88.9 ± 1.0	NB
N	*Peltigera hydrothyria*	Eastern Waterfan	Threatened	Threatened		S1	789	46.3 ± 0.0	NB
N	*Pannaria lurida*	Wrinkled Shingle Lichen	Threatened	Threatened		S1?	6	18.2 ± 1.0	NB
N	*Anzia colpodes*	Black-foam Lichen	Threatened	Threatened		S1S2	16	32.8 ± 0.0	NB
N	*Fuscopannaria leucosticta*	White-rimmed Shingle Lichen	Threatened			S2	60	52.0 ± 0.0	PE
N	*Pectenia plumbea*	Blue Felt Lichen	Special Concern	Special Concern	Special Concern	S1	2	51.9 ± 0.0	PE
N	*Pseudevernia cladonia*	Ghost Antler Lichen	Not At Risk			S2S3	2	80.3 ± 0.0	NB
N	*Aloina rigida*	Aloe-Like Rigid Screw Moss				S1	1	54.4 ± 0.0	NB
N	*Arrhenopterum heterostichum*	One-sided Groove Moss				S1	1	75.1 ± 0.0	NB
N	*Campylostelium saxicola*	a Moss				S1	3	77.4 ± 0.0	NB
N	*Dicranoweisia crispula*	Mountain Thatch Moss				S1	1	79.0 ± 0.0	NB
N	*Didymodon rigidulus var. gracilis*	a moss				S1	1	86.4 ± 1.0	NB
N	*Syntrichia ruralis*	a Moss				S1	1	93.7 ± 0.0	NB
N	*Zygodon viridissimus var. viridissimus*	a Moss				S1	1	76.6 ± 0.0	NB
N	*Enchylium tenax*	Soil Tarpaper Lichen				S1	1	54.4 ± 0.0	PE
N	*Sticta fuliginosa*	Peppered Moon Lichen				S1	2	95.0 ± 0.0	NS
N	*Cladonia straminea*	Reptilian Pixie-cup Lichen				S1	5	72.7 ± 1.0	NB
N	*Coccocarpia palmicola*	Salted Shell Lichen				S1	1	72.7 ± 1.0	NB
N	*Peltigera malacea*	Veinless Pelt Lichen				S1	2	67.9 ± 0.0	PE
N	*Bryoria bicolor*	Electrified Horsehair Lichen				S1	1	85.3 ± 1.0	NB
N	*Hygrobiella laxifolia*	Lax Notchwort				S1?	1	86.7 ± 1.0	NB
N	*Bartramia ithyphylla*	Straight-leaved Apple Moss				S1?	2	79.9 ± 1.0	NB
N	*Dicranum bonjeanii*	Bonjean's Broom Moss				S1?	1	95.1 ± 1.0	NB
N	*Dicranum condensatum*	Condensed Broom Moss				S1?	3	68.8 ± 0.0	PE
N	*Entodon brevisetus*	a Moss				S1?	1	82.8 ± 10.0	NB
N	*Oxyrrhynchium hians*	Light Beaked Moss				S1?	1	96.6 ± 0.0	NB
N	*Homomallium adnatum*	Adnate Hairy-gray Moss				S1?	4	60.0 ± 1.0	NB
N	*Plagiothecium latebricola*	Alder Silk Moss				S1?	3	69.8 ± 0.0	NB
N	*Rhytidium rugosum*	Wrinkle-leaved Moss				S1?	2	86.4 ± 1.0	NB
N	*Seligeria recurvata*	a Moss				S1?	3	53.6 ± 15.0	NB
N	*Timmia megapolitana*	Metropolitan Timmia Moss				S1?	1	99.3 ± 1.0	NS

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N	*Rhizomnium pseudopunctatum*	Felted Leafy Moss				S1?	1	72.7 ± 0.0	NB
N	*Cephaloziella spinigera*	Spiny Threadwort				S1S2	2	73.9 ± 0.0	NB
N	*Odontoschisma francisci*	Holt's Notchwort				S1S2	4	70.4 ± 0.0	NB
N	*Harpanthus flotovianus*	Great Mountain Flapwort				S1S2	2	73.5 ± 1.0	NB
N	*Jungermannia obovata*	Egg Flapwort				S1S2	1	81.0 ± 0.0	NB
N	*Odontoschisma sphagni*	Bog-Moss Flapwort				S1S2	1	82.9 ± 0.0	NB
N	*Pallavicinia lyellii*	Lyell's Ribbonwort				S1S2	1	82.8 ± 1.0	NB
N	*Radula tenax*	Tenacious Scalewort				S1S2	1	81.0 ± 0.0	NB
N	*Reboulia hemisphaerica*	Purple-margined Liverwort				S1S2	1	86.5 ± 0.0	NB
N	*Brachythecium acuminatum*	Acuminate Ragged Moss				S1S2	2	81.9 ± 2.0	NB
N	*Ptychostomum salinum*	Saltmarsh Bryum				S1S2	1	85.7 ± 1.0	NB
N	*Distichium inclinatum*	Inclined Iris Moss				S1S2	5	86.4 ± 1.0	NB
N	*Ditrichum pallidum*	Pale Cow-hair Moss				S1S2	1	83.3 ± 1.0	NB
N	*Drummondia prorepens*	a Moss				S1S2	1	77.2 ± 0.0	NB
N	*Hygrohypnum bestii*	Best's Brook Moss				S1S2	5	78.8 ± 1.0	NB
N	*Seligeria brevifolia*	a Moss				S1S2	4	76.3 ± 0.0	NB
N	*Timmia norvegica*	a moss				S1S2	2	86.7 ± 0.0	NB
N	*Timmia norvegica var. excurrens*	a moss				S1S2	1	86.7 ± 0.0	NB
N	*Tortella humilis*	Small Crisp Moss				S1S2	7	80.9 ± 1.0	NB
N	*Pseudotaxiphyllum distichaceum*	a Moss				S1S2	2	28.3 ± 1.0	NB
N	*Umbilicaria vellea*	Grizzled Rocktripe Lichen				S1S2	1	86.1 ± 1.0	NB
N	*Pilophorus cereolus*	Powdered Matchstick Lichen				S1S2	1	53.1 ± 5.0	NB
N	*Peltigera scabrosa*	Greater Toad Pelt Lichen				S1S2	4	71.2 ± 1.0	NB
N	*Tritomaria scitula*	Mountain Notchwort				S1S3	1	77.1 ± 1.0	NB
N	*Amphidium mougeotii*	a Moss				S2	11	76.6 ± 0.0	NB
N	*Anomodon viticulosus*	a Moss				S2	3	67.5 ± 10.0	NB
N	*Cirriphyllum piliferum*	Hair-pointed Moss				S2	4	65.2 ± 1.0	NB
N	*Dicranella palustris*	Drooping-Leaved Fork Moss				S2	7	73.5 ± 1.0	NB
N	*Didymodon ferrugineus*	Rusty Beard Moss				S2	1	86.2 ± 0.0	NB
N	*Anomodon tristis*	a Moss				S2	3	80.4 ± 10.0	NB
N	*Hypnum pratense*	Meadow Plait Moss				S2	1	59.2 ± 0.0	PE
N	*Isopterygiopsis pulchella*	Neat Silk Moss				S2	7	77.7 ± 1.0	NB
N	*Orthotrichum speciosum*	Showy Bristle Moss				S2	7	52.7 ± 0.0	PE
N	*Platydictya jungermannioides*	False Willow Moss				S2	4	53.6 ± 15.0	NB
N	*Pohlia elongata*	Long-necked Nodding Moss				S2	14	75.1 ± 0.0	NB
N	*Pohlia sphagnicola*	a moss				S2	1	71.4 ± 0.0	NB
N	*Seligeria calcarea*	Chalk Brittle Moss				S2	2	73.6 ± 0.0	NB
N	*Sphagnum centrale*	Central Peat Moss				S2	7	55.0 ± 0.0	PE
N	*Sphagnum flexuosum*	Flexuous Peatmoss				S2	3	57.8 ± 10.0	NB
N	*Tayloria serrata*	Serrate Trumpet Moss				S2	7	56.3 ± 100.0	NB
N	*Tetrodontium brownianum*	Little Georgia				S2	13	56.5 ± 0.0	NS
N	*Thamnobryum alleghaniense*	a Moss				S2	24	44.3 ± 0.0	NB
N	*Ulota phyllantha*	a Moss				S2	4	86.6 ± 0.0	NB
N	*Anomobryum julaceum*	Slender Silver Moss				S2	3	86.4 ± 1.0	NB
N	*Cladonia macrophylla*	Fig-leaved Lichen				S2	3	78.9 ± 1.0	NB
N	*Leptogium milligranum*	Stretched Jellyskin Lichen				S2	21	15.9 ± 0.0	NB
N	*Nephroma laevigatum*	Mustard Kidney Lichen				S2	27	48.9 ± 0.0	PE
N	*Anacamptodon splachnoides*	a Moss				S2?	3	55.1 ± 1.0	NB
N	*Andreaea rothii*	a Moss				S2?	5	76.6 ± 0.0	NB
N	*Anomodon minor*	Blunt-leaved Anomodon Moss				S2?	1	66.8 ± 1.0	NB
N	*Ptychostomum pallescens*	Tall Clustered Bryum				S2?	1	69.0 ± 100.0	NB
N	*Dichelyma capillaceum*	Hairlike Dichelyma Moss				S2?	1	82.6 ± 3.0	NB
N	*Dicranum spurium*	Spurred Broom Moss				S2?	1	91.1 ± 0.0	PE

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N	*Hygrohypnum montanum*	a Moss				S2?	1	76.9 ± 1.0	NB
N	*Sphagnum angermanicum*	a Peatmoss				S2?	2	79.4 ± 0.0	NB
N	*Trichodon cylindricus*	Cylindric Hairy-tee h Moss				S2?	2	53.6 ± 15.0	NB
N	*Plagiomnium rostratum*	Long-beaked Leafy Moss				S2?	4	85.9 ± 0.0	NB
N	*Ramalina labiosorediata*	Chalky Ramalina Lichen				S2?	1	83.2 ± 1.0	NB
N	*Collema leptaleum*	Crumpled Bat's Wing Lichen				S2?	13	51.5 ± 0.0	PE
N	*Imshaugia placorodia*	Eyed Starburst Lichen				S2?	1	54.1 ± 0.0	PE
N	*Nephroma arcticum*	Arctic Kidney Lichen				S2?	2	83.7 ± 1.0	NB
N	*Ptychostomum cernuum*	Swamp Bryum				S2S3	1	86.6 ± 0.0	NB
N	*Buxbaumia aphylla*	Brown Shield Moss				S2S3	2	91.1 ± 0.0	PE
N	*Calliergonella cuspidata*	Common Large Wetland Moss				S2S3	2	55.9 ± 0.0	PE
N	*Drepanocladus polygamus*	Polygamous Hook Moss				S2S3	3	58.4 ± 0.0	PE
N	*Palustriella falcata*	a Moss				S2S3	2	85.9 ± 0.0	NB
N	*Didymodon rigidulus*	Rigid Screw Moss				S2S3	8	81.9 ± 2.0	NB
N	*Ephemerum serratum*	a Moss				S2S3	3	53.7 ± 0.0	PE
N	*Orthotrichum elegans*	Showy Bristle Moss				S2S3	3	54.6 ± 0.0	PE
N	*Pohlia proligera*	Cottony Nodding Moss				S2S3	13	53.6 ± 15.0	NB
N	*Codriophorus fascicularis*	Clustered Rock Moss				S2S3	3	79.0 ± 0.0	NB
N	*Racomitrium affine*	a Moss				S2S3	1	74.6 ± 1.0	NB
N	*Saelania glaucescens*	Blue Dew Moss				S2S3	2	79.0 ± 0.0	NB
N	*Sphagnum subfulvum*	a Peatmoss				S2S3	3	59.0 ± 0.0	PE
N	*Taxiphyllum deplanatum*	Imbricate Yew-leaved Moss				S2S3	2	81.1 ± 1.0	NB
N	*Zygodon viridissimus*	a Moss				S2S3	3	52.9 ± 0.0	PE
N	*Schistidium agassizii*	Elf Bloom Moss				S2S3	3	74.6 ± 1.0	NB
N	*Loeskeobryum brevirostre*	a Moss				S2S3	10	76.6 ± 0.0	NB
N	*Cyrtomnium hymenophylloides*	Short-pointed Lantern Moss				S2S3	7	73.7 ± 0.0	NB
N	*Cetrariella delisei*	Snowbed Icelandmoss Lichen				S2S3	2	65.1 ± 0.0	NB
N	*Cladonia acuminata*	Scantily Clad Pixie Lichen				S2S3	2	86.1 ± 1.0	NB
N	*Cladonia ramulosa*	Bran Lichen				S2S3	4	81.1 ± 1.0	NB
N	*Cladonia sulphurina*	Greater Sulphur-cup Lichen				S2S3	5	70.6 ± 1.0	NB
N	*Dendriscocaulon umhausense*	a lichen				S2S3	1	77.7 ± 0.0	NB
N	*Parmeliopsis ambigua*	Green Starburst Lichen				S2S3	1	90.2 ± 1.0	NB
N	*Sphaerophorus globosus*	Northern Coral Lichen				S2S3	8	72.0 ± 0.0	NB
N	*Hypnum curvifolium*	Curved-leaved Plait Moss				S3	8	53.5 ± 0.0	PE
N	*Tortella fragilis*	Fragile Twisted Moss				S3	1	86.7 ± 0.0	NB
N	*Schistidium maritimum*	a Moss				S3	6	72.7 ± 0.0	NB
N	*Hymenostylium recurvirostre*	Hymenostylium Moss				S3	6	80.9 ± 0.0	NS
N	*Collema nigrescens*	Blistered Tarpaper Lichen				S3	5	58.4 ± 0.0	PE
N	*Solorina saccata*	Woodland Owl Lichen				S3	6	86.1 ± 1.0	NB
N	*Ahtiana aurescens*	Eastern Candlewax Lichen				S3	3	52.2 ± 0.0	PE
N	*Normandina pulchella*	Rimmed Elf-ear Lichen				S3	6	81.1 ± 1.0	NB
N	*Cladonia farinacea*	Farinose Pixie Lichen				S3	6	78.6 ± 0.0	PE
N	*Hypotrachyna catawbiensis*	Powder-tipped Antler Lichen				S3	4	86.0 ± 0.0	NB
N	*Scytinium lichenoides*	Tattered Jellyskin Lichen				S3	6	86.1 ± 1.0	NB
N	*Nephroma bellum*	Naked Kidney Lichen				S3	6	78.2 ± 1.0	NB
N	*Peltigera degenii*	Lustrous Pelt Lichen				S3	3	81.8 ± 1.0	NB
N	*Usnea strigosa*	Bushy Beard Lichen				S3	35	12.0 ± 0.0	NB
N	*Stereocaulon condensatum*	Granular Soil Foam Lichen				S3	8	63.2 ± 0.0	NB
N	*Leptogium laceroides*	Short-bearded Jellyskin Lichen				S3	11	51.6 ± 0.0	PE
N	*Peltigera membranacea*	Membranous Pelt Lichen				S3	24	30.6 ± 0.0	NB
N	*Cladonia botrytes*	Wooden Soldiers Lichen				S3	3	52.5 ± 0.0	PE
N	*Cladonia carneola*	Crowned Pixie-cup Lichen				S3	2	79.8 ± 0.0	NB
N	*Cladonia deformis*	Lesser Sulphur-cup Lichen				S3	8	78.9 ± 1.0	NB

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N	*Aulacomnium androgynum*	Little Groove Moss				S3?	10	53.6 ± 15.0	NB
N	*Dicranella rufescens*	Red Forklet Moss				S3?	1	86.7 ± 0.0	NB
N	*Rhytidiadelphus loreus*	Lanky Moss				S3?	3	86.1 ± 0.0	NS
N	*Sphagnum lescurii*	a Peatmoss				S3?	7	41.7 ± 0.0	NS
N	*Scytinium subtile*	Appressed Jellyskin Lichen				S3?	15	37.6 ± 0.0	PE
N	*Rostania occultata*	Crusted Tarpaper Lichen				S3?	4	54.8 ± 0.0	PE
N	*Stereocaulon subcoralloides*	Coralloid Foam Lichen				S3?	1	83.2 ± 1.0	NB
N	*Barbula convoluta*	Lesser Bird's-claw Beard Moss				S3S4	1	68.4 ± 15.0	NB
N	*Brachytheciastrum velutinum*	Velvet Ragged Moss				S3S4	3	54.5 ± 0.0	PE
N	*Calliergon giganteum*	Giant Spear Moss				S3S4	1	55.0 ± 0.0	PE
N	*Dicranella cerviculata*	a Moss				S3S4	3	74.6 ± 0.0	NS
N	*Dicranella varia*	a Moss				S3S4	2	47.2 ± 0.0	PE
N	*Dicranum majus*	Greater Broom Moss				S3S4	23	69.5 ± 0.0	NB
N	*Dicranum leioneuron*	a Dicranum Moss				S3S4	3	10.0 ± 0.0	NB
N	*Encalypta ciliata*	Fringed Extinguisher Moss				S3S4	1	86.2 ± 0.0	NB
N	*Fissidens bryoides*	Lesser Pocket Moss				S3S4	5	49.8 ± 0.0	PE
N	*Elodium blandowii*	Blandow's Bog Moss				S3S4	1	53.3 ± 0.0	PE
N	*Heterocladium dimorphum*	Dimorphous Tangle Moss				S3S4	7	62.5 ± 0.0	NB
N	*Isopterygiopsis muelleriana*	a Moss				S3S4	17	51.1 ± 0.0	PE
N	*Myurella julacea*	Small Mouse-tail Moss				S3S4	2	86.7 ± 0.0	NB
N	*Physcomitrium pyriforme*	Pear-shaped Urn Moss				S3S4	3	38.7 ± 0.0	NB
N	*Pogonatum dentatum*	Mountain Hair Moss				S3S4	4	74.6 ± 0.0	NS
N	*Sphagnum compactum*	Compact Peat Moss				S3S4	6	38.2 ± 0.0	NB
N	*Sphagnum quinquefarium*	Five-ranked Peat Moss				S3S4	2	62.5 ± 0.0	NB
N	*Sphagnum torreyanum*	a Peatmoss				S3S4	1	52.6 ± 0.0	NB
N	*Sphagnum austinii*	Austin's Peat Moss				S3S4	1	41.7 ± 0.0	NS
N	*Sphagnum contortum*	Twisted Peat Moss				S3S4	1	52.6 ± 0.0	NB
N	*Tetraphis geniculata*	Geniculate Four-tooth Moss				S3S4	14	49.9 ± 0.0	PE
N	*Tetraplodon angustatus*	Toothed-leaved Nitrogen Moss				S3S4	2	75.2 ± 0.0	NB
N	*Weissia controversa*	Green-Cushioned Weissia				S3S4	1	87.0 ± 1.0	NB
N	*Abietinella abietina*	Wiry Fern Moss				S3S4	1	86.7 ± 0.0	NB
N	*Trichostomum tenuirostre*	Acid-Soil Moss				S3S4	3	79.0 ± 0.0	NB
N	*Rauiella scita*	Smaller Fern Moss				S3S4	1	71.5 ± 0.0	NB
N	*Pannaria rubiginosa*	Brown-eyed Shingle Lichen				S3S4	16	51.8 ± 0.0	PE
N	*Pseudocyphellaria holarctica*	Yellow Specklebelly Lichen				S3S4	79	12.0 ± 0.0	NB
N	*Ramalina thrausta*	Angelhair Ramalina Lichen				S3S4	12	67.3 ± 0.0	NS
N	*Hypogymnia vittata*	Slender Monk's Hood Lichen				S3S4	24	71.2 ± 1.0	NB
N	*Scytinium teretiusculum*	Curly Jellyskin Lichen				S3S4	13	49.5 ± 0.0	PE
N	*Montanelia panniformis*	Shingled Camouflage Lichen				S3S4	5	73.4 ± 1.0	NB
N	*Cladonia floerkeana*	Gritty Bri ish Soldiers Lichen				S3S4	4	82.8 ± 1.0	NB
N	*Vahliella leucophaea*	Shelter Shingle Lichen				S3S4	18	44.5 ± 0.0	NB
N	*Xylopsora friesii*	a Lichen				S3S4	1	86.1 ± 1.0	NB
N	*Nephroma parile*	Powdery Kidney Lichen				S3S4	16	49.3 ± 0.0	NB
N	*Protopannaria pezizoides*	Brown-gray Moss-shingle Lichen				S3S4	26	48.5 ± 0.0	NB
N	*Usnea subrubicunda*	Reddish Beard Lichen				S3S4	1	98.6 ± 3.0	NS
N	*Stereocaulon paschale*	Easter Foam Lichen				S3S4	1	35.1 ± 1.0	NB
N	*Pannaria conoplea*	Mealy-rimmed Shingle Lichen				S3S4	33	45.1 ± 0.0	NB
N	*Physcia tenella*	Fringed Rosette Lichen				S3S4	7	43.4 ± 0.0	PE
N	*Anaptychia palmulata*	Shaggy Fringed Lichen				S3S4	18	54.1 ± 0.0	PE
N	*Peltigera neopolydactyla*	Undulating Pelt Lichen				S3S4	9	53.3 ± 0.0	PE
N	*Cladonia cariosa*	Lesser Ribbed Pixie Lichen				S3S4	4	38.2 ± 0.0	NB
N	*Hypocenomyce scalaris*	Common Clam Lichen				S3S4	1	83.2 ± 1.0	NB
N	*Dermatocarpon luridum*	Brookside Stippleback Lichen				S3S4	132	26.0 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	*Leucodon brachypus*	a Moss				SH	12	68.4 ± 0.0	NB
N	*Splachnum luteum*	Yellow Collar Moss				SH	1	69.0 ± 100.0	NB
N	*Cyrto-hypnum minutulum*	Tiny Cedar Moss				SH	3	88.3 ± 10.0	NB
P	*Juglans cinerea*	Butternut	Endangered	Endangered	Endangered	S1	41	57.5 ± 0.0	PE
P	*Symphyotrichum laurentianum*	Gulf of St Lawrence Aster	Threatened	Threatened	Endangered	S1	44	66.1 ± 0.0	NB
P	*Fraxinus nigra*	Black Ash	Threatened			S4S5	499	0 8 ± 0.0	NB
P	*Isoetes prototypus*	Prototype Quillwort	Special Concern	Special Concern	Endangered	S2	7	91.4 ± 0.0	NS
P	*Lechea maritima var. subcylindrica*	Beach Pinweed	Special Concern	Special Concern	Special Concern	S2	946	25.8 ± 0.0	NB
P	*Symphyotrichum subulatum (Bathurst pop)*	Bathurst Aster - Bathurst pop.	Not At Risk		Endangered	S2	59	51.3 ± 0.0	NB
P	*Cryptotaenia canadensis*	Canada Honewort				S1	1	96.3 ± 1.0	NB
P	*Antennaria howellii ssp. petaloidea*	Pussy-Toes				S1	4	72.5 ± 5.0	PE
P	*Pseudognaphalium obtusifolium*	Eastern Cudweed				S1	28	33.9 ± 5.0	NB
P	*Hieracium robinsonii*	Robinson's Hawkweed				S1	12	73.5 ± 0.0	NB
P	*Solidago multiradiata*	Multi-rayed Goldenrod				S1	19	43.6 ± 0.0	NB
P	*Symphyotrichum subulatum (non-Bathurst pop)*	Annual Saltmarsh Aster				S1	12	53.5 ± 0.0	NB
P	*Betula michauxii*	Michaux's Dwarf Birch				S1	3	88.8 ± 0.0	NB
P	*Draba arabisans*	Rock Whitlow-Grass				S1	15	74.1 ± 0.0	NB
P	*Draba glabella*	Rock Whitlow-Grass				S1	3	86.4 ± 0.0	NB
P	*Draba incana*	Twisted Whitlow-grass				S1	4	97.6 ± 0.0	PE
P	*Stellaria crassifolia*	Fleshy S itchwort				S1	3	2 0 ± 5.0	NB
P	*Chenopodiastrum simplex*	Maple-leaved Goosefoot				S1	6	61.6 ± 1.0	NB
P	*Suaeda rolandii*	Roland's Sea-Blite				S1	13	0 5 ± 0.0	NB
P	*Hypericum virginicum*	Virginia St. John's-wort				S1	2	43.2 ± 0.0	NS
P	*Corema conradii*	Broom Crowberry				S1	22	67.5 ± 0.0	PE
P	*Vaccinium boreale*	Northern Blueberry				S1	5	27.3 ± 1.0	NB
P	*Vaccinium corymbosum*	Highbush Blueberry				S1	1	51.3 ± 0.0	NS
P	*Vaccinium uliginosum*	Alpine Bilberry				S1	1	82.6 ± 1.0	PE
P	*Euphorbia polygonifolia*	Seaside Spurge				S1	28	50.4 ± 0.0	NB
P	*Bartonia virginica*	Yellow Bartonia				S1	3	95.0 ± 0.0	NB
P	*Proserpinaca pectinata*	Comb-leaved Mermaidweed				S1	2	81.7 ± 5.0	NS
P	*Polygonum douglasii*	Douglas Knotweed				S1	1	93.6 ± 0.0	NB
P	*Primula laurentiana*	Laurentian Primrose				S1	14	80.9 ± 3.0	NB
P	*Ranunculus sceleratus*	Cursed Buttercup				S1	1	84.5 ± 100.0	NB
P	*Amelanchier fernaldii*	Fernald's Serviceberry				S1	3	45.3 ± 1.0	NB
P	*Crataegus jonesiae*	Jones' Hawthorn				S1	1	93.1 ± 1.0	NB
P	*Dryas integrifolia*	Entire-leaved Mountain Avens				S1	15	42.4 ± 3.0	NB
P	*Rubus flagellaris*	Northern Dewberry				S1	3	39.9 ± 1.0	NB
P	*Geum fragarioides*	Barren Strawberry				S1	1	43.8 ± 1.0	NB
P	*Salix myrtillifolia*	Blueberry Willow				S1	25	43.1 ± 0.0	NB
P	*Saxifraga paniculata ssp. laestadii*	Laestadius' Saxifrage				S1	30	85.7 ± 0.0	NB
P	*Agalinis purpurea var. parviflora*	Small-flowered Purple False Foxglove				S1	58	10.5 ± 0.0	NB
P	*Carex annectens*	Yellow-Fruited Sedge				S1	3	8 5 ± 0.0	NB
P	*Carex atlantica ssp. atlantica*	Atlantic Sedge				S1	7	29.2 ± 0.0	NB
P	*Carex backii*	Rocky Mountain Sedge				S1	3	61.0 ± 0.0	NB
P	*Carex merritt-fernaldii*	Merritt Fernald's Sedge				S1	1	61.5 ± 0.0	NB
P	*Carex rariflora*	Loose-flowered Alpine Sedge				S1	1	97.5 ± 0.0	PE
P	*Carex scirpoidea*	Scirpuslike Sedge				S1	6	97.1 ± 0.0	NB
P	*Carex sterilis*	Sterile Sedge				S1	1	66.1 ± 2.0	NB

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P	*Carex grisea*	Inflated Narrow-leaved Sedge				S1	1	97.4 ± 5.0	NB
P	*Scirpus pendulus*	Hanging Bulrush				S1	8	40.8 ± 0.0	NS
P	*Sisyrinchium angustifolium*	Narrow-leaved Blue-eyed-grass				S1	3	61.1 ± 5.0	NS
P	*Juncus greenei*	Greene's Rush				S1	11	45.0 ± 0.0	NB
P	*Juncus stygius ssp. americanus*	Moor Rush				S1	17	41.6 ± 5.0	NB
P	*Goodyera pubescens*	Downy Rattlesnake-Plantain				S1	12	59.7 ± 0.0	NB
P	*Malaxis monophyllos var. brachypoda*	North American White Adder's-mouth				S1	4	56.3 ± 0.0	PE
P	*Malaxis monophyllos*	White Adder's-mouth				S1	1	58.2 ± 0.0	NB
P	*Platanthera flava*	Southern Rein-Orchid				S1	1	58.2 ± 0.0	NB
P	*Platanthera macrophylla*	Large Round-Leaved Orchid				S1	6	30.2 ± 0.0	NB
P	*Bromus pubescens*	Hairy Wood Brome Grass				S1	1	70.5 ± 0.0	NB
P	*Calamagrostis stricta ssp. inexpansa*	Slim-stemmed Reed Grass				S1	3	37.1 ± 1.0	NB
P	*Catabrosa aquatica*	Water Whorl Grass				S1	3	81.5 ± 5.0	PE
P	*Danthonia compressa*	Flattened Oat Grass				S1	19	33.2 ± 0.0	NB
P	*Festuca subverticillata*	Nodding Fescue				S1	7	91.7 ± 0.0	NS
P	*Potamogeton friesii*	Fries' Pondweed				S1	13	39.4 ± 0.0	NB
P	*Cystopteris laurentiana*	Laurentian Bladder Fern				S1	1	95.6 ± 1.0	NB
P	*Dryopteris filix-mas ssp. brittonii*	Britton's Male Fern				S1	2	50.4 ± 1.0	NB
P	*Schizaea pusilla*	Little Curlygrass Fern				S1	1	81.0 ± 0.0	NB
P	*Bidens heterodoxa*	Connecticut Beggar-Ticks				S1?	10	76.2 ± 0.0	PE
P	*Polygonum aviculare ssp. neglectum*	Narrow-leaved Knotweed				S1?	4	12.6 ± 0.0	NB
P	*Selaginella rupestris*	Rock Spikemoss				S1S2	9	89.1 ± 1.0	NB
P	*Coryphopteris simulata*	Bog Fern				S1S2	8	63.3 ± 0.0	NB
P	*Cuscuta cephalanthi*	Buttonbush Dodder				S1S3	8	4 0 ± 0.0	NB
P	*Eriophorum russeolum ssp. albidum*	Smooth-fruited Russet Cottongrass				S1S3	11	36.9 ± 1.0	NB
P	*Spiranthes arcisepala*	Appalachian Ladies'-tresses				S1S3	7	38.1 ± 0.0	NB
P	*Spiranthes incurva*	Sphinx Ladies'-tresses				S1S3	1	36.9 ± 0.0	NB
P	*Neottia bifolia*	Southern Twayblade			Endangered	S2	50	9 5 ± 0.0	NB
P	*Osmorhiza longistylis*	Smooth Sweet Cicely				S2	7	75.5 ± 1.0	NS
P	*Ionactis linariifolia*	Flax-leaved Aster				S2	1	65.1 ± 5.0	NB
P	*Symphyotrichum subulatum*	Annual Saltmarsh Aster				S2	52	96.4 ± 0.0	NB
P	*Pseudognaphalium macounii*	Macoun's Cudweed				S2	41	45.3 ± 0.0	PE
P	*Impatiens pallida*	Pale Jewelweed				S2	3	94.7 ± 0.0	PE
P	*Boechera stricta*	Drummond's Rockcress				S2	11	60.7 ± 0.0	NB
P	*Sagina nodosa*	Knotted Pearlwort				S2	2	68.5 ± 0.0	PE
P	*Sagina nodosa ssp. borealis*	Knotted Pearlwort				S2	3	67.8 ± 0.0	PE
P	*Stellaria longifolia*	Long-leaved Starwort				S2	7	17.1 ± 2.0	NB
P	*Atriplex glabriuscula var. franktonii*	Frankton's Saltbush				S2	7	11.2 ± 0.0	NB
P	*Oxybasis rubra*	Red Goosefoot				S2	12	7 3 ± 0.0	NB
P	*Hypericum x dissimulatum*	Disguised St. John's-wort				S2	4	56.3 ± 0.0	PE
P	*Triosteum aurantiacum*	Orange-fruited Tinker's Weed				S2	7	53.5 ± 0.0	NB
P	*Viburnum lentago*	Nannyberry				S2	1	80.6 ± 0.0	NB
P	*Viburnum recognitum*	Northern Arrow-Wood				S2	2	32.2 ± 0.0	NB
P	*Shepherdia canadensis*	Soapberry				S2	42	39.2 ± 0.0	NB
P	*Quercus macrocarpa*	Bur Oak				S2	1	96.2 ± 0.0	NB
P	*Gentiana linearis*	Narrow-Leaved Gentian				S2	1	56.3 ± 50.0	NB
P	*Myriophyllum humile*	Low Water Milfoil				S2	1	79.4 ± 1.0	NB
P	*Proserpinaca palustris*	Marsh Mermaidweed				S2	2	94.8 ± 1.0	NS

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P	*Hedeoma pulegioides*	American False Pennyroyal				S2	4	72.4 ± 1.0	NS
P	*Nuphar x rubrodisca*	Red-disk Yellow Pond-lily				S2	20	22.2 ± 0.0	NB
P	*Aphyllon uniflorum*	One-flowered Broomrape				S2	2	93.9 ± 0.0	PE
P	*Polygaloides paucifolia*	Fringed Milkwort				S2	6	89.6 ± 1.0	NB
P	*Persicaria careyi*	Carey's Smartweed				S2	2	17.1 ± 2.0	NB
P	*Anemone parviflora*	Small-flowered Anemone				S2	9	43.3 ± 0.0	NB
P	*Hepatica americana*	Round-lobed Hepatica				S2	3	96.6 ± 0.0	NS
P	*Ranunculus flabellaris*	Yellow Water Buttercup				S2	1	50.7 ± 0.0	NB
P	*Crataegus scabrida*	Rough Hawthorn				S2	4	21.9 ± 1.0	NB
P	*Crataegus succulenta*	Fleshy Hawthorn				S2	2	47.4 ± 0.0	PE
P	*Salix candida*	Sage Willow				S2	6	85.3 ± 0.0	PE
P	*Agalinis neoscotica*	Nova Scotia Agalinis				S2	1	45.1 ± 0.0	NS
P	*Euphrasia randii*	Rand's Eyebright				S2	6	50.3 ± 0.0	PE
P	*Scrophularia lanceolata*	Lance-leaved Figwort				S2	2	93.6 ± 1.0	NB
P	*Dirca palustris*	Eastern Leatherwood				S2	1	34.1 ± 1.0	NB
P	*Sagittaria montevidensis ssp. spongiosa*	Spongy Arrowhead				S2	88	44.9 ± 0.0	NB
P	*Symplocarpus foetidus*	Eastern Skunk Cabbage				S2	128	29.5 ± 18.0	NB
P	*Carex comosa*	Bearded Sedge				S2	5	36.1 ± 0.0	NB
P	*Carex granularis*	Limestone Meadow Sedge				S2	11	8 5 ± 0.0	NB
P	*Carex gynocrates*	Northern Bog Sedge				S2	2	92.5 ± 0.0	PE
P	*Carex hirtifolia*	Pubescent Sedge				S2	12	53.5 ± 0.0	NB
P	*Carex livida*	Livid Sedge				S2	9	40.7 ± 0.0	NS
P	*Carex plantaginea*	Plantain-Leaved Sedge				S2	3	87.8 ± 0.0	NB
P	*Carex rostrata*	Narrow-leaved Beaked Sedge				S2	2	56.6 ± 5.0	NB
P	*Carex tenuiflora*	Sparse-Flowered Sedge				S2	10	44.2 ± 0.0	NS
P	*Carex albicans var. emmonsii*	White-tinged Sedge				S2	13	6 3 ± 0.0	NB
P	*Eriophorum gracile*	Slender Cottongrass				S2	52	11.6 ± 0.0	NB
P	*Blysmopsis rufa*	Red Bulrush				S2	34	50.1 ± 0.0	PE
P	*Juncus vaseyi*	Vasey Rush				S2	12	24.9 ± 0.0	NB
P	*Allium tricoccum*	Wild Leek				S2	15	56.9 ± 0.0	NB
P	*Galearis rotundifolia*	Small Round-leaved Orchid				S2	3	76.6 ± 0.0	NB
P	*Calypso bulbosa var. americana*	Calypso				S2	3	61.4 ± 5.0	NB
P	*Coeloglossum viride*	Long-bracted Frog Orchid				S2	5	48.2 ± 10.0	NB
P	*Cypripedium parviflorum var. makasin*	Small Yellow Lady's-Slipper				S2	2	48.1 ± 0.0	NB
P	*Goodyera oblongifolia*	Menzies' Rattlesnake-plantain				S2	2	55.5 ± 0.0	PE
P	*Spiranthes lucida*	Shining Ladies'-Tresses				S2	2	61.7 ± 1.0	NB
P	*Spiranthes ochroleuca*	Yellow Ladies'-tresses				S2	17	29.3 ± 0.0	NB
P	*Elymus canadensis*	Canada Wild Rye				S2	1	34.7 ± 1.0	NB
P	*Piptatheropsis canadensis*	Canada Ricegrass				S2	4	37.8 ± 10.0	NB
P	*Puccinellia phryganodes ssp. neoarctica*	Creeping Alkali Grass				S2	2	16.8 ± 1.0	NB
P	*Poa glauca*	Glaucous Blue Grass				S2	10	82.9 ± 0.0	NB
P	*Puccinellia nutkaensis*	Alaska Alkaligrass				S2	2	5 0 ± 1.0	NB
P	*Zizania aquatica var. aquatica*	Eastern Wild Rice				S2	4	56.3 ± 0.0	NB
P	*Piptatheropsis pungens*	Slender Ricegrass				S2	5	55.4 ± 5.0	NB
P	*Potamogeton vaseyi*	Vasey's Pondweed				S2	1	41.8 ± 0.0	PE
P	*Asplenium trichomanes*	Maidenhair Spleenwort				S2	9	61.2 ± 1.0	NB
P	*Anchistea virginica*	Virginia chain fern				S2	30	44.2 ± 0.0	NS
P	*Woodsia alpina*	Alpine Cliff Fern				S2	4	73.9 ± 0.0	NB
P	*Diphasiastrum sitchense*	Sitka Ground-cedar				S2	4	34.0 ± 0.0	NB
P	*Selaginella selaginoides*	Low Spikemoss				S2	8	82.9 ± 0.0	NB

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P	*Toxicodendron radicans var. radicans*	Eastern Poison Ivy				S2?	7	26.4 ± 0.0	NB
P	*Symphyotrichum novi-belgii var. crenifolium*	New York Aster				S2?	5	40.5 ± 0.0	NB
P	*Humulus lupulus var. lupuloides*	Common Hop				S2?	2	55.6 ± 5.0	NB
P	*Crataegus macrosperma*	Big-Fruit Hawthorn				S2?	3	24.4 ± 0.0	NB
P	*Rubus x recurvicaulis*	arching dewberry				S2?	3	10.3 ± 0.0	NB
P	*Galium obtusum*	Blunt-leaved Bedstraw				S2?	7	31.5 ± 10.0	NB
P	*Salix myricoides*	Bayberry Willow				S2?	1	43.2 ± 1.0	NB
P	*Carex vacillans*	Estuarine Sedge				S2?	4	27.4 ± 0.0	NB
P	*Platanthera huronensis*	Fragrant Green Orchid				S2?	3	82.0 ± 0.0	NB
P	*Solidago altissima*	Tall Goldenrod				S2S3	3	40.3 ± 0.0	NB
P	*Callitriche hermaphroditica*	Northern Water-starwort				S2S3	9	46.1 ± 0.0	NB
P	*Elatine americana*	American Waterwort				S2S3	6	37.1 ± 0.0	NB
P	*Bartonia paniculata*	Branched Bartonia				S2S3	1	65.4 ± 0.0	NS
P	*Bartonia paniculata ssp. iodandra*	Branched Bartonia				S2S3	7	77.9 ± 0.0	NB
P	*Geranium robertianum*	Herb Robert				S2S3	83	47.3 ± 0.0	PE
P	*Epilobium coloratum*	Purple-veined Willowherb				S2S3	28	24.8 ± 1.0	NB
P	*Rumex persicarioides*	Peach-leaved Dock				S2S3	34	30.4 ± 1.0	NB
P	*Rumex pallidus*	Seabeach Dock				S2S3	7	43.3 ± 0.0	PE
P	*Rubus pensilvanicus*	Pennsylvania Blackberry				S2S3	38	39.3 ± 0.0	NB
P	*Galium labradoricum*	Labrador Bedstraw				S2S3	25	50.5 ± 0.0	PE
P	*Carex adusta*	Lesser Brown Sedge				S2S3	8	21.3 ± 0.0	NB
P	*Scirpus atrovirens*	Dark-green Bulrush				S2S3	2	43.5 ± 0.0	PE
P	*Corallorhiza maculata var. occidentalis*	Spotted Coralroot				S2S3	14	26.9 ± 10.0	NB
P	*Corallorhiza maculata var. maculata*	Spotted Coralroot				S2S3	3	83.1 ± 0.0	NS
P	*Neottia auriculata*	Auricled Twayblade				S2S3	8	85.8 ± 0.0	NB
P	*Spiranthes cernua*	Nodding Ladies'-Tresses				S2S3	20	30.0 ± 0.0	NB
P	*Eragrostis pectinacea*	Tufted Love Grass				S2S3	6	25.1 ± 0.0	NB
P	*Stuckenia filiformis*	Thread-leaved Pondweed				S2S3	2	8 0 ± 1.0	NB
P	*Potamogeton praelongus*	White-stemmed Pondweed				S2S3	23	42.3 ± 0.0	NS
P	*Ophioglossum pusillum*	Northern Adder's-tongue				S2S3	5	51.3 ± 50.0	NS
P	*Panax trifolius*	Dwarf Ginseng				S3	31	25.8 ± 0.0	NB
P	*Artemisia campestris ssp. caudata*	Tall Wormwood				S3	13	68.4 ± 0.0	PE
P	*Artemisia campestris*	Field Wormwood				S3	4	88.4 ± 0.0	NB
P	*Bidens hyperborea*	Estuary Beggar icks				S3	45	31.3 ± 0.0	NB
P	*Erigeron hyssopifolius*	Hyssop-leaved Fleabane				S3	98	40.2 ± 1.0	NB
P	*Nabalus racemosus*	Glaucous Rattlesnakeroot				S3	1	91.1 ± 0.0	PE
P	*Symphyotrichum boreale*	Boreal Aster				S3	18	50.8 ± 0.0	PE
P	*Betula pumila*	Bog Birch				S3	174	40.0 ± 0.0	NB
P	*Turritis glabra*	Tower Mustard				S3	1	98.5 ± 0.0	NB
P	*Arabis pycnocarpa*	Cream-flowered Rockcress				S3	11	3 3 ± 0.0	NB
P	*Cardamine maxima*	Large Toothwort				S3	4	69.6 ± 0.0	PE
P	*Subularia aquatica ssp. americana*	American Water Awlwort				S3	2	80.6 ± 0.0	NB
P	*Stellaria humifusa*	Saltmarsh Starwort				S3	16	1 8 ± 5.0	NB
P	*Ceratophyllum echinatum*	Prickly Hornwort				S3	36	21.1 ± 0.0	NB
P	*Hudsonia tomentosa*	Woolly Beach-heath				S3	409	16.3 ± 0.0	NB
P	*Cornus obliqua*	Silky Dogwood				S3	2	79.2 ± 0.0	NB
P	*Crassula aquatica*	Water Pygmyweed				S3	5	55.3 ± 0.0	NB
P	*Rhodiola rosea*	Roseroot				S3	68	73.5 ± 0.0	NB
P	*Penthorum sedoides*	Ditch Stonecrop				S3	25	50.4 ± 0.0	NB
P	*Elatine minima*	Small Waterwort				S3	1	81.0 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Geranium bicknellii*	Bicknell's Crane's-bill				S3	19	21.3 ± 0.0	NB
P	*Myriophyllum farwellii*	Farwell's Water Milfoil				S3	9	38.7 ± 1.0	NB
P	*Myriophyllum verticillatum*	Whorled Water Milfoil				S3	14	38.4 ± 1.0	NB
P	*Teucrium canadense*	Canada Germander				S3	128	4.6 ± 0.0	NB
P	*Nuphar microphylla*	Small Yellow Pond-lily				S3	7	37.7 ± 5.0	NB
P	*Epilobium hornemannii*	Hornemann's Willowherb				S3	4	84.8 ± 1.0	NB
P	*Epilobium hornemannii ssp. hornemannii*	Hornemann's Willowherb				S3	1	85.0 ± 0.0	NB
P	*Epilobium strictum*	Downy Willowherb				S3	30	7.7 ± 0.0	NB
P	*Polygala sanguinea*	Blood Milkwort				S3	41	7.4 ± 0.0	NB
P	*Persicaria arifolia*	Halberd-leaved Tearthumb				S3	144	10.1 ± 0.0	NB
P	*Persicaria punctata*	Dotted Smartweed				S3	26	39.5 ± 5.0	NB
P	*Fallopia scandens*	Climbing False Buckwheat				S3	74	17.1 ± 2.0	NB
P	*Samolus parviflorus*	Seaside Brookweed				S3	167	5 2 ± 0.0	NB
P	*Pyrola minor*	Lesser Pyrola				S3	6	44.6 ± 0.0	NS
P	*Clematis occidentalis*	Purple Clematis				S3	15	53.8 ± 0.0	NS
P	*Ranunculus gmelinii*	Gmelin's Water Buttercup				S3	50	35.6 ± 0.0	NB
P	*Thalictrum confine*	Northern Meadow-rue				S3	1	83.5 ± 1.0	PE
P	*Amelanchier canadensis*	Canada Serviceberry				S3	36	2 0 ± 0.0	NB
P	*Rosa palustris*	Swamp Rose				S3	5	36.3 ± 0.0	NB
P	*Rubus occidentalis*	Black Raspberry				S3	1	47.4 ± 0.0	NB
P	*Sanguisorba canadensis*	Canada Burnet				S3	17	79.0 ± 0.0	NB
P	*Galium boreale*	Northern Bedstraw				S3	7	54.3 ± 5.0	NS
P	*Salix nigra*	Black Willow				S3	1	94.3 ± 0.0	NB
P	*Salix pedicellaris*	Bog Willow				S3	67	9 3 ± 0.0	NB
P	*Salix interior*	Sandbar Willow				S3	1	43.0 ± 1.0	NB
P	*Comandra umbellata*	Bastard's Toadflax				S3	58	2.6 ± 0.0	NB
P	*Limosella australis*	Southern Mudwort				S3	97	6.7 ± 1.0	NB
P	*Pilea pumila*	Dwarf Clearweed				S3	70	37.8 ± 0.0	PE
P	*Viola adunca*	Hooked Violet				S3	5	61.4 ± 0.0	NB
P	*Viola nephrophylla*	Northern Bog Violet				S3	13	52.0 ± 0.0	PE
P	*Carex arcta*	Northern Clustered Sedge				S3	3	58.4 ± 20.0	NB
P	*Carex capillaris*	Hairlike Sedge				S3	11	61.4 ± 0.0	NS
P	*Carex chordorrhiza*	Creeping Sedge				S3	68	35.3 ± 0.0	NB
P	*Carex conoidea*	Field Sedge				S3	6	8.5 ± 0.0	NB
P	*Carex eburnea*	Bristle-leaved Sedge				S3	17	56.3 ± 100.0	NB
P	*Carex exilis*	Coastal Sedge				S3	1	77.1 ± 0.0	NS
P	*Carex garberi*	Garber's Sedge				S3	1	7 0 ± 0.0	NB
P	*Carex haydenii*	Hayden's Sedge				S3	4	11.8 ± 0.0	NB
P	*Carex lupulina*	Hop Sedge				S3	6	47.6 ± 1.0	NB
P	*Carex michauxiana*	Michaux's Sedge				S3	14	40.7 ± 0.0	NS
P	*Carex ormostachya*	Necklace Spike Sedge				S3	4	51.7 ± 1.0	NB
P	*Carex rosea*	Rosy Sedge				S3	10	90.5 ± 0.0	NB
P	*Carex tenera*	Tender Sedge				S3	13	22.3 ± 0.0	NB
P	*Carex tuckermanii*	Tuckerman's Sedge				S3	26	52.6 ± 10.0	NB
P	*Carex wiegandii*	Wiegand's Sedge				S3	144	11.2 ± 0.0	NB
P	*Carex recta*	Estuary Sedge				S3	20	17.7 ± 0.0	NB
P	*Carex atratiformis*	Scabrous Black Sedge				S3	3	91.7 ± 0.0	NS
P	*Cyperus dentatus*	Toothed Flatsedge				S3	1	45.9 ± 1.0	NB
P	*Cyperus esculentus var. leptostachyus*	Perennial Yellow Nutsedge				S3	1	71.6 ± 0.0	NB
P	*Eleocharis intermedia*	Matted Spikerush				S3	1	81.6 ± 0.0	NB
P	*Eleocharis quinqueflora*	Few-flowered Spikerush				S3	1	91.3 ± 0.0	PE
P	*Rhynchospora capitellata*	Small-headed Beakrush				S3	1	97.8 ± 1.0	NB
P	*Rhynchospora fusca*	Brown Beakrush				S3	9	40.8 ± 0.0	NS
P	*Trichophorum clintonii*	Clinton's Clubrush				S3	25	84.6 ± 0.0	NB
P	*Bolboschoenus fluviatilis*	River Bulrush				S3	4	28.1 ± 1.0	NB
P	*Schoenoplectus torreyi*	Torrey's Bulrush				S3	1	20.8 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	*Lemna trisulca*	Star Duckweed				S3	30	37.1 ± 0.0	NB
P	*Cypripedium reginae*	Showy Lady's-Slipper				S3	39	8 3 ± 0.0	NB
P	*Liparis loeselii*	Loesel's Twayblade				S3	63	7.1 ± 0.0	NB
P	*Platanthera blephariglottis*	White Fringed Orchid				S3	523	9.6 ± 0.0	NB
P	*Platanthera grandiflora*	Large Purple Fringed Orchid				S3	39	23.0 ± 0.0	NB
P	*Bromus latiglumis*	Broad-Glumed Brome				S3	26	47.8 ± 0.0	NB
P	*Calamagrostis pickeringii*	Pickering's Reed Grass				S3	31	40.8 ± 0.0	NB
P	*Dichanthelium depauperatum*	Starved Panic Grass				S3	7	43.1 ± 0.0	NB
P	*Potamogeton obtusifolius*	Blunt-leaved Pondweed				S3	37	35.1 ± 0.0	NB
P	*Xyris montana*	Northern Yellow-Eyed-Grass				S3	247	10.9 ± 0.0	NB
P	*Zannichellia palustris*	Horned Pondweed				S3	62	10.4 ± 0.0	NB
P	*Asplenium viride*	Green Spleenwort				S3	17	61.1 ± 1.0	NB
P	*Dryopteris fragrans*	Fragrant Wood Fern				S3	63	72.0 ± 0.0	NB
P	*Woodsia glabella*	Smooth Cliff Fern				S3	64	72.4 ± 0.0	NB
P	*Isoetes tuckermanii ssp. tuckermanii*	Tuckerman's Quillwort				S3	2	77.9 ± 0.0	NB
P	*Diphasiastrum x sabinifolium*	Savin-leaved Ground-cedar				S3	15	32.4 ± 0.0	NB
P	*Huperzia appressa*	Mountain Firmoss				S3	17	85.9 ± 0.0	NB
P	*Sceptridium dissectum*	Dissected Moonwort				S3	8	16.8 ± 2.0	NB
P	*Botrychium lanceolatum ssp. angustisegmentum*	Narrow Triangle Moonwort				S3	18	31.6 ± 0.0	NB
P	*Botrychium simplex*	Least Moonwort				S3	8	37.1 ± 0.0	NB
P	*Polypodium appalachianum*	Appalachian Polypody				S3	27	46.9 ± 1.0	NB
P	*Mertensia maritima*	Sea Lungwort				S3S4	7	54.6 ± 0.0	NB
P	*Suaeda calceoliformis*	Horned Sea-blite				S3S4	46	3 3 ± 0.0	NB
P	*Myriophyllum sibiricum*	Siberian Water Milfoil				S3S4	20	53.9 ± 0.0	NS
P	*Utricularia gibba*	Humped Bladderwort				S3S4	5	23.1 ± 0.0	NB
P	*Rumex fueginus*	Tierra del Fuego Dock				S3S4	136	3.1 ± 0.0	NB
P	*Rubus chamaemorus*	Cloudberry				S3S4	191	34.4 ± 0.0	NB
P	*Geocaulon lividum*	Northern Comandra				S3S4	46	17.1 ± 2.0	NB
P	*Juniperus horizontalis*	Creeping Juniper				S3S4	30	43.3 ± 0.0	PE
P	*Cladium mariscoides*	Smooth Twigrush				S3S4	7	23.5 ± 1.0	NB
P	*Eriophorum russeolum*	Russet Cottongrass				S3S4	346	10.2 ± 0.0	NB
P	*Eriophorum russeolum ssp. russeolum*	Russet Cottongrass				S3S4	47	23.0 ± 0.0	NB
P	*Triglochin gaspensis*	Gasp ├⌐ Arrowgrass				S3S4	78	9.1 ± 0.0	NB
P	*Spirodela polyrhiza*	Great Duckweed				S3S4	19	36.7 ± 0.0	NB
P	*Corallorhiza maculata*	Spotted Coralroot				S3S4	25	33.6 ± 5.0	NB
P	*Calamagrostis stricta*	Slim-stemmed Reed Grass				S3S4	38	3 0 ± 2.0	NB
P	*Calamagrostis stricta ssp. stricta*	Slim-stemmed Reed Grass				S3S4	19	42.7 ± 0.0	NS
P	*Distichlis spicata*	Salt Grass				S3S4	105	0 9 ± 0.0	NB
P	*Potamogeton oakesianus*	Oakes' Pondweed				S3S4	10	23.1 ± 0.0	NB
P	*Montia fontana*	Water Blinks				SH	2	3 0 ± 1.0	NB
P	*Brachyelytrum erectum*	Bearded Shorthusk				SH	2	17.1 ± 2.0	NB
P	*Agalinis maritima*	Saltmarsh Agalinis				SX	2	61.5 ± 50.0	NB

5.1 SOURCE BIBLIOGRAPHY (100 km)

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

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1	Clavette, A., and others. 2013. Peregrine Falcon nesting information from NatureNB listserv. NatureNB.
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Appendix F Habitat Descriptions

Table of Contents

1 Flora

1.1 Black Ash

The Black Ash occurs primarily in wetlands, swamps, floodplains and fens. It has an intermediate light requirement and a tendency toward greater abundance in more alkaline sites. Most sites in which it is dominant are flood prone, where its high tolerance of seasonal flooding appears to offer a competitive advantage. Black Ash also occurs widely in moist upland forests, but generally at lower densities than in wet areas (Government of Canada, 2019). Although there is suitable habitat for this species at the site, no Black Ash were observed during the field survey.

1.2 Fleshy Stitchwort

The Fleshy Stitchwort habitat includes fens, fen meadows, meadows, springs, waterside meadow shores that are prone to flooding, seashore kelp banks (Native Plant Trust, 2021). There is negligible favorable habitat for this species on or near the site; and none were observed during the field survey.

1.3 Roland's Sea-Bite

The Roland's Sea-Blite occurs primarily in salt marsh habitats, in the upper reaches that are only covered by water during particularly high tide, typically associated with Spartina (cordgrass). Sea-Bite is a coastal species that may also occur along tidal creeks or riverbanks, on mudflats, or in disturbed areas of marshes (e.g. near roads or landfills) (Crowley, 2005). Although no species were observed during the field survey, there is suitable habitat at the site.

1.4 Buttonbush Dodder

The Buttonbush Dodder inhabits anthropogenic (man-made or disturbed habitats), meadows and fields, shores of rivers or lakes, swamps (Native Plant Trust, 2021). There is negligible favorable habitat for this species on or near the site; and none were observed during the field survey.

1.5 Alaska Alkaligrass

The Alaska Alkaligrass is a plant of the coastline in wet areas with rocky, sandy saline soils. A halophyte, the grass is used for revegetation of salt marshes and other habitat in the intertidal zone in Alaska, where it is valuable for its tolerance of heavy inundation in cold saltwater during high tides and storm surges (INaturalist, 2021). Although no species were observed during the field survey, there is suitable habitat at the site.

2 Birds

2.1 Piping Plover medlodus ssp

The Piping Plover nest and forage on beaches with a mixture of sand and cobble; this habitat type is also used during migration periods (Goverment of Canada, 2011). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.2 Bank Swallow (Riparia riparia)

Bank Swallows are insectivorous birds that nest in colonies dug into the sides of sandy cliffs or banks. They also nest in gravel and sand piles in construction sites and freight yards (Government of Canada, 2019). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.3 Bobolink

Bobolinks nest in grassland and herbaceous habitats (such as wetlands), including forage fields. Fall migration begins in mid-July and they return to their Canadian nesting grounds in mid-May, after which time the males establish territories and court females. Females construct nests directly on the ground, often at the base of large herbaceous plants. Bobolinks feed on both insects and plant matter during the breeding period, though nestlings are fed only insects (mostly butterflies, moths, grasshoppers, and crickets) (2019 Cornell University, 2021). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.4 Hudsonian Godwit

The Hudsonian Godwit is a large arctic-nesting shorebird that prefers herbaceous wetland, tidal flat/shorelines, bogs/fens and also may occur in grasslands, tundras, croplands and sand dune habitats. This species nests on grassy tundra, near water, bogs and marshes, near coasts or rivers. It nests on the ground in a sparsely lined depression, in or under edge of prostrate dwarf birch or on dry top of hummock in sedge marsh. The Hudsonian Godwit feeds on marine worms, mollusks, and crustaceans and probes deeply into mud and during the nesting season eats many insects (e.g., flies, mosquitoes) (Cannings S. , NatureServe Explorer, 2002). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.5Lesser Yellowlegs

Lesser Yellowlegs are an alert “marshpiper” that inhabits in shallow, weedy wetlands and flooded fields (marshes and mudflats) across North America often in the company of other shorebird species. It breeds in meadows and open forests interspersed with marshes and bogs (2019 Cornell University, 2021). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.6Barn Swallow (Hirundo rustica)

Barn Swallows are insectivorous birds that nest in colonies dug into the sides of sandy cliffs or banks. They also nest in gravel and sand piles in construction sites and freight yards (Jue S. S., NatureServe Explorer, 2014). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.7Barrow's Goldeneye - Eastern pop.

The Barrow's Goldeneye (eastern population) breeds in Quebec and overwinters in the Maritimes and north Atlantic coast of the United States. Their winter-feeding grounds are coastal waters (Government of Canada, 2011). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.8Canada Warbler

The Canada Warbler habitat includes moist thickets of woodland undergrowth (especially aspen poplar), bogs, tall shrubbery along streams or near swamps, and deciduous second growth. Nests are on or near the ground, among roots of fallen trees, in cavities in banks, or on ledges, sides of rocks, hummocks, stumps, or fallen logs, or on the ground under shrubbery. In migration, this warbler uses various forest, woodland, scrub, and thicket habitats, mostly in humid areas. In winter, it occurs in forested areas of foothills and mountains. There are favorable habitats for this species on or near the site (Hammerson G. , NatureServe Explorer, 2004). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.9Eastern Wood-Pewee

The Eastern Wood-Pewee inhabits a wide variety of wooded upland and lowland habitats including deciduous, coniferous, or mixed forests and occurs most frequently in forests with some degree of openness, whether it be the result of forest structure, natural disturbance, or human alteration. Intermediate-aged forests with a relatively sparse midstory are preferred. Also occurs in anthropogenic habitats providing an open forested aspect such as parks and suburban neighborhoods. Nests are constructed atop a horizontal branch, 1.2-21.4 meters above the ground, in a wide variety of deciduous and coniferous trees (Hammerson G. , NatureServe Explorer, 2004). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.10 Horned Grebe

The Horned Grebe habitat includes marshes, ponds and lakes, occasionally along sluggish streams (breeding); bays, estuaries and seacoasts, and in migration commonly in inland freshwater habitats, especially lakes and rivers (nonbreeding). Nest on small and large lakes and ponds (about 0.1 ha or larger), in calm waters of marshes, along rivers and streams. Favors areas with much open water. Usually nests among tall vegetation in shallow water. Highest breeding densities occur in pothole marshes of aspen woodland (Cannings S. , NatureServe Explorer, 2002). There are favorable habitats for this species on and near the site.

2.11 Snowy Owl

The Snowy Owl inhabits tundra, primarily where mounds, hillocks or rocks are present; in winter and migration occurring also in open country such as prairie, marshes, fields, pastures and sand dunes as well as tidal shores and open leads in sea ice. Nests on the ground in open tundra, usually on a slightly raised site. Nests in a scraped-out area (Cannings S. , NatureServe Explorer, 2002). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.12 Red-necked Grebe

The Red-necked Grebe are waterbirds. The species inhabits aquatic habitats, it breeds on northerly lakes and winters mainly along ocean coastlines, usually alone but sometimes in small groups. During spring migration, flocks may form on large lakes, and pairs begin their boisterous courtship displays well before reaching breeding lakes farther north (2019 Cornell University, 2021). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.13 Red Knot rufa ssp

The Red Knot rufa inhabits primarily the seacoasts on tidal flats and beaches, less frequently in marshes and flooded fields, on sandy or pebbly beaches, especially at river mouths it feeds on mudflats, loafs and sleeps on salinas and salt-pond dikes. It nests on ground in barren or stony tundra and in well-vegetated moist tundra (Hammerson G. , NatureServe Explorer, 2014). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.14 Greater Yellowlegs

The Greater Yellowlegs inhabits estuarine habitats like tidal flat/shore, lagoon and herbaceous wetland. It also inhabits lacustrine habitats with shallow water, palustrine habitats such as herbaceous wetland like bog/fen and riparian, riverine habitats with low gradient. It also inhabits terrestrial habitats such as coniferous and mixed woodland and grassland/herbaceous. Its nonbreeding habitat includes marshes, ponds, lakes, stream margins and sand and gravel bars, lagoons, salinas, and coastal mudflats. It nests in muskeg country or at other wetlands, on the ground in a slight depression in moss or dry peat, usually near water (Cannings S. , NatureServe Explorer, 2004). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.15 Sandhill Crane

The Sandhill Crane favors marshes and agricultural fields where they eat primarily grains. In flight, neck is outstretched, unlike herons with tucked necks (EBird, 2021). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.16 Purple Martin

The Purple Martin habitats includes a wide variety of open and partly open situations, frequently near water or around towns. It formerly nested in tree cavities, abandoned woodpecker holes, crevices in rocks; in east and mid-west now nests in bird-houses and gourds put up by humans.

A wide variety of open and partly open situations, frequently near water or around towns (Subtropical and Temperate zones, in winter also Tropical Zone). It now nests in bird-houses and gourds put up by humans (Jue S. S., NatureServe Explorer, 2014). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.17 Ruddy Duck

The Ruddy Duck inhabits marshes, lakes, and coastal areas. When not breeding, it inhabits on sheltered brackish and marine coastal areas as well as lakes and rivers (Temperate Zone). It nests on freshwater marshes, sloughs, lakes, and ponds, in areas where open water is bordered by dense aquatic vegetation. Nest is a floating structure of marsh plants hidden by growing plants. Often lays eggs in nests of other waterfowl species. May nest at potholes of less than an acre (Cannings S. , NatureServe Explorer, 2001). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.18 Lesser Scaup

The Lesser Scaup breeding ground inhabits marshes, ponds, and small lakes (AOU 1998). It usually nests near small ponds and lakes, sedge meadows, creeks; in cover 1-2 ft high, within 46 m of water. It often nests on islands among colonies of gulls or terns. During migration and when not breeding, found along coast in sheltered bays, estuaries, and marshes or inland on lakes, ponds, and rivers, on salt water especially if lakes and ponds frozen. In southern its winter range, it prefers freshwater ponds, lakes, and sloughs with reasonably clear water 1 m or more deep (Jue D. K., NatureServe Explorer, 2014). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.19 Greater Scaup

The Greater Scaup, when in migration and wintering, it is found in bays, estuaries, and large open inland lakes and rivers. It breeds near shores of ponds and lakes, in marshes, or on islands, primarily in forested tundra and northern borders of the taiga; among grass or shrubs, or under spruce boughs. The nest is a hollow lined with plant material, down and feathers (Jue D. K., NatureServe Explorer, 2014). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.20 Black-headed Gull

The Black-headed Gull habitat includes lakes, rivers, bogs, moors, grasslands, swamps, and coastal marshes. During the non-breeding season, it inhabits seacoasts, estuaries, and bays. It is strongly attracted to sewer outfalls. During the breeding season it nests usually on ground along seacoast, coastal islands, or in freshwater marshes (Via, 2007). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.21 Brant

The Brant breeds on tundra in the high Arctic; winters in saltmarshes, rocky coastlines, sheltered bays, and beaches. Typically, uncommon to rare inland. Almost always seen in flocks, only rarely mixing with other geese species (EBird, 2021). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.22 Black-crowned Night-heron

The Black-crowned Night-heron marshes, swamps, wooded streams, mangroves, shores of lakes, ponds, lagoons; salt water, brackish, and freshwater situations. Roosts by day in mangroves or swampy woodland. Eggs are laid in a platform nest in groves of trees near coastal marshes or on marine islands, swamps, marsh vegetation, clumps of grass on dry ground, orchards, and in many other situations. It usually nests with other heron species (Cannings S. , NatureServe Explorer, 2002). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.23 Baird's Sandpiper

During the non-breeding season the Baird's Sandpiper inhabits mudflats, estuaries, grassy marshes, and dry grassy areas near lakes and ponds, rarely dry pastures and prairies away from water; prefers grassy margins of ponds, marshes, and wet pastures. Nests in dry coastal and alpine tundra; favors well-drained, often stony ridges--low mountaintops, river terraces, coastal barrens and bluffs. Nests on the ground in a shallow depression, often under a grass tuft or among rocks (Cannings S. a., 2004). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.24 Northern Mockingbird

The Northern Mockingbird inhabits various open and partly open situations from areas of scattered brush or trees to forest edge and semi-desert (absent in forest interior), especially in scrub, thickets, gardens, towns, and around cultivated areas. Nests in dense shrubbery, tree branches, vines, cholla, prickly pear, sagebrush, usually 1-3 m above ground, often near houses (Hammerson G. , NatureServe Explorer, 2004). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.25 Gadwall

The Gadwall inhabits lakes, ponds, rivers, marshes. Prefers freshwater but may be found on any open water during migration and winter. Moderate- to large-sized wetland of a permanent or semi-permanent nature, expanses of open water with submersed vegetation, and open undisturbed shorelines are important molting habitats. It nests in thick vegetation near freshwater lakes, ponds, or streams, including open brackish or alkaline waters. Nests usually in dry upland site under clump of shrubs or in herbaceous vegetation, average of 300 m from water. It tends to nest near semi-permanent wetlands that are relatively resistant to drought. It commonly uses man-made ponds. May nest on island, upland meadow, or grassland. Suitable nesting islands should be 0.1-0.5 ha in size, elongate, and separated from mainland by at least 150 m of water that remains 0.9 m deep in nesting season. Successful breeders usually return to nesting area used the previous year. A diversity of wetland types is required for successful reproduction, so that brood-rearing habitat is near nesting habitat; females will move brood up to 1.9 km to brood habitat (Ringelman, 1990). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.26 Solitary Sandpiper

In its breeding season the Solitary Sandpiper nests on taiga. Nests in trees in abandoned passerine nests near muskeg and woodland ponds or pools. Also reported as nesting on ground

in areas above treeline in brooks range. When not breeding it inhabits freshwater ponds, stream edges, temporary pools, flooded ditches and fields, more commonly in wooded regions, less frequently on mudflats and open marshes; favors areas where vegetation extends to water's edge (Gotthardt, 2014). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.27 Snow Goose

The Snow Goose winters in both freshwater and coastal wetlands, wet prairies, and extensive sandbars, foraging also in pastures, cultivated lands and flooded fields. Nests in tundra marshes near water, on raised hummocks and ridges. Females generally nest at their natal or prior nest site (Ormes, 2017). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.28 Great Cormorant

The Great Cormorant is often spotted standing on rocks or pilings. Dives frequently, feeding on fish. Found in many types of water bodies, ranging from rivers to reservoirs to marine environments; in North America, restricted to coastal North Atlantic (KOENEN & MEHLMAN., 1999). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.29 King Eider

The King Eider inhabits the seacoasts and large river valleys, vicinity of ponds and pools in open tundra, offshore along rocky coasts (winter). Nests on ground away from but not distant from water in open tundra; often in graminoid meadows within a few miles of the coast (Cannings S. , NatureServe Explorer, 2001). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.30 Glaucous Gull

The Glaucous Gull inhabits primarily in coastal waters, less commonly along large inland bodies of water; sea coasts, bays, estuaries, dumps. Nests on cliffs, rocky coasts, islets in and borders of tundra lakes, coastal dunes. It also inhabits low islands and sandbars usually on or near coast; inland river bars; most common on barrier islands immediately offshore from rivers that flood in spring and thereby isolate the island from foxes (Cannings S. a., 2004). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.31 Northern Shoveler

During the breeding season, the Northern Shoveler inhabits shallow, often muddy, fresh-water areas with surrounding cover, ponds, marshes, sloughs, and creeks. Nests near shallow freshwater lake, pond, marsh, etc. Nests on the ground, usually near edge of water. The nest is a hollow lined with plant material and down. When non-breeding or in migration and winter in both freshwater and brackish habitats, and in cultivated fields (not typical). (Cannings S. , NatureServe Explorer, 2001). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.32 Great Crested Flycatcher

The Great Crested Flycatcher habitats includes deciduous (mainly), mixed, or pine woodland or somewhat open forest, parks, orchards, wooded residential areas, areas of scattered trees in cultivated regions, clearings and edges of wooded areas, and swamps. Frequents upper levels of trees. Research on canopy selection and flight length indicates a preference for open canopies where unhampered foraging flights can occur. Preferred perches are tall trees but may also be found on utility lines and short shrub-like growth in recent clear-cuts. Nests in natural cavity or old woodpecker hole in live or dead tree, average of 3-6 m above ground; also, in bird box, pipe or similar cavity. When not breeding it prefers habitat similar to that used in breeding season. Found mostly in lowland forest, woodland, and humid to semiarid forest and edge. In migration, found generally in wooded habitats (Zeller, 1995). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.33 Cliff Swallow

The Cliff Swallow inhabit open to semi-open wooded habitat, cliffs, canyons, and farm country, generally near meadows, marshes, and water. They build bottle-shaped mud nest in colonies on cliffs, under eaves of buildings, under bridges, and similar sites sheltered by an overhang. Many return to same nesting area in successive years, but colonies tend to switch nesting sites between seasons, evidently due to a buildup of insect parasites in the nests. Cliff swallow commonly repair and use old nests (Cornell University, 2019). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.34 American Golden-Plover

During non-breeding season the American Golden-Plover inhabits short grasslands, pastures, golf courses, mudflats, sandy beaches, and flooded fields. Nests on grassy tundra; prefers dry upland areas. The nest is a shallow scraped-out depression, lined with mosses, leaves, grass, and lichens (Jue D. K., NatureServe Explorer, 2014). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.35 Red Crossbill

The Red Crossbill favours mature coniferous forests in mountains and boreal forest but single birds and flocks may appear in forests, towns, and backyards far to the south and east of their typical range (2019 Cornell University, 2021). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

2.36 Black Scoter

The Black Scoter inhabits mostly coastal waters, less commonly on large inland lakes and rivers when not breeding. Nests near lakes and pools on grassy or bushy tundra and in northern taiga. Usually nests close to water. The nest is a depression lined with plant material, down and feathers (Mehlman, 1997). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.37 Sanderling

The Sanderling's breed only on High Arctic tundra on gravel patches and low-growing, wet tundra but during the winter they forage and live on most of the sandy beaches of the world but will also use mudflats (2019 Cornell University, 2021). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.38 Bald Eagle

The Bald eagle breeding habitat most commonly includes areas close to (within 4 km) coastal areas, bays, rivers, lakes, reservoirs, or other bodies of water that reflect the general availability of primary food sources including fish, waterfowl, or seabirds.Nests usually are in tall trees or on pinnacles or cliffs near water. Tree species used for nesting vary regionally and may include pine, spruce, fir, cottonwood, poplar, willow, sycamore, oak, beech, or others. In winter, bald eagles may associate with waterfowl concentrations or congregate in areas with abundant dead fish or other food resources. Wintering areas are commonly associated with open water though in some regions (e.g., Great Basin). Wintering eagles tend to avoid areas with high levels of nearby human activity (boat traffic, pedestrians) and development (buildings). Bald eagles preferentially roost in conifers or other sheltered sites in winter in some areas; typically they select the larger, more accessible trees. Perching in deciduous and coniferous trees is equally common in other areas. Communal roost sites used by two or more eagles are common, and some may be used by 100 or more eagles during periods of high use. Winter roost sites vary in their proximity to food resources (up to 33 km) and may be determined to some extent by a preference for a warmer microclimate at these sites. Available data indicate that energy conservation may or may not be an important factor in roost-site selection. Communal night roosts often are in trees that are used in successive years (Cannings, 2021). Although no species were observed during the field survey, there is potential for this species to occur at the site.

2.39 Peregrine Falcon - anatum/tundrius pop.

The Peregrine Falcon habitats includes various open situations from tundra, moorlands, steppe, and seacoasts, especially where there are suitable nesting cliffs, to mountains, open forested regions, and human population centers. When not breeding it occurs in areas where prey concentrate, including farmlands, marshes, lakeshores, river mouths, tidal flats, dunes and beaches, broad river valleys, cities, and airports. Peregrine Falcon often nests on ledge or hole on face of rocky cliff or crag. Riverbanks, tundra mounds, open bogs, large stick nests of other species, tree hollows, and man-made structures (e.g., ledges of city buildings) are used locally. Nests typically are situated on ledges of vertical rocky cliffs, commonly with a sheltering overhang. Ideal locations include undisturbed areas with a wide view, near water, and close to plentiful prey. Substitute man-made sites include tall buildings, bridges, rock quarries, and raised platforms (Cannings S. E., 2021). There is negligible favorable habitat for this species on the subject site; therefore, the potential for this species to occur at the site is unlikely.

3 References

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Appendix G Tables

Table 1: Potential Vascular Plants SAR Identified within 5km of the Site
Client: NB Department of Tourism, Heritage and Culture
Site Location: Parlee Beach, Pointe-du-Chêne, New Brunswick
Englobe Project No.: 2106010

Common Name	Scientific Name	Current Status	Distance
Black Ash	*Fraxinus nigra*	COSEWIC: Threatened SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S4S5	0.8 ± 0.0
Fleshy Stitchwort	*Stellaria crassifolia*	COSEWIC: No SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1	2.0 ± 5.0
Roland's Sea-Blite	*Suaeda rolandii*	COSEWIC: No SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1	0.5 ±0.0 (yes)
Buttonbush Dodder	*Cuscuta cephalanthi*	COSEWIC: No SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1S3	4.0 ± 0.0
Alaska Alkaligrass	*Puccinellia nutkaensis*	COSEWIC: No SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2	5.0 ± 1.0 (yes)

Table 2: Vertebrate Animals SAR Identified within 5km of the Site
Client: NB Department of Tourism, Heritage and Culture
Site Location: Parlee Beach, Pointe-du-Chêne, New Brunswick
Englobe Project No.: 2106010

Common Name	Scientific Name	Current Status	Distance
Piping Plover melodus ssp	*Charadrius melodus melodus*	COSEWIC: Endangered SARA: Endangered NB Legal Status: Endangered Provincial Rarity Rank: S1B,S1M	0.5 ± 0.0
Bank Swallow	*Riparia riparia*	COSEWIC: Threatened SARA: Threatened NB Legal Status: No Status Provincial Rarity Rank: S2S3B,S2S3B	0.3 ± 0.0
Bobolink	*Dolichonyx oryzivorus*	COSEWIC: Threatened SARA: Threatened NB Legal Status: Threatened Provincial Rarity Rank: S3B,S3M	2.4 ± 1.0
Hudsonian Godwit	*Limosa haemastica*	COSEWIC: Threatened SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S3S4M	2.2 ± 0.0
Lesser Yellowlegs	*Tringa flavipes*	COSEWIC: Threatened SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S4M	0.3 ± 0.0
Barn Swallow	*Hirundo rustica*	COSEWIC: Special Concern SARA: Threatened NB Legal Status: Threatened Provincial Rarity Rank: S2B,S2M	0.3 ± 0.0
Barrow's Goldeneye-Eastern pop.	*Eucephala islandica (Eastern pop.)*	COSEWIC: Special Concern SARA: Special Concern NB Legal Status: Special Concern Provincial Rarity Rank: S2M,S2N	1.3 ± 1.0
Canada Warbler	*Cardellina canadensis*	COSEWIC: Special Concern SARA: Threatened NB Legal Status: Threatened Provincial Rarity Rank: S3B,S3M	3.6 ± 7.0
Eastern Wood-Pewee	*Contopus virens*	COSEWIC: Special Concern SARA: Special Concern NB Legal Status: Special Concern Provincial Rarity Rank: S4B,S4M	2.1 ± 0.0
Horned Grebe	*Podiceps auritus*	COSEWIC: Special Concern SARA: Special Concern NB Legal Status: Special Concern Provincial Rarity Rank: S4N,S4M	0.2 ± 0.0
Snowy Owl	*Bubo scandiacus*	COSEWIC: Not At Risk SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1N,S2S3M	0.2 ± 0 0
Red-necked Grebe	*Podiceps grisegena*	COSEWIC: Not At Risk SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S3M,S2N	0.3 ± 0.0
Red Knot rufa subspecies	*Calidris canutus rufa*	COSEWIC: Endangered, Special Concern SARA: Endangered NB Legal Status: Endangered Provincial Rarity Rank: S2M	1.3 ± 1.0
Greater Yellowlegs	*Tringa melanoleuca*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1?B,S5M	0.3 ± 0.0
Sandhill Crane	*Antigone canadensis*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1B,S1M	3.6 ± 7.0
Purple Martin	*Progne subis*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1B,S1M	0.4 ± 7.0
Ruddy Duck	*Oxyura jamaicensis*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1B,S2S3M	2.4 ± 1.0
Lesser Scaup	*Aythya affinis*	COSEWIC: No Status SARA: No Status	1.3 ± 1.0

Table 2: Vertebrate Animals SAR Identified within 5km of the Site
Client: NB Department of Tourism, Heritage and Culture
Site Location: Parlee Beach, Pointe-du-Chêne, New Brunswick
Englobe Project No.: 2106010

		NB Legal Status: No Status Provincial Rarity Rank: S1B,S4M	
Greater Scaup	*Aythya marila*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1B,S4M,S2N	2.4 ± 1.0
Black-headed Gull	*Chroicocephalus ridibundus*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1N,S2M	0.5 ± 0.0
Brant	*Branta bernicla*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1N,S2S3M	1.3 ± 1.0
Black-crowned Night-heron	*Nycticorax nycticorax*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1S2B,S1S2M	0.5 ± 0.0
Baird's Sandpiper	*Calidris bairdii*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S1S2M	4.2 ± 0.0
Northern Mockingbird	*Mimus polyglottos*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2B,S2M	2.5 ± 5.0
Gadwall	*Mareca strepera*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2B,S3M	1.0 ± 0.0 9
Solitary Sandpiper	*Tringasolitaria*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2B,S5M	2.2 ± 0.0
Snow Goose	*Anser caerulescens*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2M	2.4 ± 1.0
Great Cormorant	*Phalacrocorax carbo*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2N,S2M	1.3 ± 1.0
King Eider	*Somateria spectabilis*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2N,S2M	0.5 ± 0.0
Glaucous Gull	*Larus hyperboreus*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2N,S2M	1.3 ± 1.0
Northern Shoveler	*Spatula clypeata*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2S3B,S2S3M	2.4 ± 1.0
Great Crested Flycatcher	*Myiarchus crinitus*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2S3B,S2S3M	3.6 ± 7.0
Cliff Swallow	*Petrochelidon pyrrhonota*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2S3B,S2S3M	0.5 ± 0.0
American Golden-Plover	*Pluvialis dominica*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2S3M	0.5 ± 0.0
Red Crossbill	*Loxia curvirostra*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S2S3N,SUM	4.2 ± 1.0
Black Scoter	*Melanitta americana*	COSEWIC: No Status	0.5 ± 0.0

Table 2: Vertebrate Animals SAR Identified within 5km of the Site
Client: NB Department of Tourism, Heritage and Culture
Site Location: Parlee Beach, Pointe-du-Chêne, New Brunswick
Englobe Project No.: 2106010

		SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S3M,S1S2N	
Sanderling	*Calidris alba*	COSEWIC: No Status SARA: No Status NB Legal Status: No Status Provincial Rarity Rank: S3S4M,S1N	0.3 ± 0.0

Table 3: Locatio Sensitiv Species
Client: B Departme t f Touris , Herita e a d Culture
Si e Location: Par ee Bea h, Pointe-du-Chê e, ew Brunswick
Engl be Proj ct N .: 2106010

Common Name	Scientific Name	Current Status	Distance
Bald Eagle	*Haliaeetus leucocephalus*	COSEWIC: Not At Risk SARA: No Status NB Legal Status: Endangered Provincial Rarity Rank: S4	0 5 ± 0.0
Peregrine Falcon-anatum/tundrius pop	*Falco peregrinus pop. 1*	COSEWIC: Not At Risk SARA: Special Concern NB Legal Status: Endangered Provincial Rarity Rank: S1B,S3M	2.4 ± 1.0

Appendix H WESP-AC

CoverPage: Basic Description of Assessment

Site Name:	**Parlee Beach Provincial Park**	
Investigator Name:	Alexis Robitaille	
Date and Time of Field Assessment:	2021-07-18	
Time and Height (m) of High Tide on this date near this location	1 5m at 5:12	1 3 m at 18:25
Time and Height (m) of Low Tide on this date near this location	0 8m at 12:32	1 1m at 22:12
Latitude (decimal degrees):	46 240023°	
Longitude (decimal degrees):	64 513766°	
Is a map based on a formal on-site wetland delineation available?	Yes	
What percentage (approx) of the entire wetland polygon, as shown on the Province's map, could you see well enough to answer most of the Form T questions? i e , the Assessment Area	100	
Indicate here if you intentionally surveyed for rare plants or rare animals:	Yes	
Were you able to ask the site owner/manager about any of the questions?	No	
Have you attended a WESP-AC training session? If so, indicate approximate month & year	Yes in April 2018	
How many **tidal** wetlands have you assessed previously using WESP-AC? (approx)	5	
Attach an aerial or map showing the approximate boundary of the AA, if smaller than the entire tidal wetland polygon mapped by the province.	See Figure 2 - Delineated Wetland	

Comments about the site or this WESP-AC assessment (attach extra page if desired):

A B C D E

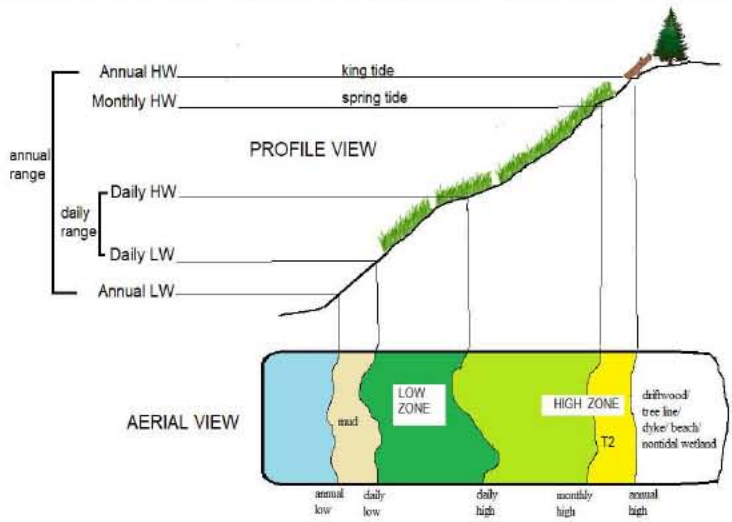
Form OF. WESP-AC for Tidal Wetlands version 2.

#	Indicator	Condition Choices	Data	Explanations
OF1	Province	Mark the province in which the wetland is located by changing the 0 in the column next to it to a "1". Mark only one.		In the automated calculations, this is used as a tag that causes the data to be normalised to the correct province.
		New Brunswick	1	
		Prince Edward Island	0	
		Nova Scotia	0	
		Newfoundland-Labrador	0	
OF2	Upland Edge Contact [UpContact]	Viewing the wetland in Google Earth or other aerial imagery, select one		In this data form, the terms *abut adjoin adjacent contiguous bordering* are used interchangeably. [WP, OX, SRH, WS]
		The wetland has no upland edge (or upland is <1% of perimeter). The wetland is entirely surrounded by (& contiguous with) water or other wetland.	0	
		0-25% of the wetland's perimeter abuts upland (including berms, sand spits, & filled areas). The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	
		26-50% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland.	0	
		51-75% of the wetland's perimeter abuts upland. The rest adjoins other wetlands or water that is mostly wider than the wetland. This will be true for many tidal wetlands.	0	
		More than 75% of the wetland's perimeter abuts upland. Any remainder adjoins other wetlands or water that is mostly wider than the wetland. Highly sheltered wetlands.	1	
OF3	Marsh Width [Width]	Including any adjacent marsh (whether tidal or not, separated by narrow berm or not), the wetland's vegetated width **at the widest point** measured as straight-line distance along the approximate runoff flow path (line semi-perpendicular to nearby wide channel, bay, or ocean; see example in Appendix B) is		See Appendix B for example. It is recognized that average or predominant marsh width would usually be a more predictive indicator than maximum marsh width. Maximum width is specified because it is easier for users to recognize and measure. [SS, WP, WH, SRH, BM, WS]
		<10 m.	0	
		10 - 50 m.	0	
		50 - 100 m.	1	
		100 - 1000 m (1 km).	0	
		1- 2 km.	0	
		>2 km.	0	
OF4	Marsh Area [Area]	Including both the wetland and all adjacent wetland (whether tidal or not, separated by berm or not), the total wetland area is		Throughout this data form, in the unlikely event that a measured value falls exactly on the break point between two successive choices, (e.g., 0.1-0.5 ha and 0.5-1 ha, and the area is exactly 0.5 ha), choose the higher of the two ranges. [SS, WP, WH, SRH, BM]
		<0.1 ha.	0	
		0.1 - 0.5 ha.	0	
		0.5 - 1 ha.	0	
		1.0 - 10 ha.	1	
		10 - 100 ha.	0	
		> 100 ha.	0	
OF5	Wave Exposure [Waves]	Part of the wetland is occasionally exposed to waves from a stretch of open subtidal water that is considerably wider than the wetland, and those waves are likely to force flooding of the wetland higher and deeper than usually caused by tides alone. See example in Appendix B. Enter 1= yes, 0= no.	1	See Appendix B for example. Sites adjoining the ocean or large bays are most vulnerable; sites on rivers seldom are. Disregard the direction of the prevailing or storm-driven winds. If the wetland is behind a sand spit or artificial berm evaluate whether that is likely to be breached at least once annually by waves. [OX, WH, WS]
OF6	Branched Tidal Channels [TideChan]	Small "blind" channels (not connected to freshwater streams) are		See Appendix B for examples. [OX, FH, WH]
		Absent.	0	
		Present, but multibranched networks are few and/or not well developed.	1	
		Present, and multibranched networks are extensive and well developed (see example in Appendix B).	0	
OF7	Rivers and Tributaries [Tribs]	Select first true statement. The wetland		See Appendix B for examples. [OX, FH, WH, WS]
		Is inundated daily by water from a major river (channel extends >5 km inland with no fish blockages insofar as is known, large watershed).	0	
		Is inundated **only** by a mapped perennial stream (channel extends <5 km inland, smaller watershed).	0	
		Neither of above, but a mapped stream or river is within 1 km.	1	
		None of the above.	0	
OF8	Distance to Freshwater Pond [DistLake]	The distance to the nearest freshwater pond larger than 1 hectare is [Note Lakes and marshes and fens that remain flooded year-round may be included].		[WH]
		< 1 km.	0	
		1 - 2 km.	0	
		2 - 3 km.	0	
		3 - 5 km.	1	
		> 5 km.	0	
OF9	Distance to Road [DistRd]	The distance from the AA edge to the nearest road or parking lot that could contribute runoff to the wetland is		[BM]
		< 2 m.	1	
		2 - 10 m.	0	
		10 - 30 m.	0	
		30 - 100 m.	0	
		> 100 m, or roads that could contribute runoff to the wetland are absent.	0	
OF10	Distance to Nutrient or Contaminant Source [DistPollu]	The distance to the nearest fertilised lawn or row crops, residence with a septic system, pasture with livestock, drained peatland, or other feature that could contribute elevated levels of nutrients and/or contaminants to the wetland, is		[BM]
		< 10 m.	1	
		10 - 20 m.	0	
		20 - 50 m.	0	
		50 - 100 m.	0	
		> 100 m, or features that could contribute contaminated runoff to the wetland are absent.	0	
OF11	Developed Land in Runoff Contributing Area [BuffPctDevel]	Within 100 m upslope from the wetland's upland edge, the percentage that is pavement, buildings, lawn, or drained land is		[BM]
		None or trace (<1%).	0	
		1- 10%.	0	
		10 - 25%.	0	
		25 - 50%.	1	
		50 - 75%.	0	
		> 75%.	0	
OF12	Open Land in Vicinity [Openland]	Within a circle of radius 5 km centered on the wetland, the percentage (excluding any ocean or bay) that is cropland, marsh, lakes, ponds, or grassland is [Note Do not include bogs or newly mined lands as "open land".]		[WH]

A	B	C	D	E
		none or trace (<1%).	0	
		1- 10%.	0	
		10 - 25%.	0	
		25 - 50%.	1	
		50 - 75%.	0	
		> 75%.	0	
OF13	Salt Marsh Landscape [Wetscape]	Along the shoreline within the 5 km circle, the percentage of the shoreline that is mapped as salt marsh (including this one) is [Note "Shoreline" is the line defined by permanent flooding. Channels count as shoreline if wider than the marshes they intersect or adjoin.]		[FH, WH, SRH, BM]
		<1%.	0	
		1 - 10%.	0	
		10 - 25%.	0	
		25 - 50%.	0	
		> 50%.	1	
OF14	Slope Nearby [Spread]	As viewed in the Toporama map (http //www.atlas.gc.ca/toporama/) at maximum zoom, 10 m vertical interval, there is a **topographic contour line** within 1 km of the wetland's upland edge or within a distance that is less than the wetland's maximum width. See example in Appendix B. Enter 1= yes, 0= no.	0	See Appendix B for illustrated example. Although this indicator's assessment procedure is far too coarse to be definitive, it is used to support the principle that tidal wetlands adjoined by steep topography are less able to "migrate" inland in response to future rise in sea level. Better information on local effects of sea level rise will be available for some communities -- check likely sources and use that to respond to this question if possible. [WS]
OF15	Tidal Inflow Restriction [Restrict]	Man-made berms, levees, or dykes which limit tidewater movement into a part of the AA that historically would have experienced daily tidal flooding are [Note Restriction by natural sand or gravel spits or beaver dams does not count. Restriction by culverts and tidegates does count.]		[OX, FH, WS]
		Absent (but a levee or berm may separate tidal wetland and **upland**).	0	
		Present, and tidal inflow is mildly affected. If external waters are saline, then characteristic salt marsh vegetation still dominates within the wetland but restriction may have allowed invasion by cat-tail, bulrush, or other freshwater-associated plants, although usually only a relatively small proportion of the wetland is affected.	0	
		Present, and tidal inflow is strongly affected. If external waters are saline, restriction has eliminated or greatly reduced characteristic salt marsh vegetation or such species are largely confined to limited areas near saltwater inflow points. Also mark this choice if fish cannot enter the wetland from marine waters due to blockage by tidegate or improperly placed culvert.	0	
OF16	Ditching [Ditch]	Ditches, artificially straightened channels, and/or channel connectors are		See Appendix B for illustrations. [WP, FH]
		Absent.	0	
		Present, but few and localized within the wetland.	0	
		Present, and a few large/long ditches or a dense network in at least part of the wetland.	1	
OF17	Soil Compaction [SoilCompac]	Vehicle tracks in the mud or flattened vegetation suggest construction equipment or ATVs have entered the wetland, or there are remnants of old dykes within the wetland.		[WP]
		Absent.	0	
		Present, but few and localized within the wetland.	1	
		Present, and extensive & widely distributed within the wetland.	0	
OF18	Tidal Range [TideAmp]	Mark the annual tidal range (most extreme tide range on any day during the year) by going to this web site **http://tides.gc.ca/eng/data/predictions**, selecting the tide station nearest the wetland which has data for May 6-8, 2016, and then calculating the height difference between the highest high tide and lowest low tide on those dates.	0.7	It is important to specify the year 2016 because the range that WESP-AC uses to normalise your tide data is based on those dates in that year. Ideally, this indicator would be based on 19 years of tidal data at each location, but that was not easily available during WESP-AC development. [OX, FH, WS]
OF19	Barrier Island	The wetland is within 1 km of a barrier island with >1 ha bare or sparsely vegetated area, and with no occupied buildings. Enter yes= 1, no= 0.	0	See Appendix B for example. [WH]
OF20	Growing Degree Days [GrowDays]	Open Google Earth and click on the GDD.kmz file, navigate to your site's location, and click its associated grid cell. The "grid code" is the Growing Degree Days value. Enter that number in the next column. If grid does not include your site, use value from the closest grid cell.	2273	[OX, WH]
OF21	Conservation Designation [ConsDesig]	The wetland is all or part of an area designated by the provincial government or the Nature Conservancy of Canada for its exceptional ecological features or highly intact natural conditions. Enter yes= 1, no= 0. In NB With GeoNB, click on Candidate PNA Map Viewer to identify Environmentally Significant Area, Protected Natural Area. In NS With Provincial Landscape Viewer, see Protected Areas.	1	"Provincially Significant Wetlands" (a NB designation) is not part of this question because all NB tidal wetlands have been so designated. [PUR]
OF22	Conservation Investment [ConsInvest]	The wetland is part of or contiguous to a wetland on which public or private organizational funds were spent to preserve, create, restore, or enhance the wetland (excluding mitigation wetlands). Ask the property owner. Enter yes= 1, no= 0. If no information, change to blank.	1	Do not include lands that were preserved for reasons mainly unrelated to the wetlands they contain. [PUR]
OF23	Mitigation Investment [MitInvest]	The wetland is all or part of a mitigation site used explicitly to offset impacts elsewhere. Ask the property owner. Enter yes= 1, no= 0. If no information, change to blank.	0	[PUR]
OF24	Sustained Scientific Use [SciUse]	Plants, animals, or water in the wetland have been monitored for >2 years, unrelated to any regulatory requirements, and data are available to the public. Or the wetland is part of an area that has been designated by an agency or institution as a benchmark, reference, or status-trends monitoring area. Ask the property owner. Enter yes= 1, no= 0. If no information, change to blank.	0	[PUR]
OF25	Species of Conservation Concern [RareFish, RareOther, RareWbird, RareSbird, RarePlants]	Within the past 20 years, in the wetland (or in similar tidal habitat within 1 km of the wetland), qualified observers have documented [mark all applicable]		Augment your own knowledge (and optional surveys) with a data request to the ACCDC and contacts with knowledgeable local experts. [FH, WH, BM]
		Presence of one or more of the **plant** species listed in the TidalPlants_Rare worksheet of the accompanying SuppInfo file.	2	
		Presence of one or more of the **fish** species listed in the TidalFish_Rare worksheet of the accompanying SuppInfo file.	0	
		Presence of one or more of the **waterbird** species of conservation concern as listed in the TidalWaterbirds_Rare worksheet of the accompanying SuppInfo file.	10	
		Presence of one or more of the **songbird, raptor, or mammal** species of conservation concern as listed in the TidalSongbird_Rare worksheet of the accompanying SuppInfo file, during their nesting season (May-August for most species).	5	
		Presence of one or more **other** species of conservation concern as listed in the Tidal_Others_Rare worksheet of the accompanying SuppInfo file.	0	
		None of the above, or no data.	0	
OF26	Important Bird Area or Ramsar wetland [IBirdArea]	The wetland is all or part of an officially designated Important Bird Area (IBA) or a Wetland of International Importance (Ramsar wetland). Enter 1= yes, 0= no.	0	Ramsar is an international convention which has a formal nominating and voting procedure for recognising wetlands of international significance. Currently, Atlantic Canada has 8 such areas. For boundaries, see http //www.ramsar.org/wetland/canada. IBAs are designated by the American Bird Conservancy based on nominations from local experts. For boundaries, open the KMZ file that accompanies this calculator, called IBAs Canada. [WH]
OF27	Wetland Bird Concentration Area [BirdConc]	In this wetland or adjacent intertidal habitat, review existing data (online at ebird.org) or conduct your own surveys. If numbers of individual birds have exceeded those shown for the same species in the BirdCriteria worksheet, or if the wetland is within an area listed in the BirdHotspots worksheet, enter yes= 1, no= 0. For NS and NB, also open the NB-NS Shorebirds KMZ file that accompanies this calculator to determine if the wetland is within 1 km of any of those places.	0	[WH]
OF28	Black Duck Nesting Area [Bduck]	Open Google Earth and then open and overlay the BlackDuck.kmz file. If necessary adjust its alignment and opacity. The predicted density (pairs per 25 sq. km) of nesting American Black Duck in the vicinity of the wetland is		A hard-copy version of the same map is in Appendix A of the Manual and may be easier to read. [WH]
		<10.	1	
		10 to 20.	0	
		20 to 30.	0	
		>30.	0	
		No information (off the map).	0	

Form T. WESP-AC for Tidal Wetlands version 2.

IMPORTANT: Review the diagram below and text in last column before answering the questions You will need to estimate boundaries of the zones of your wetland in order to answer those questions accurately



First, estimate the full extent of the wetland (Low Zone + High Zone) If visiting at **high tide**, be sure to include emergent vegetation that is underwater (i e , Low Zone), estimating its seaward edge by interpreting topography, reviewing any maps or aerial imagery taken at low tide, or asking neighbors how far out the vegetation extends at low tide Also estimate it by noting, from tide tables, today's tide range nearest this location and visually subtracting that height from where you see water beneath plants at high tide If you are visiting closer to daily **low tide**, determine the lower boundary of the High Zone by looking for recent (wet) deposits of wrack (dead plants & debris carried into the site and deposited, often clinging to stems of living vegetation beneath its canopy) to define the upper limit of the day's high tide

The Low Zone is typically dominated by smooth cordgrass (Spartina alterniflora) and sometimes glasswort (Salicornia) in the near-absence of saltmeadow cordgrass (Spartina patens), goose-tongue (Plantago maritima), and most other vascular plant species However, in freshwater tidal wetlands these plants will be mostly absent, so in those situations it will be necessary to use water marks, wrack, and local tidal range to approximate the lower edge of the High Zone

The lower boundary of the T2 (yellow) portion is difficult to distinguish unless visiting during a monthly or annual high tide This is typically where saltmeadow cordgrass and goose-tongue lower in the wetland give way to semi-terrestrial plants such as beach pea, rose, dock, yarrow, vetch, clover in a landward direction Well-weathered wrack deposits sometimes mark the lower boundary, and the zone sometimes occurs above a visible change in the marsh surface profile, or behind a low dyke, berm, or barrier beach that is overtopped by tidewater only rarely

#	Indicator	Categorical Choices	Data	Explanations
T1	High Zone Extent [PctHigh]	The percentage of the wetland's vegetation that has NO tidal water beneath it during most daily high tides of the year (i e , the HIGH ZONE) is:		See diagram and note in header above This is the percentage that the High Zone comprises of the combined Low + High Zone (light green shading in diagram) [SS, OX, FH, WH, SRH, WS]
		None, or <1% and narrower than 2 m	0	
		1-10%	0	
		10-25%	0	
		26-50%	0	
		51-75%	1	
		75-90%	0	
		>90%	0	
T2	Extreme High as % of Entire High Zone [PctKing]	Within the High Zone (i e , the part of the wetland you can still see at daily high tide), the percentage that is flooded only monthly or even less often (T2 yellow area in the above diagram) is:		See diagram and note in header above This is the percentage that the T2 zone comprises of the entire High Zone [SS, FH, SRH, WS]
		<10% of the High Zone	0	
		10-25% of the High Zone	0	
		26-50% of the High Zone	0	
		>50% of the High Zone	1	
T3	Bare Ground or Thatch: High Zone [Bare]	The ground condition in the HIGH ZONE, as it would exist in late summer and **when viewed from about 1 m above the ground**, is:		Note that this is being assessed on two scales: up-close (from 1 m above) and overall (patches of bare/thatch) "Bare" **does not include mud flats** adjacent to the wetland **or tidal channels** within it (because they would be flooded daily and thus outside of the High Zone) **Do not count wrack (drifted-in material) as "thatch."** The amount of thatch (which counts as Bare) varies seasonally and annually, so consider just the condition that would exist **in late summer** [OX]
		Little or no (<5%) *bare ground* or dead *attached* plant material (thatch) is visible between erect stems or under canopy This can occur if ground surface is extensively blanketed by graminoids with great stem densities	0	
		Some (5-20%) bare ground or thatch is visible Herbaceous plants have moderate stem densities	1	
		Much (20-50%) bare ground or thatch is visible Low stem density and/or tall plants with little near-ground foliage	0	
		Mostly (>50%) bare ground or thatch	0	
T4	Salt Pannes & Pools [Pans]	Within the High Zone, the number of pannes and pools (natural semi-circular depressions or ponds with radius >1 m which hold stagnant surface water between high tides, and may be flooded by tides only infrequently) is: [Note: Check the aerial image before answering this]		These are unlikely to be present in freshwater tidal wetlands [FH, WH]
		Few (<2 per hectare) or none	0	
		Intermediate	1	
		Several (>5 per hectare)	0	
T5	Forb Cover [Forbs]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of forbs reaches an annual maximum of:		Forbs are mostly flowering plants, such as seaside plantain (goose-tongue, *Plantago*), arrowgrass (*Triglochin*), grasswort (*Salicornia*), aster, and silverweed Cattail, bulrush, sedges, and other grasslike plants are **not** forbs [SRH, BM]
		<1% of the herbaceous cover	0	
		1-25% of the herbaceous cover	1	
		25-50% of the herbaceous cover	0	
		50-95% of the herbaceous cover	0	
		>95% of the herbaceous cover	0	
T6	Shrub Cover [Shrubs]	In the High Zone (and entirely within the TIDAL wetland), living woody vegetation shorter than 3 m and not beneath a tree canopy comprises:		Include beach pea, rose, and others (and in freshwater tidal wetlands include alder, willow), but do not include upland shrubs that are never flooded by tides [SRH]
		<1% (or none) of the vegetated area reached only by monthly or annual high tide	1	
		1-5% of the vegetated area reached by monthly or annual high tide	0	
		5-25% of the vegetated area reached by monthly or annual high tide	0	
		>25% of the vegetated area reached by monthly or annual high tide	0	
T7	Perches [Perch]	Within the wetland, objects that project >1 m above the ground surface and could serve as perches (e g , fenceposts, utility poles, boardwalks, goose nesting structures, stumps, boulders, islands of shrubs or trees) are:		Do not include trees or other perches on the wetland edge but outside the wetland [WH]
		Few (<1 per hectare) or none	1	
		Intermediate	0	
		Several (>3 per hectare)	0	
T8	Plant Species Dominance [Pdom]	In the High Zone, the 2 most common vascular plant species together comprise:		For example, if smooth cordgrass and saltmeadow cordgrass together cover >80% of the High Zone, as is often the case, the last choice is correct But if goose-tongue (*Plantago martima*) is also substantially present, the third or fourth choice might be better [BM]
		<20% of the zone's vegetated area (most species-rich, no dominants or co-dominants)	0	
		20-40% of the zone's vegetated area	0	
		40-60% of the zone's vegetated area	0	
		60-80% of the zone's vegetated area	0	
		>80% of the zone's vegetated area (monotypic or nearly so)	1	

T9	Exotic Plant Cover [Invas]	In the High Zone (and entirely within the TIDAL wetland), the areal cover of exotic plants (just the species in last column) is:		Ones known to be present in at least one of this region's tidal wetlands are: purple loosestrife (*Lythrum salicaria*), reed canary-grass (*Phalaris arundinacea*), brassbuttons (*Cotula coronopifolia*), grassleaf orache (*Atriplex littoralis*), Japanese rose (*Rosa rugosa*), Canada thistle (*Cirsium arvense*), branched centaury (*Centaurium pulchellum*), flowering rush (*Butomus umbellatus*) [BM]
		None, or trace	1	
		1-5% of the herbaceous cover	0	
		5-25% of the herbaceous cover	0	
		25-50% of the herbaceous cover	0	
		>50% of the herbaceous cover	0	
T10	Core Area 1 [NoVis]	The percentage of the High Zone almost never visited by humans during an average growing season probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge In that case include only the area occupied by the trail]		[WH, PUR]
		<5% and no inhabited building is within 100 m of the wetland	0	
		<5% and inhabited building is within 100 m of the wetland	0	
		5-50% and no inhabited building is within 100 m of the wetland	0	
		5-50% and inhabited building is within 100 m of the wetland	1	
		50-95%	0	
		>95% of the High Zone This is the most frequent choice for tidal wetlands in this region	0	
T11	Core Area 2 [MuchVis]	The percentage of the High Zone visited by humans almost daily for several weeks during an average year probably comprises: [Note: Do not include visitors on trails outside of the wetland unless more than half the wetland is visible from the trails and they are within 30 m of the wetland edge In that case include only the area occupied by the trail]		[WH, PUR]
		<5% This is the most frequent choice for tidal wetlands in this region, except in some visited often by many hunters	0	
		5-50%	1	
		50-95%	0	
		>95% of the High Zone	0	
T12	Visibility [Visibil]	The maximum percent of the wetland that is visible from the best vantage point on public roads, public parking lots, public buildings, or public maintained trails that intersect, adjoin, or are within 100 m of the wetland is (select one):		[PUR]
		<25%	0	
		25-50%	0	
		>50%	1	
T13	Consumptive Uses (Provisioning Services) [Consump]	Recent evidence was found within the wetland of the following potentially-sustainable consumptive uses Mark all that apply		Do not speculate Base this on evidence, which may include communication with landowner or other knowledgeable source [PUR]
		Haying	0	
		Grazing	0	
		Shellfish or bait worm harvest	0	
		Waterfowl hunting or furbearer trapping	0	
		Fishing	0	
		None of the above (no evidence)	1	
T14	Soil Texture [SoilTex]	The texture of soil in the **upper**most layer, but excluding live roots, in the majority of the HIGH ZONE, is:		See chart at end of Appendix A Check the soil at one or more locations away from the wetland edge and that seem representative of the whole [WS]
		Loamy: soils that may contain a little fine grit and do not make a "ribbon" longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger	0	
		Fines: includes silt, clay, silt, soils that make a ribbon longer than 2 cm when moistened, rolled, squeezed, and extended between thumb and forefinger	0	
		Organic	0	
		Coarse: includes sand, loamy sand, gravel, cobble, soils that do not make a ribbon when moistened, rolled, squeezed, and extended between thumb and forefinger	0	
T15	Salinity	Was surface water salinity measured? If yes, continue with next question If no, **go to T17.**		
T16	Measured Salinity [Salin]	The surface water salinity along the wetland's seaward edge is: [Insert reading in next column, in parts per thousand; 1 ppt = 1000 ppm = 1000 mg/L]		Measure this as far as possible from fresh tributaries and seeps, and well below the water surface While measuring, wait until salinity readings have stabilised It is recognized that salinity at some locations will vary greatly by tide, currents, time of year, and recent precipitation [OX, WH, SRH, BM, WS]
T17	Inferred Salinity [SalinClass]	Based on the wetland's dominant plant species (see the PlantList worksheet) and proximity to contributing freshwater rivers and streams, the summertime salinity in most of the wetland is likely:		Note: ppt = parts per thousand 1 ppt = 1000 mg/L [OX, WH, SRH, BM, WS]
		Oligohaline (mostly fresh or slightly brackish plants, usually < 5 ppt)	0	
		Mesohaline (brackish)	0	
		Euryhaline (few or no freshwater plants, near seawater strength, usually >30 ppt)	1	
T18	Plant Richness [PlantRich]	See the PlantList worksheet If you have the skills to identify ALL the plants, survey as much of the wetland as time and safety allow In the worksheet, mark with a "1" the species you find The number of species will be automatically tallied Transfer that number to the next column If you are not confident of your skills to identify ALL the species or for other reasons cannot survey the plants, leave a "0" in the next column	0	It is recognized that not all WESP-AC users are capable of identifying all the species on the PlantList worksheet, but leaving a 0 in column D will not automatically reduce a score This question is used to assess only one function (Biodiversity) and accounts for less than 7% of the score for that and that is only for one function (Biodiversity) Results will vary by month of the year and level of effort [BM]

WESP-AC version 2 for Tidal Wetlands of Atlantic Canada

	New Brunswick		Nova Scotia		Prince Edward Island		Newfoundland-Labrador		
Functions or Attributes	Normalised Score	Rating	Normalised Score	Rating	Normalised Score	Rating	Normalised Score	Rating	Raw Score
Storm Surge Interception (SS)	4.57	Moderate	4.90	Moderate	6.036585366	Higher	7.095435685	Higher	4.89
Water Purification (WP)	1.45	Lower	2.05	Lower	0	Lower	3.333333333	Moderate	4.78
Organic Nutrient Export (OX)	3.47	Lower	2.16	Lower	2.340897173	Lower	3.617535828	Moderate	3.65
Fish Habitat (FH)	4.36	Moderate	4.28	Moderate	4.023194508	Moderate	4.581502079	Moderate	3.10
Waterbird Habitat (WH)	2.46	Lower	2.12	Lower	0.949216774	Lower	2.847135191	Moderate	3.20
Songbird & Raptor Habitat (SRH)	5.85	Moderate	6.48	Higher	7.053571429	Higher	6.888888889	Higher	6.13
Biodiversity Maintenance (BM)	10.00	Higher	10.00	Higher	10	Higher	10	Higher	10.00
Wetland Stability (WS)	2.83	Moderate	3.76	Moderate	3.872349672	Moderate	3.827939151	Moderate	3.61
Public Use & Recognition (PUR)	7.95	Higher	7.95	Higher	8.536585366	Higher	7.954545455	Higher	5.83

NOTE: A score of 0 does not always mean the function or attribute is absent from the wetland. It usually means that this wetland has equal or less capacity than the lowest-scoring one, for that function or attribute, from among the calibration wetlands that were assessed previously in this region during development of this tool.

The Normalised Score column presents the numeric score of a function or attribute after the raw score has been mathematically adjusted (normalised) to a full 0-10 scale, based on minimum and maximum scores from among the calibration sites. See the Manual for a description of the normalisation process.

The Rating column indicates which of three rating categories (Lower, Moderate, Higher) each normalised score is assigned to. Ratings convey the relative meaning of the numeric score and allow for comparison across different functions or attributes. The score thresholds that determine the ratings differ for each row, as based on the distribution of scores for that function or attribute from among all the calibration wetlands. See the Manual for a description of the process.

Appendix E Parlee Beach Lagoon Hydrodynamics, 2021

Parlee Beach lagoon

Hydrodynamics

Project Englobe : CPS-18-19-32

Final Report

March 2022

CONSULTANTS ROPARS INC

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RESPONSABILITY LIMITATION CLAUSE

This document was prepared by Consultants Ropars Inc. in agreement with sound engineering practice and is provided exclusively for Englobe and their authorised representatives in the specific context of Parlee Beach lagoon rehabilitation project. The content of this document may not be applied or used, in whole or in part, by or to the advantage of other parts without written authorisation by Consultants Ropars Inc. No other guaranty is given, explicit or implicit.

1 Introduction

1.1 Context

Parlee Beach Lagoon is prone to sedimentation and water quality problems, due partly to the size of the lagoon and to the minimal tidal water exchanges between the lagoon and the bay. The progression of Parlee Beach dune with time tends also to close the lagoon inlet.

Figure 1.1 shows the Parlee Beach lagoon system on a 2017 aerial photo.

Figure 1.1 Parlee Beach lagoon system - 2017

1.2 Objectives of present study

The objectives of the study presented in this report are to:

- Analyse topo-bathymetry information of the lagoon,
- Analyse the water level data,
- Analyse the lagoon hydrodynamics,
- Recommend a solution to maintain the lagoon system.

2 Water levels

2.1 Data

Fisheries and Oceans Canada operate a water level station in Shediac Bay (station # 1805) since November 1971. Numerical data[1] is available from November 1971 to March 1992 and from August 2003 to June 2021. Due to the very limited data in 1971, the water level analysis was conducted on data from 1972 to 2021. The data consisted of 287 321 individual water levels.

The difference between Chart Datum (CD) and Mean Sea Level (MSL-CGVD28) is 0.65 m at Shediac Bay, CD being below MSL in this area.

Figure 2.1 presents the annual mean water level evolution at Shediac Bay between 1972 and 2021.

Figure 2.2 presents the same figure, but between 2003 and 2021.

The annual water level increase rate (relative to land benchmarks) is 3.3 mm/year between 1972 and 2021 but reaches 4.8 mm/year between 2003 and 2021.

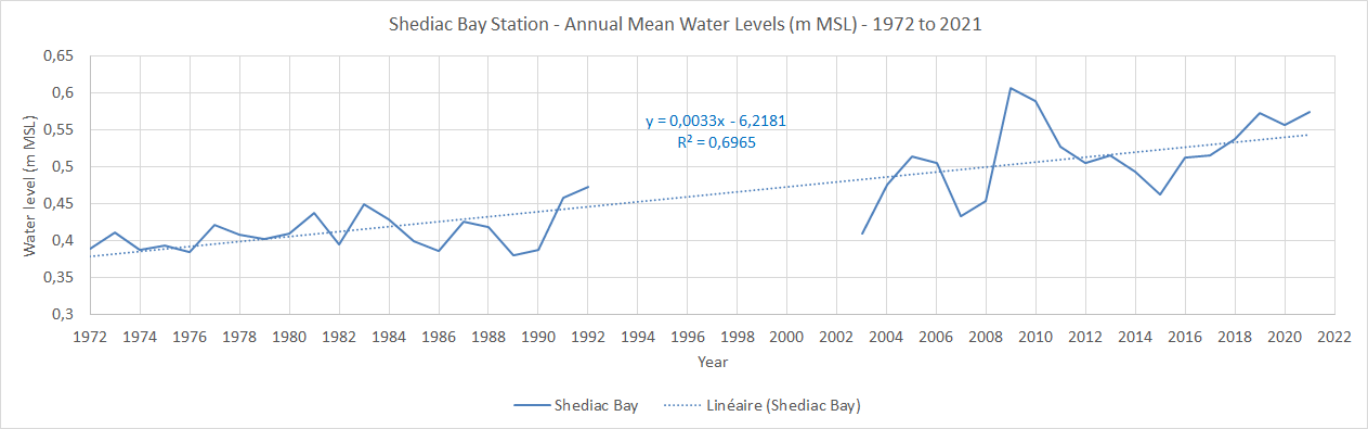


Figure 2.1 Shediac Bay – Annual mean water level evolution – 1972 to 2021

[1] https://www.isdm-gdsi.gc.ca/isdm-gdsi/twl-mne/inventory-inventaire/sd-ds-eng.asp?no=1805&user=isdm-gdsi&region=PAC#digital

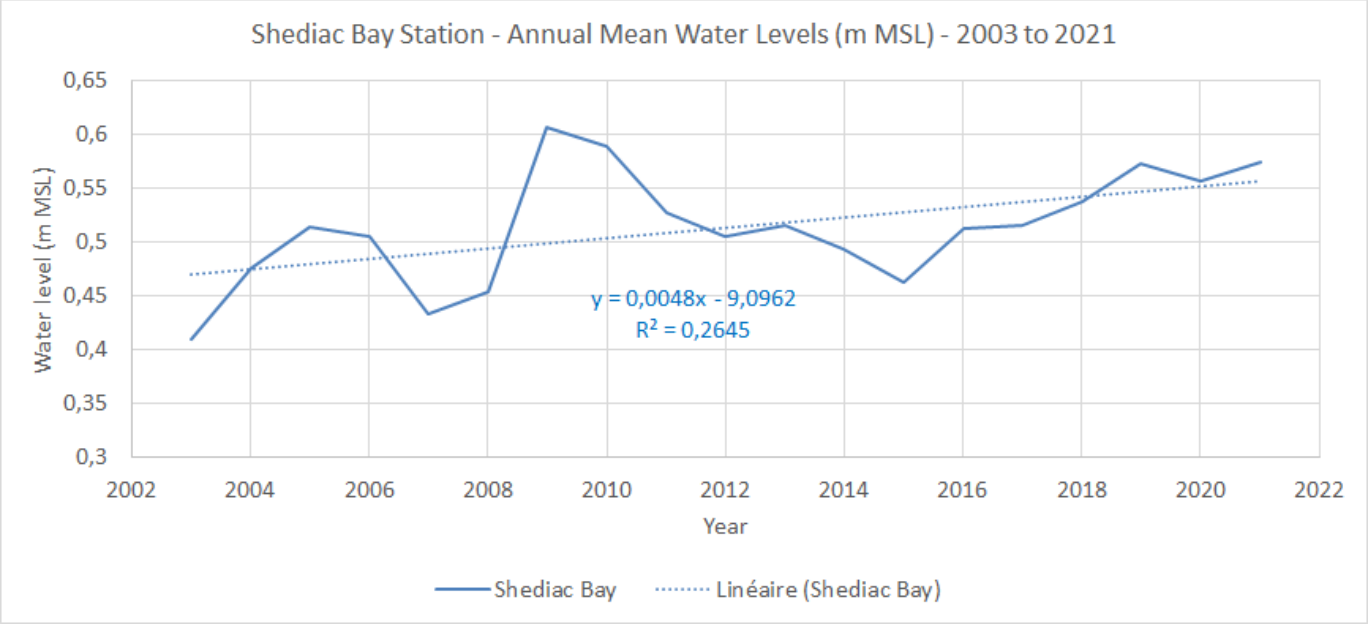


Figure 2.2 Shediac Bay – Annual mean water level evolution – 2003 to 2021

Figure 2.3 presents the annual mean, max and min water level evolution at Shediac Bay between 2003 and 2021. Three years stand out in terms of extreme high-water levels (2019, 2010 and 2004).

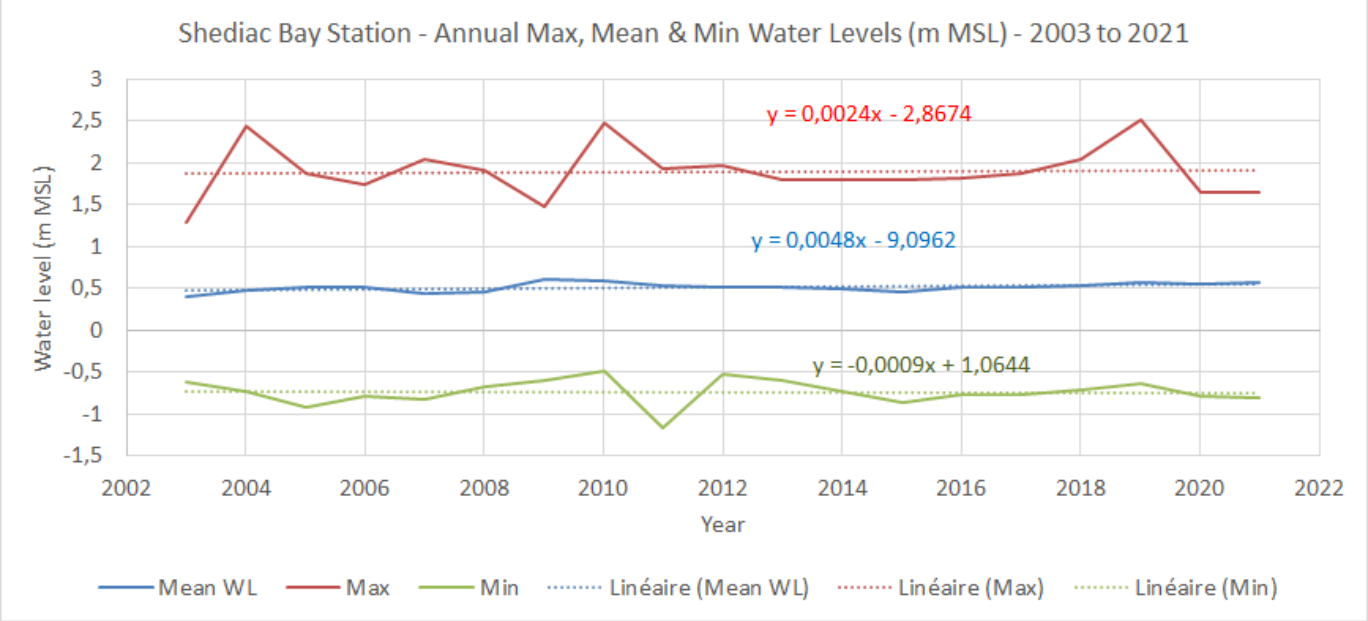


Figure 2.3 Shediac Bay – Annual mean, max and min water level evolution – 2003 to 2021

Figure 2.4 presents the extreme water levels recorded between 1972 and 2021 at Shediac Bay station. The power 3 polynomial regression is the best fit for this set of data.

According to this regression, the following figures should be selected in terms of exceedance frequency:

- 1 hour /year: +2.15 m MSL
- 1hr / 2 years: +2.31 m MSL
- 1hr / 10 years: +2.46 m MSL
- 1hr / 50 years: +2.52 m MSL

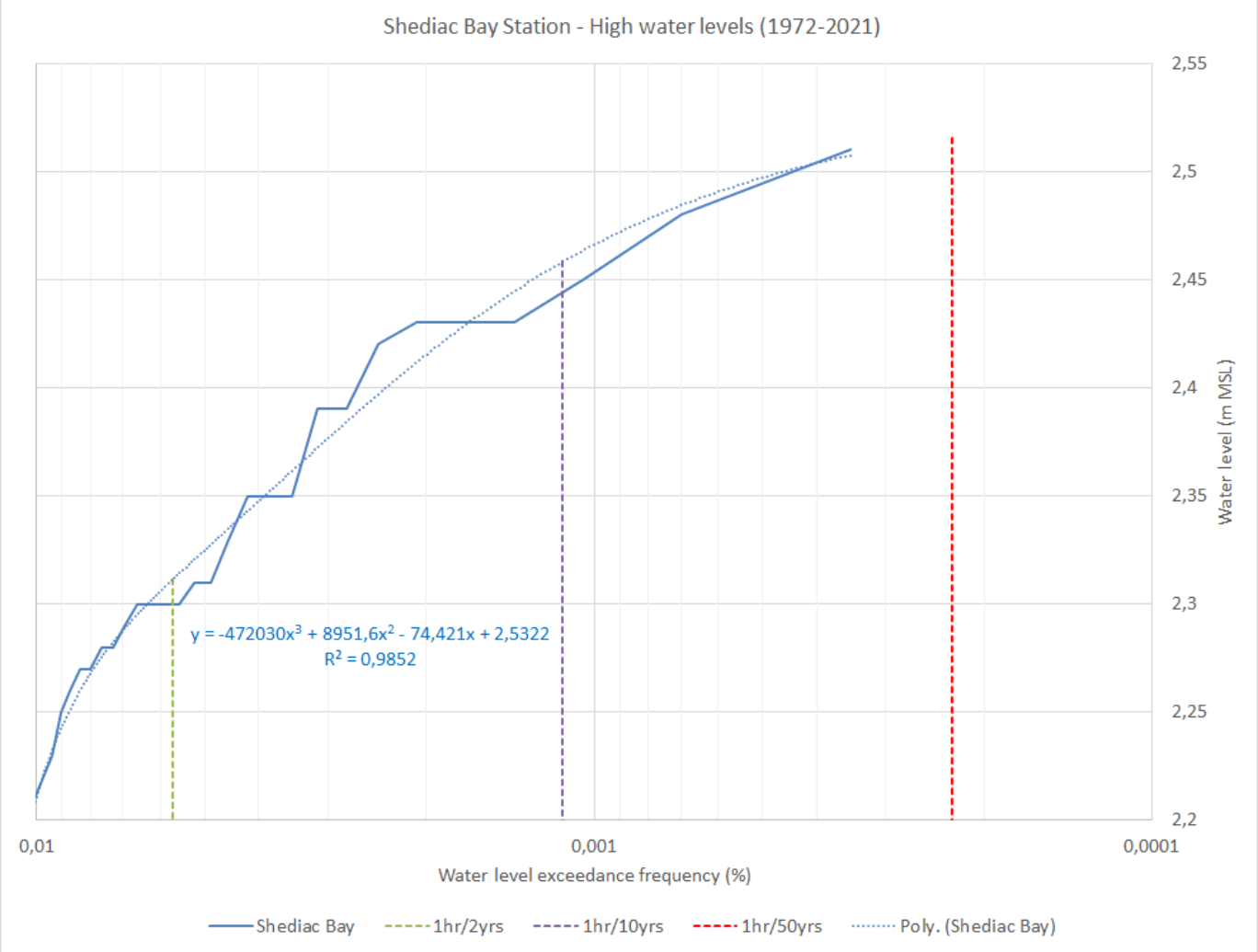


Figure 2.4 Shediac Bay – High water level exceedance frequency – 1972 to 2021

According to the available dataset, the following exceedance frequency (number of hours water is above a fixed level per year, in average) should apply to water levels in Parlee Beach area:

Table 2.1 Shediac Bay water levels exceedance frequency

Water level (m MSL)	Exceedance frequency (hours/year)
+ 2.0 m	1.9 hrs
+1.9 m	3.2 hrs
+1.8 m	5 hrs
+1.7 m	8.6 hrs
+1.6 m	14 hrs
+1.5 m	23.5 hrs
+1.4 m	37 hrs
+1.3 m	58 hrs
+1.2 m	102 hrs
+1.1 m	190 hrs
+1.0 m	367 hrs
+0.9 m	705 hrs
+0.8 m	1,311 hrs
+0.7 m	2,196 hrs
+0.6 m	3,232 hrs
+0.5 m	4,283 hrs
+0.4 m	5,230 hrs
+0.3 m	6,200 hrs

The statistical analysis of the annual max water levels is illustrated on figure 2.5. According to the polynomial regression, the following figures should be selected in terms of water level return period:

- 1 year: +1.29 m MSL
- 2 years: +1.83 m MSL
- 5 years: +2.09 m MSL
- 10 years: +2.29 m MSL
- 50 years: +2.51 m MSL

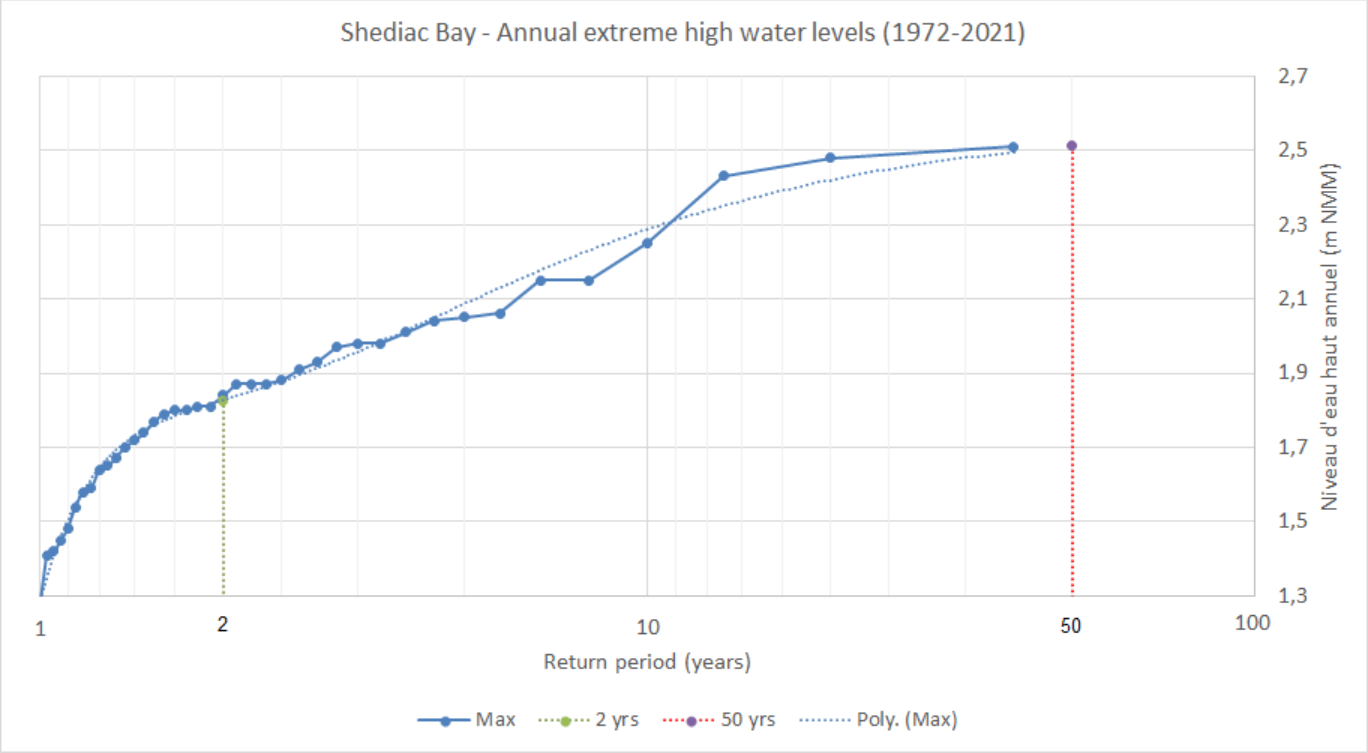


Figure 2.5 Shediac Bay – High water level return period – 1972 to 2021

2.2 Climate changes and crustal motion

Mean sea level rise[2] according to IPCC[3] and crustal motion computation by NRCan[4] have been used to get a better idea of future extreme high-water levels.

Crustal motion at Parlee Beach is 0.68 mm/year downward according to NRCan.

Data found in IPCC report dating 2021 (SSP5-8.5 scenario) tends to indicate an increase of 0.24 to 0.36 m (likely range) in the next 50 years (0.28 m projection).

This combination of sea level rise and land subsidence at Parlee Beach would result in a **water level effective increase of 0.32 m in 50 years** (0.27 m to 0.39 m likely range).

[2] Climate change 2014 – Synthesis report – Summary for policymakers (https://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_SummaryVolume_FINAL_FRENCH.pdf)

[3] Intergovernmental Panel on Climate Change

[4] http://webapp.geod.nrcan.gc.ca/geod/tools-outils/trx.php

2.3 Water level recommendations for coastal structures

This information was used to define water levels to be considered in the conception of coastal structures in the Parlee Beach area. The following characteristic water levels should be considered:

- Extreme high WL (1hr/50yrs) with CC[5] +2.84 m MSL
- Extreme high WL (1hr/50yrs) without CC +2.52 m MSL
- Extreme high WL (1hr/10yrs) +2.46 m MSL
- Extreme high WL (1hr/2yrs) +2.31 m MSL
- Extreme high WL (1hr/year) +2.15 m MSL

2.4 Tide related water levels

Tide and Current Tables edited by Fisheries & Oceans Canada give the following information for Shediac in terms of astronomical tide related water levels:

- Higher High Water Large Tide (HHWLT): +1.06 m MSL
- Higher High Water Mean Tide (HHWMT): +0.69 m MSL
- Mean Water Level: +0.39 m MSL
- Lower Low Water Mean Tide (LLWMT): -0.13 m MSL
- Lower Low Water Large Tide (LLWLT): -0.41 m MSL

Mean water level computed from data at Shediac Bay station is +0.46 m MSL (1972 to 2021). This MWL is +0.51 m if the 2003 to 2021 period is considered.

2.5 Sediment sampling

Sediment sampling was done in the Parlee Beach lagoon by Englobe in August 2021.

Figure 2.6 shows the location of the samples in the lagoon.

Figure 2.7 shows the results of the grain size analyses and figure 2.8 shows the proportions of gravel, sand and finer materials in the samples.

Sand is predominant in all the samples (SED1, SED3, SED4 and SED5), but some samples show a significant amount of silt and clay (SED2, SED6 and SED7).

[5] Climate Change + Crustal Motion

Figure 2.6 Parlee Beach lagoon sediment samples location – August 26, 2021

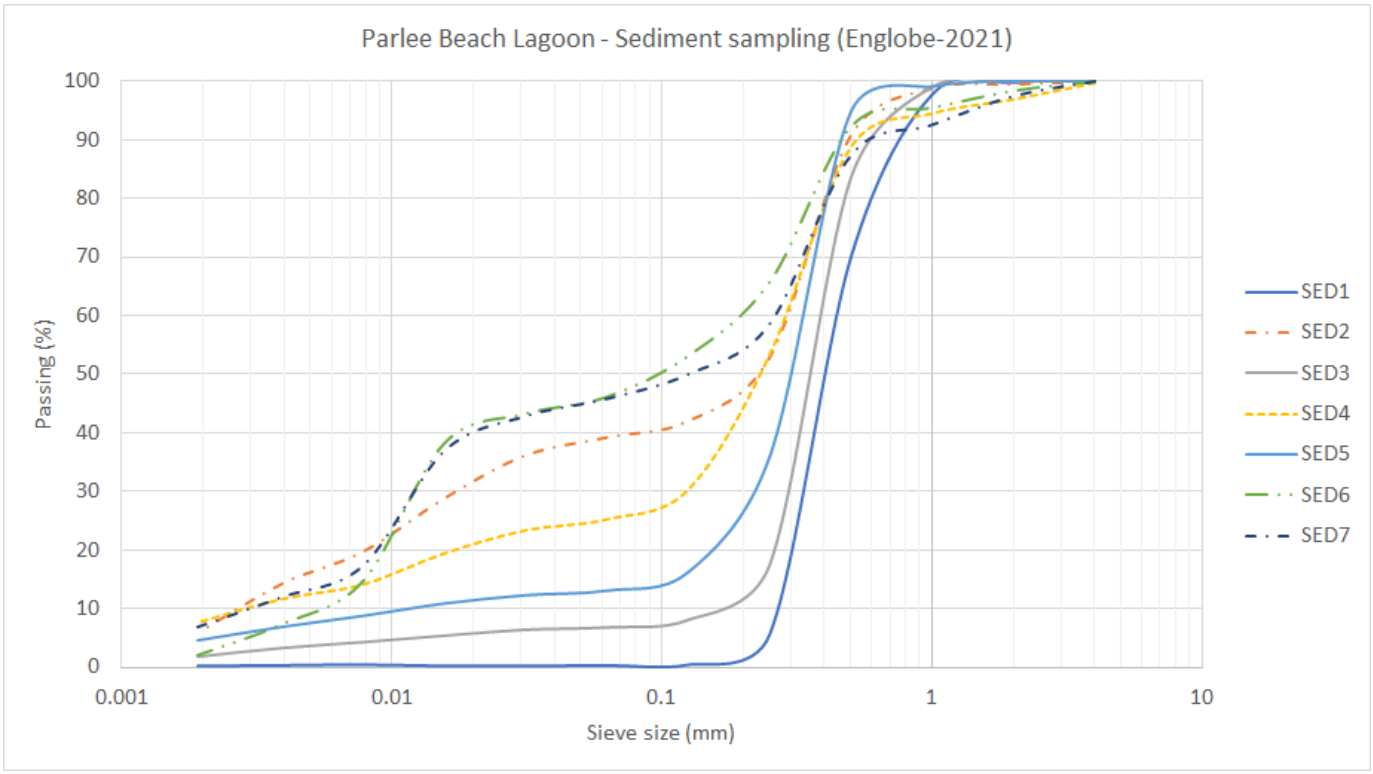


Figure 2.7 Parlee Beach lagoon sediment – Grain size analysis – August 26, 2021

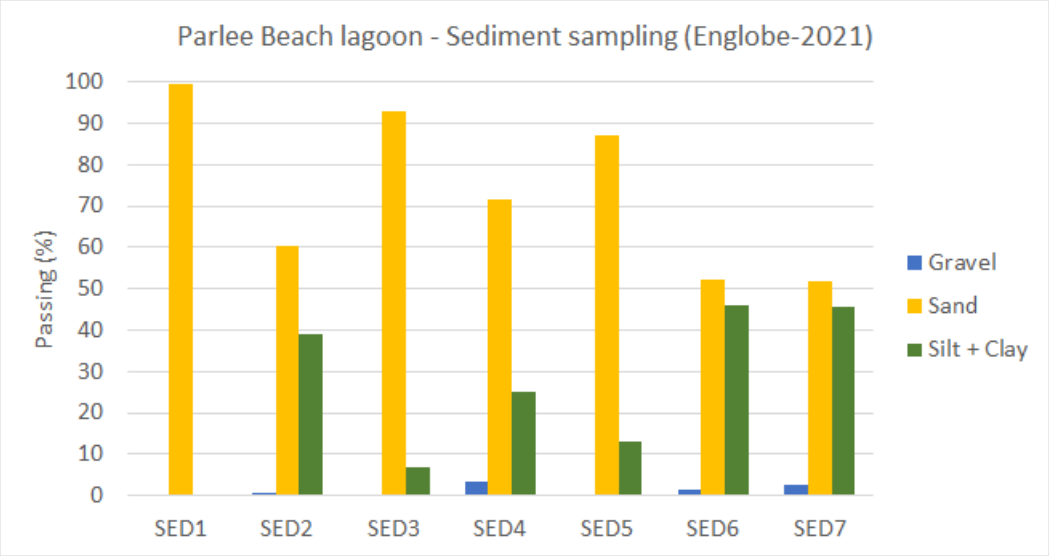


Figure 2.7 Parlee Beach lagoon sediment – Proportions of gravel, sand and fines – August 26, 2021

3 Lagoon inlet evolution

3.1 Source of data

Some historical aerial photos are available since 1953.

For more recent views of the lagoon inlet, Google Earth™ tools were used.

3.2 Aerial photos

The 1953 photo shows a beach significantly shorter in length than the present Parlee Beach. The lagoon is not very different in shape from the present situation (except for the absence of the outer lagoon).

Figure 3.1 Parlee Beach in 1953

The 1976 configuration of the beach (figure 3.2) is not very different from the 1953 situation. A new road crosses the lagoon. The lagoon inlet does not look as efficient as on the 1953 photo.

The 2001 configuration of the beach (figure 3.3) shows a westward extension of the beach and the development of parking areas. In 2012 (figure 3.4) and 2017 (Figure 3.5), the westward extension of the beach goes on and a new (outer) lagoon basin appears behind this extension. The lagoon inlet looks more efficient on the 2012 photo than on the 2017 photo.

Figure 3.2 Parlee Beach in 1976

Figure 3.3 Parlee Beach in 2001

Figure 3.4 Parlee Beach in 2012

Figure 3.5 Parlee Beach in 2017

Figures 3.6 (2019) and 3.7 (2021) show the lagoon inlet being squeezed between some stone embankment on the South side and the progressing sandy dune on the North side of the channel.

Figure 3.6 Parlee Beach lagoon inlet in 2019 (Google Earth™)

Figure 3.7 Parlee Beach lagoon inlet in 2021 (Google Earth™)

Parlee Beach is migrating westward, and the length of the lagoon increases accordingly with time.

The connection between the lagoon and the bay (the inlet) looks rather fragile, but seems to have been efficient in terms of hydrodynamics and sediment transport since the 50's.

4 Topographic data

4.1 Source of data

The projected coordinates for the project are based on the North American Datum of 1983/Canadian Spatial Reference System [NAD83 (CSRS)], New Brunswick Double Stereographic Projection with vertical datum of CGVD28.

Three sets of data were available:

- LiDAR survey done in 2013
- LiDAR survey done in 2017
- Combined photogrammetry / classic topography and bathymetry done in July 2021 (Englobe).

Transects were generated to help with the design of dredged channel and to compute quantities.

4.2 Areas of interest

The main focus of the study is on the outer lagoon and especially the channel between the outer lagoon and the bay which is prone to sedimentation due to the littoral dune topography changes with time. The following figures present the western part of the lagoon. The eastern part of the lagoon is presented in figure 4.12.

Figure 4.1 illustrates the digital terrain model obtained from the 2021 survey. The position of various transects concerning the channel and the outer lagoon is shown on this figure.

Figures 4.2 and 4.3 illustrate respectively the digital terrain models (same area and scale) obtained from 2017 and 2013 LiDAR surveys.

It is important to keep in mind that standard LiDAR surveys do not adequately represent the channel and submerged areas. These surveys only show the water surface in these areas. Furthermore, the 2017 survey was probably done at low tide, whereas the 2013 survey was probably done at high tide. So, one has to be cautious considering bottom elevations in the north-west corner of figure 4.3.

These figures show mostly the evolution of the dune which is causing restrictions to the flow in and out of the outer lagoon.

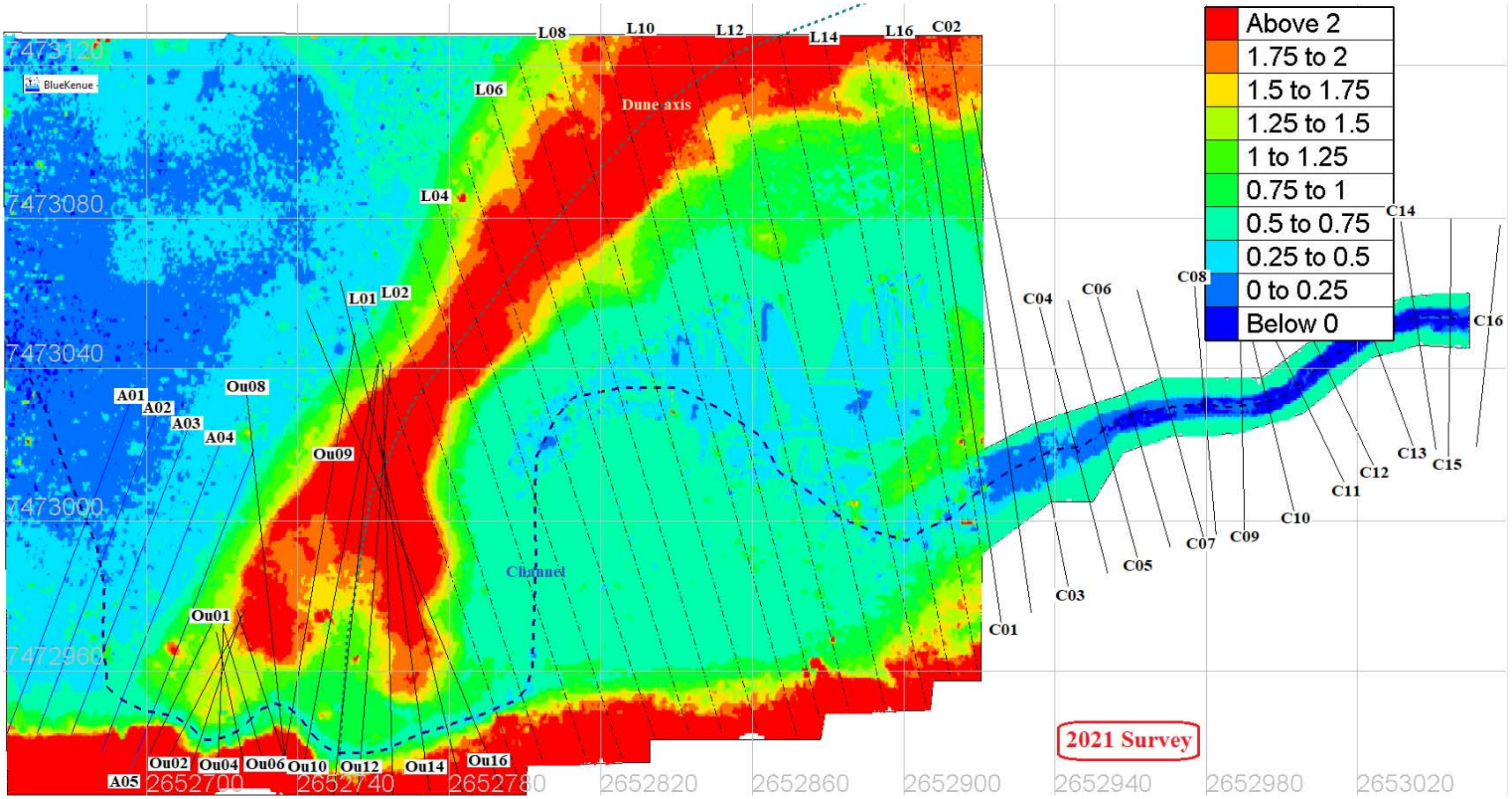


Figure 4.1 Outer Parlee Beach lagoon – Digital terrain model from 2021 survey

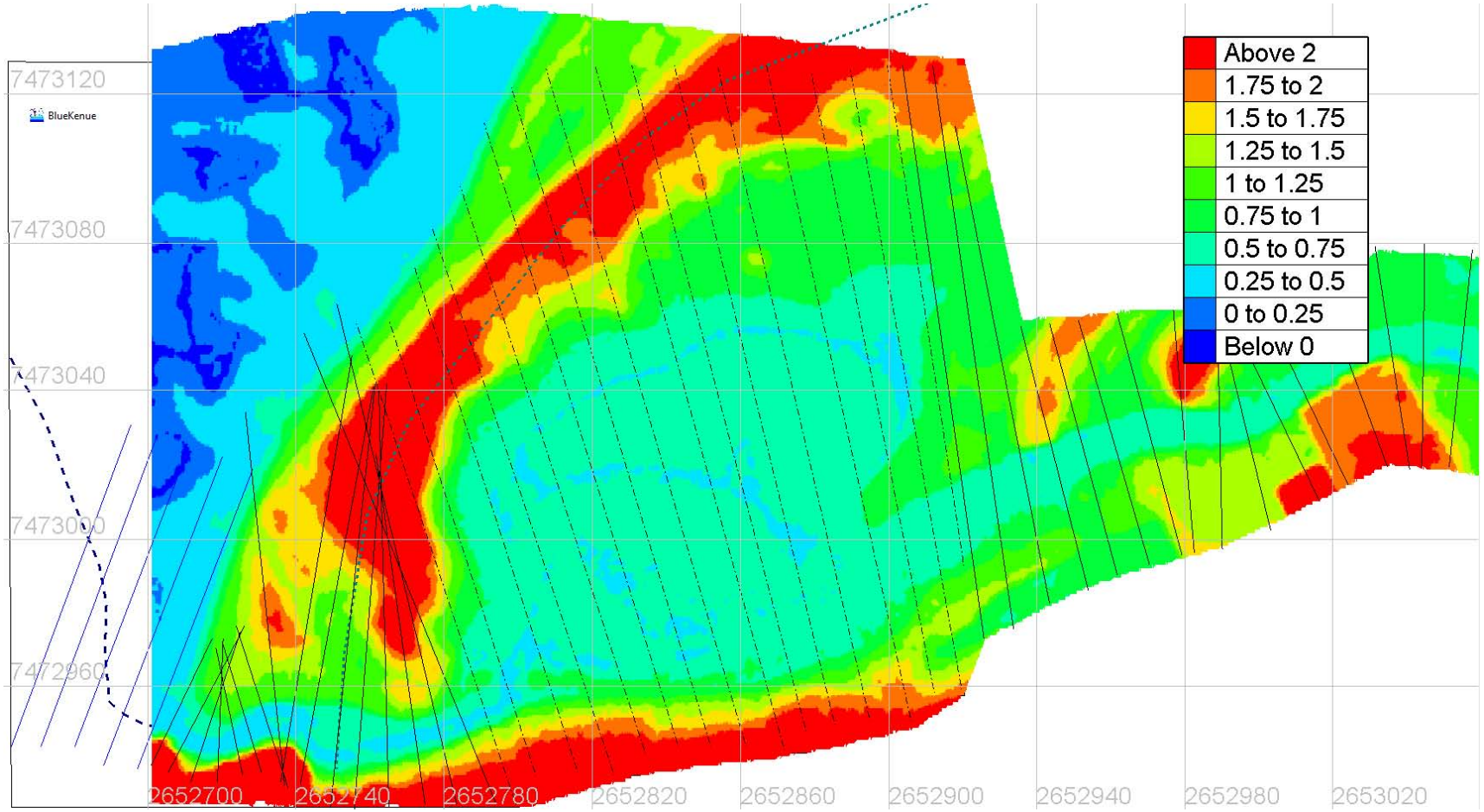


Figure 4.2 Outer Parlee Beach lagoon – Digital terrain model from 2017 LiDAR survey

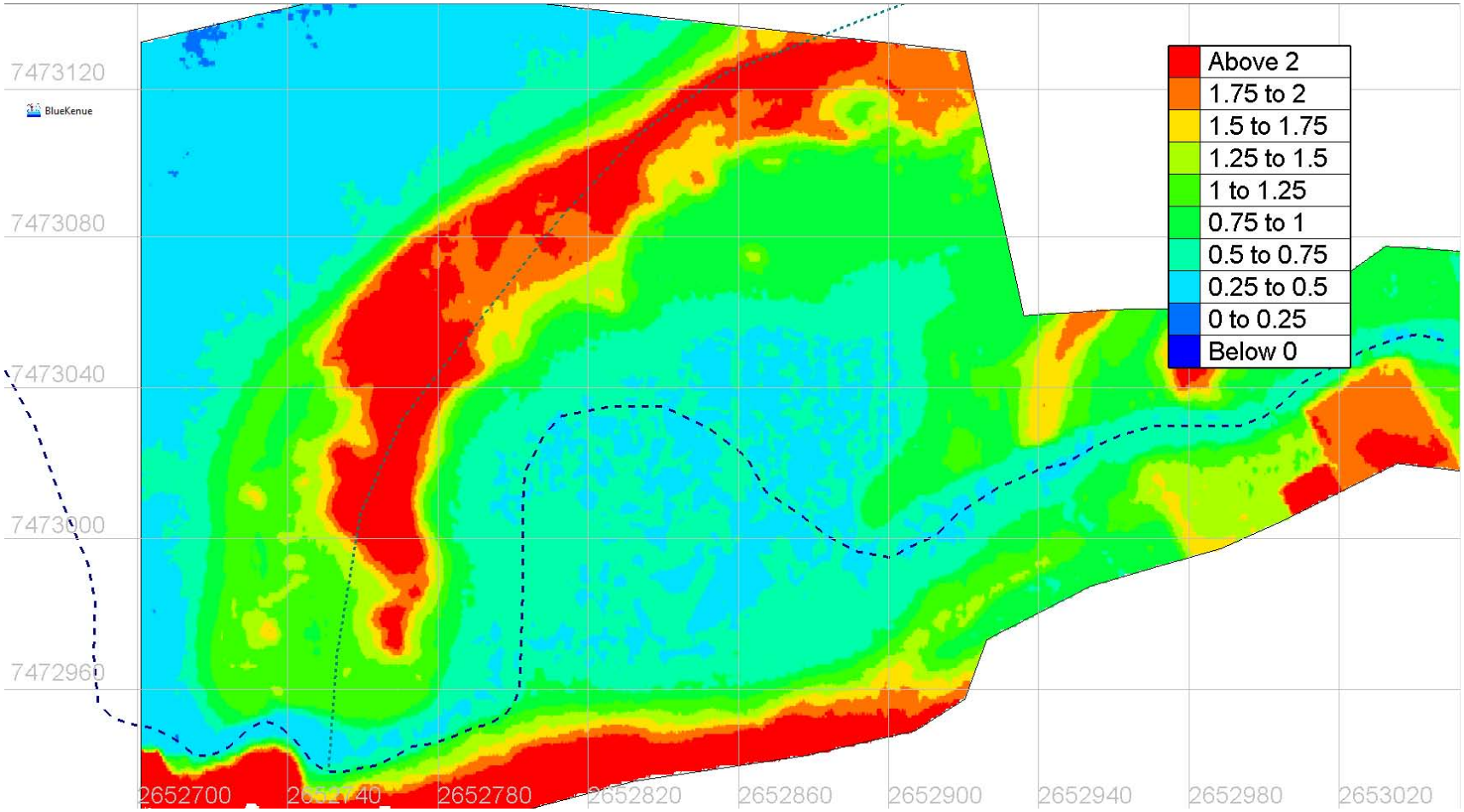


Figure 4.3 Outer Parlee Beach lagoon – Digital terrain model from 2013 LiDAR survey

4.3 Littoral dune

Figure 4.4 shows the location of transects along the littoral dune. Dune topography was collected along these transects for the three surveys and compared.

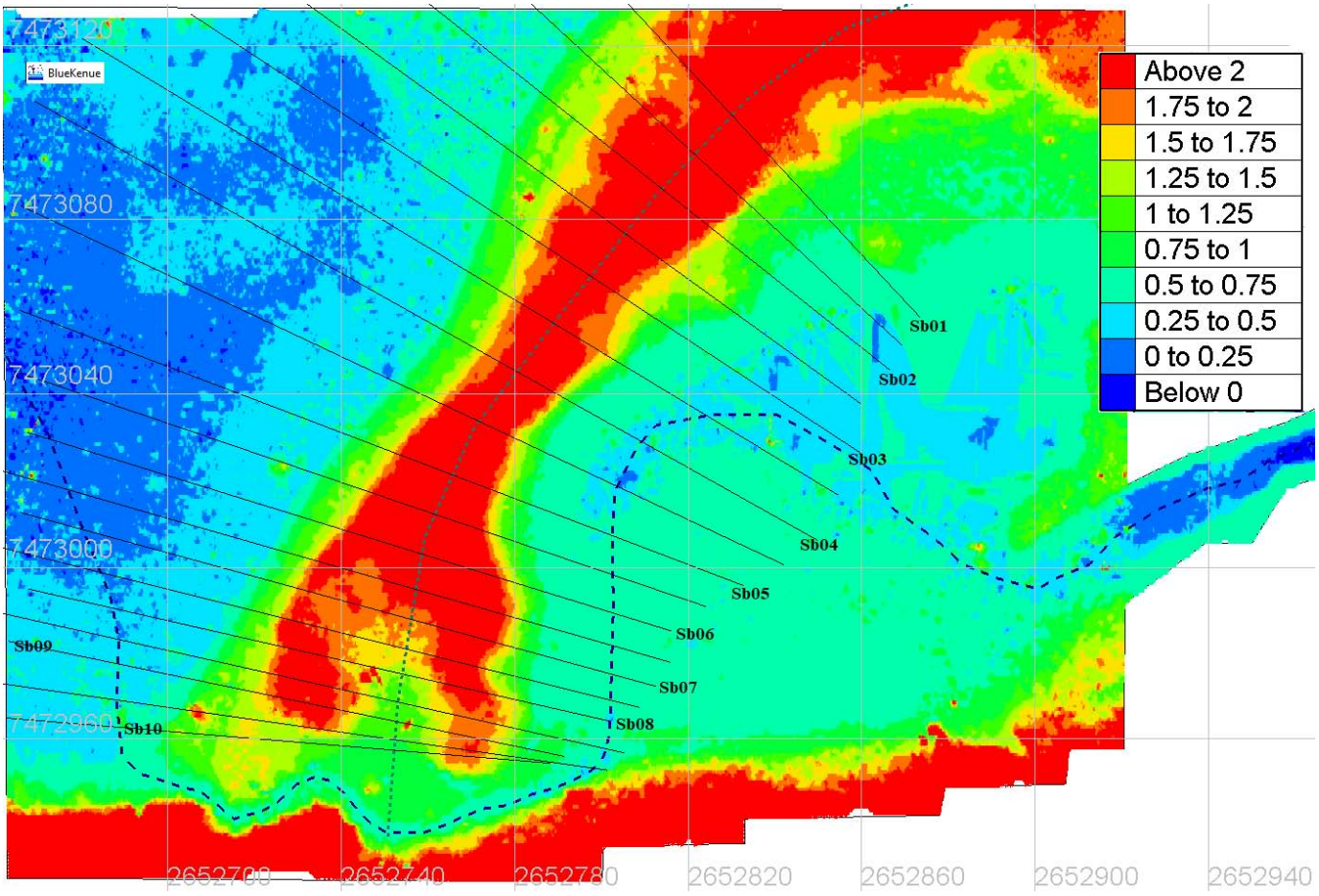


Figure 4.4 Location of transects along the littoral dune

Figures 4.5 to 4.8 illustrate the evolution of the dune topography with time. Green line represents the 2013 survey, orange line the 2017 survey and blue line the 2021 survey. The Shediac Bay is on the left side and the lagoon is on the right side of the figures. Three characteristic water levels appear on the figures:

- HHWLT, occurring 350 hours per year on average,
- Frequent storm surge level (occurring 1hr/2 years in average),
- Extreme water level, occurring once every 50 years in average.

Transect Sb02 (figure 4.5) is representative of the northern part of the dune with a recession episode of the dune top part between 2013 and 2017 and a global accretion between 2017 and 2021. This part of the dune used to be prone to submersion in 2013 and 2017.

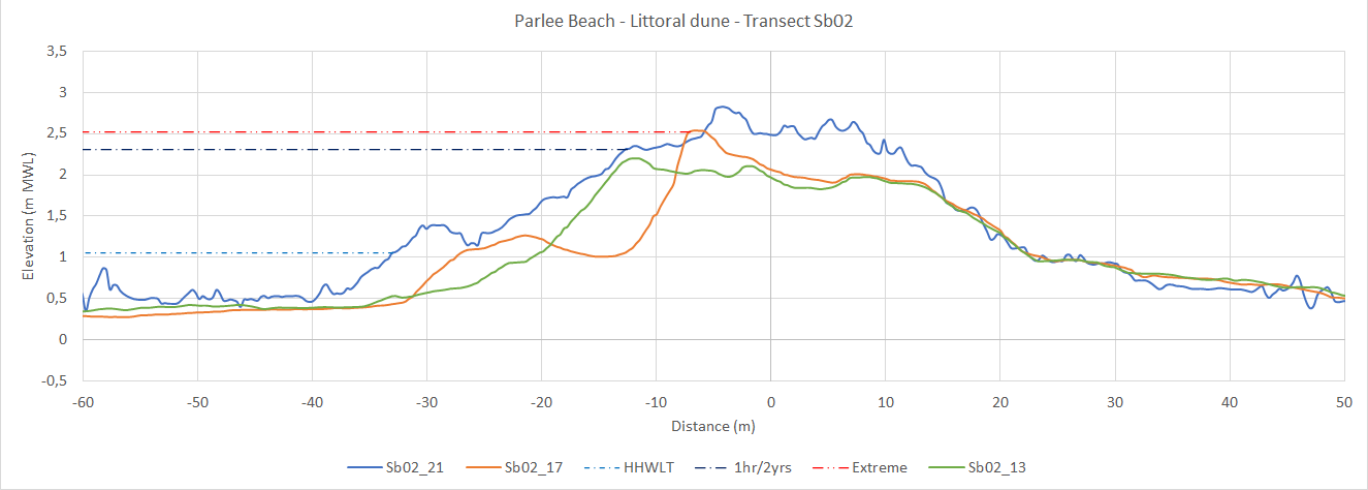


Figure 4.5 Dune topography along transect Sb02

Transect Sb04 (figure 4.6) is representative of an intermediate part of the dune with a constant recession of the dune with time. However, this part of the dune does not seem to be prone to breaching because of the increase of the dune top elevation. Top elevation of the dune used to match almost perfectly the extreme water level in 2013 and 2017. The top dune elevation in 2021 must refer to some recent strong storm events.

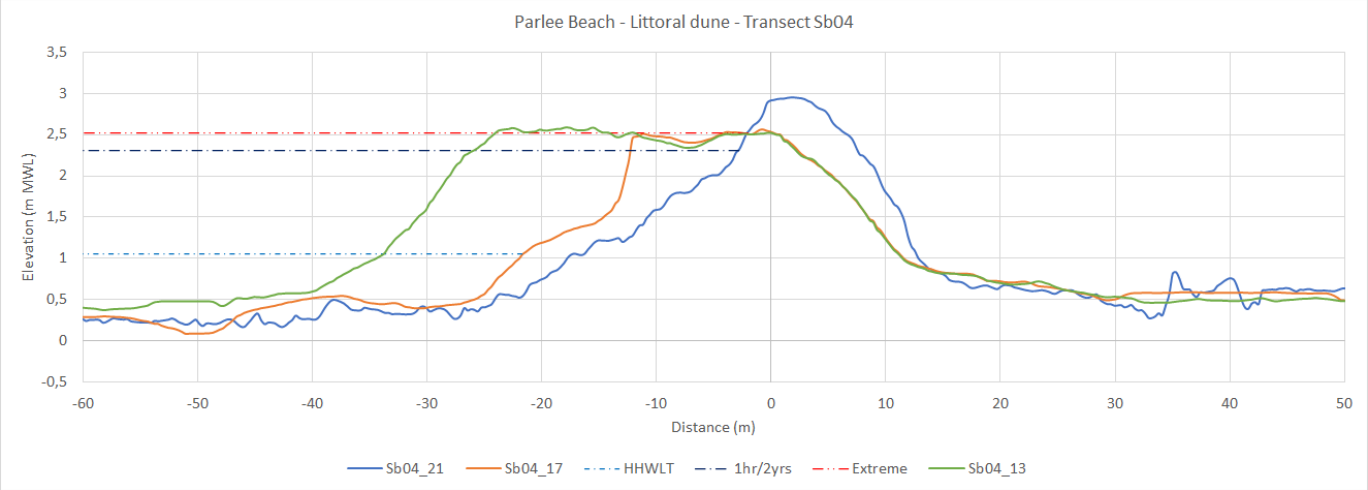


Figure 4.6 Dune topography along transect Sb04

Transect Sb07 (figure 4.7) is representative of the southern part of the dune with a constant increase with time of the dune top elevation across the emerged part of the dune. This part of the dune may be submerged sometimes.

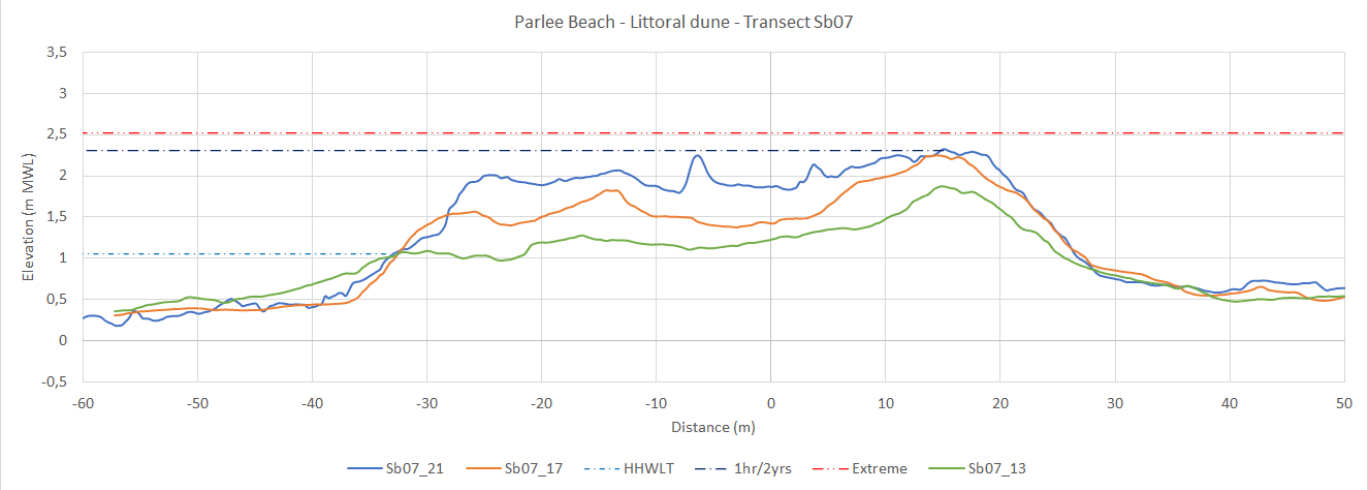


Figure 4.7 Dune topography along transect Sb07

Transect Sb10 (figure 4.8) shows the evolution of the finger points of the dune. The eastern finger point is constantly increasing in height from 2013 to 2021. The western finger point is building up laterally.

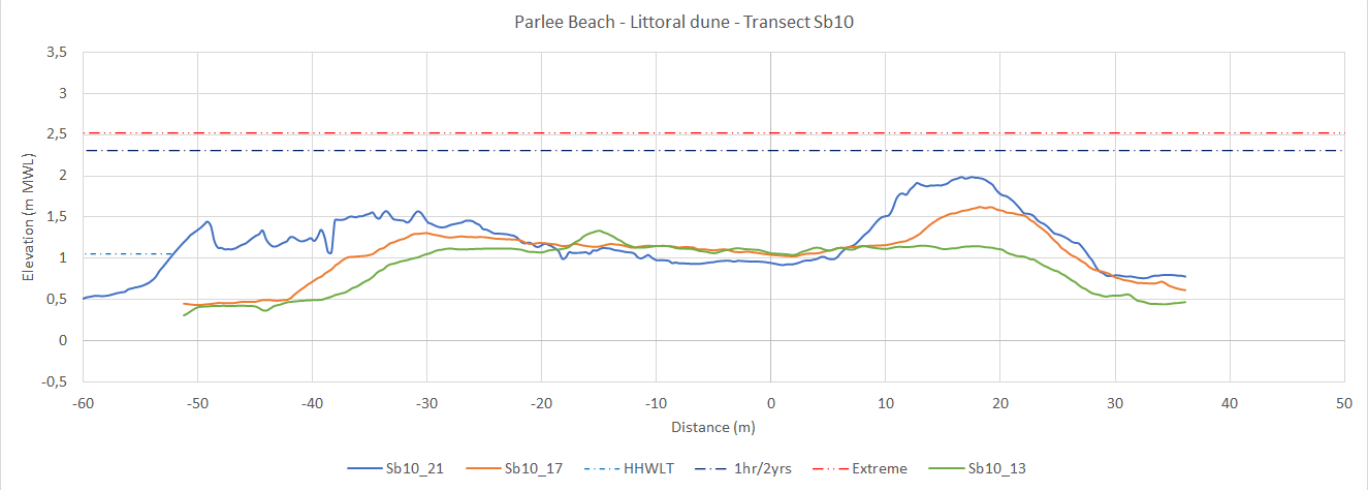


Figure 4.8 Dune topography along transect Sb10

4.4 Outer channel

The outer channel is the channel between the bay and the lagoon. Sixteen transects (Ou01 to 0u16 – see figure 4.1) were monitored to illustrate the channel evolution with time (2013 to 2021).

Figure 4.9 shows the outer channel topography according to 2021 survey. The +0.7 m isobath is outlined to show that the flow of water going into or exiting the lagoon is presently restricted at this elevation.

According to table 2.1, this water elevation exceeds this elevation about 2,200 hours per year or once every four days in a year. This is far from an optimum condition to ensure the lagoon perennity.

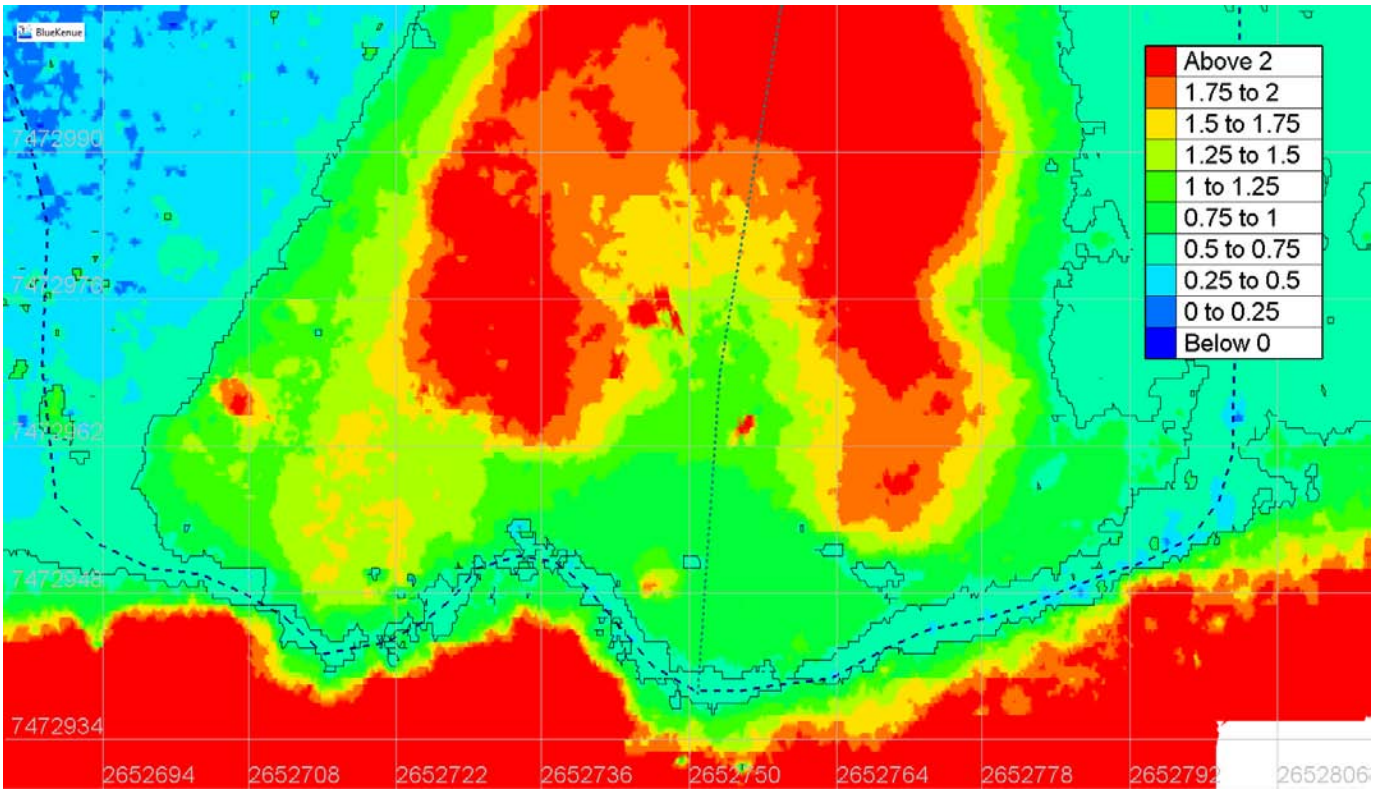


Figure 4.9 Outer channel topography in 2021 – Isobath +0.7 m in black

The next figures show the evolution of the outer channel topography with time. Green line represents the 2013 survey, orange line the 2017 survey and blue line the 2021 survey. South is on the left side and North is on the right side of the figures. Three characteristic water levels appear on the figures:

- HHWLT, occurring 350 hours per year on average,
- Frequent storm surge level (occurring 1hr/2 years in average),
- Extreme water level, occurring once every 50 years in average.

Figure 4.10 (transect Ou02) shows the evolution of the bayside or West end of the outer channel. The channel geometry shows a constant infilling process, especially on the North side of the channel with the progression of the littoral dune. Water depth in the channel is constantly decreasing with time. The apparent "accretion" on the South part of the channel is probably related to the construction of a stone protection along the shore.

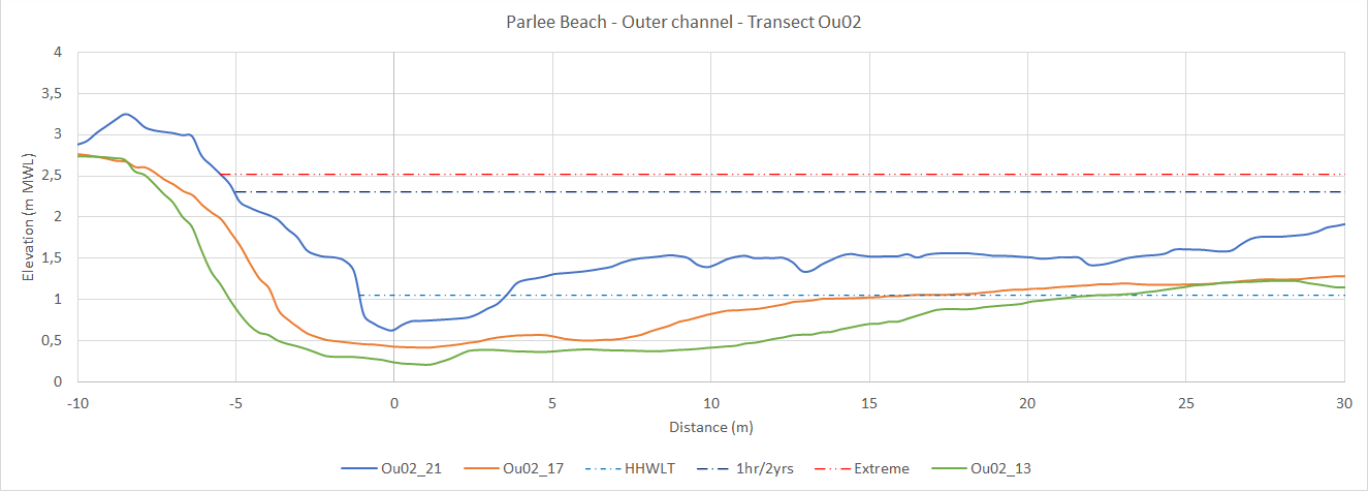


Figure 4.10 Transect Ou02 – Western part of the outer channel

Figure 4.11 (transect Ou08) shows the evolution of the middle part of the outer channel. The channel geometry also shows a constant infilling process, almost exclusively on the North side of the channel with the progression of the littoral dune. Water depth in the channel is constantly decreasing with time, even if it's in a slower way than in figure 4.10.

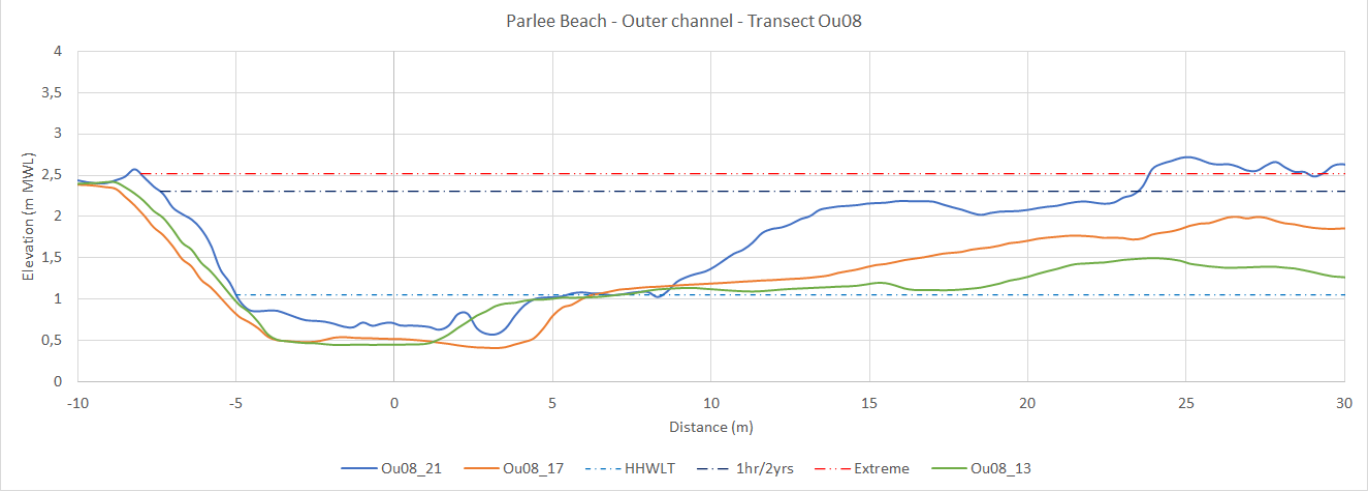


Figure 4.11 Transect Ou08 – Middle part of the outer channel

Figure 4.12 (transect Ou15) shows the evolution of the eastern end of the outer channel, where it enters the outer lagoon. The channel geometry also shows a constant infilling process on the North side of the channel with the progression of the littoral dune. Water depth in the channel does not change with time but the cross section through which water may flow is decreasing with time.

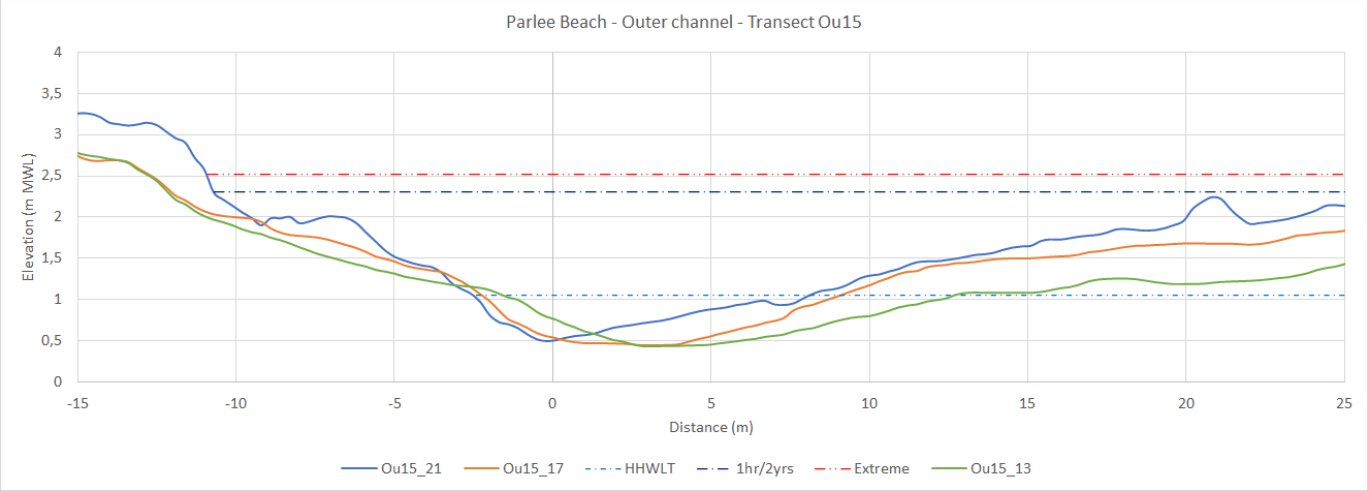


Figure 4.12 Transect Ou15 – Eastern part of the outer channel

The figures above indicate potential concern for the lagoon inlet. If action is not taken, the lagoon will no longer exchange with the bay as frequently as it does now, thus filling up more and more rapidly with time, due to weed growth and aeolian sand transport.

4.5 Outer lagoon

The outer lagoon is the first body of water East of the outer channel (see figure 1.1). Sixteen transects (Ou01 to 0u16 – see figure 4.1) were monitored to illustrate the channel evolution with time (2013 to 2021).

Figure 4.13 shows a relative stability in the lagoon bottom topography from 2013 to 2021.

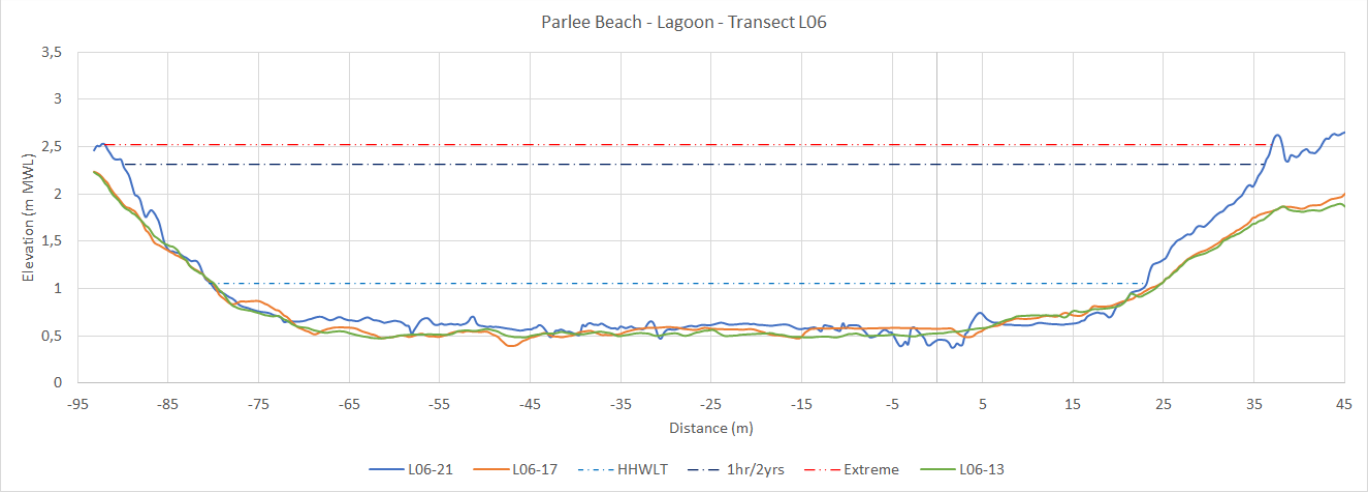


Figure 4.13 Transect L06 – Lagoon topography

4.6 West part of the channel bottom topography

The inlet is connecting the bay to the outer lagoon and the channel is connecting the outer and the inner lagoons. Transects (see figure 4.1) were monitored to illustrate the channel cross-sections. The 2017 and 2013 surveys do not give a realistic bottom elevation of the channel as these LiDAR surveys do not provide elevations below water level. The 2017 survey was retained only to provide a representation of the topography on both sides of the channel.

Figure 4.14 (Transect C03, located at the western end of the channel) and figure 4.15 (Transect C14, located in the middle part of the channel) present the two basic configurations of the western part of the channel, wider and deeper close to the outer lagoon, narrower in the middle part.

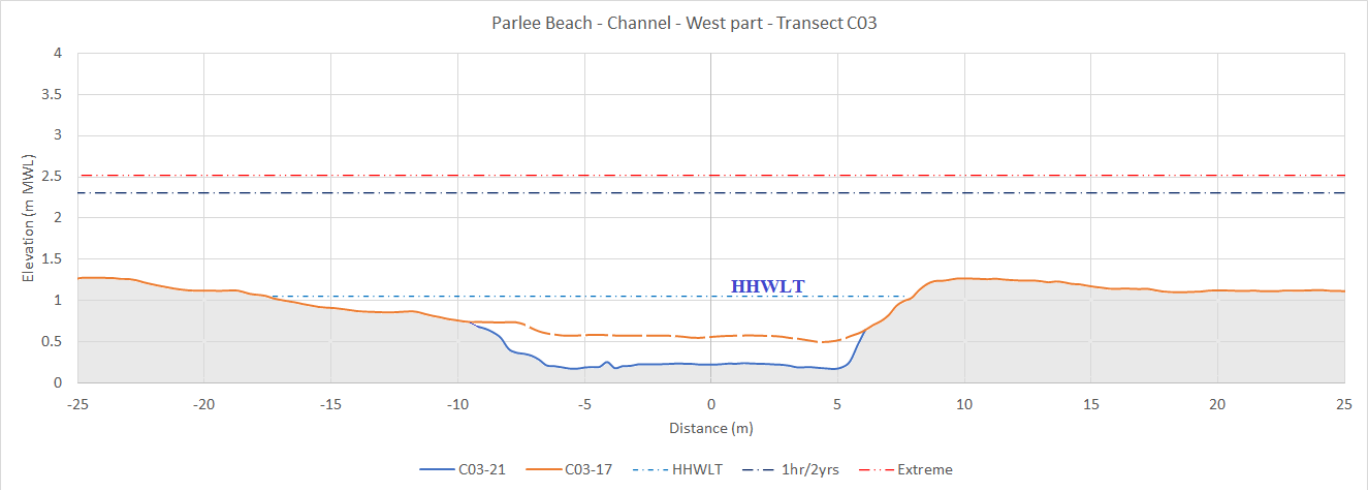


Figure 4.14 Transect C03 – Western part of the middle channel

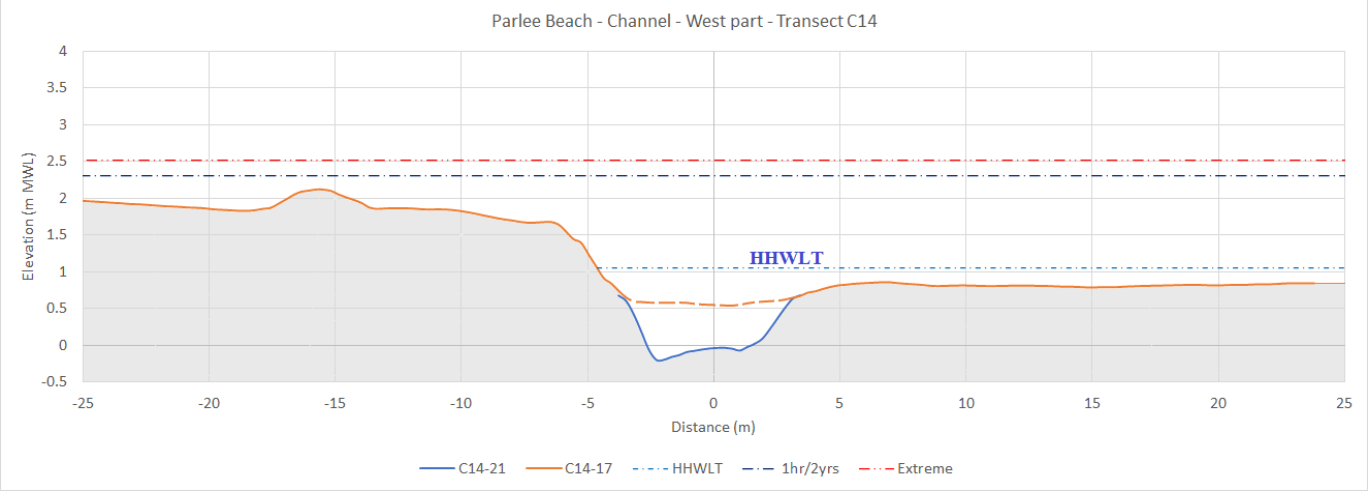


Figure 4.15 Transect C14 – Centre part of the middle channel

Figure 4.16 presents the bottom elevation of the inlet and the outer lagoon from the bay (left side) to the western part of the channel (right side). This figure is not to be considered without interpretation.

- The 2021 line is closer to the actual channel bottom, but high points must not be taken as physical obstructions to the flow.
- The outer channel is characterized with a limiting bottom elevation of +0.7 m.
- The outer lagoon bottom elevation is close to +0.5 m.

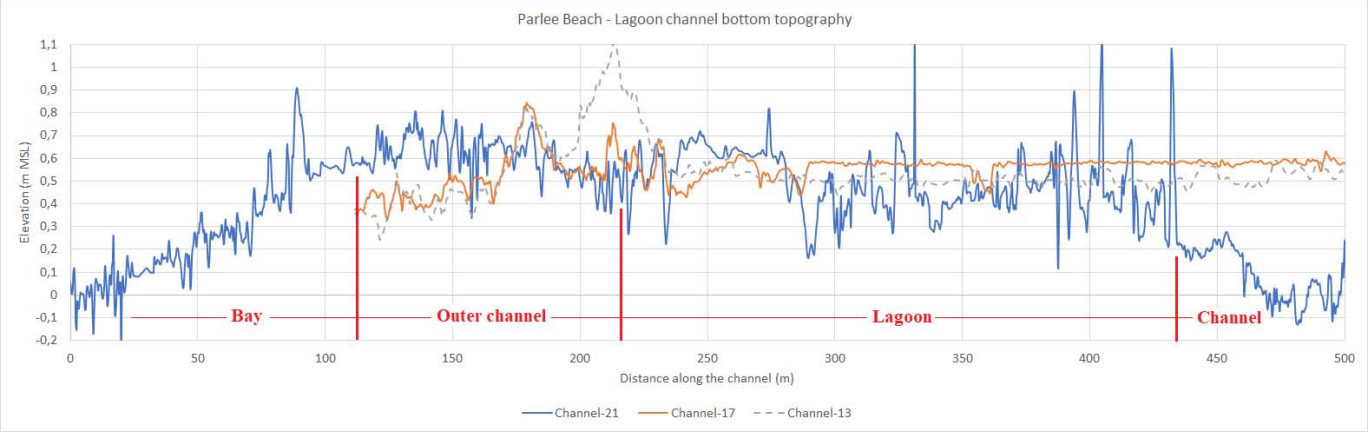


Figure 4.16 Bottom elevation of the western part of the lagoon

4.7 Channel and inner lagoon bottom topography

The channel is connecting the outer and the inner lagoons.

Figure 4.17 illustrates the topography of the eastern part of the lagoon and the beach. Topography of the channel and inner lagoon is extracted from the 2021 survey and topography of the surroundings of the lagoon is extracted from the 2017 survey.

Figure 4.18 is a detailed view of the bottom topography of the channel and inner lagoon, showing the location (black dotted line) of the bottom topography shown on figure 4.19.

Apart from one deeper section, bottom elevation of the western part of the channel is close to -0.1 m.

Close to the culvert, bottom elevation of the eastern part of the channel is close to 0.0 m.

From the 2021 survey, bottom elevation of the culvert is also close to 0.0 m.

Bottom elevation of the inner lagoon rises from 0.0 m close to the culvert to 0.2 m at the eastern end of the lagoon.

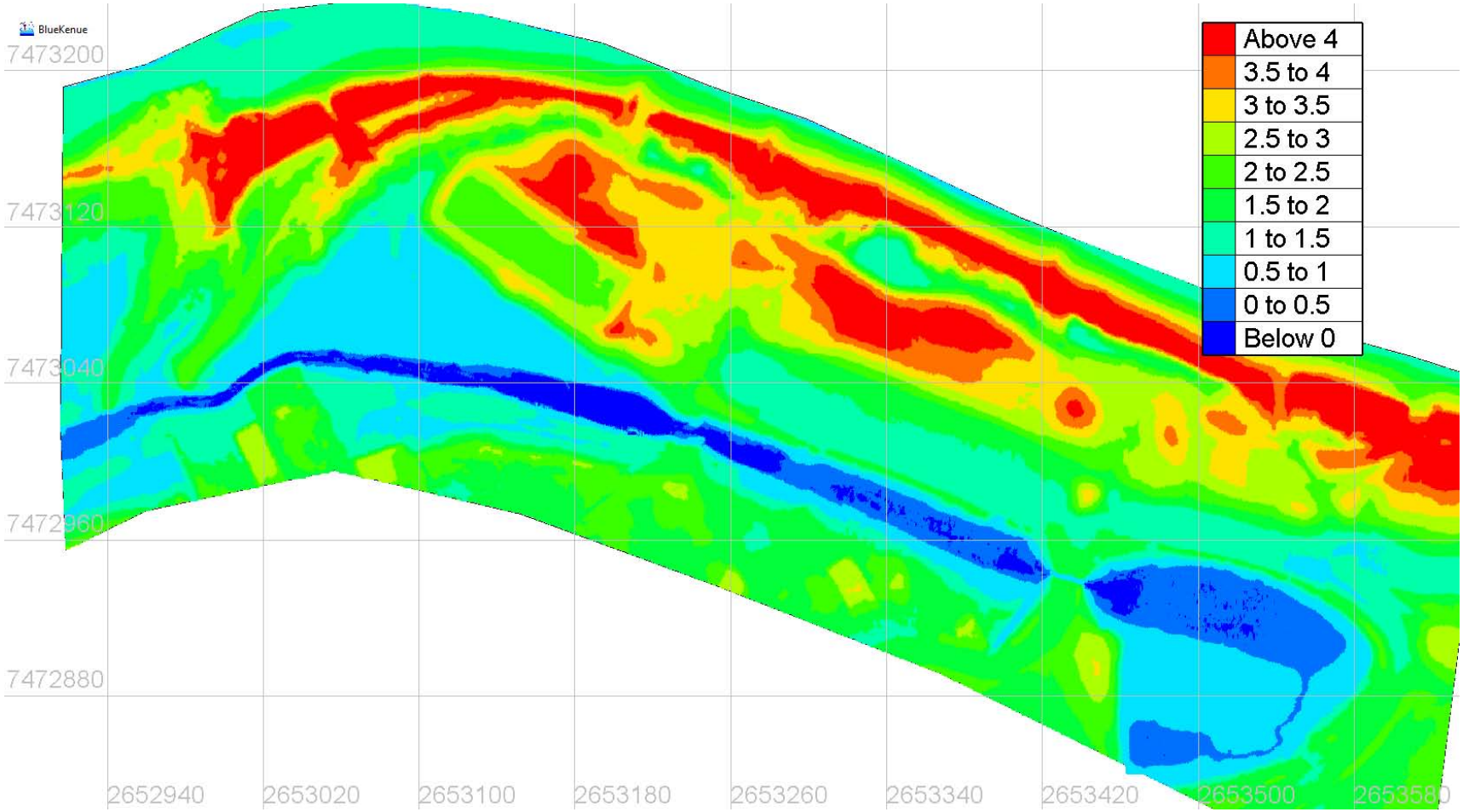


Figure 4.17 Topography of the Eastern part of the lagoon and beach (2017 and 2021 surveys)

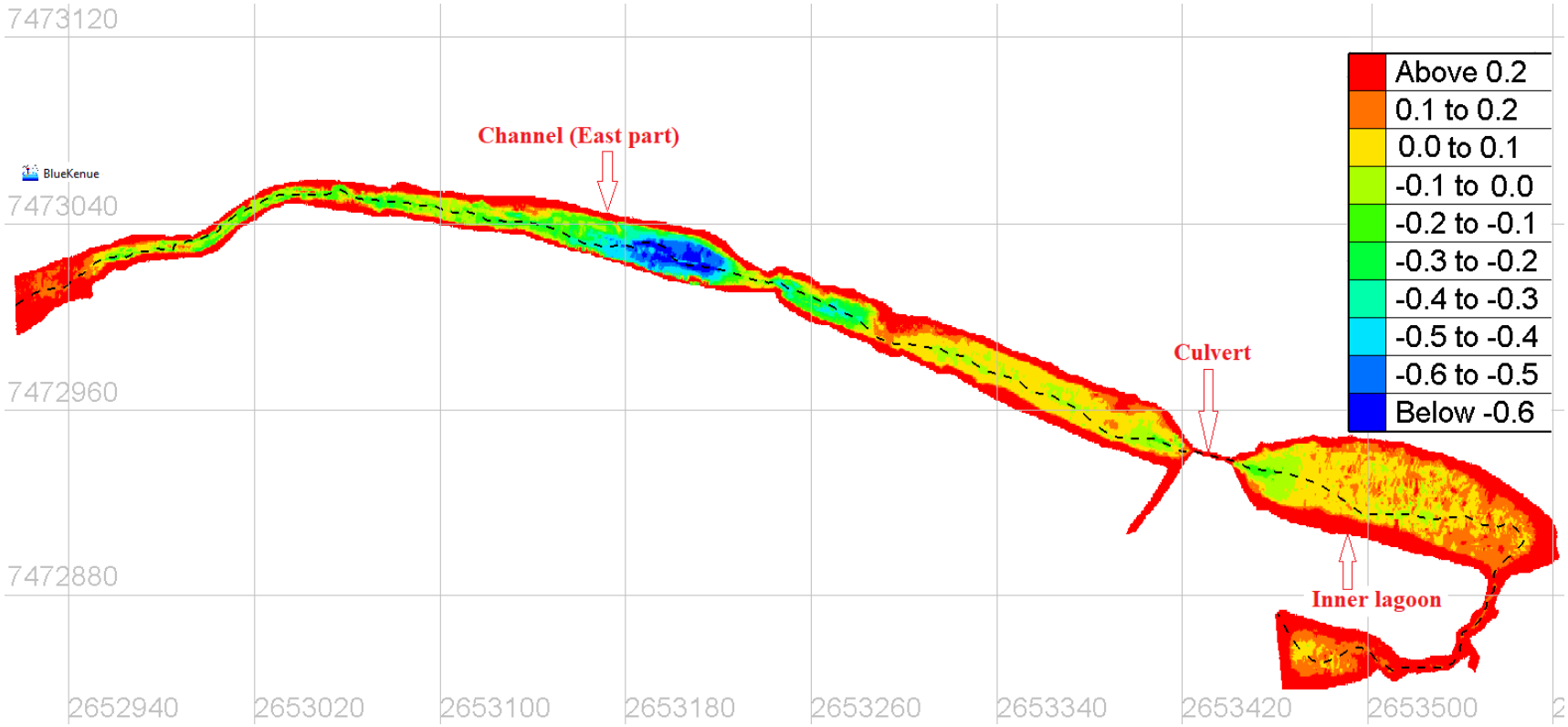


Figure 4.18 Topography of the Eastern part of the lagoon (2021 survey)

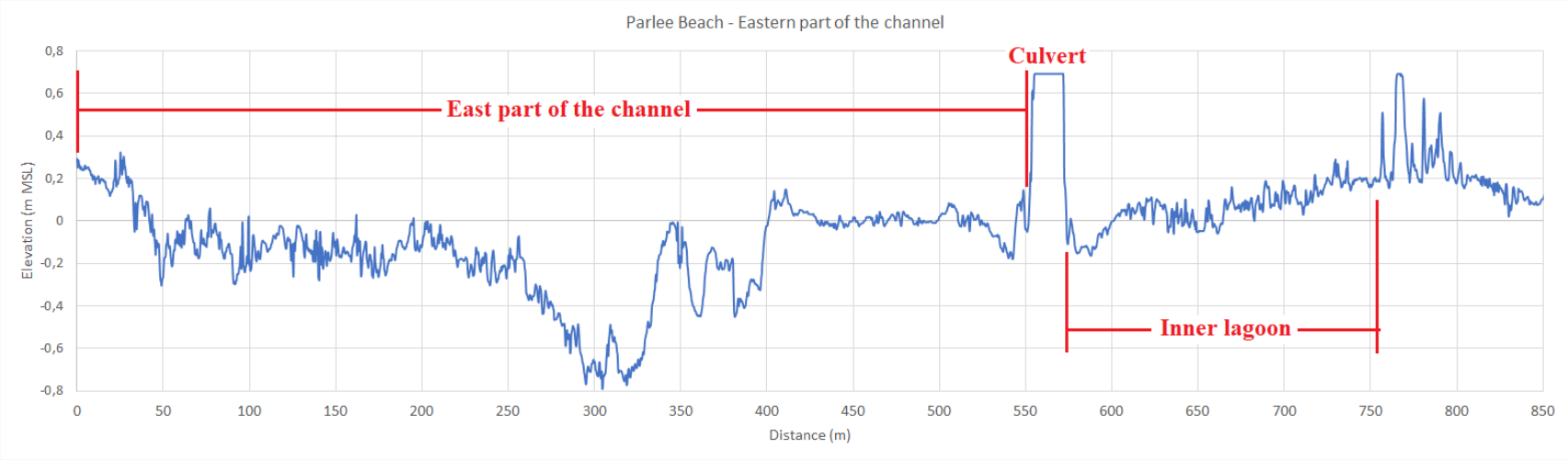


Figure 4.19 Topography of the Eastern part of the lagoon

4.8 Complete lagoon area

The present lagoon system (from the bay to the inner lagoon) wet areas were computed from the numerical terrain model for different water elevations. The present inlet shows a restriction to the flow at +0.7 m.

Figure 4.20 presents the relation between the wet area of the lagoon and the water elevation. This relation is close to linear, except for water levels between +1.0 m and +1.4 m.

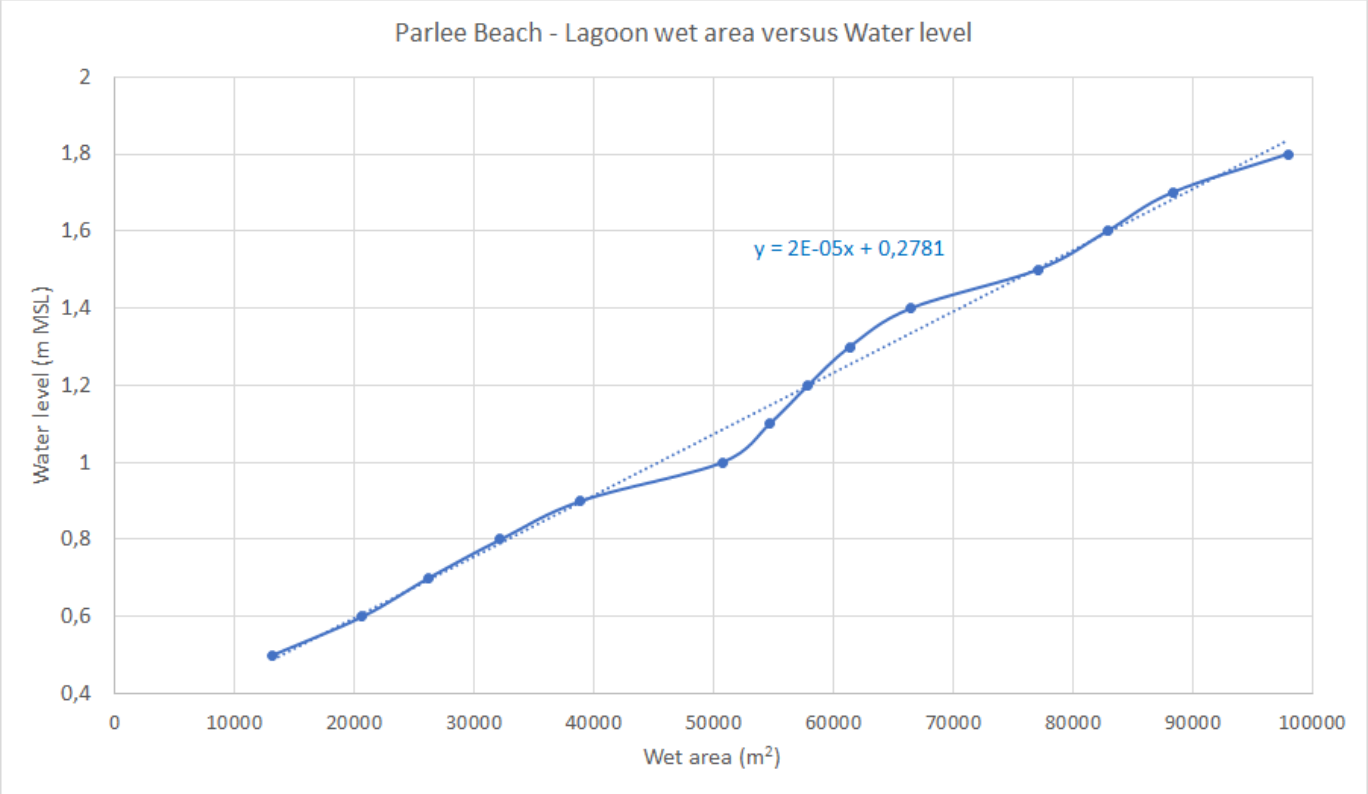


Figure 4.20 Parlee Beach Lagoon – Relation between wet area and water level

4.9 Outer lagoon inlet cross-sections

The present outer lagoon inlet wet cross-sections were computed from the numerical terrain model for different sections of the inlet.

Figure 4.21 presents the relation between the wet cross-sections of the lagoon inlet at three transects (Ou02 to Ou04) and the water elevation. A theoretical relation representing the worst restriction to water entering or exiting the lagoon was defined in order to get an idea of the maximum water velocities in the inlet.

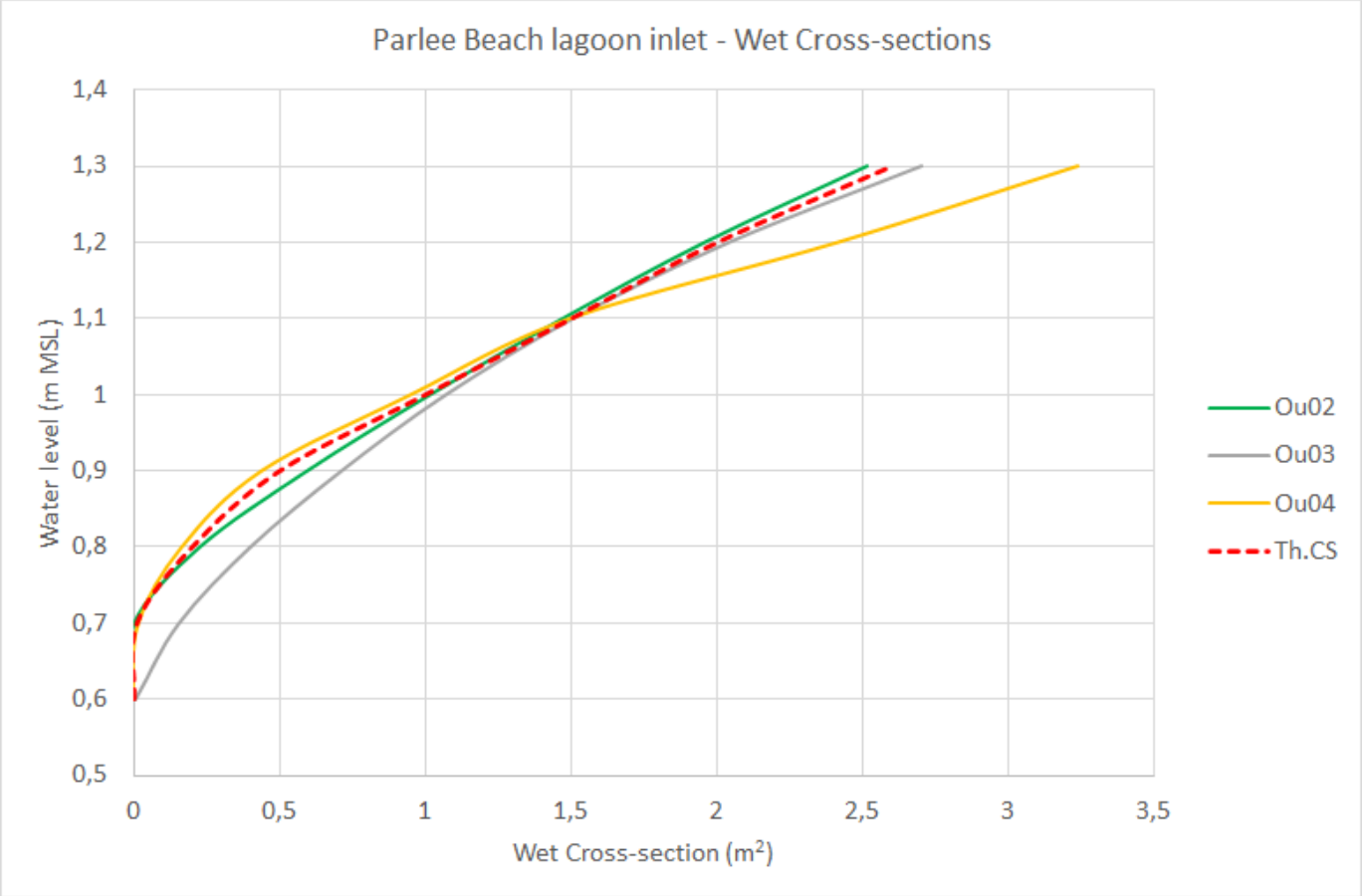


Figure 4.21 Parlee Beach Lagoon – Relation between inlet cross-sections and water level

5 Inlet restriction and tides

5.1 Inlet restriction versus tides

Figure 5.1 and figure 5.2 present two sequences of one month-long tide evolution in autumn 2020 and spring 2021. The 0.7 m elevation of the flow restriction in the inlet channel is indicated as a horizontal red dotted line. Computation of the percentage of time when water levels are above +0.7 m MSL gives the following results:

- September-October 2020: 26%
- April-May 2021: 47%

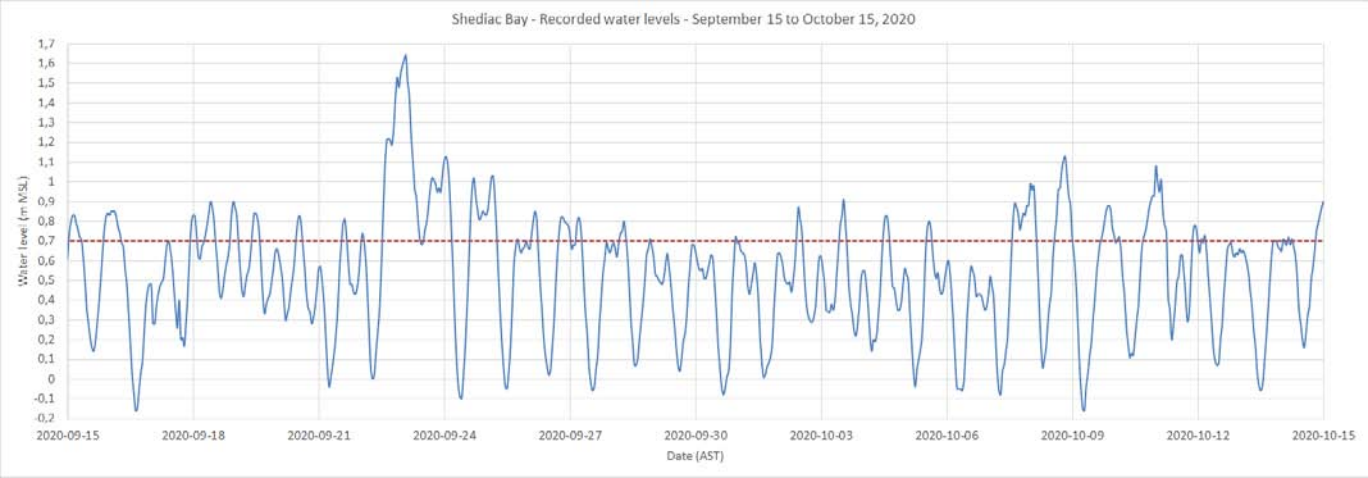


Figure 5.1 Actual water level recorded at Shediac Bay station – September 15 to October 15, 2020

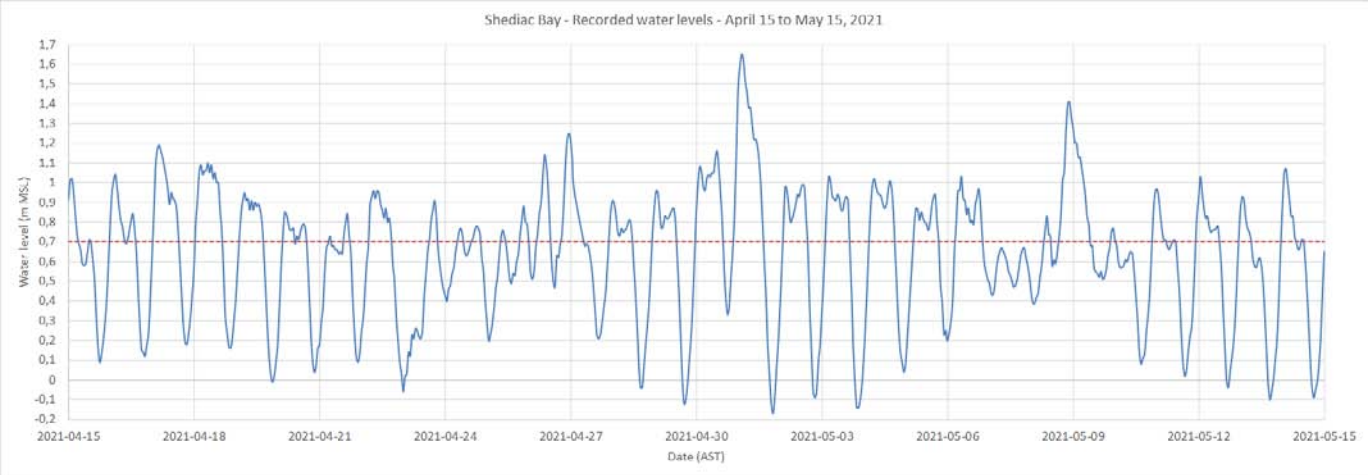


Figure 5.2 Actual water level recorded at Shediac Bay station – April 15 to May 15, 2021

According to table 2.1, the average number of hours the water elevation is above +0.7 m is 2,196 hours per year, which accounts for 25% of a standard year. During some periods of time, the water elevation could be less that +0.7 m for more than 5 or 6 days in a row.

5.2 Flow in and out of the lagoon

Currently, the optimum situation for the lagoon is for the flow into or out of the lagoon to occur approximately half of the time (an average of 12 hours a day). However, the flow may occasionally occur just a quarter or a fifth of the time (an average of 6 or 4 hours a day). Another observation from previous figures is that during these "limited flow" periods of time, flow may be nil for several consecutive days. As a result of such few exchanges with the Bay, the water quality in the lagoon is declining.

Based on observations and according to table 2.1, in order to guarantee improved flow in and out of the lagoon at least half of the time, the inlet obstruction (sediment build up) should at most be around +0.5 m and preferably at +0.3 m.

5.3 Lagoon topography

Figures 5.3 to 5.5 present the location of isobath 0.3 m (figure 5.3), isobath 0.5 m (figure 5.4) and isobath 0.7 m (figure 5.5). The whole idea of dredging the lagoon is to get the maximum amount of water going in and out of the lagoon in order to ensure the perennity of the exchanges with the Bay and improve water quality.

5.4 Dredging strategy

Several options are available in dredging the lagoon system, but there is some limit to the project below which dredging could simply be inefficient (resulting in fast closing of the outer lagoon inlet). The dredging strategy is to ensure the dredging project induces some perennity to the outer lagoon inlet geometry. In order to do that, the flow of water in and (especially) out of the lagoon must be strong and fast enough to remove sand being brought into the inlet by storm waves and wind.

5.4.1 Inlet (and bay)

If only the inlet is dredged to +0.3 m, the flow threshold will go from +0.7 m to +0.3 m just for the inlet, because there is a threshold at +0.65 m that will stop the water influx into the outer lagoon (and further upstream). The only part of the lagoon really influenced by this inlet dredging would be the inlet itself and the improvement would be at most marginal. From the available surveys (2013, 2017 and 2021), the inlet will quickly infill with sediments and the benefits from the dredging will only be temporary (one or eventually two years, if no significant storm occurs just after the dredging operations).

5.4.2 Outer lagoon

If the inlet and a channel through the outer lagoon are dredged to +0.3 m, the water influx will reach the channel and the inner lagoon. This would be a major improvement from just dredging the inlet because the amount of water transiting through the inlet will be significantly higher (probably 10 times or more).

The improvement will essentially concern the inlet stability (accelerating the current velocity in the inlet will help with the removal of sand infilling the inlet).

One more next step in improving the flow through the inlet would be to dredge the whole outer lagoon. As the bottom elevation in the outer lagoon is close to +0.5 m, quantities would not be large, but this kind of dredging could end up being expensive because of the extent of the area to dredge and the relatively thin layer to remove.

5.4.3 Channel

The dredging of the channel is spot dredging in order to remove potential flow restrictions. This dredging could eventually be postponed if the flow restrictions are minimal.

5.4.4 Culvert

From the information available, there is no flow restriction associated with the culvert and no dredging should be required at any end of the culvert (apart for some spots). A detailed inspection of the culvert would be recommended to check for obstructions in and next to the culvert.

5.4.5 Inner lagoon

Dredging the inner lagoon would increase the quantity of water transiting through the inlet and improve its long-term stability (if the flow is not restricted by the culvert). This dredging could be postponed while the impact of dredging the inlet and the outer lagoon is monitored. If dredging the inlet and the outer lagoon is not efficient enough to maintain the inlet open, then dredging the inner lagoon could make a difference. Some numerical modeling of the different scenarios could be done.

5.4.6 Recommended strategy

Dredging the inlet and a channel in the outer lagoon down to +0.3 m would be the recommended option.

Dredging the channel and the inner lagoon would improve the inlet stability, but it could be done after checking the efficiency of dredging the inlet and the outer lagoon (or be numerically modeled).

The problem with options aiming at a higher elevation is that it could end up with no significant and durable improvement of the lagoon water quality. The risks of the inlet quickly re-closing are high.

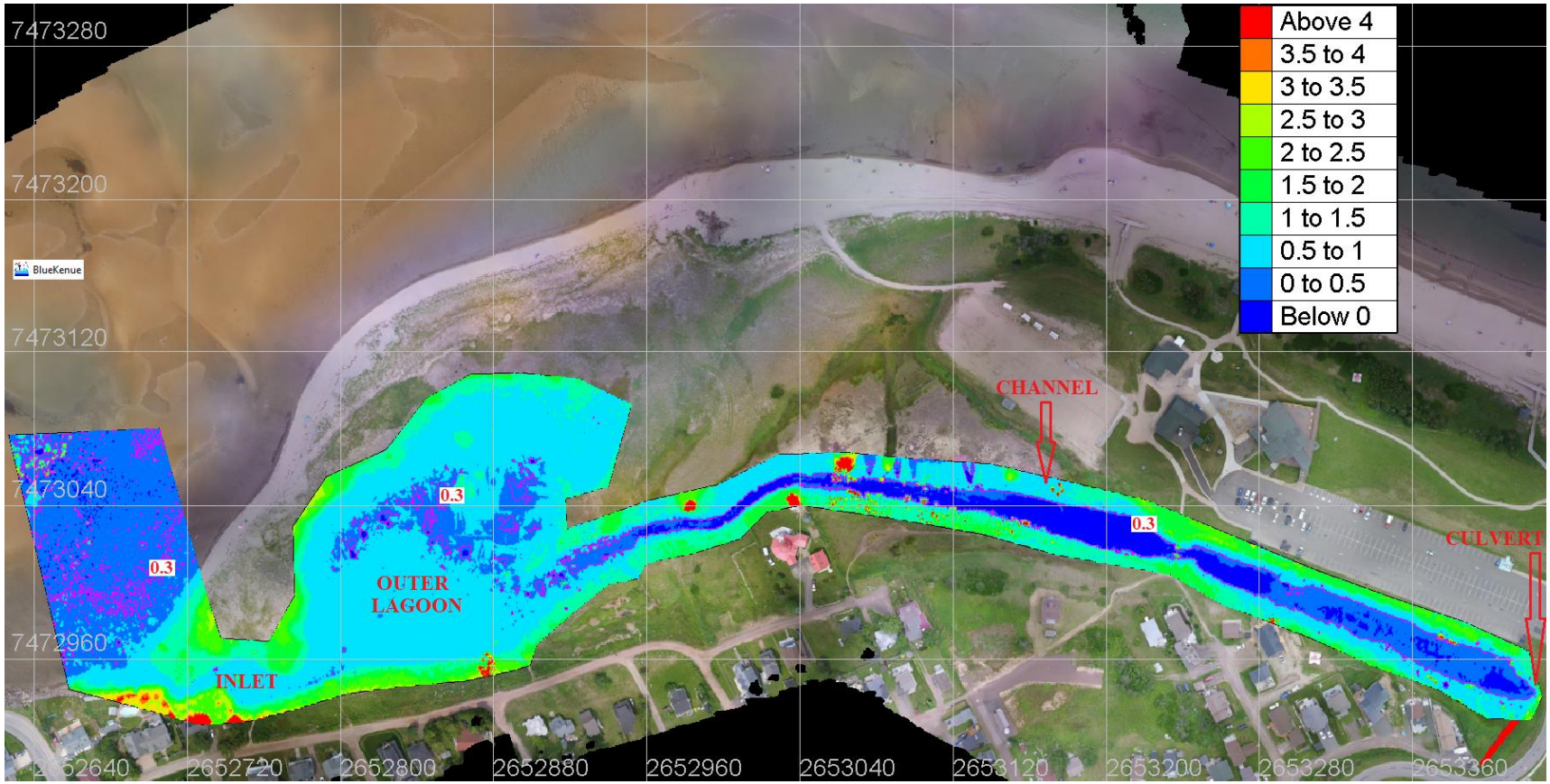


Figure 5.3 Location of isobath 0.3 m in Parlee Beach lagoon (2021 survey)

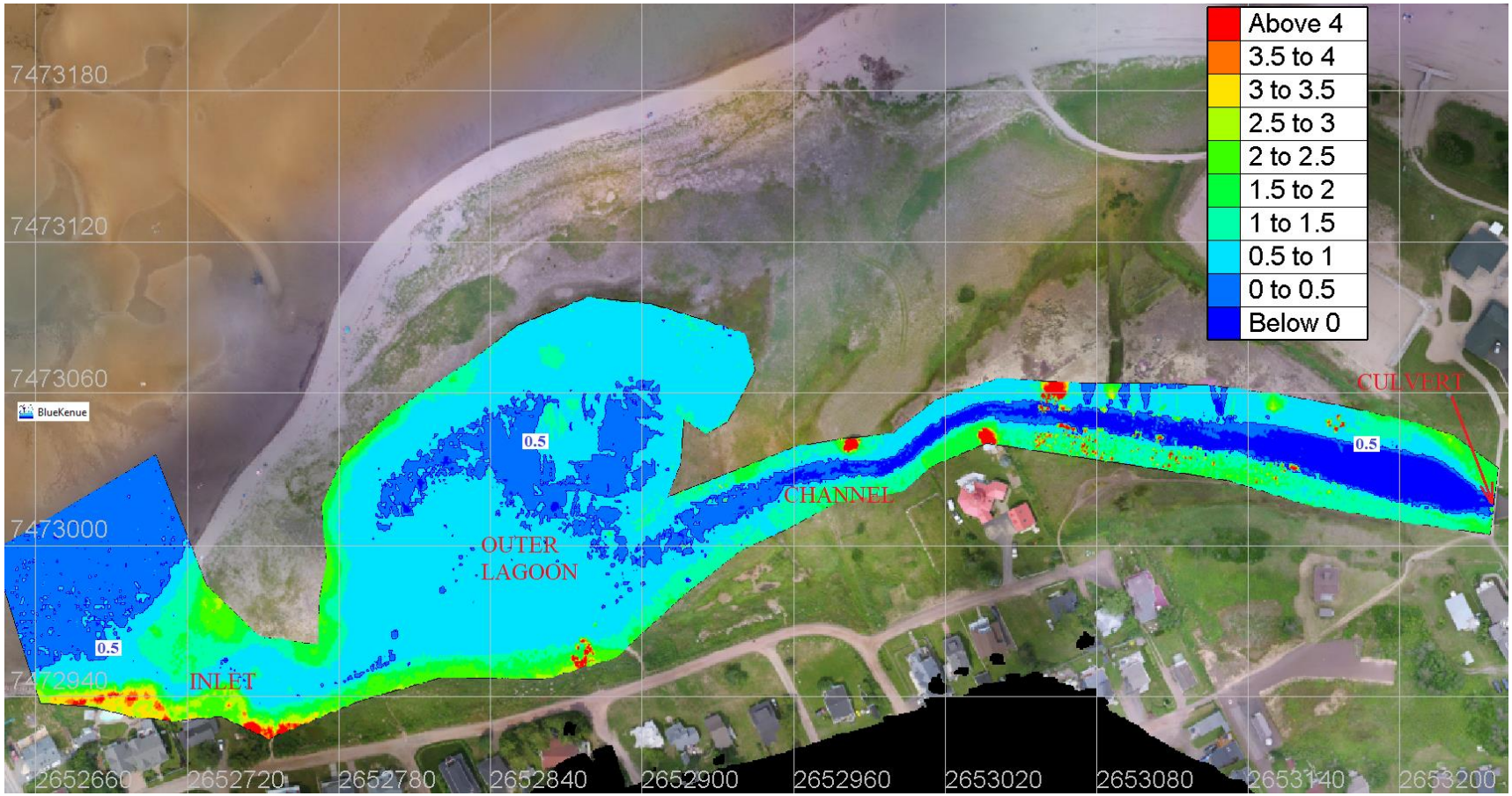


Figure 5.4 Location of isobath 0.5 m in Parlee Beach lagoon (2021 survey)

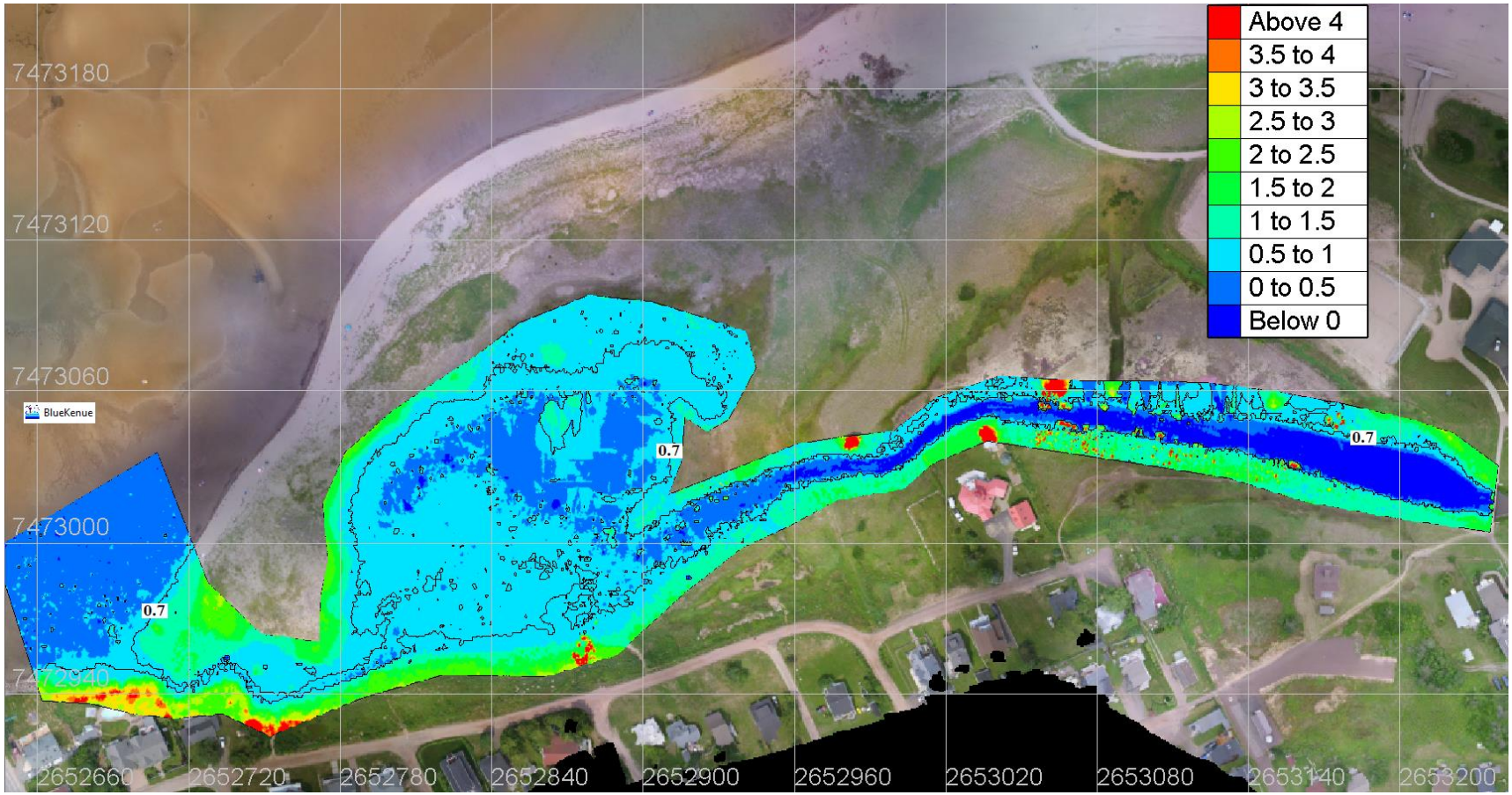


Figure 5.5 Location of isobath 0.7 m in Parlee Beach lagoon (2021 survey)

6 Inlet hydrodynamics

6.1 Inlet stability (hydrodynamics and sediments)

Several papers were produced concerning the stability of lagoon inlets. Presently, the analysis of a lagoon inlet stability is done using computer modeling. If solutions are to be implemented for the Parlee Beach lagoon, it would be recommended to realize some numerical modeling to make sure the solution is optimal.

Francis F. Escoffier prepared a report on tidal inlets for the CERC in 1977[6], based on O'Brien's works in 1966. Unfortunately for Parlee Beach lagoon, the whole theory was developed for tidal inlets with a permanent connection between the lagoon and the ocean (or the Bay). The theory states that there is a relation between the tidal prism (amount of water stored in the lagoon between high and low water) and the minimum area of the inlet (figure 6.1).

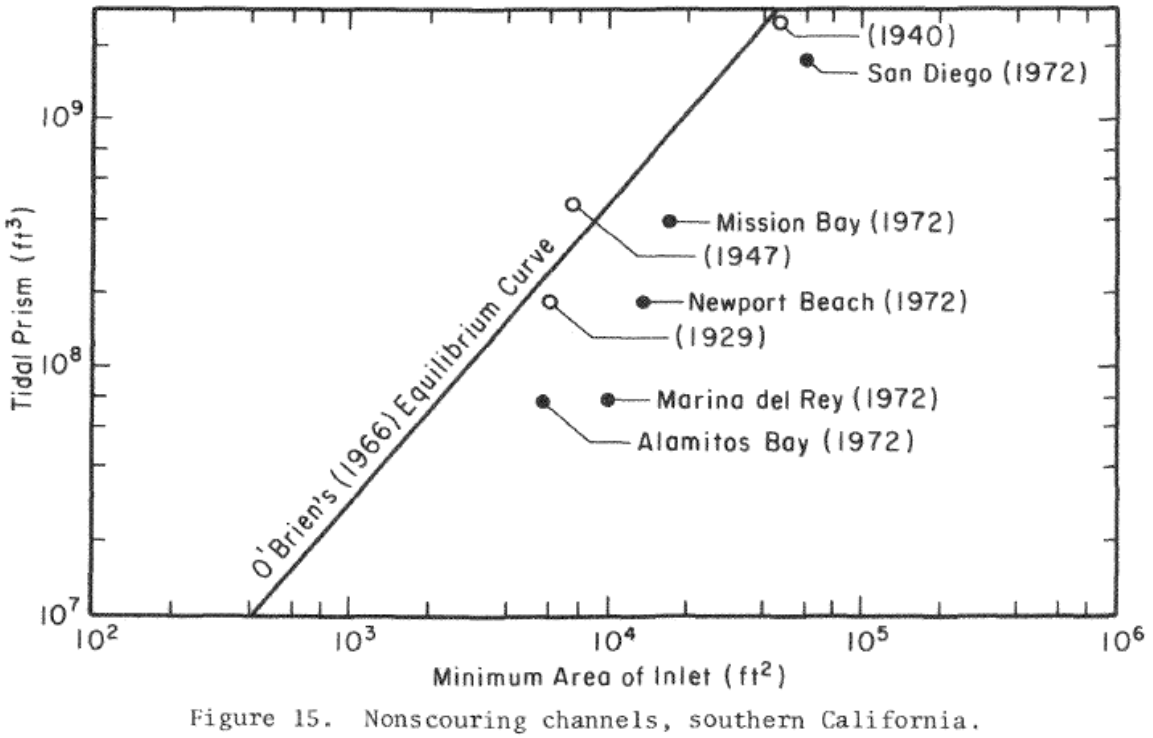


Figure 15. Nonscouring channels, southern California.

Figure 6.1 O'Brien equilibrium curve for tidal inlets – Figure 15 in Escoffier-1977

[6] Escoffier, F., "Hydraulics and stability of tidal inlets – General investigation of tidal inlets", GITI Report 13, U.S. Army Coastal Engineering Research Center, August 1977.

O'Brien (1931, 1966) presented a relation between the cross-sectional area in the gorge of an inlet and the tidal prism:

$$a_c = b\ \Omega^N \qquad \text{where:}$$

- a_c is the cross-sectional area in the gorge measured below mean sea level and
- Ω = the tidal prism or volume of water stored in the lagoon between the low and the high waters corresponding to the diurnal or the spring range of tide.

Coefficients "b" and "N" would be respectively $6.56\ 10^{-5}$ and 1.0 for Parlee Beach lagoon (no jetties).

Spring tidal range in Shediac Bay is 1.47 m (HHWLT at +1.06 and LLWLT at -0.41 m – see chapter 2.4).

6.2 Application to Parlee Beach lagoon

As the limiting elevation in the Parlee Beach lagoon inlet is +0.7 m in 2021 (see chapter 4.6) and the mean water level is at +0.5 m in Shediac Bay (see chapter 2.4), we cannot compute parameter a_c in the present situation.

The only way the stability of the Parlee Beach lagoon could be evaluated with O'Brien equation would be if the lagoon inlet (and the lagoon itself) was dredged at least to an elevation of -0.4 m, LLWLT (see chapter 2.4).

6.3 Dredging the inlet to +0.3 m

A desktop assessment was completed based on a test dredging scenario in which the dredging was done to an elevation of +0.3 m with a bottom width of 6 m, then 8 m in the outer lagoon and the inlet.

Several assumptions were made:

- The dredging would connect the inner lagoon and the channel to the Bay through the outer lagoon and the inlet,
- The culvert between the channel and the inner lagoon is free of obstruction,
- Some spot dredging would also be made on both sides of the culvert between the channel and the inner lagoon to ensure free water flow through the culvert,
- Tidal prism computation was done using the +0.3 m elevation of the dredging (instead of the LLWLT elevation at -0.41 m),
- Slope stabilization would be made (if necessary) to ensure the stability of the South bank along the inlet.

Computation of the tidal prism was done by 10 cm thick successive layers. Computed tidal prism is 19,900 m^3 and cross-sectional area from drawings is 1.25 m^2 (see chapter 4.9).

Computed cross-sectional area using O'Brien equation is 1.3 m^2. A channel width of 8 m is a minimal solution according to O'Brien equation, in order to ensure some hydrodynamic stability of the inlet (preferably to be confirmed by numerical modeling).

Maximum flow speed computed in the dredged inlet channel would vary from 0.55 m/s to 0.7 m/s for large tides.

Critical speeds for sediment movement (D_{50} = 0.4 mm and D_{90} = 0.7 mm) are:

- Van Rijn-1984: 0.33 m/s
- Soulsby 1984: 0.32 m/s

If the information about sediment size is representative of the real conditions in the inlet (see chapter 2.5 – just one sample SED1 describing the inlet), sand would be removed during large tide events. Numerical computation of the inlet hydrodynamics would be required to confirm this scenario.

Figure 6.2 presents a cross-section of the inlet dredging (transect Ou07).

Figure 6.3 presents a cross-section of the outer lagoon dredging (transect L05).

Figure 6.4 presents the location of the dredged channel through the inlet and the outer lagoon.

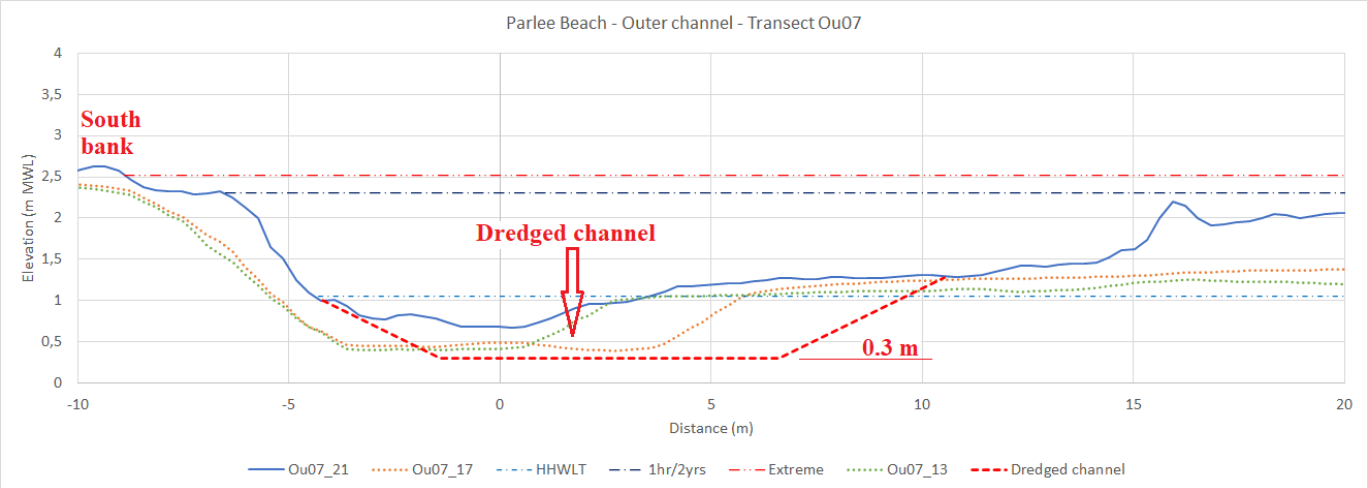


Figure 6.2 Inlet dredging to +0.3 m – Transect Ou07

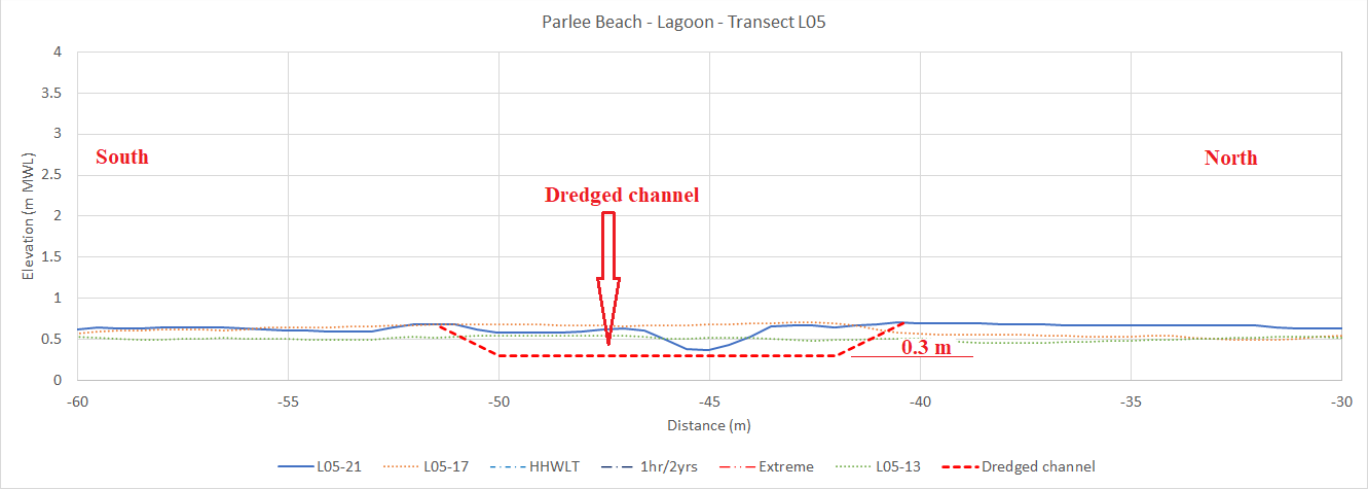


Figure 6.3 Outer lagoon dredging to +0.3 m – Transect L05

Quantity associated with the **inlet dredging** is **1,120 m^3**. This quantity includes 50 m^3 of spot dredging in the Bay and 0.2 m over-dredging in the inlet (260 m^3).

Quantity associated with the **outer lagoon dredging** is **900 m^3**. This quantity includes 180 m^3 of spot dredging in the central part of the outer lagoon and 0.2 m of over-dredging in the outer lagoon (300 m^3).

Quantity associated with the spot dredging of the **channel** is **200 m^3**.

Quantity associated with the **inner lagoon dredging** is approximately **2,200 m^3**.

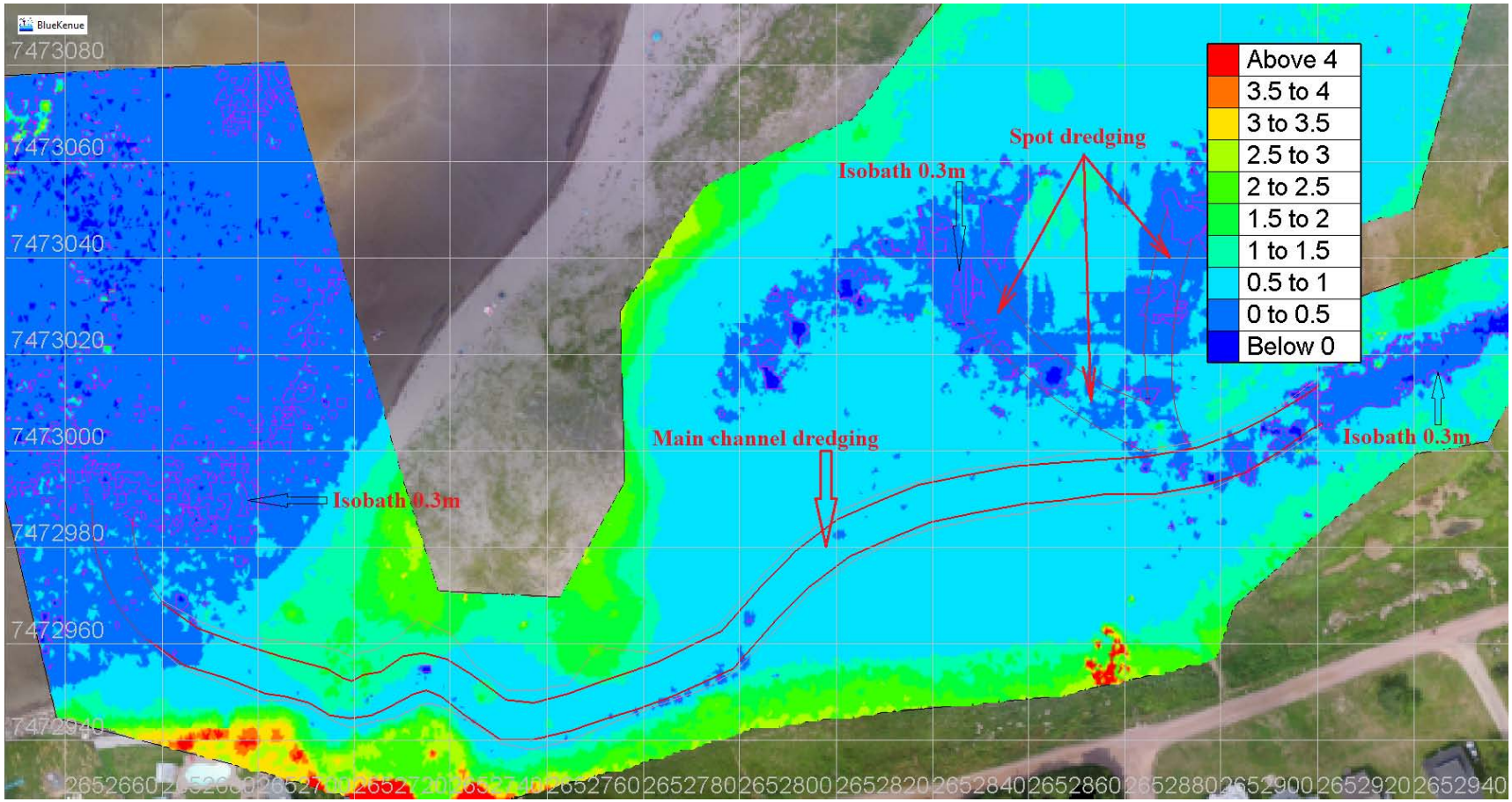


Figure 6.4 Plan view of the inlet and outer lagoon dredging to +0.3 m (2021 survey)

7 Conclusion et recommendations

7.1 Conclusion

The flow into and out of the lagoon is limited by an obstruction at an elevation of +0.7 m in the outer lagoon inlet. This obstruction restricts the flow during 80% to 50% of the time (75% of the time on average).

Because of the Bay topography, it is unrealistic to aim at dredging the inlet at an elevation of -0.4 m (Chart datum) that would allow a permanent or quasi-permanent flow into an out of the lagoon. The bottom elevation of the outer lagoon and of the open bay area at the mouth of the inlet is at +0.5 m. The bottom elevation of the culvert between the channel and the inner lagoon is at +0.0 m. If the dredging at -0.4 m of the inlet and the outer lagoon is theoretically feasible and could eventually last for some years, a channel dredged at this elevation through the open bay area would not last one year.

A “test dredging” scenario of the inlet at an elevation of +0.3 m was elaborated and gave interesting results in terms of hydrodynamic stability of the inlet. At this elevation, the dredged channel width should be at least 8 m.

Some over-dredging (down to +0.1 m) was considered to improve the longevity of the dredging operations.

7.2 Recommendations

This present desk analysis does not consider the friction of the flow on the bottom through the lagoon, so it is a bit optimistic. The only way to really check the efficiency of such a scenario would be to numerically model the exchanges between the bay and the lagoon.

Due to the cost of such numerical modelling and because the inlet seems to be at least partially operational since the 50’s, the recommendation would be to elaborate a minimal dredging project at an elevation of +0.3 m for the inlet and the outer lagoon and ensure the follow-up of the inlet and lagoon bathymetry for at least two to three years (at least once a year). The information from the follow-up would be used to improve the dredging parameters, if necessary.

If dredging the inlet and outer lagoon does not ensure the outer lagoon inlet geometrical stability, next optional steps to increase the amount of water transiting through the inlet would be to:

- Make sure the culvert is functional,
- Do some spot dredging in the channel between the inner and outer lagoons,
- Dredge the inner lagoon down to +0.3 m,
- Dredge the outer lagoon down to +0.3 m.

Numerical modelling of the different scenarios would be the only way to figure out the benefits from the different scenarios.

Maintenance dredging would be required due to the dune progression across the inlet and to aeolian sand migration. The evaluation of the delay between two maintenance dredging operations would be included in the follow-up process.

Prepared by:

Yann Ropars, ing., M. Sc.
Consultants Ropars, Inc.
yann_ropars@videotron.ca
Téléphone : (418) 998-6224

Appendix F Archaeological Assessment, 2021

Tourism, Heritage and Culture

New Nouveau Brunswick

Tourisme, Patrimoine et Culture

SITE ALTERATION PERMIT
PERMIS DE MODIFICATION DE SITE
(Archaeological Site / Site archéologique)

No: **2022SAP-08**

Under the provisions of the *Heritage Conservation Act* (S.N.B., 2010, c. H-4.05, s. 20), a Site Alteration Permit is hereby granted to:

En vertu de la *Loi sur la conservation du patrimoine* (L.N.-B., 2010, ch. H-4.05, art. 20), un permis pour modification de site est octroyé à :

Department of Tourism, Heritage and Culture

to carry out the following activities:

pour entreprendre les activités suivantes :

Beach Nourishment

at a place known to be an archaeological site and identified by the following Borden code:

dans un endroit connu pour être un site archéologique et identifié par le code Borden :

CbDd-24

located on the property(ies) identified by the following parcel identifier (PID) number(s):

situé sur la (les) propriété (s) identifiée (s) par le (s) numéro (s) d'identification de parcelle (NID) :

01053404

in the county of:

dans le comté de :

Westmorland

under the following conditions:

aux conditions suivantes :

- **Valid only for the activities described in the application submitted for this permit.**

This permit shall be valid until:

Le permis sera valide jusqu'au :

December 31, 2022

31 décembre 2022

Granted this 23th day of March, 2022
Octroyé ce 23e jour de 2022

Hon. Tammy Scott-Wallace
Minister / ministre

Stratis Consulting Inc.
115-527 Dundonald Street
Fredericton, NB E3B 1X5
Canada

14 February 2022

DELIVERED BY CANADA POST EXPRESS POST

Anne Hamilton, MA, RPA
Manager
Regulatory Services Unit
Heritage and Archaeological Services Branch
Tourism, Heritage and Culture
Government of New Brunswick
Andal Building
225 King Street
PO Box 6000
Fredericton, NB E3B 1E1

RE: Parlee Beach Dredging, Westmorland County
Transmittal of Final Technical Report for AFRP 2021 NB 88

Dear Anne Hamilton:

I am enclosing the Final Technical Report for the above-captioned project. Englobe engaged Stratis to complete a Preliminary Investigation.

A Preliminary Investigation was undertaken, which included Documentary Research, Contacting Local Individuals and Technical Experts where warranted, and a Preliminary Field Examination.

This Final Technical Report was completed in accordance with *Guidelines*[1] and meets all conditions of the AFRP, including:

- Condition No. 5, "A final technical report will be due March 31, 2022".
- Condition No. 6, "The holder of this Permit must provide copies to Archaeological Services Section, Heritage Branch, of all field records, notes, maps, drawings, catalogues, and photographs pertaining to the description and context of all objects recovered under this permit". No objects were recovered under this Permit. All required records are included in the Final Technical Report.
- Condition No. 7, "All cultural material recovered under this Permit must be deposited with Archaeological Services Section, Heritage Branch, upon termination of the Permit". No cultural material was recovered. There is no cultural material to submit.

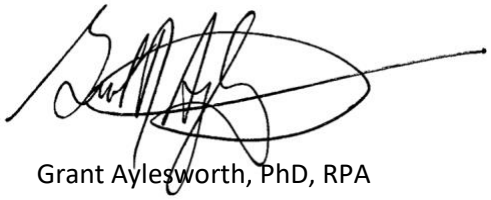
The submission of this Final Technical Report marks the termination of work under AFRP 2021 NB 88 and the fulfillment of all AFRP conditions.

[1] *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick.* Archaeological Services, Heritage Branch, Department of Culture, Tourism and Healthy Living, Government of New Brunswick. 31 July 2012.

Anne Hamilton, Government of New Brunswick, 14 February 2022

Yours truly,

Stratis Consulting Inc.



Grant Aylesworth, PhD, RPA
Managing Director

c. +1 506 999 0151
e. grant.aylesworth@stratis.consulting

Enclosures: One compact disc containing PDF of the Final Technical Report;
One hard copy of the Final Technical Report; and
One additional hard copy of field notes.

Digital Copy: Englobe

Preliminary Investigation Final Technical Report

Parlee Beach Dredging, Westmorland County

Prepared by
Stratis Consulting Inc.

Stratis

Notice to Reader

This report was prepared based on information available at the time of writing. This report is intended meet requirements of a Preliminary Investigation as required by *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick,* written by Archaeological Services, Heritage Branch, Department of Culture, Tourism and Healthy Living, Fredericton, 31 July 2012.

Copyright and Non-Disclosure

Use by Third Parties

This report was prepared at the request of, and for the sole use of, a client. This report does not constitute advice to third parties.

Cover Image

Aerial overview of eastern end of project area, facing east.

Preliminary Investigation Final Technical Report:
Parlee Beach Dredging,
Westmorland County

Preliminary Field Examination
Completed Under Archaeological Field Research Permit Number 2021 NB 88

Prepared for:

Englobe
Geotechnical, Materials and Environment
1077 St. George Boulevard
Suite 400
Moncton NB E1E 4C9

In Fulfillment of AFRP Condition No.5 (Final Technical Report),
Submitted to:

Review and Regulations Section
Heritage and Archaeological Services Branch
Culture, Heritage and Sport Division
Tourism, Heritage and Culture Department
Government of New Brunswick
P.O. Box 6000
Fredericton NB E3B 5H1

Prepared by:

Stratis Consulting Inc.
115-527 Dundonald Street
Fredericton, NB E3B 1X5

Stratis

Final version submitted to Tourism, Heritage and Culture:
14 February 2022

Grant Aylesworth, PhD

Registered Professional Archaeologist (Registration Number 15583)

Principal Investigator and Author

Table of Contents

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List of Abbreviations Frequently Used in Stratis Reports

AFRP	Archaeological Field Research Permit
AHB	Archaeology and Heritage Branch, THC
CAR	Canadian Aircraft Regulations
CEA	Centre d'études acadiennes (Université de Moncton)
CIHB	Canadian Inventory of Historic Building
DEM	Digital Elevation Model
DTI	Department of Transportation and Infrastructure
EODMS	Earth Observation Data Management System
GIS	Geographic Information System
GNB	Government of New Brunswick
GPS	Global Positioning System
HIA	Heritage Impact Assessment
LAC	Library and Archives Canada
LiDAR	Light Detection and Ranging
MARI	Maritime Archaeological Resource Inventory
NAPL	National Air Photo Library
NB	New Brunswick
NRED	Natural Resources and Energy Development (Department of), GNB
NTS	National Topographic Service
PANB	Provincial Archives of New Brunswick
PID	Parcel Identification (Number), SNB
PIPEDA	Personal Information Protection and Electronic Documents Act
RoW	Right of Way
RPA	Registered Professional Archaeologist
RPAS	Remotely Piloted Aircraft Systems
SNB	Service New Brunswick
Stratis	Stratis Consulting Inc.
THC	Tourism, Heritage and Culture (Department of)
TIFF	Tagged Image File Format

Introduction and Overview

Stratis Consulting Inc. ("Stratis") was engaged by Englobe ("the Client") to undertake a Preliminary Investigation. This investigation is a phase of Heritage Impact Assessment (HIA) for planned dredging of a tidal inlet along the southern edge of Parlee Beach Provincial Park, Westmorland County. Since the park was opened in the late 1950s, a tidal channel along the park's southern edge has filled with silt and sand and requires dredging to restore the flow of water.

Stratis completed a Preliminary Investigation (i.e., Documentary Research and Preliminary Field Examination) for the Project Area, including anticipated dredging areas. Each activity of the Preliminary Investigation followed *Guidelines*[1] as detailed in this Final Technical Report. The Documentary Research included a request for information to Archaeology and Heritage Branch (AHB) of the Department of Tourism, Heritage and Culture (THC) and other activities. The Preliminary Field Examination consisted of a walkover and flyover visual survey, conducted by Stratis under an Archaeological Field Research Permit (AFRP 2021 NB 76). The permit was issued by AHB (Appendix A). The Preliminary Field Examination was undertaken at low tide so as to be able to see as much dry land surface area as possible in the Project Area. Underwater survey was not undertaken although some parts of the Project Area have very shallow water and the submerged bottom could be viewed during the Preliminary Field Examination.

The Project Area is in a coastal wetland that includes a tidal inlet located on a tidal flat. Outside and adjacent to the tidal flat, is a marsh that extends along the edges of the tidal inlet. To the north is a dune and beach. The beach is also a wetland and at the western end of the Project Area, this has formed during the 20th century, extending the beach to the west. The bedrock is sandstone that is found throughout eastern and central New Brunswick. The surficial geology consists of modern beach sand and tidal marshes. The surficial geology consists of older tidal marshes under the contemporary beach sand, indicating that the strandline of the Northumberland Strait has transgressed.

In general, the area around Shediac has been inhabited by Indigenous people for millennia. The British Crown granted land in the Project Area during the first third of the 19th century. This included land to the Madras School and a glebe to St. Martin in the Woods. The church is not in the Project Area. Research did not determine what activities the church or school undertook in the Project Area. Euro-Canadian settlers were well established extensively in the Shediac area by the mid 1850s, with earlier settlement. A railway from Saint John to Shediac was completed by 1860, and what is now Parlee Beach Provincial Park was a recreational destination since at least that time. The area was previously known as Belliveau Beach and Gould's Beach, after families that ran pavilions and canteens on the area that is now the provincial park.

An archaeological object, a stone tool, was found at Parlee Beach in the 1980s at a location that is over 200 m outside the Project Area. Another archaeological object find location is along the southern bank of the tidal inlet near its outfall. This location yielded late 19th and early 20th century refuse. No archaeological objects were observed or collected in the Project Area during the Preliminary Investigation.

Based on the Documentary Research and Preliminary Field Examination (visual surveys), the dredging areas are mostly consistent with areas of low archaeological potential. Dredging is anticipated to take

[1] *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick.* Archaeological Services, Heritage Branch, Department of Culture, Tourism and Healthy Living. 31 July 2012.

place in the tidal inlet channel in areas that have infilled since the 20th century. One exception of elevated archaeological potential any area within 100 m of the 19th century refuse, which has been registered by THC as Borden Number CbDd-24, which is a national cataloging system. The refuse appears to have been collected from the south bank near Dredging Area A, near the western end of the Project Area. It is recommended that ground disturbance atop the bank in this area be avoided.

Proceeding to Field Evaluation (e.g., archaeological shovel testing) is not supported by the findings of the Preliminary Investigation. That is, shovel testing is not typically done in wetlands or in tidal inlet channels. Nevertheless, THC may recommend or require additional archaeological investigative steps according to THC policy (*Guidelines* p. 18). These measures, if needed, can be set out between the THC branches. Archaeological Monitoring of dredging is not permitted under *Guidelines* unless manual shovel testing is completed first. Therefore, Archaeological Monitoring of dredging cannot be recommended. Stratis made no determination in respect of the utility of monitoring dredging since monitoring for the Project would not be allowed by THC *Guidelines.*

The potential for the Project to accidentally encounter unknown archaeological sites or archaeological objects is considered low. There is potential to encounter additional 19th century refuse near CbDd024; however archaeological monitoring in 2019 along St. John Street, found nothing. As with any project, anywhere in New Brunswick, if archaeological objects are accidentally encountered, notification of THC is required by law. THC's statutory and policy requirements should be followed during the Project. Following review and approval by the Client, this final technical report should be filed by the author with THC.

No additional archaeological objects or features were found in the areas that were visually surveyed during this Preliminary Investigation. With the Preliminary Field Examination completed, the work under AFRP 2021 NB 88 is concluded.

Proceeding to additional HIA steps done at the discretion of the THC Minister.

Findings

Considering the available evidence, the anticipated activity areas for dredging are mostly consistent with areas of low archaeological potential with the exception of the area near CbDd-24. That is, most of the dredging will take place in the tidal inlet channel and remove material that has washed in as the dune complex north of Dredging Area A and B formed during the latter part of the 20th century. The Project Area is mostly wetland, which is considered low archaeological potential by THC. The southern bank of the tidal inlet, near CbDd-24 may contain additional 19th and 20th century refuse and it is recommended that the top of bank within 100 m of CbDd-24 be avoided.

The Preliminary Investigation did not identify new archaeological features, sites, or objects in the project areas. The potential to encounter unknown heritage resources during construction is considered low. Archaeological objects could be accidentally encountered if ground is disturbed near CbDd-24, so this area is recommended for avoidance. The channel itself cannot be avoided since the Project will dredge it in this area. Since archaeological testing of the channel is not practical or perhaps not possible, archaeological monitoring during dredging cannot be recommended. This is because *Guidelines* do not allow monitoring unless shovel testing has been undertaken first. A Site Alteration Permit, related to CbDd-24 has been required by THC and the SAP process may require that additional investigation be undertaken.

Besides the channel near CbDd-24, where 19th century refuse may have eroded in or been placed in the past, it is not anticipated that areas of elevated archaeological potential will be disturbed by the Project. Proceeding to Field Evaluation (*e.g.,* shovel testing) is not supported by the findings of the Preliminary Investigation since the banks of the tidal inlet, which could be considered to have elevated archaeological potential, are not anticipated to be disturbed by project-related activities.

Decisions regarding any further archaeological activities and/or investigative steps rest with THC, the Client, and the Proponent.

Recommendations

Stratis makes the following recommendations:

1. Avoid ground disturbance along top of bank within 100 m of CbDd-24;
2. develop and follow accidental archaeological discovery protocols;
3. ensure construction personnel awareness of applicable statutes;
4. duty to report archaeological and/or palaeontological discoveries;
5. submit this Final Technical Report to THC as soon as practicably possible; and
6. Apply for any required Site Alteration Permit as soon as possible.

Proponent

The project is being managed by:

Englobe
Geotechnical, Materials and Environment
1077 St. George Boulevard
Suite 400
Moncton NB E1E 4C9

+1 866 981 0191
info@englobecorp.com

On behalf of:

Parks Programming and Planning Branch
Tourism, Heritage and Culture
Marysville Place
P.O. Box 6000
Fredericton, NB E3B 5H1

+1 506 453 3115
thctpcinfo@gnb.ca

Filing with THC

Following Client review and approval of this report, a hard copy and a CD with a PDF, as required by THC policy, will be provided by Stratis to:

Research and Assessment Section
Archaeology and Heritage Branch
Culture, Heritage and Sport Division
Tourism, Heritage and Culture
Government of New Brunswick
P.O. Box 6000
Fredericton NB E3B 5H1
+1 506 453 3115

Objective and Scope of the Preliminary Investigation

The Preliminary Investigation followed THC *Guidelines*, which indicate that "The Preliminary Investigation for heritage resources is intended to identify and assess heritage resource potential or cultural sensitivity within a proposed project area" (*Guidelines*, p. 13). The Preliminary Investigation focused on heritage resource potential. Identification of cultural sensitivity, if undertaken, will be done by others. Following the *Guidelines,* the Preliminary Investigation considered the following three steps:

1. Documentary Research;
2. Contacting Local Individuals and/or Groups; and
3. Preliminary Field Examination.

The statutory context for archaeological investigations in New Brunswick is primarily the *Heritage Conservation Act*. Archaeological fieldwork related to EIAs may be required under New Brunswick's Environmental Impact Assessment Regulation but a permit is required under the *Heritage Conservation Act*. Proponents may wish to undertake archaeological investigations for other reasons. At the request of the Client, Stratis applied for a permit for a "Preliminary Field Examination" as part of a "Preliminary Investigation" (*Guidelines*, p. 17). This report falls under Section 2.2 of THC *Guidelines* and meets Condition 5 of the AFRP, a condition that requires a Final Technical Report.

Professional Expertise of the Author

Dr. Grant Aylesworth, Managing Director of Stratis Consulting Inc., undertook the Preliminary Investigation. He was the first Registered Professional Archaeologist (RPA) in the Maritime Provinces and holds a PhD in anthropology. He has completed dozens of projects for clients in the public and private sectors, including archaeological monitoring and Environmental Impact Assessments. His work for governments has included municipal, provincial, and First Nations clients. His recent experience includes a variety of projects including dam decommissioning, marsh restoration, bridge replacements, culvert replacements, wind energy, and water transmission. He has done archaeological monitoring of projects such as water main construction, decommissioning of energy generation facilities, and monitoring on historic sites. He has experience with large and small projects, from large-scale multi-million-dollar EIAs to expert court testimony and independent reviews of EIAs. He has taught university courses in archaeological methods, theory, ethics, politics, and archaeological field schools. He is a published authority including peer-reviewed work.

Archaeological Field Research Permit Number

Stratis completed the Preliminary Field Examination under AFRP 2021 NB 88, issued to Dr. Grant Aylesworth, RPA No. 15583. The AFRP expires on 31 December 2021.

Dates and Duration of the Study

The Project area was visited as soon as the AFRP was available and the Documentary Research was completed. Stratis undertook the Preliminary Field Examination on 26 September 2021.

Organizational Format of this Final Technical Report

The Preliminary Investigation was contracted by the Client with this Final Technical Report to the Client. Following THC requirements, this Final Technical Report was structured to follow Appendix D of THC *Guidelines* and is intended to meet Condition 5 of the AFRP. As such, the headings and sections in this report follow THC requirements. THC-related documents are in Appendix A.

Resources Consulted in Preparation for and During the Preliminary Investigation

Resources consulted during the Preliminary Investigation and in preparation of this Final Technical Report are cited in footnotes, tables, or as in-text citations throughout this document.

Proposed Project

The Proponent plans to dredge four areas within the water of a tidal channel along the south side of Parlee Beach Provincial Park. Dredging depth is anticipated to be approximately 80 cm from the existing channel bottom and width is anticipated to be approximately 1 m to 2 m. There is no anticipated excavation or ground disturbance along the current shoreline.

Boundaries of the Project Area

The Project Area boundaries are outlined in Figure 1, in which the four anticipated dredging areas are indicated.

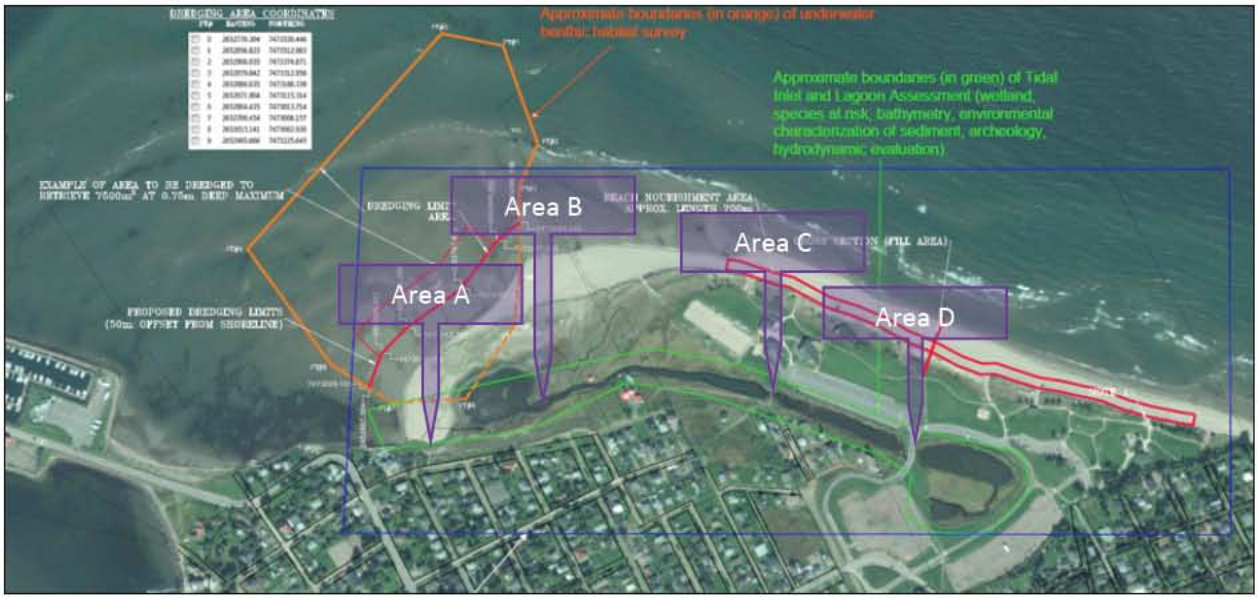

Figure 1. Approximate dredging areas, lettered by Stratis (base image supplied by Englobe).

Projected Extent and Level of Land Alteration of Disturbance

Land alteration and disturbance is anticipated to be limited to areas within the channel and not on the surrounding shoreline. The dredging will alter the bottom of the channel in that material will be removed and disposed of outside the project area. Dredging is anticipated to reach about 80 cm below the current channel bottom and cover an anticipated width of 1 m to 2 m at each of the four anticipated dredging areas. The length of the area to be dredged is not known.

The project will alter the bottom of the channel but is not anticipated to alter the surface along the existing shoreline. There are no plans for excavation, clearing, or grubbing on dry land and project access will use existing driveways. Project-related activities, therefore, have limited potential to alter or disturb the land except for the bottom of the channel. Existing parking areas and ancillary facilities will be used without modification.

Project Schedule

The Project construction dates are not currently known but are anticipated to be as soon as possible following the Environmental Impact Assessment Determination Review, should the project be approved.

Project Area

The Project is within Parlee Beach Provincial Park. There are private properties along the southern edge of the project area (Figure 1) but these properties will not be accessed or altered to carry out the Project.

Biophysical Features

The Project area is in the Maritime Plain division of the Appalachian Uplands physiographic sub-region of Canada (Atlas of Canada, n.d.). The Project area is within a provincial park. A small tidal channel runs through the Project area. The Project area that will be dredged is mapped by the Government of New Brunswick as wetland (e.g., Figure 2). Surrounding land, outside the project area is mostly infilled residential lots to the south and a sand dune complex to the north. The dune complex has been heavily modified and infilled as part of previous construction related to the provincial park.

Ecological Conditions

Agriculture and Agri-Food Canada provides an interactive map of the National Ecological Framework for Canada, available online.[2] According to this map, the Project area is in Ecoregion 122, Maritime Lowlands, Ecodistrict 500 of the Atlantic Maritime Ecozone. In general, the Project area has been a provincial park and residential area since the late 1950s, with prior recreational and other use. Historic period uses of the surrounding area were agricultural and residential. Modifications related to road and park construction are evidenced in aerial photographs and LiDAR-derived DEM images. This includes cutting, filling, road construction, bridge construction, and ditching. It is possible that the tidal inlet has been previously dredged.

[2] National Ecological Framework for Canada, Interactive Maps, Agriculture and Agri-Food Canada, Government of Canada. Available online at: https://sis.agr.gc.ca/cansis/publications/webmaps.html.

Ecological Land Classification

According to (Zelazny, 2007 [2003]), the Project area is in the Eastern Lowlands Ecoregion: Ecoregion Number 6; Ecodistrict Number 6, Kouchibouguac. Further information is available from the Zelazny publication. Shapefiles of these data are available from SNB online.[3]

Land Use Practices

The dredging area is within crown property. Surrounding areas are a mix of a publicly owned provincial park and private property. Some past land use practices are known from aerial photographs and from Zelazny (2007 [2003]). In terms of Indigenous use, Zelazny states the Ecodistrict is part of the traditional Mi'kmaq territory of Sigenigteoag, in which "many important villages or burial grounds were located at the mouths of rivers such as the Scoudouc, Butouche, Richibucto, Black, Aldouin, and on Shediac Island" (Zelazny 2007[2003]:301). Zelazny further indicates that the Northumberland coastline was one of the earliest parts of New Brunswick settled by Euro-Canadians, with nearby Shediac well established by the 1850s. Further, Zelazny states that a railway was completed between Saint John and Shediac in 1860.

All possible past land use practices are not known. Twentieth century aerial photographs indicate that the Project Area had been a beach, marsh, and wetland since the 1930s. The sand dunes to the north of Dredging Areas A and B formed in the later 20th century. In general, the area has been a recreational attraction for over 100 years.

Condition of Land

The land in, and adjacent to, the dredging area has been modified by erosional contact, tidal water flow, infilling, extensive construction, and other activities. The sand dunes to the north of Dredging Area A have formed since the mid-to late-20th century. The tidal inlet has silted or otherwise filled in during that time, since the western end of the Project Area was formerly open, albeit probably shallow, water. The land within the provincial park has been modified through construction and infilling since the 1980s. Prior to that, other recreational businesses were present in the park area, but outside the dredging locations.

Weather Conditions and Patterns

Fieldwork took place following the availability of the AFRP. Historical information on weather is available online from the Government of Canada's "Almanac Averages and Extremes".[4] Hydrometric data is available from the Government of Canada's Hydrometric Data Map Search.[5]

[3] Ecological Land Classification, Data Catalogue, GeoNB, Service New Brunswick, Government of New Brunswick. Available online at: http://www.snb.ca/geonb1/e/DC/Ecosite.asp.
[4] Almanac Averages and Extremes, Environment and Natural Resources, Government of Canada. Available online at: https://climate.weather.gc.ca/climate_data/almanac_selection_e.html.
[5] Historical Hydrometric Data Map Search, Environment and Natural Resources, Government of Canada. Available online at: https://wateroffice.ec.gc.ca/google_map/google_map_e.html?map_type=historical&search_type=province&province=NB&region=ATL.

Methodology

Guidelines (p. 59) indicate that this report section must outline methods and plans. Since the permit and the plan were for Documentary Research and a Preliminary Field Examination forming a Preliminary Investigation, the methodology simply followed the corresponding provincial *Guidelines.* The *Guidelines* (p. 47) indicate that a Registered Professional Archaeologist with at least a Master's degree must obtain an AFRP for any Preliminary Field Examination. An AFRP was applied for and granted to the author for a Preliminary Field Examination, which was then lawfully undertaken following the completion of Documentary Research.

Preliminary Investigation

According to provincial *Guidelines* (p. 13), a Preliminary Investigation must consider three methodological steps:

1. Documentary Research
2. Contacting Local Individuals and/or Groups (i.e., Direct Consultation)
3. Preliminary Field Examination (these can be walkover, drive-by, or flyover visual examinations)

Stratis followed the *Guidelines*. This Final Technical Report documents what was done for each of the three steps. Both a walkover and flyover were undertaken.

Resource Inventory

According to *Guidelines,* a Resource Inventory follows completion of Field Evaluation. Since the AFRP was for a Preliminary Field Examination as part of a Preliminary Investigation, no Field Evaluation was permitted. As such, there are no methods to report related to Field Evaluation and Resource Inventory. No new archaeological resources were identified during the Preliminary Investigation.

Findings

Appendix D of the *Guidelines* (pp. 58-62) stipulates topics that must be covered by final technical reports. As such, the subheadings in this section, were organized to meet this requirement of the *Guidelines.*

Preliminary Investigation

As per provincial *Guidelines* (p. 13), Preliminary Investigation must consider three steps: Documentary Research, Contacting Local Individuals and Groups (also termed Direct Consultation), and Preliminary Field Examination.

Documentary Research

Documentary Research was completed to meet the requirements of the *Guidelines* (p. 14-15).

Archaeological Predictive Model

The *Guidelines* (p. 14) require that the latest "Archaeological Predictive Model" for the Project area be purchased from THC. The model is a GIS-based map that, where applicable, shows features such as slope, watercourses, catalogued archaeological sites, cemeteries and other GIS features that can be of

note for a Preliminary Investigation. The map shows two known locations where archaeological objects have been found near or in the Project area and wetland. No other archaeological features are shown on the map.

The map shows that most of the Project Area that is anticipated to be dredged is wetland. The *Guidelines* do not consider the archaeological potential of wetlands; however, Archaeology and Heritage Branch (2020) has stated that "there is presently no regional evidence to support an assessment of elevated archaeological potential" for wetlands.

Any area within 50 m of a named watercourse in New Brunswick is considered under *Guidelines* to be high archaeological potential unless other factors suggest otherwise. Any are within 50 m to 80 m of a named watercourse is considered to be medium archaeological potential unless other factors suggest otherwise. A limit of 30 m applies to unnamed watercourses that flow into named watercourses. The tidal inlet in the Project Area could be considered and unnamed watercourse that flows into a named body of water and the high potential designation may apply to nearby land. However, project-related activities are not anticipated to disturb these areas since dredging will be in the watercourse, not on the watercourse banks.

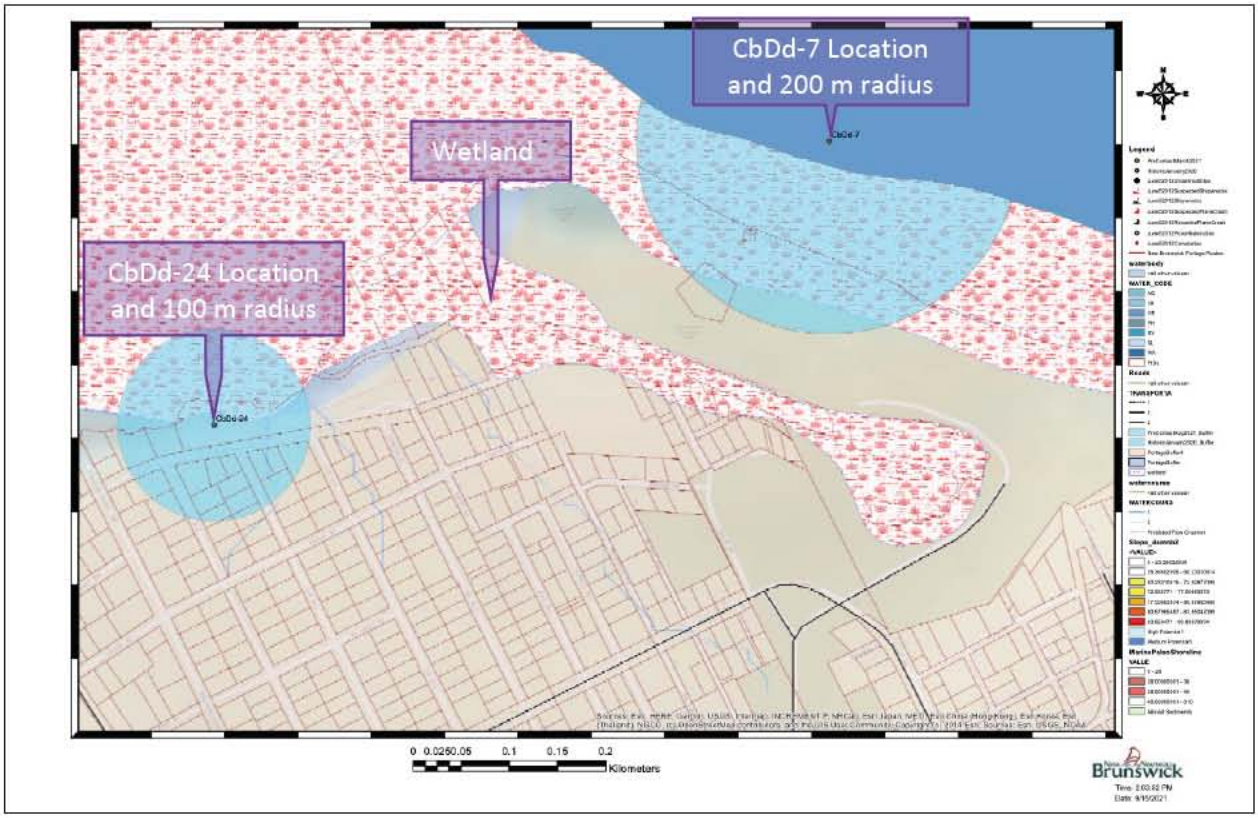

Figure 2. GIS-based map from THC showing known archaeological find areas.

Tourism, Heritage and Culture Records

Stratis submitted a written request for records from THC on 3 September 2021 (Appendix A). THC responded on 15 September 2021. A review of these records is a required component of Documentary Research, as per *Guidelines* (p. 14), that THC requires for all Preliminary Investigations. THC undertook a keyword search of their database, which is assumed to capture all of the information required by

Guidelines. THC selected the keywords: Parlee, Chene, and Shediac. As per *Guidelines*, a search for the following records was requested with the results noted:

- MARI Files
    - THC stated that there are 10 "archaeological sites" within 5 km of the Project Area. Stratis requested the Maritime Archaeological Resource Inventory (MARI) records for the two locations identified on THC's GIS-based map.
- New Brunswick Archaeological Site File
    - No information received; MARI files requested.
- Borden Map File
    - No information received.
- Archaeological Project Manuscripts
    - No information received.
- Private Collections File
    - No information received.
- New Brunswick Plane Crash Inventory
    - No information received.
- New Brunswick Cemeteries Database
    - No information received.
- THC Shipwreck Inventory
    - No information received.
- Any other relevant THC records, including:
    - Published or unpublished sources on local and regional history and other subjects;
        - No information received.
    - Palaeoecological studies
        - No information received.
    - Literature and maps relating to geological, geomorphological, or hydrological history
        - No information received.
    - A list of 25 reports on archaeological assessments or projects in or near Shediac was provided. One report (Stantec Consulting Ltd., 2019)was requested since it related to archaeological monitoring that was done on St. John Street, adjacent to the Project Area.

The MARI form for CbDd-7 indicated that, at this location, an isolated find of a stone "projectile point" was made by a child digging in a sand bar. The find was possibly made in 1984 and reported to THC in 1987.

The MARI form for CbDd-24 indicates that this location was documented for a Ministerial Inspection, the purpose of which was not stated. The MARI form indicates that late 19th to early 20th century Euro-Canadian archaeological objects, consisting of refuse, were found eroding from the shoreline. The MARI form states this is "a fairly typical late 19th – early 20th century rubbish midden".

The Stantec (2019) report related to archaeological monitoring of sewer construction along St. John Street within 100 m of CbDd-24. The monitoring was required by THC because of the rubbish found at CbDd-24. Stantec (2019, p. 10) stated that "No artifacts, features, or deposits of archaeological significance were encountered during monitoring". The Stantec report was reviewed prior to the Preliminary Field Examination and it contains an overview of the Pointe-du-Chêne area. Additional information about the archaeology of the region is available in that document.

Historic Building and Wreck Records

Searches of various historic building and wreck records were undertaken, informed by the project location, anticipated ground disturbance, and following the Documentary Research requirements of *Guidelines* (p. 14). The tidal inlet that is being dredged is a relatively small watercourse that has infilled during the 20th century and the bottom of the water is visible in some areas. Since there was no information about wrecks from THC, it is assumed that no known wrecks exist in the area.

Canadian Inventory of Historic Building

Information from the Canadian Inventory of Historic Building is held by THC and by the Government of Canada with partial materials held at PANB. The Project is not anticipated to involve disturbance of historic buildings so a check of CIHB records was not undertaken.

Receivers of Wreck

Transport Canada maintains Receivers of Wreck records, an overview of which is available online.[6] Searchable online records do not exist. Stratis previously contacted Transport Canada and was advised in writing by a Navigation Protection Program Officer that there is no online database for wrecks in New Brunswick. Additional research with Receivers of Wrecks was not undertaken.

Inventory of Wrecks of the Canadian Coast Guard

The Canadian Coast Guard maintains an Inventory of Wrecked, Abandoned, and Hazardous Vessels. No online searchable database is available, and a federal database has been under construction. Overview information is available online but there is no searchable database.[7] Further research with the Canadian Coast Guard was not undertaken.

The Lloyds Register of Ships

The Heritage and Education Centre of Lloyd's Register Foundation makes some records available online.[8] In addition to the Lloyd's Register Foundation, Internet Archive has digital copies of Lloyd's Register available online, apparently provided by the Foundation.[9] Further research into the Lloyd's Register of Ships was not undertaken.

Ocean Mapping Group, University of New Brunswick

The Ocean Mapping Group at UNB provides some seabed mapping data online.[10] The Ocean Mapping Group's seabed mapping projects do not cover any locations near the Project area.

Library and Archives Canada

Online searches were done through the Library and Archives Canada (LAC) Web site.

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[6] Receiver of Wreck: Overview, Transport Canada, Government of Canada. Available online at: https://www.tc.gc.ca/eng/programs-629.html.
[7] Information: wrecked, abandoned and hazardous vessels, Canadian Coast Guard, Government of Canada. Available online at: https://www.ccg-gcc.gc.ca/awah-ienad/program-programme-eng.html.
[8] Lloyd's Register of Ships Online, Heritage and Education Centre, Lloyd's Register Foundation. Available online at: https://hec.lrfoundation.org.uk/archive-library/lloyds-register-of-ships-online.
[9] LRFHEC (Lloyd's Register Foundation Heritage and Education Centre, an archive.org Member. Available online at: https://archive.org/details/@lrfhec.
[10] Ocean Mapping Group, Geodesy and Geomatics Engineering, University of New Brunswick, Fredericton. Available online at: http://www.omg.unb.ca/omg/Projects.html.

Collection Search

An "Advanced Search" of Collections can be done online.[11] The keywords used were: "Parlee" and "Pointe du Chêne". "Madras" was not searched.

These searches resulted primarily in military personnel records such as attestation papers, documents related to the railroad, and the breakwater that is located west of the Project area. Some of these materials date back to the 1800s. The search also identified "Parlee Beach Master Plan" Final Report, April 1977", which was funded by the Canada/New Brunswick Regional Economic Development Agreement. English and French versions were identified. The Roméo LeBlanc Fonds contained photographs and documents related to "Parlee Beach Water and Recreation Park", dating to 1984. None of these were available digitally and were not reviewed. These documents were not found at PANB.

New Brunswick Museum

Three different online searches of New Brunswick Museum records are available. The same search terms were used as for LAC.

Art, History and Photography Collection

A collection search is available online.[12] No relevant results were found. A work by Isaac Erb (Collection of the New Brunswick Museum X15918) appears to show the area to the west of the provincial park.

Archives Database

A search of the Archives Database is available online.[13] This search resulted in some administrative and other papers mostly related to Shediac and the Intercolonial Railway.

Research Library Database

A search of the Research Library Database is available online.[14] No results relevant to the archaeology of the Project area were found.

Harriet Irving Library, University of New Brunswick

Online searches were undertaken of the Harriet Irving Library, UNB. Keywords were the same as for LAC.

UNB Libraries and WorldCat

A search was conducted of UNB Library, WorldCat, and other holdings available online.[15] This resulted in Belliveau (1974), which has already been summarized by Stantec (2019). Nothing else related to the archaeology of the Project area was noted. Further use of UNB resources was not undertaken.

[11] Collection Search, Library and Archives Canada, Government of Canada. Available online at: https://www.bac-lac.gc.ca/eng/collectionsearch/Pages/collectionsearch.aspx.
[12] Search Art & History, New Brunswick Museum. Available online at: http://website.nbm-mnb.ca/collections/online/index.asp.
[13] Archives Database, Archives and Research Library, New Brunswick Museum. Available online at: http://website.nbm-mnb.ca/ics-wpd/library/archives%20screen.htm?.
[14] Library Database, Archives and Research Library, New Brunswick Museum. Available online at: http://website.nbm-mnb.ca/ics-wpd/library/library%20screen.htm.
[15] Search UNB Libraries and Beyond, UNB Libraries, University of New Brunswick. Available online at: https://unb.on.worldcat.org/discovery.

The Loyalist Collection

A search was not conducted of UNB Loyalist records because the grants do not date to the late 1700s. It is possible that the grantees were Loyalists but this was not investigated. A search of the Loyalist Collection is available online[16].

Centre d'études acadiennes (CEA), Université de Moncton

A library search was undertaken online at Centre d'études acadiennes (CEA), using the same search terms as LAC.

Library

The digital library catalogue was searched.[17] Nothing relevant to the archaeological assessment of the Project area was found. A copy of Belliveau (1974) was identified.

Institutional and Private Archives

CEA maintains substantial holdings with respect to institutional and personal histories. Various indexes are available to search these archives. The institutional and family histories would not likely contain information that is relevant to the archaeological assessment for this project. Online resources are indices only.

Other Searches

A limited review of other sources was undertaken, primarily to locate maps of the Project area and to understand more about the glebe land grant and the school land grant.

Internet Archive

An online search of the Internet Archive was undertaken for the Madras School and the Church of St. Martin's in the Woods.

Regarding the Madras School, (Moore & Forbes, 1992). These authors state (p. 89) that "The Madras School System was introduced to New Brunswick by the National Society for the Promotion of Education of the Poor, working in the interest of the Anglican Church…charter was confirmed in 1820…older students acted as monitors and instructed the younger pupils". In general, there were few schools in New Brunswick at that time, so people of all classes attended Madras Schools and paid according to their ability to do so. All religious denominations could attend and they were popular. This school system ended by 1900.

Regarding St. Martin in the Woods, an article (Sayer, 1966) about the church was located. The article indicates that many clergy came to Canada as Loyalists in the late 1700s but that this church was established by William Hannington, a parishioner of the Church of St. Martin-in-the-Fields, who purchased a grant of 5,000 acres around Shediac Cape. Mr. Hannington had been holding religious services in his home, but by 1821, following the arrival of Loyalists and other Episcopalians in the area, the church was built. This coincides with the timeline of the glebe land grant to the Church of St. Martin in the Woods. The church itself was built outside the Project Area, near Shediac Cape, and no information about activities undertaken on the glebe were found.

[16] The Loyalist Collection, UNB Libraries, University of New Brunswick. Available online at: https://loyalist.lib.unb.ca/home.

[17] Effectuer une recherche dans le catalogue, Bibliothèque du CEAAC, Centre D'Études Acadiennes Anselme-Chiasson, Université de Moncton. Available online at: https://www.umoncton.ca/umcm-ceaac/node/30.

David Rumsey Map Collection

An online search of David Rumsey collection was undertaken. This resource is available online.[18] The search term "Westmorland County, New Brunswick" was used to capture a map that may show the Project area. One map (Roe Brothers, 1878) covers the Project area. It does not show the Project area in any detail.

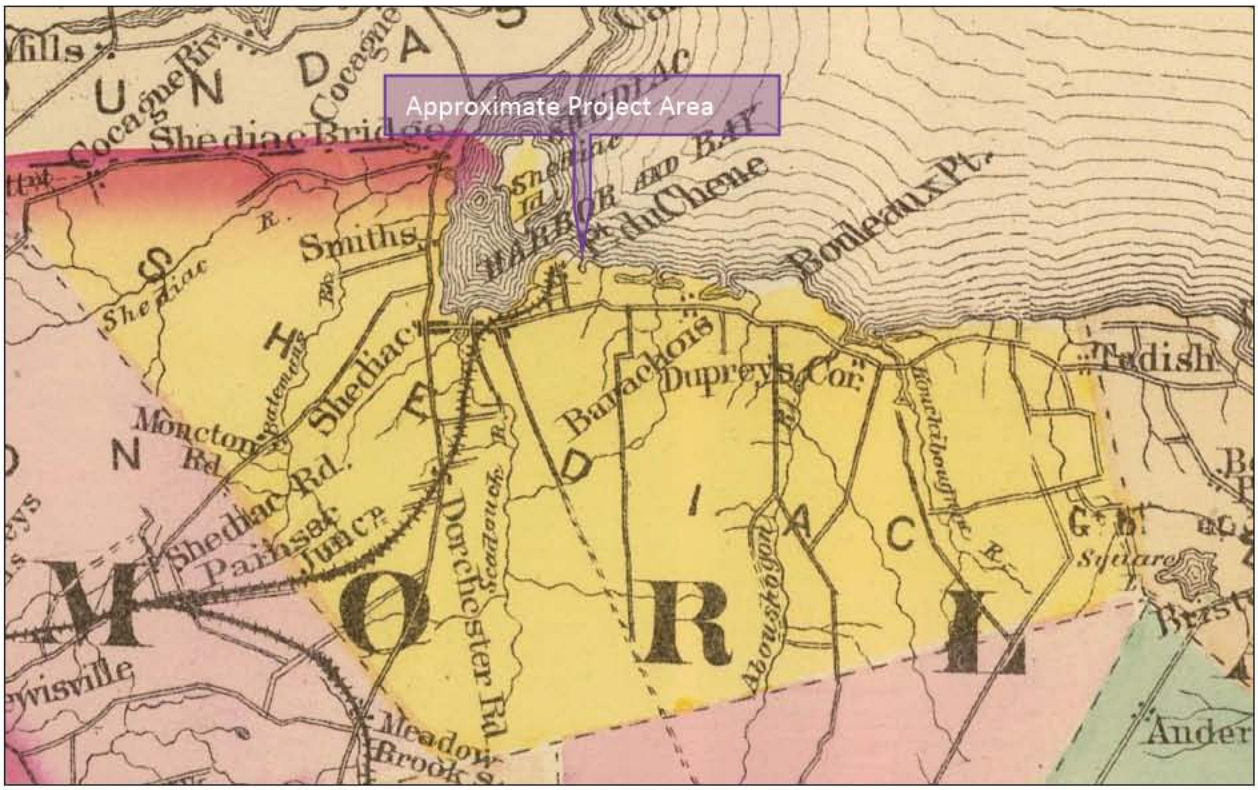

Figure 3. Excerpt from Roe and Colby (1878) showing the Project area.

Norman B. Leventhal Map and Education Center

An online search of this collection was undertaken. This is available online.[19] The LAC search terms returned no relevant results. A search for Westmorland county maps was done and (Walling, 1862) was found. This map does not show the Project area in detail but shows the rail line that was located to the west of the Project area.

[18]David Rumsey Map Collection, David Rumsey Map Center, Stanford Libraries, Stanford University. Available online at: https://www.davidrumsey.com/

[19] Digital Collections, Norman B. Leventhal Map & Education Center at the Boston Public Library. Available online at: https://collections.leventhalmap.org/.

Figure 4. Excerpt from Walling (1862) showing the Project area. Map reproduction courtesy of the Norman B. Leventhal Map & Education Center at the Boston Public Library.

National Oceanic and Atmospheric Administration

Guidelines (p. 15) require that the "North American Pollen Database" be searched. Pollen-related data is searchable in the Paleoclimatology Data "Paleo Data Search" page, available online.[20] This data search is provided by the American National Oceanic and Atmospheric Administration. A search for latitude and longitude of the Project area returned no relevant results.

Geology

Guidelines (p. 15) require "a cursory study of available literature/maps relating to the geological, geomorphological or hydrological history of the landform(s) in question". The online database of the New Brunswick Department of Energy and Resource Development was consulted. This includes surficial and bedrock geology maps.

From these searches, Stratis determined that, generally, the Project area is mapped by the Government of New Brunswick not the Geological Survey of Canada.

[20] Paleo Data Search, National Centers for Environmental Information, National Oceanic and Atmospheric Administration, Department of Commerce, United States Government. Available online at: https://www.ncdc.noaa.gov/paleo-search.

Surficial Geology

Surficial geology maps are searchable online.[21] This search resulted in one map being found in Natural Resources and Energy Development (NRED) repository. This resulted in one map (Mineral Resource Branch, 1974), an excerpt of which is below. This map describes the surficial deposits in the Project Area as modern beach sands and tidal marshes. The beach deposits consist of "well-sorted medium-grained sand…under the sands are found older tidal marsh deposits indicating a probably natural transgression of the shoreline. Modern tidal marshes are generally found behind modern beach bars at the tidal zone". The interpretation of the formation as modern coincides with the description from the MARI Form (page 3) for CbDd-24 where it was stated "this marsh and dune system is a 20th century formation". The historical maps, such as the land grants, show that the tidal inlet was present in the early 1800s.

A generalized surficial geology map was also reviewed (Rampton, 1984). This map shows the Project area as underlain by Late Wisconsinan or Early Holocene undifferentiated marine sediments.

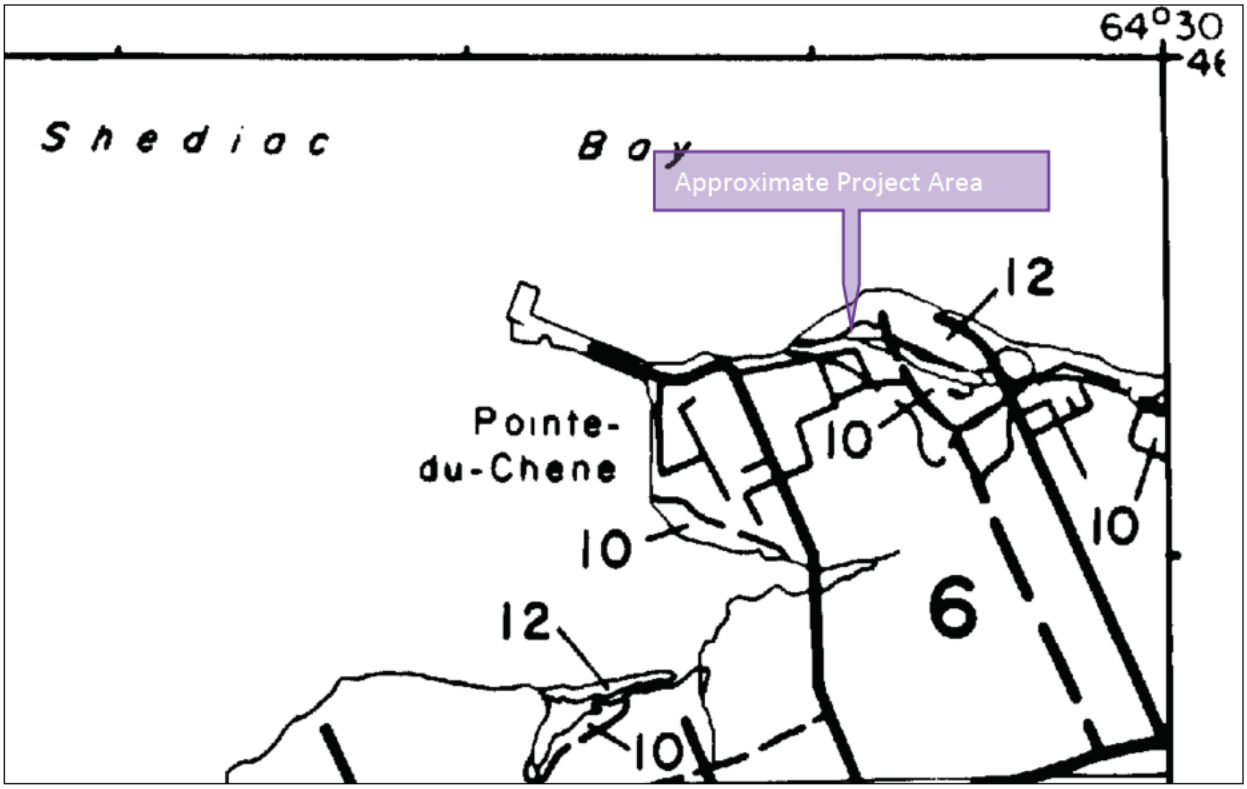

Figure 5. Excerpt from Mineral Resource Branch (1974) showing modern marine beach deposits (12) and tidal marsh deposits (10) in and around the Project area.

[21] Surficial Geology Maps, Natural Resources and Energy Development, Government of New Brunswick. Available online at: https://www2.gnb.ca/content/gnb/en/departments/erd/energy/content/minerals/content/SurficialGeologyMaps.html.

Bedrock Geology

Government of New Brunswick bedrock geology maps are searchable online.[22] There was a relatively recent 1:50 000 map that shows the Project area. This map (Smith, 2007) shows that the Project area is underlain by the Richibucto Formation, which is Late Carboniferous Pictou Group stratified rock that underlies much of eastern and central New Brunswick. This deposit is primarily grey or brownish red sandstone.

Heritage Place Registries

A variety of relevant searches regarding the Project area were undertaken in online registries.

New Brunswick Register of Historic Places

The Register was searched for the Project area. The Register is available online.[23] "Pointe-du-Chene" was not listed as a community. Shediac was searched, which resulted in 24 records that are all outside the Project area.

Canadian Register of Historic Places

This Register is available online.[24] The Register was searched using the "map search" feature. The closest result was Greenwood Cemetery, which is registered as a Local Historic Place. Greenwood Cemetery is south of Pointe-du-Chêne, well outside the Project area.

National Historic Sites: Parks Canada

A database is available online.[25] No National Historic Sites, parks, or other areas administered by Parks Canada were listed in or near the Project area.

Provincial Archives of New Brunswick

A variety of relevant searches were undertaken at the Provincial Archives of New Brunswick (PANB) as detailed in the following sections. A check of records held by PANB is required by *Guidelines* (p. 14) although specific guidance is not given.

Photographic Collections

There is a public workstation at PANB for photograph searches. The photograph database is searchable by place names; however, an archivist with the PANB Media Unit was consulted so that a thorough search could be undertaken. This resulted in a number of photographs of beaches in the Shediac area with only those identified as showing the Project area included below. Numerous other photographs show people on beaches in the Shediac area, possibly including at what is now Parlee Beach Provincial Park.

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[22] Bedrock Geology Maps 1:50 000 Scale, Natural Resources and Energy Development, Government of New Brunswick. Available online at: https://www2.gnb.ca/content/gnb/en/departments/erd/energy/content/minerals/content/BedrockGeologyMaps_1-50-000.html.

[23] Search Historic Places, New Brunswick Register of Historic Places, Government of New Brunswick. Available online at: https://www.rhp-rlp.gnb.ca/PublicSearch.aspx?blnLanguageEnglish=True.

[24] Search, The Canadian Register of Historic Places, Canada's Historic Places: A Federal, Provincial and Territorial Collaboration. http://www.historicplaces.ca/en/rep-reg/search-recherche.aspx.

[25] Find a National Historic Site, National Historic Sites, Parks Canada, Government of Canada. Available online at: https://www.pc.gc.ca/en/lhn-nhs/recherche-search.

The first oblique aerial photograph (Photograph 1, below) shows an area that is generally consistent with the location of the tidal inlet that is in the project area. The description provided by PANB is as follows:

> This is an aerial of Shediac Beach looking north across Shediac Bay with Pointe-du-Chêne in the upper left corner. It is possibly Parlee Beach. A few cottages at the Bluff are visible on the left. In the middle of the picture near the parking lot is Ocean Spray, the beach pavilion operated by the Belliveau family. Behind Ocean Spray and in front of the lighthouse can be seen another beach canteen operated by the Gould family. Ocean View, another beach pavilion, was erected at Pointe-du-Chêne in the early 1920s but had been destroyed by fire when this photo was taken in 1931. Ocean View was rebuilt during the Second World War but disappeared in the 1960s. The beach pavilions were privately run and provided beach-goers with change rooms and showers as well as a canteen and restaurant. Popular summer dances were also hosted on these sites. To the left of the second pavilion is the beach lighthouse, still standing today. Shifting sand and erosion gradually caused the lighthouse to look out of place behind the dunes, but years earlier this lighthouse stood at the water's edge. Belliveau Beach (now called Parlee Beach) is still considered the finest beach in the Shediac area. After Pointe-du-Chêne became a railway terminus in the nineteenth century, beach-goers and cottage developers made Shediac Bay one of the most popular summer vacation areas in New Brunswick.

Photograph 1. "Aerial of Shediac Beach, possibly Parlee Beach". Source: PANB P197/94, black and white glass negative, 19 July 1931).

A second oblique aerial photograph (Photograph 2, below) shows an area that is possibly the eastern end of the project area. This photo appears to be consistent with what are today called Westshore Avenue, Glebe Avenue, and Railway Avenue. The name Glebe Avenue likely reflects the land grant history of the area. Based on the National Air Photo Library (NAPL) catalog number that is on the photograph, it likely dates to around the 1930s. The description provided by PANB is as follows:

> RCAF aerial photograph with the code A1237.81 in the bottom left corner of the photograph. The photo is taken over Shediac Harbour while looking east over Pointe Du Chene. The large body of water in the top left corner with the two fingers sticking out is the large body of water at the end of Parlee Beach. Beyond that you can see Lac des Boudreau. As for the actual town on the bottom right you can see a boardwalk with a small shed on the end of it. behind it there are four long buildings creating a square. Another building can be seen to the left of the square. To the left of that there are a number of houses along the road leading up to the boardwalk. Behind all of them you can see the railway. there are only six or seven cars on it and they do not appear to be in use. Beside the railway you can see a large circle with a something going straight across it. This is the railway turntable which is used to turn the trains around. Behind the railway is simply the rest of the town.

Photograph 2. "RCAF [Royal Canadian Air Force] Aerial of Pointe Du Chene", consistent with early 1930s. Source: PANB 1938-1950 P1/149.26.

Madras School Collection (MC374)

This finding aid contains Madras School documents such as bank books, board minutes, annual reports, letters, cash receipts and other documents. Many of these are financial and administrative in nature. The Annual Report for 1821 (MC374 MS3 1 1821 Annual Report) was retrieved and reviewed. This document contained general information about the Madras school system in New Brunswick, which had been established the previous year. The 1821 report did not mention the land grant in the Project Area and no other relevant documents were noted or reviewed.

Fire Insurance Plans (MC1238)

Fire Insurance Plan indices were reviewed and the Project area was not found.

Department of Public Works Administration Records (RS126)

Department of Public Works Administration Records date from 1855-1970. This finding aid contains extensive holdings. The index was reviewed two folders were retrieved and reviewed. This included RS126 "D.1.h.3 Park Sites – reports, progress, reconnaissance, 1947, 1957-1958" and this did not cover the Project area. RS126 "C.11.a.30 T. Babbitt Parlee, 1954" was also reviewed. Nothing obviously related to the archaeological assessment was noted.

Westmorland County Council Records (RS159)

In the past, counties were an important part of the governance structure of New Brunswick so the County Council finding aid was reviewed. Nothing relevant to the archaeological assessment was noted in the index.

Records of the Surveyor General (RS637)

The finding aid was searched, particularly Section 13, Surveys. In general, the records contain "warrants", which are requests for a survey, and "returns", which are the results of the survey that followed a warrant. The index did not contain relevant listings for the Project area.

Crown Lands Grants (RS656)

The Crown Lands Grants index for maps related to the project area was searched. Several microfiches were retrieved and viewed.

RS656 17/U/2/1865, a 19th-century map of Shediac Parish by C.C. Gregory did not show the Project area.

One plan, RS656 "1/C/Westmorland County PL 76 NB, Plan Parlee Beach showing properties purchased" shows the properties that were purchased to form Parlee Beach Provincial Park. Notably, the plan shows a right of way for a road that used to cross the tidal inlet to access Gould's Beach, which appears in the 1931 oblique aerial photograph. The landowner family names reflect the name of the area as "Belliveau Beach" prior to becoming Parlee Beach Provincial Park.

One map, RS656/17/D/Westmorland (Vol. 1) County (Flat Book), called "Coast of Gulf of St. Lawrence into Shediac", by Sproule, showed the Project area. This map is undated; however, it shows the Madras School Land Grant, which dates to 1821 and not the Church of St. Martin's in the Woods Land Grant, which dates to 1828. Therefore, the map likely dates to approximately between 1821-1828. An excerpt from this map is below.

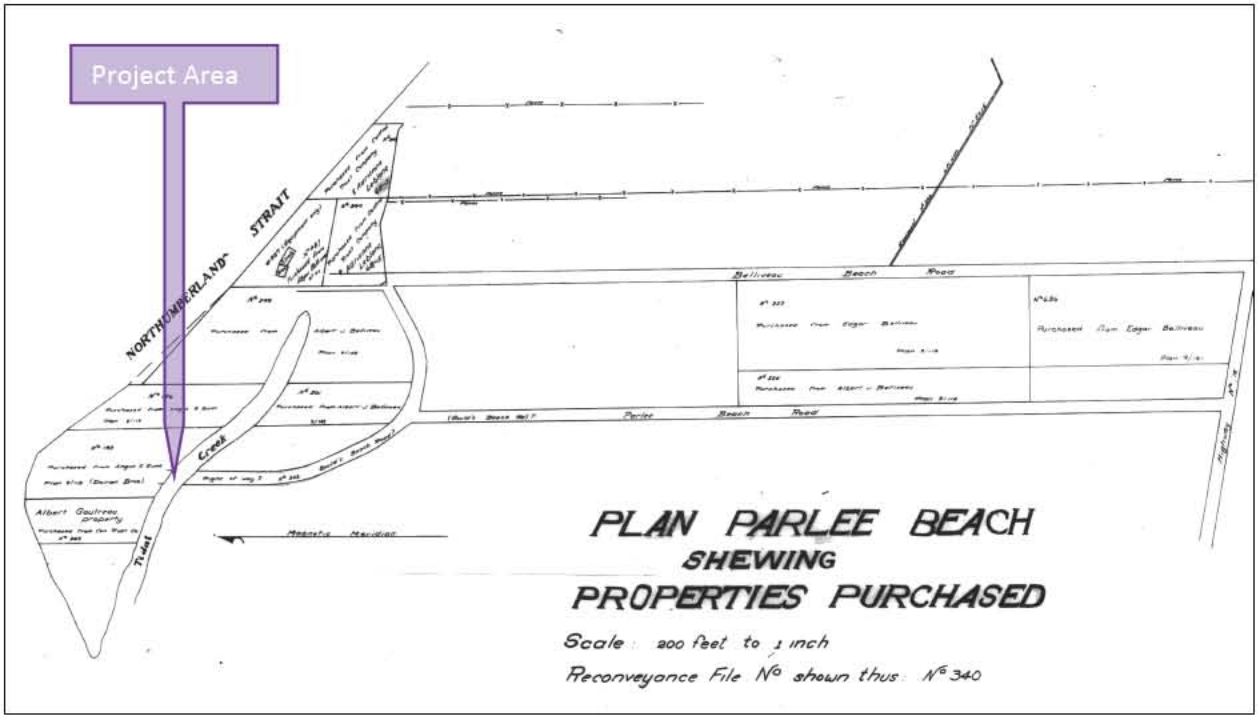


Figure 6. Undated Parlee Beach Plan, PANB RS656 1/C/Westmorland County PL76, showing Project area.

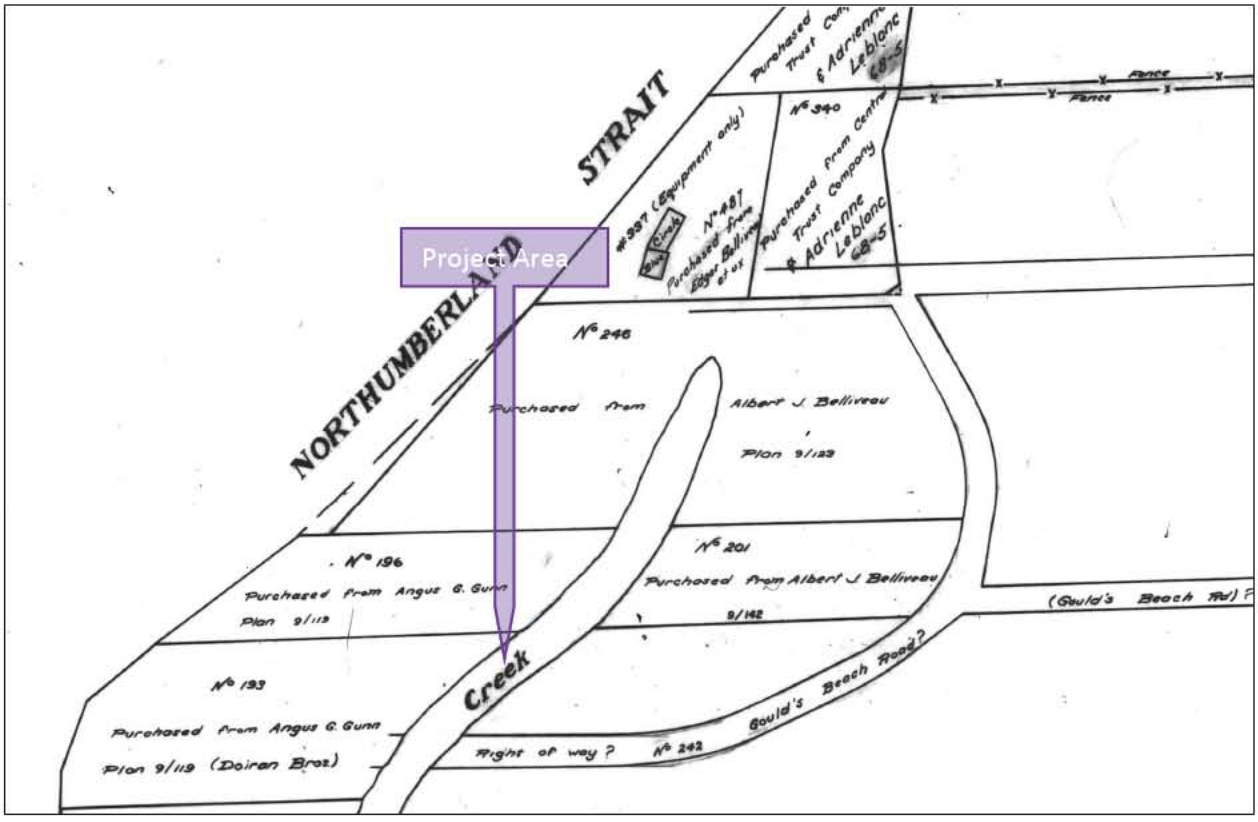


Figure 7. Excerpt from undated Parlee Beach Plan showing eastern end of Project area.

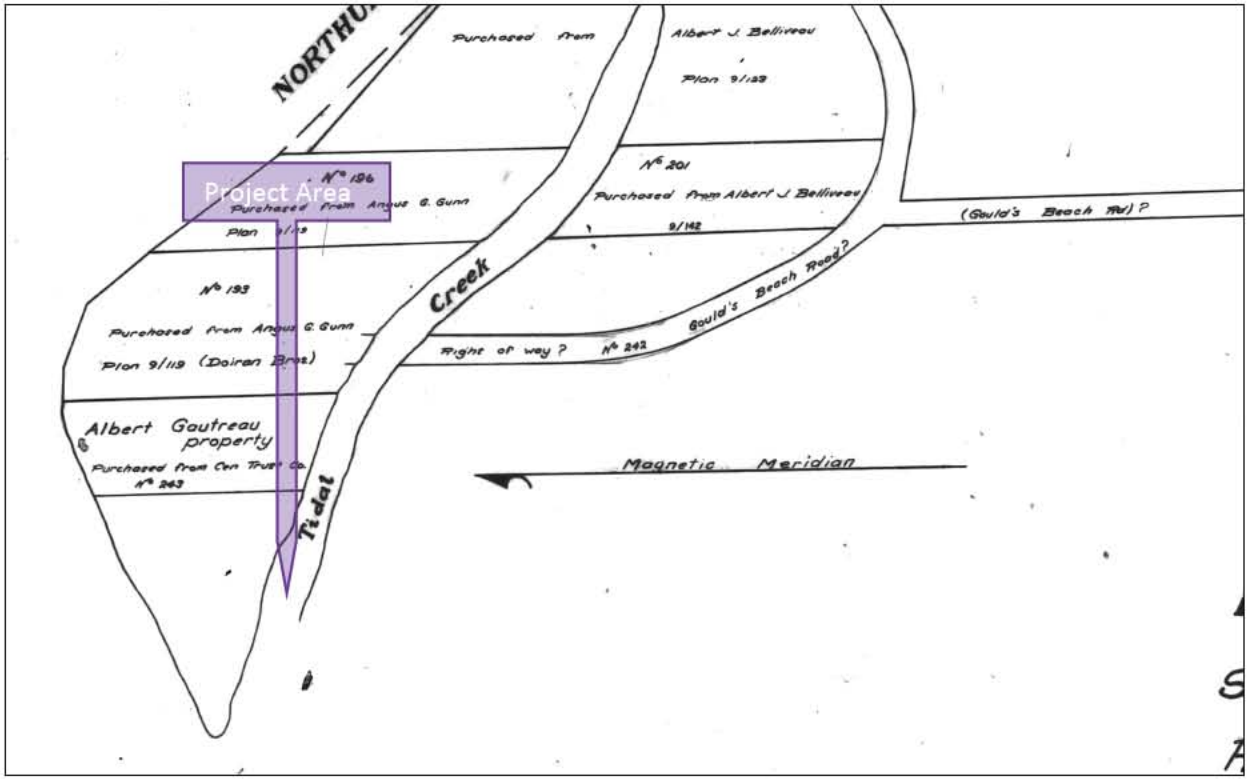


Figure 8. Excerpt from undated Parlee Beach Plan showing western section of Project area.

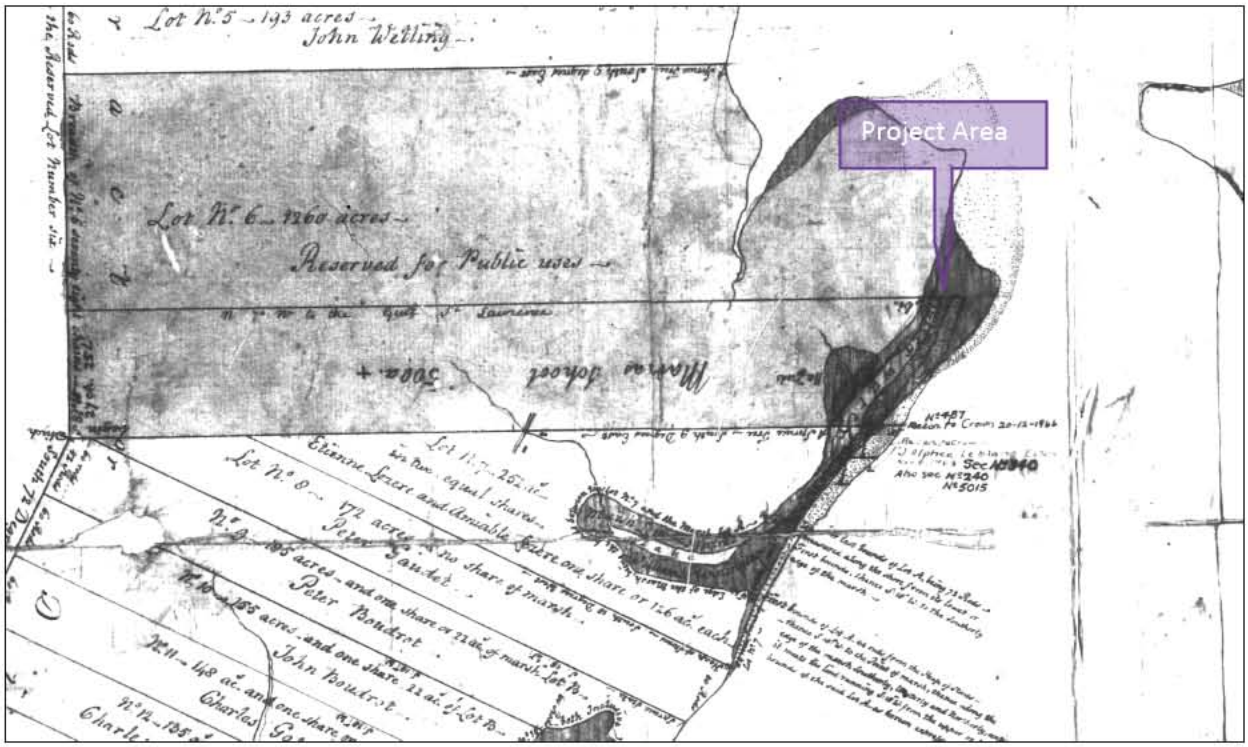


Figure 9. Excerpt from undated Sproule plan showing Project area and land grants, probably dating to 1820s.

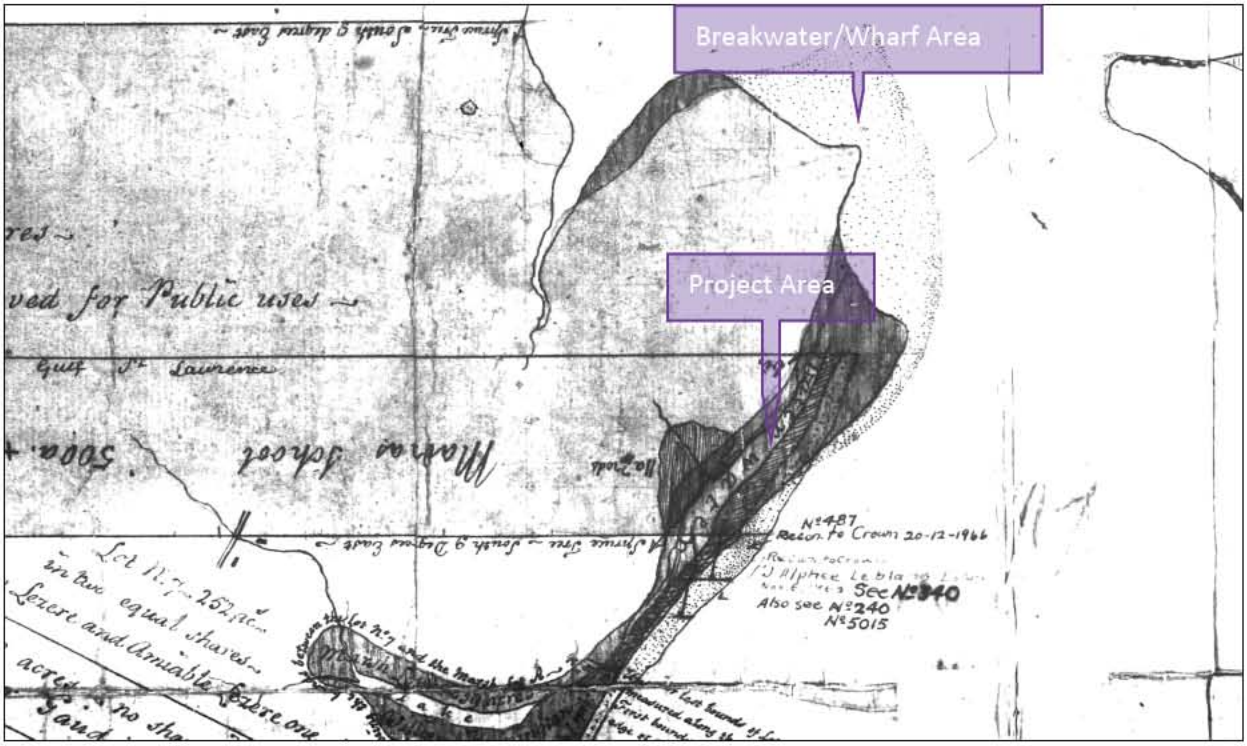


Figure 10. Closer excerpt from undated Sproule plan showing Project area and land grants, probably dating to 1820s.

Land Grants (RS686) and Land Petitions Index (RS108)

The cadastral Crown Grant Basemap for the area was reviewed, through the "Crown Grant Reference Map Viewer" available online.[26] The reference viewer provides the name of a grantee and the date of a grant, which can then be searched in other records. Since the reference map viewer is not a PANB resource, it is reported under the GeoNB Resources and Images section.

The cadastral map viewer indicated that the project area is consistent with three different grants. . The grantees were identified and then searched in RS686, which is available online.[27] The first grant, to Amiable Lezere[28], was a grant of 126 acres dating to 8 March 1806. This grant record is available on microfilm number F16303 as Grant Number 435, granted to Mr. Lezere and 39 others. The 1806 document describes the area as marsh. The second grant was to the Governor and Trustees of the Madras School[29], which was a grant of 500 acres, dating to 27 July 1821. This grant is also available in

[26] Crown Grant Reference Map Viewer, GeoNB, Service New Brunswick, Government of New Brunswick. Available online at: https://geonb.snb.ca/GRP/index.html.
[27] Index to New Brunswick Land Grants, 1784-1997 (RS686), Provincial Archives of New Brunswick, Finance and Treasury Board, Government of New Brunswick. Available online at: https://archives.gnb.ca/Search/RS686/Introduction.aspx?culture=en-CA.
[28] LEZERE, Amiable, 8 March 1806, Index to New Brunswick Land Grants, 1784-1997 (RS686), Provincial Archives of New Brunswick, Finance and Treasury Board, Government of New Brunswick. Available online at: https://archives.gnb.ca/Search/RS686/Details.aspx?culture=en-CA&Key=7379.
[29] MADRAS SCHOOL GOVERNOR & TRUSTEES, 27 July 1821, Index to New Brunswick Land Grants, 1784-1997 (RS686), Provincial Archives of New Brunswick, Finance and Treasury Board, Government of New Brunswick. Available online at: https://archives.gnb.ca/Search/RS686/Details.aspx?culture=en-CA&Key=346.

microfilm F16303 and includes a plan. . The third grant was for a glebe lot for the St. Martin's in the Woods church.[30] This grant dated to 13 November 1828. Earlier grants were not found, though these grants cover only the activities of the British Crown and not earlier settlement.

These maps show that the tidal inlet was present in the early 1800s.

Figure 11. Excerpt from the Madras School grant showing the Project Area. The grant to Mr. Lezere, and the former name of Pointe-du-Chêne as "Oak Point" are shown.

[30] SAINT MARTIN'S CHURCH, 15 November 1828, Index to New Brunswick Land Grants, 1784-1997 (RS686), Provincial Archives of New Brunswick, Finance and Treasury Board, Government of New Brunswick. Available online at: https://archives.gnb.ca/Search/RS686/Details.aspx?culture=en-CA&Key=8243.

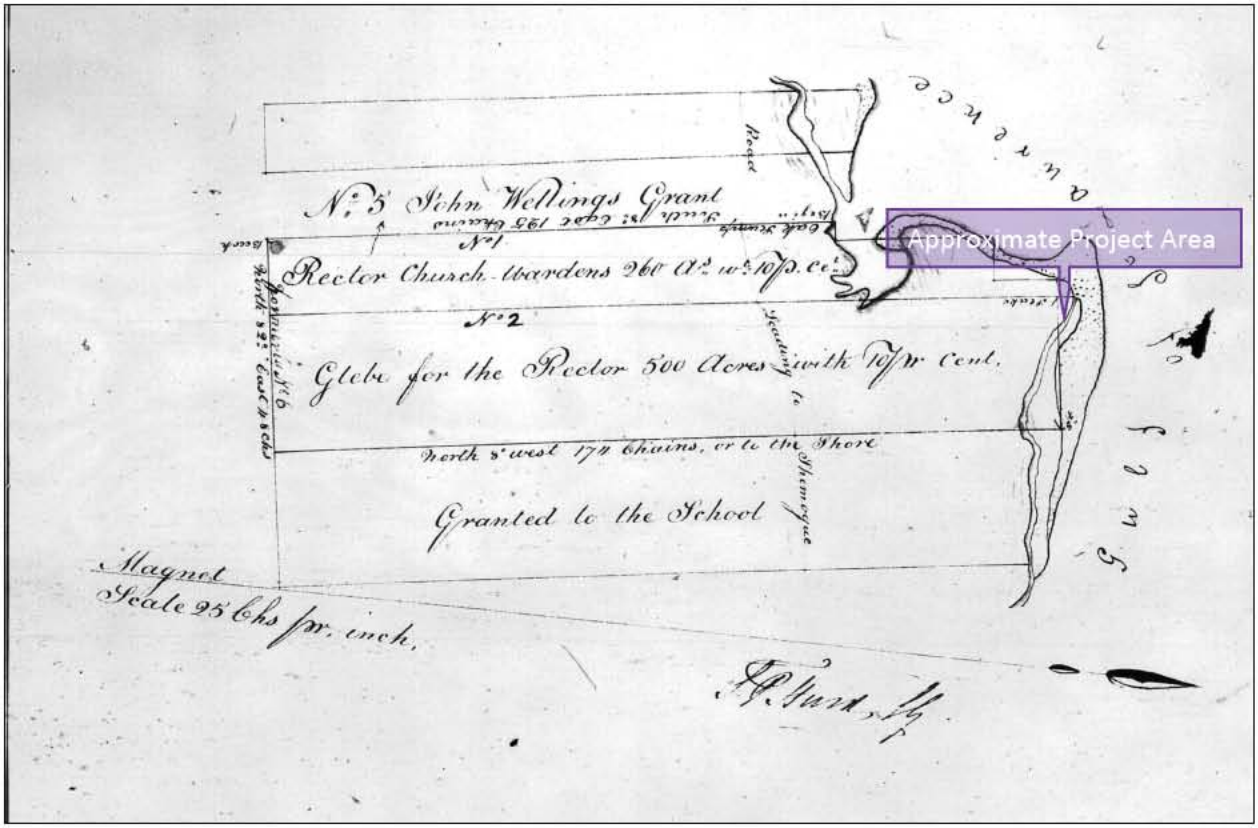


Figure 12. Excerpt from the St. Martins in the Woods grant showing the Project Area.

Wallace Hale's Early New Brunswick Probate, 1785-1835, MC3706

Since one individual, an early grantee was named for the Project area, the probate records were searched online.[31] Mr. Lezere was not listed in these records, which are limited to a 50 year period.

Place Names

Two resources, Rayburn (1975) and PANB online "Place Names of New Brunswick" (Fellows, n.d.) were consulted. Although Fellows allegedly includes the Rayburn data, differences have been noted in past research, so Rayburn was searched in addition to the Fellows database.

The nearest settlement to the Project Area is Pointe-du-Chêne. Fellows states:

> Located on the Shediac Bay, 1.85 km N of Shediac : Shediac Parish, Westmorland County: PO from 1862: in 1866 Pointe-du-Chêne was a farming and fishing community with approximately 35 resident families: in 1871 it had a population of 150: in 1898 Pointe-du-Chêne was a seaport, a sub-port of entry, terminus of the Shediac Branch of the Intercolonial Railway and a community with 1 post office, 2 stores, 2 hotels, 2 lighthouses and a population of 150.

[31]Wallace Hale's Early New Brunswick Probate, 1785-1835. Provincial Archives of New Brunswick, Finance and Treasury Board, Government of New Brunswick. Available online at : https://archives.gnb.ca/Search/MC3706/Default.aspx?culture=en-CA.

Rayburn (p. 219) simply notes "2 mi. NE of Shediac. PO from 1862".

Other place names in the project area are known to be family names for previous landowners, such as Belliveau Beach and Gould's Beach. The provincial park was named for a deceased politician.

Other PANB Resources

Finding Aid MC80 (Local History Resources) was searched for beaches, parks, Parlee, Madras, and Anglican church publications and nothing relevant to the archaeology of the Project Area was found.

Service New Brunswick PLANET

PANB staff completed a search of SNB's PLANET land registry plans for the Project Area. This resulted in 10 plans, dating to 1936, 1956 (two plans), 1986, 1987, 1988, 1989, 1990, 1991, and 1997. Most of these show the tidal inlet, labelled as a tidal creek, and some buildings and bridges that are evident in the early NAPL aerial photographs.

Nova Scotia Archives

Since the Project areas appears not to have been subject to British land grants until after the creation of New Brunswick, the Nova Scotia Archives was not searched.

Nova Scotia Land Papers 1765-1800

Nova Scotia Land Papers is an online[32] resource that can contain relevant land grant documents and plans dating to when New Brunswick was still part of Nova Scotia.

Aerial Photographs - Archival

Stratis purchased five digital scans of aerial photographs from the National Air Photo Library (NAPL) following a search of the Earth Observation Data Management System (EODMS). This search is available online.[33] The search resulted five photographs being selected, dating to 1932, 1950, 1965, 1971, and 1984. This search is limited to vertical angle photographs. At least one oblique angle photograph of the Project area exists from the 1930s, since this was obtained from PANB. The photograph from 1932 was the earliest available to show the entire Project area. Other photographs are available, with five selected to cover the 20th century.

[32] Nova Scotia Land Papers 1765-1800, Nova Scotia Archives, Government of Nova Scotia. Available online at: https://archives.novascotia.ca/land-papers/.
[33] Welcome to the Earth Observation Data Management System, Natural Resources Canada, Government of Canada. Available online at: https://www.eodms-sgdot.nrcan-rncan.gc.ca/index_en.jsp.

Photograph 3. Aerial image dating to 18 September 1932 (NAPL A4525_0019).

Photograph 4. Aerial image dating to 7 September 1950 (NAPL A12959_0309).

Photograph 5. Aerial image dating to 10 May 1965 (NAPL A18850_0006).

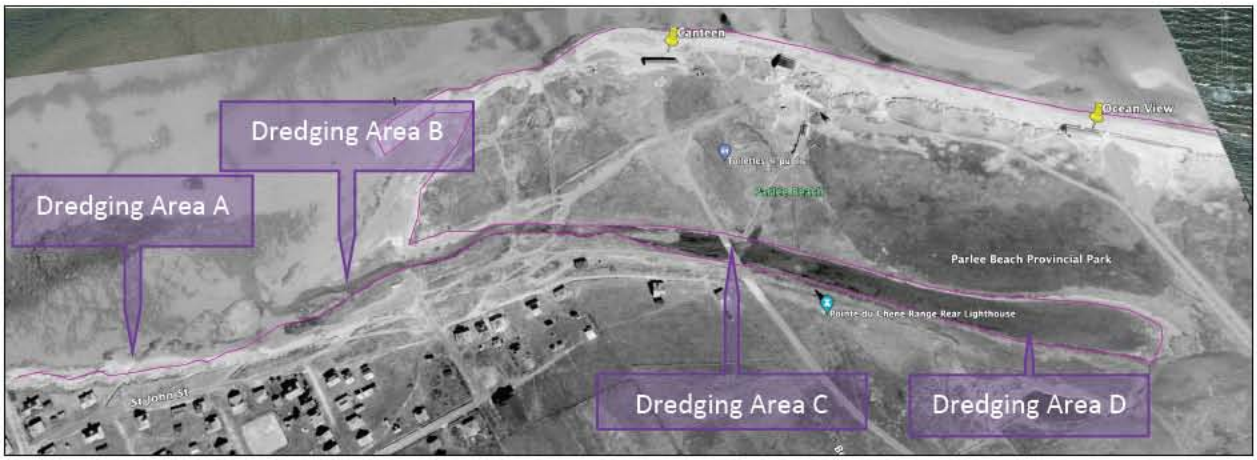
Photograph 6. Aerial image dating to 12 May 1971 (NAPL A22089_0178).

Photograph 7. Aerial image dating to 27 August 1984 (NAPL A26565_0134).

Excerpts from Archival Aerial Images

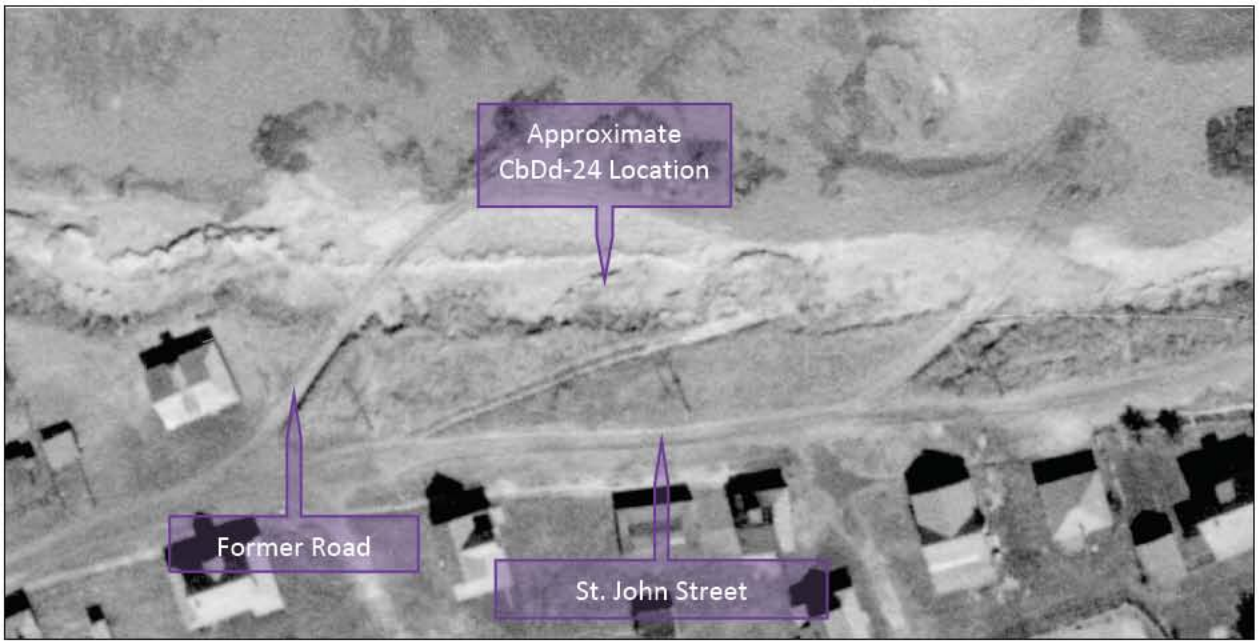
Excerpts from the aerial photographs, detailing the culvert locations and environs, are shown below.

Photograph 8. Excerpt from 1932 aerial photograph Project Area.



Photograph 9. Excerpt from 1932 aerial photograph overlain on Google Earth Pro streets with approximate shoreline, approximate dredging areas, and building locations marked.

Photograph 10. Approximate 1932 shoreline of tidal inlet on contemporary Google Earth Pro image to show that sand dune north of Dredging Areas A and B has formed through the 20th century to today.



Photograph 11. Excerpt from 1932 aerial photograph showing approximate CbDd-24 location and environs.

Photograph 12. Excerpt from 1950 aerial photograph Project Area.

Photograph 13. Excerpt from 1965 aerial photograph showing Project Area.

Photograph 14. Excerpt from 1971 aerial photograph Project Area.

Photograph 15. Excerpt from 1983 aerial photograph showing Project Area.

Discussion of Archival Aerial Images

The 1932 aerial photograph shows the locations of former beach buildings such as "Ocean View" and that the tidal inlet was present at that time; however, the western portion of the Project Area, particularly near Dredging Areas A and B were not defined by a channel as they are now. Since the 1930s, a large amount of sand has been deposited to the north of Dredging Areas A and B. This is consistent with what a local resident stated as recorded on the MARI Form for CbDd-24. That is, that the sand dune's formation was contemporary. This is consistent with the channel infilling during the 20th and 21st century and now needing dredging. That is, that the deposits that dredging is anticipated to remove are likely relatively recent in origin.

Approximate overlay of former coastline were produced using the 1930 aerial image overlain on Google Earth Pro imagery. This provided an approximate comparison of the contemporary shoreline as compared to that of 1932. Much of the tidal inlet is similar today as it was in the 20th century, however, formal and informal road crossings have fallen into disuse and new ones added across the channel. An important difference observed in the aerial photographs is that the sand deposits north of Dredging Area A and Dredging Area B seem to be relatively recent in origin, developing through the 20th century and particularly since at least the 1980s.

The CbDd-24 location was between dirt roads that appear to have provided informal access to the beach area before the provincial park was established. By 1983 with much of the park infrastructure such as roads and parking areas was established. At this time, it is evident that fill had been placed in and around the parking area and new access roads built. Dredging Area A was still open water at that time, with no apparent channel. Towards the eastern end of the project area, a pond had been partially infilled, probably to construct a parking area. Part of the tidal inlet had been infilled for a road with a culvert at Dredging Area D. The area near Dredging Area C appears to have been decommissioned as a road suitable for vehicles by this time. The 1965 and later photographs show a longitudinal ditch along the eastern side of Gary Avenue that extends into the tidal inlet.

Some of the bedrock that is still outcropping in the CbDd-24 area today may be visible in the earlier aerial photographs, for example, the one dating to 1932. Overall, the area to the south of the park, along and near the south side of the tidal inlet has seen increased building activity and infilling.

GeoNB Datasets, Images, and Stratis GIS Modelling

Various images and information are available from GeoNB.[34] Online software applications[35] and map viewers were consulted.

Crown Grant Reference Map Viewer

This online application,[36] also called the Grant Reference Plan (GRP) Viewer, was used to view and retrieve preliminary information from cadastral maps of New Brunswick Crown Grants. The Project area appears to be on three former grants as shown in the below figures.

[34] GeoNB, Service New Brunswick, Government of New Brunswick. Available online at: http://www.snb.ca/geonb1/e/index-E.asp.
[35] Applications, GeoNB, Service New Brunswick, Government of New Brunswick. Available online at: http://www.snb.ca/geonb1/e/apps/apps-E.asp.
[36] Crown Grant Reference Map Viewer, GeoNB, Service New Brunswick, Government of New Brunswick. Available online at: https://geonb.snb.ca/GRP/index.html.

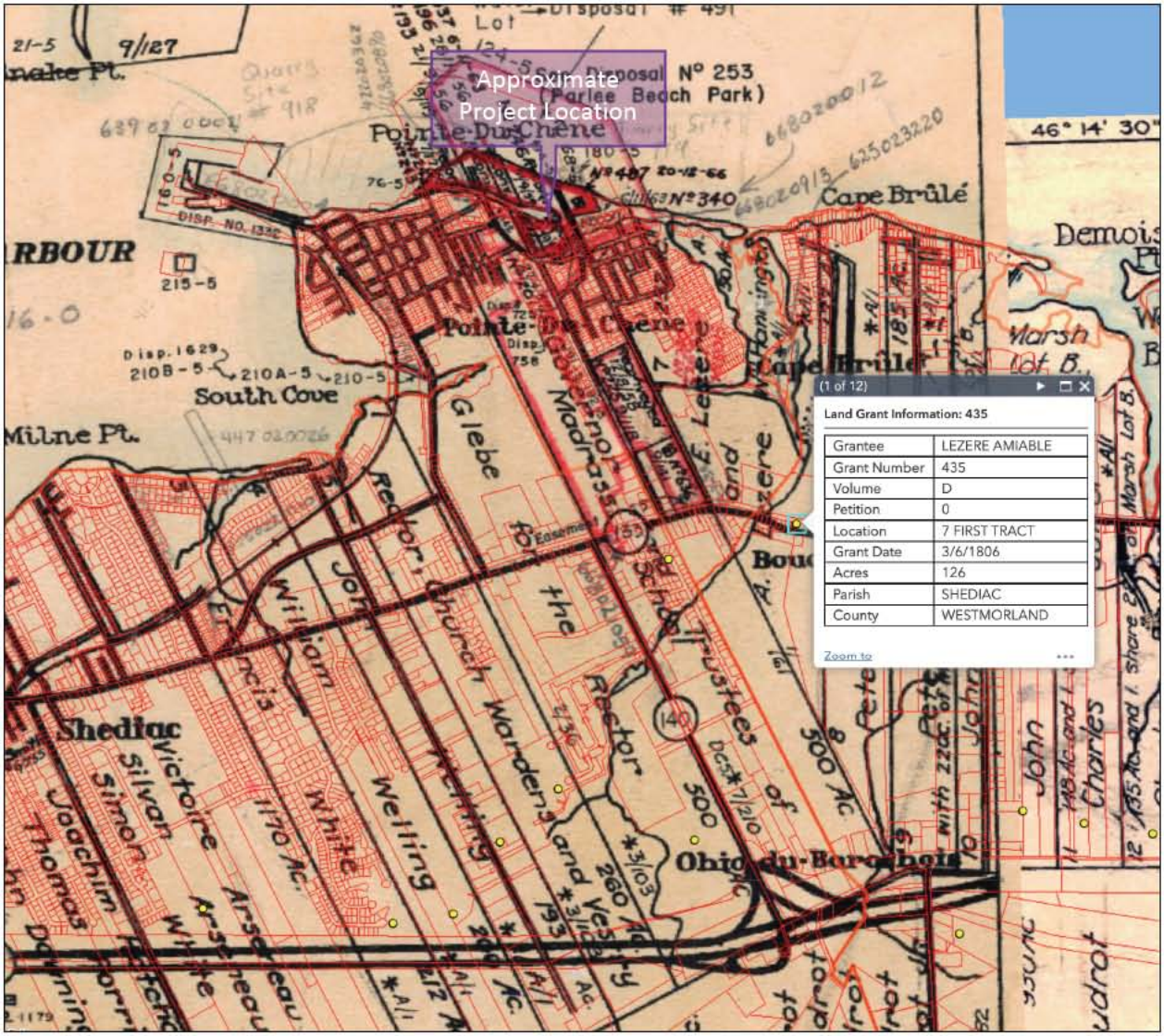


Figure 13. Cadastral map showing Project Area and Lezere Land Grant. Source: Crown Grant Reference Map Viewer.

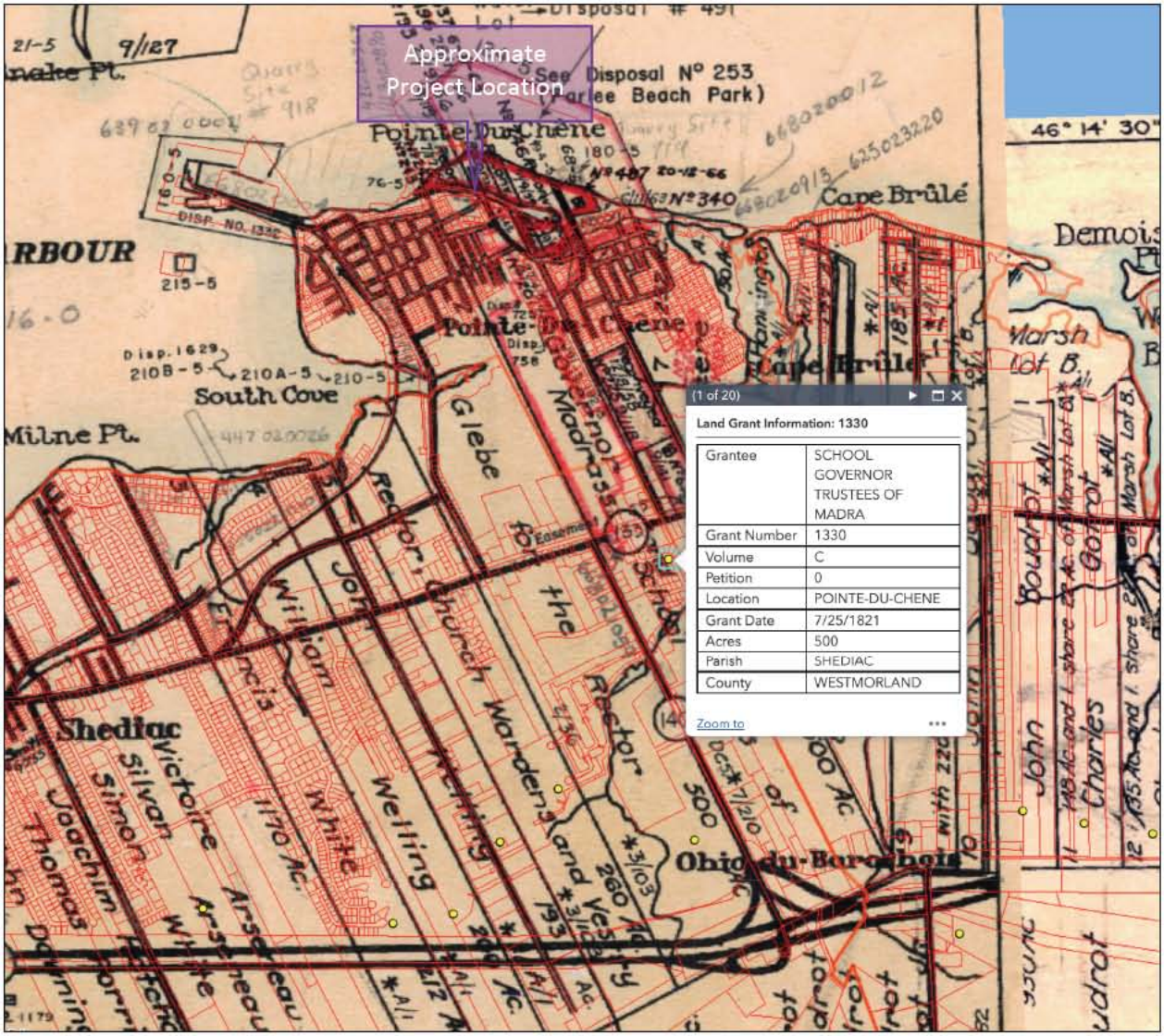


Figure 14. Cadastral map showing Project Area and Governor and Trustees of Madras School Grant. Source: Crown Grant Reference Map Viewer.

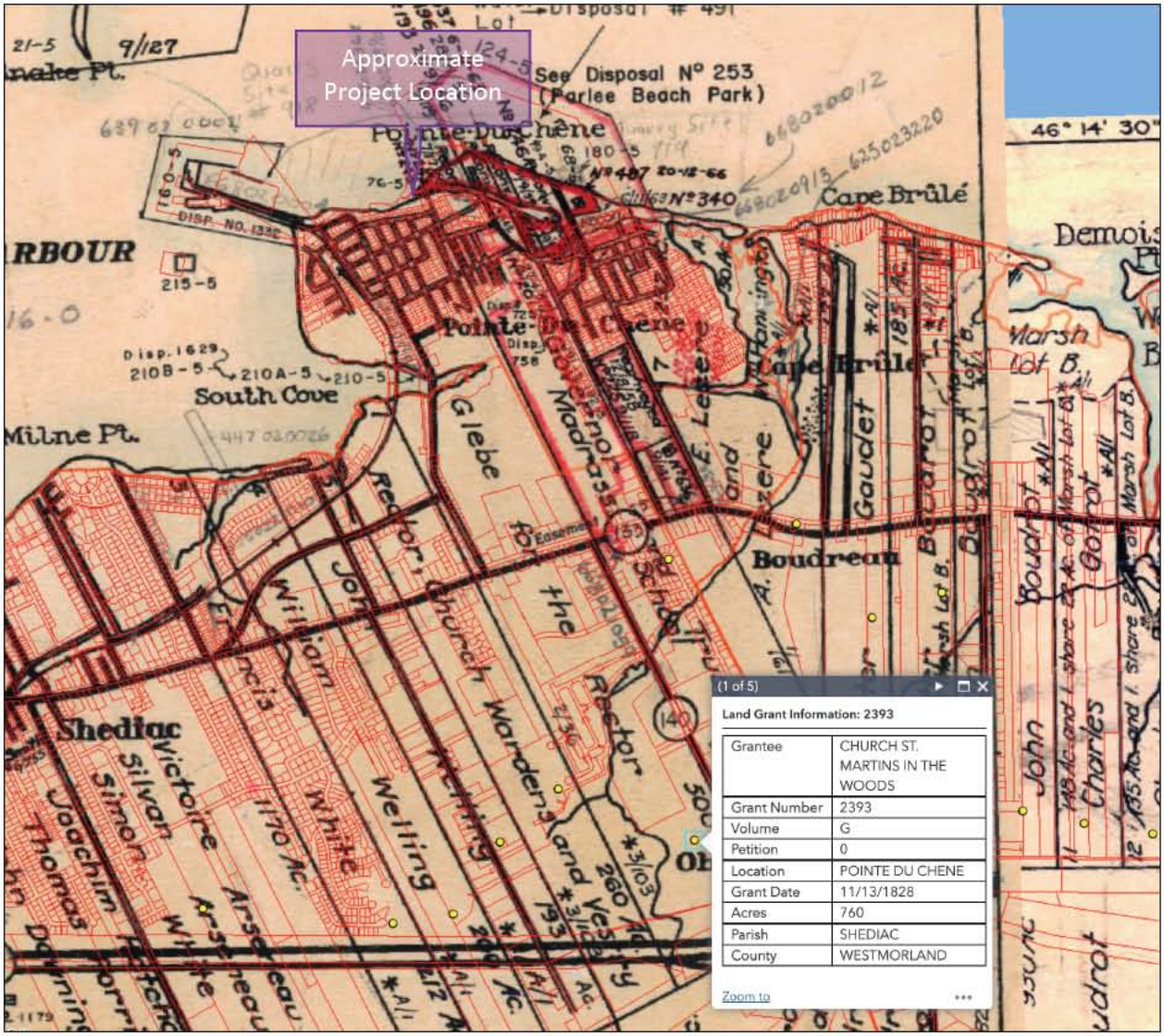


Figure 15. Cadastral map showing Project Area and Church of St. Martin's in the Woods Land Grant for glebe land. Source: Crown Grant Reference Map Viewer.

Flood Information Viewer

This online application[37] was used to view and retrieve information about the potential of the Project area to be on a floodplain, at least in terms of areas of New Brunswick where flood risk mapping has been done. The Project area appears not to have been covered by flood risk mapping data. However, the viewer provided information about the variety of types of wetland in and around the Project Area, as shown on the below image from the viewer. This ads to the wetland information on the map purchased from THC and indicates the areas to be dredged are marsh or tidal flat. In general, THC considers wetlands to have low archaeological potential for precontact archaeological resources. According to this map viewer, CbDd-24 is located in a marsh or beach wetland, not on dry land as shown in the THC map (Figure 2).

[37] Flood Information Viewer, GeoNB, Service New Brunswick, Government of New Brunswick. Available online at: https://geonb.snb.ca/flood/.

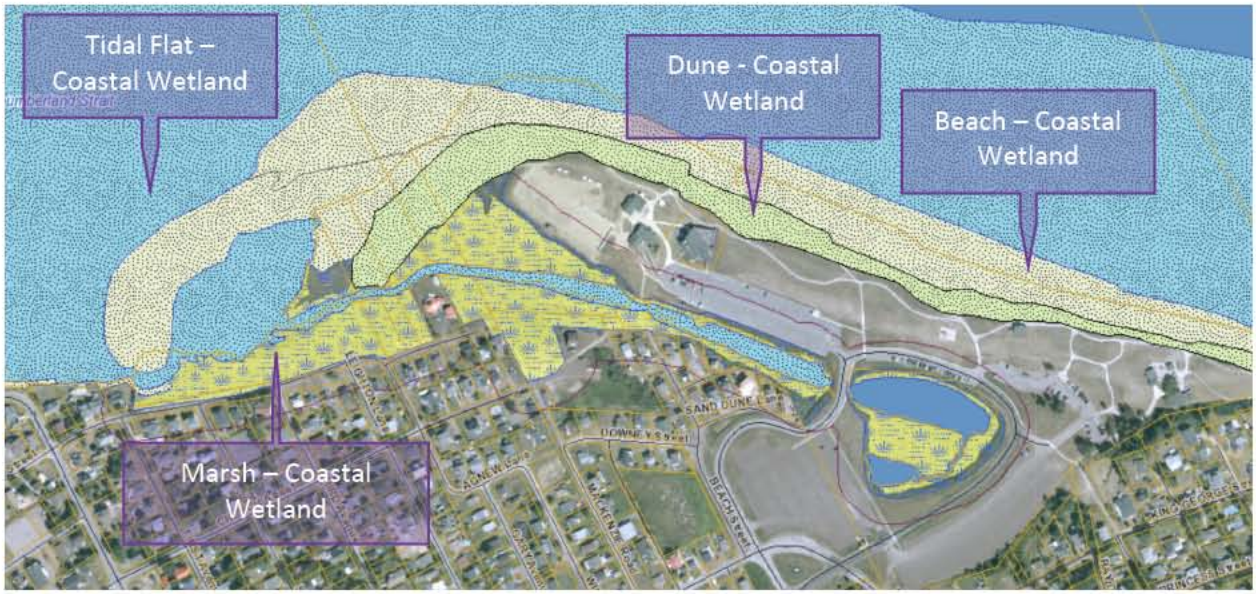


Figure 16. Flood Information Viewer map of the Project Area with descriptions Source: Flood Information Viewer, SNB.

WAWA Reference Map

The Watercourse and Wetland Alteration (WAWA) Map[38] was viewed to determine if it contained additional information about the Project Area. This map shows the area shaded in yellow in the above figure is identified as provincially significant wetland, including the area around CbDd-24.

Orthorectified Imagery

The NB Imagery Download[39] tool from GeoNB was checked for the Project area. Two recent orthoimages, dating to 2017, cover the Project Area.

[38] WAWA Reference Map, Service New Brunswick, Government of New Brunswick. Available online at: https://geonb.snb.ca/wawa/index.html.
[39] NB Imagery Download, GeoNB, Service New Brunswick. Available online at: https://geonb.snb.ca/nbimagery/index.html.

Photograph 16. Excerpt from 2017 orthorectified aerial photograph (SNB 26526E747426N) showing western portion of Project Area.

Photograph 17. Excerpt from 2017 orthorectified aerial photograph (SNB 26533E747426N) showing eastern portion of Project Area.

LiDAR-Derived Digital Elevation Model

A recent LiDAR-derived Digital Elevation Model (DEM)[40] was downloaded from GeoNB. Stratis obtained one TIFF image of a DEM tile dating to 2017 (tile 2650000_7470000). Stratis produced maps using the DEM dataset in GIS software. This resulted in the below hill shaded pseudo-colour elevation and a contour map of the Project Area and environs.

Hill shade and Pseudo-colour Elevation Modelling

Stratis produced a hill shade rendering, which provides a representation of topographic features of bare ground in the Project Area and environs. Stratis then applied a pseudo-colour processing to the elevation raster to further illustrate topography by overlaying this on a transparency of the hill shade layer, resulting in the below figure.

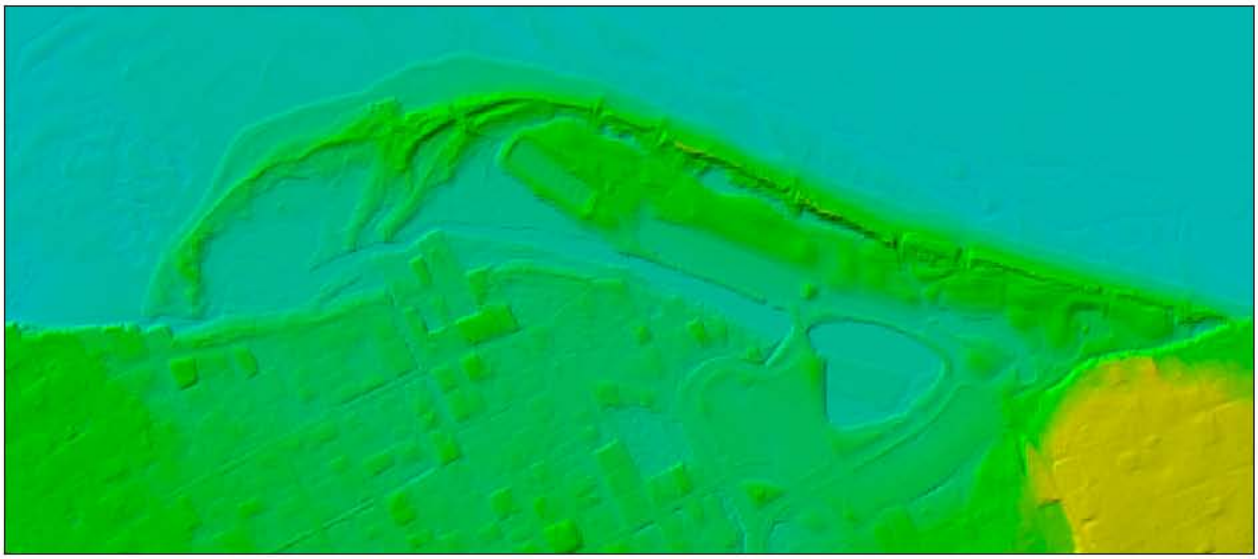


Figure 17. Project Area and topography. Pseudo-colour mapped approximate elevation gradient on transparent hill shade rendering of LiDAR-derived DEM. Elevations range from approximately -1 m to 8 m above sea level.

Slope Modelling

Stratis prepared a GIS-based slope model from the SNB LiDAR-derived DEM data. The slope map gives an impression of the range of inclination angles (to the horizontal) in the source data. Density of pixels indicates intensity of slope with lighter indicating steeper slope and darker indicating relatively flat areas.

[40] NB DEM, GeoNB, Service New Brunswick, Government of New Brunswick. Available online at: https://geonb.snb.ca/nbdem/.

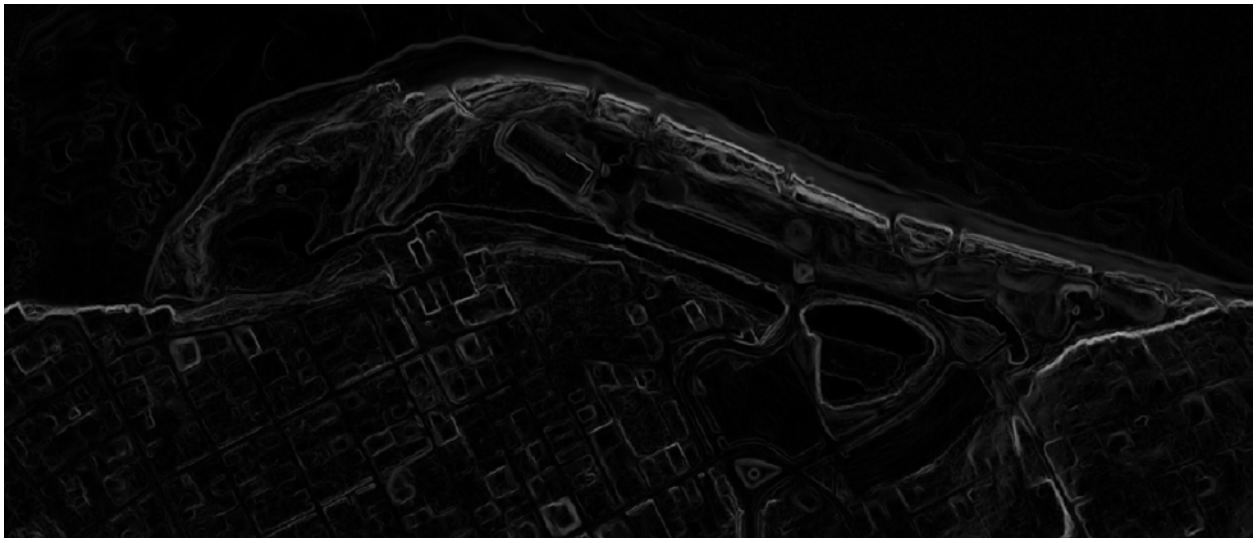


Figure 18. Slope model produced by Stratis from GeoNB LiDAR-derived DEM. Lightest areas are steepest sloped, darkest areas are relatively flat. Slope aspect is not shown but can be inferred.

Contour Modelling

To further visualize the terrain in the project area, Stratis created a GIS-based contour model from the SNB LiDAR-derived DEM data. One contour models was generated, with a 0.3 m interval. The contours illustrate the topography associated with the Project Area and environs.

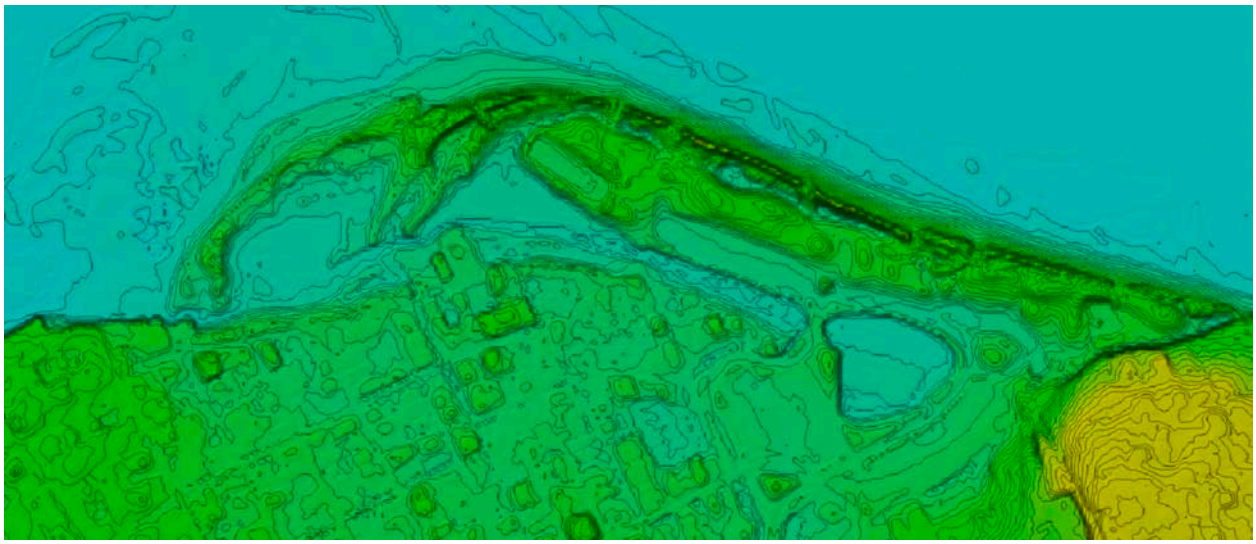


Figure 19. Contour model produced by Stratis from GeoNB LiDAR-derived DEM. Contour interval is 0.3 m, overlain on LiDAR-Derived DEM with pseudo colour.

GeoNB LiDAR

GeoNB LiDAR data for the Project area is available online.[41] Since the LiDAR-Derived DEM was available and deemed sufficient, the GeoNB LiDAR data was not accessed.

GeoNB Map Viewer

Imagery of the Project area dating to 2020 was available on the GeoNB Map Viewer[42] application.

Figure 20. GeoNB Map Viewer image of Project Area with PID outlines, 2020.

Discussion of GeoNB Datasets, Images, and Stratis GIS Modelling

The Crown Grant Reference Map Viewer indicated that British Crown land grants were issued along this section the Northumberland Strait coast during the first third of the 19th century. Three grants cover the park, with the grants dating to 1806, 1821, and 1828. The Project Area is within the 1821 and 1828 grants, with the easternmost part of the park on the 1806 grant; the area of this grant is outside the Project Area.

The Flood Information Viewer indicated four types of coastal wetland in and around the Project Area. These are marsh, which is along most of the tidal inlet, tidal flat, dune, and beach. In general, wetlands are considered by THC to have low archaeological potential. The WAWA Reference Map did not show additional details. Recent orthorectified imagery shows the Project Area with conditions similar to those during the Preliminary Field Examination.

The LiDAR-derived DEM was useful to provide the data for GIS processing into a hill shaded pseudo-colour elevation models as well as slope and contour models. The pseudo-colour elevation hill shade rendering shows the relatively narrow channel of the tidal inlet and surrounding terrain. The narrow and shallow nature of the channel is particularly evident near Dredging Area A. This model shows extensive infilling in and around the park, including numerous infilled residential lots. It also shows the infilling for the contemporary access roads and it shows the area of sand north of Dredging Area A and Dredging Area B that was deposited since the later 20th century.

The slope modelling highlights the infilling of the Project Area environs, such as various features in the park and along the shoreline of the tidal inlet near the edges of residential properties. These

[41] LiDAR Download, GeoNB, Service New Brunswick, Government of New Brunswick. Available online at: https://geonb.snb.ca/li/.
[42] GeoNB Map Viewer, Service New Brunswick, Government of New Brunswick. Available online at: http://geonb.snb.ca/geonb/.

characteristics are also reflected in the contour model. The GeoNB map viewer provides a 2020 image that allows an overview of the entire length of the Project Area.

Atlas of Canada (Toporama) Topographic Maps

The Atlas of Canada - Toporama[43]was consulted regarding the assessment area. The Atlas of Canada did not show any additional notable features in the Project area. Atlas of Canada images are included because of the mention of 1:50 000 scale maps in THC *Guidelines*.

Figure 21. Large scale overview of Project Area and environs (Source: Atlas of Canada, Natural Resources Canada).

[43] The Atlas of Canada – Toporama, Natural Resources Canada, Government of Canada. Available online at: https://atlas.gc.ca/toporama/en/index.html.

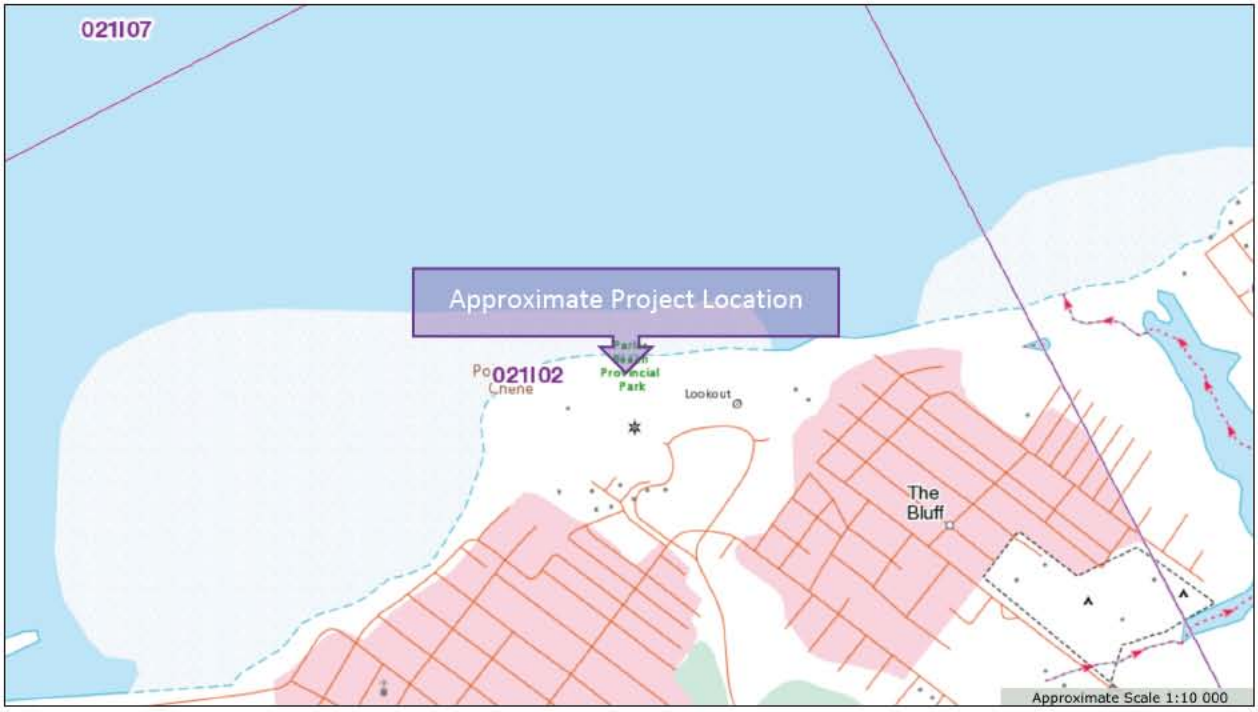


Figure 22. Closer view Project Area and environs (Source: Atlas of Canada, Natural Resources Canada).

Direct Consultation Including Local Individuals and/or Groups

The *Guidelines* (pp. 13 and 16) refer to "direct consultation" and "contacting local individuals and/or groups, including the nearest First Nations communities". The *Guidelines* (p. 16) also refer to consultation with technical experts. The assistance of the organizations mentioned in this section, and their staff, is gratefully acknowledged.

Local Individuals and Groups

Guidelines (p. 16) state that "local organizations, historical societies, collectors and specialists having local or regional expertise in the area's history, geology, pedology, and archaeology must also be consulted". Stratis requested information from THC related to Private Collections Files and no information was received. Based on the MARI Form for CbDd-7, the archaeological object is in a private collection. There are no known heritage resources in the Project Area other than CbDd-24, located on the south bank of the tidal inlet channel at Dredging Area A. No registered heritage buildings were investigated since buildings are not anticipated to be disturbed by the Project. Heritage organizations were not contacted as there are no buildings anticipated to be impacted by the Project.

First Nations Communities

Guidelines (p. 16) state that "the nearest First Nations communities must be approached to seek advice regarding the heritage of the project area". Indigenous consultation, if undertaken, will be done by others.

Provincial Archives of New Brunswick

Staff at the Provincial Archives of New Brunswick were consulted regarding searches undertaken as indicated in the "Provincial Archives of New Brunswick" section of this report.

Tourism, Heritage and Culture

Staff at THC were consulted regarding the existence of information relevant to the assessment area that may be held by THC. This included a written request (Appendix A) for the information that is required by Section 2.2.1, Documentary Research, of THC *Guidelines* (p. 14-15).

Service New Brunswick

Staff with Service New Brunswick were previously consulted to provide information and assistance regarding imagery, DEM data, and other SNB GIS-related data and information.

Transport Canada

Transport Canada was previously consulted by email and telephone to provide information and assistance regarding various databases.

Preliminary Field Examination

Provincial *Guidelines* (p. 17) indicate that a Preliminary Field Examination "may involve a simple drive-by, walk-over, or fly-over of a project area". Stratis undertook a walkover and flyover using a Remotely Piloted Aircraft System (RPAS). As per Section 2.2.3 of *Guidelines* (p. 17), a Preliminary Field Examination was used to supplement information gathered during the other aspects of the Preliminary Investigation, all aimed at assessing "heritage resource potential" (*Guidelines*, p. 13).

The walkover, together with a flyover, constituted a visual survey for the Preliminary Field Examination. Based on anticipated dredging needs the boundaries of the Preliminary Field Examination were as shown in Figure 1. The length of the shoreline was walked in this area, including both the north and south sides of the tidal inlet. This area was visually surveyed, photographed at grade, and aerial photographs were acquired.

Walkover

The walkover was completed on 26 September 2021. The walkover visual survey involved visually inspecting all banks and coastline in the Project Area, as outlined in Figure 1. Field notes were taken and, along with photographs, they provide more information on the Project area. Geotag-stamped photographs were collected at grade. The walkover was scheduled to coincide with low tide.

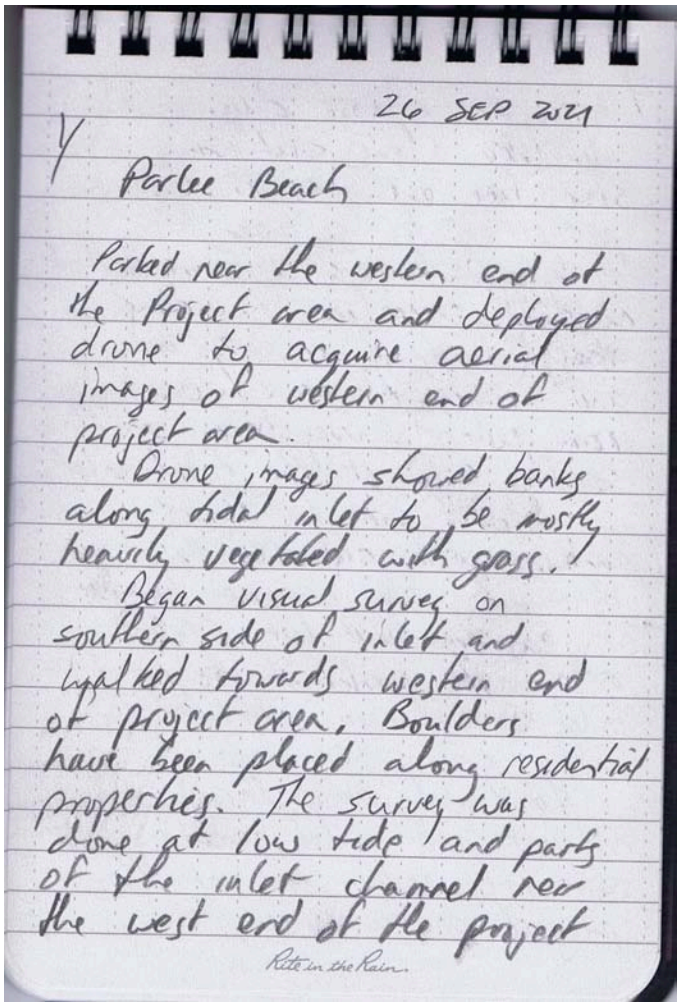
Within the anticipated Project Area, no newly discovered archaeological objects, features, or sites, as defined by the *Heritage Conservation Act* and New Brunswick Regulation 2010-132, were observed or collected during the visual survey.

Flyover

Under *Canadian Aviation Regulations (CAR)*, Stratis collected photographs with a Remotely Piloted Aircraft System (RPAS). Aerial photographs are not required by THC *Guidelines*, but they can add significantly to understanding an assessment area. The RPAS flyover and photograph acquisition was completed on 26 September 2021. The flyover was scheduled to coincide with low tide.

No archaeological objects, features, or sites, as defined by the *Heritage Conservation Act* and New Brunswick Regulation 2010-132 were observed during the flyover.

Field Notes



26 SEP 2024

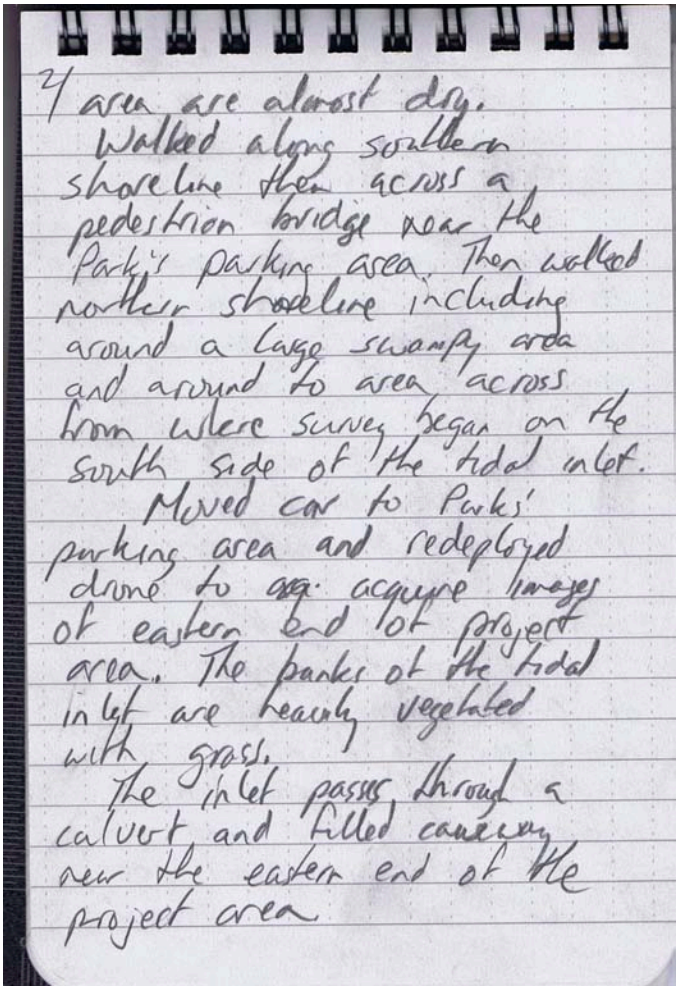
Parlee Beach

Parked near the western end of the Project area and deployed drone to acquire aerial images of western end of project area.

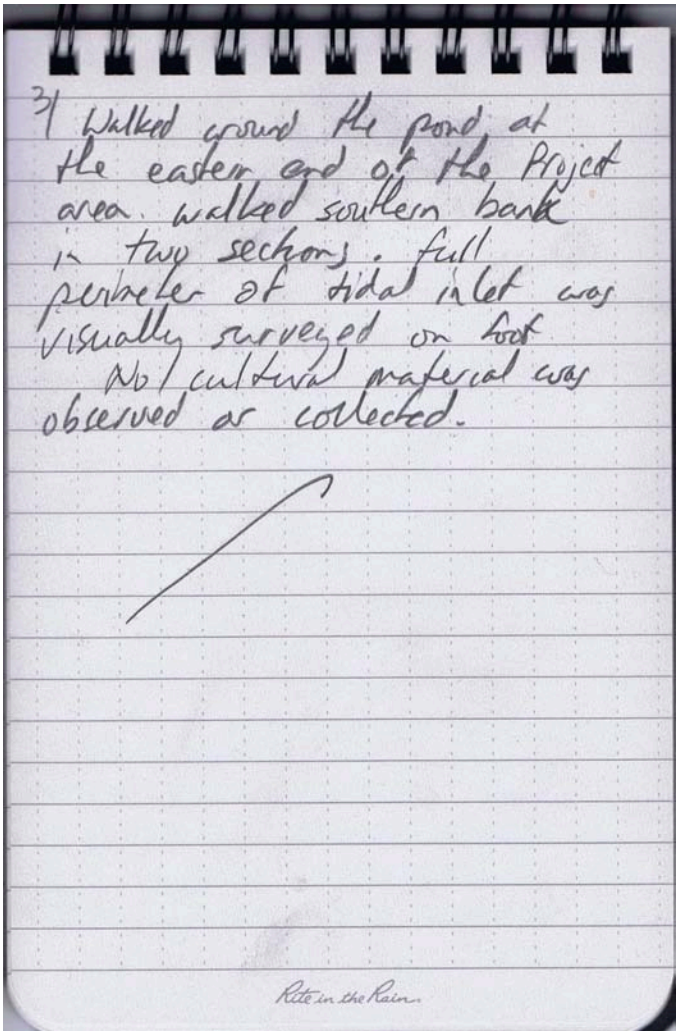
Drone images showed banks along tidal inlet to be mostly heavily vegetated with grass.

Began visual survey on southern side of inlet and walked towards western end of project area. Boulders have been placed along residential properties. The survey was done at low tide and parts of the inlet channel near the west end of the project

Rite in the Rain



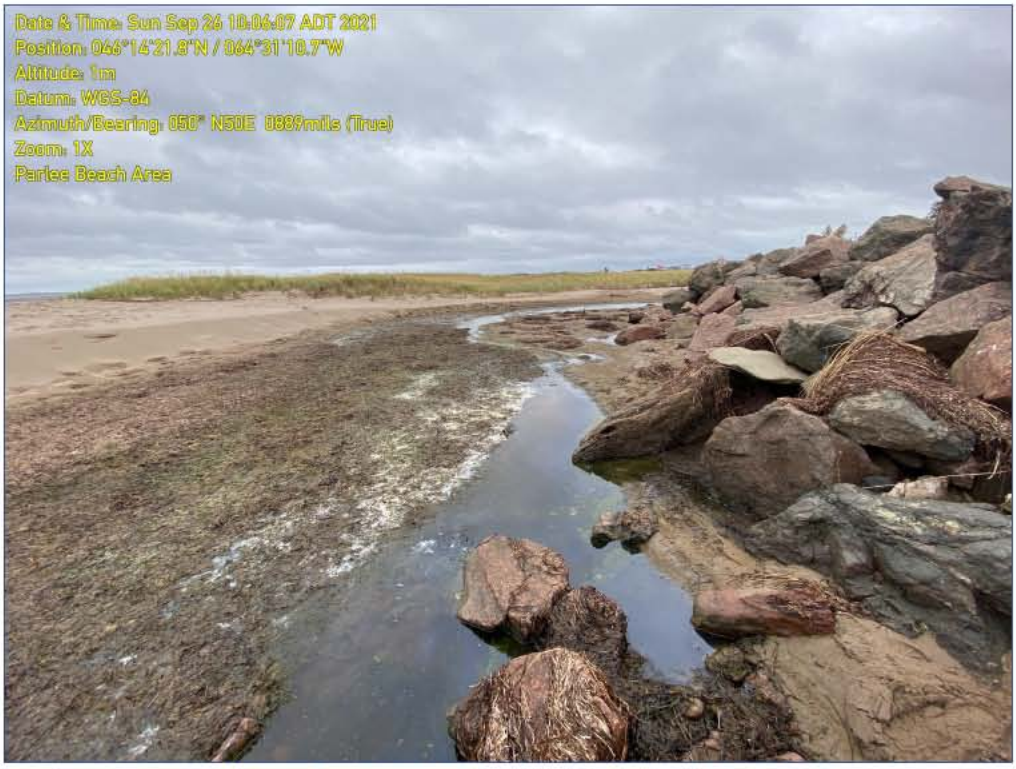
2/ area are almost dry.
Walked along southern shoreline then across a pedestrian bridge near the Park's parking area. Then walked norther shoreline including around a large swampy area and around to area across from where survey began on the south side of the tidal inlet.
Moved car to Parks' parking area and redeployed drone to acquire images of eastern end of project area. The banks of the tidal inlet are heavily vegetated with grass.
The inlet passes through a culvert and filled causeway near the eastern end of the project area.


3/ Walked around the pond at
the eastern end of the Project
area. walked southern bank
in two sections. full
perimeter of tidal inlet was
visually surveyed on foot
No / cultural material was
observed or collected.
Rite in the Rain

Geotag Stamped Field Photographs

This section contains geotagged field photographs from the walkover.

Photograph 18. Western end of Project Area, dredging Area A, facing west.



Photograph 19. Western end of Project Area, dredging Area A, facing east.

Photograph 20. Western end of Project Area, dredging Area A, facing north.

Photograph 21. Dredging Area A with CbDd-24 location at right foreground, facing east.

Photograph 22. Dredging Area A with CbDd-24 location at middle left, facing west.

Photograph 23. Area near Dredging Area B, facing east.

Photograph 24. Dredging Area C, facing east.

Photograph 25. Dredging Area C, facing west.

Photograph 26. Dredging Area C, facing east.

Photograph 27. Dredging Area A, facing east showing two channels.

Photograph 28. Dredging Area A, facing west.

Photograph 29. Dredging Area A, facing east.

Photograph 30. Dredging Area A, facing east.

Photograph 31. Dredging Area A, facing west with CbDd-24 at right.

Photograph 32. Dredging Area A, facing north.

Photograph 33. Dredging Area B, facing west.

Photograph 34. Dredging Area B, facing east.

Photograph 35. Dredging Area C, facing west.

Photograph 36. Dredging Area C, facing west.

Photograph 37. Dredging Area D, facing east.

Photograph 38. Facing west towards Project Area.

Photograph 39. Facing west towards Dredging Area C.

Photograph 40. Facing east towards Dredging Area D with recently filled lot at right.

Photograph 41. Dredging Area D, facing east.

Photograph 42. Facing east from Dredging Area D.

Discussion of Geotag Stamped Field Photographs

Dredging Area A

This area has a narrow and shallow channel that is about 1 m to 2 m wide, generally, and less than 25 cm deep. The northern side of the tidal inlet is sandy and dry, the southern side is generally infilled, and riprap or boulders placed on slopes of residential properties. The CbDd-24 location consists of bedrock outcrops on the southern side of the inlet with dense grass above the rocks. The area is sloped abruptly at the southern bank, as shown in the slope model, and it may be infilled. No archaeological objects were observed at the CbDd-24 location. The westernmost end of the project area is sandy and mostly free of surface water at low tide with one narrow channel and a wider channel. There is only one channel as one moves to the east and this too is mostly dry at low tide. With some standing water between the CbDd-24 area and the western end of the Project Area. The northern bank is entirely sand with a higher elevation area that is grass covered further back from the channel. Towards the eastern end of this Dredging Area, the channel expands into a relatively large flat area that is mostly inundated with water. This area extends along the northern side of the Project Area to Dredging Area B.

Dredging Area B

The southern side of this location is relatively straight at the bank and grass-covered. The northern side is lower and partly inundated with water. Along the north side, there is a grass-covered point of land that extends in between the clearly demarcated channel to the east and the inundated flat area to the north. It is possible that this land was the area visible as the end of the sand dunes in the historic aerial photographs, with the sand to the west of this location being deposited in the later 20th century. From this point of land and to the east, the channel markedly wider than at Dredging Area A.

Dredging Area C

This Dredging Area is around a pedestrian bridge at the location of a former road and bridge, as evidenced by the historic aerial photographs. The tidal inlet banks are higher and grass covered at their tops. The watercourse appears to be deeper than at Dredging Areas A and B. The channel is narrower near the bridge structure and this may reflect infilling from the previous bridge and road. Close to this area, both the northern and southern properties appear to be infilled – this is reflected in a steeper slope on the slope model. A large asphalt parking area is north and east of this dredging area. Between Dredging Areas C and D, the northern bank of the inlet appears to be infilled as it is higher above the watercourse. This is reflected in the DEM-derived modelling. Along the southern bank is a newly constructed home and a lot that was evidently infilled recently.

Dredging Area D

Dredging Area D is around a roadway with a corrugated steel pipe culvert and wooden pedestrian walkway along the road. The channel has been artificially narrowed here with infilling to make a causeway over the culvert to allow the road to cross the watercourse. The infilling is also evident in comparing the historical aerial photographs. East of Dredging Area D is a large pond-like feature with a small channel that leads to a smaller pond. The area is surrounded grass and other vegetation. On the south side of the inlet, west of the culvert, the land is very low, grass-covered, flat, and wet.

Remotely Piloted Aircraft System Photographs

RPAS photographs provide visual information about the Project area that is not apparent in at-grade photographs.

Photograph 43. Overview of Dredging Area A with Dredging Area B at top.

Photograph 44. Part of Dredging Area A at foreground, Dredging Area B near centre.

Photograph 45. Dredging Area B and Dredging Area C.

Photograph 46. Overview of channel between Dredging Area B and Dredging Area C.

Photograph 47. Overview of channel with Dredging Areas C and D.

Photograph 48. Overview of Dredging Area A in background with Dredging Area B in foreground.

Photograph 49 Overview of Dredging Area A.

Photograph 50. Overview of Dredging Area A.

Photograph 51. Overview of Dredging Area A.

Photograph 52. Overview of Dredging Area A with CbDd-24 location.

Photograph 53. Part of Dredging Area C, foreground, facing towards Dredging Areas A and B.

Photograph 54. Dredging Area C.

Photograph 55. Dredging Area D from Dredging Area C.

Photograph 56. Eastern end of Project Area, east of Dredging Area D.

Photograph 57. Road and corrugated steel pipe culvert at filled causeway, at Dredging Area D.

Photograph 58. Dredging Area D, partially, at foreground.

Discussion of RPAS Images

The aerial photographs provide an overview of all four dredging areas and their relationship to one another along with views of the larger Project Area. The aerial photographs show the narrow and shallow infilled channel at Dredging Area A along with the large riprap and boulders placed along the southern shoreline. The aerial photographs provide oblique views of the Project Area and the low and flat pond-like area between Dredging Areas A and B. The sand north and west of this pond-like feature was evidently deposited in the later 20th century. At Dredging Area A, the photographs show that the sand dune on the northern side of the channel appears to have migrated over time from the east and north down towards Dredging Area A where the channel is quite narrow. Based on the historical aerial images, this was once more open water without the sand dune to the north.

The land around Dredging Area C is generally a well maintained lawn. The aerial photographs show some narrowing of the channel here that can be attributed to the building of a former bridge and road that crossed the tidal inlet here, probably to allow access to what was called Gould's Beach.

The causeway-like road fill and culvert on the middle of Dredging Area D are clearly visible. The eastern end of the Project Area, where there are two pond-like features, connected by a small channel, are clearly visible with a low and wet area in between the ponds. The southern pond was truncated and filled to build a parking area. The northern side of the tidal inlet, between Dredging Areas C and D is almost entirely asphalt-covered parking lot along the top of the northern bank.

The overviews of CbDd-24 show a bedrock outcrop at the location and these are adjacent to the south side of the tidal inlet channel.

Resource Inventory

According to provincial *Guidelines* (p. 59), a Resource Inventory must be addressed in this document, as outlined in the following sub-sections. The Preliminary Investigation did not identify any heritage resources as defined under the *Heritage Conservation Act* and associated *Regulation.*

Field Evaluation

According to provincial *Guidelines* (p. 18) a Field Evaluation requires a distinct AFRP or an amended AFRP (p. 17). That is, no shovel testing can be done until after a Preliminary Investigation is completed under an AFRP, and another permit or permit amendment is applied for to undertake Field Evaluation. Stratis applied for and was issued an AFRP for a Preliminary Field Investigation (Appendix A). There was no permit or permit amendment for Field Evaluation. Similarly, Archaeological Monitoring cannot be undertaken without Field Evaluation being undertaken first. In the case of Monitoring, the *Guidelines* (p. 22) state: "Archaeological monitoring will not be conducted on areas under development which have not been assessed beforehand through some level of manual testing". Manual testing means hand digging of test pits with shovels.

Proceeding to Field Evaluation is not supported by the evidence gathered during this Preliminary Investigation. Field Evaluation would be a future stage of work, if required by the Minister of Tourism, Heritage and Culture. Field Evaluation, which typically involves digging standardized test pits looking for archaeological objects, would not be possible in the channel and is not required by THC in wetlands. Archaeological objects, in this case late 19th century and early 20th century refuse, were found along the southern edge of the channel at CbDd-24. This means that THC considers nearby areas, within 100 m, to have elevated archaeological potential. The bank where the refuse was found is elevated above the channel and perched on a bedrock outcrop and can be avoided. Shovel testing is not normally done in watercourse channels.

Although Field Evaluation was not conducted, this section and following subsections are included in this report, as required by *Guidelines*.

Area Surveyed and Level of Survey Intensity

Field Evaluation was not permitted and has not been undertaken. A Preliminary Field Examination was permitted. This involved visual examination of the Project Area by walkover and flyover.

Recorded Heritage Resources in Relation to the Project

CbDd-24 is located along the southern bank of the tidal channel within Dredging Area A. There are currently no known heritage resources in the project areas. CbDd-7 is located outside the Project Area, over 200 m from any ground-disturbing activities.

Number of Heritage Resources Recorded and Total Number Anticipated

No new heritage resources were recorded and no new heritage resources are anticipated.

Description of Existing Sites

CbDd-24 was described earlier in this report.

Evaluative Testing Procedures

No evaluative testing was permitted or undertaken.

Locations of Evaluative Testing Units

No evaluative testing was permitted or undertaken.

Qualitative and Quantitative Summary of All Cultural Material or Features

No cultural material or features as defined under the *Heritage Conservation Act* were observed or collected during this investigation.

Interpretation of the Heritage Resource Inventory

CbDd-24, according to the MARI Form, is a "fairly typical late 19th to early 20th century rubbish midden". CbDd-7 was an isolated find of an undated stone tool.

Explanation of Negative Results

Evaluative testing was not permitted and not undertaken so an explanation of negative evaluative testing (*i.e.,* shovel testing) results is not warranted.

Predictions Regarding Resources

No further predictions regarding resource variability, density, distribution, and importance can be made. These predictions, as defined by *Guidelines*, could only follow Field Evaluation, which was not permitted and not undertaken. In general terms, CbDd-24 was noted as "fairly typical" and it is reasonable to believe a large number of such rubbish middens of a similar age exist in New Brunswick.

Resource Significance and Integrity Evaluation

According to provincial *Guidelines* (p. 60), "the relative significance and integrity of each evaluated site must be presented" in this report. The Preliminary Investigation did not identify any new archaeological sites, objects, or features and the existing sites were not subjected to Field Evaluation.

Criteria for Measuring Site Significance and Integrity

The Preliminary Investigation did not identify any new archaeological sites.

Site-Specific Assessments

The Preliminary Investigation did not identify any new archaeological sites. No archaeological objects were observed or collected at CbDd-24. The CbDd-7 location appears to be under water and was outside the Project Area and not visited.

Significance Map

The Preliminary Investigation did not identify any new archaeological sites. The catalogued locations where archaeological objects have been previously found are shown on the map (Figure 2) purchased from THC. Archaeological monitoring by Stantec (2019) found no additional archaeological objects or features within 100 of CbDd-24.

Impact Identification and Assessment

According to provincial *Guidelines* (p. 60), "this section must contain a comprehensive statement of impacts and a thorough assessment of their level of effect. An impact matrix relating development actions to recorded heritage resources is recommended". The Preliminary Investigation did not identify any new archaeological sites, objects, or features. Impact and Identification and Assessment must follow Field Evaluation, which was not permitted and not undertaken. CbDd-7 is outside the Project Area and

the tidal inlet bank within 100 m of CbDd-24 is recommended to be avoided. At this time, there are, therefore, no known impacts to assess.

Map of Direct, Indirect, and Potential Impacts

The Preliminary Investigation did not identify any archaeological sites, objects, or features.

Previous Impacts

The Preliminary Investigation did not identify any previous impacts to archaeological objects or features. The MARI Form for CbDd-24 identified existing and future high potential for marine erosion as a destructive agent and medium potential for existing and future vegetation grown as a destructive agent.

It is possible that previous road construction, previous cutting and filling, and previous maintenance-related activities could have impacted archaeological objects or features, but only if these were present in the area of these activities. This is not known and, therefore, any comment about such previous impacts would be speculative.

Level of Effect of Project Impacts on Heritage Values

No Field Evaluation was undertaken so levels of effect were not investigated. CbDd-7 is outside the Project Area and the Project is anticipated to have no impact on that location. CbDd-24 is along atop the southern bank of the tidal inlet at Dredging Location A and it is recommended that no excavation or ground disturbance take place at the top of bank where archaeological objects were previously found. No archaeological objects were noted in this area during the Preliminary Field Examination.

Areas of Uncertainty

The assessment was limited to a Preliminary Investigation and areas of uncertainty are inherent in the scope of such work. A walkover visual examination and flyover visual examination, which followed Documentary Research, were intended to meet, or exceed the requirements of *Guidelines*.

Schedule of Impacts

The Preliminary Investigation did not identify any new heritage resources. There is no impact anticipated for any area within 200 m of CbDd-7. In respect of CbDd-24, it is possible that dredging in the wetland channel could encounter archaeological objects during dredging. As stated on the CbDd-24 MARI Form, erosion and vegetation grown, following dredging, could have an impact in the future following the completion of the Project. Accidental discovery of archaeological objects, if it were to occur, would be limited to phases of construction or maintenance that involve ground disturbance.

Impacts and Resource Depletion Without the Project

The Preliminary Investigation did not identify any new archaeological objects or features. With respect to CbDd-7, this was recorded as an isolated find and with or without the Project it is presumed that no additional depletion of archaeological resources near CbDd-7 will take place. Future erosion of the area is possible. With respect to CbDd-24, based on the MARI Form, erosion and vegetation are anticipated to impact the area without the Project.

Conclusions and Recommendations

Following Guidelines (p. 61), this section must discuss the management of unavoidable adverse impacts to heritage resources and include a discussion of mitigation measures. The Preliminary Investigation did not identify any new heritage resources in the Project area. CbDd-7 is over 200 m outside any project-

related activities, As such, there are no known unavoidable adverse impacts for that location. In respect of CbDd-24, the refuse midden, the top of bank is recommended for avoidance. Dredging within the tidal inlet channel near this location is unavoidable. Dredging has the potential to encounter archaeological objects in the channel in this area; however, archaeological monitoring is not permitted, according to the Guidelines, unless the area is first tested manually with shovels. Excavating within the channel with shovels in search of archaeological objects is not practicable. If archaeological objects are accidentally discovered during dredging, they must be reported as required by New Brunswick statutes.

Summary of Findings

Considering the available evidence, the anticipated activity areas for dredging are mostly consistent with areas of low archaeological potential with the exception of the area near CbDd-24. That is, most of the dredging will take place in the tidal inlet channel and remove material that has washed in as the dune complex north of Dredging Area A and B formed during the latter part of the 20th century. The Project Area is mostly wetland, which is considered low archaeological potential by THC. The southern bank of the tidal inlet, near CbDd-24 may contain additional 19th and 20th century refuse and it is recommended that the top of bank within 100 m of CbDd-24 be avoided.

The Preliminary Investigation did not identify new archaeological features, sites, or objects in the project areas. The potential to encounter unknown heritage resources during construction is considered low. Archaeological objects could be accidentally encountered if ground is disturbed near CbDd-24, so this area is recommended for avoidance. The channel itself cannot be avoided since the Project will dredge it in this area. Since archaeological testing of the channel is not practical or perhaps not possible, archaeological monitoring during dredging cannot be recommended. This is because *Guidelines* do not allow monitoring unless shovel testing has been undertaken first. A Site Alteration Permit, related to CbDd-24 has been required by THC and the SAP process may require that additional investigation be undertaken.

Besides the channel near CbDd-24, where 19th century refuse may have eroded in or been placed in the past, it is not anticipated that areas of elevated archaeological potential will be disturbed by the Project. Proceeding to Field Evaluation (*e.g.,* shovel testing) is not supported by the findings of the Preliminary Investigation since the banks of the tidal inlet, which could be considered to have elevated archaeological potential, are not anticipated to be disturbed by project-related activities.

Decisions regarding any further archaeological activities and/or investigative steps rest with THC and the Proponent.

Registered Archaeological Sites

The map (Appendix A) purchased from AHB shows two registered archaeological locations. CbDd-24 is within the Project Area and CbDd-7 is outside the Project Area.

Anticipated Requirements Regarding Site Alteration Permits

Under the *Heritage Conservation Act*, the alteration of a known archaeological or palaeontological site requires a Site Alteration Permit (SAP). This applies to the specific location of an archaeological or palaeontological site. In practice, THC has included any area within 100 m to 200 m of a catalogued archaeological location to require a Site Alteration Permit. A separate SAP is required for each

archaeological location. CbDd-7 is outside the Project Area and a SAP is not anticipated for that location. CbDd-24 is close to the dredging area and is anticipated to require a SAP.

Any decision regarding the need for any SAPs is made by THC.

Potential Laydown Areas and Potential Detours

Existing roads and parking areas are recommended for laydown. The Project is not anticipated to require detours. Dredging Area D is on either side of an existing road. If the road needs to be temporarily closed, it is recommended that traffic be diverted to the existing road along the eastern end of the Project Area. No placement of fill for detours, or excavation for detours, is anticipated.

Figure 23. Recommended detours and avoidance areas.

Recommendations

Recommendations are contained in the following sections.

Recommendation 1: Avoid ground disturbance along top of bank within 100 m of CbDd-24

Guidelines consider any area within 100 m of a historic period archaeological location to have elevated potential to contain additional archaeological resources. As such, project-related activities should avoid any ground disturbance along the top of bank of the southern side of the tidal inlet within 100 m of CbDd-24.

It is suggested that this area be marked on project plans.

Recommendation 2: Develop and follow accidental archaeological discovery protocols

It is recommended that the Proponent follow Accidental Discovery Protocols, which are available from THC.

THC *Guidelines* include protocols to be followed in the event of accidental discovery of archaeological objects and/or human remains in the context of an EIA. It is recommended that Accidental Discovery Protocols be adopted for the Project.

Recommendation 3: Ensure construction personnel awareness of applicable statutes

It is recommended that the Proponent ensure that contractors and subcontractors and their personnel are aware that the Heritage Conservation Act has a requirement to report accidentally encountered archaeological objects to THC and discoveries may require work to be paused or stopped. It is recommended that the Proponent ensure that contractors and subcontractors are aware that violating the Heritage Conservation Act *may be an offence that is punishable under the* Provincial Offences Procedure Act*.*

Recommendation 4: Duty to report archaeological and/or palaeontological discoveries

Discovery of an archaeological object or objects, palaeontological object(s), burial object(s), or human remains is required to be reported to THC, under Section 9 of the Heritage Conservation Act*.*

It is possible that heritage resources may be unintentionally encountered during project-related activities. Under Section 9 of New Brunswick's *Heritage Conservation Act*, the accidental discovery of an archaeological object, burial object, or human remains must be reported to THC as soon as practicably possible. Under *New Brunswick Regulation 2010-132*, an archaeological object is defined under Sections 3(a) to 3(d) as:

- anything associated with military history;
- at least 50 years old if a wrecked or abandoned vessel or aircraft including cargo;
- at least 75 years old if a motor vehicle; and
- at least 100 years old for any other object.

Failure to report archaeological objects to Tourism, Heritage and Culture may be an offence.

Recommendation 5: Submit this Final Technical Report to THC as soon as practicably possible

It is recommended that this Final Technical Report be submitted to THC by Stratis, as soon as practicable, upon completion of review and approval by the Client and/or Proponent.

A condition of the AFRP, under which the Preliminary Field Examination was done, is submission of this Final Technical Report to THC. An AFRP conditions stipulate that this report is to be submitted by 31 March 2022.

Following submission to THC, the Minister may require additional information from the Proponent. This Final Technical Report includes all that is required by *Guidelines* for a Preliminary Investigation and meets all AFRP Conditions. THC may determine that additional information is required, including Field Evaluation such as shovel testing. That decision rests with the Minister of THC.

Recommendation 6: Apply for any Required Site Alteration Permit as soon as Possible

It is anticipated that a Site Alteration Permit will be required by THC for CbDd-24. An SAP is valid for one calendar year. It is recommended that an SAP application be submitted as soon as practicable in the calendar year in which dredging will take place.

Under the *Heritage Conservation Act*, submission of an SAP application may result in the Minister requiring additional investigative steps prior to issuing an SAP.

Mitigation Measures

Guidelines (p. 61) indicate that this section must include mitigation measures for each impacted archaeological site and recommendations with sufficient detail to allow THC to comment on appropriateness. The Preliminary Investigation did not identify any previously undocumented archaeological sites. The preceding recommendations and this Preliminary Investigation may be viewed as mitigation measures in respect of avoiding potential impacts to known and unknown heritage resources. CbDd-24 may be impacted by Project-related activities. The Site Alteration Permit application process, under the *Heritage Conservation Act*, allows for gathering of additional information, if required, as additional mitigation. The preceding recommendations may be considered mitigation measures.

The *Guidelines* indicate that, where appropriate and applicable, this section must consider the issues raised under the following sub-headings.

Avoidance

The southern bank of the tidal inlet, within 100 m of CbDd-24 is recommended to be avoided.

Impact Management Actions

Accidental discovery protocols are a recommended impact management action. Avoidance is a recommended impact management action. Other impact management actions may be required by THC.

Justifications for Non-Actions

Site-specific actions, such as avoidance, are recommended for the southern bank of the tidal inlet within 100 m of CbDd-24.

Surveillance and/or Monitoring Recommendations.

The Preliminary Investigation did not identify previously unregistered archaeological objects or features. The *Guidelines* (p. 22) stipulate that archaeological monitoring may not be undertaken unless "manual testing" is previously completed. Manual testing, which is hand excavation with shovels, is part of Field Evaluation, which was not permitted and not undertaken.

Minimal ground disturbance is anticipated in that dredging is anticipated to remove material that has been deposited in the Project Area over approximately the last 50 years. Following *Guidelines*, archaeological monitoring cannot be undertaken without prior Field Evaluation (i.e., manual testing). Specifically, this means that archaeological monitoring is not permitted by THC until after manual testing with shovels is completed. Any requirement for manual testing is determined by the Minister for THC. Surveillance following project completion is not recommended. Any chance discovery of archaeological objects must be reported to THC. Archaeological objects could be exposed by erosion or other natural processes.

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Note Regarding Comprehensive Listing of Sources

Guidelines (p. 61) require a list of all sources cited. In addition to in-text citations, the comprehensive enumeration of sources cited includes in-text citations and footnotes.

Compliance with PIPEDA

Stratis must comply with *Personal Information Protection and Electronic Documents Act* (*PIPEDA*). As such, every effort has been made to exclude personally identifying information from this report.

Closing

This report represents a level of Documentary Research and Preliminary Field Examination suitable for a Preliminary Investigation under THC *Guidelines* and does not constitute an exhaustive search for all available information about the Project area. This report fulfills a condition of an AFRP, specifically that "a final technical report will be due March 31, 2022".

The information and recommendations in this report were based upon work undertaken in accordance with generally accepted practices at the time the work was undertaken. The information and recommendations in this report are in accordance with the author's understanding of the Project as it was presented at the time the work was undertaken.

This report was reviewed and approved by the Client before submission to THC. This report was authored by the undersigned.

Final determinations regarding additional archaeological activities, if any, rest with THC.

[FINAL HARD COPY TO BE SIGNED BY]

Grant R. Aylesworth, PhD, RPA (No. 15583)
Managing Director

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Appendix A

THC-Related Documents:

Model and Information Request

Archaeological Model

Archaeological Permit

ARCHAEOLOGICAL PREDICTIVE MODEL & INFORMATION REQUEST

PARLEE BEACH DREDGING

SEPTEMBER 3, 2021

Table of Contents

Request for Archaeological Potential Model

Please accept this request for an Archaeological Potential Model, with thanks.

Requested Parameters

Respectfully, the following parameters are requested:

1. The model should be identifiable by location with the location specified in the file name or on any printout.
2. The model should not have extraneous information (e.g., PID numbers and dots), such that parts of the model become illegible. Models may be used by Stratis in archaeological assessments "as provided/as is" and are deemed to satisfy related AHB requirements once issued.
3. Possible areas of interest are shown in the attached figures. Models should be as small as practically possible so as to cover these relatively small areas.
4. Invoices for models should be itemized and identify the location for each charge.
5. Invoicing should be completed and submitted to Stratis in a timely manner, such as within 30 days of the model being completed.
6. If models show catalogued archaeological sites (i.e., sites with a Borden Number), the sites database abstract and/or a PDF of relevant MARI forms should accompany each model. Please note the attached request, which is required by *Guidelines*.
7. This request for an archaeological model is also a request for PDF files or database abstracts relating to any previous archaeological research (under permits or inspections) within or near (within 5 km) of the general area. PDFs of relevant documents, if any, should accompany the model.
8. Please review and respond to the attached Request for Information, as required by *Guidelines.*

Thank you!

Billing Address

Stratis Consulting Inc.
115-527 rue Dundonald Street
Fredericton, NB E3B 1X5
Canada

Invoices may be emailed to: accounting@stratis.consulting

Project Location

The location is in and around Parlee Beach Provincial Park. The location is shown in Figures 1, 2, and 3.

Figure 1. Approximately 1:50,000 map showing approximate project location (Image source: Atlas of Canada).

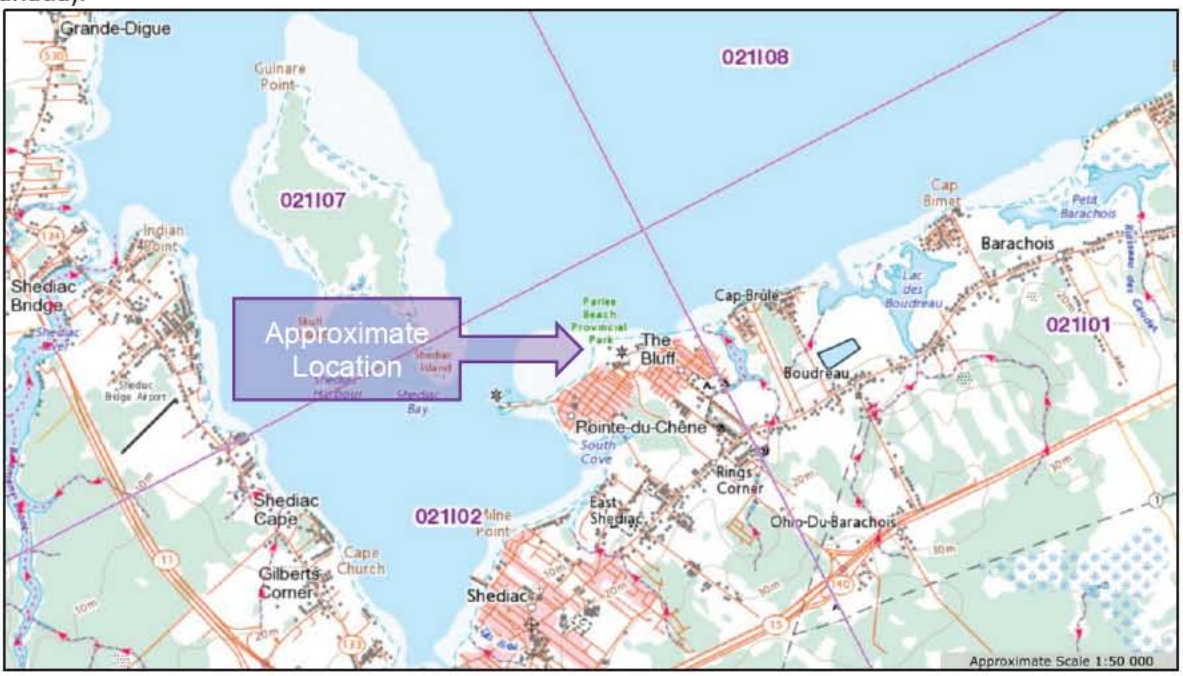


Figure 2. Approximately 1:10,000 map showing approximate project location (Image source: Atlas of Canada).

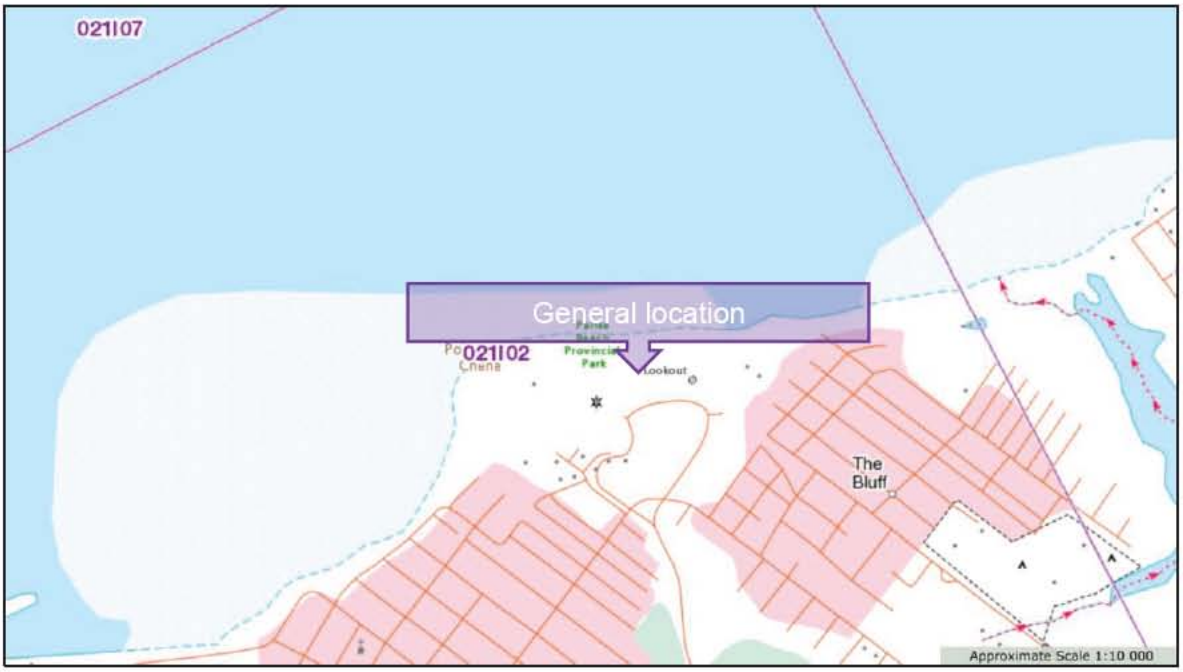


Figure 3. Project location with approximate boundaries of assessment area. (Image source: Englobe).

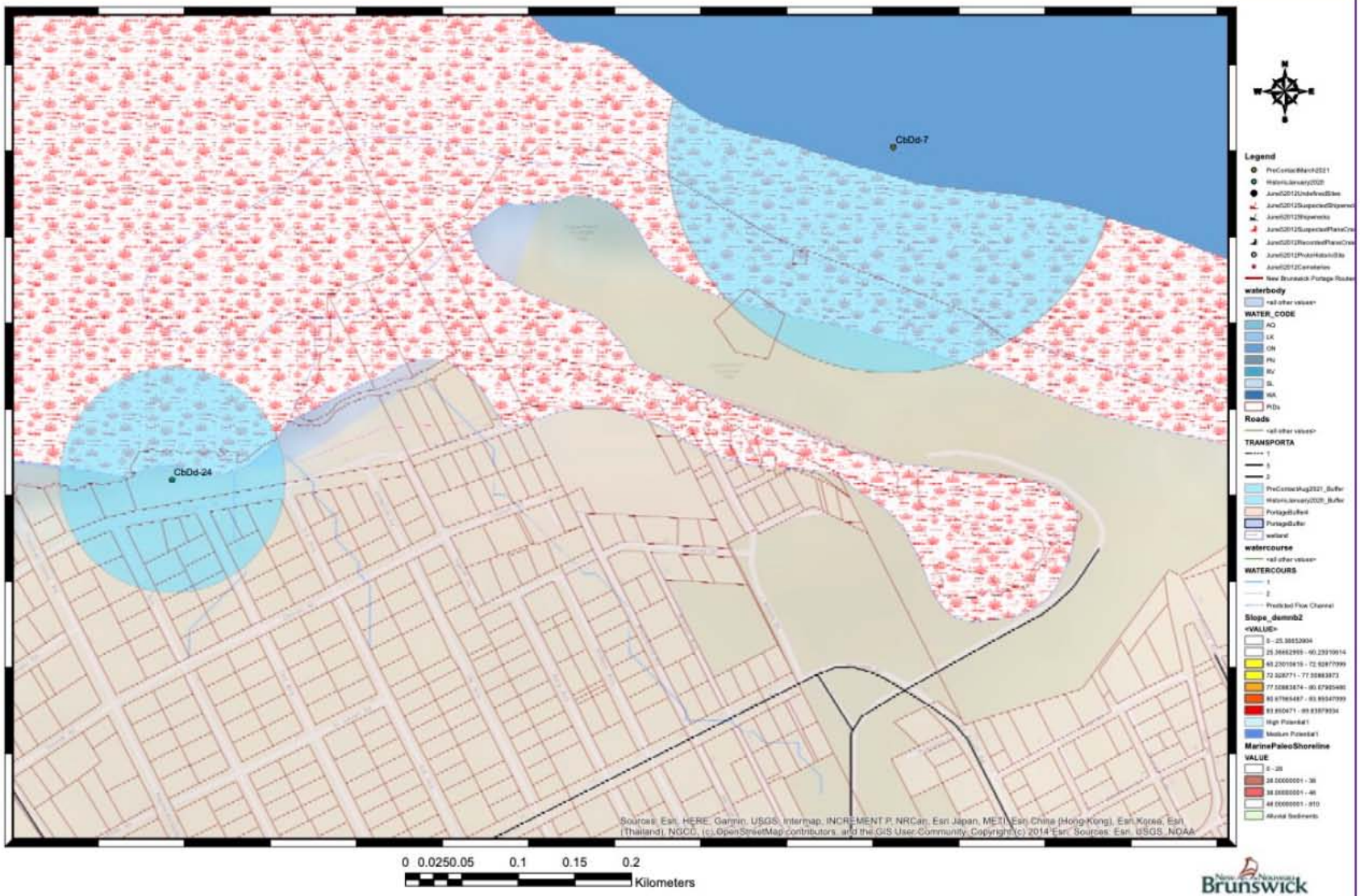
Request for Information

Please accept this request for information which is required by *Guidelines*. Please provide the requested information and return this completed checklist to Stratis with the archaeological model and the available information.

Archaeology and Heritage Branch Records Request	
Following *Guidelines*[1], the following information is required from Archaeology and Heritage Branch (AHB).	
MARI Files	
As required by *Guidelines* (p. 14), do these GNB records contain relevant information? If yes, please provide digital copies of the records. If no, please indicate that GNB records do not contain relevant information.	☐Yes ☐No
New Brunswick Archaeological Site File	
As required by *Guidelines* (p. 14), do these GNB records contain relevant information? If yes, please provide digital copies of the records. If no, please indicate that GNB records do not contain relevant information.	☐Yes ☐No
Borden Map File	
As required by *Guidelines* (p. 14), do these GNB records contain relevant information? If yes, please provide digital copies of the records. If no, please indicate that GNB records do not contain relevant information.	☐Yes ☐No
Archaeological Project Manuscripts	
As required by *Guidelines* (p. 14), do these GNB records contain relevant information? If yes, please provide digital copies of the records. If no, please indicate that GNB records do not contain relevant information.	☐Yes ☐No
Private Collections File	
As required by *Guidelines* (p. 14), do these GNB records contain relevant information? If yes, please provide digital copies of the records. If no, please indicate that GNB records do not contain relevant information.	☐Yes ☐No
New Brunswick Plane Crash Inventory	
As required by *Guidelines* (p. 14), do these GNB records contain relevant information? If yes, please provide digital copies of the records. If no, please indicate that GNB records do not contain relevant information.	☐Yes ☐No

[1] *Guidelines and Procedures for Conducting Professional Archaeological Assessments in New Brunswick.* Archaeological Services, Heritage Branch, Department of Culture, Tourism and Healthy Living. 31 July 2012.

New Brunswick Cemeteries Database	
As required by *Guidelines* (p. 14), do these GNB records contain relevant information? If yes, please provide digital copies of the records. If no, please indicate that GNB records do not contain relevant information.	☐Yes ☐No
AHB Shipwreck Inventory	
As required by *Guidelines* (p. 14), do these GNB records contain relevant information? If yes, please provide digital copies of the records. If no, please indicate that GNB records do not contain relevant information.	☐Yes ☐No
Published and Unpublished Sources on Local and Regional History and Other Subjects	
As required by *Guidelines* (p. 14), do GNB records contain relevant information? Relevant information includes "published and unpublished sources on local and regional history, Pre-Contact history, architectural history, ethnography, cultural geography, and other pertinent disciplines" (required by *Guidelines* p. 15). If yes, please provide digital copies of the records. If no, please indicate that GNB records do not contain relevant information.	☐Yes ☐No
Palaeoecological Studies	
As required by *Guidelines* (p. 14), do other GNB records contain relevant information? Relevant information includes "palaeoecological studies to assess past environmental conditions" (required by *Guidelines* p. 15). If yes, please provide digital copies of the records. If no, please indicate that GNB records do not contain relevant information.	☐Yes ☐No
Literature and Maps Relating to Geological, Geomorphological, or Hydrological History	
As required by *Guidelines* (p. 14), do other GNB records contain relevant information? Relevant information includes "literature/maps relating to the geological, geomorphological or hydrological history of the landform(s) in question" (required by *Guidelines* p. 15). If yes, please provide digital copies of the records. If no, please indicate that GNB records do not contain relevant information.	☐Yes ☐No
Thank you!	


CbDd-7
CbDd-24
Legend
waterbody
WATER_CODE
Roads
TRANSPORTA
watercourse
WATERCOURS
Slope_demnb2
MarinePaleoShoreline
VALUE
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community. Copyright (c) 2014 Esri. Sources: Esri, USGS, NOAA
0 0.0250.05 0.1 0.15 0.2
Kilometers
Brunswick
Time: 2:03:52 PM
Date: 9/15/2021

New Nouveau Brunswick

The Province of New Brunswick
Archaeological Field Research Permit

Province du Nouveau-Brunswick
Permis de travaux archéologiques sur le terrain

Under the provisions of Sections 13 and 14 of the *Heritage Conservation Act*, a permit is hereby granted to:

En vertu des l'articles 13 et 14 de la *Loi sur la conservation du patrimoine*, un permis est octroyé à:

Grant Aylesworth

to undertake the following archaeological field research project entitled:

pour entreprendre le projet de recherches archéologiques mentionné ci-après et intitulé :

Archaeological Impact Assessment for Improvements to Parlee Beach

in the county(ies) of:

dans le (s) comté (s) de :

Westmorland

under the following conditions:

1. The Permit shall be issued on the understanding the investigations are to be conducted for the sole purpose of recovering information and materials for scientific and historical study, and for the preservation of New Brunswick's historic resources; and that the research shall conform to the best scientific standards available.
2. The archaeological field research being carried out under this Permit may be inspected at any reasonable times; and this Permit may be revoked at any time by the Minister.
3. The holder of this Permit will report to the Archaeology and Heritage Branch, any archaeological site found during the archaeological field research being carried out under this Permit within two (2) working days of the find.
4. This Permit shall be valid until December 31, 2021
5. A final technical report will be due March 31, 2022
6. The holder of this Permit must provide copies to the Archaeology and Heritage Branch, of all field records, notes, maps, drawings, catalogues, and photographs pertaining to the description and context of all objects recovered under this Permit.
7. All cultural material recovered under this Permit must be deposited with the Archaeology and Heritage Branch, upon termination of the Permit.

aux conditions suivantes :

1. Le permis est émis à condition que les recherches soient effectuées dans le seul but d'obtenir des renseignements et du matériel pour des études scientifiques et historiques et de préserver les resources historiques du Nouveau-Brunswick; la recherche se conformera aux normes scientifiques les plus rigoureuses parmi celles disponibles.
2. Les recherches archéologiques menées dans le cadre de ce permis peuvent faire l'objet d'une inspection à n'importe quelle heure raisonnable, et le ministre peut révoquer le permis en tout temps.
3. Le détenteur du permis signalera à la Direction de l'archéologie et du patrimoine tout site archéologique trouvé au cours des recherches archéologiques réalisées dans le cadre du permis et ce, dans un délai de deux jours de travail après la découverte.
4. Le permis sera valide jusqu'au 31 décembre 2021
5. Un rapport technique final sera rédigé pour le 31 mars 2022
6. Le détenteur du permis fournira à laDirection de l'archéologie et du patrimoine, une copie de tous les documents, dessins et catalogues ainsi que de toutes les notes, cartes et photographies servant à la description et à l'établissement du contexte pour les objets trouvés dans le cadre du permis.
7. Tout article culturel découvert dans le cadre du permis doit être confié à la Direction de l'archéologie et du patrimoine à l'expiration du permis.

APPROVED: / APPROUVÉ :

Anne Hamilton,
Manager / Gestionnaire
Archaeology and Heritage Branch / Direction de l'archéologie et du patrimoine
Department of Tourism, Heritage and Culture / Ministère du Tourisme, du Patrimoine et de la Culture
(A person duly designated by the Minister of Tourism, Heritage and Culture pursuant to Sec. 100 of the Heritage Conservation Act to sign this permit on his behalf)
(Une personne dûment désignée par le Ministre du Tourisme, du Patrimoine et de la Culture en vertu de l'article 100 de la Loi sur la conservation du patrimoine pour signer ce permit à sa place)

SEP 14 2021
Date granted / Date d'octroi

PERMIT NO: / N° DU PERMIS : **2021 NB 88** (Impact Study / Étude d'impact)

Web: stratis.consulting

Appendix G Underwater Benthic Habitat Assessment, 2021

Englobe
Soils Materials Environment

NB Department of Tourism, Heritage and Culture

PARLEE BEACH PROVINCIAL PARK
POINTE-DU-CHENE, NEW BRUNSWICK

October 2021

Underwater Benthic Habitat Survey

2106010

FINAL REPORT

Prepared by:

Taylor McGregor, EIT
Junior Engineer
Environmental Engineering

Verified by:

Alexandra Stevenson, B.Sc. Env.
Project Manager
Environmental Engineering

Approved by:

Scott Fisher, P.Eng.
Team Leader
Environmental Engineering

S mmary

nglobe C rp. (Englob) wa retained b NB De artment of Tourism, He it ge and Cu ture (THC) to com lete a Unde water en hic Habi at Survey (UBH), as requ ste by he Dep rt ent of F sheri s and Oc ans (DFO) t the Parlee Be ch Provincial P rk lo ated in Pointe-D -Che e, N w Brunsw ck

T e Parlee Beac P ovi cial Pa k site onsis s o a dr dgi g area at th ex reme we tern end o t e each and t ansp rti g the dredged mat rials to he be ch her the re stockpi ed o er he winter a d spread ove the beac n the pri g. The UBHS as c nd cted in the existin dr dge are to e aluate he cu rent h bitat prio to dredging act vities. he urpose o th progr m is to fu fil p rmitt ng req ireme ts or dredgi g a d disp sal at sea.

An nd rwat r vide along , 200 m tre (m) ransec s as film d a d int rpreted as p rt of UBH , co pleted on Aug st 26, 2021, withi the dre ging area in the hediac ay at t e Par ee each Pro incial Park it .

Th Parlee Beach P ovin ial Park u de water video an lysis ndic tes tha the dr dging area onsists of o e unif rm ha itat type c nsis ing o sand subtidal plai s that p ov de habitat or benthic pec es th t refe s ndy substr tes. So e em ty shell fragme ts ere observed o b scattere thro gho t the ite. No ra e or enda gered sp cie were observe dur ng the su vey.

ithin th dre ging a ea th surve are sh ws surfic al sedime t as pr dominantl flat to r ppl d sand c vering over 98-9 % of he botto with the r mainder comp ised of sh ll deb is 1% ove age and boulders (1%)

Wit in t is sandy h bitat, mac ofaun l s ecies we e ide tified at 1, 2 an T3. The acadian h rm t cra was most fr quen ly ide tifi d along all thr e of t ese transects, on moon sna l was o serv d at T and u ide tifiable fish spe ies were re orded a ong all thr e f these ra sect . No macrof unal speci s were ob erved al ng 4 and T5

S ars ma ro lora con isting of e lgrass (1% coverag) was obs rve at our T1 i te val (55-160m, 160-165m, 80- 85m an 185-190) and one T interv l (145 150). Br shy r d we d (1% co erage) as also bserved a on T1 in erval (100- 05m) a d one 3 int rval 100-05m . Seawe d d bri was not d a ong e ch tra se t interval in v rying qua tities from 1% t 70% cov rage

The hab tat observed in he su ve area (T th ough T5) was li it d. he s ndy lai s do no prov de good cov r fo macrofauna, and although fish species may occasionally occur in the area, the subtidal nature of the area does not provide good habitat for fish species.

Production Team

Client

NB Department of Tourism, Heritage and Culture (THC)	Martin MacMullin, Asset Management Branch

Englobe Corp.

Site Assessor	Alexis Robitaille, B.Sc.
Report Preparation	Taylor McGregor, EIT
Report Reviewer	Alexandra Stevenson, B.Sc. Env.
Project Manager	Scott Fisher, P.Eng

Revision and Publication Register		
Revision N°	**Date**	**Modification and/or Publication Details**
00	2021-10-04	Report Issued

Property and Confidentiality

Table of Contents

Tables

Appendices

1 Introduction

Englobe Corp. (Englobe) was retained by NB Department of Tourism, Heritage and Culture (THC) to complete an Underwater Benthic Habitat Survey (UBHS), as requested by the Department of Fisheries and Oceans (DFO) at the Parlee Beach Provincial Park located in Pointe-Du-Chene, New Brunswick.

The Parlee Beach Provincial Park site consists of a dredge area at the extreme western end of the beach, a tidal inlet, lagoon and channel located south of the current dredge limits, and a beach that extends over 700 meters along the northeast coast of the Provincial Park. The current UBHS focuses on the dredge area at the extreme western end of the beach. This area is dredged regularly, and the dredged materials are transported to the beach where they are stockpiled over the winter and spread over the beach in the spring. The UBHS was conducted in the existing dredge area to evaluate the current habitat prior to dredging activities.

Refer to Appendix A for a site location plan (Figure 1).

2 Scope and Methodology

Englobe retained the services of a diving team/crew from Dominator Marine Services Inc. based in Carter's Point, NB. Under Englobe's supervision, the divers navigated to each identified transect location using a handheld Global Positioning System (GPS). The crew completed an underwater video survey along 5 transects measuring 200 metres (m) each for a total length of 1000 m. The dredge boundary limits were provided by NB THC and based on the boundaries provided, Englobe finalized a transect location plan. The transect locations with the date of filming is provided in Table 1, below. Refer to Figure 2 in Appendix A for a transect location plan.

Table 1 – Transect Coordinates & Date of Sampling

TRANSECT ID	SAMPLE COORDINATES (LATITUDE, LONGITUDE – DECIMAL DEGREES)				DATE
	START		FINISH		
T1	46.239995°	-64.519725°	46.241462°	-64.521230°	August 26, 2021
T2	46.240283°	-64.519255°	46.240667°	-64.518774°	August 26, 2021
T3	46.240667°	-64.518774°	46.242156°	-64.520247°	August 26, 2021
T4	46.241094°	-64.518490°	46.242699°	-64.519669°	August 26, 2021
T5	46.241413°	-64.518063°	46.243068°	-64.518884°	August 26, 2021

A GPS was used to locate the pre-determined start and finish points of transects. Each transect was continuously filmed pausing at each 5 m mark and scanning to the right and left of the transect line to provide a wider view of the habitats.

An Englobe representative was on-site to guide the dive crew in the event that any issue arose and to obtain supporting habitat and biological information.

For each transect and every 5 m, Englobe interpreted the underwater video which includes site specific information on the substrate type and marine macrofloral/faunal species present; detailed descriptions of biological presence and/or habitat that are related to commercial, recreational or aboriginal fisheries; and general delineations of substrate types and a general characterization.

3 Underwater Habitat Survey Results

The results of the transect surveys are presented in Appendix B (Tables B.1 to B.5) which includes the following information for each 5 m increment of transect line:

- Visual determination of substrate type (in order of dominance);
- Macrofaunal species identification and abundance; and
- Macrofloral species identification and percent coverage.

A summary of the information provided in Appendix B is described in the following paragraphs. Photographs of each 5 m transect segment have been included in Appendix C.

For the purpose of the video survey review and macrofaunal species identification and enumeration, four categories were developed to characterize the observed abundance levels.

The categories are as follows:

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.

Transect T1

T1 was the most western transect located within the dredging area at the site in the Northumberland Straight located approximately 485m west of the nearest Parlee Beach Provincial Park Building. T1 was 200m in length extending southeast to northwest, as shown on Figure 2.

The surficial sediment was predominantly flat to rippled sand covering over 98-99% of the bottom with the remainder comprised of shell debris (1% coverage) and boulders (1% coverage).

In terms of observed macrofauna, single individuals of acadian hermit crab (*Pagurus acadianus*) were recorded at eight intervals (85-90m, 115-120m, 125-130m, 130-135m, 160-165m, 175-180m, 185-190m and 195-200m). Observations of unknown fish species were also observed along six intervals (120-125m, 145-150m, 160-170m and 190-200m). No other macroflauna were observed over the entire transect.

In terms of macroflora, a small patch (1% coverage) of brushy red weed (*Ceramium purpureum*) was observed at one interval (100-105m) and sparse eelgrass (*Zostera marina*) (1% coverage) was observed at four intervals (155-165m and 180-190m). Seaweed debris was also observed along the entire transect in varying quantities (1% to 50% coverage).

Transect T2

T2 was located approximately 50m east of T1 within the dredging area at the site in the Northumberland Straight. T2 was 200m in length extending southeast to northwest, as shown on Figure 2.

The surficial sediment was predominantly flat to rippled sand covering over 99% of the bottom with the remainder comprised of shell debris (1% coverage).

In terms of observed macrofauna observed, unknown fish species were observed along sixteen intervals (70-75m, 80-85m, 90-115m, 120-125m, 130-140m, 150-165m, 170-175m, 180-185m and 195-200m). Individual acadian hermit crab (*Pagurus acadianus*) were recorded at three intervals (105-110m, 125-130m and 140-145m). No other macrofauna were observed over the entire transect.

In terms of macroflora, no live and/or attached species were observed over the entire transect. Seaweed debris was observed along the entire transect in varying quantities (1% to 70% coverage).

Transect T3

T3 was located approximately 50m east of T2 within the dredging area at the site in the Northumberland Straight. T2 was 200m in length extending southeast to northwest, as shown on Figure 2.

The surficial sediment was predominantly flat to rippled sand covering over 99% of the bottom with the remainder comprised of shell debris (1% coverage).

In terms of observed macrofauna, acadian hermit crabs were most commonly observed along the transect at twelve intervals (105-110m, 120-155m, 160-170m and 180-190m). One moon snail (*Euspira heros*) was also observed at interval 155-160m. No other macroflauna were observed over the entire transect.

In terms of macroflora, brushy red weed (*Ceramium purpureum*) (1% coverage) was observed at one interval (100-105m) and eelgrass (*Zostera marina*) (1% coverage) was observed at one interval (145-150m). Seaweed debris was also observed along the entire transect in varying quantities (1% to 10% coverage).

Transect T4

T4 was located approximately 50m east of T3 within the dredging area at the site in the Northumberland Straight. T2 was 200m in length extending southeast to northwest, as shown on Figure 2.

The surficial sediment was predominantly flat to rippled sand covering over 99% of the bottom with the remainder comprised of shell debris (1% coverage).

o macr fauna or liv macrof ora was obser ed over the e tire transec . parse se wee debris (% co era e) wa observe along th e tire tr nsect, exc pt for on inte val (0-5) where t e se weed debris was mo e ab nda t (60% overage).

Tran ect T5

T5 w s locate a proximat ly 0m ea t o 4 within the d edging a ea at the s te in the North mberland tr ight. T2 w s 00m in ength xtend ng southe st to no thw st, as shown o Fig re 2.

The s rfic al sedim nt w s p ed min ntly flat o r ppled san covering ov r 99% of the bot om with the r mainder co pr sed f shell de ris (1% cove age)

No macrof una or ive m croflora was ob erved ov r he enti e tr nse t. Sp rse seaw ed de ris (1% cover ge wa observed alon the nti e trans ct, wi h t e ex eption o on interval (0 5m) where the eaweed debri was more bund nt (5% cov rage)

4 Concl sions

The arle Be ch Provi cial Park un er ate video nalysis indi ates that he dredg ng area c nsists of o e unifo m habit t type con isting f sa dy sub idal lains that rovi e hab tat f r benthic peci s that p ef r sandy sub trates. So e e pty s el fra me ts were ob erved t be s attered hrough ut he site. No r re r endang red s eci s were obse ved d ring the urvey.

Wi hin the dredging rea, the surve are shows s rfic al sed me t w s pred mina tly flat to ri pled sand co ering over 98-9 % of the ott m with t e remainder comp ised f shell ebris (1% co erage) nd b ulders (1% .

W thi t is and hab tat, macrofau al s eci s we e identifi d at T1, T and 3. The a ad an her it crab as ost frequent y ident fi d alo g all three of hese t anse ts, one moon sn il was o served at T3 nd unidentifi ble fi h s ecies w re r co ded along ll three of these t an ects. N ma rofaunal pec es were bs rved al ng T4 and T5

Sparse m croflora onsistin of eelgrass 1% ove ag) was ob erved at fo r T1 i ter als (15 - 160m, 16 -16 m, 1 0-185m a d 85- 90) and on T3 interv l (45- 50). Brush red weed (1 cover ge) w s lso bserv d a one T interv l (100-10 m) and o e T in erv l (100-105m . Seawe d debris wa no ed alo g ea h t ansect nte val in varyi g q antit es fro 1 to 70% cov rage

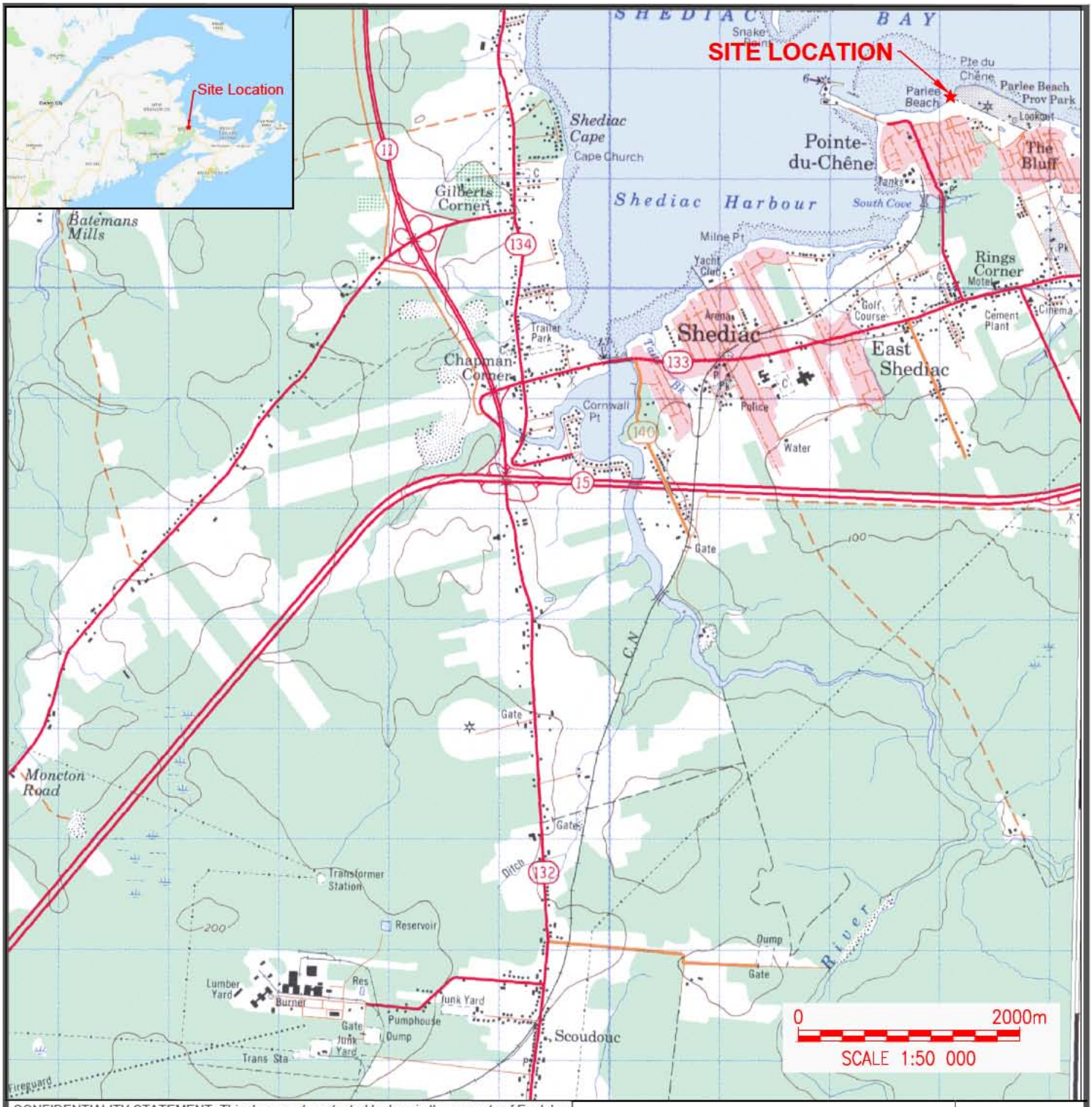
The h bit t observed n t e survey area (T1 thr ugh T5) was limi ed. T e andy pla ns o not pro ide go d ove for macr fau a, and ltho gh fish spe ies ay occasi nally ccu in the area, the s btidal nat re of th ar a d es not pr vid g od hab tat for fis s ecies

5 Repo t Use and Cond tions

Thi repor as p epare f r the e cl siv use of NB THC an DF a d is ased on da a a d informat on obt ined dur ng a s te v si by nglobe on t e subject pr pe ty; and is based so ely pon the c ndition of he propert on the date of such insp ct on, upplem nted by nformati n o taine a d d scribed h rei . The eval at on and c nclusions con ained in this report have been prepared in light of the expertise and experience of Englobe. Environmental conditions

are dynamic in nature and changing circumstances in the environment and in the use of the property can alter radically the conclusions and information contained herein.

Appendix A Figures



NB Department of Tourism, Heritage and Culture

Underwater Benthic Habitat Survey

Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Site Location Plan

Englobe
1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

Discipline: Environment		Prepare by: JM	Verify by: JM
Scale: 1: 50,000		Draw by: JJ	Approval by: SF
Date: October 2021		Figure no: 1	
Page setup: Figure 1	Paper size: Letter	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000	0 - - -	——	-

LEGEND:

- Transect Location and Length
- Direction of Transect

NB Department of Tourism, Heritage and Culture

0 30 60 90 120 150m

SCALE 1: 3000

Englobe

Englobe Corp.

1077 St. George Blvd., Suite 400
Moncton, NB E1E 4C9
506-857-2777

N

Underwater Benthic Habitat Survey

Parlee Beach Provincial Park
Pointe-du-Chêne, New Brunswick

Transect Location Plan

No.	Version	Date	By	Verif	Appr.
XX	X	Oct. 2021	JJ	TM	SF

Discipline: Environment		Prepare by: TM	Verify by: TM
Scale: 1: 3000		Draw by: JJ	Approval by: SF
Date: October 2021		Figure no: 2	
Page setup: Fig. 2	Paper size: 11 x 17	Register no.:	

Man.	Project	Otp	Project Phase	Electronic ref.	Rev.
148	2106010	000			

Appendix B Transect Surveys

Table B.1 Transect T1 (200 m Survey, August 26, 2021) Parlee Beach, NB

Transect Distance / Interval (m)	Substrate (Estimated % Coverage[2])	Macrofaunal Life Observed (Estimated Abundances[3])	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)	Comments
0-5	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
5-10	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
10-15	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
15-20	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
20-25	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
25-30	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
30-35	Sand 99%[1] ; Shell debris 1%	-		Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
35-40	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
40-45	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 2%	Flat to rippled sand
45-50	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
50-55	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 40%	Flat to rippled sand
55-60	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 50%	Flat to rippled sand
60-65	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 50%	Flat to rippled sand
65-70	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 50%	Flat to rippled sand
70-75	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 20%	Flat to rippled sand
75-80	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 20%	Flat to rippled sand
80-85	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 20%	Flat to rippled sand
85-90	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus) U - 1	-	Seaweed debris 25%	Flat to rippled sand
90-95	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 10%	Flat to rippled sand
95-100	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
100-105	Sand 98% ; Boulders 1%; Shell debris 1%	-	Brushy Red Weed (*Ceramium purpureum*) 1%	Seaweed debris 1%	Flat to rippled sand
105-110	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
110-115	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
115-120	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 1	-	Seaweed debris 1%	Flat to rippled sand
120-125	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 1%	Flat to rippled sand
125-130	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 1	-	Seaweed debris 1%	Flat to rippled sand
130-135	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 1	-	Seaweed debris 1%	Flat to rippled sand
135-140	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
140-145	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
145-150	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 1%	Flat to rippled sand
150-155	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand

Table B.1 Transect T1 (200 m Survey, August 26, 2021) Parlee Beach, NB

Transect Distance / Interval (m)	Substrate (Estimated % Coverage[2])	Macrofaunal Life Observed (Estimated Abundances[3])	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)	Comments
155-160	Sand 99% ; Shell debris 1%	-	Eelgrass (Zostera marina): 1%	Seaweed debris 1%	Flat to rippled sand
160-165	Sand 99% ; Shell debris 1%	Unknown Fish Species: C 'Acadian hermit crab (Pagurus acadianus): U - 1	Eelgrass (Zostera marina): 1%	Seaweed debris 1%	Flat to rippled sand
165-170	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 1%	Flat to rippled sand
170-175	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
175-180	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 1	-	Seaweed debris 1%	Flat to rippled sand
180-185	Sand 99% ; Shell debris 1%	-	Eelgrass (Zostera marina): 1%	Seaweed debris 1%	Flat to rippled sand
185-190	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 1	Eelgrass (Zostera marina): 1%	Seaweed debris 1%	Flat to rippled sand
190-195	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 1%	Flat to rippled sand
195-200	Sand 99% ; Shell debris 1%	Unknown Fish Species: C Acadian hermit crab (Pagurus acadianus): U - 1	-	Seaweed debris 1%	Flat to rippled sand

Notes: [1] Visibility issues, infered substratee composition
" - " = None Observed

[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).

[3] 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.

Table B.2 Transect T2 (200 m Survey, August 26, 2021) Parlee Beach, NB

Transect Distance / Interval (m)	Substrate (Estimated % Coverage[2])	Macrofaunal Life Observed (Estimated Abundances[3])	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)	Comments
0-5	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
5-10	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
10-15	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
15-20	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
20-25	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
25-30	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
30-35	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
35-40	Sand 99%[1] ; Shell debris 1%	-	-	Seaweed debris 2%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
40-45	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
45-50	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
50-55	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
55-60	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
60-65	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
65-70	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
70-75	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 20%	Flat to rippled sand
75-80	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 40%	Flat to rippled sand
80-85	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 70%	Flat to rippled sand
85-90	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 70%	Flat to rippled sand
90-95	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 50%	Flat to rippled sand
95-100	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 20%	Flat to rippled sand
100-105	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 10%	Flat to rippled sand
105-110	Sand 99% ; Shell debris 1%	Unknown Fish Species: C Acadian hermit crab (Pagurus acadianus): U - 1	-	Seaweed debris 5%	Flat to rippled sand
110-115	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 5%	Flat to rippled sand
115-120	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
120-125	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 5%	Flat to rippled sand
125-130	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 1	-	Seaweed debris 1%	Flat to rippled sand
130-135	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 1%	Flat to rippled sand
135-140	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 1%	Flat to rippled sand
140-145	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 1	-	Seaweed debris 1%	Flat to rippled sand
145-150	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
150-155	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 1%	Flat to rippled sand
155-160	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 1%	Flat to rippled sand
160-165	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 5%	Flat to rippled sand
165-170	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
170-175	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 5%	Flat to rippled sand
175-180	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
180-185	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 5%	Flat to rippled sand
185-190	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
190-195	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
195-200	Sand 99% ; Shell debris 1%	Unknown Fish Species: C	-	Seaweed debris 5%	Flat to rippled sand

Notes: [1] Visibility issues, infered substratee composition

" - " = None Observed

[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).

[3] 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.

Table B.3 Transect T3 (200 m Survey, August 26, 2021) Parlee Beach, NB

Transect Distance / Interval (m)	Substrate (Estimated % Coverage[2])	Macrofaunal Life Observed (Estimated Abundances[3])	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)	Comments
0-5	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
5-10	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 25%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
10-15	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
15-20	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
20-25	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
25-30	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
30-35	Sand 99% ; Shell debris 1%	-		Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
35-40	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
40-45	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 2%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
45-50	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
50-55	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 10%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
55-60	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 10%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
60-65	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 10%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
65-70	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 10%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
70-75	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 10%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
75-80	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 10%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
80-85	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	[1] The camera is out of the water, this affects substrate visibility; Flat to rippled sand
85-90	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
90-95	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
95-100	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
100-105	Sand 98% ; Boulder 1%;	-	Brushy Red Weed (*Ceramium purpureum*) 1%	Seaweed debris 1%	Flat to rippled sand
105-110	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 2	-	Seaweed debris 1%	Flat to rippled sand
110-115	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
115-120	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
120-125	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 1	-	Seaweed debris 1%	Flat to rippled sand
125-130	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 3	-	Seaweed debris 1%	Flat to rippled sand
130-135	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 2	-	Seaweed debris 1%	Flat to rippled sand
135-140	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagu1us acadianus): U - 2	-	Seaweed debris 1%	Flat to rippled sand
140-145	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 2	-	Seaweed debris 5%	Flat to rippled sand
145-150	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 7	Eelgrass (Zostera marina): 1%	Seaweed debris 5%	Flat to rippled sand
150-155	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 5	-	Seaweed debris 5%	Flat to rippled sand
155-160	Sand 99% ; Shell debris 1%	Moon snail (Euspira heros): U - 1	-	Seaweed debris 5%	Flat to rippled sand
160-165	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 1	-	Seaweed debris 5%	Flat to rippled sand
165-170	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 3	-	Seaweed debris 5%	Flat to rippled sand
170-175	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
175-180	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
180-185	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 1	-	Seaweed debris 5%	Flat to rippled sand
185-190	Sand 99% ; Shell debris 1%	Acadian hermit crab (Pagurus acadianus): U - 2	-	Seaweed debris 5%	Flat to rippled sand
190-195	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand
195-200	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 5%	Flat to rippled sand

Notes:
[1] Visibility issues, infered substratee composition
" - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] 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.

Table B.4 Transect T4 (200 m Survey, August 26, 2021) Parlee Beach, NB

Transect Distance / Interval (m)	Substrate (Estimated % Coverage[2])	Macrofaunal Life Observed (Estimated Abundances[3])	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)	Comments
0-5	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 60%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
5-10	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
10-15	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
15-20	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
20-25	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
25-30	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
30-35	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
35-40	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
40-45	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
45-50	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
50-55	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
55-60	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
60-65	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
65-70	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
70-75	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
75-80	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
80-85	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
85-90	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
90-95	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
95-100	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	Flat to rippled sand
100-105	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
105-110	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
110-115	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
115-120	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
120-125	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
125-130	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
130-135	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
135-140	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
140-145	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
145-150	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
150-155	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
155-160	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
160-165	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
165-170	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
170-175	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
175-180	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
180-185	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
185-190	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
190-195	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
195-200	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand

Notes: ¹ Visibility issues, infered substrate composition
" - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] 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.

Table B.5 Transect T5 (200 m Survey, August 26, 2021) Parlee Beach, NB

Transect Distance / Interval (m)	Substrate (Estimated % Coverage[2])	Macrofaunal Life Observed (Estimated Abundances[3])	Macrofloral Life Observed (Estimated % Coverage)	Debris/Other (Estimated % Coverage or Abundances)	Comments
0-5	Sand 99% ; Shell debris 1%	-	-	Seaweed debris: 5%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
5-10	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
10-15	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
15-20	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
20-25	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
25-30	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
30-35	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
35-40	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
40-45	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
45-50	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
50-55	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
55-60	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
60-65	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
65-70	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
70-75	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
75-80	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
80-85	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
85-90	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
90-95	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
95-100	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
100-105	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
105-110	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
110-115	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	'¹ The camera is out of the water, this affects substrat visibility; 'Flat to slightly rippled sand;
115-120	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
120-125	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
125-130	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
130-135	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
135-140	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
140-145	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
145-150	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
150-155	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
155-160	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
160-165	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
165-170	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
170-175	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
175-180	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
180-185	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
185-190	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
190-195	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand
195-200	Sand 99% ; Shell debris 1%	-	-	Seaweed debris 1%	¹ The camera is out of the water, this affects substrate visibility; Flat to rippled sand

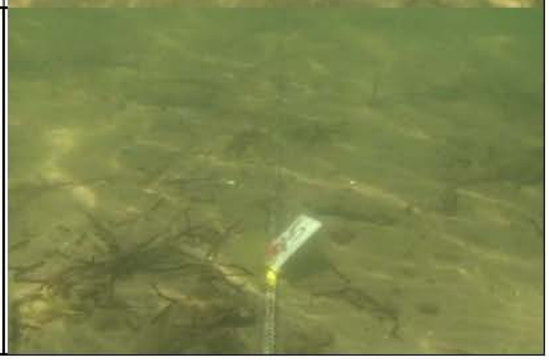
Notes: ¹ Visibility issues, infered substrate composition
" - " = None Observed
[2] Boulder (>256 mm), Cobble (>64-256 mm), Gravel (>2-64 mm), Sand (0.06-2 mm), Silt (<0.06 mm).
[3] A = Abundant, C = Common, O = Occasional, U = Uncommon (see below).

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 C Transect Photos

Transect Interval (m)	Representative Substrate Character
Transect T1	
0-5	
5-10	
10-15	
15-20	
20-25	

25-30	
30-35	
35-40	
40-45	
45-50	

50-55	
55-60	
60-65	
65-70	
70-75	

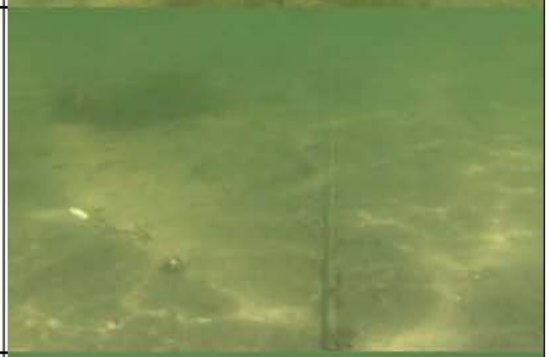
75-80	
80-85	
85-90	
90-95	
95-100	

100-105	
105-110	
110-115	
115-120	
120-125	

125-130	
130-135	
135-140	
104-145	
145-150	

150-155	
155-160	
160-165	
165-170	
170-175	

175-180	
180-185	
185-190	
190-195	
195-200	

Additional Photos	
Brushy Red Weed (*Ceramium purpureum*)	
Eelgrass (*Zostera marina*)	
Acadian hermit crab (*Pagurus acadianus*)	
Acadian hermit crab (*Pagurus acadianus*)	
Unknown Fish Species	

Unknown Fish Species	
Unknown Fish Species	
Transect T2	
0-5	
5-10	
10-15	

15-20	
20-25	
25-30	
30-35	
35-40	

40-45	
45-50	
50-55	
55-60	
60-65	

65-70	
70-75	
75-80	
80-85	
85-90	

90-95	
95-100	
100-105	
105-110	
110-115	

115-120	
120-125	
125-130	
130-135	
135-140	

140-145	
145-150	
150-155	
155-160	
160-165	

165-170	
170-175	
175-180	
180-185	
185-190	

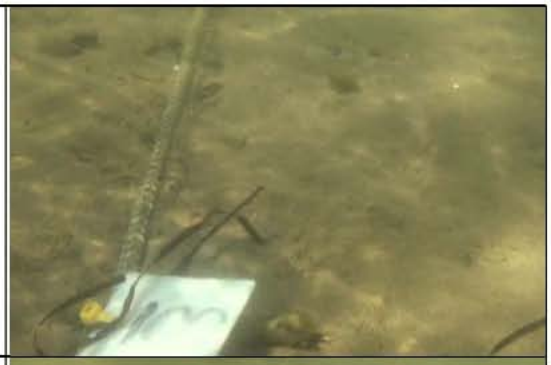
190-195	
195-200	
Additional Photos	
Unknown Fish Species	
Unknown Fish Species	
Unknown Fish Species	

Acadian hermit crab (*Pagurus acadianus*)	
Transect T3	
0-5	
5-10	
10-15	
15-20	

20-25	
25-30	
30-35	
35-40	
40-45	

45-50	
50-55	
55-60	
60-65	
65-70	

70-75	
75-80	
80-85	
85-90	
90-95	

95-100	
100-105	
105-110	
110-115	
115-120	

120-125	
125-130	
130-135	
135-140	
140-145	

145-150	
150-155	
155-160	
160-165	
165-170	

170-175	
175-180	
180-185	
185-190	
190-195	

195-200	
Additional Photos	
Acadian hermit crab (*Pagurus acadianus*)	
Moon snail (*Euspira heros*)	
Eelgrass (*Zostera marina*)	
Transect T4	
0-5	

5-10	
10-15	
15-20	
20-25	
25-30	

30-35	
35-40	
40-45	
45-50	
50-55	

55-60	
60-65	
65-70	
70-75	
75-80	

80-85	
85-90	
90-95	
95-100	
100-105	

105-110	
110-115	
115-120	
120-125	
125-130	

130-135	
135-140	
140-145	
145-150	
150-155	

155-160	
160-165	
165-170	
170-175	
175-180	

180-185	
185-190	
190-195	
195-200	
Transect T5	
0-5	

5-10	
10-15	
15-20	
20-25	
25-30	

30-35	
35-40	
40-45	
45-50	
50-55	

55-60	
60-65	
65-70	
70-75	
75-80	

80-85	
85-90	
90-95	
95-100	
100-105	

105-110	
110-115	
115-120	
120-125	
125-130	

130-135	
135-140	
140-145	
145-150	
150-155	

155-160	
160-165	
165-170	
170-175	
175-180	

180-185	
185-190	
190-195	
195-200