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Greater Shediac Sewerage Commission

CAP-BRULÉ WASTEWATER TREATMENT FACILITY EIA REGISTRATION DOCUMENT

Consultant Project #2003869

December 2020

Prepared by:

Jeff Meadows, M. Eng., P. Geo.
Senior Environmental Engineer
Environmental Engineering

Reviewed by:

Laura Leger, P.Eng.
Project Manager
Civil Engineering

Chris Gallant, P.Eng
Project Manager
Civil Engineering

Pierre Plourde, P.Eng
Service Director
Municipal Engineering

Approved by:

Pierre Plourde, P.Eng
Service Director
Municipal Engineering

Chris Gallant, P.Eng.
Project Manager
Civil Engineering

Production Team

Client

Greater Shediac Sewerage Commission

Englobe Corp.

Senior Environmental Engineer	Jeff Meadows, M. Eng., P. Geo.
Project Manager	Chris Gallant, P.Eng.

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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

Name of Proponent	Greater Shediac Sewerage Commission
Address	25 Cap-Brulé Rd. Boudreau-Ouest, New Brunswick E4P 6H8
Chief Executive Office	
Name	Mr. Joey Frenette B.Sc.,P.Tech
Official Title	General Manager, Greater Shediac Sewerage Commission
Telephone	506-532-7025
Fax	506-533-7041
Email	joey@gssc-cesb.ca
Principal Contact Person for purposes of Environmental Impact Assessment	
Name	Laura Leger, P. Eng.
Official Title	Project Engineer, Crandall, a division of Englobe Corp.
Telephone	506-857-2777
Fax	506-857-2773
Email	laura.leger@englobecorp.com

Property Ownership

The current Greater Shediac Sewerage Commission (GSSC) Wastewater Treatment Facility (WWTF) proposed for upgrading is located on land presently owned by the GSSC (PID #01065655 and #010165663). The existing lagoons are to be repurposed as part of the proposed project. The existing lagoons will be altered by deepening and addition of various equipment such as baffles and a new aeration system. Some of the existing buildings will be decommissioned and a new central main WWTF building will be constructed. The current outfall will no longer be used, and a new outfall equipped with a diffuser system, will be constructed beneath the land surface by horizontal drilling out into the Northumberland Strait.

If authorization is received to upgrade the Cap-Brulé Wastewater Treatment Facility as proposed herein, no additional lands will be required for the work. All upgrading will be done within the existing GSSC property.

The Land Gazette status of PIDs 01065655 and 01065663 were reviewed through the GeoNB application, to verify the potential existence of land-related notices or restrictions (such as

petroleum storage, dump sites, etc.), that may have an impact on land use. No records were shown ("no records returned"), indicating that there are no known concerns related to the past land use (nothing has been registered with the province). The data for the two PIDs are found in Appendix A.

As indicated on the Figures in Appendix B, the proposed project site is located at 25 Cap-Brulé Rd. Boudreau-Ouest, in Shediac, NB, E4P 6H8. Figure 1 shows where the Site is located with respect to its location in the Province of New Brunswick and Figure 2 is an aerial photo of some of the features of the Site and neighbouring communities. Appendix A has several Site photos.

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

- A closeup of existing infrastructure of the Cap-Brulé WWTF are shown in the aerial photo in Figure 3.
- Figure 4 illustrates the alternative sites examined as part of the feasibility study.
- Figure 5 sets out the existing conditions of the Site with additional details.
- Figure 6 is a plan showing the proposed new facility and its updated components.
- Figure 7 shows the proposed outfall concept and location of the provincially significant wetlands adjacent to the Site.
- Figure 8 details the stages of treatment of the existing WWTP.
- Figure 9 shows the residences located within 150m of the facility.
- Figure 10 is the zoning map of Beaubassin East.

The Approval to Operate for the Site is found in Appendix C.

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

(a) Environmental Risk Assessment (ERA), for the Greater Shediac Sewerage Commission (GSSC) Cap Brulé Wastewater Treatment Plant. GSSC, 25 ch Cap-Brulé Rd., Boudreau-Ouest, NB, E4P 6H8, 2014. Prepared by Crandall Engineering Ltd. 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9. Appendix D.

(b) Feasibility Study: Cap Brulé WWTP Outfall, for the Greater Shediac Sewerage Commission (GSSC) Cap Brulé Wastewater Treatment Plant. GSSC, 25 ch Cap-Brulé Rd., Boudreau-Ouest, NB, E4P 6H8, 2015. Prepared by Crandall Engineering Ltd. 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9. Appendix E.

(c) Greater Shediac Sewerage Commission, Shediac East Long-Term Wastewater Management Strategy, May 15, 2019a. Prepared by Crandall Engineering Ltd. 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9. Appendix F.

(d) Greater Shediac Sewerage Commission, Cap Brulé Wastewater Treatment Facility, Preliminary Design Report. Crandall, September 11, 2019b, prepared by Crandall Engineering Ltd. 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9. Appendix G.

(e) Climate Change Resilience Assessment, Upgrade of Cap-Brulé Wastewater Treatment Facility, Greater Shediac Sewerage Commission - Wastewater Treatment Facility – July 2020, Final Report, Englobe Corp. 1001, rue Sherbrooke Est, bureau 600, Montréal (Québec) Canada H2L 1L3. Appendix H.

2 The Undertaking

2.1 Name of the Undertaking:

"Upgrade of the Cap-Brulé Wastewater Treatment Facility, Greater Shediac Sewerage Commission", Shediac, New Brunswick.

2.2 Project Overview:

The existing Cap-Brulé wastewater treatment facility is located to the east of the Town of Shediac on Cap-Brulé Road, off of Route 133 (the "Site"). The GSSC (Cap-Brulé) facility is an aerated lagoon (secondary treatment level) facility which has ultraviolet disinfection of the effluent prior to discharge. Based on its average daily flow volume of 6,340 m^3/day as measured over the monitoring period, the Cap-Brulé facility is classified as a "medium WWTF".

The GSSC presently treats wastewater in two aerated lagoons and polishing cell with pre-treatment and disinfection which provides secondary treatment levels for the Shediac east area. Figure 8, found in Appendix B, illustrates the sequence of treatment through the current WWTF.

In 1971-1972 the GSSC constructed a wastewater treatment facility in Cap Brulé that included a two-cell facultative lagoon with surface aerators. The influent to the treatment plant enters the site at the south-west corner through two separate connections; one connection from the trunk sewer that brings flows from the Town of Shediac, Shediac Cape, Cap Brulé & Pointe-du-Chêne and one connection from the east that collects flows from the east side of the lagoon. Effluent from the WWTF is discharged into a manmade channel into Lac des Boudreau by gravity.

The wastewater treatment facility on this site has evolved and has been upgraded over several projects since the original lagoon was constructed here in 1970. These projects have included the following:

- 1971-72 (original) two cell facultative lagoon with surface aerators.
- 1994-96 Improvements to the Regional Wastewater Treatment Plant, separated into five (5) contracts which included a new pre-treatment building, dividing one of the original lagoon cells into two aerated cells, and a new blower building.
- 2004 Submersible Pumping Station (LS 24) constructed next to the screw pump building.
- 2009 Wastewater Treatment Plant Upgrade - Disinfection (UV) Unit.
- 2012 Screw pump upgrades.

The GSSC completed a Master Plan for the Site in 2005.

Although the current facility still meets the requirements of GSSC Approval to Operate (issued by the Province of New-Brunswick) it is approaching its hydraulic and loading capacity (age/construction limitations and increased population demands). Major work is required for the outfall, and the buildings and aeration systems are outdated. Furthermore, the current outfall location does not meet the required mixing levels at the end of its dispersion plume.

As recommended in the subsequent report entitled Feasibility Study: Cap-Brulé WWTP Outfall (Crandall, 2015 – this document's Appendix E), a new outfall location approximately 350m off-

shore is required to achieve the required mixing ratios for the facility. As previously noted, a new outfall to the Northumberland Strait is part of this proposed project.

As a result of these issues, the Shediac East Long-Term Wastewater Management Strategy report that was published in 2019 (Crandall, 2019), recommended that an upgraded wastewater treatment facility (WWTF) be constructed at the existing Site.

The layout of the Town of Shediac and the locations of the existing WWTF and Pumping Stations are shown on attached Figures (Appendix B). Various alternative treatment concepts were evaluated, and it was concluded that the most appropriate approach was the establishment of an updated/reconstructed Hybrid Lagoon/Moving Bed Biofilm Reactor (MBBR) treatment facility within the footprint of the GSSC's existing lagoons to treat all municipal wastewater to current and anticipated standards. This will provide the capacity for growth within the service area (Crandall, 2019a; 2019b, Appendices F and G, this document).

The topography and development of the surrounding areas, coupled with the minimum setbacks stated in the "Atlantic Canada Wastewater Guidelines", does not permit an entirely new site being utilized to be an economically viable alternative. An alternative site was examined but it had characteristics that led it to being disqualified (Figure 4, Appendix B).

The new WWTF will still employ the existing lagoons at the facility (reconstructed lagoons) and a Moving Bed Biofilm Reactor (MBBR) technology will be added. Construction of the upgraded facility is expected to begin in 2021 and will last for three years. The design life of the initial WWTF upgrades would be 25 years.

Crandall Engineering Ltd. provided the Greater Shediac Sewerage Commission (GSSC) with a Preliminary Design Report for the Cap-Brulé Wastewater Treatment Facility (WWTF, Crandall, 2019a). This Preliminary Design submission was based on "Option 3" of Crandall's Shediac East Long-Term Wastewater Management Strategy Report, Crandall, 2019a (the "Long-Term Strategy"). This concept generally consists of the following:

- Construction of a new combined screening / grit removal / blower / UV Disinfection / filtration / lift station building (referred to as the "headworks building" hereafter), including stand-by generators;
- Re-construction of the existing Polishing Cell (Cell #3) into the new, deeper, HDPE-lined aerated Lagoon #1;
- Upgrading of the existing Cell #2 and Cell #1 to be used as the new aerated Lagoon #2 and aerated/polishing Lagoon #3, including HDPE liner replacement.
- Replacement of the existing aeration system with a new fine-bubble floating aeration system, and associated work;
- New pumped outfall to re-located discharge point, in order to provide improved effluent dispersion in the receiving environment (Northumberland Strait);
- New influent and effluent pumping stations;
- Construction of a Moving Bed Biofilm Reactor (MBBR) for additional $CBOD_5$ treatment and ammonia reduction, as well as disc filters for further TSS removals following the MBBR;
- Installation of alum injection equipment between the new Lagoon #1 and #2 for alum precipitation in the lagoon before high-level filtration in the headworks building.

The Preliminary Design Report (2019b) provided preliminary design drawings, a preliminary cost estimate, a preliminary decommissioning plan and sequence of work, and a commissioning brief (Crandall 2019), as indicated on the conceptual site layout (Figure 6 included in Appendix B).

The Greater Shediac Sewerage Commission (GSSC) is receiving funding from Infrastructure Canada for the **Greater Shediac Sewerage Commission WWTP Upgrades.** The project is being funded under the **Canada – New-Brunswick Integrated Bilateral Agreement for the Investing in Canada Infrastructure Program.**

2.3 Purpose / Rationale / Need for the Undertaking:

As discussed, the GSSC has been progressively adding and improving components of this WWTF since 1994. In 2014 the Greater Shediac Sewerage Commission (GSSC) completed its Environmental Risk Assessment (ERA) in accordance with Canadian Council of Ministers of the Environment (CCME) guidelines, on its main wastewater treatment facility in Cap-Brulé, NB. Resulting from this assessment (Crandall, 2015), the following observations were made for the existing facility:

- Effluent quality was meeting its Certificate of Approval to Operate;
- Effluent quality was meeting the CCME requirements for $CBOD_5$ and TSS;
- The current outfall location does not meet the required mixing levels at the end of its dispersion plume.

As a result, a new outfall location was proposed for off-shore discharge (Figure 7, Appendix B).

The 2015 Crandall report had the following major components associated with the proposed new outfall study:

- A study of the present mixing characteristics of the receiving waters.
- Overview of the effluent treatment requirements to ensure that these would be met.
- Overall options to reduce TAN to acceptable concentrations.
- Evaluation of effluent discharge locations and mixing characteristics.
- Pumping requirements.
- Design considerations for the proposed outfall.
- Comparison of disadvantages and advantages options.
- Impact of new effluent on TAN effluent discharges.
- Regulatory approval requirements.

The three options evaluated included:

- Option 1: Expanding treatment for nitrogen reduction (typically biologically based nitrification-denitrification process.
- Option 2: Dredging the outlet from Lac Boudreau Ouest (a provincially mapped wetland), to allow better flushing of the pond.
- Option 3: New Outfall and Effluent Pumping Station to by-pass any future dune movement or watercourse blockage.

This report concluded that the new Outfall and Effluent Pumping station was the preferred option.

Specifically this report stated, "based on a comparison of alternatives to satisfy EQO limits for TAN and effluent dilution objectives, it is recommended that a new outfall be installed from the WWTF to a point in the Northumberland Strait where the CCME desired dilution is achieved and the outfall pipe is reasonably protected from winter ice. This point is approximately 350 m from the shoreline and 925 m from the WWTF outlet at the UV Disinfection Building".

As a result of the ERA Study (Crandall, 2015), where a new outfall location was recommended to meet the mixing requirements for this facility, a new location discharging directly to the Northumberland Strait was proposed. To construct a new outfall the following three (3) options were presented:

- Option 1: Gravity Outfall: This option involves installation of a new large diameter outfall. This option relies on water level at the lagoon to provide the required head to overcome friction losses.

- Option 2: Pumped Outfall: This involves construction of a new pumping station at the WWTF outfall to pump the effluent to the proposed discharge location via a new forcemain.

- Option 3: Status Quo: This option would see the outfall remain in its current configuration, discharging into Lac des Boudreau. This option was not considered any further, as it does not meet the mixing requirements of CCME. Furthermore, it is expected that due to the nature of the current discharge, Lac des Boudreau would continue to be infilled by tidal action and sand deposition.

A "do-nothing" approach is not preferred in this case as the GSSC's existing WWTF will require updates to respond adequately to the area's future sewage treatment needs.

While the facility is currently meeting the requirements of its Certificate of Approval to Operate (COA – Appendix C), there are many components that are reaching the end of their service life. Therefore, a review of how the facility will meet future treatment requirements was warranted.

On account of the significant investment required at this facility, Crandall/Englobe was commissioned by the GSSC to complete the Long-Term Wastewater Management Strategy for the Shediac East area (Cap-Brulé WWTF – Crandall, 2019a). The purpose of this study was to complete a comprehensive review of the entire WWTF and to provide conceptual design and review of options to upgrade the facility to meet long term needs. This study included the following main tasks:

- Detailed review of previously completed reports and studies;
- Establishment of existing flow and loading conditions at the facility;
- Complete a review of the existing infrastructure and remaining life;

- Review current and future treatment requirements and best practices;
- Review potential impacts of Climate Change (Sea Level Rise) on the existing and future facility;
- Estimation of Long-Term (25-year and 50-year) flows and loading;
- Evaluation of treatment technology options;
- Concept design and cost estimation for treatment technology options.

The conclusion of the study further reinforced that the existing WWTF needed to be replaced as it was not meeting the mixing levels required at the end of its dispersion plume. In addition, many of the existing assets and major components have been reached, or are nearing the end of their expected useful life. It is expected that the existing facility will be impacted by climate change hazards in the near future. A separate climate lens report was written and is available for review if required (Englobe, 2020 – Appendix H).

The Greater Shediac Sewerage Commission services the Town of Shediac and surrounding areas (including Shediac Cape, Cap Brulé & Pointe-du-Chêne), with a large seasonal variation in population. Using 2% growth rate on the 2016 Census data to estimate the service population resulted in approximately of 7,475 people. Additional detailed information regarding the population statistics is discussed in Crandall, 2019b (Appendix G, this document).

The new WWTF will provide several benefits which were not quantified as part of this analysis. These benefits included:

- Benefits from minimizing water pollution;
- Benefits from minimizing loss in aquatic life and habitats;
- Benefits from minimizing loss in ecological services;
- Benefits from minimizing impact on tourism; and
- Benefits from minimizing wastewater runoff.

Based on Crandall's Long-Term Strategy (2019a), the following summarizes the design parameters selected for the design:

- 2018 Average Effluent Flow: 8,500 m^3/day
- 2018 Peak Flow: 383 L/s
- Design Average Flow (25-years): 12,500 m^3/day
- Design Peak Flow: 500 L/s
- Design average BOD_5 concentration: 148 mg/L (influent)
- Design average TSS concentration: 148 mg/L (influent)
- Design BOD_5 Loading: 1,850 kg/day
- Design TSS Loading: 1,850 kg/day
- Sludge allowance: 200mm
- Ice allowance: 150mm

The following effluent standards will be used in the design of the upgraded treatment facility in accordance with the CCME guidelines, the facility's current Certificate of Approval to Operate (CAO – Appendix C), and the Guidelines for Canadian Recreational Water Quality:

- Effluent $CBOD_5$ 25 mg/L (average)

- Effluent suspended solids 25 mg/L (average)
- Un-ionized Ammonia at 15◦C ±1◦C: 1.25 mg/L (maximum)
- TAN (based on best practice review): 5.0 mg/L - winter, 2.0 mg/L - summer (non-toxic)[1]
- TP (based on best practice review): 1.0 mg/L
- Effluent E. coli : 200 / 100mL (average)
- Acute lethality: Non-lethal
- Summer Design Temperature: 16°C
- Winter Design Temperature: 0.5°C
- Dissolved oxygen in effluent: > 2 mg/L
- Design Life of Upgraded Facility: 25 years

1. Although the current facility is meeting the WSER requirement for a "not acutely lethal" effluent, it is noted that lagoon systems alone cannot guarantee a non-lethal effluent because they are not designed to provide ammonia treatment. The selected design concept presented herein provides ammonia treatment using MBBR technology, which will be installed following the lagoon treatment cells.

When evaluating options to service the future needs of GSSC, two (2) main treatment plant types were considered. Under each type, two (2) treatment technologies were reviewed. They were:

- Lagoon Type Treatment Plant
  - Facultative lagoon
  - Aerated Lagoon
- Mechanical Type Treatment Plant
  - Sequential Batch Reactor (SBR)
  - Moving Bed Biofilm Reactor (MBBR)

Each treatment plant type has their benefits, drawbacks and limitations. These two (2) treatment types were reviewed to select the preferred options to be evaluated in more detail through conceptual design. Furthermore, additional treatment technologies were presented for review during conceptual design. These technologies included pre-treatment, Submerged Attached Growth Reactors (SAGR), MBBR Cells, phosphorus treatment, and UV disinfection.

The following three (3) preferred options were carried forward into conceptual design:

1) Aerated Lagoon Facility

2) MBBR Mechanical-type Facility

3) Hybrid Lagoon/MBBR Facility

Conceptual design was completed for the selected three (3) options, including conceptual design of the required headworks building and outfall, which are required regardless of the option.

Based on this analysis (2019a Crandall report), it was recommended that the Commission proceed to preliminary design of Option 3: Hybrid Lagoon/MBBR Facility. This option was

recommended due to the operational flexibility and reduced operation and maintenance requirements. Furthermore, this option re-uses the existing lagoon cells (reconstructed) at the WWTF and is thus cost effective.

2.4 Project Location:

The proposed project is within the municipal boundary of the Beaubassin-Est, NB (Figure 1, found in Appendix B). The Community is situated along the south side of Northumberland Strait, in the southeast portion of the Province of New Brunswick roughly 40 km northeast of the City of Moncton. The WWTF is located to the east of the Town of Shediac on Cap-Brulé Road, off of Route 133 (Figure 2, found in Appendix B). Specifically, the upgraded WWTF is to be constructed on the improved site of Cells #1 to #3 of the existing GSSC Lagoon facility. The upgraded WWTF footprint will still be located entirely on property owned by the GSSC, PIDs #01065655 and #01065663.

The existing WWTF site is shown on the attached Figure 3 (Appendix B). The coordinates for the site of the proposed WWTF are:

Latitude : 46.230129 (N)

Longitude: -64.483274 (W)

N 5120686.13

E 385624.28

2.5 Siting Considerations

GENERAL SITE CONSIDERATIONS

It is proposed to use the existing facility to upgrade it from the existing WWTF to a hybrid Lagoon/MBBR WWTF, it was logical to consider this site for several significant reasons:

- It is presently utilized for wastewater treatment so historic zoning and public acceptance are immediate benefits;
- Much of the existing municipal wastewater collection system directs flows to this location, reducing infrastructure modifications that would be required for a new site;
- Because the existing facility is a three-cell lagoon, the other cells can be conveniently utilized to provide treatment during construction of the new facility;
- Using this site allows the existing effluent outfall to the Lac des Boudreau to be modified, from a simple excavated trench to a constructed, horizontally drilled outfall pipe installation into the Northumberland Strait. This concept should simplify approvals, but will be far more effective as far as meeting mixing requirements;
- The property is already owned by the GSSC so no new property acquisition costs are encountered;
- Because the entire site for the proposed new WWTF is currently utilized as a wastewater treatment facility, heritage resource, archaeological and culturally significant considerations are not applicable;

- The existing houses in the area of the Site receive their water supply from water wells. These wells will be sampled and in a well sampling program before construction begins and a second round of well sampling will be completed post construction. In addition, a questionnaire will be completed for each well in an effort to determine the condition, age, etc., of each water well for comparative purposes to data collected post construction. Residences within a 150 m radius of the Site are shown in Figure 9 (Appendix B).

ZONING

The Site of the upgraded WWTF is designated under the "Beaubassin East Rural Community Zoning Map" and is covered under the "Community Centre (C-C)" category. This is shown on the portion of the "Land Use Map" included as part of Appendix A.

The proposed land is zoned as "Community Centre (C-C)". The proposed work will not require a rezoning of the land. The Site has been a WWTF for >50 years. The adjacent wetland to the north of the Site is zoned as "E-Environment Conservation". A map showing zoning of the immediate area is found in Appendix B (Figure 10).

Whereas the Cap-Brulé WWTF is a coastally located facility and has the potential to be impacted by rising sea levels and/or storm surge, a desktop review was completed of potential impacts to the current and future facilities at this site. Published predictions on future extreme water levels were reviewed in relation to key WWTF components. This is summarized in the following table:

Table 2-1 - Summary of Sea Level Rise Impacts to Existing WWTF.

Location	Elevation (m)	2030		2100	
		Elev. (m) 1:1/1:100	Diff. (m)[1]	Elev. (m) 1:1/1:100	Diff. (m)[1]
Outfall	0.71		-2.69		-3.61
Metering Chamber	1.96	2.15/3.4	-1.44	3.07/4.32	-2.36
UV Channel	3.25		-0.15		-1.07
Top of Berms	Approx. 4.9		1.5		0.58

1. Negative values denote a surcharged condition.

As shown in the table above, existing facility components following the existing UV building are at risk of being impacted by sea-levels during peak events.

For the new proposed WWTP, sea level rise was taken into consideration during the preliminary design and is summarized in the following table:

Table 2-2 - Summary of Sea Level Rise Impacts to new WWTF.

Location	Elevation (m)	2030		2100	
		Elev. (m) 1:1/1:100	Diff. (m)[1]	Elev. (m) 1:1/1:100	Diff. (m)[1]
Pumped Outfall	-2.4	2.15/3.4	-5.8	3.07/4.32	-6.72

Overflow Outfall	0.57		-2.83		-3.75
Headworks Building	Approx. 7.7		4.3		3.38
MBBR	Approx. 7.55		4.15		3.23
Disc Filter Building	7.31		3.91		2.99
UV Channel	1.733		-1.667		-2.587
Top of Berms – Cell 1	6.5		3.1		2.18
Top of Berms – Cell 2	4.9		1.5		0.58
Top of Berms – Cell 3	4.9		1.5		0.58

As noted in table 2.2, the risk of overtopping the lagoon berms is low. Furthermore, all new facilities are well above the 1:100-year return period event in 2100, and the outfall will be pumped and therefore not affected by Sea Level Rise. Access to the WWTF is not impacted during an Extreme Sea-level event.

Appendix H contains the Climate Lens Report competed for the GSSC Site.

The following climate change hazards were identified for the WWTF (Englobe 2020):

1. **Temperature Increases:** Mean annual temperatures in the Moncton/Shediac area are expected to rise approximately 0.3 °C – 1.0 °C between 2020 and 2050.

2. **Freeze-Thaw Days**: The number of winter freeze-thaw days will increase by 3 days per year by 2050 and 5 days per year by 2080.

3. **Sea Ice Coverage**: By the end of the century (2100) it is expected that there will be almost no sea ice coverage remaining in the Gulf of St. Lawrence. A reduction in sea ice will contribute to higher waves.

4. **Sea Level Rise**: Sea levels along the coast of New-Brunswick have risen approximately 30 cm over the past 100 years. They are expected to continue rising in the future.

5. **Extreme Weather Events**: Extreme weather events such as hurricanes and tropical storms are expected to increase in the future, resulting in higher storm surges and increased coastal flooding and coastal erosion.

6. **Precipitation**: The mean annual precipitation in the Moncton area is expected to rise from 1020 mm in 2020 to 1040 mm in 2050, and then 1060 mm by 2080. Data obtained from the Climatedata.ca website indicate that average total precipitation in the Shediac area would increase by approximately 4 mm per year from 2020 to 2100 based on an RCP of 2.6.

7. **Shoreline Impacts**: Sea level rise combined with increased storm surges is expected to cause more coastal flooding and erosion. Dunes, cliffs, beaches, and marshlands along the Northumberland Strait are expected to continue to erode each year. The above climate change hazards will all contribute to an increased risk of flooding along the coast of New Brunswick, where the WWTF is located.

The primary risk identified for this project was "**flooding causing impaired operation of the WWTF resulting in increased risk to public health and the surrounding environment".** It was determined that due to the location of the WWTF and without any mitigation measures in place, the likelihood of flooding leading to impaired operation of the existing WWTF was rated as "moderate" and the consequence was rated as "low". This resulted in an overall risk rating of **"low".**

Several mitigation measures have already been identified by the engineering design team, as outlined in the *Cap-Brulé Wastewater Treatment Facility Preliminary Design Report*. The main mitigation measures include:

- **Adaptability:** The system must be able to handle an increase in capacity occasionally. To do so, bypasses can be added to the treatment process to help handle peak flow events. It is also possible to add an equalization capacity to the system. This will allow peak flows to be stored temporarily in an equalization basin until the flow returns to normal and the wastewater can be returned to the treatment process under lower and more uniform flow conditions. This equalization capacity is mainly to handle peaks from rain events as opposed to storm events.

- **Wastewater runoff:** The lagoon berms must be high enough to avoid being overloaded from the surface and avoid any runoff of wastewater. They will be at least above the 1:100-year return period event in 2100.

- **Flooding:** A pumped outfall instead of a gravity outfall will prevent water from infiltrating the sewer and increasing the flows. While a high-pumping head is not required, such a pumping facility must have a high capacity to deal with the variation in flow through the WWTF.

- **Damage to the outfall:** Forcemain (pressure pipe) installation is better able to accommodate the required diffusers that will be installed at the end of the outfall, with the ability to add "duckbill" check valves to minimize the potential for silt, sand, or other debris to enter the outfall.

- **Storm surges and freeze thaw cycles:** Install a pumped pipe instead of a gravity pipe. The gravity pipe would be shallow in order to sit on the sea floor at the discharge location and could become prone to movement during freeze thaw cycles within the wetland soil conditions. There is also risk with severe ice conditions and storms along the coast. The pumped pipe should be buried deep enough under the sand shoals in the intertidal area to avoid disturbing the pipeline.

With the above mitigation measures built into the new WWTF design, the residual risk of **"flooding causing impaired operation of the WWTF resulting in increased risk to public health and the surrounding environment"** was rated. It was determined that the likelihood of this risk would be reduced to "vey low" while the consequences of this risk would remain "low". This resulted in an overall risk rating of **"negligible".**

The Climate Change Resilience Assessment has concluded that without any mitigation measures the new WWTF would be at a low risk of flooding, which could lead to impaired operation of the WWTF resulting in increased risk to public health and the surrounding environment. However, with the mitigation measures that have been outlined by the engineering design team, this risk would be reduced to 'negligible' (see Crandall, 2019b, Appendix G).

PROXIMITY TO WETLANDS AND WATERCOURSES

As shown on the attached Figures in Appendix B, there are watercourses and wetlands (Boudreau Ouest Marsh) within 30m of the site based on GeoNB's delineation (Figure 7). These will be further discussed in Section 3.0. The Site has operated successfully next to these provincially Significant wetlands for >50 years. The proposed EIA for this project will include a wetland monitoring program and monitoring will continue for the duration of its operation.

Some of the work to upgrade the wastewater collections system, including some pipelines (i.e. some existing pipelines are to be removed and the new force main (outfall piping)), will be within the wetland. WAWA Permits will be obtained for such work and any conditions will be adhered to during the construction process. There will be some geotechnical drilling that will be completed along the proposed outfall location and this work will require machinery to access the wetland. This work is proposed to be done in the winter to minimize disruption to the wetland. However, it is important to note that the new WWTF *will not be any closer to the watercourse/wetland than the existing lagoon facility is*. The Environmental Management Plan (EMP) can be found in Appendix I. Construction practices for the WWTF upgrade will follow this plan for protection of the environment.

Another site consideration will be the work to be done during the decommissioning of any existing facilities (i.e. some buildings and some piping, etc.) not required for the new system. Most significantly, this will be some of the existing buildings on Site. A portion of the reclamation work will be within 30 m of the wetland (cell reconstruction). WAWA Permits for this work will also be applied for and any conditions adhered to during the work.

RECEIVING WATER CHARACTERISTICS

In 2014, Crandall conducted and Environmental Risk Assessment study (Appendix E) that was done to characterize the effluent in the receiving water. This 12-month study identified Environmental Quality Objectives (EQOs) in the receiving water leading to the Northumberland Strait and the Effluent Discharge Objectives (EDOs) required in the WWTF effluent to ensure that the receiving water's EQOs were not exceeded.

The ERA found that most of the substances were not of significant concern. As a result, the effluent is meeting the requirement of CCME and NBDELG and on-going monitoring was recommended for key substances.

The outfall receiving body of water is Lac des Boudreau, a small pond that drains to the Northumberland Strait only under low tide conditions. Because of the characteristics of the lake, the water for mixing is limited and the facility's current outfall location does not provide adequate conditions for effluent dispersion.

It was recommended that further study be conducted regarding the possibility of relocating the effluent discharge pipe to a more appropriate location where an acceptable mixing zone could be achieved. As previously indicated, a new pumped outfall was recommended for this site with a discharge location directly in the Northumberland Strait.

2.6 Physical Components and Dimensions of the Project:

Figure 5 (Appendix B) shows the overall location of the various components of the existing WWTF lagoons. An aerial photograph of the WWTF site is also in Appendix B. Also attached is the site plan of the upgraded WWTF, Figure 6 (Appendix B), as developed through the Preliminary Design process.

2.7 Construction Details

The proposed upgrade of the GSSC Wastewater Treatment Plant will be a major undertaking. It has, to this point, gone through considerable assessment and evaluation of alternatives. 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 there is *continuous treatment of the wastewater throughout the construction period*.

Some of the information presented previously in this Registration Document has described certain aspects of the construction process. It is very important to maintain wastewater treatment throughout the construction process, thus avoiding potential impacts to the receiving waters and to commission the new components insofar as practical prior to their being brought into service. This information is from the Preliminary Design Report (Crandall 2019b) found in Appendix G.

The proposed construction sequence for the entire project is summarized below:

In accordance with the Option 3 concept developed in the Long-Term Strategy (Appendix F), the following is a summary of the overall upgrade concept and associated site work.

Although the overall upgrade concept is based on achieving the effluent quality parameters over a 25-year design period, it is noted that the NBDELG (following the CCME Guidelines) does not yet require the facility to meet all of these treatment standards. In addition, the facility's $CBOD_5$ loading is not projected to exceed the capacity of the lagoon portion of the upgraded facility for close to 25 years. Upgrades will be carried out in phases (2021-2023), generally as follows:

1.Construction of the New Headworks Building, including the installation of new screening and grit removal equipment, aeration system blowers, UV disinfection system, stand-by generators, influent screw lift station and effluent lift station.

2. Lagoon earthworks, site piping, and aeration system upgrades.

3. New outfall piping to Northumberland Strait.

4. MBBR, alum, and disc filtration systems.

NORMAL WWTF OPERATION

Based on the selected concept, once fully constructed, incoming flows to the WWTF will normally be directed through the influent lift station to the new headworks room of the headworks building for screening, grit removal and influent flow metering prior to being directed to the new proposed 5.5m deep aerated Lagoon #1 (aerated cells #1A and #1B, current polishing cell). A new fine bubble floating aeration system will be installed in all three ponds, and all existing aeration system components will be removed. These steps are outlined in the Preliminary Design Report Appendix G (Crandall, 2019b).

Following the new Lagoon #1, the flow will normally be directed to the existing 3.0m deep (liquid depth), aerated Lagoon #2, which will be retained and transformed into the new aerated lagoon #2 (Aerated Cells #2A and #2B). Alum addition will take place in a mixing manhole between the new Aerated Lagoons #1 and #2.

From Lagoon #2, the flow will normally be directed to the existing 3.0m deep (liquid depth), aerated Lagoon #1, which will be retained and transformed into the new aerated/polishing lagoon #3 (aerated cell #3A and aerated polishing cell #3B).

Following Lagoon #3, the flow will be directed to the MMBR for additional $CBOD_5$ treatment and ammonia reduction, then to the disc filters for additional TSS and phosphorus removal following the MBBR back through the headworks building for UV disinfection. Following this, the treated effluent will be pumped by the effluent lift station through a new outfall pipe to the Northumberland Strait.

Therefore, under normal flow conditions, wastewater would run the following sequence:

- Flow directed to Headworks Building via a new pump station (submersible pumps)
- Fine Screening
- Grit Removal
- Flow measurement (Parshall Flume)
- Site Piping
- Lagoon #1 (Cells #1A, #1B)
- Chamber with stop-logs between Lagoon #1 and #2
- Alum injection and mixing chamber
- Lagoon #2 (Cells #2A and #2B)
- Piping with Stop logs between Lagoon #2 and #3
- Lagoon #3 (Cells #3A and #3B)
- Chamber with Stop logs

- MBBR Treatment
- Filtration (Disc Filters)
- Flow Enters Filtration/UV side of headworks building
- UV disinfection
- UV Control Weir
- Flow measurement
- Effluent Lift Station
- Flow exits WWTF to forcemain piping to Northumberland Strait

SYSTEM BY-PASSES

By-passes will be provided around the various treatment components, controlled by sluice gates installed inside the associated chambers or channels, for operational flexibility in the event that future maintenance is required. The following by-pass options have been included:

- Headworks by-pass: a by-pass channel will be incorporated in the screening and grit removal room which includes sluice gates to allow the operator to manually by-pass the pre-treatment components. This by-pass is intended to provide a means of removing the screening unit and channel from service for maintenance purposes. Flow will continue to be metered via a partial flume outside the building before entering Lagoon #1 directly.
- Lagoon #1 by-pass: a manhole downstream of the headworks building's headworks room (SAMH-8 – see Figure 6 in Appendix B) includes sluice gates to allow the operator to manually by-pass Lagoon #1 and direct flow to Lagoon #2.
- Lagoon #2 by-pass: a series of manholes with sluice gates are installed between Lagoon #1 and Lagoon #2 (SAMH-11) to allow for manual bypass of Lagoon #2 and to direct flow to Lagoon #3.
- Lagoon #3 by-pass: a series of manholes with sluice gates are installed between Lagoon #2 and Lagoon #3 (SAMH-15) to allow Lagoon #3 to be manually by-passed, directing flow to the MBBR.

MBBR by-pass: Since the MBBR is constructed in the third phase, the first phase piping will be configured to by-pass the future MBBR until built. As a result, a by-pass will already be existing once the New MBBR and disc filters are installed.

- UV/filter by-pass: UV disinfection system can be manually by-passed by operating sluice gates in the channels located in the headworks building which sends flow directly to the effluent lift station and then to the outfall piping.
- Effluent lift station overflow by-pass: an emergency treated water overflow pipe has been included, to the existing outfall channel, in the event of excess effluent flows. This pipe will be constructed along the same route as the new forcemain and discharge at the existing gravity discharge.

LAGOON CONSTRUCTION AND SITE WORK

The following Table 2-3 summarizes the new lagoon cells:

Table 2-3 - Lagoon Construction and Site Work

	Lagoon 1 (Cells #1A, #1B)	Lagoon 2 (Cells #2A, #2B)	Lagoon 3 (Cells #3A, #3B)
Lagoon Bottom Dimensions (m, L x W)	182 x 170	57.5 x 180	67 x 185
Slope (H : V)	3:1	4:1	4:1
Design Top of Dike Elevation (m)	6.5	4.9	4.9
Design Water Elevation (m)	5.5	4	4
Design Bottom Elevation (m)	0.97	0.97	0.97
Design Water Depth (m)	4.53	3.03	3.03
Liner Type	New HDPE	New HDPE	New HDPE
Freeboard (m)	1.0 m	0.9 m*	0.9 m*

- The recommended freeboard is 1.0m, in accordance with the Atlantic Canada Wastewater Guidelines Manual (ACWGM). However, since there is limited space to raise the existing dike between the existing Cells #1 and #2, it is proposed that the d ke elevation will remain as-is.

To create the treatment cells, the installation of one (1) new floating baffle curtain will be required in each pond, for a total of three (3) new curtain walls. Since the existing aerated Cells #1 and #2 are already lined with an HDPE liner, isolated repairs to the existing liner would be required in locations where new pipes are being installed or removed that penetrate the liner, including at each existing airline, as well as in locations where the existing liner is in poor condition. Since it is anticipated that this will lead to many spot repairs, a complete re-lining of these ponds is anticipated.

The new Lagoon #1 (existing polishing cell) will be fully HDPE-lined and will include a sub-drain system below the HDPE liner to manage groundwater below the new HDPE liner, discharging any collected groundwater to the outfall channel. Due to the presence of a synthetic liner in each lagoon cell, a safety rope system is included around the perimeter of each lagoon as a safety feature. In areas receiving the most wear, an extra layer of HDPE liner will be installed for durability, including locations near the baffle curtains and areas designated for launching a maintenance boat.

As indicated by the design elevations presented in Table 3-1 (Crandall 2019b, Appendix G), the existing polishing cell will be deepened and expanded, and its dikes raised, to increase the retention time. Because of the work being carried out on the dikes, new security fencing will be required in some areas. Surface water will be managed through the installation of new culverts and the construction of new drainage ditches to direct water around the perimeter of the lagoon site to existing ditches.

The top of the new dikes will be constructed to be 4.5m wide, including a new crushed rock driving surface. This will allow for improved safety when driving on these surfaces for routine maintenance purposes. There will be some obstructions on these dykes which include aeration and baffle wall anchor posts. These will be marked with high-visibility marking systems.

A new driveway/parking area will be constructed around the headworks building. Consideration has been given to traffic movement around the headworks building and providing sufficient room to access the overhead doors. It is proposed to asphalt the new headworks building's

driveway and parking area, although the driving surface on the lagoon dikes will be crushed rock.

Five (5) existing WWTF buildings (screw pump lift station, lift station, service building and pre-treatment building) will be decommissioned as part of this project; however, it is anticipated that the existing blower building and existing UV Building will be retained for storage / workspace. Refer to Section 4 for preliminary details on the construction sequence and decommissioning (Appendix G – Crandall, 2019b).

WWTF SITE PIPING

The condition of the existing lagoon site piping from the inlet of the WWTF to the outfall cannot be verified due to its age and difficulty in locating past drawings and it is not large enough to meet the projected future wastewater flows. Therefore, new 900mm diameter sanitary piping is proposed throughout the Site. In addition, the existing manholes and control structures will be decommissioned and replaced with new ones, as required.

The lagoon's liquid depth will be controlled by three (3) control chambers to allow for the water level in each cell to be controlled separately and permit future by-passing of each cell if required. These chambers (SAMH-10, SAMH-11 and SAMH-19 – Figure 6, in Appendix B) will maintain the design water elevation and will include stop logs to allow for future water level adjustments if required. A gate valve will be installed in the bottom of the flow control chambers, which can be opened in the event that a specific lagoon needs to be completely drained.

Based on the current aeration system layout, multiple new shallow-buried (+/-1.0m deep) HDPE main air headers are proposed to control the air flow to each Lagoon cell. Typical lagoon construction details can be found on Drawings C08 and C09 (Appendix G).

WWTF OUTFALL PIPING

As discussed in Crandall's December 2015 Feasibility Study: Cap-Brulé WWTP Outfall and Long-Term Strategy (Crandall, 2019a), a new outfall location was recommended to provide improved effluent/receiving water mixing. Following a review of several options, a new pumped outfall discharging directly to the Northumberland Strait was proposed. Preliminary Outfall/Forcemain assumptions are as follows:

- An outfall forcemain size of +/- 600 mm would be required;
- For the portion of the outfall that lays between the existing northern dike and the Northumberland Strait, directional drilling is the preferred method for this type of installation due to environmental limitations, as opposed to open trench installation;
- "Duckbill" check valve(s) will be installed at the end of the outfall to minimize opportunities for silt, sand, or other debris to enter the outfall;
- An emergency treated water overflow to the current outfall location will be incorporated;

ALUM INJECTION

To meet the anticipated future phosphorus effluent target of 1.0 mg/L, it is anticipated that an alum injection system will be installed between Lagoon #1 and Lagoon #2. This will include a

small building/enclosure to be constructed near the Lagoon #1 outlet chamber. This will house the alum tank and a duplex skid mounted pump system for alum dosage. Following injection, a mixing manhole will be required prior to the flows being directed to Lagoon #2; this will ensure good mixing of the alum with the wastewater.

Alum attaches with phosphorus to create floc, which is heavy enough to precipitate out of wastewater. The wastewater then passes through the subsequent lagoon cells where settling occurs. If a lower concentration of phosphorus is required, this can be achieved using the disc filters discussed further in Section 3.6.3, Appendix G ().

SLUDGE MANAGEMENT

At this stage it is anticipated that sludge from the existing cells will be managed and disposed of off-site by method of dredging and dewatering. Project specifications will include sludge de-watering requirements and disposal will be done at an approved certified site.

NEW AERATION SYSTEM AND BLOWERS

As indicated on the drawings (Appendix G, Crandall, 2019b), the existing static tube diffuser system will be removed, and a new fine bubble diffuser aeration system is proposed. Oxygen will be supplied to each lagoon cell through the installation of a new fine-bubble diffuser aeration system, consisting of shallow-buried main air headers and floating aeration laterals. This system can be maintained by a two (2)-person crew using a boat, without removing the system from service. A boat with an electric motor will provide the operators with the required equipment for servicing the system.

Air will be supplied to the diffusers by new blowers. The blowers will be programmed to alternate at a set time interval, with the stand-by unit available as a back-up to ensure continuous treatment.

NEW MBBR TREATMENT UNITS

To meet the WSER requirement for a "not acutely lethal" effluent, and to provide additional $CBOD_5$ treatment, the selected concept provides for ammonia removal using MBBR technology.

This will require the construction of a new MBBR tank with a medium bubble aeration grid to provide oxygen to the wastewater and movement of the media. Sieves at the tank's outlet piping ensure that the MBBR media are retained within the tanks. The wastewater will travel through the MBBR train and consists of two (2) reactors in series: one (1) to provide final $CBOD_5$ treatment, followed by a second reactor to provide nitrification (ammonia removal). A disc filter will be installed to serve two (2) functions: TSS polishing and phosphorus treatment (in conjunction with alum injection).

Blowers are required to provide oxygen to the MBBR aeration grid.

NEW HEADWORKS AND HEADWORKS BUILDING ARCHITECTURAL

The new headworks and headworks building will house all major equipment and system controls conveniently in a single secure location. This includes the new blowers, a new screening unit, grit removal equipment, filtration equipment, and new ultraviolet (UV) disinfection equipment, influent and effluent lift stations, as well as all system controls, office

space, storage, a washroom, electrical room, and stand-by generator room. The construction of the disc filtration system and MBBR will include the installation of a new small building (separate from the new headworks building) to house the alum pumps and controls, as well as alum mixing chambers and associated piping.

The following is a summary of the architectural design considerations:

- The new headworks building footprint will be approximately 920 m², which will be divided into five (5) main sections: the influent pump station, the headworks room (screening and grit removal), the UV disinfection room, the effluent lift station room, and the Blower section which will include the office, a washroom, an electrical room, stand-by generator room, and storage room for spare parts and other required equipment. Concrete in-floor channels will be required for the screening and grit removal systems, and the UV disinfection system. Channel elevations have been designed to provide the necessary hydraulics through the channel for each system.
- It is anticipated that the new headworks building will consist of concrete foundations, masonry block walls with brick veneer and skylight windows to provide natural light, epoxy floor finish, and a structural flat roof with multiple level.
- Overhead doors will be provided in the blower room and the headworks room. The UV room will have a double door entrance to a mezzanine level and stairs leading to the UV room level. Since the UV channels have been hydraulically modeled at a lower level the mezzanine will include an overhead crane system to remove or install equipment.
- Elevated concrete housekeeping pads will be provided for the new blowers.
- An exterior concrete pad will be provided outside the screening room, and a series of bollards will be installed to provide an area for screening bins to be stored while awaiting pick-up. Bollards have been proposed rather than a curb for easier snow removal headworks.

NEW HEADWORKS BUILDING WASTEWATER TREATMENT MECHANICAL

The following sections summarize the major components of the wastewater treatment mechanical systems. In addition to the major components, the facility will include features such as:

- Continuous flow monitoring capability in three (3) locations: WWTF influent following grit removal unit, WWTF effluent lift station, and effluent lift station by-pass line to monitor non-disinfected discharges to the environment.
- Steel air piping and air flow meters to monitor the actual air flow to the lagoon and MBBR.

MECHANICAL SCREEN AND WASHER / COMPACTOR

GENERAL

Because the existing bar screen is nearing the end of its useful life, a new fine screening system is proposed.

FINE SCREEN SYSTEM

A mechanical rotating fine screen system is proposed to be installed on the headworks side of the headworks building. The fine screen will be selected to provide a high debris removal rate. Because of the high debris removal rate it will result in more material being collected that must be disposed of, but the objective is to remove such material before it accumulates in the lagoon cells.

WASHER COMPACTOR

To accompany the fine screen, a Screw Washer Compactor has been selected for this site, which will wash the debris to help remove any organics. Following the washing, the debris is compacted to remove as much water as possible. A pipe installed from the washer compactor to the upstream side of the screening system will allow the washer compactor to drain the wash water.

WASTE COLLECTION

In order to facilitate the screening system's waste collection headworks, it is anticipated that waste will be collected in heavy duty plastic rolling bins.

GRIT REMOVAL AND WASHING / DE-WATERING SYSTEM

In addition to the fine screen previously described, the facility will be equipped with a grit removal system located after the fine screen. The purpose of the grit removal system is to remove heavy debris such as grit, sand, gravel that enters the system (generally high precipitation events) before they settle at the bottom of the lagoon. The grit is then collected and disposed at an approved facility.

WASH WATER

In order to provide the required wash water for the screening and grit removal equipment, a new duplex water booster pump system will be installed in the building to handle the peak flow and pressure demands. The system will include a large indoor water reservoir to handle the peak demand. The reservoir will be filled by the exterior potable water well. As part of the design, the re-use of rainwater will be evaluated as an alternate source for wash water.

DISC FILTERS – SUSPENDED SOLIDS POLISHING AND PHOSPHORUS TREATMENT

The MBBR treatment units are expected to generate a small amount of suspended solids, so a disc filter system will be installed in order to consistently meet TSS limits, depending on the TSS concentration of the lagoon cells' effluent.

These filters will operate only when the solids concentrations are high. Additionally, a coagulant (alum) can be added prior to the filters to reduce the phosphorus concentration.

Periodic backwashing is required to clean the filters. The backwash water will then be piped back to the lagoon inlet.

NEW UV DISINFECTION SYSTEM

Effluent disinfection will be achieved through the installation of a new UV Disinfection System. For this application, the disinfection system will be designed to meet the disinfection limit of 200 E. coli /100ml at the design peak flow rate.

The UV system will be installed directly in a concrete channel in the UV room floor, with a safety grating overtop. The water level in the UV channel is controlled by a serpentine weir supplied by the UV system supplier. The proposed system includes automatic wiping of the bulb sleeves to maintain a high level of transmittance. A monitoring panel will be supplied for each UV bank to provide continuous monitoring of UV lamp age and intensity.

FLOW MONITORING

As noted, flow monitoring will be provided at three (3) locations at the facility: the inlet (following screening), the outlet (effluent lift station), and the effluent lift station treated water by-pass. The inlet and effluent lift station by-pass flow metering locations will each consist of a parshall flume with an ultrasonic level sensor, which will permit continuous flow monitoring with minimal maintenance, while the effluent lift station will be equipped with a magnetic flow meter.

INFLUENT AND EFFLUENT LIFT STATION

The upgraded facility will require two (2) new lift stations: an influent lift station to direct the wastewater into the lagoon, and an effluent lift station to convey the treated water into the Northumberland Strait. Because the stations have different functions, they will have different characteristics; however, both stations' pumps will be controlled by a VFD (variable frequency drive) system so the pumping rate closely matches the incoming flow and avoid excessive on-off pumping cycles.

INFLUENT LIFT STATION

As is the case at the existing WWTF, an influent lift station will be required in order to pump the untreated wastewater into the upgraded treatment facility. The following is a summary of the characteristics of this new influent lift station:

- Based on the increased depth of the new influent lift station (compared to the current screw pump station), it is recommended to use submersible pumps instead of screw pumps similar to those used in the existing facility.
- This station has been designed based on the installation of four (4) pumps, with two (2) pumps running and two (2) pumps on stand-by, to minimize the risk of down-time through additional redundancy
- At this preliminary stage, it is anticipated that the wet well will be separated into two compartments, with two (2) pumps in each compartment, to permit cleaning and maintenance of one side of the wet well while maintaining the full pumping capacity of the station.
- Stand-by power is recommended to ensure continuous flow into the WWTF and prevent overflows of untreated wastewater. This has been included in the preliminary design at this stage.

EFFLUENT LIFT STATION

As previously discussed, upgrades to the outfall are anticipated in the future in order to promote improved mixing of the treated effluent with the receiving water. Therefore, the current upgrade concept includes a new effluent lift station and forcemain outfall. Additional details on assumptions and design parameters are provided below:

The Effluent Pumping Station is recommended to have three (3) submersible pumps with two (2) pumps operating during peak flow and one (1) pump on stand-by;

- The effluent pumping station will be designed to pump the effluent 350 m from the shore along the outfall piping in order to provide the desired mixing and dilution developed in previous study;
- There will be a flow meter on the discharge pipe from the pumps to the outfall that will measure and totalize flow and send signals to the GSSC's WWTF SCADA system.

MECHANICAL BUILDING SYSTEMS SUMMARY (REFER TO DRAWINGS M01 TO M04)

PLUMBING:

The plumbing will be from the existing potable well complete with double-check valve backflow prevention device in order to protect the water main from potential contamination and electronic water meter, to monitor water consumption at the facility. The water meter will be connected to the building's controls system to trend-log water consumption.

HEATING/COOLING

The building will be heated by multiple electric unit heaters hung from the ceiling, rated for the appropriate classification of each room. Ventilation will be provided in Blower Room adequate to limit the space temperature. The Headworks and UV rooms will be heated by an in-floor radiant heating system. A mini-split heat pump will be installed for the Lab Office.

VENTILATION

Ventilation for the Headworks and UV rooms will be accomplished via roof mounted heat recovery ventilators (HRV) rated for the appropriate classification of each room, which will be sized to maintain a minimum required number of air changes per hour (ACH) continuously and an elevated number when the building is occupied to ensure occupant safety. Fan speeds shall be controlled via Variable Frequency Drives (VFDs) tied to gas detection sensors such that should the gas levels increase over an allowable limit, the fans will increase in speed and indicate an alarm.

Ventilation for the lab office, washroom and shower area will be accomplished by a small HRV, which will run on a time of day schedule, with pushbutton over-ride for activation outside of normal occupied hours.

Ventilation for the blower room, electrical room and mechanical-electrical room shall be by inline exhaust fans. The fans shall be sized in order to provide adequate air changes in order to limit the space temperature in summer months and relieve heat generated by the blowers and electrical equipment. These fans will be controlled via space temperature sensors tied into the building's control system with user adjustable setpoints.

The generator room ventilation shall consist of ducted radiator plenums complete with motorized exhaust air and recirculation dampers.

ELECTRICAL SYSTEMS SUMMARY

ELECTRICAL SITE DISTRIBUTION

A 1600A, 347/600 V, 3 phase, 4 wire service entrance is proposed for this new building based on preliminary calculations. The electrical service entrance will be supplied by extending NB Power's overhead 12kV lines to a new NB Power take off pole and then underground to a pad mount transformer, the transformer will be near the main electrical room.

EMERGENCY/GENERATOR BACKUP POWER SOURCE

The emergency power source will consist of three (3) interior generators c/w double walled sub-base fuel tanks to provide a runtime of 24 hours for the facility in case of normal power disruptions.

BUILDING LIGHTING

All interior and exterior lighting will be LED fixtures.

BUILDING CONTROLS

Process, heating, ventilation and general building controls will all be completed through the station control panel. This station control panel is proposed to have various inputs, outputs and alarms as required to monitor and control all systems. Alarms will be provided for monitoring at other site locations.

Accessibility to the control panel will also be possible by utilizing a remote connection through a SCADA remote client access to allow operators to view all system parameters and acknowledge alarms remotely. All equipment and process will be displayed as well on a computer screen in a full graphic user interface to allow ease of monitoring of facility equipment.

COMMISSIONING AND TRAINING REQUIREMENTS

WWTF TREATMENT COMPONENTS

The Contractor will be responsible to ensure proper commissioning and training is provided by a qualified representative for all major pieces of equipment, including the screening and grit removal systems, the new aeration system and blowers, the UV disinfection system, pumps, flow meters, MBBR and disc filters.

In addition, all new sanitary and air piping, sluice gates, and manholes will be tested for leakage, and sanitary piping will be video inspected prior to acceptance.

BUILDING MECHANICAL COMPONENTS

The installing Contractor will be responsible to test/verify all system functionality of the fan & gas detection systems in each room. The installing Contractors shall work together to ensure

all aspects of their respective systems are tested/confirmed to be functioning as designed and intended in order to provide a safe environment for the occupants. This work includes the air handing systems, controls systems, gas-detection systems, and plumbing systems. Each Contractor shall be responsible to train building operators on the operation and maintenance of the gas sensors, fans and controllers.

ELECTRICAL COMPONENTS

Commissioning and training will be detailed as required for the headworks building and the treatment system components and to operate the electrical systems. One of the major systems that will involve commissioning and training is the station control panel, as it controls and provides alarms for all equipment and processes within the headworks building.

ENERGY & SUSTAINABLE DEVELOPMENT

WWTF TREATMENT COMPONENTS

The design of the WWTF upgrades will be carried out with sustainable development in mind. In particular, the following components are considered to be energy efficient when compared to past technologies:

- Fine-bubble aeration system;
- Positive displacement screw blowers controlled by VFDs;
- Low pressure UV lamps rated for 15,000 hours.
- Submersible pumps controlled by VFD's.

BUILDING MECHANICAL COMPONENTS

Ventilation systems will be designed to run only as necessary and will only be increased in airflow while occupied by the users. Fans serving the blower, UV and strainer rooms will be specified with VFDs to maximize efficiency and accommodate speed control. Heating systems will be sized for only the minimum amount required to satisfy space conditions in each room. Low flow-toilet, and low-flow aerators on sinks will be specified to limit the potable water use of the building; and a water meter will be installed and monitored by the controls system to monitor water consumption and alert the users to potential wasteful water leaks in the system based on known-usage.

ELECTRICAL COMPONENTS

Lighting will be all LED lighting and the main switchboard will have an owner power meter to monitor energy consumption. Astronomical timeclock will be installed to operate exterior building lights and reduce unnecessary headworks. Occupancy sensors will be investigated for use in limited use, non-rated areas. All electric motors will be high efficiency and operated on VFD's where practical, process equipment commissioning will finalize pump headworks and parameter adjustments to meet both performance and energy demands.

FACILITY HYDRAULICS

GENERAL

To evaluate the hydraulic performance and resulting hydraulic grade line (HGL) in the proposed treatment facility, a hydraulic model was prepared using the SewerCAD software package. This model considers hydraulic losses through piping, bends, channels, pre-treatment equipment, UV equipment, flumes, manholes and control chambers. By calculating the hydraulics through the proposed facility, the following design decisions were made:

- Channel widths;
- Pipe sizing;
- Elevations of control weirs, channels, and pre-treatment equipment.

FLOW PATTERNS

The WWTF's flow patterns and by-passes are described in Section 3.1 (Appendix G, Crandall, 2019b).

CLASS "B" COST ESTIMATE AND PRELIMINARY SCHEDULE

CONSTRUCTION COSTS

Based on the previous sections of this Report, and the Figures included in Appendix B, a class "B" cost estimate has been developed and included in Appendix G (Crandall, 2019b). The construction cost is estimated to be approximately **$32,4 million** (including contingency, Engineering and Environmental Allowance), including Net HST.

SCHEDULE

The overall project will be constructed in multiple contracts:

- Contract 1 – Construction of the Headworks Building
- Contract 2 – Construction of New Lagoons
- Contract 3 – Construction of New Forcemain & Outfall
- Contract 4 – Construction of MBBR and Disc Filter

The following preliminary schedule has been put in place at this preliminary stage based on various contract spread over 3 years.

Table 2-4 - Preliminary Project Schedule

Phase	Description	Approximate Duration
Contract 1 – Construction of New Headworks Building	- Environmental Impact Assessment Registration (EIA) - Additional Field Work, Geotechnical Investigation and Survey Required - Wastewater Treatment Process Review and confirmation - Final Equipment Selection - Headworks Building Detailed Design and Tender documents - Construction of New Headworks facility	Detailed Design – December 2020 to May 2021 Construction – May 2021 to 2023
Contract 2 – Construction of New Lagoons	- Lagoons Detailed Design and Tender documents - Reconstruction of Lagoons Cells - Installation of New Aeration System - Commissioning of the new Headworks and Lagoons	Detailed Design – Winter 2021 to Fall 2021 Construction - Fall 2021 to 2021
Contract 3 – Construction of New Forcemain & Outfall	- Environmental Permits - Outfall Forcemain Detailed Design and Tender Documents - Construction of New Forcemain and Outfall	Detailed Design – 2021 to 2022 Construction – 2022 to 2023
Contract 4 – Construction of MBBR and Disc Filter	- Detailed Design and Tender Documents of MBBR and Disc Filter - Construction and installation of MBBR and Disc Filter	Detailed Design – 2021- 2022 Construction – 2022 to 2023

Therefore, a total of 3-years is anticipated from the start of construction to the commissioning.

The estimated hours of construction will be from Monday to Friday from 7:00 am to 7:00 PM.

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

- Earthwork and construction of structures: Excavators, dozers, pumps, dump trucks, concrete trucks, compaction equipment.
- Pipe work: Excavators, compaction equipment.
- Structures: Excavators for foundations, concrete trucks, supply trucks for trades, cranes for lifting items such as trusses;
- Landscaping: Trucks importing topsoil, fencing materials;
- Driveway and parking lot construction: dozers to grade the site, trucks to bring in base material and asphalt; compaction equipment.

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

- Exhaust and other emissions from construction equipment.
- Noise from construction equipment.

- Runoff from disturbed surface areas during wet weather events and silt from disturbed surface areas. This will be minimized by installing silt fences and other erosion protection devices around work areas and to reinstate disturbed areas as soon as is practical.
- Petroleum hydrocarbons from possible leaks, spills or accidents from construction equipment and vehicles. This will be minimized by having spill kits on site and to conduct daily inspections of equipment. An Environmental Management Plan (EMP) has been prepared (Appendix I) and will be followed during construction. No refuelling or maintenance of vehicles will be permitted to occur within 30 m of a watercourse.

All waste generated during construction will be stored in containers and disposed of off-site in appropriately licensed facilities.

The following sequence and procedures are recommended during the construction process (to be confirmed during detailed design):

- Mobilization and installation of environmental protection devices.
- Clearing of the work site, and disposal of materials off-site (remaining portion of the property to remain in current state).
- Construction/modification of new facilities, including:
- Excavation for new building foundation, in-ground concrete tanks, piping and structures, and stormwater retention pond;
- Importing structural fill as required to bring the site up to sub-grade level in fill areas to be used for vehicle movement and building construction; this material will be spread in layers and well compacted to minimize settlement;
- Supply and installation of underground infrastructure including water, sanitary, and stormwater services;
- New electrical service to the site;
- Construction of new concrete tanks;
- Construction of a new treatment building;
- Site grading and drainage;
- Supply and installation of new security fencing;
- Construction of new driveway and parking area with asphalt surface;
- Property restoration with topsoil/hydroseed and/or granular surfaces as appropriate;
- Start-up and commissioning of equipment.

Imported materials are expected to include the following (where "imported" is interpreted to mean "brought in from off the construction site"). It is noted that granular materials will be sourced from clean, reputable quarries.

- Imported fill material and topsoil;
- Imported bedding for pipes;
- Imported granular material for structure foundations, driveway/parking area base material, etc.;
- Imported asphalt for driveway and parking surface;
- Imported construction materials for piping installation;

- Imported construction materials for buildings and concrete structures: wood, steel, concrete, etc.; and
- Imported equipment for "In the Round" System

2.8 Operation and Maintenance Details

The anticipated sequence of operation for the new facility is summarized below. For each item in the sequence, a list of operating and maintenance requirements is included. The facility will be operated and maintained by the GSSC.

The typical operational requirements for the new major components and operations personnel responsibilities are summarized below. This information has been developed based on typical installations and will be updated as part of the design process for this facility.

Table 2-5 - Summary of Anticipated WWTF Operation and Maintenance Tasks (Typical)

Task	Frequency
Check Blower Operation, Blower Pressure, Flow Rate Blower Hours, Discharge Temperature, and VFD Speed	Daily
Check Operation of all submersible Pumps	Daily
Check for Excessive Noise / Vibration in Blowers	Daily
Check Dissolved Oxygen Levels in System	Daily
Inspect Aeration Pattern to identify possible diffuser problems that would affect oxygen transfer	Daily
Check Screen Operation	Daily
Check UV Output	Daily
Take note of any unusual conditions that may impact treatment efficiency and/or system operation	Daily
Check / Clean by-pass bar screen	Min. Daily during by-pass
Check Inlet Filters and Clean if Required	Weekly
Check Blower Oil Level	Weekly
Check Blower Drive Belt Tension	Weekly
Check Blower Belt Guard	Weekly
Inspect Aeration Lateral Tension	Monthly
Purge Condensation from Main Buried Air Headers and Exercise Aeration System Valves	Monthly
Obtain representative samples for testing and reporting as specified under CCME and WSER requirements	Monthly
Inspect UV Channel for Algae, Clean if Required	Monthly
Inspect UV Lamp Sleeve, Clean if Necessary	Monthly
Inspect and clean UV module	Every 2 Months
Lubricate wearing parts on Screening Unit	Every 3 Months
Adjust Screening Unit Chain	Every 6 Months
Check Blower Drive Belts and Belt Pulleys, Check and Clean Pressure Valve, Change Oil, Check and Clean Inlet and Exhaust Air Openings	4000 hrs/6 months

Task	Frequency
Change Blower Inlet Filters, Replace Grease	8000 hrs/12 months
Replace Belts on Blowers, Check Belt Pulley Alignment, Check Non-return Flap for Wear and Tightness, Check Flexible Pipe Connections	16,000 hrs/2 years
Check Hose Lines on Blowers	20,000 hrs/3 years
Replace Hose Lines on Blowers	6 years
Replace UV Lamps	12,000 hours
Clean UV Channel	Annually / more frequently if required
Clean Aeration Diffuser Membrane/Membrane Protection	Annually / as change in flow is detected
Adjust Aeration Lateral Tension	Seasonally / as required
Adjust Aeration Lateral Valve	as needed to maintain DO (note date of adjustment)
Clean Debris Adhering to Screening Unit	As required
Management of screened material disposal	As required
Site maintenance, including removal of debris, trimming vegetation as required within the WWTF site, snow removal to ensure continuous access, building maintenance and cleaning	As required
Generator Bi-Weekly Automatic Exerciser	Scheduled
Generator oil, belts, oil filter, fuel filter and accessories	Annually. As recommended by manufacturer.

More specific operational requirements will be prepared as part of the detailed design and construction of the new facilities, which will include Operation and Maintenance Manuals and Schedules from the equipment suppliers. Maintenance frequency will be as recommended by the supplier/manufacturer of each component.

This operations and maintenance table outlines the steps that are to be taken for optimum performance of the system, and thus very relative for protection of the environment. A clean well-maintained system translates to consistent effluent quality and thus less chance of upsets that might allow impacts to the environment (i.e. increases in nitrogen-ammonia species and phosphate).

2.9 Future Modification, Extensions, or Abandonment:

The project is designed to be able to service the ultimate design population, flow and loading described within the Crandall Engineering Ltd. Greater Shediac Sewerage Commission, Cap Brulé Wastewater Treatment Facility, Preliminary Design Report. Crandall 2019b. This provides for growth within the serviced area of the Town of Shediac as projected to the year 2043 which is also full development of the area served. Therefore, it is not anticipated that there will be future expansions of the proposed WWTF.

Future modifications would be required only in the event of a change in the effluent discharge objectives (EDOs) dictated by Provincial or Federal regulatory agencies. It was noted in the project description that the process is designed to not only meet current $CBOD_5$ and TSS EDOs, but is also capable of significantly reducing nitrogen and phosphorous levels in the effluent

through biological (non-chemical) processes. This ability should position the proposed WWTF well to meet future regulatory requirements.

It is not anticipated that the proposed WWTF would be abandoned. Effective wastewater treatment is an ongoing requirement.

2.10 Project-Related Documents

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

(a) Environmental Risk Assessment (ERA), for the Greater Shediac Sewerage Commission (GSSC) Cap Brulé Wastewater Treatment Plant. GSSC, 25 ch. Cap-Brulé Rd., Boudreau-Ouest, NB, E4P 6H8, February 27, 2014. Prepared by Crandall Engineering 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9. Appendix D.

(b) Greater Shediac Sewerage Commission, Feasibility Study, Cap Brulé WWTP Outfall, December 2, 2015. Prepared by Crandall Engineering 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9. Appendix E.

(c) Greater Shediac Sewerage Commission, Cap Brulé Wastewater Treatment Facility, Shediac East Long-Term Wastewater Management Strategy, prepared by Crandall Engineering 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9 Appendix F.

(c) Greater Shediac Sewerage Commission, Cap Brulé Wastewater Treatment Facility, Preliminary Design Report, September 11, 2019b, prepared by Crandall Engineering 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9. Appendix G.

(d) Climate Change Resilience Assessment, Upgrade of Cap-Brulé Wastewater Treatment Facility, Greater Shediac Sewerage Commission - Wastewater Treatment Facility – July 2020, Final Report, Englobe 1001, rue Sherbrooke Est, bureau 600, Montréal (Québec) Canada H2L 1L3. Appendix H.

It does not appear that the existing GSSC WWTF was subject to any prior EIA assessments.

The legislative requirement for EIA assessments came into effect in 1987. The initial construction of the GSSC's lagoons was done in 1971 to 1972 (two cell facultative lagoon with surface aerators) and various upgrading steps occurred up to 2009 (Disinfection UV unit) and 2012 (screw pump upgrades), so most of this pre-dated the Provincial EIA requirement.

3 Description of the Existing Environment

3.1 Physical and Natural Features

Site Topography and General Surface Drainage Regime:

The location of the WWTF upgrade is shown on Figure 6 (Appendix B). The entire upgraded wastewater treatment facility will be located within the limits of the existing property owned by

the Greater Shediac Sewerage Commission. No additional land outside of the present WWTF site is required for the new facility, with the exception of the directionally drilled and installed new outfall piping to the Northumberland Strait. This piping will be installed by drilling underneath the wetland and thus will not be affecting the wetland system itself. The horizontal drilling process will be monitored at surface where possible as this is planned to take place during the winter months. The remainder of the work that will be affected is that of the present wastewater treatment facility footprint.

As part of the evaluation conducted for the Preliminary Design Study (Appendix G), geotechnical investigations were carried out in various areas of the WWTF site. Five (5) boreholes were drilled at this site; the borehole logs and plan showing their location are attached as part of Appendix G, the Preliminary Design Report (Crandall, 2019b) and the geotechnical report and boreholes are found in that report's Appendix A.

These boreholes indicate that the upper soil layers are "residual soil" consisting of very dense gravelly sand, with a trace of silt and moist. Two boreholes encountered fill material from the construction of the dikes around the lagoon cells.

Surface drainage from the site flows to the north towards the wetland; from Route 133 the land slopes in a northerly direction. Close to Route 133, the elevation of the land surface is roughly 10 masl, and it slopes to about 0 masl at the wetland boundary. As long the western boundary along Cap de Brule Road, the surface runoff is directed into a ditch that parallels this road. This 0 masl contour is just a few metres north of the edge of the lagoons.

3.2 Cultural Features

Due to the site of the upgraded WWTF currently being entirely used as the site of an existing WWTF, there are no cultural, heritage, tourism or resource areas within the limits of the subject property.

There are no formal recreational sites within 500 m of the subject property.

3.3 Existing and Historic Land Uses

As noted, this project is an upgrade of an existing wastewater treatment facility entirely within the existing property. This subject property has been in use as a wastewater treatment facility location for over 50 years. Figure 10 (Appendix B) shows that most of the adjacent properties are residential in nature with a few commercial buildings. To our knowledge, there are no known previous developments on this site that may have been of cultural or historic interest.

Concerning adjacent land use within 150 m of the limits of the proposed WWTF, using the distance as recommended by the "Atlantic Canada Wastewater Design Guidelines", it is as described below:

- South: abuts Route 133 and numerous residences. There are several occupied residences in this area – see Figure 9 in Appendix B.

- West: to the west is Cap de Brulé Road and one residence roughly southwest of the main GSSC office.
- North: to the north is a Provincially significant wetland and is part of Lac des Boudreau.
- East: to the east is a series of hay fields and a water course that drains the area into Lac des Boudreau.

Apart from the site's use as a WWTF there are no additional impacts from this Site. Any sludge in the cells will be removed and properly disposed of prior to the filling of the upgraded cells for the new WWTF.

Watercourses, Wetlands and Species at Risk (SAR):

As noted in the previous Sections, the proposed project site is within 30 m of a Watercourse or Wetland according to GeoNB's delineation. However, as the guidelines for working around watercourses and wetlands have recently changed, a preliminary wetland assessment was completed in early October of 2020 to confirm the Site's characteristics.

A formal wetland review/delineation has been completed, a report summarizing the findings of the wetland delineation is being compiled and additional information will be collected in 2021 and will be provided as soon as it is available. The directional drilling, that will be within the wetland, is schedule in 3 years from now. Since the wetland is outside the majority activities of the scope of work it should not affect the project initiation date for the construction.

The environmental review for the Site also indicated the potential presence of protected flora, fauna, and migratory birds, which have been historically documented within 10-km of the project site. Again, a field survey will be completed during the appropriate season to confirm the presence or absence of these species and their critical habitat as required to identify construction limitations and restrictions.

The wetlands (Lac des Boudreau) will require a WAWA permit for any work to occur within 30-m of it. This is expected to include a portion of the berm construction for the planned upgrades to the lagoons, as well as removal of some of the existing piping.

Protected Watersheds and Wellfields:

There are no protected watersheds or wellfields within the project areas. Existing houses have their own well for potable water. The private wells will be sampled and monitored prior and during construction as part of the well sampling program.

4 Summary of Environmental Impacts and Mitigation

The primary purpose of this project is to enhance the degree of wastewater treatment being provided by the GSSC in order to protect and improve the local environment. It is also necessary to expand to meet the growing population of permanent residents and increasing tourism expectations.

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. Since this project is for a wastewater treatment facility, the Sector-Specific Guidelines have also been recognized in preparing this list.

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 is possible during the construction phase when fill is being placed, when soil is exposed (i.e. when the existing lagoons are deepened and berm reconstruction is occurring), and when piping/structures are being installed and older existing piping is removed.
  - Mitigation: Since there are homes in the immediate vicinity of the Site, construction contracts will require the contractor to apply water to control dust when directed. Regarding local streets affected by construction, the contractor will be required to keep them cleaned.
- Odours (i.e. diesel) are possible during the construction phase, primarily from the trucks and equipment that will be used to excavate and haul and compact fill, bring concrete to the site for foundations, etc. Because the treatment process is an aerobic process and there is already a WWTF at this location, little to no increase in sewage odours are expected during construction operations.
  - Mitigation: There are several residential properties within 150 m of the site (Figure 9, Appendix B), but any odours from truck or equipment exhaust, etc., will be controlled within working hours. These houses appear to be the only "sensitive land uses" in the area.

Odours during WWTF operation should actually be reduced from the current condition because the aerosols from some of the surface aeration lagoons will be eliminated as the cells are progressively upgraded.

4.2 Biology and Ecology (Aquatic)

- Inshore marine habitat: There is no work being done in Lac des Boudreau, and associated wetlands, with the exception of the horizontal directional drilling underneath the wetland. During this horizontal drilling program, the area immediately above the alignment of the drilling will be monitored for potential drilling mud impacts at surface. The existing WWTF outfall will no longer be used. A potential impact could be some silt runoff from the Site while under construction, but silt fencing will be in place.
  - Mitigation: Runoff protection including silt fencing will be placed and maintained during construction (i.e. raising the berms of the lagoons on the sides near wetlands). Any soil areas will have cover re-established prior to silt fencing being removed. It was noted that a proposed "Environmental Management Plan" has been prepared and is attached in Appendix I.

If required a program to investigate benthic invertebrate populations prior to construction and then monitor this area after the outfall/diffusers are in place and operating can be carried-out.

Likely this monitoring program will continue to collect data from the seafloor area of the diffusers as the Site operates (every two years).

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

4.3 Biology and Ecology (Terrestrial)

- Vegetative cover: the existing vegetation on the site is the grass growth on the existing lagoon dikes, plus some trees and shrubs. There is no timber growth on this Site.
- Mitigation: Any vegetative cover disturbed during construction to remain as vegetative cover will be replaced as part of the scope of the work.
- None of the other items under this category are applicable to this project due to the Site's utilization as a WWTF.

4.4 Physical (Climate/Atmospheric):

- Noise: The facility will include equipment such as blowers and pumps. There will also be diesel generators to provide stand-by power to essential components.
- Mitigation: Pumps will be placed in buildings or chambers and will not be placed in an exposed exterior location; this will contain any operating noise from pumps. The blowers that are an essential part of the process aeration system will also be placed inside well-insulated buildings. The intake piping will include residential silencers. Diesel generators will operate only periodically for "exercising" or when required by a power outage. The diesel exhaust will have a residential silencer. When operating, the generator will require a ventilation system for cooling air which will generate unavoidable fan noise. However, these events will be of short duration, and exercising will be scheduled to be done during daytime hours.
- 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 site will be raised by placing imported fill to build up the dykes of the existing lagoons, but no work will be done outside of the limits of the existing WWTF.

Geologic information collected from geotechnical/environmental drilling across the Site will be compiled to gain a better understanding of the near-surface soils. This includes past geotechnical boreholes drilled and logged at the Site. The geologic information collected to date has been done through geotechnical drilling and the soil is described as very dense gravelly sand, trace silt and moist. The bedrock was described as sandstone.

4.6 Physical (Geomorphology)

- Topography: of the site will not be changed from the lagoon cells presently there. The existing lagoons are already at an elevation above the flood risk level. In the Greater Shediac Sewerage Commission, Shediac East Long-Term Wastewater Management

Strategy, Crandall, May 15, 2019 (Appendix F), there is a detailed discussion (Section 3.4) of sea level rise and the Plausible Upper Bound Water Level Elevation, which was calculated to be 4.32 m asl (Level 2100 - 3.64 m +/- 0.68 m).

- The Site slopes from a southerly to northerly direction across the Site towards Lac des Boudreau and the Northumberland Strait.
- Soil erosion: this is possible during construction.
- Mitigation: any soil areas disturbed will be contained by silt fencing and will be reinstated as soon as possible following construction. There will be no extreme slopes which might result in erosion.
- Soil bearing capacity: this will be improved by the placement and compaction of structural fill.

4.7 Physical (Groundwater)

- Quality: the project will not negatively impact groundwater conditions or quality. The new WWTF will continue to contain wastewater during treatment within the lagoons. The existing lagoons will be lined with new HDPE liner material and thus will be an improvement over the present lagoons which are equipped with existing HDPE liners.

4.8 Physical (Surface Water)

- Surface water quality: in the Lac des Boudreau *could* be impacted by inadequate treatment of wastewater prior to discharge. Also, spring freshets have overtopped the dikes (and other precipitation events (logged at the GSSC's website https://gssc-cesb.ca/administration/deversements/), allowing partially treated wastewater to escape to the wetland. The protection of this wetland during construction has already been noted.
- Mitigation: The purpose of this project is to significantly improve the treatment efficiency being provided by the GSSC and area for its wastewater. The new process allows much more control over the process to achieve higher degrees of treatment than the present lagoons are capable of, and also has the potential to reduce nutrient discharges to the ocean. Therefore, the WWTF upgrade project will have positive impacts on surface water quality. An Environmental Risk Assessment Study has been carried out (2014, Appendix D) which has established the Effluent Discharge Objectives (EDOs) required to meet the NBDELG Certificate of Approval to operate.

The existing WWTF does have effluent disinfection (UV treatment); the proposed WWTF upgrade will include an upgraded UV effluent disinfection, to treat projected flows.

- None of the other criteria under this category will be negatively impacted by this project.

4.9 Valued Spaces/Locations:

- Visual Character: the nature of the WWTF will be slightly different from the exiting lagoon-style facility. It will have some of the older above-ground buildings removed and a new central building constructed, so it may be more visible from local streets.

- Mitigation: the buildings will receive architectural treatment for visual enhancement. There will be some improvements to fencing (new security fencing) and, landscaping will be done with plantings to provide partial screening of the facility and further soften its visual impact. The site will continue to be maintained by the GSSC in a clean and attractive manner.
- The proposed project will not negatively impact any of the other criteria listed under this category.

4.10 Community Structure (Socio-economic)

- Population: part of the reason for this project is to accommodate wastewater flows from future growth within the Town of Shediac and GSSC serviceable boundaries (including future tourist growth); this is a positive result. This process will also improve the quality of effluent that will eventually be released to the environment and the overall water quality of the Northumberland Strait and Lac Boudreau Ouest.
- Public health: is also positively benefitted by the project because of the higher degree of treatment provided by the new facility.
- Annual expenditures will be impacted by the costs (capital and O & M) of the new facility. 84 % of capital costs will be recovered by the Federal and Provincial funding assistance and the remainder, including operational and maintenance costs, will be recovered from user charges.

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.
- Municipal infrastructure: will not be negatively impacted during the construction process; wastewater treatment will continue to be provided. Wastewater collection will also continue uninterrupted during construction. This is procedure has been identified in the proposed "*Sewage Management Plan"* attached in Appendix "I".
- The GSSC has an existing Sewer Use By-law (By-Law No. 3 "E").
- Traffic volumes will be periodically increased but will not be significant during the construction period. Any traffic delays originating from the new system construction will be temporary in nature, and signage and flagging will be in accordance with NB DTI requirements.
- Access to other properties will not be impacted by the WWTF 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 Town of Shediac and area by improving wastewater treatment efficiency.

- The new WWTF will not result in a reduction in the number of existing developed properties within 150 m of the Site. Figure 9 (Appendix B) shows the number of houses found within the radius of 150 of 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, as noted in the construction sequence section above, an application to temporarily by-pass a portion of the treatment process will need to be made prior to construction (Temporary By-Pass Authorization) to compensate for a reduced treatment efficiency during construction. This will be included in detailed design.

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. The Environmental Management Plan in Appendix I outlines the steps that will be taken to avoid environmental impacts from construction activities.

6 Public and First Nation Involvement

The GSSC is planning a public meeting or meetings in the near future in order to inform the public on the proposed plans to upgrade the GSSC's wastewater facility treatment systems. 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 GSSC representatives and by personnel from the GSSC's consulting engineering firm that has carried out the Preliminary Design Study 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. The site plan and a rendering of the proposed WWTF will be part of this display. 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 to construct.
- WAWA Permit from the NBDELG for the work within 30 m of any unmapped wetlands or watercourses (there are GeoNB mapped wetlands and/or watercourses present).
- NBDELG temporary by-pass authorization for reduced treatment during construction.
- Building permits, electrical, mechanical plumbing permits, etc.
- An updated "*Certificate of Approval to Operate*" as provided by the NBDENV once the facility has been completed and is being operated by the GSSC.

8 Funding

The Greater Shediac Sewerage Commission has received the required funding assistance for this project from the Integrated Bilateral Agreement divided between the following:

Greater Shediac Sewerage Commission	16.67%	$5,389,078
Province of New Brunswick	33.33%	$10,774,922
Federal Government of Canada	50%	$16,164,000
Total	**100%**	**$32,328,000**

The GSSC's share of the project cost will be obtained from the direct user charges. This project cannot be completed without the above funding assistance.

9 References

Atlantic Canada Wastewater Guidelines Manual (ACWGM).

Canadian Council of Ministers of the Environment (CCME), Technical Supplement 3, Canada-wide Strategy for the Management of Municipal Wastewater Effluent, Standard Method and Contracting Provisions for the Environmental Risk Assessment, June 2008.

CCME requirements (Strategy of Management of Municipal Wastewater Effluent, 2009).

Environmental Risk Assessment (ERA), for the Greater Shediac Sewerage Commission (GSSC) Cap Brulé Wastewater Treatment Plant. GSSC, 25 ch Cap-Brulé Rd., Boudreau-Ouest, NB, E4P 6H8, February 27, 2014. Prepared by Crandall Engineering 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9.

Feasibility Study: Cap Brulé WWTP Outfall, for the Greater Shediac Sewerage Commission (GSSC) Cap Brulé Wastewater Treatment Plant. GSSC, 25 ch Cap-Brulé Rd., Boudreau-Ouest, NB, E4P 6H8, 2015. Prepared by Crandall Engineering 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9.

Greater Shediac Sewerage Commission, 2019a, Shediac East Long-Term Wastewater Management Strategy, Crandall, May 15, 2019. Prepared by Crandall Engineering 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9.

Greater Shediac Sewerage Commission, 2019b, Cap Brulé Wastewater Treatment Facility, Preliminary Design Report. Crandall, September 11, 2019, prepared by Crandall Engineering 1077 St. George Blvd, Suite 400, Moncton, NB E1E 4C9.

Climate Change Resilience Assessment, Upgrade of Cap-Brulé Wastewater Treatment Facility, Greater Shediac Sewerage Commission - Wastewater Treatment Facility – July 2020, Final Report, Englobe 1001, rue Sherbrooke Est, bureau 600, Montréal (Québec) Canada H2L 1L3.

Wastewater Systems Effluent Regulations, Environment and Climate Change Canada.

10 Signature

Dec 16'20

Date

Mr. Joey Frenette B.Sc.,PTech
General Manager
Greater Shediac Sewerage Commission.