Appendix G Preliminary Design Report, Crandall, 2019b

Greater Shediac Sewerage Commission

Cap-Brule Wastewater Treatment Facility

Crandall Project No. 18411

PRELIMINARY DESIGN REPORT

DRAFT SUBMISSION

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1. INTRODUCTION

Crandall Engineering Ltd. is pleased to provide Greater Shediac Sewerage Commission (GSSC) with the enclosed Preliminary Design Report for the Cap-Brule Wastewater Treatment Facility (WWTF). This Preliminary Design submission is based on "Option 3" of Crandall's Shediac East Long-Term Wastewater Management Strategy Report, dated November 29, 2018 (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 "operations building" hereafter), including stand-by generator;
- ✓ 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 repair / 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;
- ✓ New influent and effluent pumping stations;
- ✓ Future construction of a Moving Bed Biofilm Reactor (MBBR) for additional $CBOD_5$ treatment and ammonia reduction (if required by the N.B. Department of Environment and Local Government [NBDELG]), as well as disc filters;
- ✓ Future installation of alum injection equipment between the new Lagoon #1 and #2 for alum precipitation in the lagoon before high-level filtration in the operations building (if required by the NBDELG).

The Preliminary Design Report presented herein provides preliminary design drawings, a preliminary cost estimate, a preliminary decommissioning plan and sequence of work, and a commissioning brief.

2. BACKGROUND

2.1 TOPOGRAPHICAL SURVEY

Based on Crandall's review of the available survey data, additional topo survey was required and was carried out on November 19th, 2018, to collect information on the existing site characteristics and grades. The data collected during this investigation has been incorporated into the Preliminary Design drawings.

2.2 GEOTECHNICAL INVESTIGATIONS

A geotechnical investigation was carried out on December 17, 2018. Five (5) boreholes were drilled to depths from 4.6m to 6.1m below grade. Groundwater was observed at approximately 3.0 m to 3.7 m below the ground surface at the time of the field work. The borehole logs indicate that bedrock was encountered at ground surface to approximately 1.2 meters below existing grade. Fill of 600 to 1,200 mm was encountered at boreholes 18BH-03 and 18BH-05.

In general, the investigation confirmed that slab-on-grade construction would be practical for the new operations building. The complete Geotechnical Report is included in Appendix A for reference.

2.3 SUMMARY OF DESIGN PARAMETERS

Based on Crandall's Long-Term Strategy dated November 19th, 2018, the following summarizes the design parameters selected for the design:

- ✓ 2018 Average Effluent Flow: 8,500 cu.m./day
- ✓ 2018 Peak Flow: 383 l/s
- ✓ Design Average Flow (25-years): 12,500 cu.m./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 BOD5 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), 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[2]
- ✓ Effluent E. coli 200 / 100ml (average)
- ✓ Acutely 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 would be installed following the lagoon treatment cells in the future, when one of the following two scenarios occurs:

a. The facility ceases to produce consistent non-toxic test results and requires an additional treatment process to provide ammonia reduction;

b. The facility's loading exceeds the capacity of the lagoon portion of the treatment process and requires an additional treatment process to meet the $CBOD_5$ effluent limit of 25 mg/L.

2 Effluent standard to be applied when required by legislation.

3. PRELIMINARY DESIGN

The following paragraphs summarize the Preliminary Design of the WWTF upgrade, which has been based on the design criteria presented in Section 2. Preliminary Design drawings can be found in Appendix B.

3.1 LAGOON CONSTRUCTION, SITE WORKS AND PIPING (REFER TO DRAWING C04 and C05)

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

3.1.1 ANTICIPATED PHASING

Although the overall upgrade concept is based on achieving the effluent quality parameters indicated in Section 2 over a 25-year design period, it is noted that the NBDELG 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. Therefore, it is anticipated that the upgrades would be carried out in phases, generally as follows (refer to Section 4 for further information on the anticipated phasing):

1. Lagoon earthworks, site piping, aeration system upgrades, and construction of new building. This phase will also include the installation of new screening and grit removal equipment, aeration system blowers, UV disinfection system, stand-by generator, influent screw lift station and effluent lift station.
2. New outfall piping to Northumberland Strait.
3. MBBR, alum, and filtration systems when higher level treatment becomes required by the

NBDELG.

3.1.2 NORMAL WWTF OPERATION

Based on the selected concept, once fully constructed (including future components), incoming flows to the WWTF will normally be directed through the influent lift station to the new headworks room of the operations building for screening, grit removal and influent flow metering prior to being directed to the new 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.

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 (future) for additional $CBOD_5$ treatment and ammonia reduction, them to the disc filters (future) for additional TSS and phosphorus removal following the MBBR (future) back through the operations building for UV disinfection, and effluent flow metering prior to being 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 operations 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 (Crest elevation 5.5m)
- ✓ Alum injection and mixing chamber (future, if required)
- ✓ Lagoon #2 (Cells #2A and #2B)
- ✓ Piping with Stop logs between Lagoon #2 and #3 (Crest elevation 4.0m)
- ✓ Lagoon #3 (Cells #3A and #3B)
- ✓ Chamber with Stop logs (Crest elevation 4.0m)
- ✓ MBBR Treatment (future, if required)

- ✓ Filtration (Disc Filters) (future, if required)
- ✓ Flow Enters Filtration/UV side of operations building
- ✓ UV disinfection
- ✓ UV Control Weir (Crest elevation 3.346m)
- ✓ Flow measurement (18" Parshall Flume)
- ✓ Effluent Lift Station (submersible pumps)
- ✓ Flow exits WWTF to outfall piping
- ✓ Discharge to the current open channel (discharge to new forcemain) (future)

3.1.3 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 then entering Lagoon #1 directly.
- ✓ Lagoon #1 by-pass: a manhole downstream of the operations building's headworks room (SAMH-8) 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 y-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 900mm diameter pipe will be constructed along the same route as the 600mm forcemain and discharge at the existing gravity discharge.

3.1.4 LAGOON CONSTRUCTION AND SITE WORK

As indicated on the drawings, the following table summarizes the design lagoon dimensions.

	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	4.0	4.0
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)	1.0m	0.9m*	0.9m*

* 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 dike 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, 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.

To allow for driving access around the site, with consideration for obstructions including aeration and baffle wall anchor posts, the top of the new dikes will be 4.5m wide, including a new crushed rock driving surface.

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

3.1.5 WWTF SITE PIPING

The condition of the existing lagoon site piping from the inlet of the WWTF to the outfall cannot be verified and is not large enough to meet the projected future wastewater flows; therefore, new 900mm dia. sanitary site 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) will maintain the design water elevation and will include stop logs to allow for future water level adjustments if required (total adjustment of +150mm to -450mm from the design liquid elevation). A gate valve will be installed in the bottom of the flow control chambers, which can be opened in the event that the lagoon needs to be completely drained.

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

3.1.6 WWTF OUTFALL PIPING

As discussed in Crandall's December 2015 Feasibility Study: Cap-Brulé WWTP Outfall and November 2018 Long-Term Strategy, a new outfall location was recommended to provide improved effluent/receiving water mixing, and 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;
- ✓ The outfall will be constructed with a swab launching station at the Effluent Pumping Station end and a removable cap at the diffuser end to facilitate discharge of swabbed materials and the swabs for maintenance purposes.

3.1.7 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, which 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, to 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 higher level of phosphorus removal is required, this can be achieved using the disc filters discussed further in Section 3.6.3.

3.1.8 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.

3.2 NEW AERATION SYSTEM AND BLOWERS (REFER TO DRAWINGS C05 AND M05)

As indicated on the drawings, 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 and a trailer will provide the operators with the required equipment for servicing the system.

Air will be supplied to the diffusers by new 75 Hp blowers (each sized for approximately 1644 scfm), operating in a two (2) on, one (1) stand-by configuration. The blowers would be programmed to alternate at a set time interval, with the stand-by unit available as a back-up to ensure continuous treatment.

Please refer to Appendix C for preliminary equipment selections for both the blowers and the aeration system.

3.3 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, which is 18 m x 55.5 m 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).

Three 75 Hp blowers are required to provide oxygen to the MBBR aeration grid (each sized for approximately 1775 scfm), which will operate in a 2 running, 1 stand-by configuration.

3.4 NEW OPERATIONS AND HEADWORKS BUILDING ARCHITECTURAL (REFER TO DRAWINGS A01 TO A04)

The new operations 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 following is a summary of the architectural design considerations:

- ✓ The new operations building footprint will be approximately 920 m^2, 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 operations 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 operations. A canopy has not been included at this time, as the installation of a canopy may impede snow removal operations without effectively sheltering the area from snow buildup.

3.5 NEW OPERATIONS BUILDING WASTEWATER TREATMENT MECHANICAL (REFER TO DRAWINGS A01-A03 AND M05)

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.

3.5.1 MECHANICAL SCREEN AND WASHER / COMPACTOR

3.5.1.1 GENERAL

Because the existing bar screen is nearing the end of its useful life, a new fine screening system is proposed. Cut sheets of the selected equipment are provided in Appendix C for reference.

3.5.1.2 FINE SCREEN SYSTEM

A Veolia Escalator® Fine Screen is proposed for this application. Based on the peak design flow of 500 l/s, the fine screen system will be installed on a 60-degree angle in a 1,500mm wide x 1,500mm deep channel on the headworks side of the operations building. The fine screen will have 6mm perforations in order to provide a high debris removal rate (estimated at 79%, a significant improvement over the efficiency of current vertical bar screen type system). Because of the high debris removal rate, this system does 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.

The screening unit includes an automatic washing feature, although periodic manual cleaning will also be required. Based on the technical data included in Appendix C, the unit's automatic cleaning cycle requires an intermittent wash water flow of 2.0l/s.

Based on discussions with the supplier, it is recommended to monitor the liquid elevation in the screening channel using ultrasonic level sensors as opposed to float switches, which can get caught in incoming debris. In addition, Crandall also recommends the installation of an additional float switch upstream of the screen system to measure the high-water level. This switch would directly activate the screen system in the event that the ultrasonic level sensors fail. A manual push-button activation will also be included in the design.

For ease of maintenance and cleaning purposes, the screen will be able to pivot out of the channel using a trolley crane. The screen, which weighs 2,100 kg, can be lifted from the bottom using the two (2) lifting lugs. Because of the room classification under the electrical code, a manual trolley crane with stainless steel chains is recommended.

To minimize corrosion from the wastewater elements, the screen system will be constructed with stainless steel parts where applicable.

3.5.1.3 WASHER COMPACTOR

To accompany the fine screen, a Veolia Rotopac® Type RPW 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.

The unit's automatic cleaning cycle requires an intermittent flow of 0.6l/s, not including any manual cleaning that may be carried out by the operators.

3.5.1.4 WASTE COLLECTION

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

3.5.2 GRIT REMOVAL AND WASHING / DE-WATERING SYSTEM

Two (2) Grit Removal systems were evaluated for this site to determine which was best suited to the GSSC's requirements. Each represents a different approach to grit removal. The evaluation was based on the following criteria: performance efficiency, materials of construction / durability, price (capital cost and operation/maintenance costs), owner preference. In this evaluation, it was considered that the Grit Removal System and the Grit Washing/Dewatering System would be a single integrated package, and each grit removal system is associated with a specific washing/dewatering unit.

The Veolia Mectan V Grit Removal System uses a traditional design where flow enters a conical

chamber that has paddles to create sufficient flow velocity to keep the lighter organics in suspension while the heavier grit settles out. Grit removal efficiency varies with particle size; for material with a specific gravity of 2.65, it will remove 68% of particles between 100 and 150 microns. Its removal efficiency goes up to 96% for particles 300 microns and larger. The system is installed in a circular concrete tank.

The Hydro International HeadCell Grit Removal System applies a different approach. It provides a tank in which is suspended a group of stacked circular "trays" that slope toward an open center. The unit has no internal moving parts and does not require power. Hydro International states that the removal efficiency of their system is 95% removal of grit with a specific gravity of 2.65 and a size of 106 microns or greater. This indicates it is approximately 40% more efficient than the Veolia unit. The Hydro International system must be placed in a square concrete chamber.

Each manufacturer offers a grit washing and dewatering system to separate the grit from the grit/water mixture that leaves the grit removal tank.

The Veolia system uses a hydro-cyclone separator and is rated for a solids handling capacity of 3 m^3/hr. The Hydro International system is based on an estimated grit loading of 0.45 m^3/hr. Each system would be sufficient for the GSSC peak flow rate and grit concentration anticipated at this facility.

One technical consideration that must be recognized is the process water requirement difference between the two systems. The Veolia system indicates that the grit removal system requires 4.8 l/s @ 380 kPa (75 USgpm @ 55 psi) for fluidization of the grit, and the wash water requirement for the grit washing/dewatering is 0.38 l/s @ 275 kPa (6 gpm @ 40 psi).

The Hydro International system indicates that a continuous 1.26 l/s @ 345 kPa (20 USgpm @ 50 psi) is required for fluidization of the settled grit, as well as an intermittent 3.15 l/s @ 345 kPa (50 USgpm @ 50 psi) of wash water for the grit washing, and a continuous 0.32 l/s @ 345 kPa (5 USgpm @ 50 psi) of wash water for grit dewatering. While the Veolia system has a greater rate of flow, the fluidization flow is required only when the grit pump operates, typically on a resettable timer. The Hydro International flow is indicated as "continuous", although other options may be available.

3.5.3 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.

3.5.4 DISC FILTERS – SUSPENDED SOLIDS POLISHING AND PHOSPHORUS TREATMENT

When the MBBR treatment units are installed, they are expected to generate a small amount of suspended solids, so a disc filter system may be required in the future in order to consistently meet TSS limits, depending on the TSS concentration of the lagoon cells' effluent. At this stage, it is anticipated that a separate building would be constructed in the event that disc filtration becomes necessary. Therefore, the disc filters have not been included in the preliminary design since it is not known with certainty if they will be required. An area has been reserved on-site for this potential future building, which has also been considered in the development of the preliminary piping configuration.

It is anticipated that once installed (if required), these filters would operate only when the solids concentrations are high. Additionally, if phosphorus treatment is desired, 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 would then be piped back to the lagoon inlet.

3.5.5 NEW UV DISINFECTION SYSTEM

Effluent disinfection will be achieved through the installation of a new UV Disinfection System. For this application, five (5) banks of twelve (12) UV lamps are required to meet the disinfection limit of 200 E. coli /100ml at the design peak flow rate of 500 l/s.

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. Additionally, the banks can be lifted from the channel for maintenance with the aid of an automatic bank lifting system. A monitoring panel will be supplied for each UV bank to provide continuous monitoring of UV lamp age and intensity. Further details on the selected equipment are provided in Appendix C for reference.

3.5.6 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 (18-inch throat) 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.

3.6 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. The wet well will include a level sensor that will send a signal to the VFD controller so that the pumping rate can be programmed to suit the effluent flow rate.

3.6.1 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.
- ✓ Each pump will lift the influent via separate pipes to the above channel of the pre-treatment, as shown in Drawing A01-A02 and M05 in Appendix B;
- ✓ Each pump has been sized for a capacity of 250 l/s (4000 USgpm), for a total peak design flow of 500 l/s (8000 USgpm) using two (2) pumps. This will result in approximately 45 Hp pumps.
- ✓ 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.

The influent lift station has been included in the concept for the overall operations building, as shown on Drawing A01-A02 and M05 in Appendix B.

3.6.2 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) 110-135 hp submersible pumps rated at 500 L/s (8,000 USgpm) 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 500 m from the shore in order to provide the desired mixing and dilution developed in previous study;
- ✓ Stand-by power would be recommended at this phase should regulations change and not permit the use of the existing outfall as an overflow;
- ✓ 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.
- ✓ The effluent station is recommended to be constructed with a basement that will allow piping to rest horizontal as it leaves the building. This will improve operation and maintenance of larger valves and flow meter to be placed on portable karts.

The effluent lift station has been included in the concept for the overall operations building, as shown on Drawing A01-A02 and M05 in Appendix B;.

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

3.7.1 PLUMBING:

The building will be serviced by a minimum 38mm diameter domestic water service provided by the civil services Contractor to the building (refer to Drawing C04 for details). Domestic water entrance will be installed 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.

Domestic water distribution in the facility will be accomplished via PEX-A type plastic piping c/w closed-cell elastomeric flexible insulation and PVC Jacketing. Piping will be specified to be purchased in straight-runs of piping rather than coils for performance, reliability, and post-installation appearance. All piping will be hung from the ceilings and along interior walls to feed individual fixtures.

Domestic hot water shall be supplied via an electric domestic hot water tank installed in the Blower Room space next to the shower room. The electric domestic hot water tank shall be sized to accommodate the domestic hot water load of the hand-sinks and hose-bibbs within the facility, as well as the tempered-water requirement of the emergency eyewash/shower fixtures. Domestic Hot Water recirculation will also be provided to ensure consistent hot water service to the eye-washes between periods of use.

Hot & Cold-water hose bibbs shall be provided in both the Headworks and UV Rooms in a location convenient to the users.

Emergency eyewash/shower units will be provided in the Headworks UV room for occupant safety. Eyewash & Shower units will be specified with manufacturer-supplied thermostatic mixing valves to ensure ANSI/Work-Place approved temperature water will be supplied to each emergency fixture. These valves will be installed next to each emergency fixture within a cabinet.

A wall-mounted electric pressure washer will be provided within the Blower Room complete with hard-pipped Schedule 40 Stainless Steel distribution piping to serve hose-reels in both the UV and Screener rooms. The system will be sized for the use of one (1) hose reel at a time, served by cold-water only.

Drainage for the Headworks Room, Blower Room and showers will be piped to the upstream side of the Headworks room wet well, and drainage from the UV and Mechanical/Electrical rooms will be drained to the UV treatment trench.

3.7.2 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 to no more than 30°C, refer to ventilation description. The Headworks and UV rooms will be heated by an in-floor radiant heating system fed from a propane-fired condensing boiler plant c/w hydronic pumps and accessories. A mini-split heat pump will be installed for the Lab Office.

3.7.3 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. Fans in both rooms shall also be connected to manual crank timers in order to allow manual over-ride of fan operation to increase air change rates. Occupancy shall be detected via ceiling-mounted occupancy sensors tied to the controls system.

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 to no more than 30C 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. Air relief shall be provided by an appropriately sized intake air louver on the exterior wall complete with electronic damper actuator interlocked with the fan operation.

The generator room ventilation shall consist of ducted radiator plenums complete with motorized exhaust air and recirculation dampers. Air relief shall be provided by an appropriately sized gravity air intake ventilator complete with motorized damper and interlocked to the generator via the building controls.

All ductwork will be constructed of stainless steel, all plenums will be welded and all ductwork thermally insulated & jacketed due to the fluctuating temperatures in the space, and the expected high levels of humidity in the spaces. This level of construction and insulation will increase the longevity of the equipment construction, and aid in reducing the possibility of mold/mildew growth.

All damper actuators which control ventilation dampers open to the outdoors will be specified as fail-closed in order to minimize the opportunities for building freezing during a power outage.

3.8 ELECTRICAL SYSTEMS SUMMARY

3.8.1 ELECTRICAL SITE DISTRIBUTION

A 1600A, 347/600 V, 3 phase, 4 wire service entrance is proposed for this 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. 600 V will be supplied to the main electrical switchboard via an underground concrete encased trench from the NB Power pad **mount. Power will be distributed at 347/600 V to multiple panels as indicated on the proposed single line diagram.**

3.8.2 ELECTRICAL BUILDING DISTRIBUTION

Power will be utilized at 347/600V and 120/208V via a step-down transformer. Majority of electrical distribution equipment will be in the main electrical room. Each area will have its dedicated distribution panel along with step-down transformer, this will provide ease of electrical access should the equipment require maintenance. The operations building will be split in two classifications, non-rated and Class 1 Zone 1 (proposed). Equipment located in the Class 1 Zone 1 area will be rated for this type of area and application, large electrical distribution equipment will

be avoided in this area due to cost factors.

All panels will consist of 3 phase, 4 wire, with bolt-on type circuit breakers. Panel boards will have bracing capacity based on available short circuit current. Circuit breakers will have interrupting capacity based on conductor length, conductor size and quantity along with transformer capacity and impedance. Panel bus bars will be of aluminum material. Circuit breakers will be thermal magnetic type. Circuit breaker, 400A and above will be electronic type.

3.8.3 EMERGENCY/GENERATOR BACKUP POWER SOURCE

The emergency power source will consist of three (3)-400kW, 600V, 3phase interior generators c/w double walled sub-base fuel tanks to provide a runtime of 24hours for the facility in case of normal power disruptions. The reasoning behind three generators vs. one larger unit is that in case of unit failure, the facility can still operate at a reduced output while running on two generators. Replacement parts are more readily available from suppliers reducing long lead times to repair units. The facility will also have 2 automatic transfer switches (ATS) as per C282-09 requirements, the facility requires to have life safety systems separated from general loads. To accomplish this, a secondary smaller ATS for the life safety loads such as, fire alarm, emergency lighting, exit signage and smoke control system will be installed in the main electrical room with a dedicated 'life safety' panel.

3.8.4 BUILDING LIGHTING

All interior and exterior lighting will be LED fixtures. Exterior lighting is proposed to be controlled by astronomical time clock with an override switch inside each exterior door. LED lights are chosen to avoid an accumulation of light seeking insects. Exterior lights will be installed at all exterior doorways and in areas where service work may be required after hours. Interior lighting will have local control and will be rated for the environment it is installed in.

Exit signage will be installed at all egress points and corridors leading to exit corridors, in compliance with NBC 2010. Exit signage will consist of LED type Green Pictogram designation, with to the generators providing illumination in the event of a power failure to the building. Class 1, Zone 1 exit signage will be rated for such application.

3.8.5 EMERGENCY LIGHTING

Emergency lighting will be installed to meet NBC requirements utilizing The general area lighting will be illuminated to minimum NBC 2010 emergency lighting levels of 10 lux.

3.8.6 FIRE ALARM SYSTEM

A single-stage fire alarm system will be installed in compliance with NBC 2010 and CAN/ULC-S524. The fire alarm system will be an addressable, zoned, fully supervised, microprocessor based

utilizing digital multiplexing techniques for data transmission. The fire alarm system will be monitored through monitoring agency as well as the SCADA interface for any alarms and notify operators.

3.8.7 SECURITY/DOOR ACCESS SYSTEM

Door control will include lock-down features to lock doors within the facility. The system will be operated and programmed from local keypads located at all main entry doorways. The security keypads will be monitored through the SCADA interface for any alarms and notify operators.

3.8.8 CLOSED CIRCUIT TELEVISION (CCTV)

A CCTV system will be installed consisting of cameras and video storage. Digital/IP cameras will be installed at all areas of interest to monitor equipment and general building perimeter. Exterior cameras will cover all main entries into the facility.

3.8.9 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.

The station control panel will be provided with a HMI screen to monitor and view any alarms and processes locally at the panel. 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.

4. COMMISSIONING AND TRAINING REQUIREMENTS

4.1 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, and flow meters.

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.

4.2 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.

4.3 ELECTRICAL COMPONENTS

Commissioning and training will be detailed as required for the operations 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 operations building.

5. ENERGY & SUSTAINABLE DEVELOPMENT

5.1 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.

5.2 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 (and ECM motors for the bathroom and office fans) 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.

5.3 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 operations. 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 operations and parameter adjustments to meet both performance and energy demands.

6. FACILITY HYDRAULICS

6.1 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.

6.1.1 FLOW PATTERNS

The WWTF's flow patterns and by-passes are described in Section .3.1.

6.1.2 DESIGN INPUTS

As established in the Long-Term Strategy report, the design of the new WWTF was done using a peak flow of 500 l/s according to flow monitoring completed in 2018. Therefore, the hydraulic model was created with a 500 l/s peak flow scenario at a steady state. A steady state analysis is

inherently conservative, as it does not consider the buffering effect of the lagoon cells. Other design parameters include:

- ✓ Static water level at Lagoon #1: 5.45m
- ✓ Static water level at Lagoon #2: 4.0m
- ✓ Static water level at Lagoon #3: 4.0m
- ✓ UV control weir: 3.346m
- ✓ Headworks Parshall Flume: Above calculated water level in downstream piping, to improve flow measurement accuracy.
- ✓ Headworks Screen: Above calculated water level upstream of Parshall Flume.

6.2 MODEL SETUP

Selection of component elevations and sizes was completed by starting at the Lagoon #1 water elevation and then calculating the losses through the system in an upstream direction. Lagoon #2 and 3 water elevation were used as the controlling elevation for the UV. The UV channel and weir were set to allow for partial draining of Lagoon #2.

The following initial assumptions were used when calculating the model:

- ✓ UV channel 1000mm wide concrete
- ✓ Other Channels 1000mm wide concrete
- ✓ Site piping 900mm dia.
- ✓ Stop-log weirs 900mm wide
- ✓ Parshall Flumes 18" throat
- ✓ UV control weir Serpentine plate weir – approx. 4m total length
- ✓ Fine Screen 6mm fine screen "Veolia's John Meunier – Escalator"

Product data-sheets for the major pieces of equipment can be found in Appendix C.

6.3 MODEL RESULTS

Hydraulic loses through the system were found to be acceptable and therefore the assumed physical parameters presented in Section 6.2 were maintained.

Please see Appendix D for hydraulic grade line profiles through the facility.

7. OPERATIONAL CONSIDERATIONS

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; however, each facility must develop their own maintenance schedule based on site-specific requirements.

Table 7.1: 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
Change Blower Inlet Filters, Replace Grease	8000 hrs/12 months

Task	Frequency
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.

This is not an exhaustive list and will be refined as the project moves ahead. 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.

Additionally, the specifications will stipulate a list of spare parts that must be supplied as part of the construction contract.

8. ENVIRONMENTAL CONSIDERATIONS

With the GSSC's authorization, the November 29, 2018 Long-Term Strategy was submitted to the NBDELG for their review and comments. The following paragraphs quotes the email response from Environment New Brunswick:

"A review has been completed and I wish to inform you that the works proposed (new outfall discharge location, new aerated lagoon/MBBR treatment system) should be communicated to the Environment Impact Assessment Branch and be registered for an EIA review."

8.1 ENVIRONMENTAL IMPACT ASSESSEMENT

The environmental impact assessment (EIA) is the process where potential environmental impacts are identified when a proposed construction project is undertaken. The EIA, required by the NB Department of Environment and Local Government for this project, will identify all the steps required to avoid and document any negative impacts to the environment or reduce them to an acceptable level. A typical EIA for a project of this undertaken would estimate to last approximately six (6) months to a year before being determined.

8.2 APPROVAL TO CONSTRUCT

An Approval to Construct applications must be submitted and approved before construction with all treatment parameters and design submitted. The Approval to Construct also includes the Watercourse and wetland application that will be required for work in and around the adjacent wetland.

8.3 ADDITIONAL ENVIRONMENTAL CONSIDERTATIONS

In addition, standard environmental mitigation measures will be included such as silt fencing and erosion control structures as required. In addition, 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 to compensate for a reduced treatment efficiency during construction. Crandall can assist with this process.

9. CLASS "B" COST ESTIMATE AND PRELIMINARY SCHEDULE

9.1 CONSTRUCTION COSTS

Based on the previous sections of this Report, and the drawings included in Appendix B, a class "B" cost estimate has been developed and included in Appendix E. The construction cost is estimated to be approximately **$34.4 million** (including contingency, Engineering and

Environmental Allowance), including Net HST. However, as previously indicated, it is proposed that the project be constructed in phases were the forcemain outfall be considered for Phase 2 and the MBBR and related components in Phase 3.

The project cost can be summarized as follows:

Phase 1 (Lagoons and Headworks Building): $24.5M

Phase 2 (Outfall): $3.0M

Phase 3 (MBBR): $6.9M

At this time, it is recommended to proceed with Phase 1 and 2 only, since additional treatment is not required at this time.

9.2 SCHEDULE

Based on the scope of work noted herein a preliminary schedule outlook is as follows:

Phase 1: Approximately 36 months of design, environmental approvals and construction.

Phase 2: Approximately 12 months of design, environmental approvals and construction

Phase 3: Approximately 12 months of design, environmental approvals and construction

It is noted that the following major components, having extended delivery times, could impact the construction schedule. However, based on the current schedule, major delays are not anticipated due to delivery timeframes.

- ✓ Aeration system and blowers;
- ✓ Floating baffle curtains;
- ✓ Screening system and washer compacter;
- ✓ Stop logs;
- ✓ Sluice gates;
- ✓ Air flow meters;
- ✓ UV System;
- ✓ Pumps;
- ✓ Various other building components and devices.

10. OTHER CONSIDERATIONS

Based on the above Sections, the following outlines other considerations related to the project, as follows:

The design parameters presented herein are based on the current National Effluent Limits. If the NB Department of Environment and Local Government confirms that more stringent effluent limits would be required the design parameters and lagoon sizing will require revision. Similarly, the final outfall location should be re-considered following the field investigation phase of the EIA Study.

APPENDIX A: GEOTECHNICAL INVESTIGATION
ENGLOBE CORP –April 2019

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Appendixes

1 Introduction

Englobe Corp (Englobe), at the request of Crandall Engineering, has carried out a geotechnical investigation for the proposed expansion of the existing waste water treatment facility (WWTF) at the Greater Shediac Sewerage Commission (GSSC) in Beaubassin-ouest, New Brunswick. The purpose of the investigation was to assess the subsurface conditions and to provide recommendations for foundations design and associated earthworks at the site.

This report presents the observations and geotechnical engineering recommendations associated with the geotechnical investigation of the site. Included herein are the factual results of the field investigation including discussion of field procedures, subsurface conditions, and recommendations for site development.

2 Site and Project Description

A new secondary WWTF is proposed for construction at the Greater Shediac Sewage Commission collection system site, located in Beaubassin-ouest, New Brunswick. The treatment system will include the construction of a new final treatment-disinfection building and a moving bed biofilm reactor (MBBR) treatment aeration facility. Finished floor elevations for the new treatment center are not known at this time however; the building is to include influent and effluent lift stations and as such, below-grade structures are anticipated.

The site of the new treatment facility will be located south of the existing blower building at the site. The MBBR aeration cell will be located to the east of the blower building and south of the existing waste water treatment lagoons. Currently the site is a grassed field with flat topography. Access to the site is from the GSSC driveway, extending west from Cap-Brulé Road.

3 Investigation Procedure

The field investigation was performed on December 17, 2018, with a total of five boreholes drilled at the locations as shown on Drawing No. 18411-1P-C02, prepared by Crandall Engineering Ltd. Three boreholes were located within the proposed treatment/disinfection building area, and two boreholes were located within the proposed MBBR treatment. The boreholes were drilled using a track-mounted drill rig supplied by Lantech Drilling Group of Dieppe, New Brunswick.

The investigation was supervised by geotechnical engineering personnel who logged the subsurface conditions encountered during the advancement of the boreholes. The boreholes were advanced using continuous flight solid stem augers with field sampling and testing performed in the open borehole. Standard Penetration Tests (SPT) were performed at regular intervals in the boreholes to obtain blow counts (i.e. N-values) using a 50-millimeter outside-diameter split barrel sampler in general accordance with American Society for Testing and Materials (ASTM) standard D1586 *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils.*

Following field sampling and visual description, overburden samples were placed in sample bags and transported to our laboratory for further examination and testing on select samples.

4 Subsurface Conditions

The subsurface conditions generally consist of topsoil followed by a gravelly sand fill deposit and/or silty sand deposit over sandstone bedrock. Fill was encountered in two boreholes to a depth of approximately 0.6 to 1.2 meters. The boreholes were drilled to depths ranging from 4.6 meters to 6.1 meters below the existing ground surface. Groundwater and bedrock were encountered in all the boreholes.

Details of the subsurface conditions encountered during the field investigation are provided on the Borehole Logs attached in Appendix B. An explanation of terms and symbols used in the report is provided in Appendix A. Soil gradation laboratory testing results on select soil samples obtained during the field investigation are attached in Appendix C.

Note that the stratigraphic boundaries on the Borehole Logs typically represent a transition of one soil type to another and do not necessarily indicate an exact plane of geologic change. Subsurface conditions may vary between and beyond the borehole locations.

4.1 Topsoil

Topsoil was encountered in boreholes 18BH-03, 18BH-04 and 18BH-05. The layer thickness ranged from approximately 100 to 200 millimeters. The layer consisted of a silty sand with some organics and trace silt. The layer was frozen at the time of the investigation program.

4.2 Fill

Fill was encountered below a topsoil layer in boreholes 18BH-03 and 18BH-05. The fill is described as gravelly sand with trace silt. The thickness ranged from approximately 600 to 1,200 millimeters. The in situ moisture condition was described as moist was frozen in the upper portion.

4.3 Residual Soil/Inferred Bedrock

Residual soil and bedrock was inferred in all of the boreholes advanced for this investigation. Bedrock was not cored using rock coring and diamond drilling methods and was inferred by drill rig performance, auger cuttings and recovered split-barrel samples. Due to the auger drilling method employ for this investigation, a definitive determination of the bedrock mass properties was not possible. The inferred surface of bedrock ranged from ground surface to approximately 1.2 meters below existing grade. It should be noted that the inferred bedrock may be highly weathered to the point of being classified as residual soil according to the International Society for Rock Mechanics (ISRM) terminology and therefore may be considered an intermediate geomaterial.

Laboratory gradation testing of two select residual soil/bedrock samples indicated a material with 0 to 1.4 percent gravel, 71.2 to 75.4 percent sand, and a fines (i.e. silt and clay sizes) content of 24.6 to 27.3 percent. Moisture content testing of select samples was 14 to 16 percent.

According to publicly available geologic mapping (Smith, 2007), bedrock in the area consists of grey to brownish red sandstone and intraformational mudstone-clast conglomerate of the Pictou Group which dates to the Late Carboniferous Period. Visual review of split-barrel samples

confirms the bedrock consists of brown sandstone. The inferred sandstone is near horizontally bedded and could be augured to the depths of exploration without refusal.

4.4 Groundwater

Groundwater was encountered in each borehole during the investigation program at depths ranging from approximately 3.0 to 3.7 meters below existing grade. It should be noted that groundwater levels can be expected to fluctuate during periods of heavy precipitation associated with seasonal weather trends or a particular event, site use, adjacent site use, and construction activity.

5 Discussion and Design Recommendations

5.1 General Discussion

The project involves the expansion of the existing GSSC facility to include the construction of a new secondary wastewater treatment facility, associated headworks and lift stations, final treatment/disinfection building and MBBR treatment units. The ground floor elevation for the proposed building was not provided but for reporting purposes, it was assumed to be near existing grade. The proposed lift stations are assumed to be located about 8 to 10 meters below finished floor grade.

Subsurface conditions in the area of the proposed development includes a thin layer of topsoil, nominal fill, followed by inferred residual soil/sandstone bedrock. The following paragraphs present a discussion of site development based on the observed subsurface conditions. The recommendations outlined in the following sections assume that planned construction will occur within the area of the boreholes advanced for this investigation. Additional design recommendations are provided in the subsections below.

5.2 Site Preparation, Excavation and Earthworks

To prepare the subgrade for the base for the proposed development, topsoil and existing fill should be completely removed from the building area defined as the zone extending downward and outward from exterior footings are an angle of one horizontal to one vertical (1H:1V). The inferred sandstone bedrock subgrade should be compacted with appropriate compaction equipment and effort to stabilize the subgrade and reduce the infiltration of water from precipitation or surface water flows.

In the case of the proposed lift stations, deeper excavations into the inferred sandstone bedrock will be required. We anticipate the inferred bedrock can be efficiently removed with large conventional excavation equipment. Hydraulic hoe-ramming may be required for deeper excavations. The contractor should familiarize themselves with the means and methods for bedrock removal, such as encountered at this site, prior to tender submission.

Following excavation to design subgrade levels, the prepared bearing surface should be evaluated by geotechnical personnel. To reduce subsequent subgrade softening following site preparation, we recommend placement of a lean concrete mud slab or a well-graded crushed rock with low fines content immediately following excavation. The mudslab should be a minimum of 75 millimeters in thickness; subject to construction methodology and conditions at time of excavation.

5.3 Engineered Fill

Unless otherwise specified, imported engineered fill should consist of well-graded, granular soil with a maximum particle size of 75 millimeters and a maximum of 10 percent passing the 75-micrometer sieve size, such as pit run or quarried rock fill. Imported sandstone may be used as engineered fill provided the maximum particle size is less than 200 millimeters prior to compaction. Existing fill and sandstone can be selectively reused as engineered fill as outlined in Section 5.4.

Unless otherwise specified, engineered fill should be placed in lifts not exceeding 300 millimeters in loose thickness and be compacted throughout the lift thickness to at least 98 percent of the standard Proctor maximum dry density as determined in accordance with ASTM D698 *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort*. Engineered fill compaction should be verified by means of in-place density testing using a nuclear density gauge in accordance with ASTM D6938 *Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods* (*Shallow Depth*).

5.4 Re-use of Existing Soil

Excavated site fill and residual soil/sandstone are considered suitable for re-use at the site as common material or, in some applications, as engineered fill. Topsoil is not suitable for reuse as engineered fill. The re-use of on-site soils will be contingent to a large extent on the condition after excavation, handling and stockpiling. Processing of site soils or bedrock may be required to create a suitable product.

Existing site soils may be selected for re-use provided particles larger than 200 millimeters are removed, the material is not frozen, and is free of roots, organics and other deleterious materials.

The existing site soils or bedrock are fine-grained and as such is moisture sensitive. The moisture content should be maintained within one to two percent of the optimum moisture content to achieve adequate compaction. Prior to re-use of site soils as structural fill, we recommend adequate laboratory testing of stockpiled soils and bedrock be performed to determine whether the soil moisture content will be appropriate to achieve the required compaction. Existing site soils will not readily compact if it exceeds the optimum moisture content and will only dry readily during warm and dry weather; therefore, re-use of existing soils or bedrock as engineered fill should be limited to late spring to early fall construction.

5.5 Soil and Rock Bearing Capacity

For the design of foundations by Limit States Design methods, the following factored bearing resistance values are recommended for this development:

Table 1 Limit States Design Parameters

LIMIT STATES DESIGN PARAMETER	ENGINEERED FILL	INFERRED BEDROCK
Factored Geotechnical Resistance at Ultimate Limit States (ULS)	300 kPa	700 kPa
Geotechnical Resistance at Serviceability Limit States (SLS)	250 kPa	275 kPa

The serviceability limit states (SLS) are based on a maximum total settlement of 25 millimeters and 19 millimeters differential settlement. A bearing resistance factor of 0.5 was applied to the factored values provided above. The SLS bearing pressures should resist the un-factored loads in accordance with the 2015 National Building Code of Canada (NBCC).

5.6 Interpreted Soil and Inferred Bedrock Parameters

Soil and inferred bedrock parameters recommended for design use are outlined in the following table. The parameters indicated have been summarized from laboratory and field testing and from known empirical correlations. The values indicated are provided as a guide and their specific use in design should be confirmed with the geotechnical engineer.

Table 2 Interpreted Soil and Bedrock Design Parameters

PARAMETER	STRUCTURAL FILL	EXISTING FILL/RESIDUAL SOIL	INFERRED BEDROCK
Bulk Unit Weight, kN/m3	21	20	21
Moisture Content, %	9	9	9
Effective Unit Weight, kN/m³	11	10	11
Soil Cohesion (C_u), kN/m³	0	0	0
Effective Angle of Internal Friction	32˚	28˚	36˚
Active Earth Pressure Coefficient, (K_a)	0.31	0.36	0.26
Passive Earth Pressure Coefficient, (K_p)	3.25	2.80	3.85

5.7 Seismic Considerations

The subsurface conditions encountered were reviewed in accordance with NBCC requirements. The Site Classification for Seismic Site Response is Site Class C provided foundations are constructed as discussed herein. Based on the existing subsurface conditions encountered in this investigation, the site is not susceptible to liquefaction in the event of an earthquake.

5.8 Slab-on-Grade Construction

During The site prepared as detailed herein is suitable for slab-on-grade construction. The slab can be designed using a modulus of subgrade reaction of 40 Megapascals per meter (MPa/m), valid for a 300-millimeter square plate, provided the recommendations below are followed.

A 150-millimeter thick layer of free-draining granular soil, such as 19-millimeter minus crushed rock with a maximum of 5 percent passing the 75-micron sieve, should be placed immediately beneath the floor slab for leveling purposes and to provide capillary break. The crushed rock should be compacted to a minimum of 98 percent of the corrected maximum dry density, as determined in accordance with ASTM D698. The slab-on-grade should be separated from load bearing walls and/or columns to reduce potential cracking.

In the event a subfloor depressurization system is required for the control of radon gas, we recommend the free draining granular material be selected in accordance with applicable NBCC requirements.

5.9 Waterproofing and Drainage

Foundation sealant should be applied to below-grade structure walls. To prevent adfreeze forces against exterior foundation walls, we recommend the use of a bond breaker, such as corkboard, foam insulation or plastic sheeting.

To prevent the buildup of hydrostatic forces on lift station foundation walls or other below grade structures, foundation drainage should be provided. Backfill adjacent to walls may consist unless non-frost susceptible fill is specified as backfill adjacent to exterior foundation walls such as 75-millimeter minus or 31.5-millimeter minus crushed rock or pit run gravel. Alternatively, drainage mat systems may be installed on concrete foundation walls and connect to the perimeter drainage system.

5.10 Underground Services

New underground services should be in free-draining granular material such as 19-millimeter minus well-graded gravel for a minimum thickness of 150 millimeters below the pipe and 300 millimeters above the pipe; subject to pipe diameter. The bedding should be compacted in-place to 95 percent standard Proctor maximum dry density. The remainder of the service trench can be backfilled with select on-site or imported soils to a minimum 95 percent standard Proctor maximum dry density percent. The reuse of on-site soils as trench backfill will be contingent to a large extent on the condition of the materials after excavation, handling and stockpiling. Services should be placed a minimum of 1.8 meters below finished grade for frost protection unless permanent insulation is provided.

6 Construction Considerations

The following comments on specific construction aspects of the project are provided for the guidance of designers. The contractor undertaking the work should make their own interpretation of the factual information provided in this report as it affects their construction procedures and scheduling.

6.1 Earthwork in Wet and Cold Environments

Approved native soil and bedrock subgrades will be susceptible to softening in the presence of water and construction traffic; therefore, excavations should be maintained in a dry condition. Subgrade surfaces disturbed or softened during construction should be over-excavated and replaced with structural fill meeting the requirements of Section 5.3 and/or 5.4.

Footing excavations should be maintained in a dry condition and protected if the weather forecast calls for precipitation. Wherever possible, surface runoff should be directed away from excavations by ditching and/or pumping.

For winter construction, the potential exists for the onset of frost if exposed subgrade soils are not insulated during cold weather construction. Frost can occur in fine-grained soils due to expansion of water during the freezing process and during seasonal thaw, producing displacement. In addition, the compaction effort applied to frozen soil cannot be accurately verified with a nuclear density gauge. Proof-rolling inspection of frozen soil may suggest subgrades are temporarily stable but still soften during seasonal thaw.

During cold-weather construction, fill imported to the site should be newly quarried, and placed and compacted immediately following delivery to the site. Compaction testing and proof-rolling activities should be completed immediately following the initial compactive effort. Failing areas should be remediated or removed before the onset of frost.

Fill should not be placed on frozen, or snow and ice-covered subgrades. In excavations, subgrade surfaces should be covered with insulating blankets or heated tarps if the forecast calls for below freezing conditions.

6.2 Temporary Excavations

Excavations in existing site soils are expected to remain temporarily stable at side slopes of 1H:1V while, long-term stability, can be achieved at 3H:1V for these soils. Excavations within the bedrock are expected to remain temporary stable at side slopes of 1H:3V in sandstone and 1H:2V in siltstone/mudstone. Excavations below the water table and in saturated conditions may require flattening of the slopes.

Safe excavation slopes are the responsibility of the earthworks contractor. As a minimum, temporary excavations must be sloped in accordance with the applicable New Brunswick Occupational Health and Safety Guidelines. If an excavation cannot be properly sloped or benched, the contractor should install an engineered shoring system to safely support the temporary excavation. Temporary slopes should be protected from surface-runoff erosion by means of berms and swales located along the top of the slope and by means of plastic sheeting placed over the slope

Excavation slopes should be checked regularly for signs of instability and flattened as required. Soil stockpiles should not be located within 1.5 times the height of the excavation depth to avoid surcharging the excavation walls.

6.3 Dewatering

Periodic construction dewatering will be required, particularly in deep excavations for lift station construction, to maintain excavations in a dry condition. Dewatering may be accomplished by using submersible pumps. Pumps should be located sufficiently deep to lower groundwater levels a minimum of 600 millimeters below subgrade elevation. Water pumped from excavations is expected to contain fine-grained soils and will require care in disposal. Provision for proper site drainage in accordance with applicable municipal, provincial, and federal environmental requirements should be made at the construction stage.

6.1 Materials Testing and Inspection

During construction of the proposed facility we recommend a geotechnical engineering firm be retained by the owner and/or the contractor to provide on-going consultation, confirm these recommendations are followed, and ensure the materials used during construction meet specifications. Englobe can provide these services if requested.

7 Closure

The geotechnical investigation undertaken herein has involved random sampling of site conditions. Should conditions be encountered during constructions that are contrary to those reported herein, we request immediate notification so that reassessment can be undertaken.

8 References

Smith, E.A. (complier) 2007. Bedrock geology of the Port Elgin area (NTS 21 I/O), Westmorland County, New Brunswick. New Brunswick Department of Natural Resources, Minerals, Policy and Planning Division, Plate 2007-47.

AERATED CELL #1

AERATED CELL #2

POLISHING CELL

P.T. BLDG.

SCREW PUMP L.S.

BLOWER BLDG.

GARAGE

18 BH-01
2655433.921
7471764.874
ELEV.:6.850m

18 BH-02
2655445.871
7471781.231
ELEV.:6.410m

18 BH-03
2655471.447
7471768.974
ELEV.:7.130m

18 BH-04
2655516.075
7471807.705
ELEV.:6.410m

18 BH-05
2655555.667
7471807.705
ELEV.:7.510m

LEGEND:

BOREHOLE (BH)

NOTES

NO.	DATE	REVISIONS	BY	APPR.
A.1	APR/12/19	ISSUED FOR BOREHOLE LOCATIONS REVISED	BW	CM
A.0	FEB/22/19	ISSUED FOR BOREHOLE LOCATIONS	BW	CM

crandall
A DIVISION OF ENGLOBE

PROJECT TITLE

SHEDIAC EAST LONG-TERM WASTEWATER MANAGEMENT STAREGY

SHEDIAC N.B.

DRAWING TITLE

BOREHOLE LOCATION PLAN

Scale
5m 0 10m
(1:500 FULL SCALE)

Drawn By	Design By
BW	CM
Checked By	Cadd Check
BW	BW

Sheet 1 of 1

File Name
18411-1P-C02.DWG

Drawing No.
18411-1P-C02

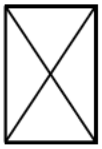
O:\18411-00-C\CADD\DESIGN\PRESENTATION DWGS\18411-1P-C02.DWG, 12/04/2019 4:48 PM

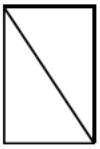
Appendix A Terms and Symbols

SOIL SAMPLES

CONDITION – This column graphically indicates the depth and condition of the sample:

 undisturbed

 disturbed

 not recovered

TYPE – The type of sample is indicated in this column as follows:

A auger sample
B block sample
C rock core, or frozen soil core
D drive sample
G grab sample
SS split spoon
P Pitcher tube sample
U tube sample (usually thin-walled)
W wash or air return sample
O other (see report text)

PENETRATION RESISTANCE – Unless otherwise noted this column refers to the number of blows (N) of a 140 pound (63.5 kg) hammer freely dropping 30 inches (0.76 m) required to drive a 2 inch (50.8 mm) O.D. open-end sampler 0.5 feet (0.15 m) to 1.5 feet (0.45 m) into the soil, or until 100 blows have been applied, in which case, the penetration is stated. This is the standard penetration test referred to in ASTM D 1586.

OTHER TESTS

In this column are tabulated results of other laboratory tests as indicated by the following symbols:

*C	Consolidation test
Fines	Percentage by weight smaller than #200 sieve
D_R	Relative density (formerly specific gravity)
k	Permeability coefficient
*MA	Mechanical grain size analysis and hydrometer test (if appropiate)
pp	Pocket pentrometer strength
*q	Triaxial compression test
q_U	Unconfined compressive strength
*SB	Shearbox test
SO_4	Concentration of water-soluble sulphate
*ST	Swelling test
TV	Torvane shear strength
VS	Vane Shear Strength (undistrubed-remolded)
ε_f	Unit strain at failure
γ	Unit weight of soil or rock
γ_d	Dry unit weight of soil or rock
ρ	Density of soil or rock
ρ_d	Dry density of soil or rock

* The results of these tests usually are reported separately

SYMBOLS AND TERMS USED ON THE BOREHOLE AND TEST PIT RECORDS

SOIL DESCRIPTION

Behavioural properties (i.e. plasticity, permeability) take precedence over particle gradation in describing soils.

Terminology describing soil structure:

Desiccated	- having visible signs of weathering by oxidation of clay minerals, shrinkage cracks etc.
Fissured	- having cracks, and hence a blocky structure
Varved	-composed of regular alternating layers of silt and clay
Stratified	- composed of alternating layers or different soil types, e.g. silt and sand or silt and clay
Well Graded	- having wide range in grain sizes and substantial amounts of all intermediate particle sizes
Uniformly Graded	- predominantly of one grain size.

Terminology used for describing soil strata based upon the proportion of individual particle size present:

Trace, or occasional	Less than 10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. silt and sand)	35-50%

The standard terminology to describe cohesionless soils includes the relative density, as determined by laboratory test or by the Standard Penetration Test 'N' - value: the number of blows of 140 pound (64 kg) hammer falling 30 inches (760 mm), required to drive a 2 inch (50.8 mm) O.D. split spoon sampler one foot (305 mm) into the soil.

Relative Density	'N' Value	Relative Density %
Very loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe cohesive soils includes the consistency, which is based on undrained shear strength as measured by insitu vane tests, penetrometer tests, unconfined compression test, or occasionally by standard penetration tests.

Consistency	Undrained Shear Strength		'N' Value
	Kips/sq ft.	kPa	
Very Soft	<0.25	<12.5	<2
Soft	0.25-0.5	12.5-25	2-4
Firm	0.5-1.0	25-50	4-8
Stiff	1.0-2.0	50-100	8-15
Very Stiff	2.0-4.0	100-200	15-30
Hard	>4.0	>200	>30

SOIL CLASSIFICATION SYSTEM (MODIFIED U.S.C.)

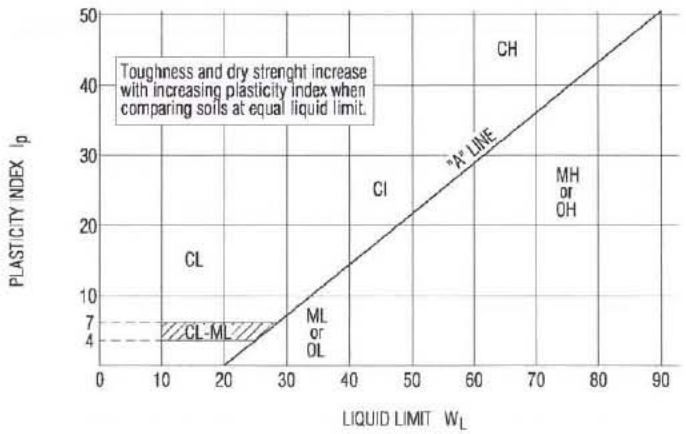
MAJOR DIVISION			GROUP SYMBOL	GRAPHIC SYMBOL	COLOR CODE	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
HIGHLY ORGANIC SOILS			Pt		ORANGE	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOR OR ODOR, AND OFTEN FIBROUS TEXTURE	
COARSE-GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN NO. 200 SIEVE SIZE)	GRAVELS MORE THAN HALF COARSE FRACTION LARGER THAN NO.4 SIEVE SIZE	CLEAN GRAVELS	GW		RED	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, <5% FINES	$Cu = \frac{D_{60}}{D_{10}} > 4$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			GP		RED	POORLY-GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, <5% FINES	NOT MEETING ALL ABOVE REQUIRMENTS	
		DIRTY GRAVELS	GM		YELLOW	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$	
			GC		YELLOW	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE OR $I_p > 7$	
	SANDS MORE THAN HALF COARSE FRACTION SMALLER THAN NO.4 SIEVE SIZE	CLEAN SANDS	SW		RED	WELL-GRADED SANDS, GRAVELLY SANDS, <5% FINES	$Cu = \frac{D_{60}}{D_{10}} > 6$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			SP		RED	POORLY-GRADED SANDS, OR GRAVELLY SANDS, <5% FINES	NOT MEETING ALL ABOVE REQUIRMENTS	
		DIRTY SANDS	SM		YELLOW	SILTY SANDS, SAND-SILT MIXTURES >12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$	
			SC		YELLOW	CLAYEY SANDS, SAND-CLAY MIXTURES >12% FINES	ATTERBERG LIMITS ABOVE "A" LINE OR $I_p > 7$	
FINE - GRAINED SOILS (MORE THAN HALF BY WEIGHT PASSES NO.200 SIEVE SIZE)	SILTS BELOW "A" LINE ON PLASTICITY CHART; NEGLIGIBLE ORGANIC CONTENT		ML		GREEN	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	$W_L < 50$	SEE CHART BELOW
			MH		BLUE	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	$W_L > 50$	
	CLAYS ABOVE "A" LINE ON PLASTICITY CHART; NEGLIGIBLE ORGANIC CONTENT		CL		GREEN	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	$W_L < 30$	
			CI		GREEN-BLUE	INORGANIC CLAYS OF MEDIUM PLASTICITY SILTY CLAYS	$W_L > 30, < 50$	
			CH		BLUE	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	$W_L > 50$	
	ORGANIC SILTS & ORGANIC CLAYS BELOW "A" LINE ON PLASTICITY CHART		OL		GREEN	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$	
			OH		BLUE	ORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$	

FILL TILL BEDROCK

1. All sieve sizes mentioned on this chart are U.S. Standard, ASTM E11.
2. Boundary classifications possessing characteristics of two groups are given combined group symbols eg GW-GC is a well-graded gravel-sand mixture wtih clay binder between 5% and 12%.
3. Soil fractions and limiting textural boundaries are in accordance with the Unified Soil Classification System, except that an inorganic clay of medium plasticity (CI) is recognized.
4. The following adjectives may be employed to define percentage ranges by weight of minor components:

and	50 - 36%
gravelly, sandy, silty, clayey, ect.	35 - 21%
some	20 - 11%
trace	10 - 1%

PLASTICITY CHART



Englobe

Appendix B Borehole Logs

BOREHOLE LOG

PROJECT
New Treatment Facility
Greater Shediac Sewage Commission

LOGGED/DWN. KM	CKD. CSM	DATE OF INVEST. 17/12/18	JOB NO. P-0016110-0-25	HOLE NO. 18BH-01

CASING RESISTANCE blows/300mm ▲

WC % wp-□ w-● wl-△
10 20 30 40 50

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM Geodetic

SURFACE ELEVATION 6.850 meters

SOIL SAMPLE

COND.	TYPE	PENE. RESIST.
	SS	N=52
	SS	N=50/125
	SS	N=50/25
	SS	N=50/50
	SS	N=50/0

DRILL TYPE
Track Mounted Drill Rig

OTHER TESTS

RESIDUAL SOIL: Very dense gravelly sand, trace silt, moist

Inferred Sandstone BEDROCK

End of Borehole at 4.6m
Water encountered at 3.0m

▽ Water level at 3.0m

ft	m
1	
2	
3	1
4	
5	
6	2
7	
8	
9	
10	3
11	
12	
13	4
14	
15	
16	5
17	
18	
19	
20	6

BOREHOLE LOG

PROJECT
New Treatment Facility
Greater Shediac Sewage Commission

LOGGED/DWN. KM	CKD. CSM	DATE OF INVEST. 17/12/18	JOB NO. P-0016110-0-25	HOLE NO. 18BH-02

CASING RESISTANCE blows/300mm ▲

WC % wp- □ w- ● wl- △
10 20 30 40 50

DEPTH ft m

MODIFIED USCS

SOIL SYMBOL

SOIL DESCRIPTION

DATUM Geodetic

SURFACE ELEVATION 6.410 meters

SOIL SAMPLE

DRILL TYPE: Track Mounted Drill Rig

OTHER TESTS

Depth (ft)	Depth (m)	Soil Description	COND.	TYPE	PENE. RESIST.	OTHER TESTS
0	0	RESIDUAL SOIL: Compact to very dense silty sand, trace gravel, moist - Ground frozen to approximately 300mm				
2				SS	N=10	Sieve/Moisture
3	1			SS	N=50/75	
5		Inferred Sandstone BEDROCK		SS	N=50/100	Moisture
8				SS	N=50/75	
10	3			SS	N=50/0	Moisture
15				SS	N=50/25	
		End of Borehole at 4.6m Water encountered at 3.0m				

BOREHOLE LOG

PROJECT
New Treatment Facility
Greater Shediac Sewage Commission

LOGGED/DWN. KM	CKD. CSM	DATE OF INVEST. 17/12/18	JOB NO. P-0016110-0-25	HOLE NO. 18BH-03

DRILL TYPE: Track Mounted Drill Rig

OTHER TESTS

CASING RESISTANCE blows/300mm

WC % wp- □ w- ● wl- △ (10 20 30 40 50)

DATUM Geodetic

SURFACE ELEVATION 7.130 meters

DEPTH ft	DEPTH m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION	SOIL SAMPLE COND.	TYPE	PENE. RESIST.
0	0			TOPSOIL			
1				FILL: Gravelly sand, trace silt, moist		SS	N=20
2				Inferred weathered BEDROCK: Very dense to compact silty sand, trace gravel, moist			
3	1					SS	N=23
4							
5							
6	2					SS	N=53
7							
8							
9							
10	3						
11						SS	N=50/75
12						SS	N=50/50
				Inferred Sandstone BEDROCK			
13	4						
14							
15						SS	N=50/25
16	5						
17							
18							
19							
20	6					SS	N=50/0
				End of Borehole at 6.1m Water encountered at 3.7m			

BOREHOLE LOG

PROJECT
New Treatment Facility
Greater Shediac Sewage Commission

LOGGED/DWN. KM	CKD. CSM	DATE OF INVEST. 17/12/18	JOB NO. P-0016110-0-25	HOLE NO. 18BH-04

DRILL TYPE: Track Mounted Drill Rig

DATUM Geodetic

SURFACE ELEVATION 6.410 meters

CASING RESISTANCE blows/300mm

WC % wp- □ w- ● wl- △ (10 20 30 40 50)

DEPTH ft	DEPTH m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION	COND.	TYPE	PENE. RESIST.	OTHER TESTS
1				TOPSOIL				
				RESIDUAL SOIL: Compact gravelly sand, trace silt, moist		SS	N=13	
3	1			RESIDUAL SOIL: Very dense silty SAND, moist		SS	N=52	Sieve/Moisture
5						SS	N=50/25	Moisture
8	2			Inferred Sandstone BEDROCK		SS	N=50/0	
10						SS	N=50/0	
15	4					SS	N=50/0	Moisture
				End of Borehole at 4.6m Water encountered at 3.0m				
20	6							

BOREHOLE LOG

PROJECT
New Treatment Facility
Greater Shediac Sewage Commission

LOGGED/DWN. KM	CKD. CSM	DATE OF INVEST. 17/12/18	JOB NO. P-0016110-0-25	HOLE NO. 18BH-05

DRILL TYPE: Track Mounted Drill Rig

OTHER TESTS

CASING RESISTANCE blows/300mm

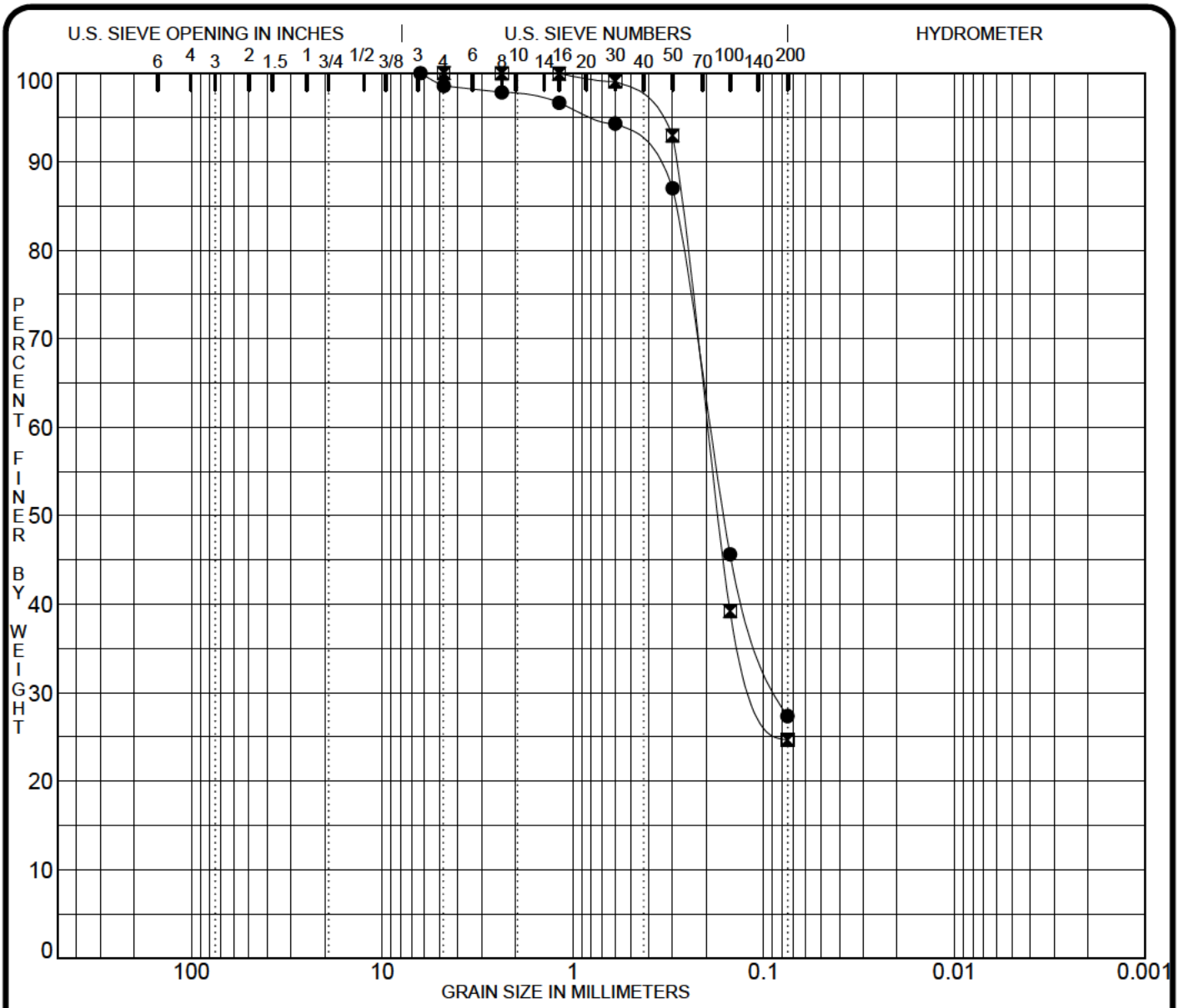
WC % wp- □ w- ● wl- △ (10 20 30 40 50)

DATUM Geodetic

SURFACE ELEVATION 7.510 meters

DEPTH ft	DEPTH m	MODIFIED USCS	SOIL SYMBOL	SOIL DESCRIPTION	SOIL SAMPLE COND.	TYPE	PENE. RESIST.
0	0			TOPSOIL			
1				FILL: Gravelly sand, trace silt, moist		SS	N=19
2							
3	1					SS	N=8
4				RESIDUAL SOIL: Compact gravelly sand, trace silt, moist			
5							
6	2					SS	N=11
7							
8							
9							
10	3			Inferred weathered BEDROCK: Very dense silty sand, some gravel, moist		SS	N=50/75
11							
12							
13	4						
14				Inferred Sandstone BEDROCK		SS	N=50/0
15							
16							
17	5						
18							
19							
20	6					SS	N=50/0
				End of Borehole at 6.1m Water encountered at 3.7m			

Appendix C Laboratory Test Results



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● 18BH-02	1.1m	**Silty SAND, trace gravel**	**15**					
⊠ 18BH-04	0.9m	**Silty SAND**	**15**					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● 18BH-02	1.1m	**6.30**	**0.19**	**0.083**		**1.4**	**71.2**	**27.3**	
⊠ 18BH-04	0.9m	**4.75**	**0.20**	**0.097**		**0.0**	**75.3**	**24.7**	

PROJECT New Treatment Facility - Greater Shediac Sewage Commission

JOB NO. P-0016110-0-25

DATE 16/4/19

GRADATION CURVES

Englobe

APPENDIX B: PRELIMINARY DESIGN DRAWINGS

GREATER SHEDIAC SEWERAGE COMMISSION
COMMISSION DES ÉGOUTS SHEDIAC ET BANLIEUES

PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

PRELIMINARY ONLY
DATE PLOTTED: Sep 10, 2019
NOT TO BE USED FOR CONSTRUCTION

SHEDIAC, N.B.

PROJECT No. 18411-1

ISSUED FOR CLIENT REVIEW

LIST OF DRAWINGS

crandall
A DIVISION OF ENGLOBE

MONCTON
1077 boul. St. George Blvd.
Suite 400
Moncton, N.B. Canada
E1E 4C9
Tel: (506) 857-2777
Fax: (506) 857-2753

SAINT JOHN
133 Prince William Street
Suite 703
Saint John, N.B. Canada
E2L 2B5
Tel: (506) 693-5893
Fax: (506) 693-3250

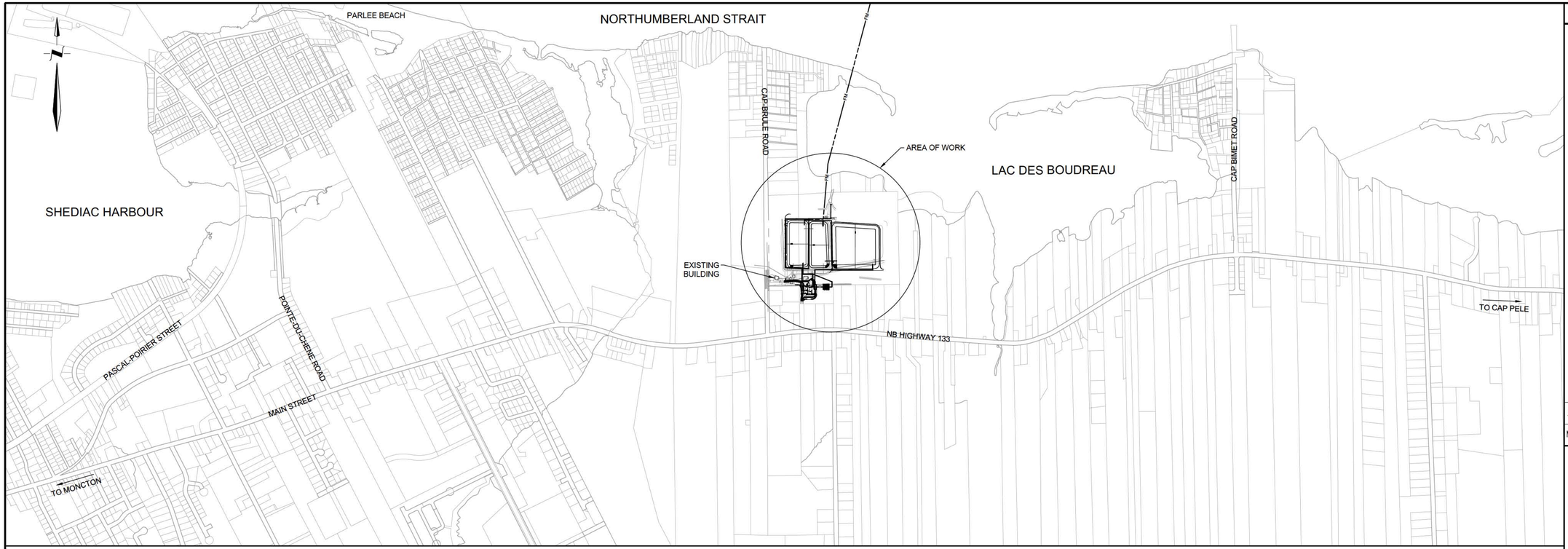
FREDERICTON
564 Prospect Street
Suite 101
Fredericton, N.B. Canada
E3B 9M3
Tel: (506) 451-4400
Fax: (506) 693-3250

CRANDALLENGINEERING.CA

Client: GREATER SHEDIAC SEWERAGE COMMISSION

Project: PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

PROJECT No. 18411-1



CONTROL POINT (m)				
POINT No.	LOCATION	NORTHING	EASTING	ELEV.
5534	HWY NO.15	7469642.371	2654563.596	44.870

GENERAL LEGEND

ITEM	EXISTING	NEW
R.O.W.		
WATER MAIN	W	W
SANITARY SEWER	S	S
SEWER PRESSURE PIPE	FM	FM
STORM SEWER	ST	ST
SANITARY MANHOLE		
STORM MANHOLE		
CATCH BASIN		
SLUICE BOX		
VALVE		
FIRE HYDRANT		
CURB STOP		
BENDS		
TEE		
CAP OR PLUG		
REDUCER		
SLEEVE OR COUPLING		
UTILITY POLE		
TREE		
WELL		
BOREHOLE		
ASPHALT DRIVEWAY	A	
GRAVEL DRIVEWAY	G	
FENCE		
CULVERT		
TREE LINE		
GUIDE RAIL		
RAILROAD		
EROSION CONTROL STRUCTURE		TYPE "A" TYPE "B" TYPE "C"
WATERCOURSE		
LEFT DITCH		
RIGHT DITCH		
WETLAND		
SILT FENCING		
LIMIT OF CONTRACT		L.O.C.
LIMIT OF GRADING		L.O.G.
LIMIT OF PAVING		L.O.P.
LIMIT OF WORK		L.O.W.
NOT IN CONTRACT		N.I.C.

NOTES

NO.	DATE	REVISIONS	BY	APPR.
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GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

crandall
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PRELIMINARY ONLY
DATE PLOTTED: Sep 10, 2019
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PROJECT TITLE

PRELIMINARY DESIGN -
CAP-BRULE WASTE WATER
TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

LOCATION PLAN AND LEGEND

Scale	Drawn By	Design By
100m 0 200m (1:10 000 FULL SCALE)	SML	LEL
	Checked By	Cadd Check
	CG	TWA
	Sheet 1 of 25	

File Name
18411-1D-CVR-C01.DWG

Drawing No.
18411-1D-C01

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NORTHUMBERLAND STRAIT

PROPOSED FORCEMAIN DISCHARGE TO NORTHUMBERLAND STRAIT

PROPOSED NEW 600mm Ø FORCEMAIN

LAC DES BOUDREAU

EXISTING UV BUILDING

EXISTING WWTF DISCHARGE OUTLET

AERATED LAGOON NO.1

NEW AERATED CELL NO.1A

NEW AERATED CELL NO.1B

AERATED LAGOON NO.2

NEW AERATED CELL NO.2A

NEW AERATED CELL NO.2B

AERATED LAGOON NO.3

NEW AERATED CELL NO.3A

NEW AERATED CELL NO.3B

MBBR

WWTF

PROPOSED HEADWORKS, UV BUILDING

EXISTING BLOWER BUILDING

EXISTING PRE-TREATMENT BUILDING

HEAD OFFICE

WWTF ENTRANCE

CAP-BRULE ROAD

TOWARDS ROUTE NO. 133

NOTES

LEGEND

- PHASE NO.1 - WWTP, LAGOON AND UNDERGROUND INFRASTRUCTURE
- PHASE NO.2 - FORCEMAIN AND DISCHARGE
- PHASE NO.3 - MBBR SYSTEM

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GREATER SHEDIAC SEWERAGE COMMISSION
COMMISSION DES ÉGOUTS SHEDIAC ET BANLIEUES

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PROJECT TITLE

PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

OVERALL PLAN AND PHASING

Scale
20m 0 40m
(1:2000 FULL SCALE)

Drawn By	Design By
SML	LEL
Checked By	Cadd Check
CG	TWA

Sheet 2 of 25

File Name
18411-1D-C02.DWG

Drawing No.
18411-1D-C02

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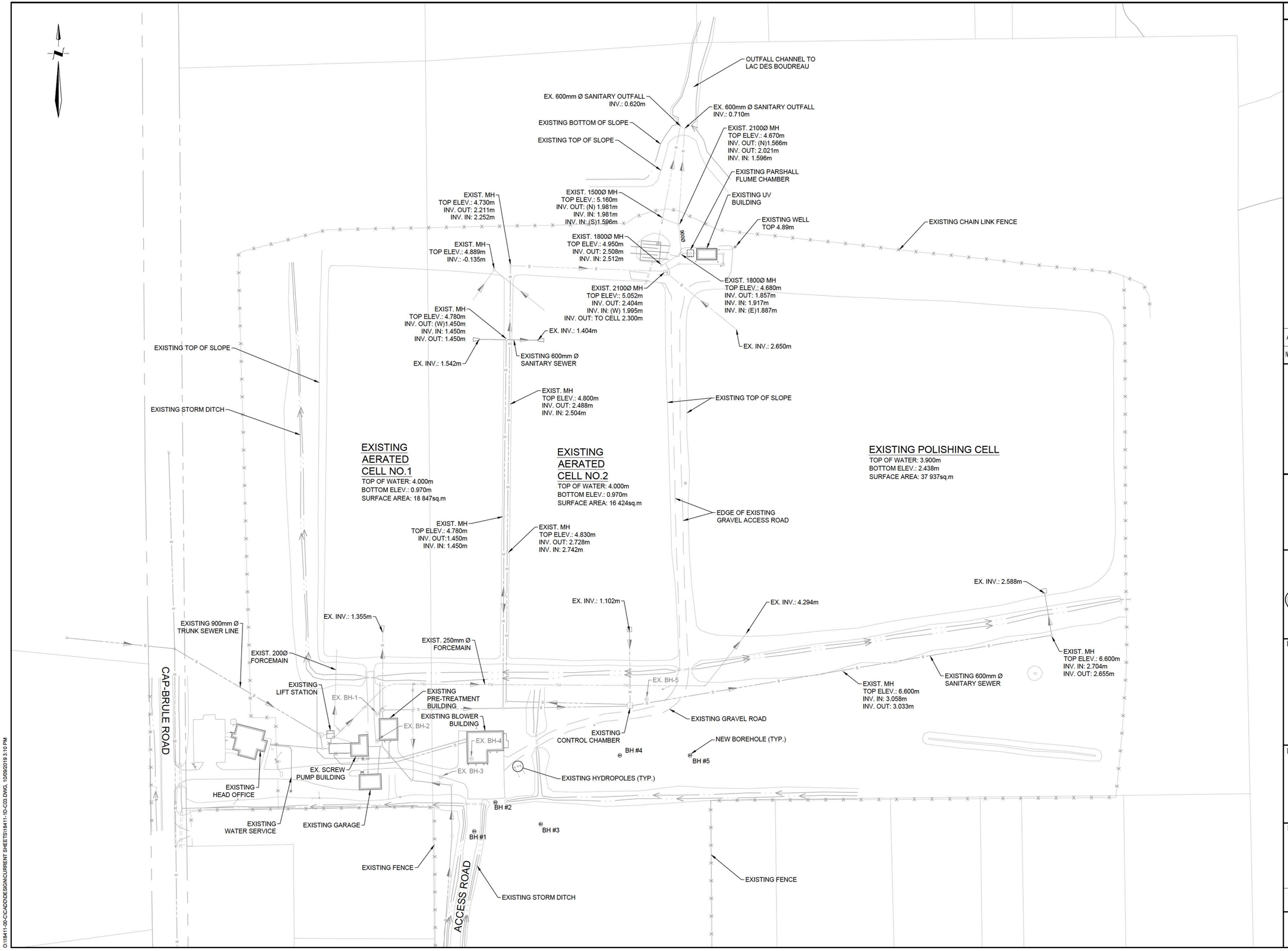

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NOTES

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GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUE

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PROJECT TITLE

PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

EXISTING CONDITIONS

Scale	Drawn By	Design By
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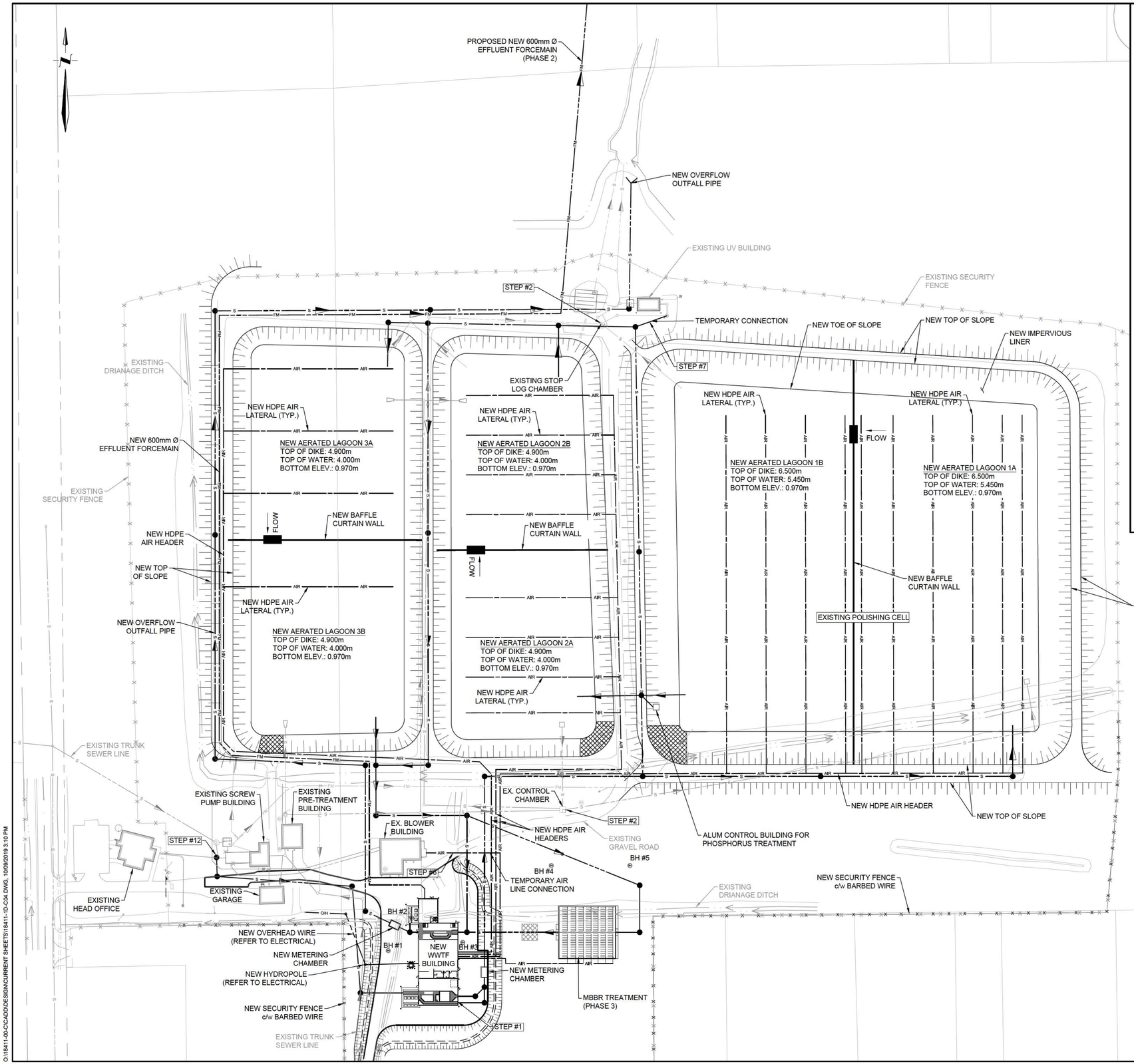
	CG	TWA
	Sheet 3 of 25	

File Name
18411-1D-C03.DWG

Drawing No.
18411-1D-C03



CONSTRUCTION AND DECOMMISSIONING SEQUENCE

PHASE 1

1. BEGIN CONSTRUCTION OF NEW WWTF BUILDING AND WET WELLS.
2. PLUG CONTROL CHAMBER NO.1 OUTLET TO EXISTING POLISHING CELL AND BY-PASS FLOWS THROUGH EXISTING 600mm Ø PIPE BETWEEN EXISTING CELL NO.1 AND CELL NO.2.
3. PLUG INLET FROM POLISHING CELL AT STOP LOG CHAMBER.
4. DRAIN POLISHING CELL AND REMOVE SLUDGE.
5. INSTALL NEW SANITARY PIPING AND AIR PIPING AROUND PERIMETER OF NEW AERATED LAGOON NO.1.
6. CONSTRUCT NEW AERATED LAGOON NO.1 BERMS AND LINER.
7. TEMPORARILY CONNECT NEW AIR PIPING TO EXISTING BLOWER PIPING NEAR EXISTING BLOWER BUILDING.
8. TEMPORARILY CONNECT NEW AERATED LAGOON NO.1 SANITARY PIPING TO INLET OF EXISTING UV BUILDING.
9. BY-PASS ALL FACILITY FLOWS TO NEW AERATED LAGOON NO.1.
10. CONSTRUCT NEW AERATED LAGOON NO.2 AND NO.3.
11. INSTALL SANITARY AND FUTURE FORCEMAIN PIPING BENEATH NEW BERMS.
12. COMPLETE AND COMMISSION NEW HEADWORKS BUILDING.
13. CONNECT NEW INFLUENT SANITARY PIPING TO EXISTING TRUNK SEWER. ALL NEW SANITARY SEWER IS TO BE COMPLETED AT THIS TIME.
14. DECOMMISSIONING AND DEMOLITION OF EXISTING BUILDING AND STRUCTURES TO BE REMOVED.
15. FLOW = TRUNK SEWER ==> NEW PRE-TREATMENT ==> AERATED LAGOON NO.1 ==> NEW AERATED LAGOON NO.2 ==> NEW AERATED LAGOON NO.3 ==> NEW UV ==> GRAVITY DISCHARGE BY NEW OVERFLOW TO EXISTING DISCHARGE LOCATION.

PHASE 2

16. DIRECTIONAL DRILL TO NORTHUMBERLAND STRAIT FOR NEW PUMPED OUTFALL CONNECTION.

PHASE 3

17. INSTALL NEW MBBR TREATMENT SYSTEM AND CONNECT TO EXISTING CHAMBERS.

NOTES

NO.	DATE	REVISIONS	BY	APPR.
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GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUE

crandall
A DIVISION OF ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Sep 10, 2019
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

CONSTRUCTION AND DECOMMISSIONING SEQUENCE

Scale	Drawn By	Design By
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	Checked By	Cadd Check
	CG	TWA
	Sheet 4 of 25	

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18411-1D-C04.DWG

Drawing No.
18411-1D-C04

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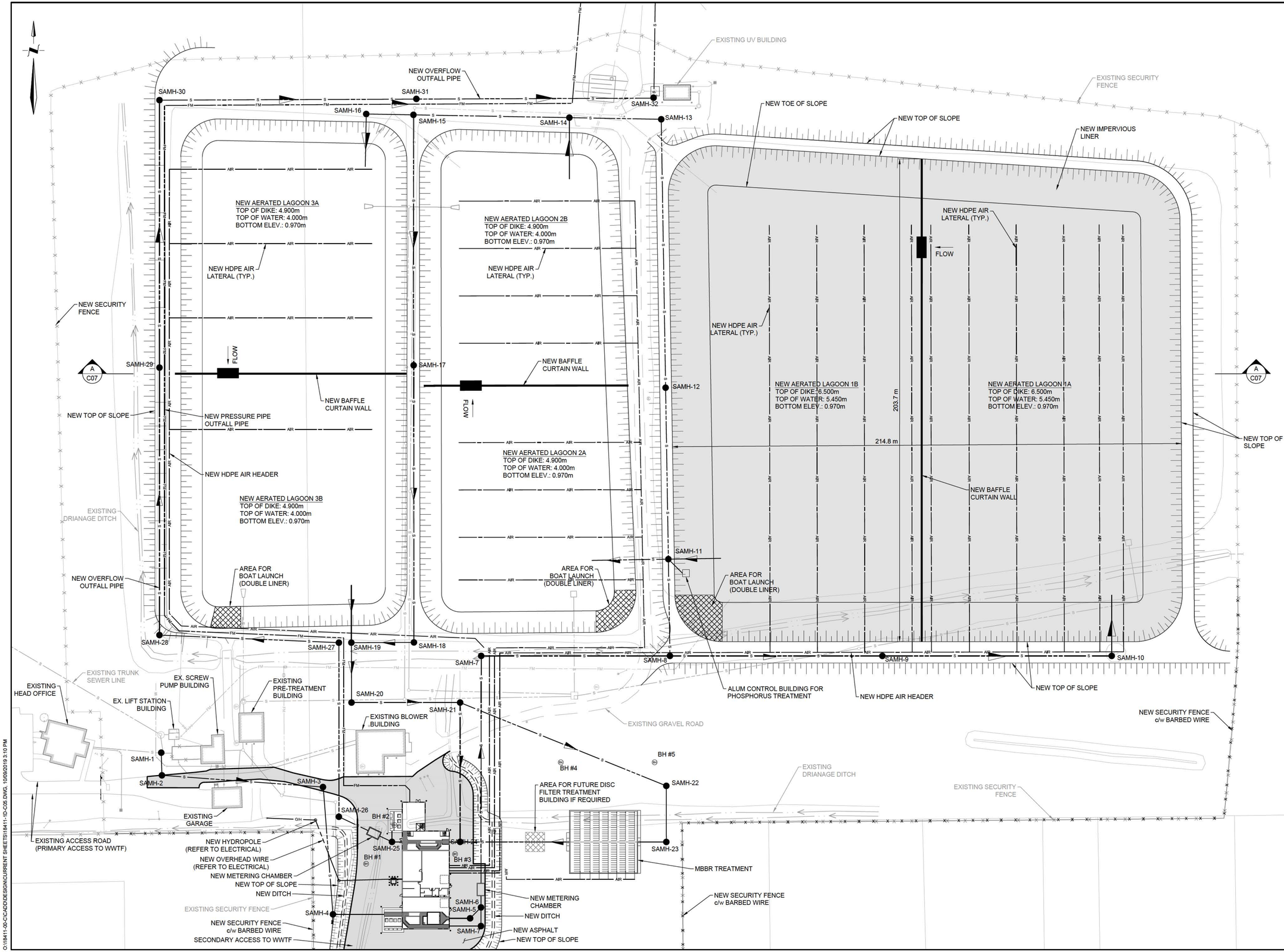

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DRAWING TITLE

OVERALL SITE PLAN

Scale	Drawn By	Design By
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	Checked By	Cadd Check
	CG	TWA
	Sheet 5 of 25	

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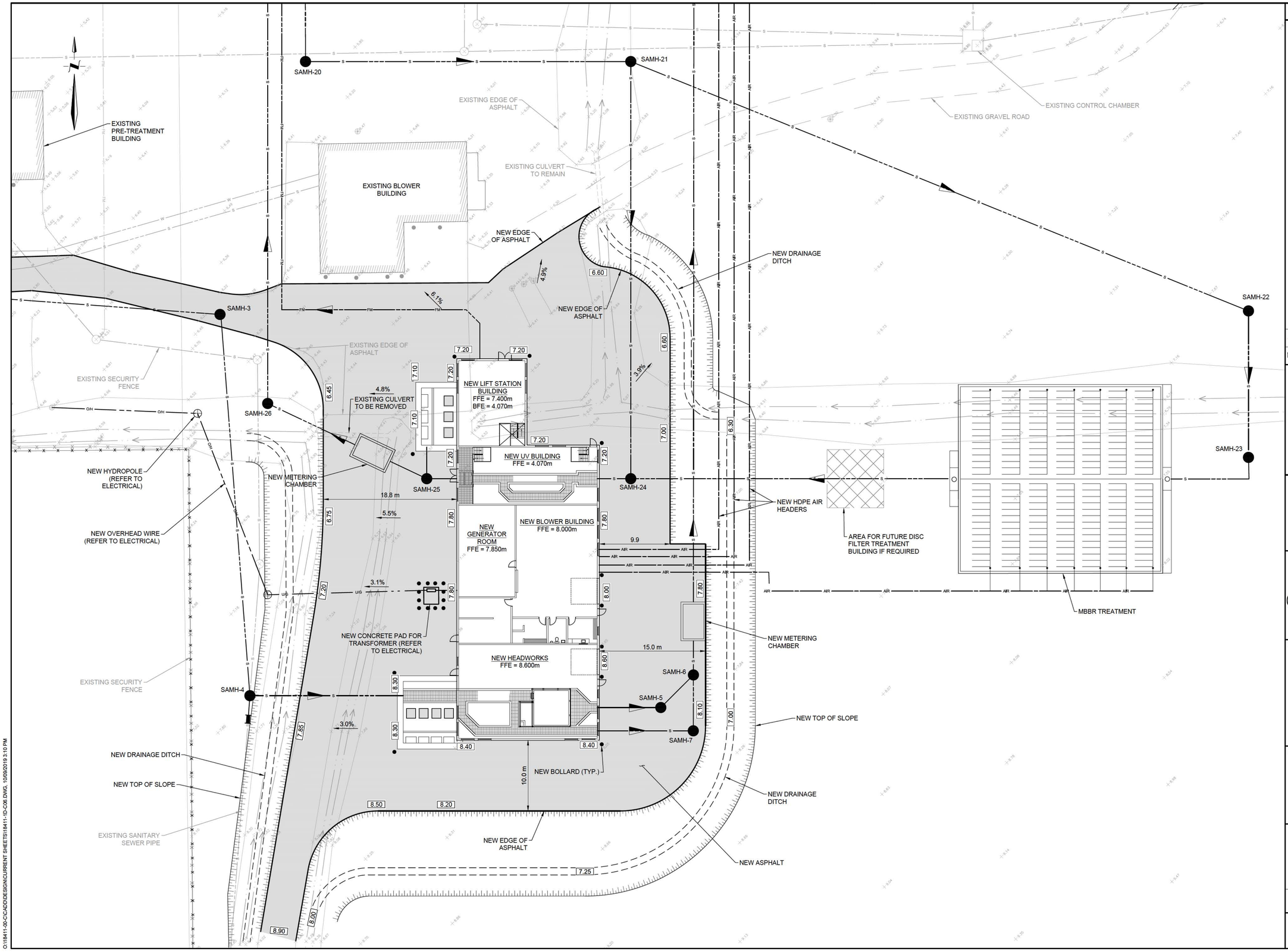

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NOTES

NO.	DATE	REVISIONS	BY	APPR.
A.0	SEPT 11/19	ISSUED FOR CLIENT REVIEW	SML	CG

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

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PROJECT TITLE

PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

WWTF SITE PLAN

Scale	Drawn By	Design By
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	Checked By: CG	Cadd Check: TWA
	Sheet 6 of 25	

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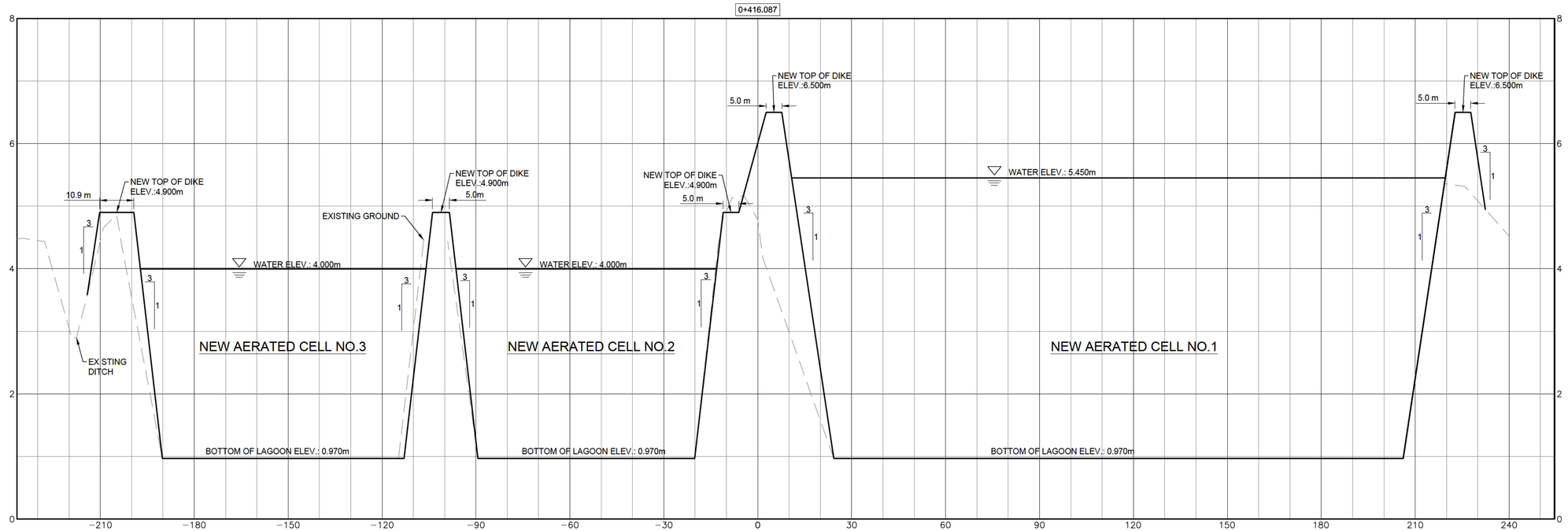

A C05 LAGOON CROSS SECTION

7.5m 0 15m

(1:750 FULL SCALE)

NOTES

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A.0	SEPT 11/19	ISSUED FOR CLIENT REVIEW	SML	CG

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

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PROJECT TITLE

PRELIMINARY DESIGN -
CAP-BRULE WASTE WATER
TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

LAGOON CROSS SECTION

Scale	Drawn By	Design By
AS NOTED	SML	LEL
	Checked By: CG	Cadd Check: TWA
	Sheet 7 of 25	

File Name: 18411-1D-C07.DWG

Drawing No.: 18411-1D-C07

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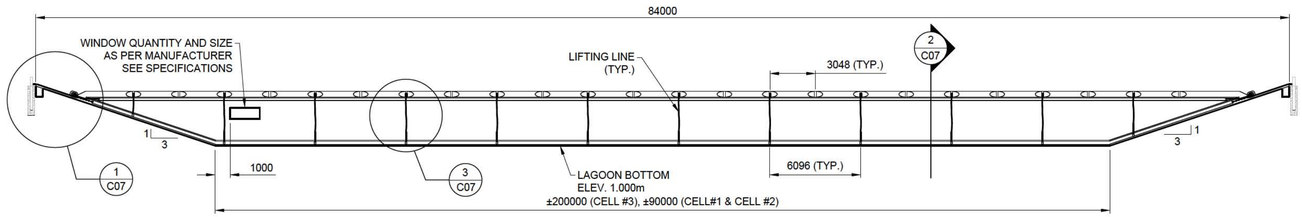
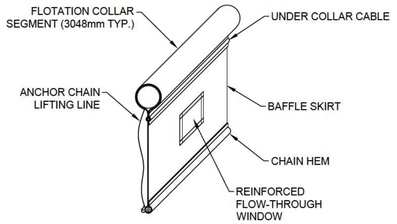
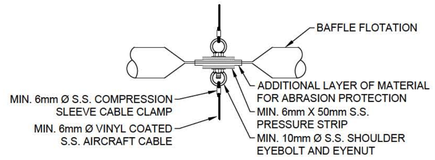


ELEVATION - BAFFLE CURTAIN WALL (2 REQUIRED)

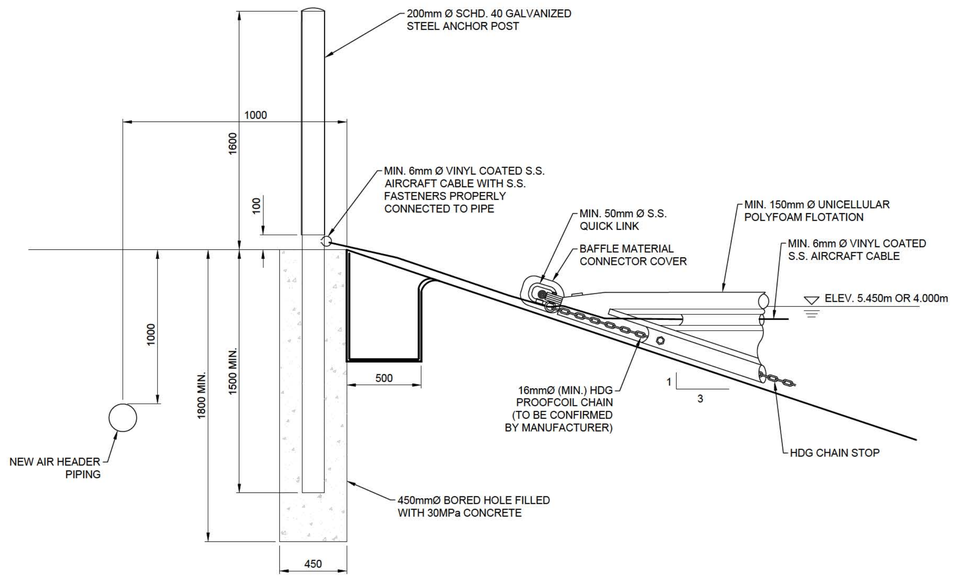
2m 0 4m
1:200 (FULL SCALE)



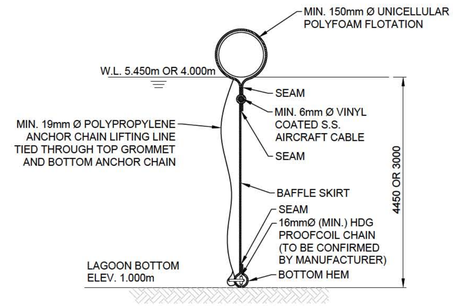
BAFFLE ISOMETRIC
N.T.S.



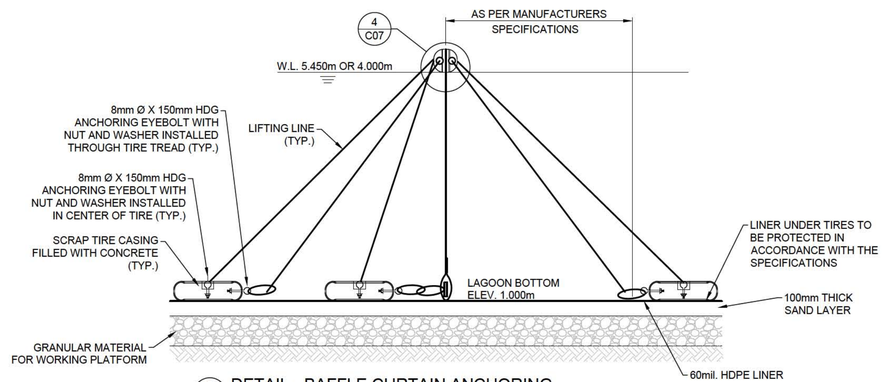
4 C07 DETAIL - ANCHOR LIFTING LINE CONNECTION
N.T.S.



1 C07 DETAIL - BAFFLE CURTAIN END CONNECTOR
N.T.S.



3 C07 SECTION - BAFFLE CURTAIN
N.T.S.



2 C07 DETAIL - BAFFLE CURTAIN ANCHORING (QUANTITY AS PER MANUFACTURERS SPECIFICATIONS)
N.T.S.

NOTES

NO.	DATE	REVISIONS	BY	APPR.
A.0	SEPT 11/19	ISSUED FOR CLIENT REVIEW	SML	CG

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

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PROJECT TITLE

PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

LAGOON BAFFLE DETAILS

Scale	Drawn By	Design By
AS NOTED	SML	LEL
	Checked By	Cadd Check
	CG	TWA
	Sheet 8 of 25	

File Name
18411-1D-C08-C10.DWG

Drawing No.
18411-1D-C08

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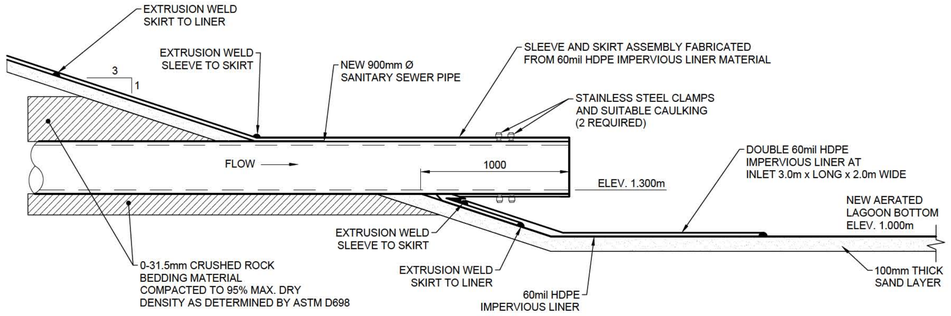
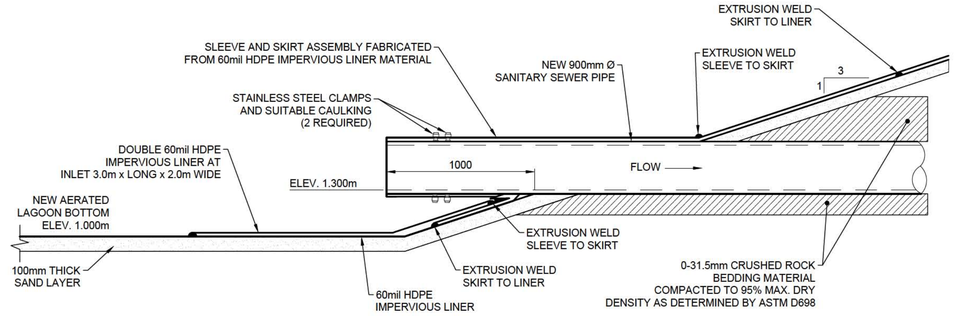
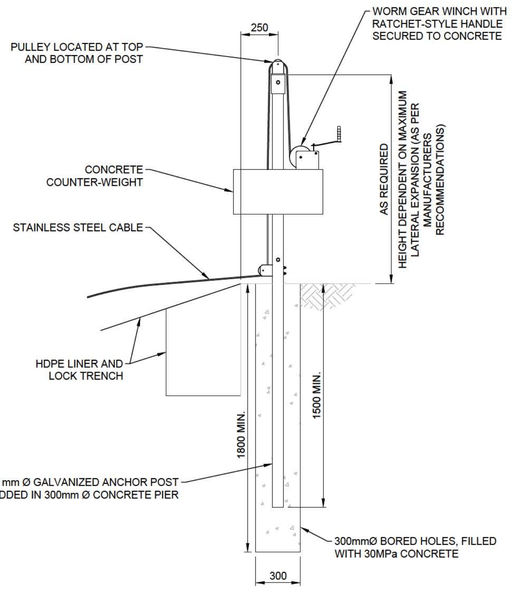


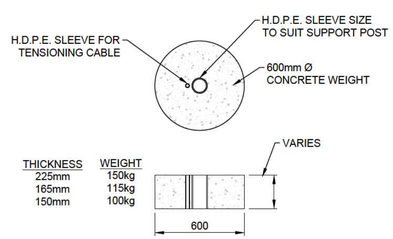
DETAIL - NEW AERATED LAGOON INLET PIPE
PIPE THROUGH LINER
N.T.S.



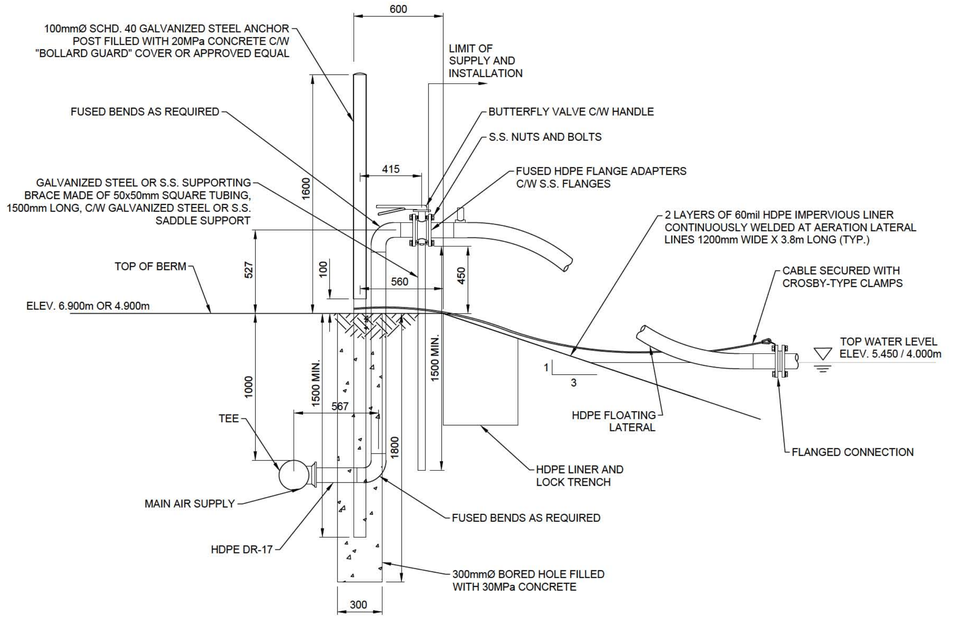
DETAIL - NEW AERATED LAGOON OUTLET PIPE
PIPE THROUGH LINER
N.T.S.



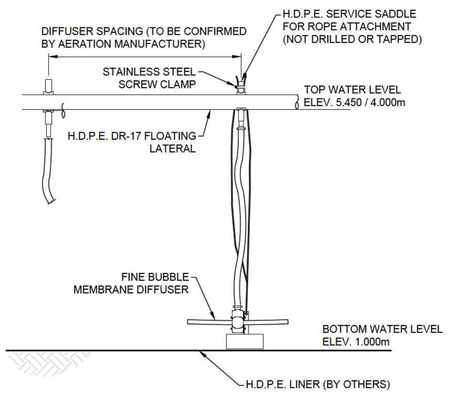
SELF-ADJUSTING TENSION ASSEMBLY
N.T.S. (AT LATERAL FREE END)



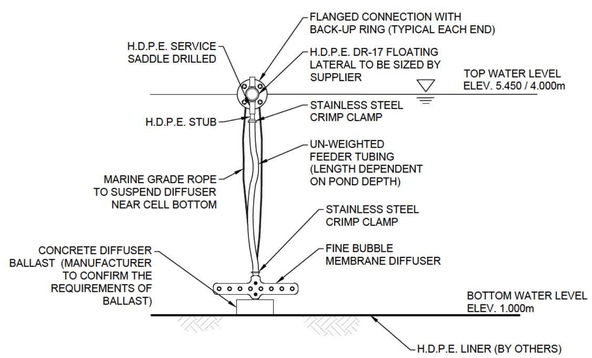
COUNTER WEIGHT DETAIL
N.T.S.



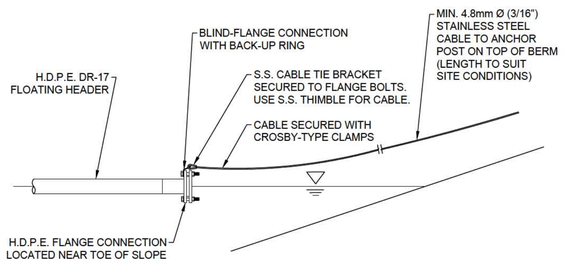
DETAIL - AIR LATERAL CONNECTION
N.T.S.



LATERAL DETAIL - ELEVATION (AERATION CELL)
N.T.S.



LATERAL DETAIL - SECTION (AERATION CELL)
N.T.S.



LATERAL DETAIL AT HEADER(FREE END)
N.T.S.

NOTES

NO.	DATE	REVISIONS	BY	APPR.
A.0	SEPT 11/19	ISSUED FOR CLIENT REVIEW	SML	CG

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

crandall
A DIVISION OF ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Sep 10, 2019
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PROJECT TITLE

PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

LAGOON LINER AND AERATION DETAILS

Scale	Drawn By	Design By
AS NOTED	SML	LEL
	Checked By	Cadd Check
	CG	TWA
	Sheet 9 of 25	

File Name
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Drawing No.
18411-1D-C09

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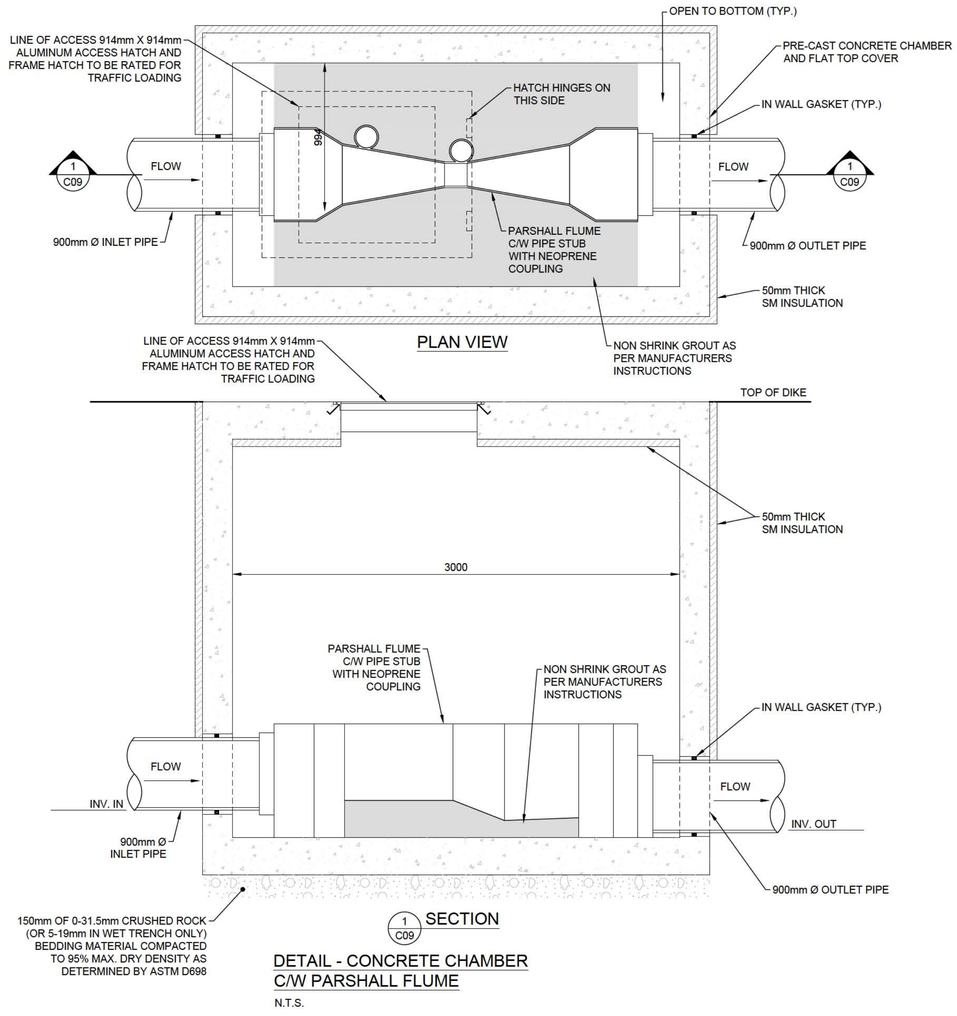
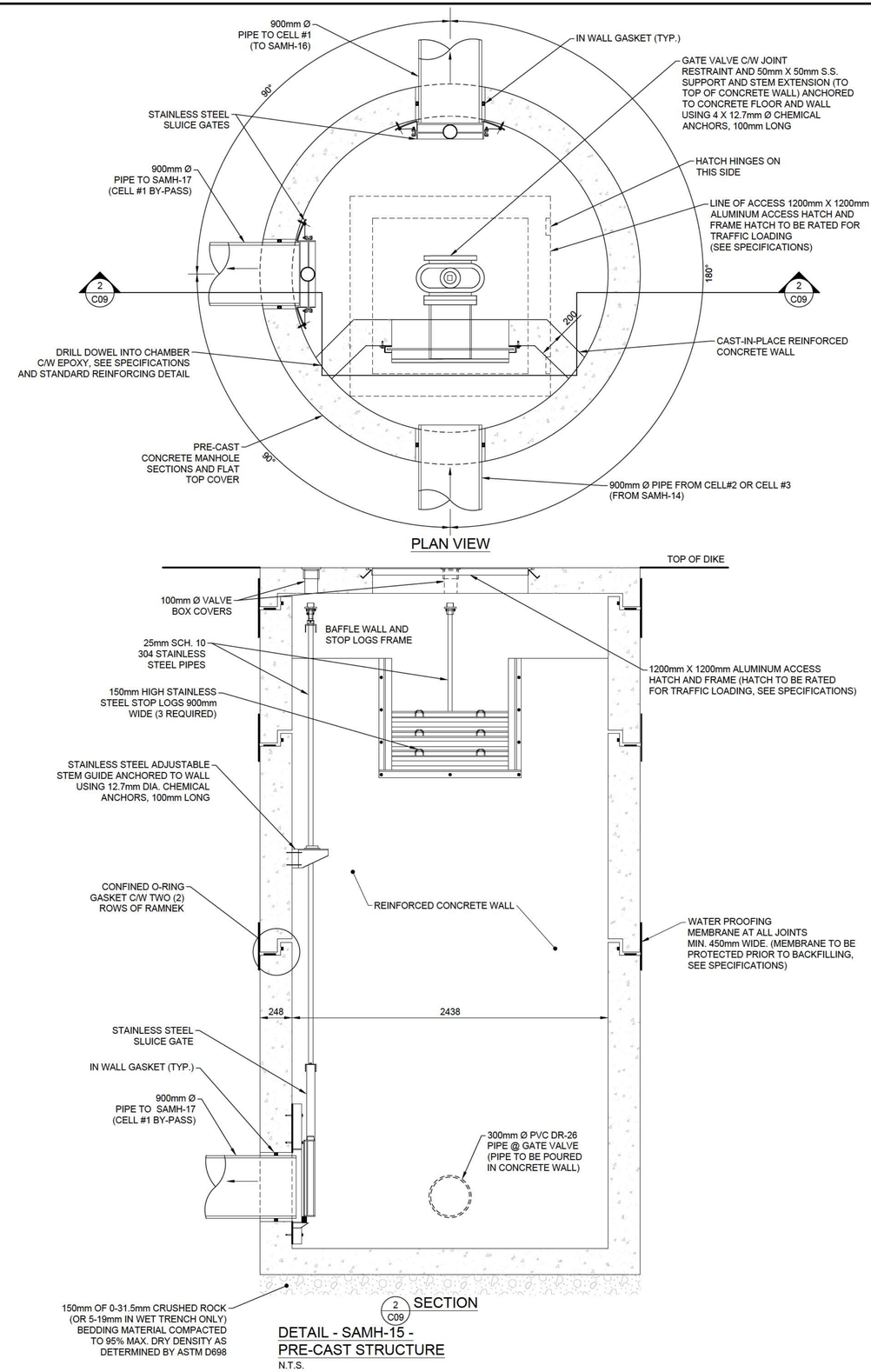


PLAN VIEW

1 C09 SECTION

DETAIL - CONCRETE CHAMBER C/W PARSHALL FLUME

N.T.S.



PLAN VIEW

2 C09 SECTION

DETAIL - SAMH-15 - PRE-CAST STRUCTURE

N.T.S.

NOTES

NO.	DATE	REVISIONS	BY	APPR.
A.0	SEPT 11/19	ISSUED FOR CLIENT REVIEW	SML	CG

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

crandall
A DIVISION OF ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Sep 10, 2019
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

METERING CHAMBER AND CONTROL STRUCTURE DETAILS

Scale	Drawn By	Design By
AS NOTED	SML	LEL
	Checked By	Cadd Check
	CG	TWA
	Sheet 10 of 25	

File Name
18411-1D-C08-C10.DWG

Drawing No.
18411-1D-C10

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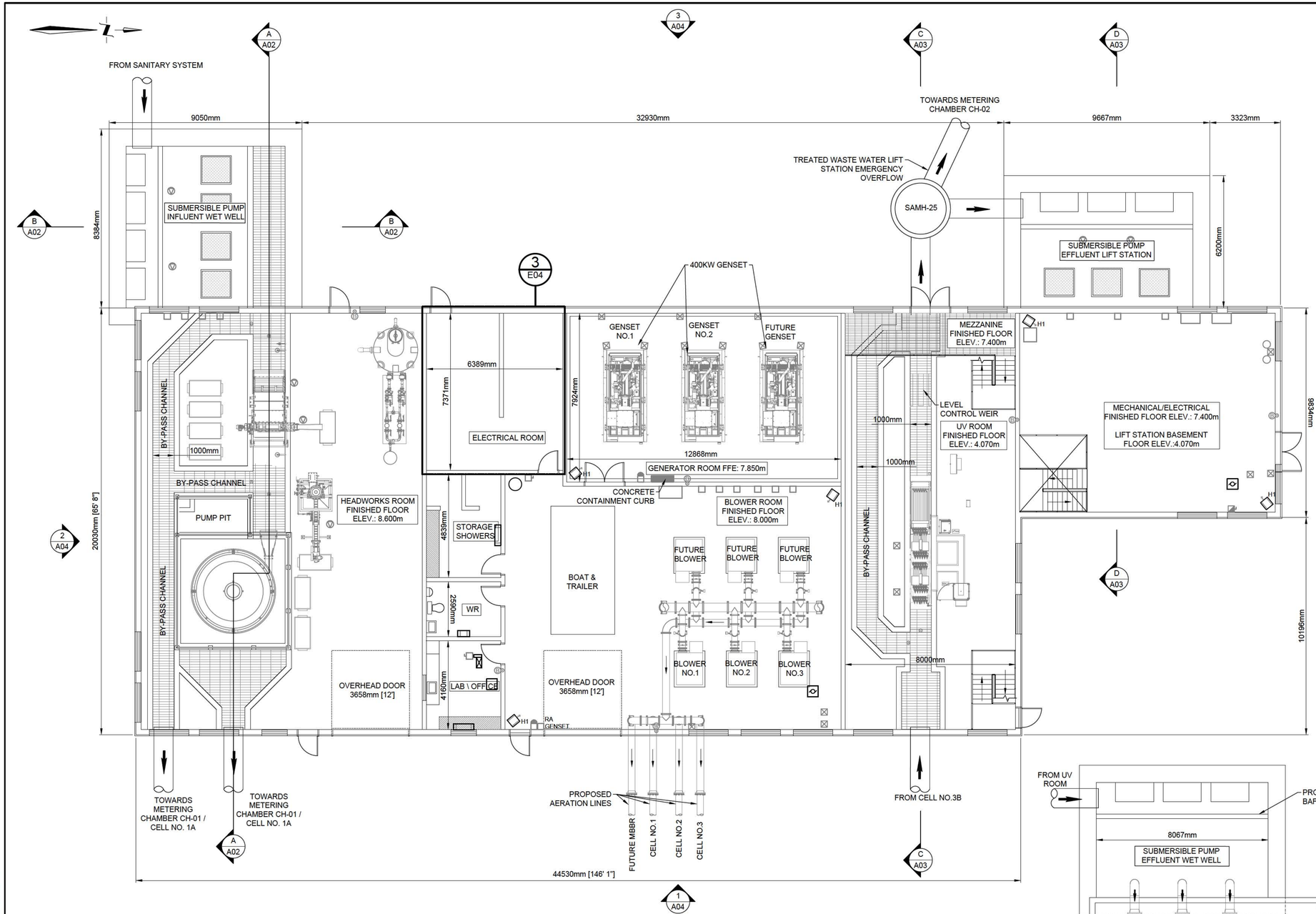
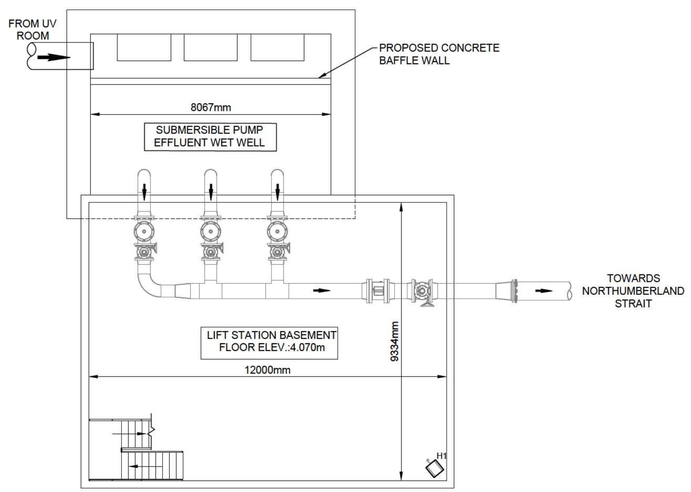


ARCHITECTURAL FLOOR PLAN



LIFT STATION BASEMENT FLOOR PLAN

NOTES

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DRAWING TITLE

ARCHITECTURAL FLOOR PLANS

Scale	Drawn By	Design By
1m 0 2m (1:100 FULL SCALE)	SML	SML
	Checked By: CG	Cadd Check: TWA
	Sheet 11 of 25	

File Name: 18411-1D- A01-A04.DWG

Drawing No.: 18411-1D-A01

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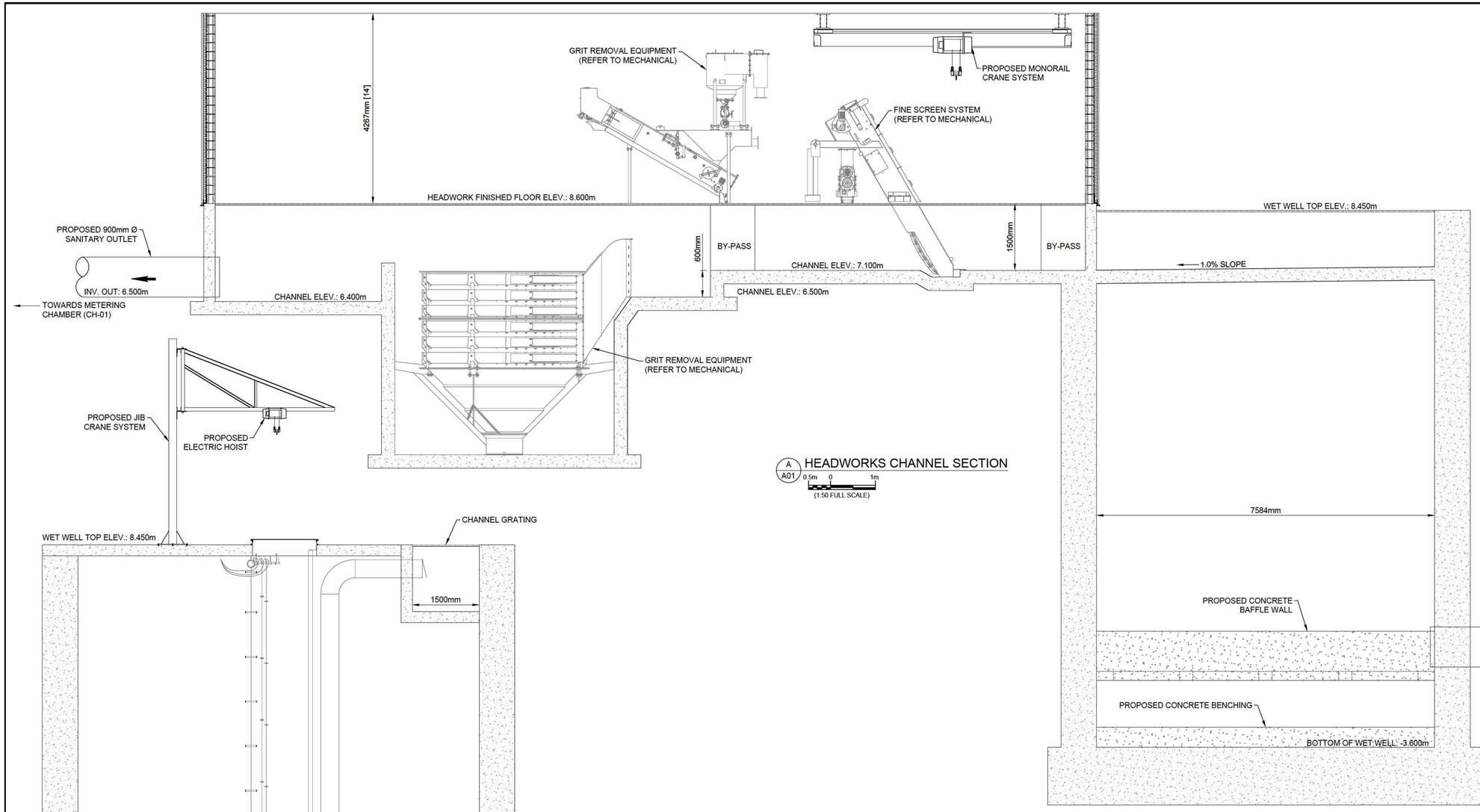
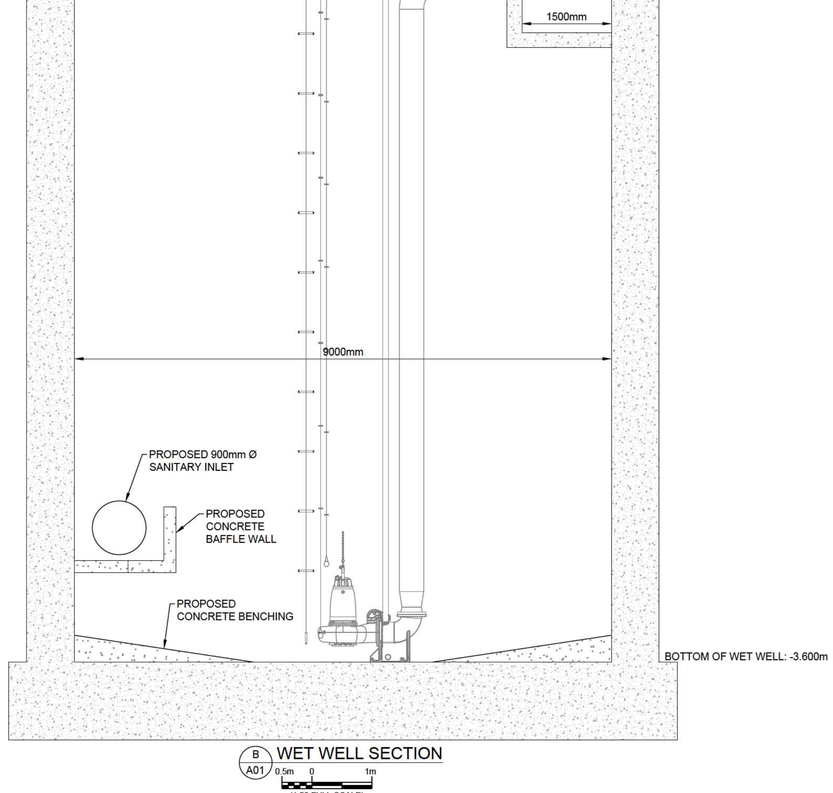


A / A01 HEADWORKS CHANNEL SECTION
0.5m 0 1m
(1:50 FULL SCALE)



B / A01 WET WELL SECTION
0.5m 0 1m
(1:50 FULL SCALE)

NOTES

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GREATER SHEDIAC SEWERAGE COMMISSION
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CAP-BRULE WASTE WATER
TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

HEADWORKS AND INFLUENT
WET WELL SECTIONS

Scale	Drawn By	Design By
AS NOTED	SML	SML
	Checked By	Cadd Check
	CG	TWA
	Sheet 12 of 25	

File Name
18411-1D- A01-A04.DWG

Drawing No.
18411-1D-A02

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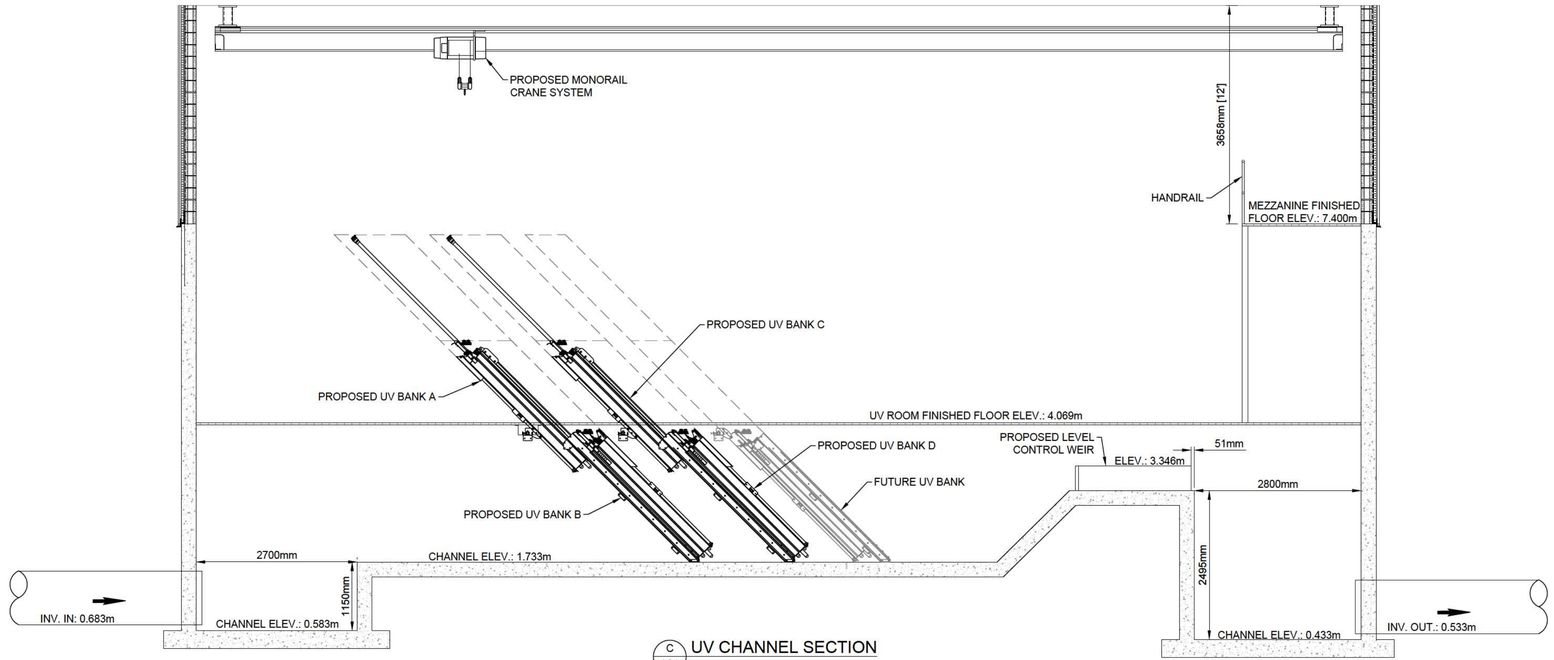

C A01 UV CHANNEL SECTION

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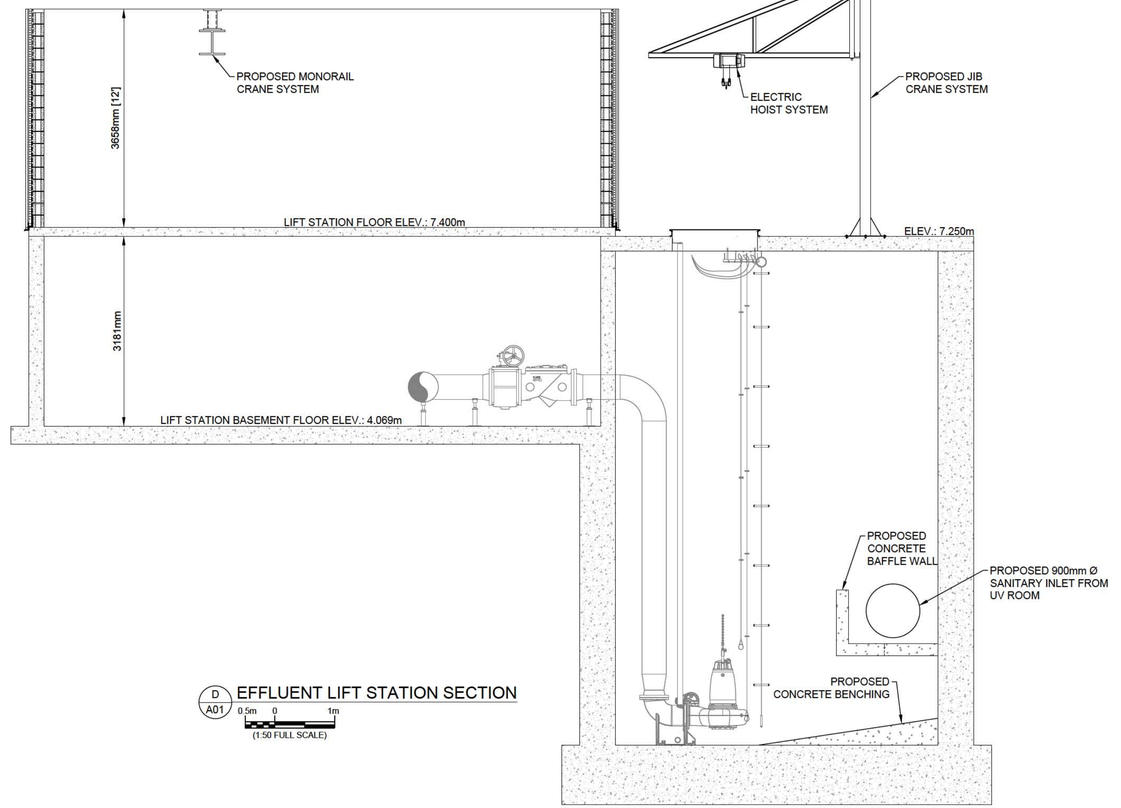
(1:50 FULL SCALE)



D A01 EFFLUENT LIFT STATION SECTION

0.5m 0 1m

(1:50 FULL SCALE)

NOTES

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GREATER SHEDIAC SEWERAGE COMMISSION
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PROJECT TITLE

PRELIMINARY DESIGN -
CAP-BRULE WASTE WATER
TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

UV CHANNEL AND EFFLUENT
LIFT STATION SECTIONS

Scale	Drawn By	Design By
1m 0 2m (1:100 FULL SCALE)	SML	SML
	Checked By: CG	Cadd Check: TWA
	Sheet 13 of 25	

File Name: 18411-1D- A01-A04.DWG

Drawing No.: 18411-1D-A03

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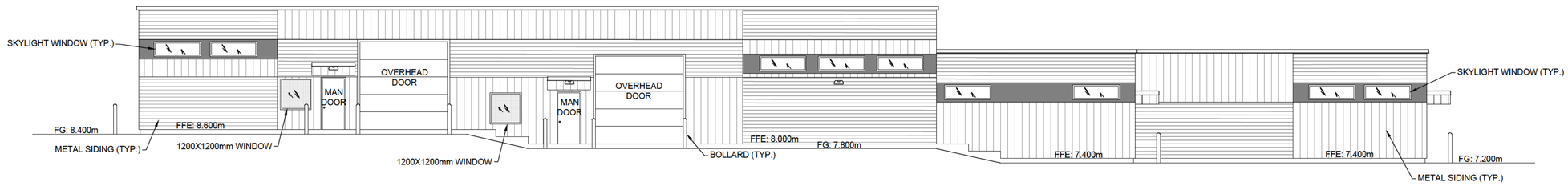
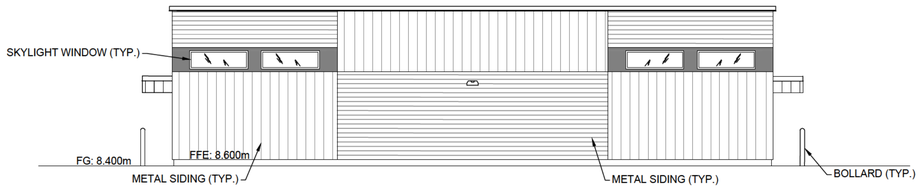
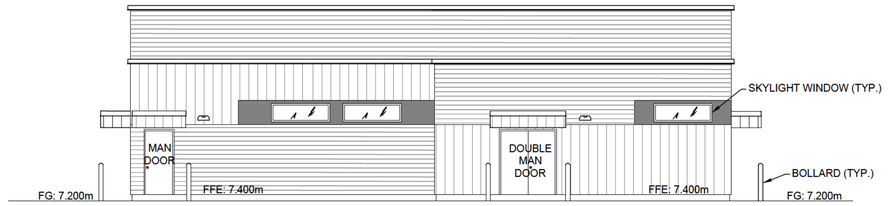


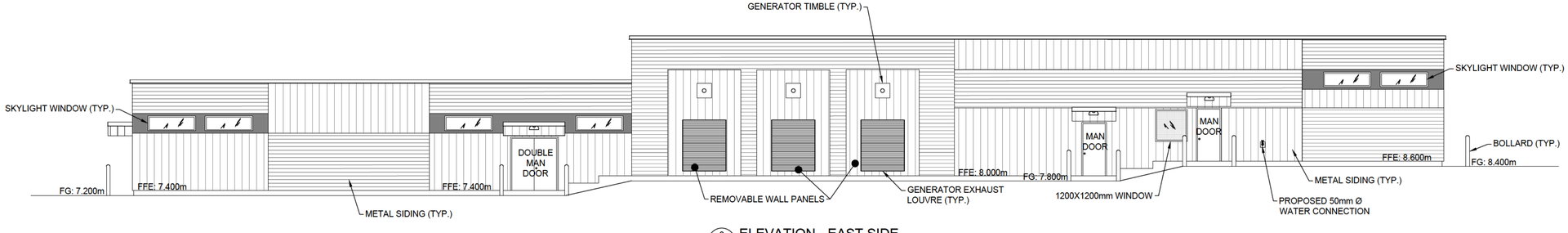
1 A01 ELEVATION - WEST SIDE



2 A01 ELEVATION - NORTH SIDE



4 A01 ELEVATION - SOUTH SIDE



3 A01 ELEVATION - EAST SIDE

NOTES

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PROJECT TITLE

PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

ARCHITECTURAL ELEVATIONS

Scale	Drawn By	Design By
1m 0 2m (1:100 FULL SCALE)	SML	SML
	Checked By: CG	Cadd Check: TWA
	Sheet 14 of 25	

File Name: 18411-1D- A01-A04.DWG

Drawing No.: 18411-1D-A04

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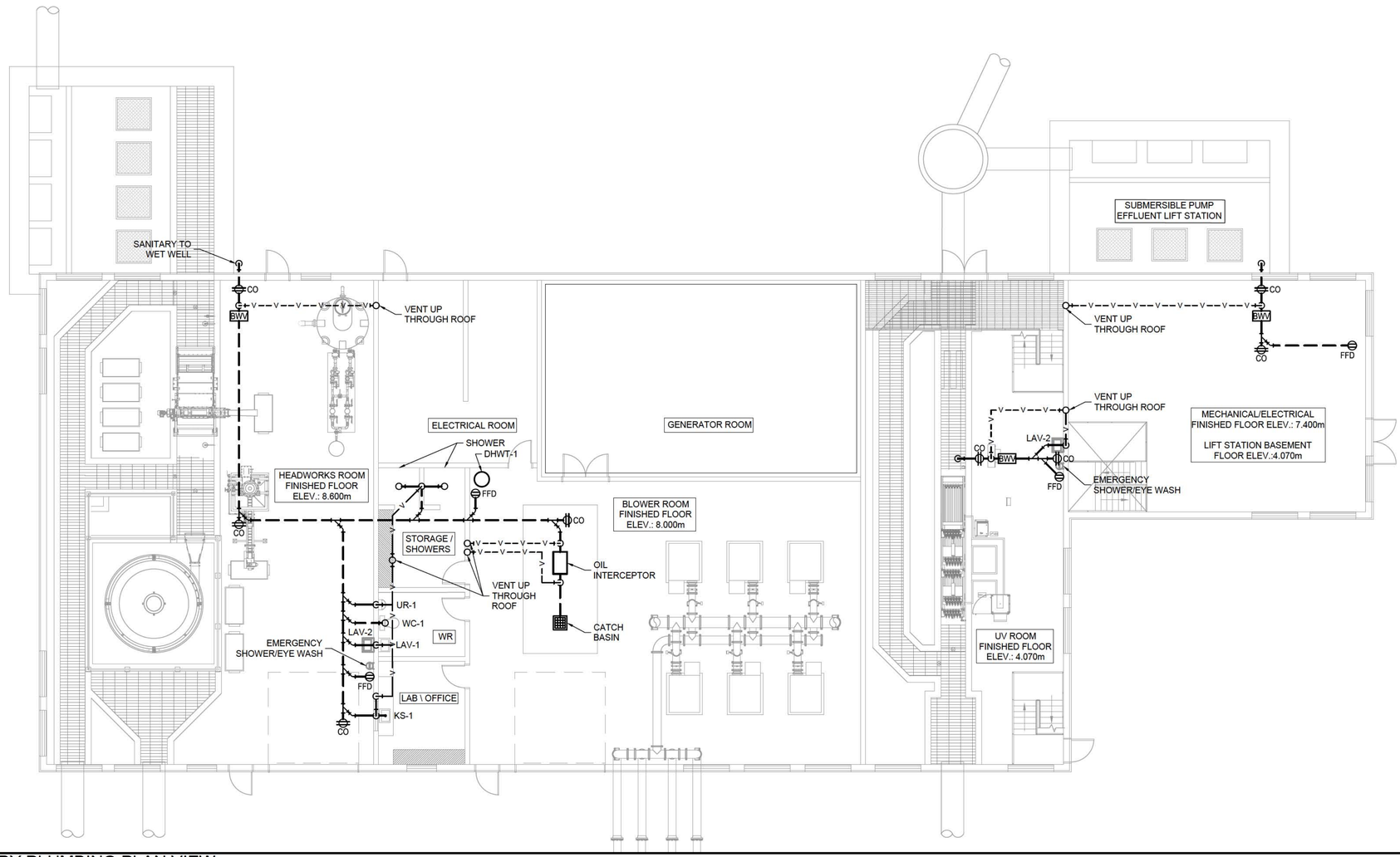
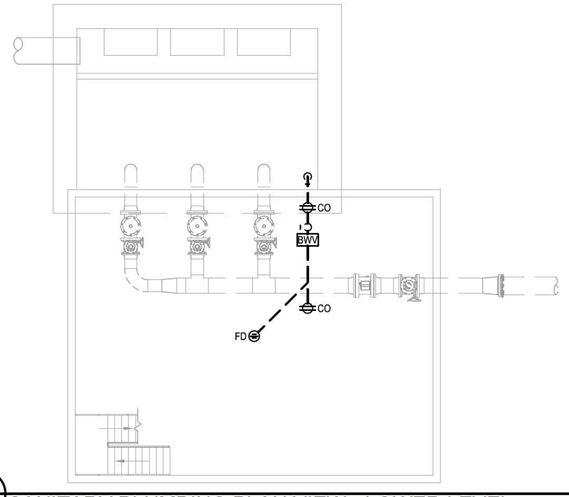


1 M01 SANITARY PLUMBING PLAN VIEW 1:100



2 M01 SANITARY PLUMBING PLAN VIEW - LOWER LEVEL 1:100

PLUMBING LEGEND

	NEW COLD WATER
	NEW HOT WATER
	NEW HW RECIRC.
NPC	NEW NON-POTABLE COLD WATER
V V	NEW PLUMBING VENT
V V V	NEW PLUMBING VENT BELOW SLAB
	NEW SANITARY
TP TP	NEW TRAP PRIMER LINE
TP	NEW TRAP PRIMER
FFD	FUNNEL FLOOR DRAIN
CO	FLOOR CLEAN OUT (INSTALL AS PER SPEC.)
	BALL VALVE
M	WATER METER
BFP	BACK FLOW PREVENTOR - REDUCED PRESSURE
BWV	BACK WATER VALVE
	PIPE DOWN
	PIPE UP
P#	PUMP
HB	HOSE BIBB

3 - LEGEND NTS

4 - NOTES NTS

NOTES

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GREATER SHEDIAC SEWERAGE COMMISSION
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PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

SANITARY PLUMBING PLAN AND DETAILS

Scale	Drawn By	Design By
SCALE	MR	YS
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	Sheet 15 of 25	

File Name: 18411-1D- M01-M04.DWG

Drawing No.: 18411-1D-M01

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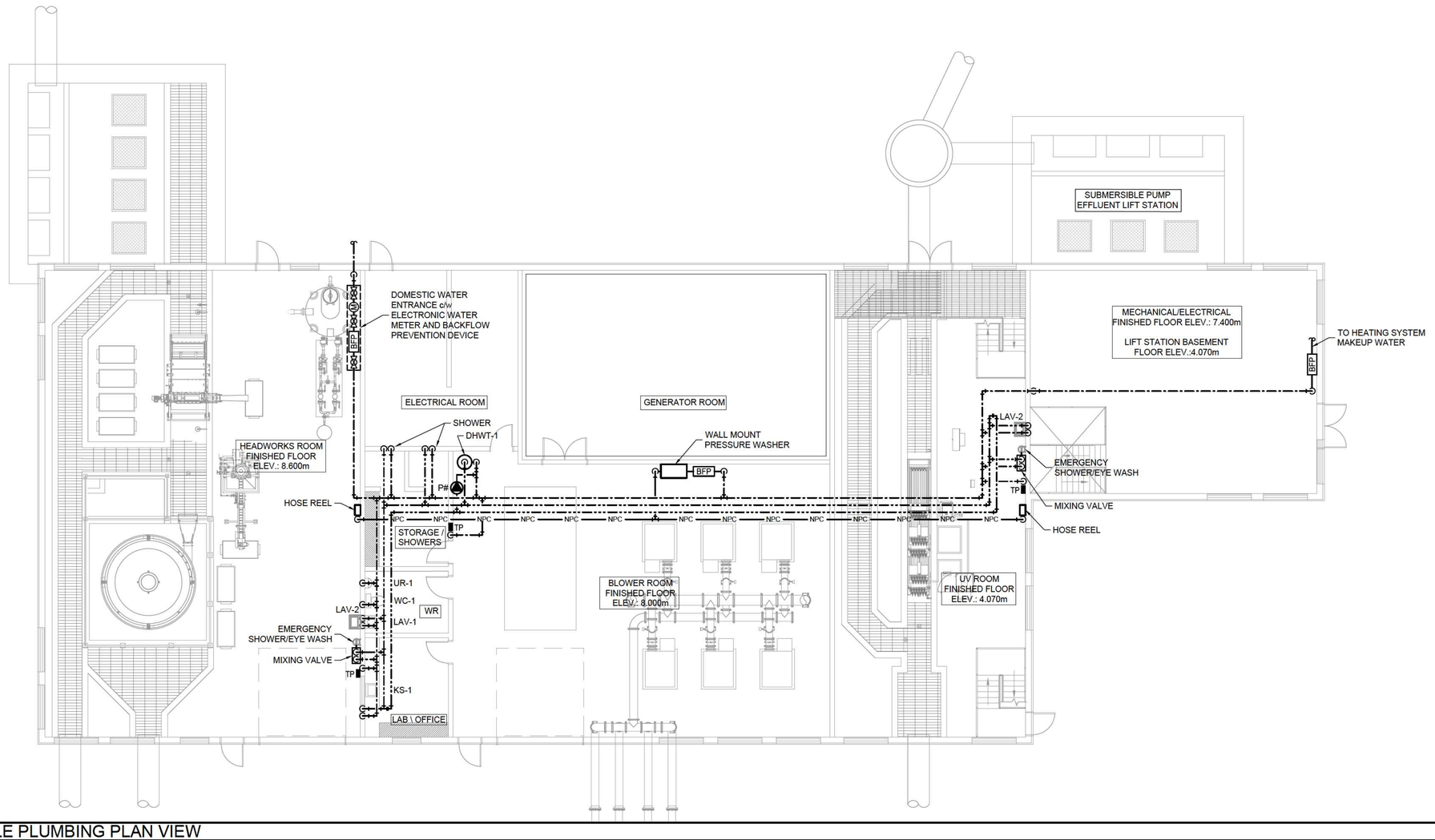
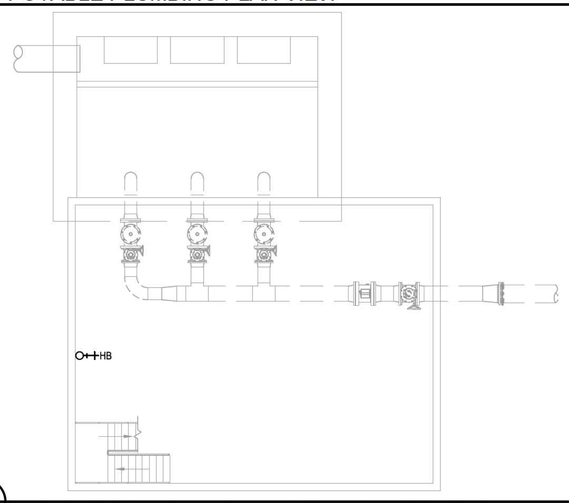


1 M02 POTABLE PLUMBING PLAN VIEW 1:100



2 M02 POTABLE PLUMBING PLAN VIEW - LOWER LEVEL 1:100

NOTES

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CAP-BRULE WASTE WATER
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SHEDIAC N.B.

DRAWING TITLE

POTABLE PLUMBING PLAN
AND DETAILS

Scale	Drawn By	Design By
SCALE	MR	YS
	Checked By	Cadd Check
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	Sheet 16 of 25	

File Name
18411-1D- M01-M04.DWG

Drawing No.
18411-1D-M02

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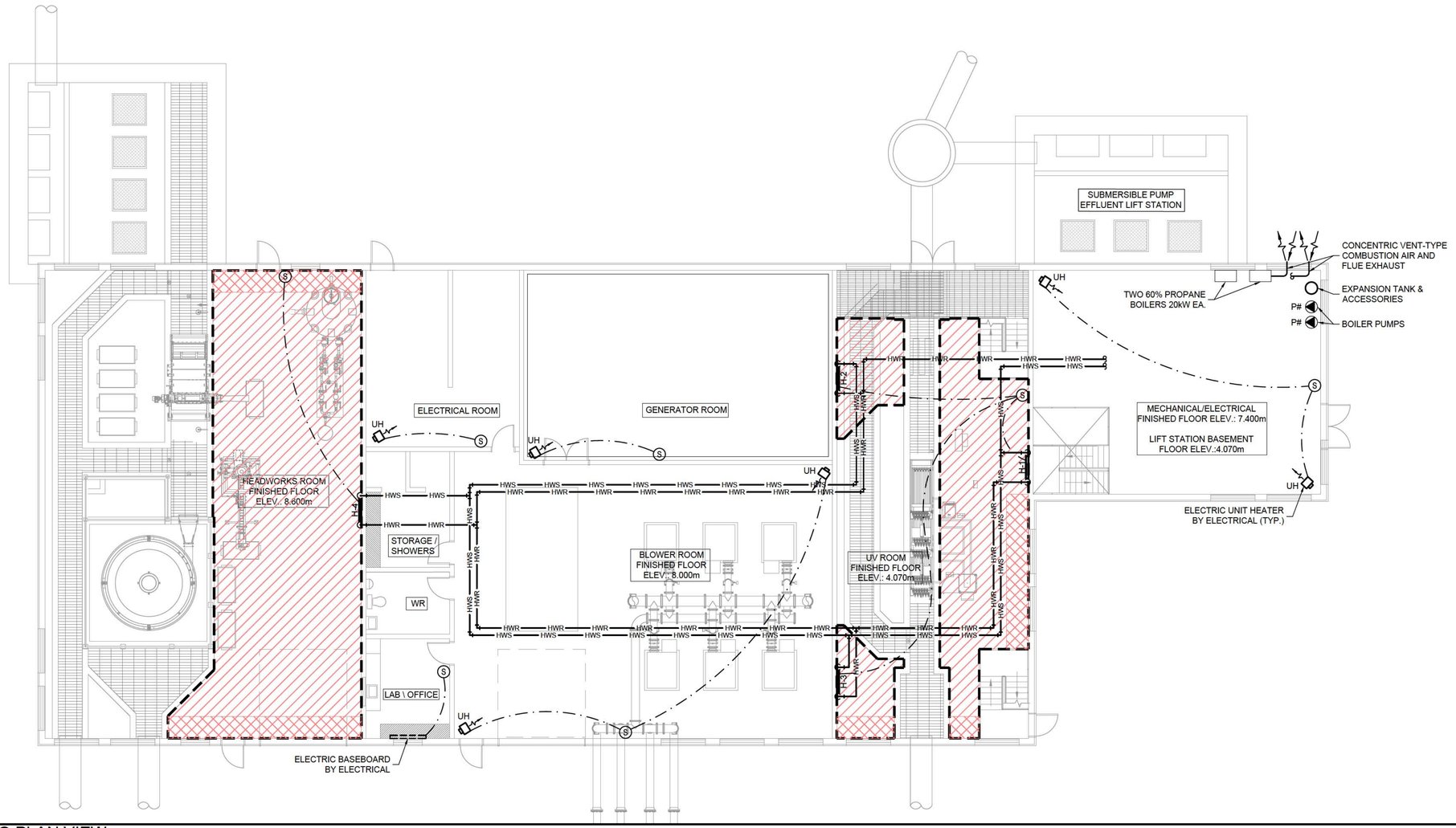

1 M03 HEATING PLAN VIEW 1:100

HEATING / COOLING LEGEND

HWS	NEW HEATING WATER SUPPLY
HWR	NEW HEATING WATER RETURN
P#	PUMP
UH	ELECTRIC UNIT HEATER BY ELEC.
	ELECTRIC BASEBOARD HEATER BY ELEC.
	SENSOR/TSTAT WIRING
S	SENSOR BY CONTROLS
	PIPING UP
	PIPING DOWN

2 - LEGEND NTS

3 - NOTES NTS

NOTES

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GREATER SHEDIAC SEWERAGE COMMISSION
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CAP-BRULE WASTE WATER
TREATMENT FACILITY

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DRAWING TITLE

HEATING PLAN AND DETAILS

Scale	Drawn By	Design By
SCALE	MR	YS
	Checked By	Cadd Check
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	Sheet 17 of 25	

File Name
18411-1D- M01-M04.DWG

Drawing No.
18411-1D-M03

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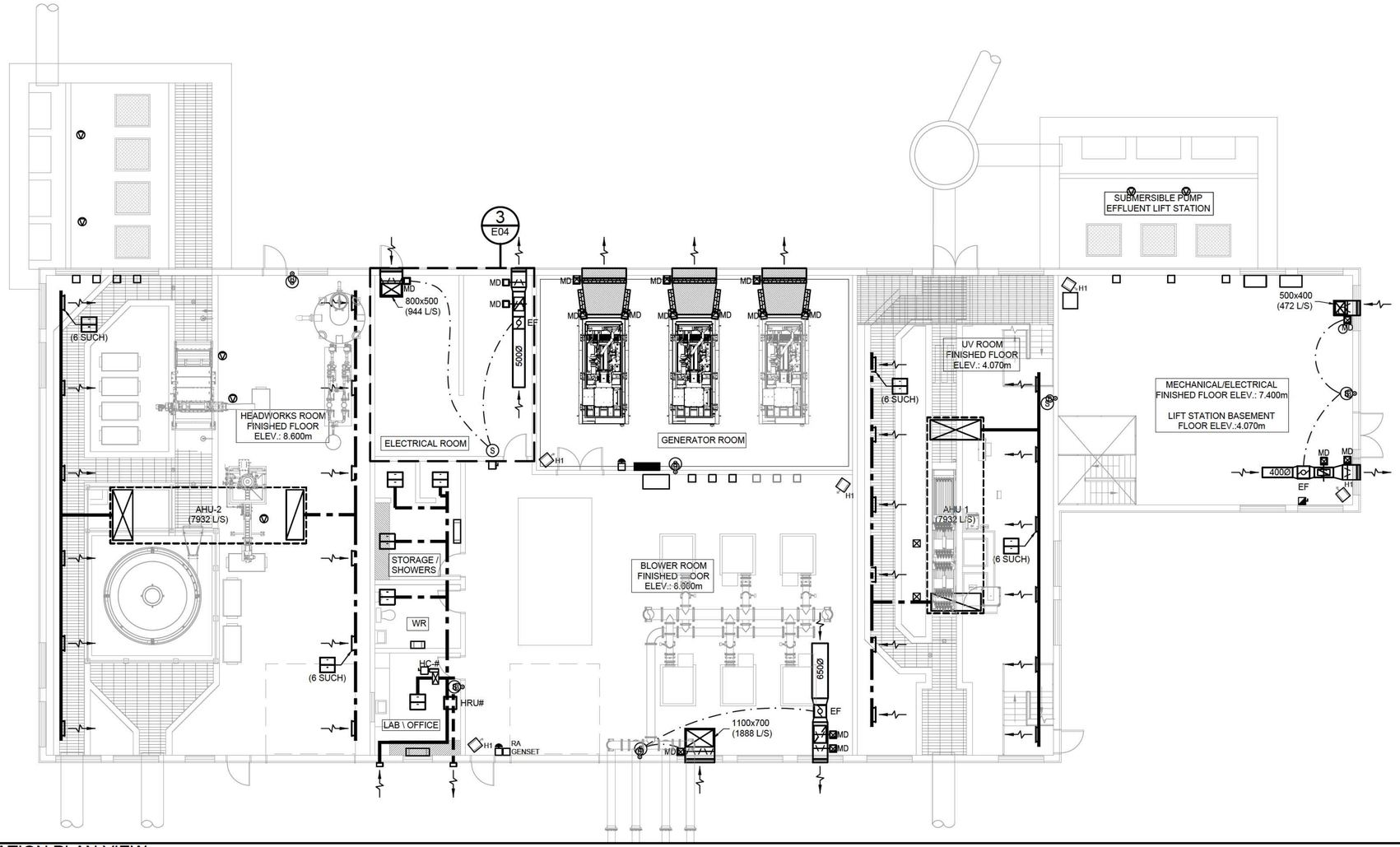

1 / M04 VENTILATION PLAN VIEW 1:100

VENTILATION LEGEND

- NEW RECTANGULAR DUCTWORK
- NEW ROUND DUCTWORK
- NEW ROUND TO RECTANGULAR TRANSITION
- NEW RIGID SUPPLY AIR OR OUTSIDE AIR DUCT
- NEW RIGID RETURN AIR DUCT
- NEW RIGID EXHAUST AIR DUCT
- DUCT UP
- DUCT DOWN
- DIFFUSER/GRILLE
- MD — MOTORIZED DAMPER
- EF — EXHAUST FAN
- HC-# — HEATING COIL
- SENSOR/TSTAT WIRING
- S — SENSOR BY CONTROLS
- HRU# — HEAT RECLAIM UNIT

2 / - LEGEND NTS

3 / - NOTES NTS

NOTES

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A.0	SEPT 11/19	ISSUED FOR CLIENT REVIEW	MR	YS

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DRAWING TITLE

VENTILATION PLAN AND DETAILS

Scale	Drawn By	Design By
SCALE	MR	YS
	Checked By	Cadd Check
	- - -	TWA
	Sheet 18 of 25	

File Name: 18411-1D- M01-M04.DWG

Drawing No.: 18411-1D-M04

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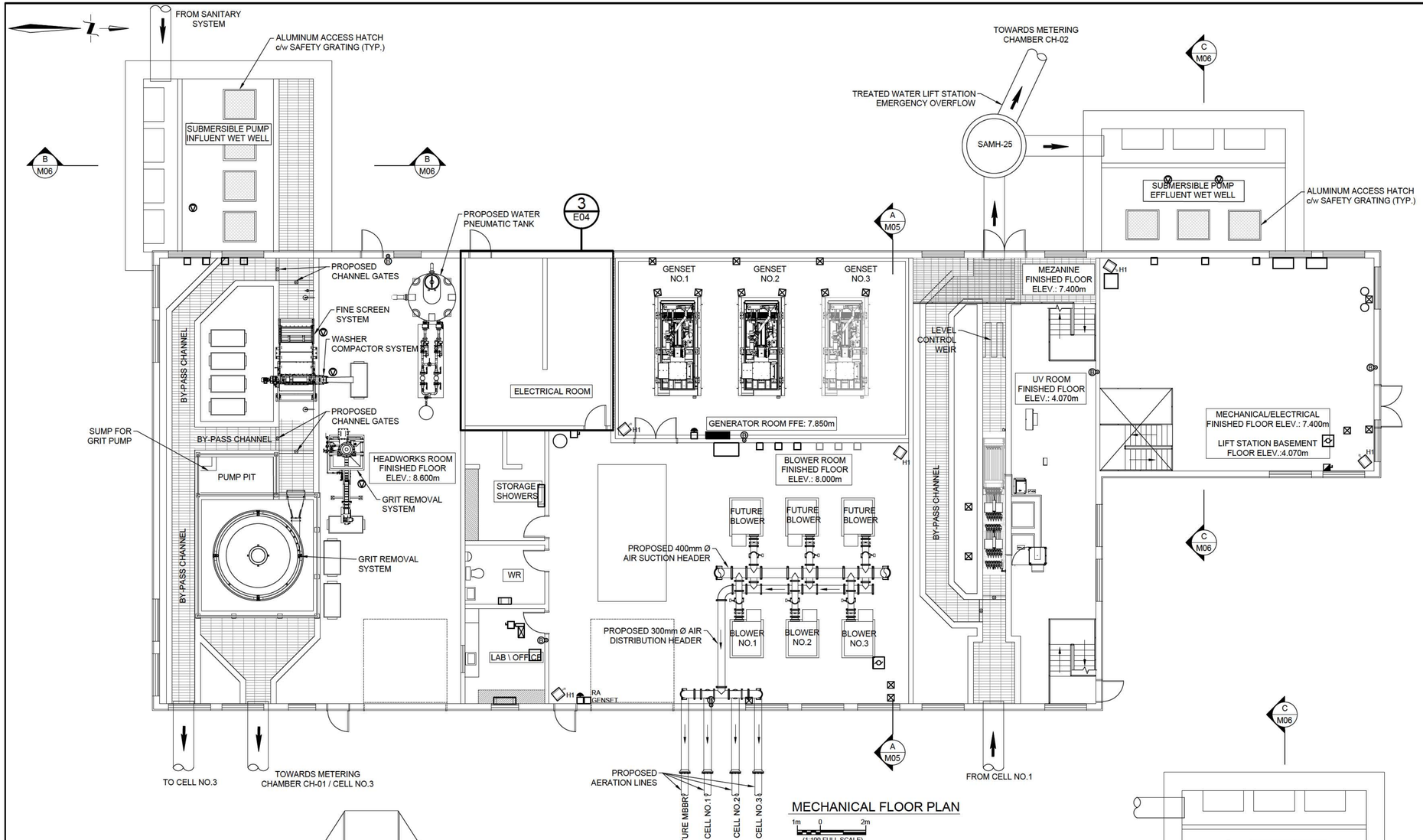

MECHANICAL FLOOR PLAN

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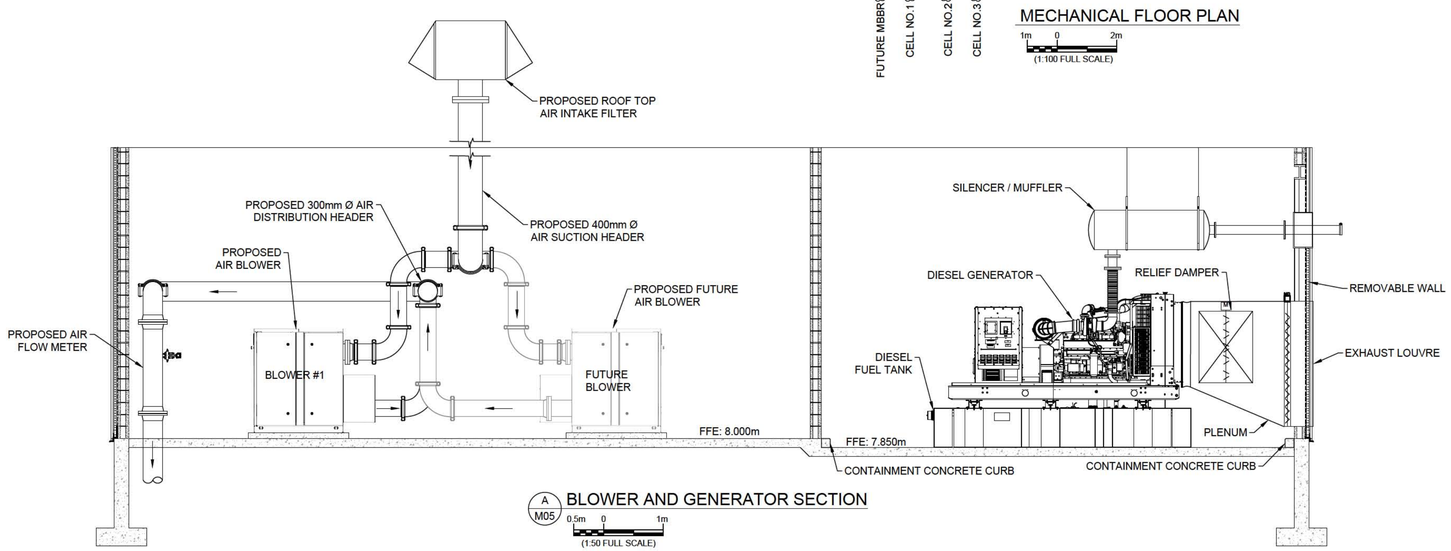
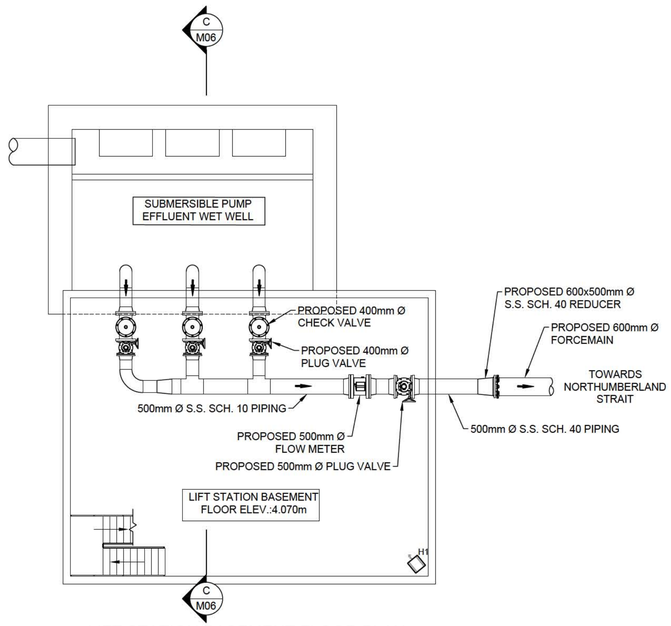
(1:100 FULL SCALE)



A M05 BLOWER AND GENERATOR SECTION

0.5m 0 1m
(1:50 FULL SCALE)



LIFT STATION BASEMENT FLOOR PLAN

1m 0 2m
(1:100 FULL SCALE)

NOTES

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A.0	SEPT 11/19	ISSUED FOR CLIENT REVIEW	SML	SS

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MECHANICAL FLOOR PLAN AND SECTIONS

Scale	Drawn By	Design By
AS NOTED	SML	SML
	Checked By: SS	Cadd Check: TWA
	Sheet 19 of 25	

File Name: 18411-1D- M05-M06.DWG

Drawing No.: 18411-1D-M05

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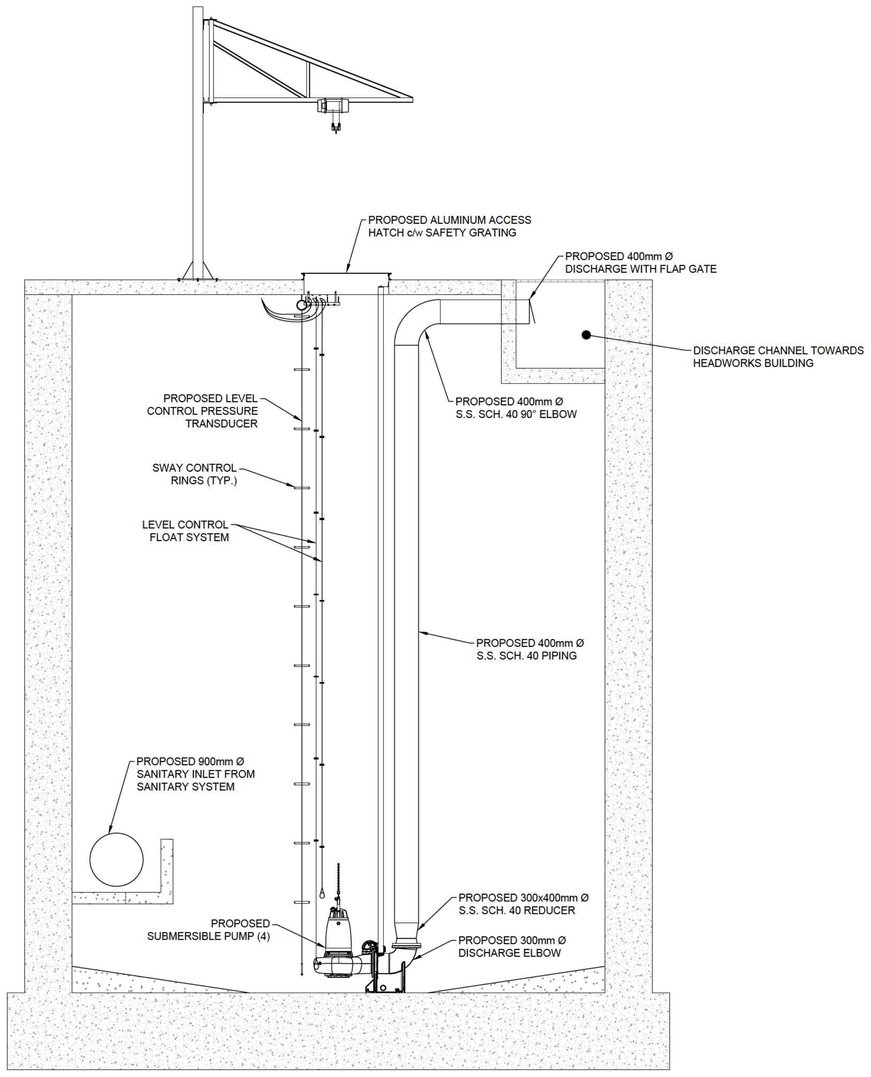

B M05 INFLUENT WET WELL SECTION
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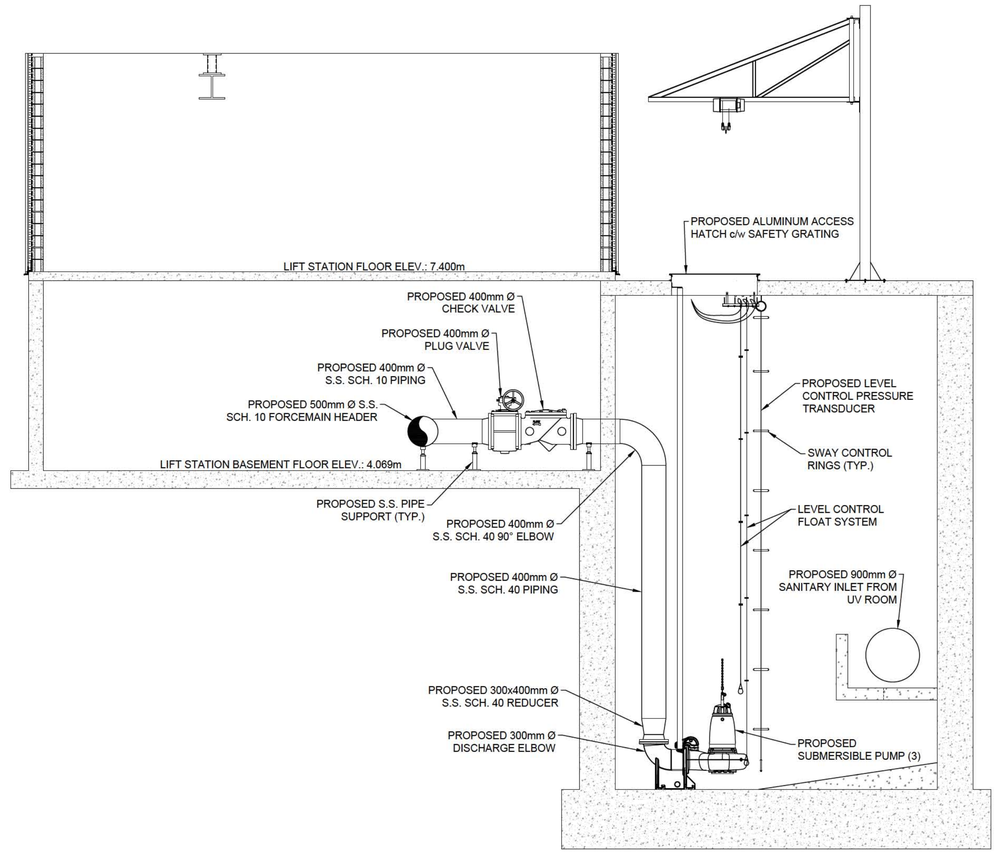
(1:50 FULL SCALE)



C M05 EFFLUENT WET WELL SECTION
0.5m 0 1m
(1:50 FULL SCALE)

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DRAWING TITLE

INFLUENT AND EFFLUENT WET WELL SECTIONS

Scale	Drawn By	Design By
AS NOTED	SML	SML
	Checked By: SS	Cadd Check: TWA
	Sheet 20 of 25	

File Name: 18411-1D- M05-M06.DWG

Drawing No.: 18411-1D-M06

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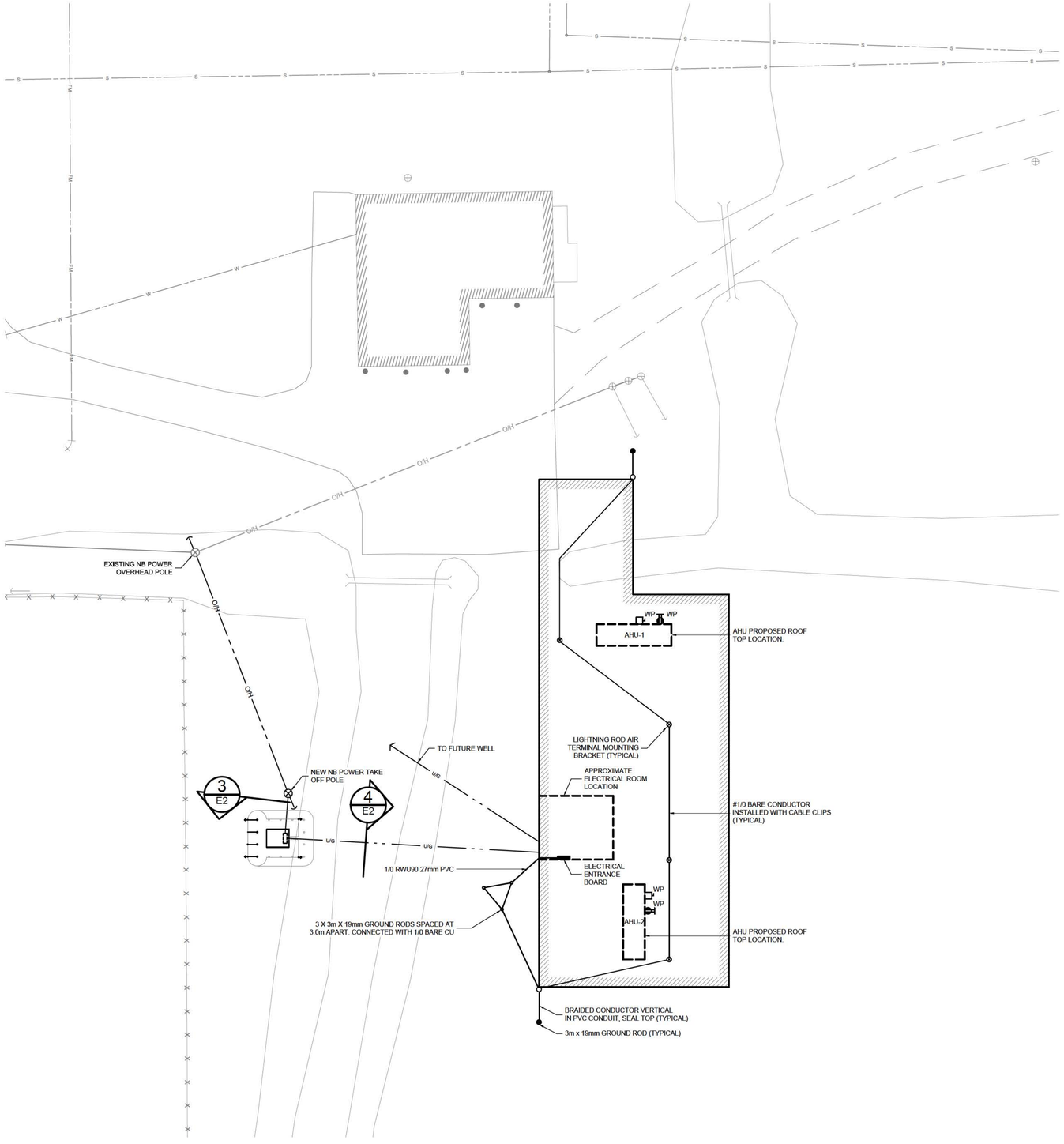

1 - SITE PLAN 1:250

SITE PLAN LEGEND

- ELECTRICAL CABLE
- O/H ELECTRICAL
- U/G ELECTRICAL
- EXISTING O/H ELECTRICAL
- EXISTING ELECTRICAL CABLE
- EXISTING U/G ELECTRICAL
- ELECTRICAL POLE
- GUY WIRE
- 15A, 125V DOUBLE DUPLEX RECEPTACLE
- WP 20A, 125V GFCI WEATHERPROOF DUPLEX RECEPTACLE
- DIRECT CONNECTION
- JUNCTION BOX
- BACK BOX
- DISCONNECT
- MOTOR STARTER, REFER TO MECHANICAL EQUIPMENT SCHEDULE
- MOTOR
- PUSH BUTTON STATION
- EMERGENCY POWER OFF
- SURFACE MOUNT PANELBOARD
- R RELAY
- C CONTACTOR
- FACP FIRE ALARM CONTROL PANEL
- ISO FAULT ISOLATOR MODULE
- S SMOKE DETECTOR
- H HEAT DETECTOR
- CR CONTROL RELAY
- MANUAL PULL STATION
- FIRE ALARM HORN/STROBE
- END OF LINE DEVICE
- IM SINGLE INPUT MODULE
- IM2 DUAL INPUT MODULE
- BATT BATTERY PACK C/W DUAL HEADS, '#' INDICATES DC CIRCUIT NUMBER.
- DUAL REMOTE HEADS, '#' INDICATES DC CIRCUIT NUMBER.
- WALL /CEILING MOUNTED EXIT SIGN SHADING - INDICATES NUMBER AND LOCATION OF FACES ARROW - INDICATES DIRECTION OF EXIT, TWO ARROWS REQUIRE TWO SIGNS INSTALLED AT THE SAME LOCATION
- LINEAR LUMINAIRE, HATCHING DENOTES ALWAYS ON
- WALL MOUNTED LUMINAIRE
- SUSPENDED UNIT HEATER, H-# INDICATES TYPE, REFER TO SCHEDULE
- BASEBOARD HEATER, H-# INDICATES TYPE, REFER TO SCHEDULE
- DX DOOR CONTACT
- KP ENTRANCE KEYPAD
- HORN SECURITY ALARM BEACON
- WP INDICATES WEATHER PROOF
- XP INDICATES EXPLOSION PROOF

2 - LEGEND NTS

NOTES

NO.	DATE	REVISIONS	BY	APPR.
A.0	SEPT 11/19	ISSUED FOR CLIENT REVIEW	DL	EB

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

crandall
A DIVISION OF ENGLOBE

PRELIMINARY ONLY
DATE PLOTTED: Sep 10, 2019
NOT TO BE USED FOR CONSTRUCTION

PROJECT TITLE

PRELIMINARY DESIGN - CAP-BRULE WASTE WATER TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

ELECTRICAL SITE PLAN

Scale	Drawn By	Design By
AS NOTED	DL	EB
	Checked By: DM	Cadd Check: JB
	Sheet 21 of 25	

File Name: 18411-1D-E01.DWG

Drawing No.: 18411-1D-E01

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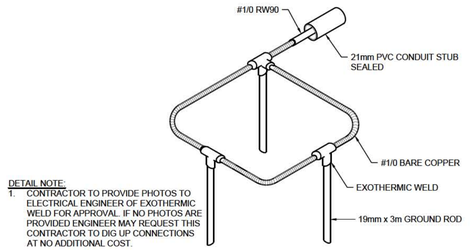
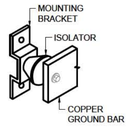
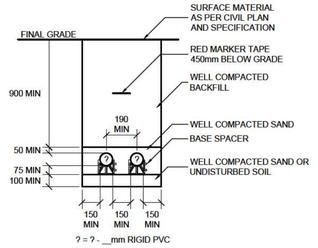


DETAIL NOTE:
1. CONTRACTOR TO PROVIDE PHOTOS TO ELECTRICAL ENGINEER OF EXOTHERMIC WELD FOR APPROVAL. IF NO PHOTOS ARE PROVIDED ENGINEER MAY REQUEST THIS CONTRACTOR TO DIG UP CONNECTIONS AT NO ADDITIONAL COST.

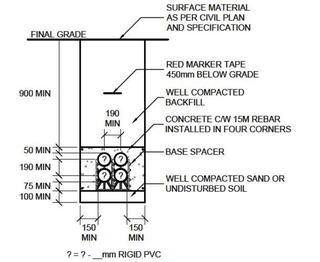
1 - GROUND GRID DETAIL NTS



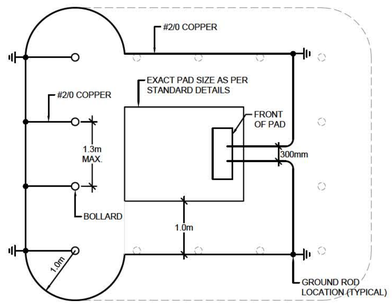
2 - GROUND BAR MOUNTING DETAIL NTS

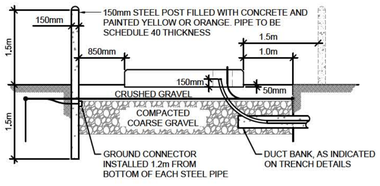


3 - TRENCH DETAIL NTS



4 - TRENCH DETAIL NTS

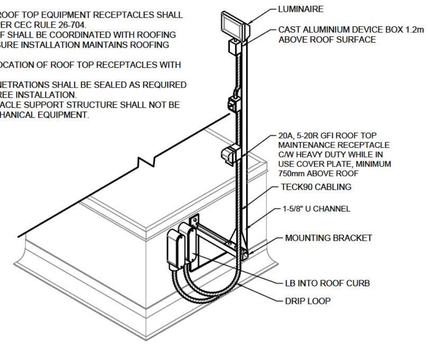




DETAIL NOTES:
1. ALL WORK SHALL BE DONE IN ACCORDANCE WITH NB POWER SERVICE ENTRANCE STANDARDS ED9U-10 (1Ø PAD), ED9U-25 (3Ø PAD) AND ED9U-60 (VEHICULAR PROTECTION), ED9U-85 (BLAST WALL).
2. DISTANCE OF BOLLARDS IN FRONT OF PAD SHALL BE MINIMUM OF 1.5m AWAY TO ALLOW FOR DOOR ACCESS. ALL OTHER BOLLARDS SHALL BE MINIMUM OF 850mm FROM PAD.
3. GROUNDING SHALL BE IN ACCORDANCE WITH SECTION 10 OF THE LATEST CANADIAN ELECTRICAL CODE - PART1.
4. ELECTRICAL CONTRACTOR SHALL SUPPLY AND INSTALL CONCRETE PAD. PAD SHALL BE PRECAST, COORDINATE WITH NB POWER FOR SUPPLIER INFORMATION. INCLUDE ALL COSTS ASSOCIATED WITH FREIGHT TO SITE.

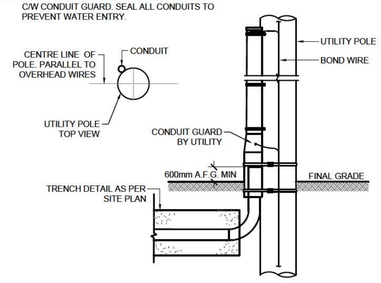
5 - PAD MOUNT TRANSFORMER DETAIL - VEHICLE AREA NTS

DETAIL NOTES:
1. INSTALLATION OF ROOF TOP EQUIPMENT RECEPTACLES SHALL BE INSTALLED AS PER CEC RULE 26-704.
2. ALL WORK ON ROOF SHALL BE COORDINATED WITH ROOFING CONTRACTOR. ENSURE INSTALLATION MAINTAINS ROOFING WARRANTY.
3. CONFIRM EXACT LOCATION OF ROOF TOP RECEPTACLES WITH FLOOR PLANS.
4. ALL FASTENER PENETRATIONS SHALL BE SEALED AS REQUIRED TO HAVE A LEAK FREE INSTALLATION.
5. ROOF TOP RECEPTACLE SUPPORT STRUCTURE SHALL NOT BE FASTENED TO MECHANICAL EQUIPMENT.



6 - ROOF TOP RECEPTACLE DETAIL NTS

DETAIL NOTES:
1. INSTALL AS PER NB POWER STANDARD
2. UNDERGROUND SERVICE CONDUIT SHALL BE SEALED AND INSTALLED AS PER CEC 6-300. PROVIDE SUITABLE DRAINAGE TO CONDUIT TO AVOID MOISTURE AND WATER BACKUP.
3. CONDUITS SHALL RISE MINIMUM 600mm A.F.G C/W CONDUIT GUARD. SEAL ALL CONDUITS TO PREVENT WATER ENTRY.



7 - TAKE OFF POLE DETAIL NTS

NOTES

NO.	DATE	REVISIONS	BY	APPR.
A.0	SEPT 11/19	ISSUED FOR CLIENT REVIEW	DL	EB

GREATER SHEDIAC SEWERAGE COMMISSION
DES ÉGOUTS SHEDIAC ET BANLIEUES

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DRAWING TITLE

SITE DETAILS

Scale	Drawn By	Design By
AS NOTED	DL	EB
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	DM	JB
	Sheet 22 of 25	

File Name
18411-1D-E02.DWG

Drawing No.
18411-1D-E02

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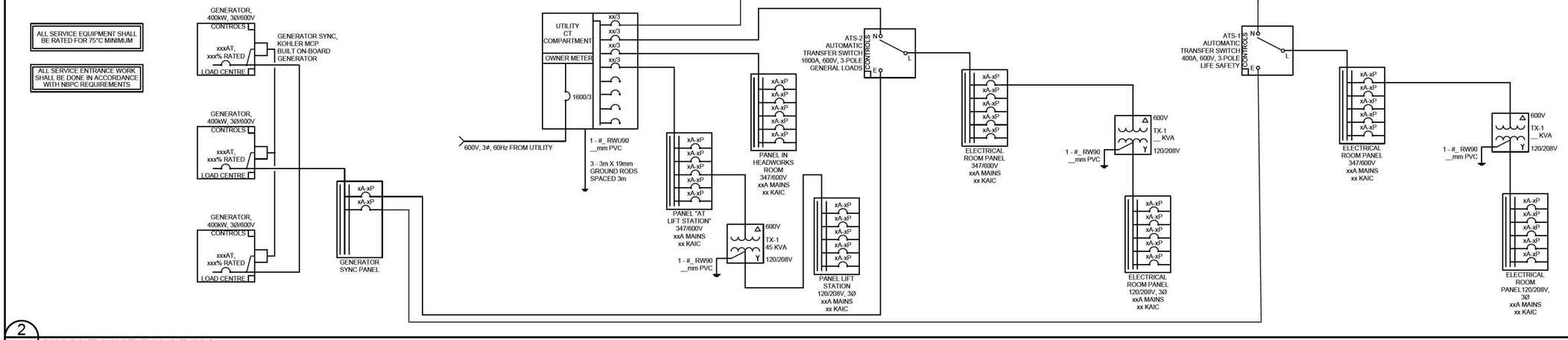
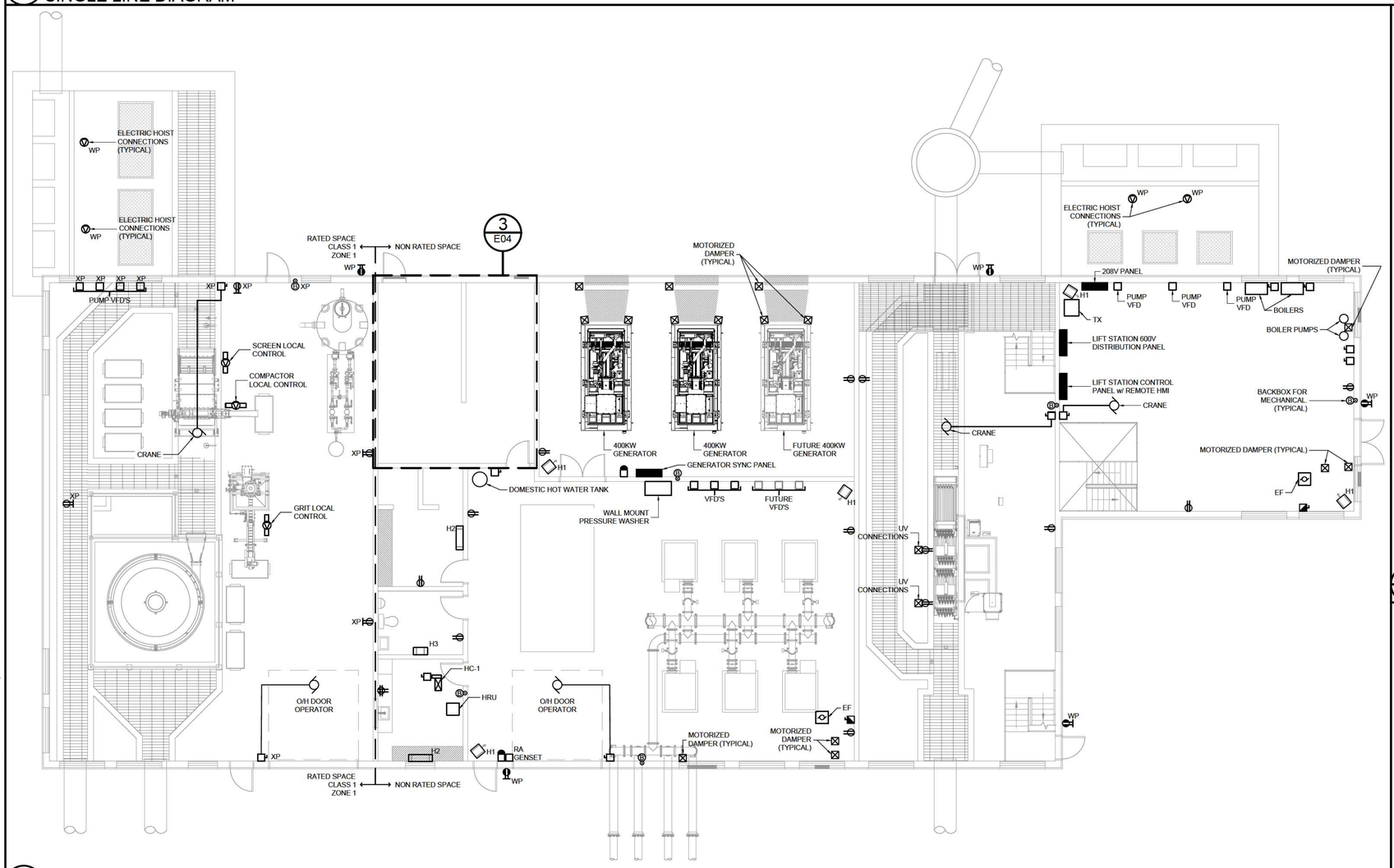
ALL SERVICE EQUIPMENT SHALL BE RATED FOR 75°C MINIMUM

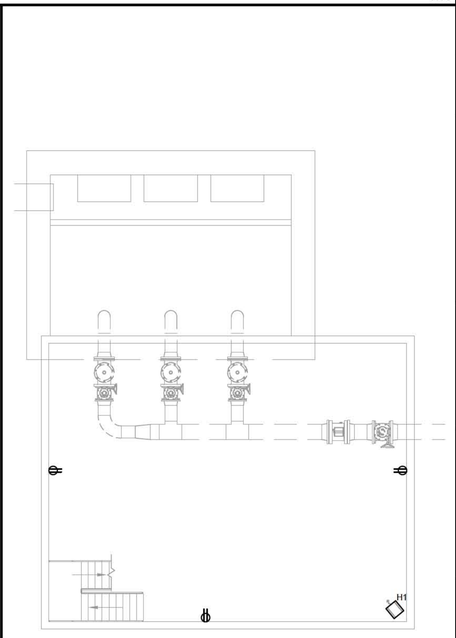
ALL SERVICE ENTRANCE WORK SHALL BE DONE IN ACCORDANCE WITH NBPC REQUIREMENTS



2 - SINGLE LINE DIAGRAM — NTS



1 - POWER LAYOUT - MAIN LEVEL — 1:100



4 - POWER LAYOUT - LOWER LEVEL — 1:100

Service Entrance Calculation (Rule 8-210)			
New Building	1432 m^2		
Basic:	20 W/m^2		
Basic load:	28640 W		
Special Loads:	**Load (W)**	**Demand Factor**	**Load (W)**
Electric heat	19500	100%	19500
Mechanical Ventilation	80021	80%	64017
Propane Tank Vaporizer	20000	80%	16000
DHWT	25000	80%	20000
Mechanical Process	1199969	100%	1199969
Total	1373130 W		1348126
Service Entrance Voltage	600 V,3ø		
Building Current:	1323 A		1299

3 - PRELIMINARY LOAD DEMAND — NTS

NOTES

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DRAWING TITLE

ELECTRICAL SINGLE LINE AND POWER DISTRIBUTION FLOOR LAYOUTS

Scale	Drawn By	Design By
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	Checked By	Cadd Check
	DM	JB
	Sheet 23 of 25	

File Name: 18411-1D-E03.DWG

Drawing No.: 18411-1D-E03

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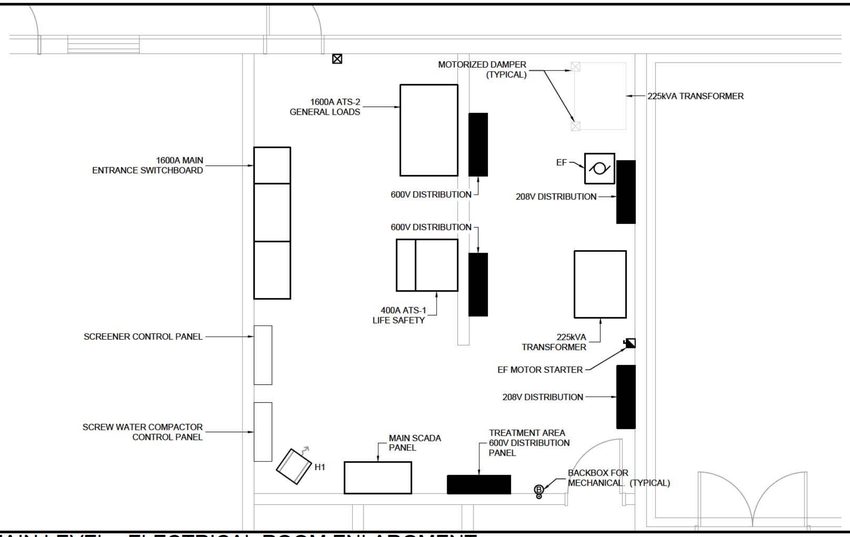
LUMINAIRE SCHEDULE

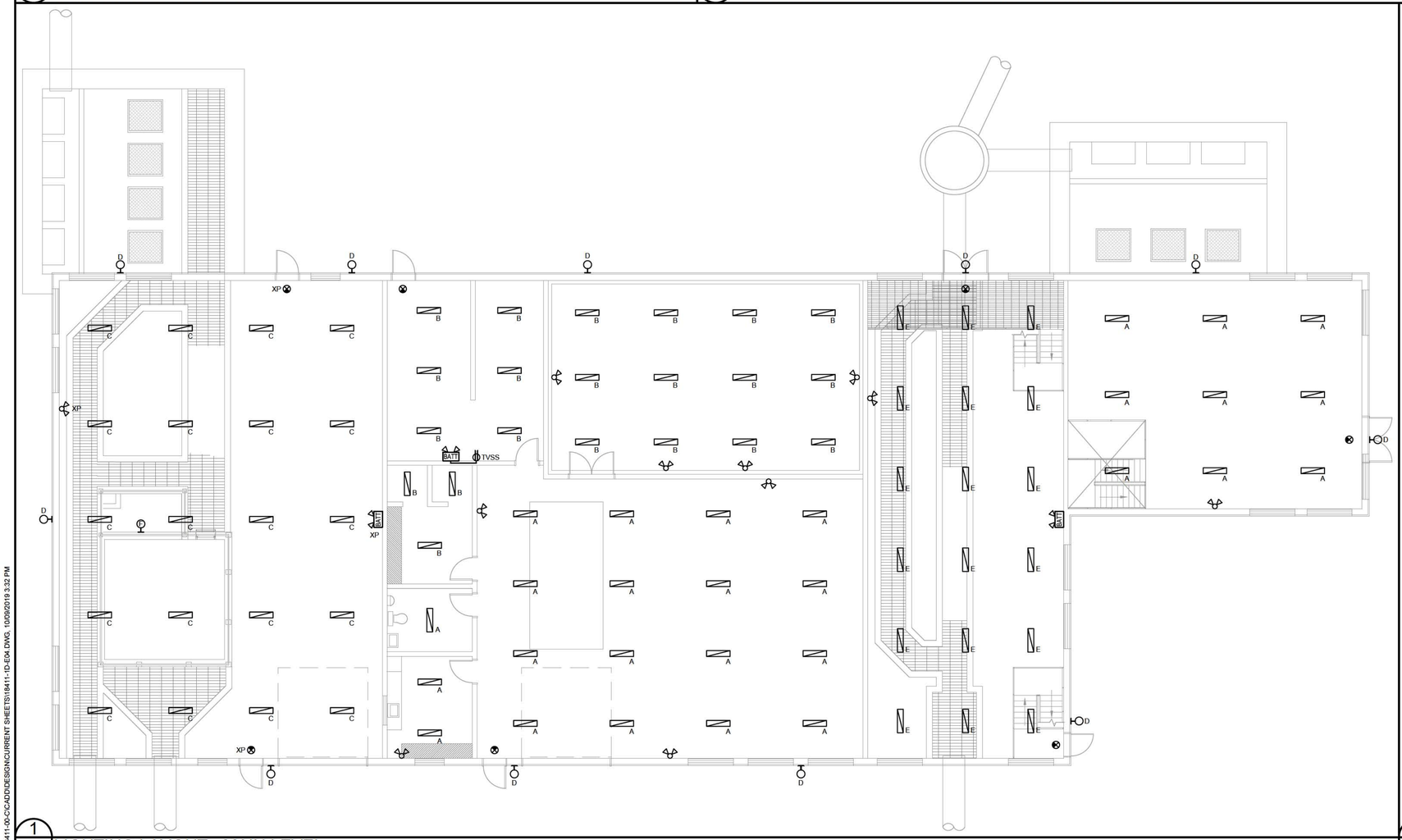
TYPE	DESCRIPTION	MANUFACTURER	LAMP	VOLTAGE
A	220mm X 1200mm WRAP AROUND FROSTED ACRYLIC LENS, HEAVY GAUGE ROLLED STEEL HOUSING, LED, 0-10V DIMMING DRIVER RoHS COMPLIANT	PHILIPS, DAY-BRITE OWL-4-40L-840-UNV-DIM	4000 LUMENS 37 WATTS 4000 K	
B	64mm X 1200mm STRIP LIGHT, DAMP LOCATION, CONTOURED FROSTED ACRYLIC LENS, HEAVY GAUGE ROLLED STEEL HOUSING, LED, 0-10V DIMMING DRIVER RoHS COMPLIANT	PHILIPS, DAY-BRITE FSS-4-40L-840-UNV-DIM	4000 LUMENS 31 WATTS 4000 K	
C	1200mm LONG, CLASS 1, DIVISION 1, LED LINEAR, FULLY GASKETED IP66/67 RATED ENCLOSURE WET LOCATIONS, TEMPERED GLASS LENS	DIALIGHT, SAFESITE LSC3C4M3GEX	7250 LUMENS 68 WATTS 5000 K	
D	LED EXTERIOR WALL SCONES, DISTRIBUTION TYPE 3, DOWNWARD FACING, DIE-CAST HOUSING HOUSES LEDS AND DRIVERS	PHILIPS, KEENE LPW16-78BZ	3374 LUMENS 36 WATTS 4000 K	
E	178mm X 1200mm, LED SEALED INDUSTRIAL VAPOR TIGHT, WET LOCATION, STANDARD POLYCARBONATE LEN, WHITE ONE PIECE, MOLDED FIBERGLASS REINFORCED POLYESTER BODY HOUSING NON-CONDUCTIVE AND NON-CORROSIVE BODY	PHILIPS, DAY-BRITE V2-W-P-T-43L-840-4-UNV-0-10VDIM	4300 LUMENS 38 WATTS 4000 K	
F	EXPLOSION PROOF PIT LED LIGHT, CLASS 1 DIVISION 1	THOMAS & BETTS DL-0-05-E-UN-0-TG-B2-E	5800 LUMENS 45 WATTS 40 K	
BATT	FULLY GASKETED DIE-CAST ALUMINUM BACK PLATEWITH CLEAR POLYCARBONATE COVER. NEMA-4x CERTIFIED, WHITE FINISH	READY-LITE: LDX12-72W-NM-2-LD10 LDX-HZ SERIES FOR EXPLOSION RATED AREAS	120VAC INPUT, 12V DC OUTPUT, 2x6W LED	
	LED DUAL HEAD REMOTE, WHITE FINISH	READY-LITE: RM-2-LD10	12V DC INPUT, 2x6W LED	
	EXTRUDED ALUMINIUM PICTORAL EXIT SIGN, UNIVERSAL MOUNTING, UNIVERSAL FACES C/W AUTO TEST AND DIAGNOSITC, SELF-POWERED C/W BATTERY CHARGER, WHITE FINISH	READY-LITE: RA-3-W-SPD TUFHZ SERIES FOR EXPLOSION RATED AREAS.	3W LED	

NOTES:
1.

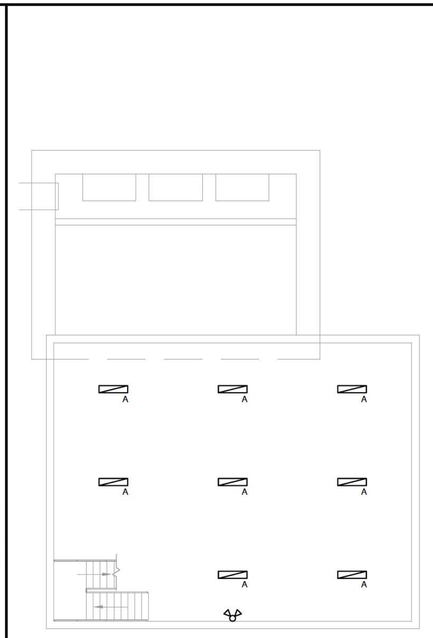
2 - LUMINAIRE SCHEDULE NTS



3 - POWER LEVEL- MAIN LEVEL - ELECTRICAL ROOM ENLARGMENT 1:50



1 - LIGHTING LAYOUT - MAIN LEVEL 1:100



4 - LIGHTING LAYOUT - LOWER LEVEL 1:100

NOTES

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LIGHTING FLOOR LAYOUT AND SCHEDULE

Scale	Drawn By	Design By
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	Checked By: DM	Cadd Check: JB
	Sheet 24 of 25	

File Name: 18411-1D-E04.DWG

Drawing No.: 18411-1D-E04

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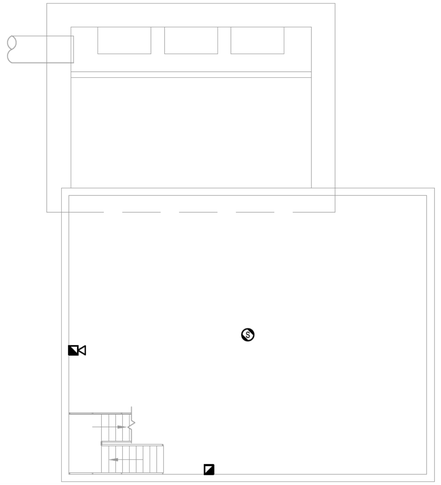
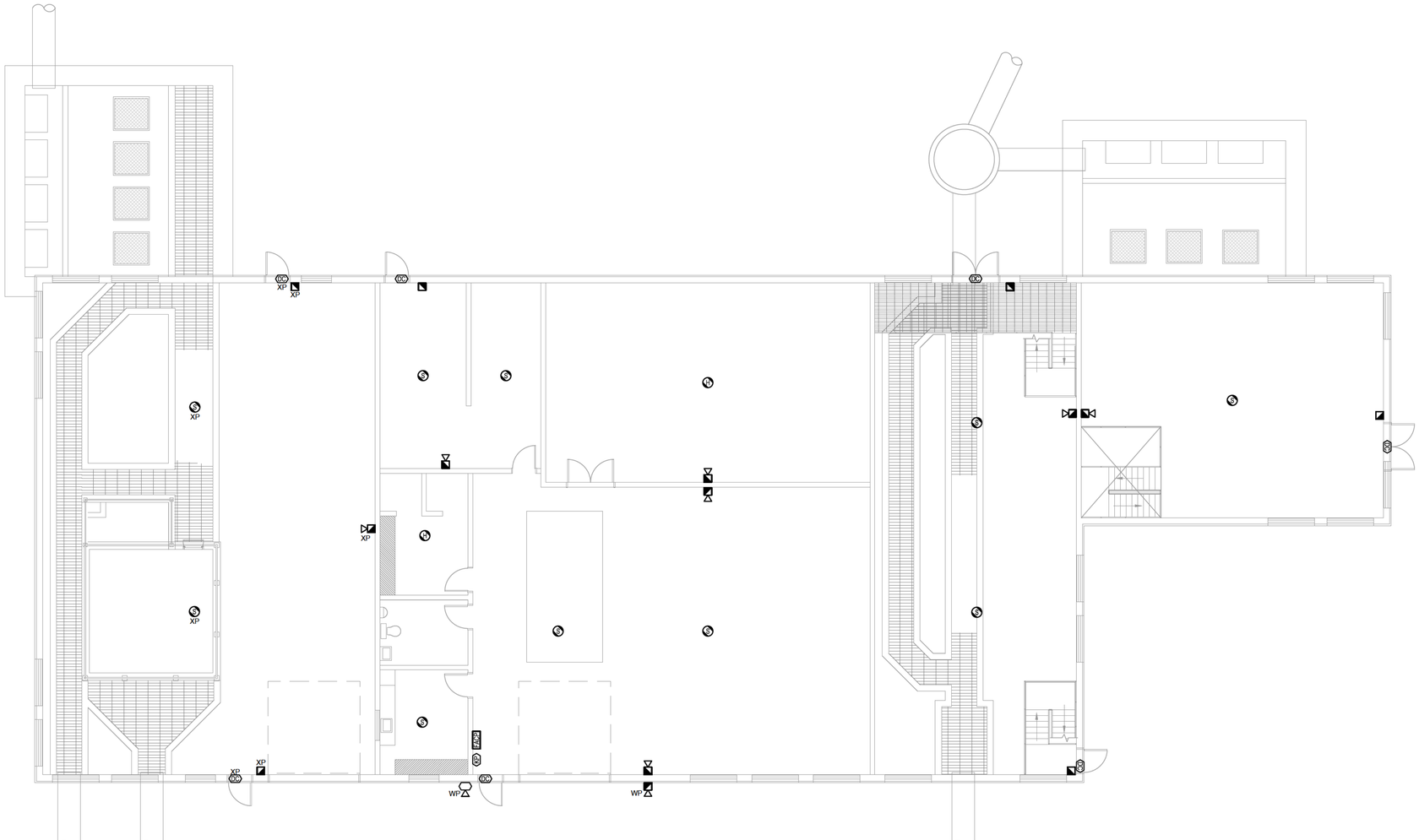
HEATER SCHEDULE				
TAG	DESCRIPTION	AREA OF USE	CONTROLS	MANUFACTURER
H1	5KW UNIT HEATER	INSIDE	CONTROLLED BY SCADA TO RELAY ON HEATER	STELPRO
H2	1KW UNIT HEATER C/W BUILT IN RELAY FOR TEMPERATURE CONTROL	INSIDE	CONTROLLED BY SCADA TO RELAY ON HEATER	STELPRO
H3	500W UNIT HEATER C/W BUILT IN RELAY FOR TEMPERATURE CONTROL	INSIDE	CONTROLLED BY SCADA TO RELAY ON HEATER	STELPRO

NOTES:
1.

2 - HEATER SCHEDULE NTS



3 - FIREALARM AND SECURITY LAYOUT - LOWER LEVEL 1:100



1 - FIRE ALARM AND SECURITY LAYOUT 1:100

NOTES

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CAP-BRULE WASTE WATER
TREATMENT FACILITY

SHEDIAC N.B.

DRAWING TITLE

FIRE ALARM AND SECURITY
LAYOUT

Scale	Drawn By	Design By
AS NOTED	DL	EB
	Checked By: DM	Cadd Check: JB
	Sheet 25 of 25	

File Name: 18411-1D-E05.DWG

Drawing No.: 18411-1D-E05

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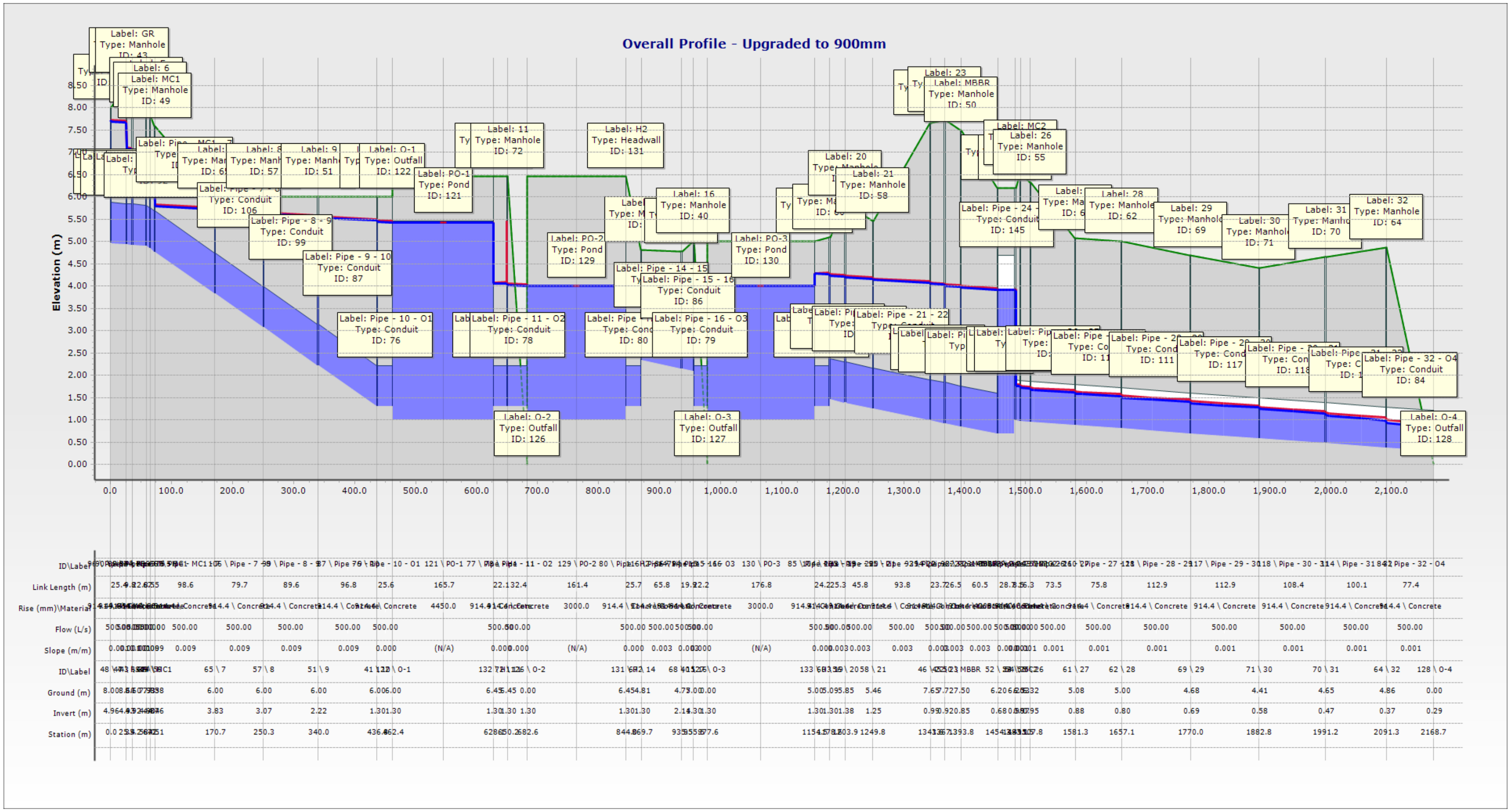
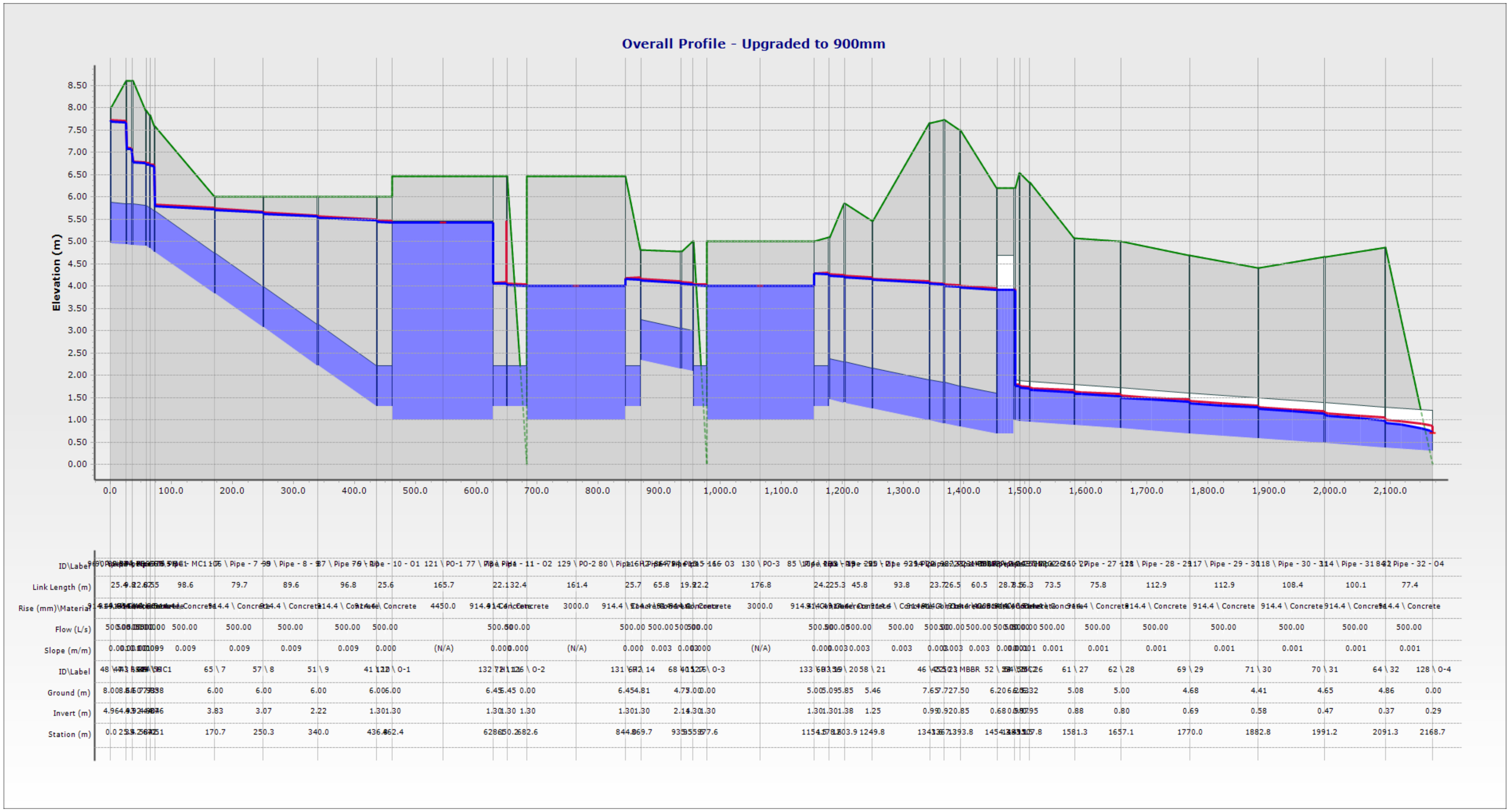
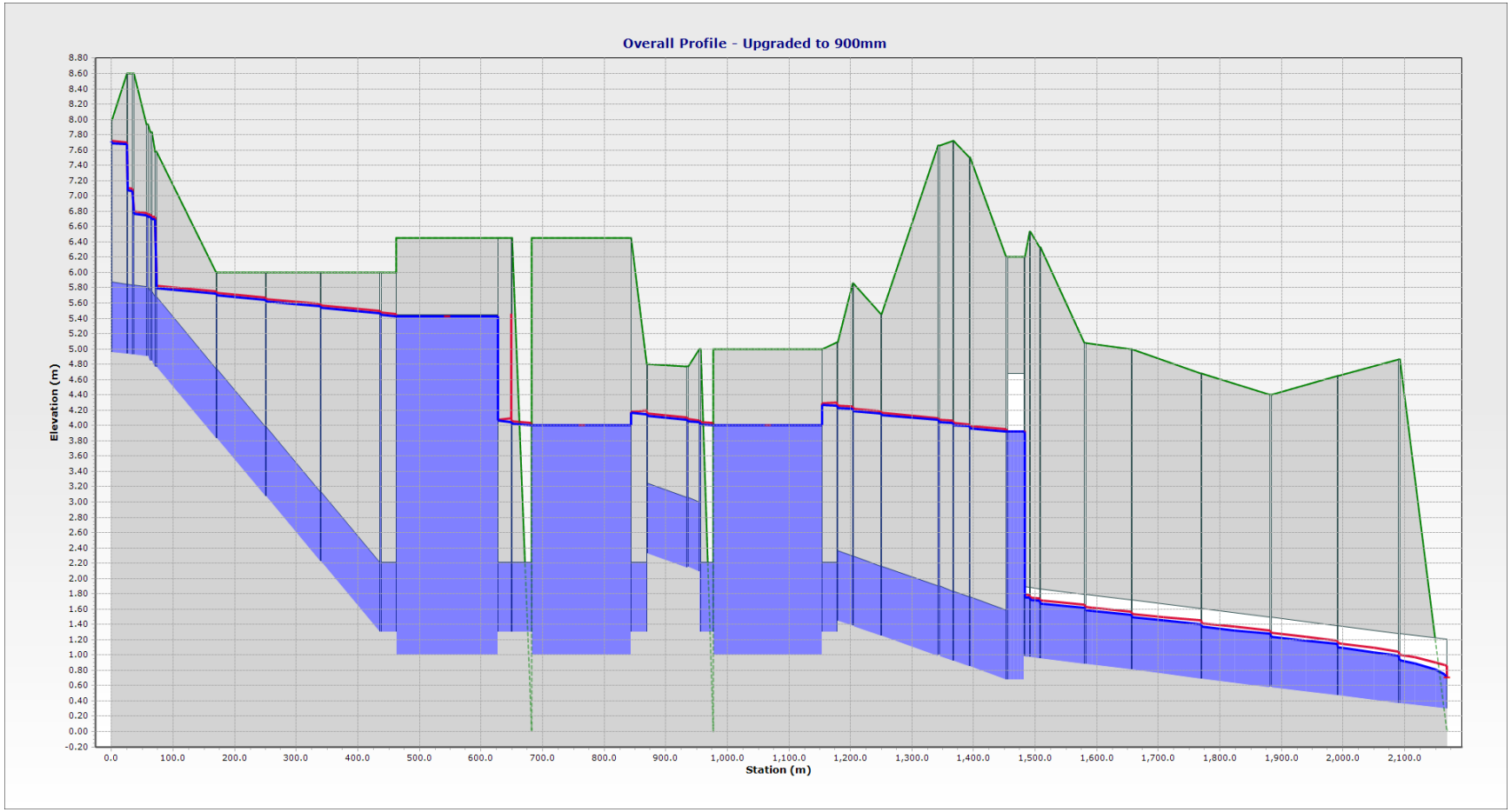
APPENDIX C: CUT SHEETS / PRODUCT DATA SHEETS

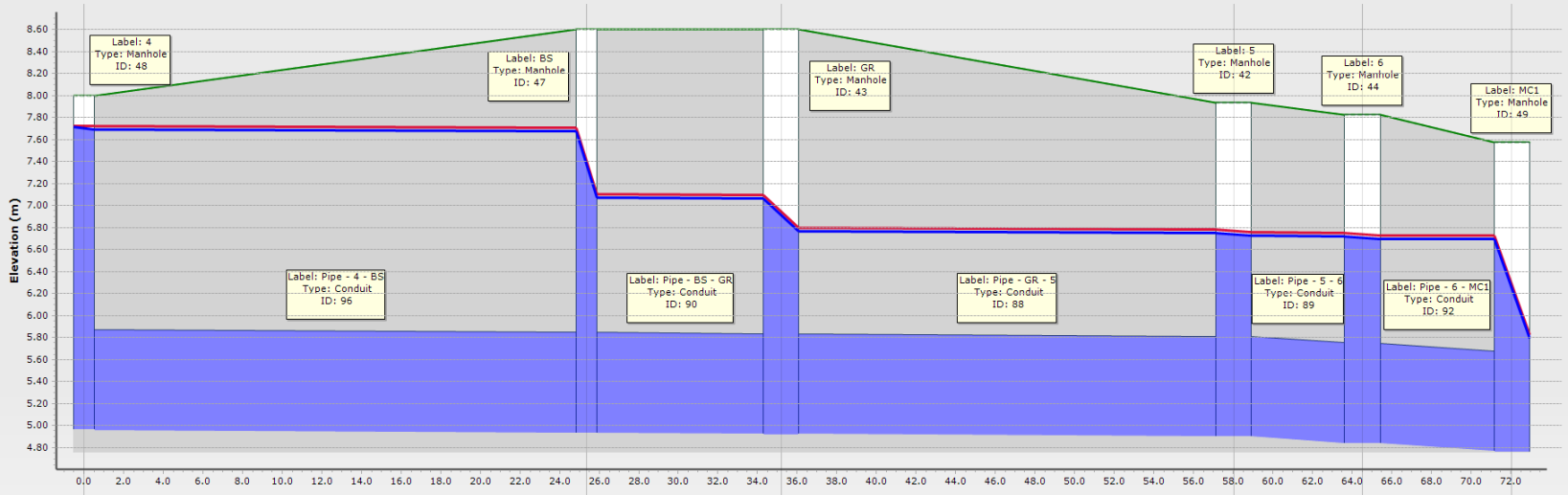
APPENDIX D: HYDRAULIC GRADE LINE


Overall Profile - Upgraded to 900mm
Elevation (m)
ID\Label
Link Length (m)
Rise (mm)\Material
Flow (L/s)
Slope (m/m)
ID\Label
Ground (m)
Invert (m)
Station (m)


Overall Profile - Upgraded to 900mm
Elevation (m)
ID\Label
Link Length (m)
Rise (mm)\Material
Flow (L/s)
Slope (m/m)
ID\Label
Ground (m)
Invert (m)
Station (m)


Overall Profile - Upgraded to 900mm
Elevation (m)
8.80
8.60
8.40
8.20
8.00
7.80
7.60
7.40
7.20
7.00
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
5.00
4.80
4.60
4.40
4.20
4.00
3.80
3.60
3.40
3.20
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
-0.20
0.0
100.0
200.0
300.0
400.0
500.0
600.0
700.0
800.0
900.0
1,000.0
1,100.0
1,200.0
1,300.0
1,400.0
1,500.0
1,600.0
1,700.0
1,800.0
1,900.0
2,000.0
2,100.0
Station (m)

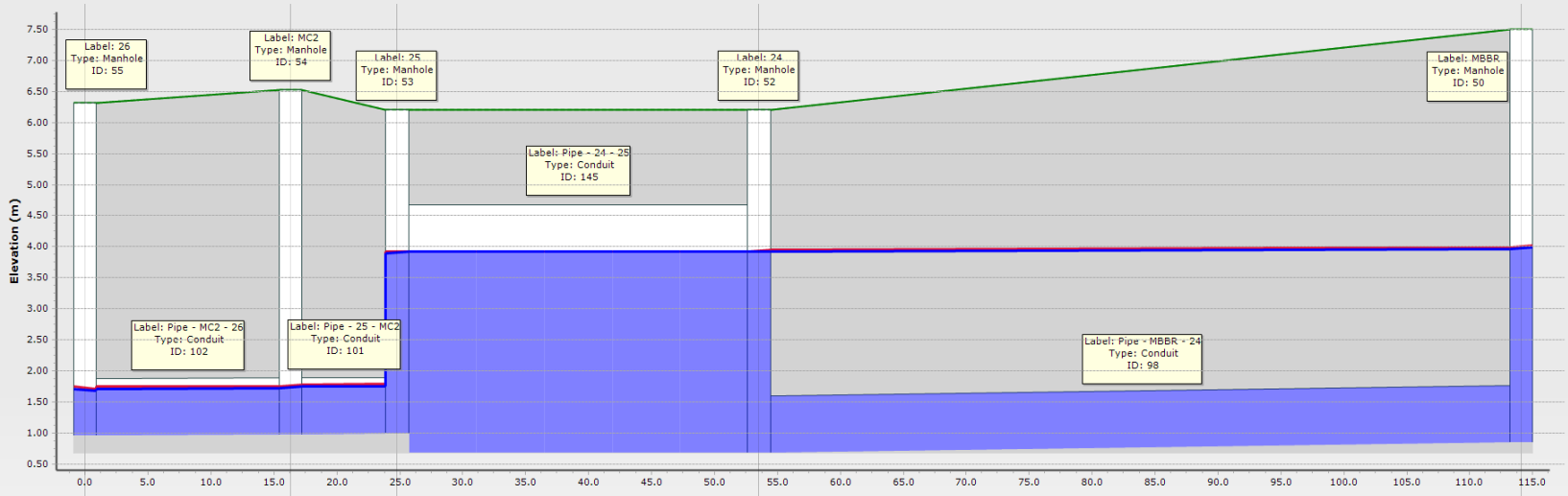
Pre-Treatment Building - Upgraded to 900mm



ID\Label	96 \ Pipe - 4 - BS	90 \ Pipe - BS - GR	88 \ Pipe - GR - 5	89 \ Pipe - 5 - 6	92 \ Pipe - 6 - MC1
Link Length (m)	25.4	9.8	22.8	6.5	7.5
Rise (mm)\Material	914.4 \ Concrete	914.4 \ Concrete	914.4 \ Concrete	914.4 \ Concrete	914.4 \ Concrete
Flow (L/s)	500.00	500.00	500.00	500.00	500.00
Slope (m/m)	0.001	0.001	0.001	0.009	0.009

ID\Label	48 \ 4	47 \ BS	43 \ GR	42 \ 5	44 \ 6	49 \ MC1
Ground (m)	8.00	8.60	8.60	7.93	7.83	7.58
Invert (m)	4.96	4.93	4.92	4.90	4.84	4.76
Station (m)	0.0	25.4	35.2	58.0	64.5	72.1

UV Building - Upgraded to 900mm



ID\Label	102 \ Pipe - MC2 - 26	101 \ Pipe - 25 - MC2	145 \ Pipe - 24 - 25	98 \ Pipe - MBBR - 24
Link Length (m)	16.3	8.5	28.7	60.5
Rise (mm)\Material	914.4 \ Concrete	914.4 \ Concrete	4000.0 \ Concrete	914.4 \ Concrete
Flow (L/s)	500.00	500.00	500.00	500.00
Slope (m/m)	0.001	0.001	0.000	0.003

ID\Label	55 \ 26	54 \ MC2	53 \ 25	52 \ 24	50 \ MBBR
Ground (m)	6.32	6.53	6.20	6.20	7.50
Invert (m)	0.95	0.97	0.98	0.68	0.85
Station (m)	0.0	16.3	24.8	53.5	114.1

APPENDIX E: CLASS "B" COST ESTIMATE

Greater Shediac Sewerage Commission

25 YEAR LAGOON CONCEPT - PHASE 1 (Lagoons and Headworks Building)
PRELIMINARY COST ESTIMATE - September 11, 2019
Project No. 18411

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total Cost
	Lagoon Construction				
1.	**Construction Facilities**				
a.	Site Office Rental, Complete	lump sum	1	$24,000.00	$24,000.00
b.	Electrical & Misc Services, Complete	lump sum	1	$4,000.00	$4,000.00
2.	**Removals**				
a.	Repurpose Existing UV Building & Mechanical Removals, Complete	lump sum	1	$35,000.00	$35,000.00
b.	Screw Pump, Wet Well & Building Demo & Removals, Complete	lump sum	1	$75,000.00	$75,000.00
c.	Removal of all Exising Aeration Equipment, Complete	lump sum	1	$40,000.00	$40,000.00
d.	Miscelaneous Removals & Abandonment of Existing Infrastructure incl. Liner, Complete	lump sum	1	$50,000.00	$50,000.00
e.	Temporary WWTP Bypass & Treatment During Construction, Complete	lump sum	1	$110,000.00	$110,000.00
3.	**Lagoon Earthworks**				
a.	Stripping and Material Re-use, Complete	sq.m.	67,000	$1.00	$67,000.00
b.	Mass Excavation and Material Re-use, Complete	cu.m.	106,000	$7.50	$795,000.00
c.	Hydroseeding & Mulching at Lagoon No. 1 & 2, Complete	sq.m.	15,000	$3.00	$45,000.00
4.	**Sanitary Piping**				
a.	Sanitary Sewer Mains, incl. Fittings, Complete	lin.m.	2,200	$700.00	$1,540,000.00
b.	Sanitary Sewer Manholes, Complete	unit	33	$6,500.00	$214,500.00
c.	Major Flow Control Chambers, Complete	unit	4	$50,000.00	$200,000.00
d.	Minor Flow Control Chambers, Complete	unit	3	$25,000.00	$75,000.00
e.	Sanitary Pressure Pipe - Outfall - On-site - Open Cut, incl. Fittings, Valves and Connections, Complete	lin.m.	600	$600.00	$360,000.00
5.	**WWTP Accessories (Boat and Motor)**				
a.	Boat and Electric Motor, Complete	unit	1	$15,000.00	$15,000.00
6.	**WWTP Air Piping System**				
a.	Buried Air Distribution Header Piping, incl. Fittings, Complete	lin.m.	1,300	$325.00	$422,500.00
b.	Transition Piping (HDPE DR-17) - Buried to Above Ground, incl. Fittings, Connections, and Above Ground 100 mm dia. Butterfly Valves, Complete	unit	22	$3,500.00	$77,000.00
c.	Blow-Off Connections, Including Butterfly Valves and Bollards c/w Bollardguard, Complete	unit	5	$3,000.00	$15,000.00
d.	Installation of Diffuser Lateral Free-end Anchor incl. Bollards c/w Bollardguards, Complete	unit	22	$500.00	$11,000.00
e.	Floating Fine Bubble Diffuser System, Complete	lump sum	1	$800,000.00	$800,000.00
7.	**Security Fencing**				
a.	Chain Link Security Fencing incl. Personel & Vehicle Gates, Complete	lin.m.	100	$150.00	$15,000.00
8.	**New Lagoon Construction**				
a.	Crusher Tailings Lining Material, Complete	tonne	9,900	$20.00	$198,000.00
b.	0-31.5 mm Crushed Stone, Complete	tonne	1,800	$20.00	$36,000.00
c.	Construction of Lagoon Granular Working Platform, incl. Geotextile, Complete				
i.	Granular Material	tonne	16,800	$15.00	$252,000.00
ii.	Woven Geotextile	sq.m.	27,700	$2.50	$69,250.00
d.	Lagoon Sub-Drain System, Complete				
i.	Perforated sub-drain system, including Fittings, Reducer, Geotextile, Clear Stone, Complete	lin.m.	3,440	$50.00	$172,000.00
.ii	Solid Pipe	lin.m.	30	$75.00	$2,250.00
.iii	Storm Sewer Manholes, Complete	unit	2	$4,500.00	$9,000.00
e.	Impermeable HDPE Geomembrane Liner - Including Lock Trench, Pipe Sleeves, etc., Complete	sq.m.	48,100	$8.75	$420,875.00
f.	Safety Rope System - 19 mm dia. Polypropylene, Anchors, etc., Complete	lin.m.	750	$25.00	$18,750.00
g.	Imported Fill, Complete	tonne	25,000	$8.00	$200,000.00
h.	Sludge Removal, Complete	cu.m.	1,200	$125.00	$150,000.00
9.	**Existing Lagoon #1 Construction**				
a.	Floating Baffle Curtain Wall (bottom dimension), Complete	lin.m.	58	$600.00	$34,800.00
b.	Safety Rope System - 19 mm dia. Polypropylene, Anchors, etc., Complete	lin.m.	530	$25.00	$13,250.00
c.	Sludge Removal, Complete	cu.m.	900	$125.00	$112,500.00
d.	0-31.5 mm Crushed Stone, Complete	tonne	900	$20.00	$18,000.00
e.	Impermeable HDPE Geomembrane Liner - Including Lock Trench, Pipe Sleeves, etc., Complete	sq.m.	20,200	$10.00	$202,000.00
10.	**Existing Lagoon #2 Construction**				
a.	Floating Baffle Curtain Wall (bottom dimension), Complete	lin.m.	58	$600.00	$34,800.00
b.	Safety Rope System - 19 mm dia. Polypropylene, Anchors, Removal of existing liner, etc., Complete	lin.m.	530	$25.00	$13,250.00
c.	Sludge Removal, Complete	cu.m.	900	$125.00	$112,500.00
d.	0-31.5 mm Crushed Stone, Complete	tonne	900	$20.00	$18,000.00
e.	Impermeable HDPE Geomembrane Liner - Including Lock Trench, Pipe Sleeves, Removal of existing liner, etc., Complete	sq.m.	20,200	$10.00	$202,000.00
	Building Construction				
11.	**Building Earthworks**				
a.	Stripping, Complete	sq.m.	5000	$3.00	$15,000.00
b.	Mass Excavation, Complete	cu.m	3570	$10.00	$35,700.00
c.	Topsoiling, Hydroseeding & Mulching, Complete	sq.m.	6000	$12.00	$72,000.00
d.	0-31.5 mm Crushed Stone, Complete	tonne	2,700	$35.00	$94,500.00
e.	Asphalt, 100mm thick, Complete	tonne	1,100	$150.00	$165,000.00
f.	Bollards	unit	25	$1,200.00	$30,000.00
12.	**Building Foundation, Structural and Architectural, Complete**				
a.	Building Foundation	lump sum	1	$3,900,000.00	$3,900,000.00
b.	Building Structural and Architectural	lump sum	1	$3,000,000.00	$3,000,000.00
13.	**Building and WWTF Mechanical incl. Plumbing & Ventilation**				
a.	Building Mechanical incl. Plumbing & Ventilation, Complete	lump sum	1	$850,000.00	$850,000.00
b.	Influent Pumps, Complete	lump sum	1	$1,250,000.00	$1,250,000.00
c.	Effluent Pumps, Complete	lump sum	1	$500,000.00	$500,000.00
d.	UV System, Complete	lump sum	1	$750,000.00	$750,000.00
e.	Partial Fume Flow Meter, Complete	unit	2	$75,000.00	$150,000.00
f.	Blower Units, Complete	unit	3	$100,000.00	$300,000.00
g.	Grit Removal	lump sum	1	$450,000.00	$450,000.00
h.	Screening System inc. Washing, Compaction and Controls, Complete	lump sum	1	$450,000.00	$450,000.00
i.	Gas Monitoring System, Complete	Unit	2	$15,000.00	$30,000.00
14.	**Building General Electrical**				
a.	General Electrical, Complete	lump sum	1	$660,000.00	$660,000.00
b.	Generator, Complete	units	3	$200,000.00	$600,000.00
15.	**Building SCADA Communication and Controls**				
a.	PLC Hardware	lump sum	1	$10,000.00	$10,000.00
b.	Panel Fabrication	lump sum	1	$5,000.00	$5,000.00
c.	Controls installation	lump sum	1	$25,000.00	$25,000.00
d.	Programming Software	lump sum	1	$10,000.00	$10,000.00
e.	SCADA Communications and Controls, Complete	lump sum	1	$60,000.00	$60,000.00

Construction Sub-Total :	$20,691,425.00
Construction Contingency Allowance :	$1,035,000.00
Engineering Allowance:	$1,739,000.00
Environmental Study Allowance :	$70,000.00
Geotechnical Allowance :	$45,000.00
Sub Total :	$23,580,425.00
15% HST :	$3,537,063.75
HST Rebate :	-$2,526,474.11
GRAND TOTAL (Net HST incl.) :	**$24,591,014.64**

*** Not Inc uding Land Purchase**

Greater Shediac Sewerage Commission

25 YEAR LAGOON CONCEPT - PHASE 2 (Directional Drilled Outfall)
PRELIMINARY COST ESTIMATE - September 11, 2019
Project No. 18411

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total Cost
1.	**Sanitary Piping**				
a.	Sanitary Pressure Pipe - Outfall - Off-site -Directional Drilling, incl. Fittings, Valves and Connections, Complete	lin.m.	1,000	$ 2,500.00	$2,500,000.00
				Construction Sub-Total :	$2,500,000.00
				Construction Contingency Allowance :	$150,000.00
				Engineering Allowance:	$140,000.00
				Environmental Study Allowance :	$40,000.00
				Geotechnical Allowance :	$30,000.00
				Sub Total :	$2,860,000.00
				15% HST :	$429,000.00
				HST Rebate :	-$306,428.57
				GRAND TOTAL (Net HST incl.) :	**$2,982,571.43**

* Not Including Land Purchase

Greater Shediac Sewerage Commission

25 YEAR LAGOON CONCEPT - PHASE 3 (MBBR)
PRELIMINARY COST ESTIMATE - September 11, 2019
Project No. 18411

Item No.	Description	Unit	Estimated Quantity	Unit Price	Total Cost
1.	**New Concrete Basin**				
a.	Foundation Excavation	cu.m	7,200.00	$10.00	$72,000.00
b.	Footing, Reinforced Concrete	cu.m	100.00	$1,200.00	$120,000.00
c.	Long Wall, Reinforced Concrete	cu.m	300.00	$1,200.00	$360,000.00
d.	Short Wall, Reinforced Concrete	cu.m	250.00	$1,200.00	$300,000.00
e.	Slab, Reinforced Concrete	cu.m	600.00	$1,200.00	$720,000.00
f.	Backfilling & Base Aggregate	tonne	4,600.00	$30.00	$138,000.00
g.	Waterstop	lin.m	170.00	$110.00	$18,700.00
h.	Railing	lin.m	180.00	$300.00	$54,000.00
i.	Grating	sq.m	260.00	$250.00	$65,000.00
2.	**Burried Air Distrbution Piping incl Fittings**				
a.	Burried Air Pipe	lin.m.	130.00	$400.00	$52,000.00
b.	Valves / Blow Off	unit	2.00	$3,500.00	$7,000.00
3.	**Sanitary Sewerage Piping**				
a.	Sanitary Sewer Mains, incl. Fittings	lin.m.	210.00	$750.00	$157,500.00
b.	Sanitary Sewer Manholes	unit	2.00	$6,500.00	$13,000.00
4.	**MBBR Mechanical Equipment**				
a.	MBBR Mechanical Equipment	lump sum	1.00	$3,600,000.00	$3,600,000.00
5.	**Additional Items (Mechanical & Electrical)**				
a.	Additional Mechanical	lump sum	1.00	$100,000.00	$100,000.00
b.	Additional Electrical	lump sum	1.00	$100,000.00	$100,000.00
c.	Additional Instrumentation	lump sum	1.00	$50,000.00	$50,000.00

Construction Sub-Total :	$5,927,200.00
Construction Contingency Allowance :	$238,000.00
Engineering Allowance:	$370,000.00
Environmental Study Allowance :	$10,000.00
Geotechnical Allowance :	$20,000.00
Sub Total :	$6,565,200.00
15% HST :	$984,780.00
HST Rebate :	-$703,414.29
GRAND TOTAL (Net HST incl.) :	**$6,846,565.71**

*** Not Including Land Purchase**

Greater Shediac Sewerage Commission

25 YEAR LAGOON CONCEPT - PHASE 3 (MBBR)
PRELIMINARY COST ESTIMATE - September 11, 2019
Project No. 18411

Item No.	Description	Total (incl. NET HST)
1.	PHASE 1 (Lagoons and Headworks Building)	$24,591,014.64
2.	PHASE 2 (Directional Drilled Outfall)	$2,982,571.43
3.	PHASE 3 (MBBR)	$6,846,565.71
	GRAND TOTAL (Net HST Incl.)	$34,420,151.79