CITY OF CLARENCE-ROCKLAND

EXPANSION LANDS SECONDARY PLAN – MASTER SERVICING STUDY

July 2019

CIMA+ File No. A000817

CONTACT
Brian O'Dell
Brian.O'Dell@cima.ca
T 613-860-2462 ext. 6636

CIMA CANADA INC. (CIMA+)
110–240 Catherine Street,
Ottawa, ON K2P 2G8
T 613-860-2462 **F** 613-860-1870

cima.ca

Table of Contents

List of Tables

List of Figures

List of Appendices

1. Introduction

The City of Clarence-Rockland is part of the counties of Prescott and Russell. As part of the Official Plan of the United Counties of Prescott and Russell, the urban area of Clarence-Rockland was identified for expansion. This expanded urban area will accommodate new urban development to meet Clarence-Rockland's projected growth over the planning period to 2035. Fotenn, CIMA+ and Shore Tanner were retained by the City of Clarence-Rockland (City) to complete a Secondary Plan for the Expansion Lands. Once complete, this Secondary Plan will be appended to the Official Plan for the City's Urban Area as an amendment.

1.1 Study Area

The proposed growth area is located southeast of the existing urban area, immediately adjacent to Caron Street as illustrated in **Figure 1**. The area is comprised of approximately 137.23 hectares (ha) of land held under multiple ownerships in blocks of land that are currently undeveloped or in use for agricultural purposes.

Figure 1: Expansion Lands

As depicted in **Figure 1**, the study area (Expansion Lands) includes the area south of David Street and west of Clarence Creek. It is situated mostly to the east of Caron Street, except for an area of approximately 23 hectares on the west side of Caron Street in the southwest of the Expansion Lands. The Rockland Golf Club and the residential neighbourhood of Rockland East are located to the north of the Expansion Lands.

1.2 Background Documents

The following background drawings, studies and guidance documents were obtained as part of the Master Servicing Study:

- City of Clarence-Rockland Design Guidelines for Subdivisions and Site Plans, dated June 2018;
- City of Clarence-Rockland existing infrastructure model plan views in PDF form for the sanitary network, storm sewer network and water distribution network;
- City of Clarence Rockland existing infrastructure GIS files and LiDAR surface;
- City of Clarence-Rockland fire hydrant flow test data for Hydrant numbers: 351, 213, 212, 208 and 179;
- Sanitary Master Plan Update – Final Report by CH2M Hill, dated November 2009;
- Sanitary Sewer Calculation Sheet for Caron St. Reconstruction by WSP, dated April 29, 2013;
- Proposed Sanitary Servicing Areas sheet number SK1.23 by GENIVAR, Issued for ECA, dated January 23, 2013;
- Sewage Pumping Station Capacity and Condition Assessment and Sanitary Treatment Facility Capacity and Capital Investment Report by WSP, dated June 9, 2014;
- Clarence-Rockland Sewage Treatment Plant Upgrades – Equalization Tank Conceptual Design Report (FINAL) by RVA, dated May 29, 2017;
- OCWA Quarterly Operations Report Card for the City of Clarence-Rockland Water and Wastewater Facilities, 4th Quarter 2016;
- Plan and Profile of Caron Street As-Built Drawings by GENIVAR, dated November 25, 2015;
- Clarence-Rockland and Limoges Water Servicing Study by CH2MHill, dated April 24, 2018;
- Design Brief for Sewage Pumping Station No. 9, Revision 1 by Atrel Engineering Ltd., dated November 2018;

- Pumping Station No. 9 Issued for Approval Drawings by Atrel Engineering Ltd., dated November 16, 2018;
- Stormwater Management Pond Design Brief for Morris Village Subdivision by JFSA Water Resources and Environmental Consultants, dated May 2009 and updated October 2017;
- Topographical Survey for Lot 23 Concession 2 by Arpentages SCHULTZ BARRETTE Surveying, Ref. No. CON. 2(O.S.)-28;
- Final Preferred Concept Plan and Final Densities by Fotenn Planning and Design, dated March 4, 2019

1.3 Design Criteria

This section provides an overview of the design criteria for the Expansion Lands based on the City of Clarence Rockland, South Nation Conservation (SNC), and Ministry of the Environment, Conservation and Parks (MECP) guidelines.

1.3.1 City of Clarence-Rockland Design Guidelines

Generally, Part 4 – Design Requirements, of the City of Clarence-Rockland's Design Guidelines for Subdivisions and Site Plans was utilized for this study and should be followed in development of the proposed Expansion Lands. A brief summary of the key design criteria is provided below:

Watermains:

- Fire protection demand is to be per the requirements of the Fire Underwriters Survey;
- An average flow of 350 L/person/day and the per unit population provided in Table 4-12 of the design guidelines was used to develop flows for residential land use areas;
- An average flow of 28 m^3/ha per day was used to develop flows for commercial and community facility land use areas;
- Domestic peaking factors used for minimum hour, maximum day and peak hour were obtained from Table 4-14 of the design guidelines; and
- The watermain system must be designed to meet the pressure requirements outlined in Table 4-15 in the design guidelines.

Sanitary Sewers:

- An average flow of 350 L/person/day and the per unit population provided in Table 4-1 of the design guidelines was used to develop flows for the residential land use areas;
- An average flow of 28 m^3/ha per day was used to develop flows for commercial and community facility land use areas;
- Extraneous flows of 0.28 L/s/ha and 0.14 L/s/ha were used for residential and commercial areas, respectively;

- The peaking factor for residential areas was determined using the Harmon formula and a peaking factor of 1.5 was used for commercial areas;
- Full flow velocity in sanitary sewers is to be a minimum of 0.6 m/s and a maximum of 3.0 m/s; and
- Actual velocities have been considered to ensure self-cleansing velocities are achieved.

Storm Sewers and Stormwater Management:

- Storm sewers were designed to convey a 5-year return frequency storm and sized using the Rational Method;
- An inlet time of 15 minutes was utilized;
- Runoff coefficients used for sewer sizing were obtained from Table 4-5 of the design guidelines;
- IDF curves based on Ottawa rainfall intensities and the Ottawa Sewer Design Guidelines were used;
- Depth of rainfall data was obtained from MTO's IDF Curve Lookup tool for the project site;
- The 100-year post-development peak flow shall not exceed the 100-year pre-development peak flow, and the 5-year post-development peak flow shall not exceed the 5-year pre-development peak flow;
- A minimum of 80% total suspended solids (TSS) removal is to be provided;
- The SCS Type II storm event distribution for both the 24-hour storm event duration was used to size the SWM ponds; and
- Full flow velocity is storm sewers is to be a minimum of 0.8 m/s and a maximum of 3.0 m/s.

1.3.2 Ministry of Environment, Conservation and Parks (MECP)

Additional stormwater runoff from new pavement can impact receiving watercourse and flood conditions. Quality and quantity control measures to treat stormwater runoff should be considered for all new impervious areas and, where possible, existing surfaces. A Stormwater Management Plan should be prepared in accordance with the MOECC "Stormwater Management Planning and Design Manual" dated May 2003.

The MOECC Design Guidelines for Sewage Works and Design Guidelines for Drinking Water Systems should be referenced where applicable.

1.3.3 South Nation Conservation Authority (SNCA)

No specific design criteria were identified by SNCA at the time of this study. However, the following two documents should be considered at the detailed design stage:

- Clarence Creek Floodplain Mapping Report DRAFT prepared by SNCA, dated April 2019; and
- UCPR Stormwater Facilities Planning and Maintenance Guide DRAFT 2 prepared by SNCA, dated May 27, 2019.

2. Existing Conditions

This section is provided to summarize key components of the City's existing infrastructure which will be utilized to support the Expansion Lands. The following observations are based on a review of as-built drawings as well as background reports and documents supplied by the City.

This is a preliminary review of existing water, sanitary and stormwater servicing. Prior to development, the exact location and capacity of relevant services should be determined.

2.1 Water Distribution System

The City's water distribution system consists of a water treatment plant, transmission mains, distribution mains, reservoirs and pump stations. The sections below provide further details regarding existing capacities and any significant constraints.

2.1.1 Water Treatment Plant Capacity and Demand

Based on the information presented in the Final Report for the Clarence-Rockland and Limoges Water Servicing Study by CH2MHILL, provided by the City to CIMA+, the following existing capacities have been identified for the Clarence-Rockland Water Treatment Plant (WTP):

- Existing WTP capacity is 13,500 m^3/day; and the
- Existing WTP high lift pumping capacity is 13,500 m^3/day.

These values represent the maximum amount of treated water that the WTP can produce using existing equipment and processes. An excerpt from the report is provided in **Appendix C1**.

Consumption rates are compiled into an annual Summary Report by Ontario Clean Water Agency (OCWA). OCWA is a quasi-private sector corporation that operates the urban water system under contract with the City. The 2016 Summary Report of water consumption is provided in **Appendix C2**. Key items drawn from this report include:

- The highest value of the Daily Flow Maximums for 2016 was 8,823.4 m^3/day. This represents the highest water demand day during the year;
- The average of the Daily Flow Averages for 2016 was 6,170.51 m^3/day. This represents an average day of water consumption over the year.

Based on this information, it is evident that water treatment plant capacity (13,500 m^3/day) exceeds 2016 average day usage (6,170 m^3/day). It also exceeds peak water consumption as recorded in 2016 (8,823 m^3/day). Not considering any on-going or other future development within the City, the available information suggests that an additional 4,677 m^3/day of treated water can be produced by the WTP in support of Expansion Lands development.

Although the WTP appears to have capacity, the Final Report for the Clarence-Rockland and Limoges Water Servicing Study recommended that around the year 2027, to be able to meet future water demand based on growth estimated in the report, the existing WTP will have to undertake capacity upgrades. The capacity upgrades identified in the report are listed below:

- Acquire land adjacent to the existing WTP to expand the WTP;
- Increase the WTP treatment capacity;
- Increase the WTP high lift pumping capacity;
- Increase the clear well storage volume at the WTP;
- Replace existing 300 mm diameter Edwards St. watermain with a new 500 mm diameter watermain; and
- Increase Caron Booster Station capacity.

2.1.2 Water Distribution Mains and Transmission Mains

Based on water distribution system model information provided by the City, the proposed Expansion Lands area is currently not serviced by the City's water distribution system. Figure 4-1 from the CH2MHILL report found in **Appendix C1,** shows existing pressure zones for the City. Based on this information, the proposed Expansion Lands will be located within existing Pressure Zone 2 (green highlighted area) and have the following water infrastructure nearby which are expected to be instrumental in servicing the Expansion Lands area:

- Existing 200 mm diameter watermain on David Street;
- Existing high pressure 300 mm diameter transmission main on Caron Street; and the
- Caron Street Booster Station.

It is expected that the Expansion Lands can be serviced by the Caron Street Booster Station. Based on the CH2MHILL report in **Appendix C1**, the existing capacity of the Caron Street Booster Station is 3,975 m^3/day. Currently, the existing capacity exceeds the monthly maximum usage which was measured at 2,563 m^3/day in 2016. Based on this information, it is estimated that the available capacity in the Caron Street Booster Station is 1,412 m^3/day. See the Quarterly Operations Report Card by the OCWA in **Appendix C3**.

Although the Caron Street Booster Station appears to have capacity, the Final Report for the Clarence-Rockland and Limoges Water Servicing Study recommended that around the year 2027, to be able to meet future water demand based on growth estimated in the report, the existing Caron Street Booster Station will have to undertake capacity upgrades.

2.2 Sanitary Sewer System

The City's sanitary sewer system consists of sewers, numerous pumping stations and a wastewater treatment plant (WWTP). The sections below provide further details regarding existing capacities and any significant constraints.

2.2.1 Sanitary Sewers

Based on City provided as-built drawings from the Caron Street Reconstruction project dated November 25, 2015 (**Appendix C4**), existing sanitary sewers adjacent to the proposed Expansion Lands development consist of the following:

- A 300 mm diameter sanitary sewer on Caron Street flowing to the south, which starts as a 200 mm diameter sewer north of Fairway Drive. This sewer terminates in a manhole approximately 35 m south of David Street;
- A 450 mm diameter forcemain on Caron Street, capped south of David Street and connected to the deep sanitary sewer near the intersection of Caron Street and Docteur Corbeil Boulevard; and
- A 250 mm diameter sanitary sewer on David Street, from Caron Street to the capped location approximately 20 m east of the sanitary sewer in Caron Street.

It should be noted that the above identified sewers and forcemain are currently not in service.

As part of the Caron Street Reconstruction project, the deep sanitary trunk sewer near the intersection of Caron Street and Docteur Corbeil Boulevard was upgraded to accommodate future flows from on-going and identified development areas. The sanitary sewer calculation sheet for the deep sanitary trunk sewer along with a sketch showing the sanitary servicing areas can be found in **Appendix C4**. The Expansion Lands are identified as Area 33 and Area 34 in the Sanitary Servicing Areas sketch, SK1.23. Based on this information, the deep sanitary trunk sewer along Caron Street considers future development in the proposed Expansion Lands area as well as other development areas. In ultimate build out conditions the deep sanitary trunk sewer along Caron Street will be operating with a theoretical 13% reserve capacity. Further investigation should be conducted to measure the actual sanitary flow to determine actual sanitary sewer capacity.

2.2.2 Sanitary Pumping Stations

The City has constructed several sewage pumping stations in the existing urban area to pump sewage flows towards the WWTP. Currently, a total of eight existing sanitary pumping stations are in operation and one is being designed.

Pumping Station No. 1 is the City's largest pumping station, as it transfers collected sewage from the full urban service area to the Clarence-Rockland WWTP. It is located south of Highway 17, next to Caron Street, and would collect flow from the proposed Expansion Lands. A review of the

Sewage Pumping Station Capacity and Condition Assessment and Sanitary Treatment Facility Capacity and Capital Investment Report by WSP, dated June 9, 2014, found in **Appendix C5**, was conducted and the following list of information for Pumping Station No. 1 was identified:

- Existing average daily flow is 44.14 L/s (estimated 2013 flows from 2005 data);
- Existing maximum daily flow is 82.19 L/s (estimated 2013 flows from 2005 data);
- Existing peak instantaneous sewage flow is 203.91 L/s (estimated 2013 flows from 2005 data);
- Existing firm rated capacity is 200 L/s; and
- Flows more than 200L/s from Pumping Station No. 1 have been reported by O.W.C.A. in the past 5 years.

Based on this information, it appears that Pumping Station No. 1 is currently operating at or even beyond its firm capacity and requires upgrades to accommodate any additional flows from future developments. The WSP report went further into options for increasing the capacity of Pumping Station No. 1 and associated cost estimates. An excerpt from the WSP report has been provided in **Appendix C5**. Further investigation into the capacity of Pumping Station No. 1 is required before development of the Expansion Lands.

Pumping Station No. 9 will be located within the Morris Village development and is currently under review by the City. When constructed, Pumping Station No. 9 will have a capacity to accommodate the flows for a proposed development of 260 L/s. The flows from Pumping Station No. 9 will be discharged to the deep sanitary trunk sewer near the intersection of Docteur Corbeil Boulevard and Caron Street.

The sanitary drainage area for Pumping Station No. 9 accounts for a portion of the proposed Expansion Lands development, located on the west side of Caron Street. This portion of the proposed Expansion Lands development falls within area External 3 as shown on the Issued for Approval drawings. An excerpt from the Design Brief dated November 2018 as well as the Issued for Approval Sanitary Drainage Area Master Plan (Drawing No. 110704-PSSANMI) dated November 16, 2018, have been provided in **Appendix C6**.

Although the portion of the Expansion Lands on the west side of Caron Street was accounted for in the design of Pumping Station No. 9, it is assumed all areas within the Expansion Lands will be serviced by a pumping station located within the Expansion Lands.

2.2.3 Wastewater Treatment Plant

The system of sanitary sewers and pumping stations collectively direct sanitary flows to a single WWTP that supports the Clarence-Rockland serviced area. The City's WWTP is a secondary treatment facility based on sequencing batch reactor technology. Disinfection is provided by chlorination prior to discharge to the Ottawa River. Sludge is stabilized through an aerobic digestion process prior to storage on site and land application.

According to the Amended Certificate of Approval Number 3-0466-93-967, dated February 14, 1996, found in **Appendix C5,** the current rated capacity of the WWTP is as follows:

- Rated Average Daily Flow Capacity of 6,800 m^3/day;
- Rated Maximum Daily Flow Capacity of 17,340 m^3/day; and a
- Rated Peak Flow Capacity of 20,400 m^3/day.

Under existing peak flow conditions, the WWTP does not provide enough retention time for chlorination prior to discharging to the Ottawa River.

Based on the Equalization Tank Conceptual Design Report by RVA, the City is undertaking the following upgrades to the WWTP to address capacity issues and provide for future growth:

- Increase the pumping capacity and conveyance capacity of Pumping Station No. 1 to 400 L/s; and
- Twinning the forcemain to convey an ultimate peak flow capacity of 850 L/s and for operation redundancy.
- Construction of a new headworks facility, complete with fine screening and grit removal system to improve both pre-treatment and secondary treatment effectiveness; and,
- Design and construction of an equalization tank, as previously identified within the long-term plan for the WWTP, to normalize peak flows from inflow and infiltration.

It is anticipated that these modifications will improve the WWTP's ability to accommodate future growth within the City. An excerpt of the RVA report has been provided in **Appendix C7**. Further investigation into the capacity of the WWTP is required before development of the Expansion Lands.

2.3 Drainage and Storm Sewer System

The pre-development condition of the proposed Expansion Lands is rolling cultivated fields which drain to low areas and eventually to adjacent ditches and creeks. The major creeks adjacent to the Expansion Lands are Clarence Creek and Lafontaine Creek, both creeks are tributaries to the Ottawa River. The proposed Expansion Lands are approximately 3 to 3.5 km upstream from the confluence of the creeks with the Ottawa River.

Caron Street (north of David Street) has an urban cross section and handles runoff from the roadway by catch basins and storm sewers. **Appendix C8** shows the catchment areas for the storm sewers, along with the associated storm sewer calculation sheet for sizing the piping network. The portion of Area M on David Street and south of David Street identified in

Appendix C8 fall within the proposed Expansion Lands. It has been assumed for this study, that drainage within this catchment will be serviced by the Expansion Lands.

Currently Caron Street (south of David Street) and David Street have a rural cross section and handle runoff from the roadway by roadside ditches and culverts until a stormwater outfall is reached. Runoff from the cultivated lands follows the path of least resistance until Clarence Creek or Lafontaine Creek is reached. No existing stormwater management (SWM) facilities were identified in the review of infrastructure servicing the Expansion Lands.

Two sources of topographical were reviewed as part of this study. One source was a topographical survey for Lot 23 Concession 2 by Arpentages SCHULTZ BARRETTE Surveying and the other source was LiDAR data provided by the City. A copy of both sources of topographical information have been attached in **Appendix C10.**

A pre-development catchment analysis was performed on LiDAR data, provided by the City, for the proposed Expansion Lands. It is estimated the study area consists of four subcatchments. Three of the subcatchments discharge to Clarence Creek in the East and one subcatchment discharges to Lafontaine Creek in the West. See **Figure 2** below and the Conceptual SWM Facility Locations Sketch **in Appendix C13**.

Preliminary stormwater runoff calculations were completed for the Expansion Lands under pre-development conditions using parameters listed in **Section 1.3.1** and taken from the City of Ottawa Sewer Design Guidelines. It was estimated that pre-development lands ranged from approximately 0.36% to 3.5% impervious surfaces. Percent impervious parameters were estimated by measuring impervious areas (i.e. roofs, driveways and roadways) and comparing them to the total subcatchment area. **Figure 2** below is a screenshot from the PCSWMM model used to estimate peak runoff. The figure is not to scale and the subcatchments as well as the outlets are shown schematically. The subcatchments are labeled as S1 through S4. Each subcatchment drains to an outlet which is identified by a red triangle. The number below the subcatchment ID is the estimated area in hectares.

Figure 2: Screenshot of Pre-Development Model Sub-Catchments

Information from **Figure 2** above is presented in **Table 1** below. The peak runoff shown in **Figure 2** and **Table 1** was estimated using the 24 hour 100-year SCS Type II design storm.

Table 1: Pre-Development Model - 24hr 100yr Design Storm

Sub-Catchment	Area (ha)	Peak Runoff (m^3/s)
S1	25	1.62
S2	26.4	3.05
S3	54.7	**4.13**
S4	45.5	**3.83**

The numbers in bold in **Table 1** above indicate the release rate used to control post-development flows to pre-development flows.

3. Proposed Conditions

From a servicing perspective, the Study will address how the Expansion Lands will increase water and wastewater demands, and how these demands will be accommodated by the municipal system. From a stormwater management perspective, the Study will address how increased impervious surfaces and runoff will be conveyed and controlled in order to meet quantity, quality and erosion control criteria for the City.

This section is provided to identify critical infrastructure required to service the study area as it relates to the Preferred Concept Plan as shown in **Appendix B**. The following estimates are based on a high-level analysis of projected land use areas and densities as well as background reports and documents supplied by the City.

At this time, the future population and demands for the proposed Expansion Lands are not certain, but they have been estimated for the purposes of this Study. Further analysis will be required during the design development and approvals stage that will quantify water, sanitary and stormwater demands based on proposed phasing. These demands will be used to determine how new developments can be serviced through the existing infrastructure.

3.1 Population Estimate

Table 2 below shows the estimated population for the Expansion Lands which were used to develop water demands and sanitary flows.

Table 2: Population Density Estimate

Land Use Designation	Gross Area (ha)	Medium Scenario		Employment	
		Projected Units	Projected Population	Projected Floor Area (m^2)	Projected Employment
Low Density Residential	76.46	688	2,339	N/A	N/A
Medium Density Residential	22.55	203	548	N/A	N/A
High Density Residential	11.14	100	180	N/A	N/A
Commercial	2.91	N/A	N/A	7,283	182
Other (parks, etc.)	24.17	N/A	N/A	N/A	N/A
Total	**137.23**	**991**	**3,067**	**7,283**	**182**

The population project above is based on projected units for specific land use areas provided by Fotenn and person per unit ratios as identified in the City's design guidelines.

3.2 Water Servicing

Future water demands for the ultimate build out of the Expansion Lands were estimated using the design criteria for watermains listed in **Section 1.3.1**, the Preferred Concept Layout and the population density estimate. **Table 3** below shows the person per unit type that was used for each land use type.

Table 3: City of Clarence-Rockland Design Guidelines Table 4-12 Average Persons per Unit (Residential Uses)

Land Use Type	Unit Type	Persons Per Unit
Low Density	Residential, single family	3.4
Medium Density	Residential, townhouse (row)	2.7
High Density	Apartment, average	1.8

Based on the population density estimate in **Section 3.1**, the ultimate build out population of the proposed Expansion Lands is approximately 3,067 people. Using this estimated population along with Table 4-14 from the City design guidelines, the following peaking factors were used to estimate water demand for residential land use areas:

- Minimum Hour Factor of 0.50;
- Maximum Day Factor of 2.00; and
- Peak Hour Factor of 3.00.

Peaking Factors for Commercial/Community Center land use areas were obtained from City of Ottawa Water Design Guidelines and are 1.5 for Maximum Day and 1.8 for Maximum Hour. The estimated water demand for the ultimate build out of the Expansion Lands are shown in **Table 4** below and supporting calculations can be found in **Appendix C11**.

Table 4: Water demand for the ultimate build out

Land Use Type	Average Daily Consumption (L/s)	Daily Peak Flow (L/s)	Hourly Peak Flow (L/s)
Low Density	9.48	18.95	28.43
Medium Density	2.22	4.44	6.66
High Density	0.73	1.46	2.19
Commercial/Community Center	16.60	24.90	29.88
Total	29.03	49.75	67.16

As indicated in **Section 2.1.2** above, it is estimated that the available capacity of the Caron Street Booster Station is 1,412 m^3/day. When comparing the estimated Average Daily Consumption of the proposed Expansion Lands, 29.03 L/s (2,508.19 m^3/day), to the available capacity of the Caron Street Booster Station, 1,412 m^3/day, it appears there is insufficient capacity of the Caron Street Booster Station to meet the estimated water demand of the ultimate build out. Further investigation and analysis prior to development of the Expansion Lands is recommended to determine the appropriate capacity improvements and timing of the capacity improvements to support the proposed Expansion Lands.

At the time of detailed design, the water system should be looped through the Expansion Lands. The specific connections and extensions of the water infrastructure to create a looped system are to be determined at the detailed design stage. Furthermore, this development will be serviced by a high pressure watermain. Individual services to each unit will likely require pressure reducing valves (PRVs) or PRVs will likely be required on the watermain within the right-of-way. A detailed watermain analysis will assist in determining requirements and appropriate locations of the PRVs. See the Proposed Water Servicing Sketch in **Appendix A** for a conceptual layout.

Fire flow requirements were not evaluated as a result of specific development information not being known at the time of this study (i.e. building size, location, use, setbacks, etc.). A fire flow analysis will need to be conducted at the time of detailed design.

Further analysis and hydrant flow tests will be required to determine capacities and servicing opportunities for individual developments and the reserve pressure within the municipal system. These calculations are dependent on individual site plans and the results of surrounding hydrant flow tests and cannot be accurately estimated at this stage.

3.3 Sanitary Servicing

Preliminary sanitary demand calculations were completed for the Expansion Lands assuming ultimate build out. A demand was calculated by using the design criteria for sanitary sewers listed in **Section 1.3.1**, **Table 5** below, the Preferred Concept Layout and the estimated population density. Assuming a standard infiltration rate of 0.28 L/ha/s for residential land use areas, 0.14 L/s/ha for commercial/community center land use areas and using the Harmon Peaking Factor Formula for residential land use areas only, the estimated peak sanitary flows for the proposed Expansion Lands were calculated as **77.45 L/s**. An infiltration rate of 0.14 L/s/ha for commercial/community center land use areas was used to fall in line with the sanitary model used in the Sanitary Master Plan Update. An excerpt of the Sanitary Master Plan Update has been provided in **Appendix C9.**

Table 5: City of Clarence-Rockland Design Guidelines Table 4-1 Average Persons per Unit (Residential Uses)

Land Use Type	Unity Type	Person Per Unit
Low Density	Residential, single family	3.4
Medium Density	Residential, townhouse (row)	2.7
High Density	Apartment, average	1.8

Sanitary design calculations can be found in **Appendix C12**. During the preliminary sanitary sewer design, catchment areas 34_5 and 34_4 were only able to meet the cleansing velocity requirement with relatively steep slopes when compared to the rest of the system. If the steep slopes were implemented, it would cause the need for deep trunk sewers downstream. Therefore, to reduce the risk of these complications, we recommend maintaining minimum slopes in the upstream sewer network and to implement a flushing program. Further analysis will be required at the detailed design stage to assess the capacity of individual sewer connections as well as the requirement of flushing programs.

Due to the topography of the proposed Expansion Lands, a sanitary pumping station will be required for servicing. As part of the Caron Street Reconstruction project, a 450 mm diameter forcemain was installed in Caron Street. The existing forcemain is capped south of David Street and connected to the deep sanitary sewer near the intersection of Caron Street and Docteur Corbeil Boulevard. Currently, the forcemain is not in use and studies supporting its size have not been provided. Further analysis will be required at the detailed design stage to assess the capacity of the forcemain.

The pumping station location is recommended to be placed in the northeast corner of the proposed Expansion Lands, south of David Street and west of Clarence Creek. This location is the lowest point within the proposed Expansion Lands which is closest to an existing City road. Having the pumping station located near the low spot on site reduces the risk of having long deep sanitary sewers and a deep sanitary pumping station. CIMA+ recommends the location of the sanitary pumping station be revisited at the time of development when more accurate information is available on the phasing of development. Depending on the desired phasing of the Expansion Lands, a second sanitary pumping station or a temporary sanitary pumping station may be required. See the Proposed Sanitary Servicing Sketch in **Appendix A** for a conceptual layout of the sanitary network.

As indicated in **Section 2.2** above, it is estimated that both the WWTP and Pumping Station No. 1 will require capacity improvements to support the proposed Expansion Lands. Further investigation into the capacity of the WWTP and Pumping Station No. 1 is required before development of the Expansion Lands.

3.4 Storm Servicing and Stormwater Management

To direct drainage from future developed lots and roadways, a storm sewer system will need to be designed and constructed. The Rational Method was used to conduct a preliminary analysis for storm sewer sizing of the trunk sewers. Future runoff for the ultimate build out of the Expansion Lands was estimated using the design criteria for storm sewers and stormwater management listed in **Section 1.3.1** and the Preferred Concept Layout. Runoff coefficients used in this analysis are shown below in **Table 6** below:

Table 6: Runoff Coefficients Used in Storm Sewer Sizing Calculations

Land Use Type	Source	Runoff Coefficient (C)
Low Density	Single Family (urban)	0.40
Medium Density	Row housing, townhouses	0.60
High Density	Apartments	0.70
Commercial/Community Center	Commercial	0.80

The results of the preliminary analysis can be found in **Appendix C13** and are shown on the Proposed Storm Servicing Sketches (SK-01 and SK-02) in **Appendix A**. Although the storm sewers were designed to convey a 5-year return frequency storm, it should be noted that the high density and commercial/community center land use areas are restricted to releasing the quality event volume as defined in Table 3.2 from the Stormwater Management Planning and Design Manual from the MOECC (currently MECP). Further discussion of the SWM facilities is provided below.

SWM facilities will be required within the Expansion Lands in order to meet quantity, quality, and erosion control criteria defined in the City's design guidelines. Such end of pipe facilities as wetlands, wet ponds and dry ponds need to be correctly implemented to meet stormwater objectives. As identified in **Section 2.3**, four possible outlets were identified from existing topographical information during a pre-development catchment analysis. Generally, the four outlets are located near the low spots within the proposed Expansion Lands and were considered as potential locations for future SWM facilities.

Through consultation with the City, it was decided to limit the number of stormwater management facilities servicing the proposed Expansion Lands to two facilities in order to reduce the future operation and maintenance costs. Furthermore, each pond will provide quality control for the entire catchment area serviced by it, but only quantity control for the low and medium density land use areas serviced by it. Therefore, on-site quantity controls for the high density and commercial/community land use areas will be required at detailed design. As a result of reducing the potential number of SWM facilities from four to two, there is an increased risk of significant grading requirements to ensure positive drainage to the SWM facilities.

Preliminary stormwater runoff calculations were completed for the Expansion Lands under pre and post-development conditions. It was assumed that post-development lands will increase to approximately 55% impervious surfaces. A post-development approximation of 55% was assumed as this would generally represent a low to medium density development. A post-development approximation of 90% was assumed for high density and commercial development. There are opportunities to reduce the impervious area, but this value provides a fair and conservative estimate for the purpose of this study. CIMA+ recommends that this value be revisited at the time of development when more accurate information is available on the form of development.

The computer software PCSWMM was used to estimate runoff and approximate storage volumes, using the parameters listed in **Section 1.3.1** and taken from the City of Ottawa Sewer Design Guidelines. **Figure 3** below is a screenshot from the PCSWMM model used to estimate peak runoff for the post-development scenario. The figure is not to scale and the subcatchments as well as the outlets are shown schematically. The subcatchments are labeled as S3 and S4 as well as H1 through H3. Each subcatchment drains to an outlet which is identified by a red triangle. The number below the subcatchment ID is the estimated area in hectares.

Figure 3: Screenshot of Post-Development Model Sub-Catchments

When comparing the pre-development subcatchments shown in **Figure 2** to the post-development subcatchments shown in **Figure 3**, it should be noted that the post-development subcatchment S3 incorporates the pre-development subcatchment areas S1 and S2. Furthermore, high density land use areas as well as commercial/community centers, identified as H1 and H2, have been subtracted from the overall subcatchment area for S3 due to these areas proposed requirements for on-site quantity control. The same approach was used for the post-development subcatchment area S4. As a rough estimate, **Table 7 and 8** below provide a quick summary of estimated pre-development peak runoff (allowable release rate), post-development peak runoff and associated storage volumes for the 24 hour 100-year SCS Type II design storm.

Table 7: Post-Development Model - 24hr 100yr Design Storm, Catchment S3

Sub-Catchment	Area (ha)	Pre-Development Peak Runoff (m^3/s)	Post-Development Peak Runoff (m^3/s)	Quantity Storage (m^3)	Quality Plus Permanent Storage (m^3)
S3	93.6	4.13	33.17	37,000	17,784
H1	11.4	N/A	N/A	N/A	2,850
H2	1.1	N/A	N/A	N/A	275

The total estimated storage requirement for Subcatchment S3, which would service the west side of the site, is approximately 58,000 m^3. This reflects the sum of the quantity storage and quality plus permanent storage volumes identified in **Table 7** above rounded up to the nearest thousand.

Table 8: Post-Development Model - 24hr 100yr Design Storm, Catchment S4

Sub-Catchment	Area (ha)	Pre-Development Peak Runoff (m^3/s)	Post-Development Peak Runoff (m^3/s)	Quantity Storage (m^3)	Quality Plus Permanent Storage (m^3)
S4	41.5	3.83	15.04	13000	7885
H3	4	N/A	N/A	N/A	1000

The total estimated storage requirement for Subcatchment S4, which would service the east side of the site, is approximately 22,000 m^3. This reflects the sum of the quantity storage and quality plus permanent storage volumes identified in **Table 8** above rounded up to the nearest thousand.

It should be noted that the total catchment area is larger than the proposed Expansion Lands area due to adjacent lands and roadways that are anticipated to contribute runoff to the proposed Expansion Lands.

The Quantity Storage column reflects the quantity storage required to control the post-development peak runoff rate to the pre-development peak runoff rate. The Quality Plus Permanent Storage column reflects the quality storage required per Table 3.2 from the Stormwater Management Planning and Design Manual from the MOECC (currently MECP). The criteria used for Table 3.2 from the Stormwater Management Planning and Design Manual is as follows:

- 80% long term S.S. removal level;
- SWMP Type is a Wet Pond;
- 55% impervious level for low and medium density residential areas; and
- 85% impervious level for high density and commercial/community center areas.

The total storage requirements are rough estimates and they should be confirmed/further optimized during the detailed design stage. Hydrographs produced by the PCSWMM model which show the estimated storage volumes and respective release rates can be found in **Appendix C13.**

The proposed locations of the SWM facilities, as shown in **Appendix A**, are based on LiDAR information and discussions with the City. A preliminary analysis was conducted to verify cover requirements are met and the SWM facility can have a gravity outlet to adjacent watercourses. This preliminary analysis identified that fill will likely be required around the upstream storm sewer located on Street C. The storm sewer in the southern end of Street B has roughly 1 meter of cover when taking into consideration the existing ground elevation. During detailed design when more accurate information becomes available, the exact location of the SWM facilities should be reviewed to ensure gravity discharge to their identified outlets.

4. Dry Utilities

The term dry utilities commonly refer to hydro, gas and communication infrastructure. Currently, there has been no correspondence with Owners of dry utility infrastructure that service the City. A draft of this report should be circulated to known utility companies in the area prior to any development of the Expansion Lands to identify constraints or specific requirements associated with the development.

5. Implementation, Phasing and Costing

Based on the previously mentioned engineering studies and estimated demands for water and sanitary services, the ultimate build out scenario for proposed Expansion Lands requires the City to implement capacity upgrades to the following critical City infrastructure:

- Water Treatment Plant;
- Caron Street Booster Station;
- Wastewater Treatment Plant; and
- Pumping Station No. 1.

The phasing of the proposed Expansion Lands poses implications on the cost of developing the lands. Development considerations such as stormwater management facility locations, significant grading (cut and/or fill), the sanitary pumping station and deep trunk sewers have been identified for planning purposes on the Civil Infrastructure Figures in **Appendix A** and should be optimized during detailed design.

Depending on the desired phasing of the Expansion Lands, a second sanitary pumping station or a temporary sanitary pumping station may be required. The location of any sanitary pumping station should be reviewed when further information is known about the phasing of the development.

Currently, phasing for the proposed Expansion Lands is unknown. It is recommended that the City conduct a Master Phasing Study to assess which area of the proposed Expansion Lands should be developed first and the timing of capacity upgrades to critical City infrastructure.

6. Conclusions and Recommendations

The report has described the existing conditions with respect to municipal infrastructure and the proposed municipal infrastructure for implementation of the expansion lands. The findings of this study are summarized as follows:

1. The Expansion Lands projected population used to estimate water and sanitary demand was estimated at 3,067 people.
2. Based on the Final CH2MHILL report for the servicing Clarence-Rockland and Limoges, around the year 2027 the City's WTP will be required to undertake capacity upgrades to meet further demand. This is for the scenario in the report which discusses only servicing the City.
3. It appears there is insufficient capacity of the Caron Street Booster Station to meet the estimated water demand of the ultimate build out. Further investigation and analysis prior to development of the Expansion Lands is recommended to determine the appropriate capacity improvements and timing of the capacity improvements to support the proposed Expansion Lands.
4. At the time of detailed design, the water system should be looped through the Expansion Lands. The specific connections and extensions of the water infrastructure to create a looped system are to be determined at the detailed design stage. Further analysis will be required to calculate individual fire flow rates and confirm that minimum and maximum pressure requirements are maintained under the various demand scenarios (i.e. maximum day + fire flow).
5. In ultimate build out conditions the deep sanitary trunk sewer along Caron Street will be operating with a theoretical reserve capacity of 13%. Further investigation should be conducted to measure the actual sanitary flow to determine actual sanitary sewer capacity.
6. Further investigation into the capacity of Pumping Station No. 1 is required before development of the Expansion Lands.
7. A new sanitary pumping station will be required to provide sanitary servicing for the proposed Expansion Lands. This pumping station will connect to an existing 450 mm diameter forcemain in Caron Street. The pumping station is recommended to be in the northeast corner of the development. CIMA+ recommends that the number of sanitary pumping stations and their location be revisited at the time of development when more accurate information is available on the phasing of development. Further analysis will be required at the detailed design stage to assess the capacity of the forcemain.

8. A flushing program for the proposed upstream sewers in the sanitary network may be required as a result of the sewers not achieving self cleansing velocity.
9. The City is undertaking upgrades to the WWTP. It is anticipated that these modifications will improve the WWTP's ability to accommodate future growth within the City. Further investigation into the capacity of the WWTP is required before development of the Expansion Lands.
10. At a minimum, two SWM facilities will be required to meet quality, quantity and erosion control criteria to comply with the City's design guidelines. Significant grading (cut and fill) will be required to have the proposed Expansion Lands drain to two SWM facilities.
11. From a preliminary cover analysis for the proposed storm sewers, it was identified that fill will likely be required for the upstream sewers on Street C and the southern sewer on Street B to met minimum fill requirements.

Prepared by:

LICENSED PROFESSIONAL ENGINEER
B. R. O'DELL
100529918
July 2, 2019
PROVINCE OF ONTARIO

Brian O'Dell, P.Eng.
Engineer, Infrastructure

Verified by:

LICENSED PROFESSIONAL ENGINEER
T. G. KENNEDY
100173201
JULY 2, 2019
PROVINCE OF ONTARIO

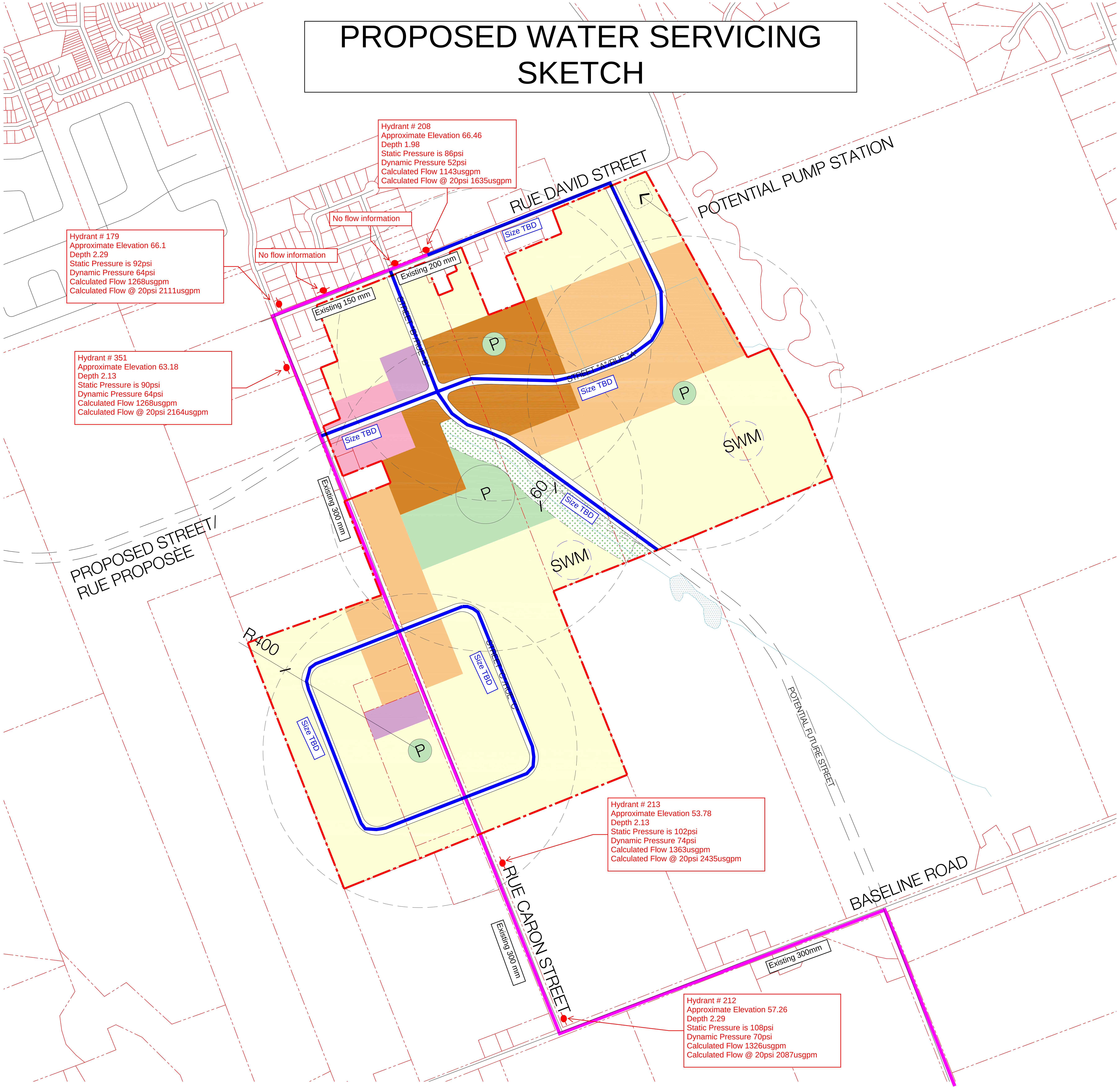
Tim Kennedy, P.Eng.
Project Engineer, Infrastructure

A

Appendix A

Civil Infrastructure Figures

PROPOSED WATER SERVICING SKETCH



Legend:

- Existing watermain
- Proposed watermain

CIMA+ Project No.: A000846
Prepared By: Brian O'Dell, P.Eng.
Date: 2019-04-29

LAND USE STATISTICS

SITE AREA		
Total Site Area:	1,372,345m^2 137 hectares	
AREA		**% Res**
Low Density Residential:	764,561m^2	69.41
Medium Density Residential:	225,472m^2	20.47
High Density Residential:	111,433m^2	10.12
Commercial:	29,130m^2	
Open Space/Parkland:	64,023m^2	
Institutional:	22,274m^2	
Environmental Protection Area:	39,719m^2	

NOTES

1. The base plan (lot lines, existing roads and surrounding areas) is based on the City's Open Data and aerial images. The site area is approximate and all dimensions need to be confirmed by a proper survey.

2. Assume 30.0m setback from centreline of stream.

3. Assume road ROW of 26.0m.

EXPANSION LANDS SECONDARY PLAN

PREFERRED CONCEPT LAND USE PLAN

LEGEND/LÉGENDE

- LOW DENSITY RESIDENTIAL/ RÉSIDENCES À FAIBLE DENSITÉ
- MEDIUM DENSITY RESIDENTIAL RÉSIDENCES À DENSITÉ MOYENNE
- HIGH DENSITY RESIDENTIAL RÉSIDENCES À HAUTE DENSITÉ
- COMMERCIAL COMMERCES
- COMMUNITY FACILITIES INSTALLATIONS COMMUNAUTAIRE
- ENVIRONMENTAL PROTECTION AREA ZONE DE PROTECTION ENVIRONNEMENTALE
- WATER EAU
- P OPEN SPACE/PARKLAND PARCS ET ESPACES OUVERTS
- SWM APPROXIMATE LOCATION OF STORMWATER MANAGEMENT POND EMPLACEMENT APPROXIMATIF DU SYSTÈME DE GESTION DES EAUX PLUVIALES
- PROPERTY LINE LIMITE DE PROPRIÉTÉ
- NEIGHBOURHOOD SIZE (400m RADIUS) TAILLE DU QUARTIER (RAYON DE 400 MÈTRES)

0 125m 250m 500m

No.	REVISION	DATE	BY
8	REVISIONS	2019.03.04	BL
7	REVISIONS	2019.02.08	BL
6	PREFERRED CONCEPT	2019.01.17	BL
5	PUBLIC MEETING	2019.01.07	BL
4	DRAWING	2018.12.20	ET
3	DRAWING	2018.12.19	BL
2	CLIENT REVIEW	2018.11.22	BL
1	DRAWING	2018.11.21	BL

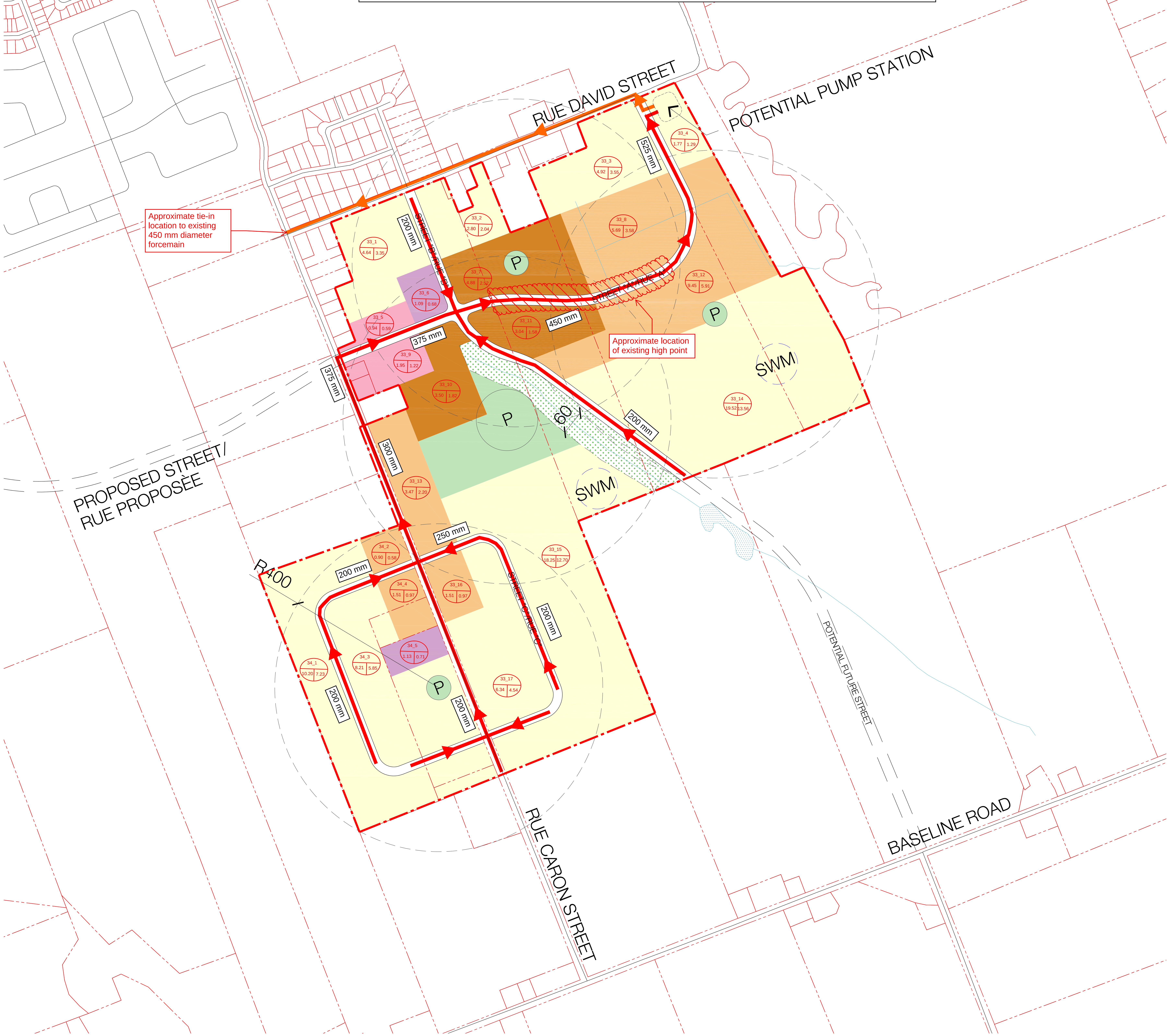
CLIENT
CITY OF CLARENCE/ROCKLAND

FOTENN
Planning + Design
223 McLeod Street, Ottawa ON K2P 0Z8
613.730.5709 www.fotenn.com

DESIGNED	BL
REVIEWED	UMG
DATE	2018.11.20

P1

PROPOSED SANITARY SERVICING SKETCH



LAND USE STATISTICS

SITE AREA

Total Site Area:	1,372,345m^2 137 hectares

AREA		% Res
Low Density Residential:	764,561m^2	69.41
Medium Density Residential:	225,472m^2	20.47
High Density Residential:	111,433m^2	10.12
Commercial:	29,130m^2	
Open Space/Parkland:	64,023m^2	
Institutional:	22,274m^2	
Environmental Protection Area:	39,719m^2	

NOTES

1. The base plan (lot lines, existing roads and surrounding areas) is based on the City's Open Data and aerial images. The site area is approximate and all dimensions need to be confirmed by a proper survey.

2. Assume 30.0m setback from centreline of stream.

3. Assume road ROW of 26.0m.

LEGEND:

- PROPOSED SANITARY SEWER
- PROPOSED SANITARY FORCEMAIN
- FLOW DIRECTION
- SANITARY CATCHMENT ID
- ESTIMATED SANITARY FLOW (L/s)
- SANITARY CATCHMENT AREA (ha)

CIMA+ Project No.: A000846
Prepared By: Brian O'Dell, P.Eng.
Date: 2019-05-03

Note:

1) See Appendix C12 for sanitary flow calculations and sewer sizing.

EXPANSION LANDS SECONDARY PLAN

PREFERRED CONCEPT LAND USE PLAN

LEGEND/LÉGENDE

- LOW DENSITY RESIDENTIAL/ RÉSIDENCES À FAIBLE DENSITÉ
- MEDIUM DENSITY RESIDENTIAL RÉSIDENCES À DENSITÉ MOYENNE
- HIGH DENSITY RESIDENTIAL RÉSIDENCES À HAUTE DENSITÉ
- COMMERCIAL COMMERCES
- COMMUNITY FACILITIES INSTALLATIONS COMMUNAUTAIRE
- ENVIRONMENTAL PROTECTION AREA ZONE DE PROTECTION ENVIRONNEMENTALE
- WATER EAU
- OPEN SPACE/PARKLAND PARCS ET ESPACES OUVERTS
- APPROXIMATE LOCATION OF STORMWATER MANAGEMENT POND EMPLACEMENT APPROXIMATIF DU SYSTÈME DE GESTION DES EAUX PLUVIALES
- PROPERTY LINE LIMITE DE PROPRIÉTÉ
- NEIGHBOURHOOD SIZE (400m RADIUS) TAILLE DU QUARTIER (RAYON DE 400 MÈTRES)

0 125m 250m 500m

No.	REVISION	DATE	BY
8	REVISIONS	2019.03.04	BL
7	REVISIONS	2019.02.08	BL
6	PREFERRED CONCEPT	2019.01.17	BL
5	PUBLIC MEETING	2019.01.07	BL
4	DRAWING	2018.12.20	ET
3	DRAWING	2018.12.19	BL
2	CLIENT REVIEW	2018.11.22	BL
1	DRAWING	2018.11.21	BL

CLIENT

CITY OF CLARENCE/ROCKLAND

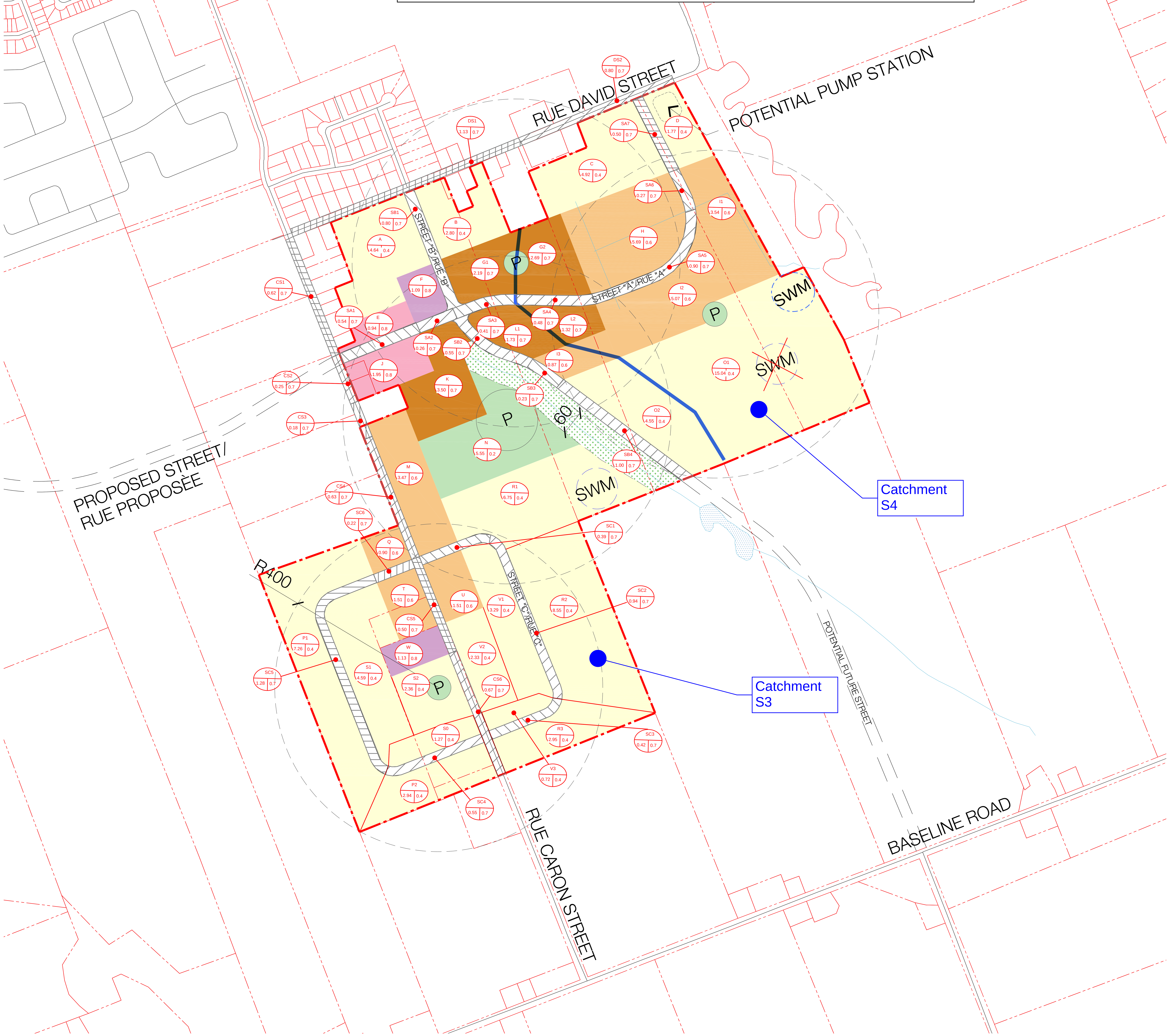
FOTENN Planning + Design

223 McLeod Street, Ottawa ON K2P 0Z8
613.730.5709 www.fotenn.com

DESIGNED	BL
REVIEWED	UMG
DATE	2018.11.20

P1

PROPOSED STORM SERVICING SKETCH SK01



LEGEND:

- PROPOSED STORM SEWER
- APPROXIMATE LOCATION OF CATCHMENT SPLIT
- FLOW DIRECTION
- SUBCATCHMENT ID (33_1)
- RUNOFF COEFFICIENT (1.88)
- STORM CATCHMENT AREA (ha) (4.64)

CIMA+ Project No.: A000846
Prepared By: Brian O'Dell, P.Eng.
Date: 2019-05-03

Note:

1) See Appendix C13 for storm flow calculations and sewer sizing.

LAND USE STATISTICS

SITE AREA

Total Site Area:	1,372,345m^2	
	137 hectares	

AREA		% Res
Low Density Residential:	764,561m^2	69.41
Medium Density Residential:	225,472m^2	20.47
High Density Residential:	111,433m^2	10.12
Commercial:	29,130m^2	
Open Space/Parkland:	64,023m^2	
Institutional:	22,274m^2	
Environmental Protection Area:	39,719m^2	

NOTES

1. The base plan (lot lines, existing roads and surrounding areas) is based on the City's Open Data and aerial images. The site area is approximate and all dimensions need to be confirmed by a proper survey.

2. Assume 30.0m setback from centreline of stream.

3. Assume road ROW of 26.0m.

EXPANSION LANDS SECONDARY PLAN

PREFERRED CONCEPT LAND USE PLAN

LEGEND/LÉGENDE

- LOW DENSITY RESIDENTIAL/ RÉSIDENCES À FAIBLE DENSITÉ
- MEDIUM DENSITY RESIDENTIAL RÉSIDENCES À DENSITÉ MOYENNE
- HIGH DENSITY RESIDENTIAL RÉSIDENCES À HAUTE DENSITÉ
- COMMERCIAL COMMERCES
- COMMUNITY FACILITIES INSTALLATIONS COMMUNAUTAIRE
- ENVIRONMENTAL PROTECTION AREA ZONE DE PROTECTION ENVIRONNEMENTALE
- WATER EAU
- P OPEN SPACE/PARKLAND PARCS ET ESPACES OUVERTS
- SWM APPROXIMATE LOCATION OF STORMWATER MANAGEMENT POND EMPLACEMENT APPROXIMATIF DU SYSTÈME DE GESTION DES EAUX PLUVIALES
- PROPERTY LINE LIMITE DE PROPRIÉTÉ
- NEIGHBOURHOOD SIZE (400m RADIUS) TAILLE DU QUARTIER (RAYON DE 400 MÈTRES)

0 125m 250m 500m

No.	REVISION	DATE	BY
8	REVISIONS	2019.03.04	BL
7	REVISIONS	2019.02.08	BL
6	PREFERRED CONCEPT	2019.01.17	BL
5	PUBLIC MEETING	2019.01.07	BL
4	DRAWING	2018.12.20	ET
3	DRAWING	2018.12.19	BL
2	CLIENT REVIEW	2018.11.22	BL
1	DRAWING	2018.11.21	BL

CLIENT

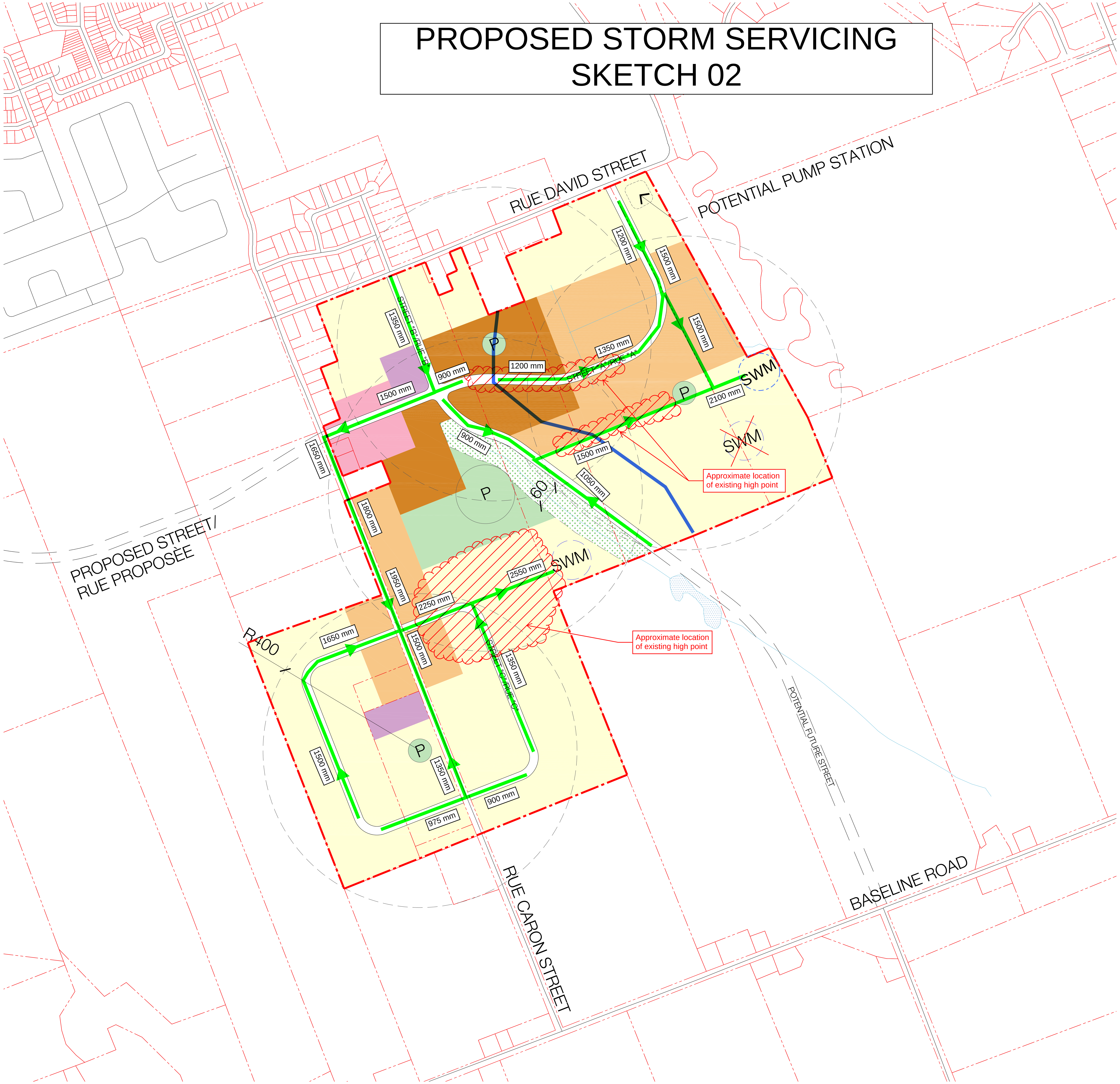
CITY OF CLARENCE/ROCKLAND

FOTENN Planning + Design

223 McLeod Street, Ottawa ON K2P 0Z8
613.730.5709 www.fotenn.com

DESIGNED	BL
REVIEWED	UMG
DATE	2018.11.20

P1



LAND USE STATISTICS

SITE AREA

Total Site Area:	1,372,345m²	
	137 hectares	

AREA		% Res
Low Density Residential:	764,561m²	69.41
Medium Density Residential:	225,472m²	20.47
High Density Residential:	111,433m²	10.12
Commercial:	29,130m²	
Open Space/Parkland:	64,023m²	
Institutional:	22,274m²	
Environmental Protection Area:	39,719m²	

NOTES

1. The base plan (lot lines, existing roads and surrounding areas) is based on the City's Open Data and aerial images. The site area is approximate and all dimensions need to be confirmed by a proper survey.

2. Assume 30.0m setback from centreline of stream.

3. Assume road ROW of 26.0m.

LEGEND:
- PROPOSED STORM SEWER
- APPROXIMATE LOCATION OF CATCHMENT SPLIT
- FLOW DIRECTION
- SUBCATCHMENT ID
- RUNOFF COEFFICIENT
- STORM CATCHMENT AREA (ha)

CIMA+ Project No.: A000846
Prepared By: Brian O'Dell, P.Eng.
Date: 2019-05-03

Note:
1) See Appendix C13 for storm flow calculations and sewer sizing.

EXPANSION LANDS SECONDARY PLAN

PREFERRED CONCEPT LAND USE PLAN

LEGEND/LÉGENDE

- LOW DENSITY RESIDENTIAL/ RÉSIDENCES À FAIBLE DENSITÉ
- MEDIUM DENSITY RESIDENTIAL RÉSIDENCES À DENSITÉ MOYENNE
- HIGH DENSITY RESIDENTIAL RÉSIDENCES À HAUTE DENSITÉ
- COMMERCIAL COMMERCES
- COMMUNITY FACILITIES INSTALLATIONS COMMUNAUTAIRE
- ENVIRONMENTAL PROTECTION AREA ZONE DE PROTECTION ENVIRONNEMENTALE
- WATER EAU
- P OPEN SPACE/PARKLAND PARCS ET ESPACES OUVERTS
- SWM APPROXIMATE LOCATION OF STORMWATER MANAGEMENT POND EMPLACEMENT APPROXIMATIF DU SYSTÈME DE GESTION DES EAUX PLUVIALES
- PROPERTY LINE LIMITE DE PROPRIÉTÉ
- NEIGHBOURHOOD SIZE (400m RADIUS) TAILLE DU QUARTIER (RAYON DE 400 MÈTRES)

0 125m 250m 500m

No.	REVISION	DATE	BY
8	REVISIONS	2019.03.04	BL
7	REVISIONS	2019.02.08	BL
6	PREFERRED CONCEPT	2019.01.17	BL
5	PUBLIC MEETING	2019.01.07	BL
4	DRAWING	2018.12.20	ET
3	DRAWING	2018.12.19	BL
2	CLIENT REVIEW	2018.11.22	BL
1	DRAWING	2018.11.21	BL

CLIENT
CITY OF CLARENCE/ROCKLAND

FOTENN Planning + Design

223 McLeod Street, Ottawa ON K2P 0Z8
613.730.5709 www.fotenn.com

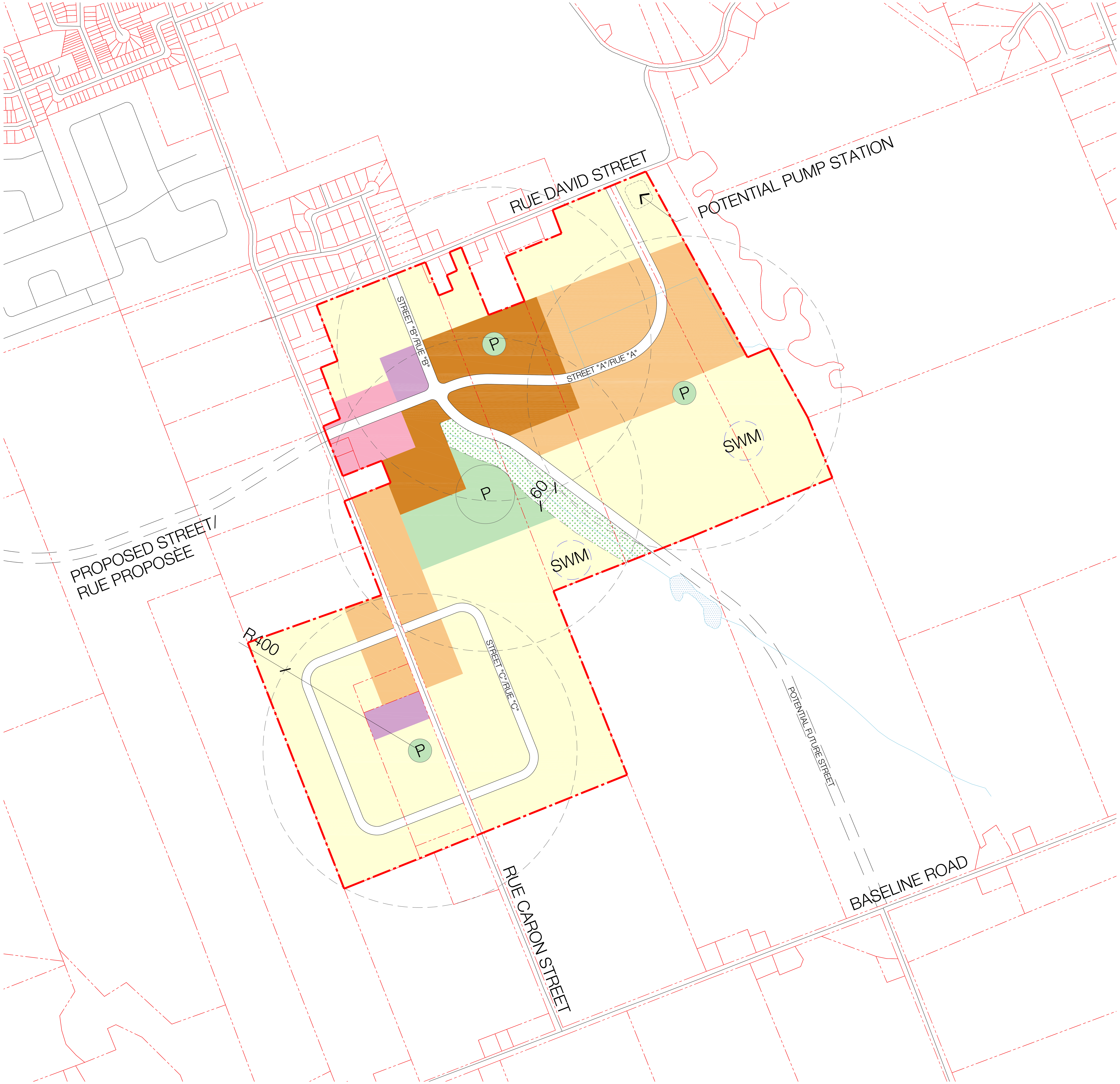
DESIGNED	BL
REVIEWED	UMG
DATE	2018.11.20

P1

B

Appendix B

Population Estimate Documents



LAND USE STATISTICS

SITE AREA	
Total Site Area:	1,372,345m^2 137 hectares

AREA		% Res
Low Density Residential:	764,561m^2	69.41
Medium Density Residential:	225,472m^2	20.47
High Density Residential:	111,433m^2	10.12
Commercial:	29,130m^2	
Open Space/Parkland:	64,023m^2	
Institutional:	22,274m^2	
Environmental Protection Area:	39,719m^2	

NOTES

1. The base plan (lot lines, existing roads and surrounding areas) is based on the City's Open Data and aerial images. The site area is approximate and all dimensions need to be confirmed by a proper survey.

2. Assume 30.0m setback from centreline of stream.

3. Assume road ROW of 26.0m.

EXPANSION LANDS SECONDARY PLAN

PREFERRED CONCEPT LAND USE PLAN

LEGEND/LÉGENDE

- LOW DENSITY RESIDENTIAL/ RÉSIDENCES À FAIBLE DENSITÉ
- MEDIUM DENSITY RESIDENTIAL RÉSIDENCES À DENSITÉ MOYENNE
- HIGH DENSITY RESIDENTIAL RÉSIDENCES À HAUTE DENSITÉ
- COMMERCIAL COMMERCES
- COMMUNITY FACILITIES INSTALLATIONS COMMUNAUTAIRE
- ENVIRONMENTAL PROTECTION AREA ZONE DE PROTECTION ENVIRONNEMENTALE
- WATER EAU
- P OPEN SPACE/PARKLAND PARCS ET ESPACES OUVERTS
- SWM APPROXIMATE LOCATION OF STORMWATER MANAGEMENT POND EMPLACEMENT APPROXIMATIF DU SYSTÈME DE GESTION DES EAUX PLUVIALES
- PROPERTY LINE LIMITE DE PROPRIÉTÉ
- NEIGHBOURHOOD SIZE (400m RADIUS) TAILLE DU QUARTIER (RAYON DE 400 MÈTRES)

0 125m 250m 500m

No.	REVISION	DATE	BY
8	REVISIONS	2019.03.04	BL
7	REVISIONS	2019.02.08	BL
6	PREFERRED CONCEPT	2019.01.17	BL
5	PUBLIC MEETING	2019.01.07	BL
4	DRAWING	2018.12.20	ET
3	DRAWING	2018.12.19	BL
2	CLIENT REVIEW	2018.11.22	BL
1	DRAWING	2018.11.21	BL

CLIENT
CITY OF CLARENCE/ROCKLAND

FOTENN Planning + Design

223 McLeod Street, Ottawa ON K2P 0Z8
613.730.5709 www.fotenn.com

DESIGNED	BL
REVIEWED	UMG
DATE	2018.11.20

P1

CLARENCE-ROCKLAND EXPANSION LANDS SECONDARY PLAN

PROJECTED DENSITIES AND POPULATION

This projection uses the methodology described in the 2012 Hemson report.

Land Use Designation	Gross Area (ha)	Medium Scenario		Employment	
		Projected Units	Projected Population	Projected Floor Area (m2)	Projected Employment (jobs)
Low Density Residential	76.46	688	1,789		
Medium Density Residential	22.55	203	528		
High Density Residential	11.14	100	261		
Commercial	2.91			7,283	182
Other (parks, etc.)	24.17				
TOTAL	**137.23**	**991**	**2,577**	**7,283**	**182**

Projected Density (Medium Scenario): 17 people and jobs/gross hectare

Assumptions

Density scenarios are based on the 2012 Hemson Growth Study	Low	7
	Med	9
	High	12
Employment Density	25% of land area at 1 job per 40 square metres	

Land Use Distribution

Designation	Area (square metres)	Area (hectares)	Percentage of Total Area
Low Density Residential	764,561	76.46	56%
Medium Density Residential	225,472	22.55	16%
High Density Residential	111,433	11.14	8%
Commercial (Retail)	29,130	2.91	2%
Parks and Open Space	64,023	6.40	5%
Institutional/Community Facility	22,274	2.23	2%
Environmental Protection Area	39,719	3.97	3%
Roads	115,733	11.57	8%
TOTAL	**1,372,345**	**137.23**	**100%**

C

Appendix C

Supporting Civil Figures

CIMA+

C1

Appendix C

Clarence-Rockland and Limoges Water Servicing Study Excerpt

2 Model Parameters and Assumptions

2.1 Water Demands

2.1.1 Historical Clarence-Rockland Water Demands

Existing SCADA daily flow data was examined to determine existing demands and peaking factors (see Figure 2-1 for graphical, and Table 2-1 for tabular representation of the data). From the Rockland WTP and the Caron BS flows, the PZ-1 and PZ-2 flows were calculated. The total system flow was taken from the Rockland WTP flow meter. The PZ-1 flow was calculated by subtracting the Caron BS flow from the Rockland WTP flow. The PZ-2 flow was taken from the Caron BS flow meter.

Figure 2-1. Daily SCADA Flow Records – January 2012 to May 2017

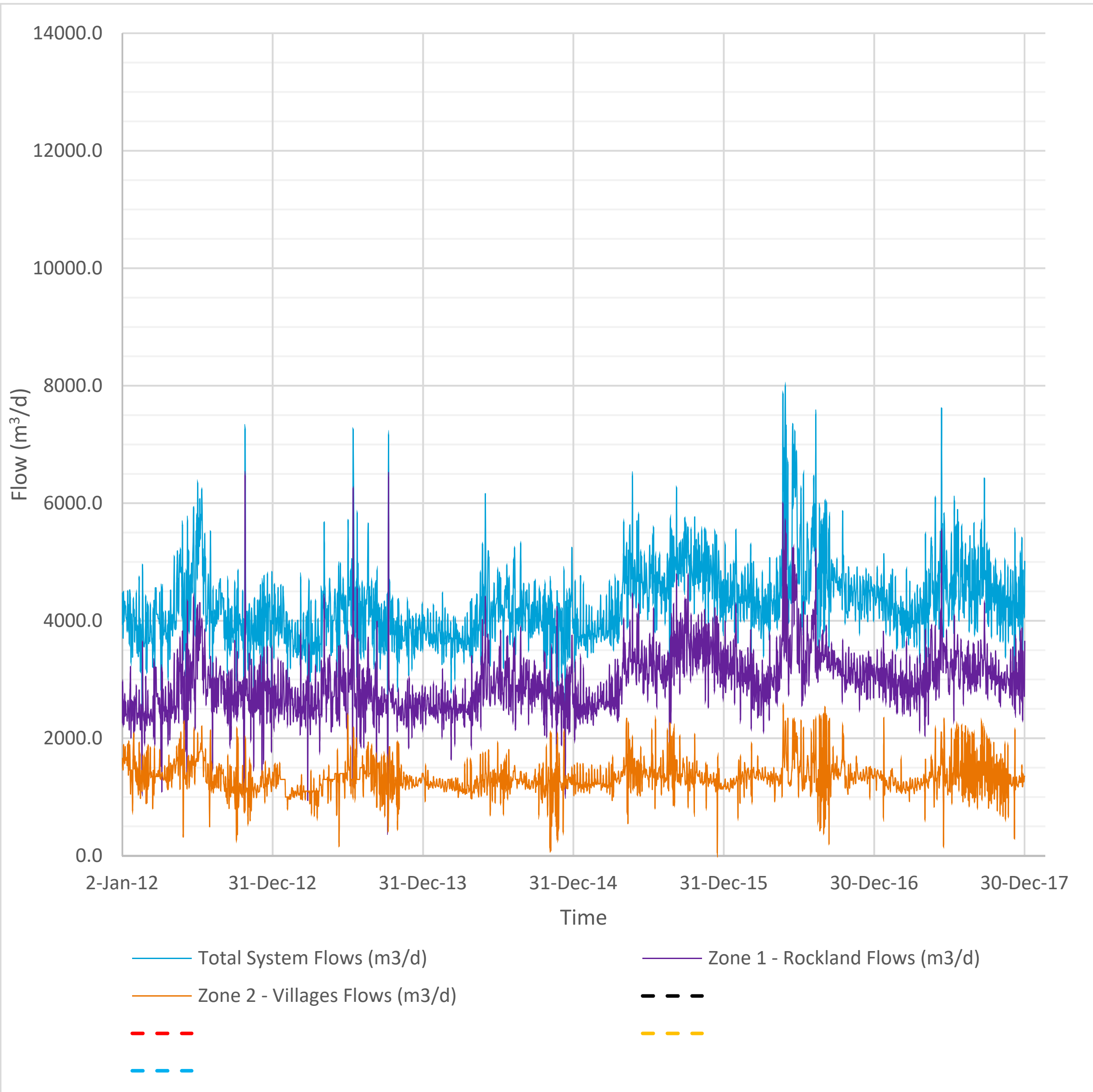


Table 2-1. Daily SCADA Flow Records – Annual Average – 2012 to 2017

Year	Total System	Zone 1 – Rockland	Zone 2 – Villages
2012	4,128.5	2,752.3	1,376.1
2013	3,960.1	2,698.6	1,261.5
2014	3,985.4	2,748.4	1,237.0
2015	4,508.5	3,156.8	1,351.7
2016	4,573.5	3,197.0	1,376.5
2017	4,427.3	3,092.8	1,334.5

Table 2-2. Daily SCADA Flow Records – Total System Average Day, Maximum Day, and 99th Percentile Maximum Day Demands – 2012 to 2017

Year	Average Day	Maximum Day	Maximum Day 99th Percentile
2012	4,128.5	7,260.1	5,981.8
2013	3,960.1	7,182.1	5,751.7
2014	3,985.4	6,161.1	5,242.7
2015	4,508.5	6,461.7	5,749.3
2016	4,573.5	7,942.6	6,938.0
2017	4,427.3	7,619.2	5,946.4

2.1.2 Future Clarence-Rockland Water Demands

The future City water demand projections are based on the following sources:

- Table: Province of Ontario *Residential Population by Age Groups (2016-2041)* (Province of Ontario)
- Report: *United Counties of Prescott and Russell Official Plan (2016-2035)*, Planning Department of the United Counties of Prescott and Russell (April, 2017) (Planning Department of the United Counties of Prescott and Russell, 2017)
- Report: *Official Plan of the Urban Area of the City of Clarence-Rockland (2016-2035)*, Planning Department of the City of Clarence-Rockland, (November 19, 2013) (Planning Department of the City of Clarence-Rockland, 2013)
- Table: *Development Charges Study – Growth Forecast – Residential Units* (April 7, 2017) (Planning Department of the City of Clarence-Rockland, 2017)
- Report: *Urban Area Statistiques – Lots approuvés (2015)*, City of Clarence-Rockland Planning Department, 2016 (Planning Department of the City of Clarence-Rockland, 2016)
- Table: Daily SCADA flow records for the WTP and the Caron BS (2012-2017) (City of Clarence-Rockland, 2017)
- GIS shapefile: UCPR Zoning layer (United Counties of Prescott and Russell, 2017)
- Map: The City of Clarence-Rockland – Future Development (Planning Department of the City of Clarence-Rockland)

Using the 99th percentile maximum and average flows, a maximum day multiplier was calculated. The design maximum day multiplier was rounded up for each.

Hourly flow data from the pumping facilities and the elevated tower would be required to calculate a peak hour multiplier, however this data was not available. Therefore, the peak hour multiplier was assumed to be 1.5 times the maximum day multiplier as indicated in the Ministry of Environment (MOE) *Design Guidelines for Drinking-Water Systems, 2008* (Ministry of the Environment, 2008).

Table 2-5. Clarence-Rockland Residential and Employment Demand Multipliers

Description	PZ-2 – Villages	PZ-1 – Rockland	Total[3]
Minimum (m^3/d)	50.4	436.5	1,349.2
Average (m^3/d)	1,328.7	2,955.9	4,284.6
Maximum (m^3/d)	2,563.0	6,470.0	7,942.6
Maximum (percentile)[1] (m^3/d)	2,289.6	4,458.8	6,383.3
Maximum Day Multiplier (percentile) (times Average Day)	1.72	1.51	1.49
Peak Hour Multiplier (times Maximum Day)	1.5	1.5	1.5
Design Maximum Day Multiplier (times Average Day)	1.8	1.6	1.66[2]
Design Peak Hour Multiplier (times Maximum Day)	1.5	1.5	1.5

Notes:
1. Max (percentile) is used for 99th percentile of the observed data to exclude the outliers or erroneous data point
2. Calculated based on total maximum day demand divided by total average day demand with PZ specific demand multipliers
3. The Totals are the combined PZ-1 + PZ-2 flows. The minimum and maximum total flows do not occur concurrently with the PZ-1 or PZ-2 minimum or maximum flows and therefore are not additive.

2.1.2.4 Projected Future Clarence-Rockland Water Demands

With the total connected residential and employment populations from Section 2.1.2.1, and the unit residential and employment demand factors from Section 2.1.2.2, the total projected future City average day water demands were calculated. Using the maximum day and peak hour multipliers from Section 2.1.2.3, the maximum day and peak hour demands were also calculated. A summary of the average day, maximum day, and peak hour demands are presented in Table 2-6 for each design year.

Table 2-6. Clarence-Rockland Total Water Demands (2016-2047)

Year	ADD (m^3/d)	MDD (m^3/d)	PHD (m^3/d)
2016	4,575.7	7,610.9	11,416.3
2017	4,793.4	8,008.0	12,012.0
2022	5,631.4	10,247.0	15,370.5
2027	6,518.2	11,929.6	17,894.4
2032	7,259.2	13,413.6	20,120.4
2037	8,044.7	15,202.9	22,804.3
2042	8,760.5	16,866.6	25,300.0
Beyond 2042	10,695.2	19,912.8	29,869.3

Notes:
1. Definitions: ADD – Average Day Demands, MDD – Maximum Day Demands, PHD – Peak Hour Demands

2.1.2.5 Clarence-Rockland Diurnal Curve

The diurnal curve is a theoretical maximum day pattern with the peak hour multiplier of 1.5 times maximum day demand. This pattern is applied to both the average day, and maximum day EPS scenarios.

5 Recommendations

5.1 Scenario 1 – Clarence-Rockland Only

5.1.1 Scenario 1-1 – 2017 Recommendations

This scenario represents the existing conditions in the system. No capacity upgrades are required for this scenario. However, the following operational upgrades are recommended:

- New 300 mm diameter watermain on St. Jean St. from Patricia St. to Docteur Corbeil Blvd. Note that this watermain is not required to meet the design criteria for Scenario 1-1, but is needed for redundancy and to improve pressures in future scenarios. However, it will be built in the short-term due to the timing of work on the Morris development.
- New 350 mm watermain from the Caron BS to the intersection of Bouvier Rd. and Labonte St. totaling approximately 6.2 km including pressure reducing valves to create sub-PZ-2A.

5.1.2 Scenario 1-2 – 2022 Recommendations

This scenario is an incremental increase in water demands compared to the 2017 scenario. No additional upgrades are required beyond what has been indicated in previous scenarios.

5.1.3 Scenario 1-3 – 2027 Recommendations

This scenario is an incremental increase in water demands compared to the 2022 scenario. The following capacity upgrades are recommended:

- Acquire land adjacent to the existing WTP to expand the WTP.
- Increase the Rockland WTP treatment capacity from 13,500 m^3/d to 23,000 m^3/d to meet the Beyond 2042 scenario maximum day demand (assuming an extra 10% for filter backwashes).
- Increase the Rockland WTP high lift pumping capacity from 13,500 m^3/d to 25,500 m^3/d to meet the Beyond 2042 scenario maximum day demand plus additional capacity to compensate for PZ-1 storage deficiency.
- Expand the Rockland WTP clearwell storage volume to meet the Beyond 2042 scenario storage requirements for PZ-1.
- Replace existing 300 mm Edwards St. watermain (east side of road) with new 500 mm watermain. Extent of replacement from the WTP to the south side of Highway 17.
- Expand the Caron BS capacity from 3,975 m^3/d to 8,000 m^3/d.

5.1.4 Scenario 1-4 – 2032 Recommendations

This scenario is an incremental increase in water demands compared to the 2027 scenario. No additional upgrades are required beyond what has been indicated in previous scenarios.

5.1.5 Scenario 1-5 – 2037 Recommendations

This scenario is an incremental increase in water demands compared to the 2032 scenario. No additional upgrades are required beyond what has been indicated in previous scenarios.

5.1.6 Scenario 1-6 – 2042 Recommendations

This scenario is an incremental increase in water demands compared to the 2037 scenario. No additional upgrades are required beyond what has been indicated in previous scenarios.

5.1.7 Scenario 1-7 – Beyond 2042 Recommendations

This scenario includes all water demands that are anticipated beyond the year 2042 and is not an incremental increase from the 2042 scenario. The timing of these future developments and water demands is currently unknown. This scenario is included in the analysis so that the recommended infrastructure is sized to account for these future known water demands. No additional upgrades are required beyond what has been indicated in previous scenarios.

5.2 Scenario 2 – Clarence-Rockland Plus Limoges

5.2.1 Scenario 2-1 – 2017 Recommendations

This scenario represents the existing conditions in the system with the addition of the 2017 Limoges demands. The following capacity and operational upgrades are recommended:

- New 400 mm watermain main from the Cheney ET to the existing Limoges WTP totaling approximately 9.8 km to connect Limoges to the Clarence-Rockland water system.
- New 300 mm diameter watermain on St. Jean St. from Patricia St. to Docteur Corbeil Blvd. Note that this watermain is not required to meet the design criteria for Scenario 2-1, but is needed for redundancy and to improve pressures in future scenarios. However, it will be built in the short-term due to the timing of work on the Morris development.
- New 450 mm watermain from the Caron BS to the Bouvier ET totaling approximately 9.3 km including pressure reducing valves to create sub-PZ-2A.
- New 450 mm watermain on Caron St. from Docteur Corbeil Blvd. to the Caron BS totaling approximately 0.2 km.
- Expand the Caron BS capacity from 3,975 m^3/d to 15,000 m^3/d.

5.2.2 Scenario 2-2 – 2022 Recommendations

This scenario is an incremental increase in water demands compared to the 2017 scenario. The following capacity upgrades are recommended:

- Increase the Rockland WTP treatment capacity from 13,500 m^3/d to 30,500 m^3/d to meet the Beyond 2042 scenario maximum day demand (assuming an extra 10% for filter backwashes). This includes land acquisition adjacent to the existing WTP for the expansion.
- Increase the Rockland WTP high lift pumping capacity from 13,500 m^3/d to 32,700 m^3/d to meet the Beyond 2042 scenario maximum day demand plus additional capacity to compensate for PZ-1 storage deficiency.
- Expand the Rockland WTP clearwell storage volume to meet the Beyond 2042 scenario storage requirements for PZ-1.
- Replace existing 300 mm Edwards St. watermain (east side of road) with new 500 mm watermain. Extent of replacement from the WTP to the south side of Highway 17.
- New 350 mm watermain from the Bouvier ET to the intersection of Bouvier and Lacroix totaling approximately 2.6 km.

5.2.3 Scenario 2-3 – 2027 Recommendations

This scenario is an incremental increase in water demands compared to the 2022 scenario. The following capacity upgrades are recommended:

- New watermain from the Bouvier and Lacroix to the Cheney ET totaling approximately 8.3 km. This includes approximately 3.0 km of 350 mm diameter watermain and 5.3 km of 300 mm diameter watermain.

6 Capital Works Plan

6.1 Infrastructure Costs

6.1.1 Recommended Infrastructure Upgrades – Scenario 1 – Clarence-Rockland Only

A Class D estimate was prepared for each recommended infrastructure upgrade for Scenario 1 from Section 5.1 and the estimated costs are shown in Table 6-3 and Table 6-2. The cost estimates in Table 6-3 and Table 6-2 are estimated using the two watermain unit price calculations shown in Section 6.1.4 (Conservative, and Aggressive unit cost estimates).

Table 6-1. Summary of Recommended Infrastructure Upgrade Costs – Scenario 1 – Conservative Cost Estimate

Infrastructure Recommendation Description	Estimated Base Cost ($ M)	Base Cost Markups[1] ($ M)	Subtotal ($ M)	Subtotal Markups[2] ($ M)	Total[3] ($ M)
Zone 1 - Rockland					
Rockland WTP Upgrades[4]	8.10	4.46	12.56	1.88	14.44
Replace Watermain – Edwards St: Rockland WTP to Highway 17 (east side pipe)	0.40	0.16	0.56	0.08	0.65
New Watermain – Caron St: Docteur Corbeil Blvd. to the Caron BS	0.14	0.06	0.20	0.03	0.23
New Watermain – St. Jean St: Patricia St. to Docteur Corbeil Blvd.	0.28	0.11	0.39	0.06	0.45
Zone 2 – Villages					
Caron BS Upgrades	1.23	0.67	1.90	0.28	2.18
New Watermain – Caron BS to Bouvier Rd. and Labonte St.	4.37	1.75	6.11	0.92	7.03
New Watermain – Bouvier Rd. and Labonte St. to Bouvier ET	2.52	1.01	3.52	0.53	4.05
Total	**17.04**	**8.22**	**25.24**	**3.78**	**29.03**

Notes:
1. Contractor's overhead, profit, mobilization, bonds, and insurance (15%), and design contingency (40% for facility upgrades, and 25% for watermain upgrades).
2. Construction contingency (5%), and average price escalation (10%).
3. Excludes HST.
4. The Rockland WTP Upgrades cost estimate includes low lift and high lift pumping and treatment capacity. It assumes that a new intake in the Ottawa River is not required.

Table 6-2. Summary of Recommended Infrastructure Upgrade Costs – Scenario 1 – Aggressive Cost Estimate

Infrastructure Recommendation Description	Estimated Base Cost ($ M)	Base Cost Markups[1] ($ M)	Subtotal ($ M)	Subtotal Markups[2] ($ M)	Total[3] ($ M)
Zone 1 - Rockland					
Rockland WTP Upgrades[4]	8.10	4.46	12.56	1.88	14.44
Replace Watermain – Edwards St: Rockland WTP to Highway 17 (east side pipe)	0.28	0.11	0.39	0.06	0.45
New Watermain – Caron St: Docteur Corbeil Blvd. to the Caron BS	0.10	0.04	0.15	0.02	0.17
New Watermain – St. Jean St: Patricia St. to Docteur Corbeil Blvd.	0.25	0.10	0.34	0.05	0.40
Zone 2 – Villages					
Caron BS Upgrades	1.23	0.67	1.90	0.28	2.18
New Watermain – Caron BS to Bouvier Rd. and Labonte St.	3.21	1.28	4.49	0.67	5.16
New Watermain – Bouvier Rd. and Labonte St. to Bouvier ET	1.85	0.74	2.59	0.39	2.97
Total	**15.02**	**7.40**	**22.42**	**3.35**	**25.77**

Notes:

1. Contractor’s overhead, profit, mobilization, bonds, and insurance (15%), and design contingency (40% for facility upgrades, and 25% for watermain upgrades).
2. Construction contingency (5%), and average price escalation (10%).
3. Excludes HST.
4. The Rockland WTP Upgrades cost estimate includes low lift and high lift pumping and treatment capacity. It assumes that a new intake in the Ottawa River is not required.

6.1.4 Unit Cost Assumptions

The cost estimates for the watermain upgrade recommendations, and for compensation costs discussed in previous sections are based on the watermain unit costs indicated in Table 6-6, and **Error! Reference source not found.**.

The conservative unit price calculations were derived using the cost data in the City of Ottawa June 20, 2016 Unit Spec Code List document. The following unit items were referenced: G030.03 (200 mm), G030.04 (250 mm), G030.05 (300 mm), and G030.06 (400 mm). The 350 mm diameter cost was interpolated between the 300 mm and 400 mm costs. The 450 mm, and 500 mm diameter costs were extrapolated from the costs for the other sizes.

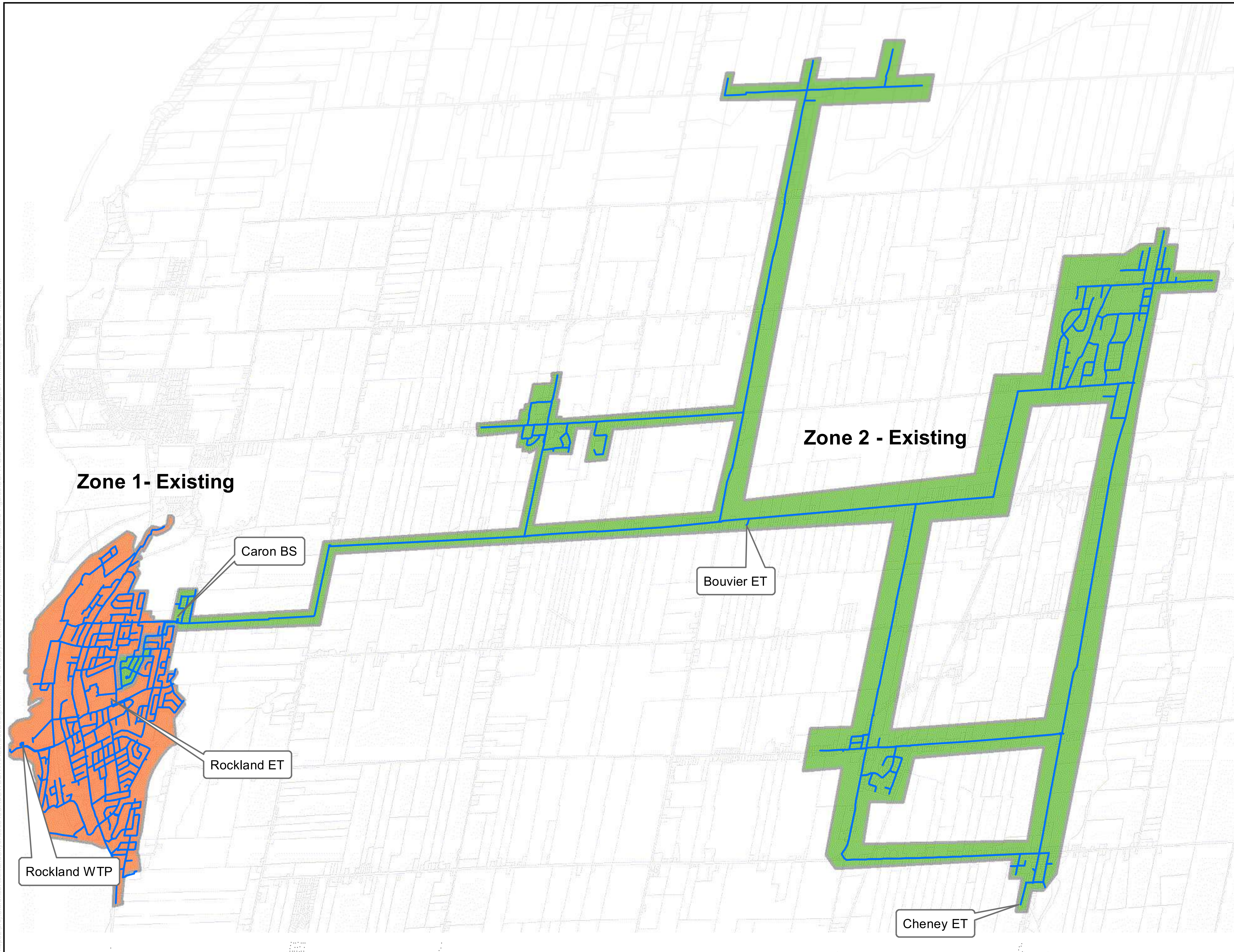
Table 6-6. Unit Costs for Watermains – Conservative Calculations

Diameter (mm)	Base Cost[1]	Subtotal[2]	Total[3]
200	$ 443.15	$ 620.41	$ 713.47
250	$ 504.19	$ 705.87	$ 811.75
300	$ 571.12	$ 799.57	$ 919.50
350	$ 595.65	$ 833.91	$ 959.00
400	$ 620.18	$ 868.25	$ 998.49
450	$ 680.50	$ 952.70	$1,095.61
500	$ 725.05	$ 1,015.07	$1,167.33

Notes:

1. The base cost includes the pipe material and installation cost, trench reinstatement, and valves.
2. The subtotal includes a 40% markup on the base cost for contractor's overhead, profit, mobilization, bonds, and insurance (15%), and design contingency (25%).
3. The total includes a 15% markup on the subtotal for construction contingency (5%) and average price escalation (10%). Excludes HST.

The aggressive cost estimates were calculated using a base unit price of $500/m provided by EXP, for the installation of new transmission watermains.



City of Clarence-Rockland

Limoges Water Supply Analysis

FIGURE NUMBER 4-1
EXISTING PRESSURE ZONE CONFIGURATION

CREATED BY: SH
REVIEWED BY: AL

ch2m

C2

Appendix C

2016 Annual Record of Surface Water Taking

ONTARIO CLEAN WATER AGENCY
AGENCE ONTARIENNE DES EAUX

Annual Record Of Surface Water Taking
Relevé annuel des prises d'eau de surface

Personal information contained on this form is collected under the authority of the Ontario Water Resources Act, Section 20. The Purpose of the form is to record details and information about the taking of water annually. Questions should be directed to the respective hub office in your area.

Les renseignements personnels qui figurent dans le présent formulaire sont recueillis en vertu de l'article 20 de la Loi sur les ressources en eau de l'Ontario. Ce formulaire sert à dossiers les détails et les renseignements concernant la prise d'eau annuelle. Prière d'adresser toutes questions au personnel du bureau régional de votre secteur.

Year(Année): **2016** Permit No.(N° de permis):**2563-7H9QE8** Source: **Ottawa River**

Name of Permittee: **Corporation of the City of Clarence**
Nom du titulaire du permis

Mailing Address: **1560 rue Laurier, Rockland ,Ontario,K4P 1P7**
Adresse postale

Concession: I
Concession:

Lot: 27
Lot:

Location Of Taking: **Rockland WTP**
Lieu de la prise d'eau

Twp. or Municipality: **City of Clarence-Rockland**
Canton ou municipalité

Month	Monthly Flow Total (m3/month)	Daily Flow Average (m3/day)	Daily Flow Maximum (m3/day)	Daily Flow Peak Flow Rate (L/min)	Daily Flow Peak Flow Rate (L/sec)	Number of Days of Water Taking	Maximum Daily Run Time (hr)
Jan	143,884.2	4,641.43	5,477.8	4,798.8	69.24	31	24.0
Feb	133,453.5	4,601.84	5,407.7	4,611.3	69.23	29	22.0
Mar	142,111.8	4,584.25	5,439.7	8,481.3	70.28	31	22.7
Apr	136,936.1	4,564.54	5,537.0	8,695.0	69.9	30	23.0
May	170,584.9	5,502.74	8,823.4	9,211.3	106.18	31	23.9
Jun	185,115.2	6,170.51	7,810.6	9,166.3	112.17	30	23.3
Jul	166,299.4	5,364.50	7,171.8	9,217.5	114.09	31	21.9
Aug	176,702.5	5,700.08	8,246.5	9,313.8	111.67	31	21.2
Sep	156,914.0	5,230.47	6,972.3	9,263.8	112.63	30	18.6
Oct	153,298.2	4,945.10	6,151.3	9,232.5	112.71	31	16.7
Nov	141,775.3	4,725.84	5,391.9	9,192.5	113.27	30	14.2
Dec	147,531.3	4,759.07	6,727.2	9,933.8	116.07	31	16.1
Total	1,854,606.4					366	
Avg	154,550.5	5,067.23			98.12		
Max	185,115.2	6,170.51	8,823.4	9,933.8	116.07		24.0
Criteria			**14,500**	**10,089**		366	24.0

C3

Appendix C

OCWA Quarterly Operations Report Card, 4th Quarter of 2016

CIMA+

OCWA
Quarterly Operations Report Card

For the City of Clarence-Rockland Water and Wastewater Facilities

Alfred Hub Operations
4th Quarter 2016

Ontario Clean Water Agency
Agence Ontarienne Des Eaux

Ontario Clean Water Agency
Agence Ontarienne Des Eaux

Table of Contents

Ontario Clean Water Agency
Agence Ontarienne Des Eaux

Quarterly Operations Report - 2016

1.0 FACILITY LISTINGS

1.1 Water Treatment & Distribution

Facility	Appurtenances
6847W Rockland Water Treatment Plant	1 Raw Water Low Lift Station 1 WTP (Actiflo Process)
6847D Clarence-Rockland Water Distribution System	3 Water Storage Towers 1Water Booster Station An Area Water Distribution System supplying Rockland, Clarence Creek, St. Pascal, Bourget, Hammond and Cheney

1.2 Wastewater Treatment & Collection

Facility	Appurtenances
6816S Rockland Wastewater Treatment System	1 Sequential Batch Reactor Treatment system 2 Biosolids Storage and Drying Lagoons
6816C Rockland Wastewater Collection System	7 Sewage Pumping Stations in Rockland 11 Low Pressure Residential pumping stations in Rockland 1 Communal Sewage System In Clarence-Creek

2.0 COMPLIANCE

2.1 Water Treatment and Distribution

Most Recent MOE Compliance Inspection Report - Rating

ORG	Facility	Inspection Date	Report Period	Inspector Name	MOE CIR Rating	Inspection Report Received	Inspection Report Reply Submitted
6847D	Rockland WTP and WD	02/09/2016	2015	Jean Veilleux	100%	13/04/16	N/A

Annual Reports (Water)

All 2015 Annual Reports required under the Drinking Water Systems Regulation (O. Reg. 170/03) of the Safe Drinking Water Act: Water Taking, Section 10 and Schedule 22 Reports, were completed and submitted by February 27th, 2016.

Adverse Water Quality Incidents (AWQI's)

Date	Facility	AWQI#	ISSUE	Date Resolved
N/A		N/A		

2.2 Wastewater Treatment & Collection

Most recent MOE Inspections

ORG	Facility	Inspection Date	Report Period	Inspector Name	Inspection Report Received	Inspection Report Reply Submitted
6816S	Rockland WWT	Oct.31st 2014	Odor issue	Jean Veilleux	N/A	N/A
6816S	Rockland WWT	March 13th 2015	Acute Lethality non compliance	Ian Rumbolt Environment Canada	N/A	N/A
6816S	Rockland biosolids	October 20th 2015	2015	Brent Winters	Jan. 5th 2016	Jan.14th 2016
6816S	Rockland WPCP and collection	May 10th 2016	2016	Jean Veilleux	Aug. 22nd	N/A
6816S	Rockland biosolids Roy Farm	October 5th 2016	2016	Brent Winters		

Non Compliance, Reportable Spills and Bypasses

Facility	Event	Date Reported
Rockland Sewage	Raw sewage spill due to forcemain break at Pumping Station #1 SAC Report # 7083-AF5TWL	October 27th 2016
Rockland Sewage	Contained raw sewage spill in the Greenbelt trench when connecting new forcemain on Laurier St. SAC Report # 5765-AFYNS5	November 23rd 2016
Rockland WTP	Monthly Total Suspended Solids collected in the backwash supernatant tank above 25mg/l	December 23rd 2016

Annual Reports (Wastewater)

The 2015 Annual Report required under the Certificate of Approval No. 3-0466-93-967 and ECA No. 1990-9P3PRG was completed and issued on March 29th, 2016.

3.0 FACILTY PERFORMANCE

3.1 Water Treatment and Distribution System

Facility	Reporting Period	Attachments
Rockland WTP & Distribution	Jan 1st – Dec 31st 2016	Attachment I; Performance Assessment Report

3.2 Wastewater Treatment and Collection System

Facility	Reporting Period	Attachments
Rockland WPCP & WWC	Jan 1st – Dec 31st 2016	Attachment II: Performance Assessment Report

4.0 DRINKING WATER QUALITY MANAGEMENT STANDARD (DWQMS)

An internal audit of the Operational Plan was conducted February 10th by OCWA staff. The operational plan and reviews were then sent to SAI Global (external auditors) for review and they were an on-site for an audit March 7th and no **non-compliances were identified**. The municipality received their new Drinking Water Permit and License March 14th 2016 and OCWA received their Certificate of Accreditation April 14th 2016.

.

5.0 MAINTENANCE / CAPITAL / VALUE ADDED

5.1 Water Treatment and Distribution

Facility	Date	Description
Rockland WTP	Oct.12th	Water intake crib inspection by ODS
Clarence Rockland dist.	Oct 12th	PRV inspection in Hamlets
Cheney distribution	Oct.14th	Fused service repair at 3262 Drouin rd.
Cheney distribution	Oct.19th	Fused service repair at Corner store
Clarence-Creek dist.	Oct. 25th	Inspected new water connection at 1591 Bouvier
Clarence Rockland dist.	November	Completed all hydrant winterizing and inspections
Rockland distribution	Nov.24th	New water main for Greenbelt project on line
Clarence-Rockland dist.	Nov.29th	Repaired hydrants: R-099AD (Marble) R-214AD (David)

		R-285 (Giroux) CC-016 (Landry) H-252AD (Gagnée). And one on St-Jean
Rockland distribution	Dec.7th	2" water service repair at 220 Laurier, Poupart
Rockland distribution	Dec.16th	Water main leak on Baseline rd. near Caron, ordered parts to repair, work done Jan.25th, Martin Normand

5.2 Wastewater Treatment and Collection

Facility	Date	Description
Rockland collection	On-going	Cleaned inlet basket at sta.#1 bi-weekly
Rockland WPCP	Oct.12th	Sewage outfall inspection by ODS
Rockland collection	Oct.27th	Sewage forcemain failure due to core drilling at sta.#1, repaired temporarily, spill reported to SAC
Rockland collection	Nov.10th	Pump failures at sta.#3 due to faulty wiring, rebuilt both motors and replaced control wiring and components
Rockland collection	Nov.21st	Cleaned all pumping station wet wells
Rockland WPCP	Oct.-Nov.	Hauled 3,482m3 biosolids to farmland

5.3 Preventive Maintenance Plan (PMP) Quarterly Work Order Summary

Please refer to attachment III and IV outlining the work order status for the water and wastewater facilities

6.0 COMMUNICATIONS

6.1 Water Treatment & Distribution

Facility	Date	Complaint/Incident	Actions Taken
Rockland distribution	Oct.20th	Odour complaint at 1447 Laurier	Called home owner, seems to be plumbing issue
Hammond distribution	Nov.9th	Car hit hydrant at 3115 Gendron	Repaired
Clarence-Creek dist.	Nov.29th	Water quality complaint at 2804 Bouvier	Visted home, wrong anode in hot water tank

6.2 Wastewater Treatment and Collection

Facility	Date	Complaint/Incident	Actions Taken
Rockland collection	Nov.1st	Slow flowing drain at 835 St-Jacques	Inspected municipal sewers all OK service lateral issue
Rockland collection	Dec. 19th	Sewer back up at 278 Hélène st.	Municipal sewer cleaned on Hélène and Caron in that area, Aqua Drain

7.0 RECOMMENDATIONS / GENERAL COMMENTS

7.1 Water Treatment and Distribution

- ASPEC Automation was at the water treatment plant several times in the past months to perform various repairs and PLC maintenance

7.2 Wastewater Treatment and Collection

- Hauled 3,482 m3 of biosolids from lagoons to three NASM approved farms this fall (Pascal Roy, Serge Ethier and André-Jean Pilon). These volumes are increasing due to the heavier flows in 2016. Extra cost are possible in 2017 due to this increase and extra removal of biosolids (one lagoon holds 1800 m^3)

Ontario Clean Water Agency
Performance Assessment Report Water

January 1st to December 31st 2016

Facility: [6847] ROCKLAND DRINKING WATER SYSTEM

Works: [6847] ROCKLAND DRINKING WATER SYSTEM

	01/2016	02/2016	03/2016	04/2016	05/2016	06/2016	07/2016	08/2016	09/2016	10/2016	11/2016	12/2016	<--Total-->	<--Avg.-->	<--Max.-->	<--Min.-->	<--Criteria-->
Flows:																	
Raw Flow: Monthly Total - Raw Water (m³)	143884.2	133453.5	142111.8	136936.1	170584.9	185115.2	166299.4	176702.5	156914	153298.2	141775.3	147531.3	1854606.4				
Raw Flow: Monthly Avg - Raw Water (m³/d)	4641.43	4601.84	4584.25	4564.54	5502.74	6170.51	5364.5	5700.08	5230.47	4945.1	4725.84	4759.07		5065.86			
Raw Flow: Monthly Max - Raw Water (m³/d)	5477.8	5407.7	5439.7	5537	8823.4	7810.6	7171.8	8246.5	6972.3	6151.3	5391.9	5364.5			8823.4		
Treated Flow: Monthly Total - Treated Water WTP (m³)	139389.9	127700.4	133083.8	126195.9	157818.9	168595	149890.3	158898.5	143813.6	142323.9	133116.6	138429.7	1719256.5				
Treated Flow: Monthly Total - Treated Water Booster Station (m³)	37588	38516	42829	40090	45945	48646	44571	46530	43360	44825	40925	42530	516355				
Treated Flow: Monthly Avg - Treated Water WTP (m³/d)	4496.45	4403.46	4293.03	4206.53	5090.93	5619.83	4835.17	5125.76	4793.79	4591.09	4437.22	4465.47		4696.56			
Treated Flow: Monthly Avg - Treated Water Booster Station (m³/d)	1212.52	1328.14	1381.58	1336.33	1482.1	1621.53	1437.77	1500.97	1445.33	1445.97	1364.17	1371.94		1410.7			
Treated Flow: Monthly Max - Treated Water WTP (m³/d)	5543.3	4955.9	5254.3	5073.8	7942.6	7333.4	6492.3	7511.7	6040.9	5853.9	4910	4863.6			7942.6		
Treated Flow: Monthly Max - Treated Water Booster Station (m³/d)	1320	1680	1909	1510	2563	2337	2303	2408	2535	2216	1678	1512			2563		
Turbidity:																	
Raw: Max Turbidity - Raw Water (NTU)	20.08	16.82	48.87	68	34.04	32.67	27	50	24.11	16.71	21.34	50			68		
Treated: Min Turbidity - Treated Water WTP (NTU)	0.06	0.09	0.12	0.1	0.09	0.08	0.1	0.06	0.09	0.1	0.08	0.08				0.06	
Treated: Max Turbidity - Treated Water WTP (NTU)	0.49	0.26	0.2	0.43	0.12	0.55	0.21	0.15	0.14	0.2	0.63	0.14			0.63		
Filter Eff: Min Turbidity - Actiflo Filter #1 (NTU)	0.05	0.08	0.16	0.12	0.02	0.08	0.12	0.14	0.12	0.11	0.08	0.09				0.02	
Filter Eff: Min Turbidity - Actiflo Filter #2 (NTU)				0.07	0.04	0.06	0.06	0.08	0.09	0.09	0.06	0.13					
Filter Eff: Max Turbidity - Actiflo Filter #1 (NTU)	0.37	0.28	0.3	0.45	0.44	0.38	0.27	0.29	0.27	0.31	0.25	0.43			0.45		1.0 NTU
Filter Eff: Max Turbidity - Actiflo Filter #2 (NTU)				0.39	0.29	0.74	0.55	0.42	0.32	0.38	0.34	0.55			0.74		1.0 NTU
Chemical Parameters:																	
Treated: Max Nitrite - Treated Water WTP (mg/L)	< 0.1			< 0.1			< 0.1								< 0.1		
Treated: Max Nitrate - Treated Water WTP (mg/L)	0.4			0.4			0.2								0.4		
Distribution: Max THM - Distribution Water (µg/l)	46.7			41.5			72.5			45.5					72.5		100 µg/l
Chlorine Residuals:																	
Treated: Min Free Cl2 Resid - Treated Water WTP (mg/L)	0.56	1.15	0.75	0.56	0.86	1.3	0.86	0.56	0.8	0.45	0.45	0.65				0.45	0.05mg/l
Treated: Max Free Cl2 Resid - Treated Water WTP (mg/L)	2.66	2.71	2.46	2.71	2.46	2.4	2.18	2.56	2.47	2.56	2.84	2.61			2.84		4.0mg/l
Treated: Min Combined Cl2 Resid - Treated Water WTP (mg/L)	0.55	0.7	0.51	0.56	0.6	1.48	0.81	0.56	0.92	0.67	0.44	0.73				0.44	.30mg/l
Treated: Max Combined Cl2 Resid - Treated Water WTP (mg/L)	2.94	2.95	2.88	2.93	2.88	2.52	2.91	2.96	2.79	2.83	2.86	2.71			2.96		3.0mg/l
Dist: Min Combined Cl2 Resid - Distribution Water (mg/L)	1.52	1.37	1.17	1.19	1.3	1.16	0.76	0.8	1.64	1.25	1.51	1.2				0.76	.30mg/l
Dist: Max Combined Cl2 Resid - Distribution Water (mg/L)	1.9	1.95	2.17	2.22	2.41	1.74	1.33	1.73	2.29	1.81	2.18	2.05			2.41		3.0mg/l
Bacti Samples Collected:																	
Raw Bacti: # of samples - Raw Water	4	4	5	4	5	4	4	5	4	5	5	4	53				
Treated Bacti: # of samples - Treated Water WTP	4	4	5	4	5	4	4	5	4	4	5	4	52				
Dist Bacti: # of samples - Distribution Water	30	32	38	32	39	32	32	38	28	32	40	30	403				
Treated Bacti: # of TC exceedances - Treated Water WTP	0	0	0	0	0	0	0	0	0	0	0	0	0				
Treated Bacti: # of EC exceedances - Treated Water WTP	0	0	0	0	0	0	0	0	0	0	0	0	0				
Dist Bacti: # of TC exceedances - Distribution Water	0	0	0	0	0	0	0	0	0	0	0	0	0				
Dist Bacti: # of EC exceedances - Distribution Water	0	0	0	0	0	0	0	0	0	0	0	0	0				

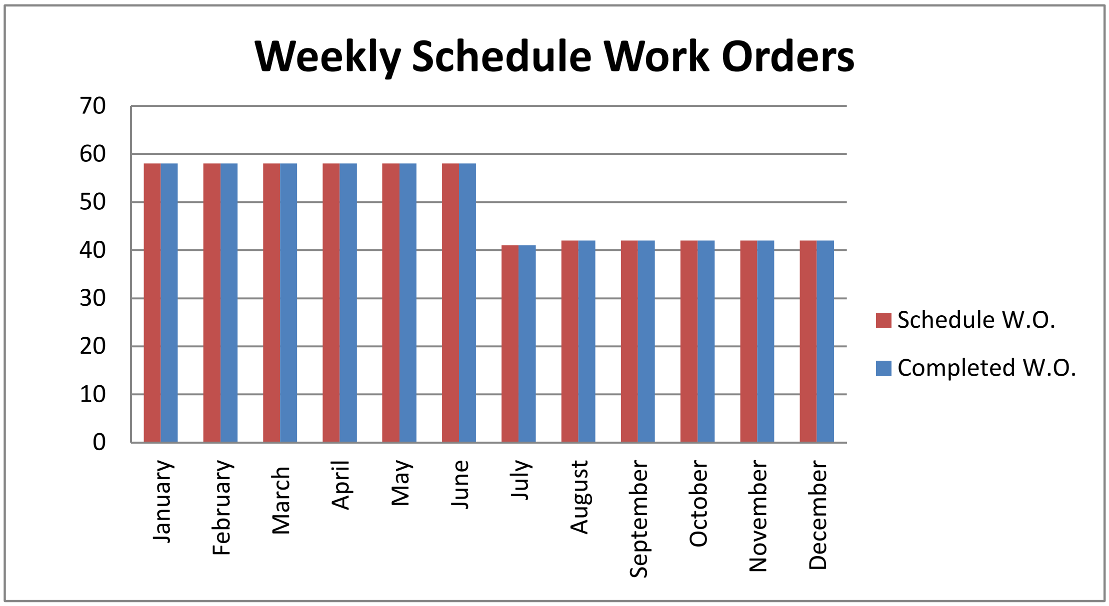
Ontario Clean Water Agency
Performance Assessment Report Wastewater/Lagoon

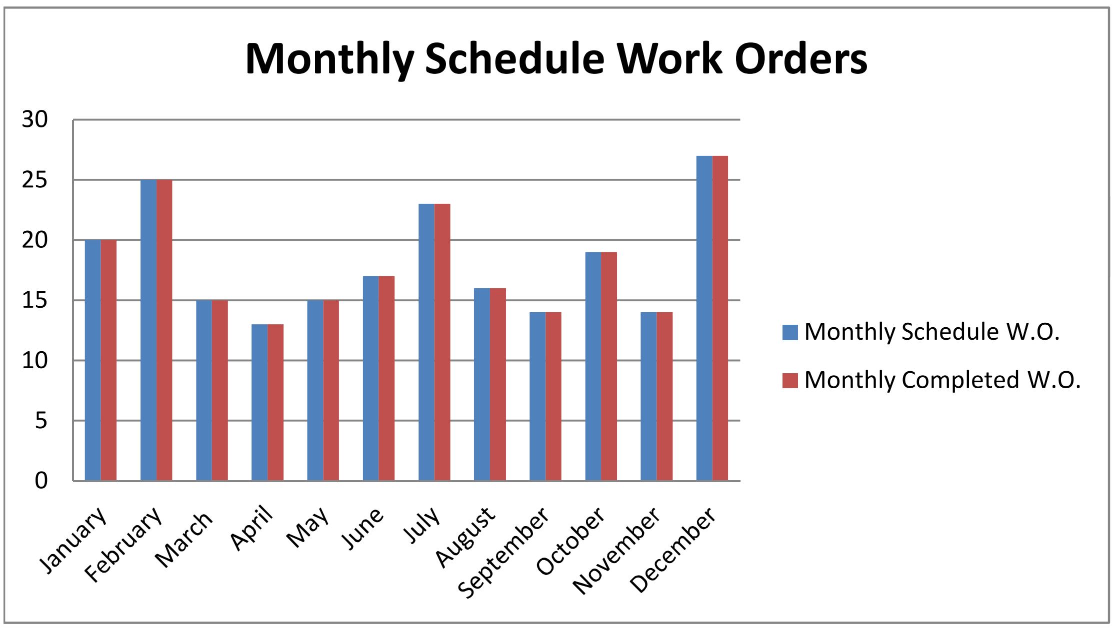
January 1st to cember 31st 2016

Facility: **[6816] ROCKLAND WASTEWATER TREATMENT FACILITY**
Works: **[6816] ROCKLAND WASTEWATER TREATMENT FACILITY**

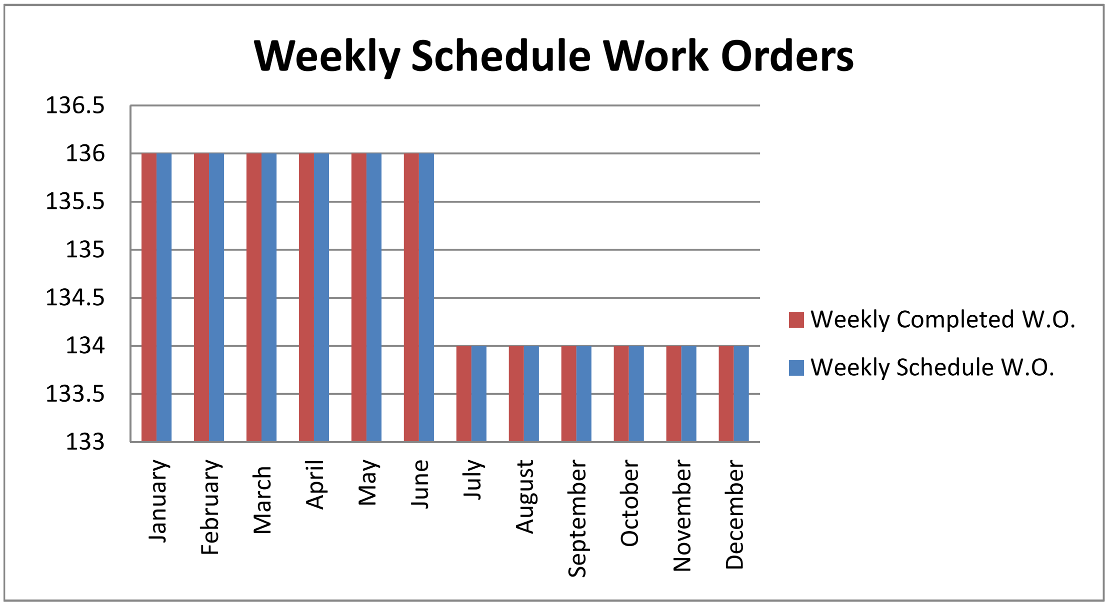
	01/2016	02/2016	03/2016	04/2016	05/2016	06/2016	07/2016	08/2016	09/2016	10/2016	11/2016	12/2016	<--Total-->	<--Avg.-->	<--Max.-->	<--Criteria-->
Flows:																
Raw Flow: Total - Raw Sewage (m³)	131237	124983	200134	188478	123931	109661	107221	123332	108678	122218	115956	131635	1587464			
Raw Flow: Avg - Raw Sewage (m³/d)	4233.45	4309.76	6455.94	6282.6	3997.77	3655.37	3458.74	3978.45	3622.6	3942.52	3865.2	4246.29		4337.39		Rated Capacity 6800m3
Raw Flow: Max - Raw Sewage (m³/d)	5842	6680	11442	9690	4303	4316	3753	5811	4184	5858	4666	6299			11442	
Eff. Flow: Total - WPCP Effluent (m³)	131237	124983	200134	188478	123931	109661	107221	123332	108678	122218	115956	131635	1587464			
Eff. Flow: Avg - WPCP Effluent (m³/d)	4233.45	4309.76	6455.94	6282.6	3997.77	3655.37	3458.74	3978.45	3622.6	3942.52	3865.2	4246.29		4337.39		
Eff. Flow: Max - WPCP Effluent (m³/d)	5842	6680	11442	9690	4303	4316	3753	5811	4184	5858	4666	6299			11442	
Carbonaceous Biochemical Oxygen Demand: CBOD:																
Eff: Avg cBOD5 - WPCP Effluent (mg/L)	< 4	< 15.25	< 3	< 3.25	< 11	< 6.5	< 8.25	< 7.6	< 12.5	< 3	< 3	< 3.25		< 6.717	< 15.25	Annual Avg. 25mg/l
Loading: cBOD5 - WPCP Effluent (kg/d)	< 16.934	< 65.724	< 19.368	< 20.418	< 43.976	< 23.76	< 28.535	< 30.236	< 45.283	< 11.828	< 11.596	< 13.8		< 27.621	< 65.724	170 kg/d
Biochemical Oxygen Demand: BOD5:																
Raw: Avg BOD5 - Raw Sewage (mg/L)	291.75	177.5	113.2	143	250.4	213.75	203.75	228.6	146.75	191.6	169.25	183.5		192.754	291.75	
Raw: # of samples of BOD5 - Raw Sewage (mg/L)	4	4	5	4	5	4	4	5	4	5	4	4	52			
Total Suspended Solids: TSS:																
Raw: Avg TSS - Raw Sewage (mg/L)	1565	324	474	493.5	342.4	276	339	422.4	210	282.857	239	895		488.596	1565	
Raw: # of samples of TSS - Raw Sewage (mg/L)	4	4	5	4	5	4	4	5	4	7	4	4	54			
Eff: Avg TSS - WPCP Effluent (mg/L)	7.5	< 9	14.4	8.5	28.2	12.25	28.25	16.444	23.143	21.4	8.5	21.5		< 16.591	28.25	Annual Avg. 25 mg/l
Eff: # of samples of TSS - WPCP Effluent (mg/L)	4	4	5	4	5	4	4	9	7	5	4	4	59			
Loading: TSS - WPCP Effluent (kg/d)	31.751	< 38.788	92.965	53.402	112.737	44.778	97.709	65.423	83.837	84.37	32.854	91.295		< 69.159	112.737	170 kg/d
Percent Removal: TSS - Raw Sewage (mg/L)	99.521	97.222	96.962	98.278	91.764	95.562	91.667	96.107	88.98	92.434	96.444	97.598			99.521	
Total Phosphorus: TP:																
Raw: Avg TP - Raw Sewage (mg/L)	17.365	5.94	4.42	4.86	7.716	6.68	7.125	7.434	6.273	6.467	6.313	6.6		7.266	17.365	
Raw: # of samples of TP - Raw Sewage (mg/L)	4	4	5	4	5	4	4	5	4	7	4	4	54			
Eff: Avg TP - WPCP Effluent (mg/L)	0.267	0.345	0.418	0.308	0.842	0.493	0.762	0.548	0.731	0.636	0.215	0.415		0.498	0.842	Monthly Avg. 1.0 mg/l
Eff: # of samples of TP - WPCP Effluent (mg/L)	4	4	5	4	5	4	6	9	7	5	4	4	61			
Loading: TP - WPCP Effluent (kg/d)	1.132	1.487	2.699	1.932	3.366	1.8	2.634	2.179	2.65	2.507	0.831	1.762		2.082	3.366	6.8 kg/d
Percent Removal: TP - Raw Sewage (mg/L)	98.46	94.192	90.543	93.673	89.088	92.627	89.31	92.631	88.339	90.166	96.594	93.712			98.46	
Nitrogen Series:																
Raw: Avg TKN - Raw Sewage (mg/L)	72.7	49.55	38.04	37.975	53.86	53.775	55.725	53.34	55.025	50.7	52.275	55.6		52.38	72.7	
Raw: # of samples of TKN - Raw Sewage (mg/L)	4	4	5	4	5	4	4	5	4	7	4	4	54			
Eff: Avg TAN - WPCP Effluent (mg/L)	16.3	17.025	10.836	10.155	18.72	23.025	19.725	19.02	21.5	20.26	19.05	18.425		17.837	23.025	
Eff: # of samples of TAN - WPCP Effluent (mg/L)	4	4	5	4	5	4	4	5	4	5	4	4	52			
Loading: TAN - WPCP Effluent (kg/d)	69.005	73.374	69.957	63.8	74.838	84.165	68.224	75.67	77.886	79.875	73.632	78.238		74.055	84.165	
Eff: Avg NO3-N - WPCP Effluent (mg/L)	0.6	0.5	1.06	0.875	< 0.2	0.15	0.15	0.12	< 0.65	0.2	0.15	0.25		< 0.409	1.06	
Eff: # of samples of NO3-N - WPCP Effluent (mg/L)	4	4	5	4	5	4	4	5	4	5	4	4	52			
Eff: Avg NO2-N - WPCP Effluent (mg/L)	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.15	< 0.15	< 0.1	< 0.1	< 0.1	< 0.1	< 0.2		< 0.117	< 0.2	
Eff: # of samples of NO2-N - WPCP Effluent (mg/L)	4	4	5	4	5	4	4	5	4	5	4	4	52			
Disinfection:																
Eff: GMD E. Coli - WPCP Effluent (cfu/100mL)	1.682	2	8.025	2	2.993	2	9	9.236	6.535	2	2	2		4.122	9.236	200cfu/100ml
Eff: # of samples of E. Coli - WPCP Effluent (cfu/100mL)	4	4	5	4	5	4	4	5	4	5	4	4	52			

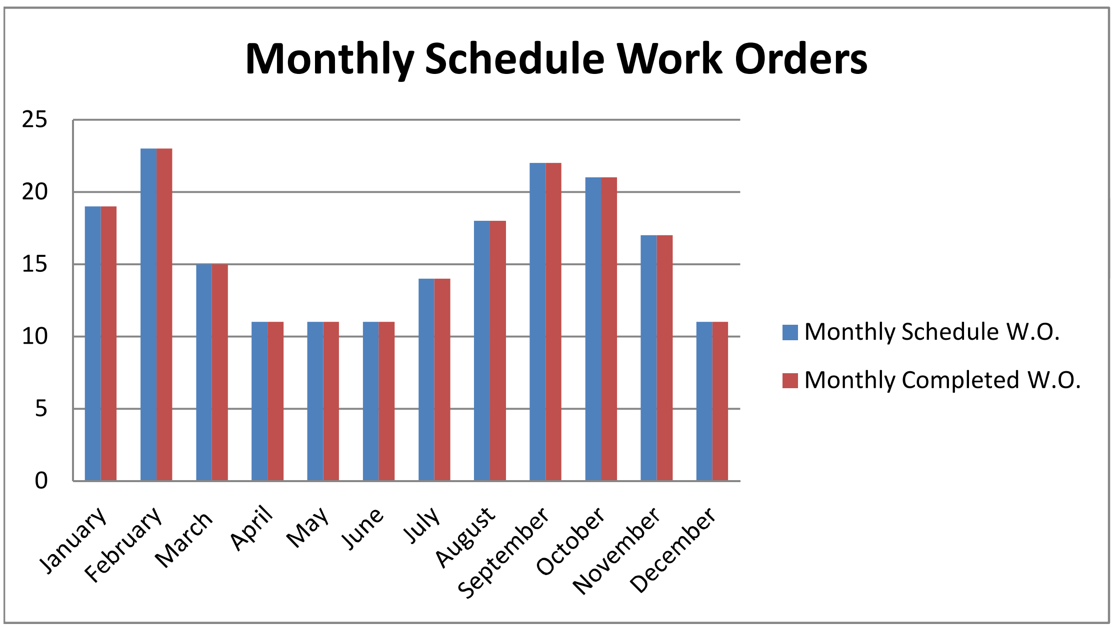
Rockland Water Treament Plant Work Order Status Report





Rockland Wastewater Treament Plant Work Order Status Report

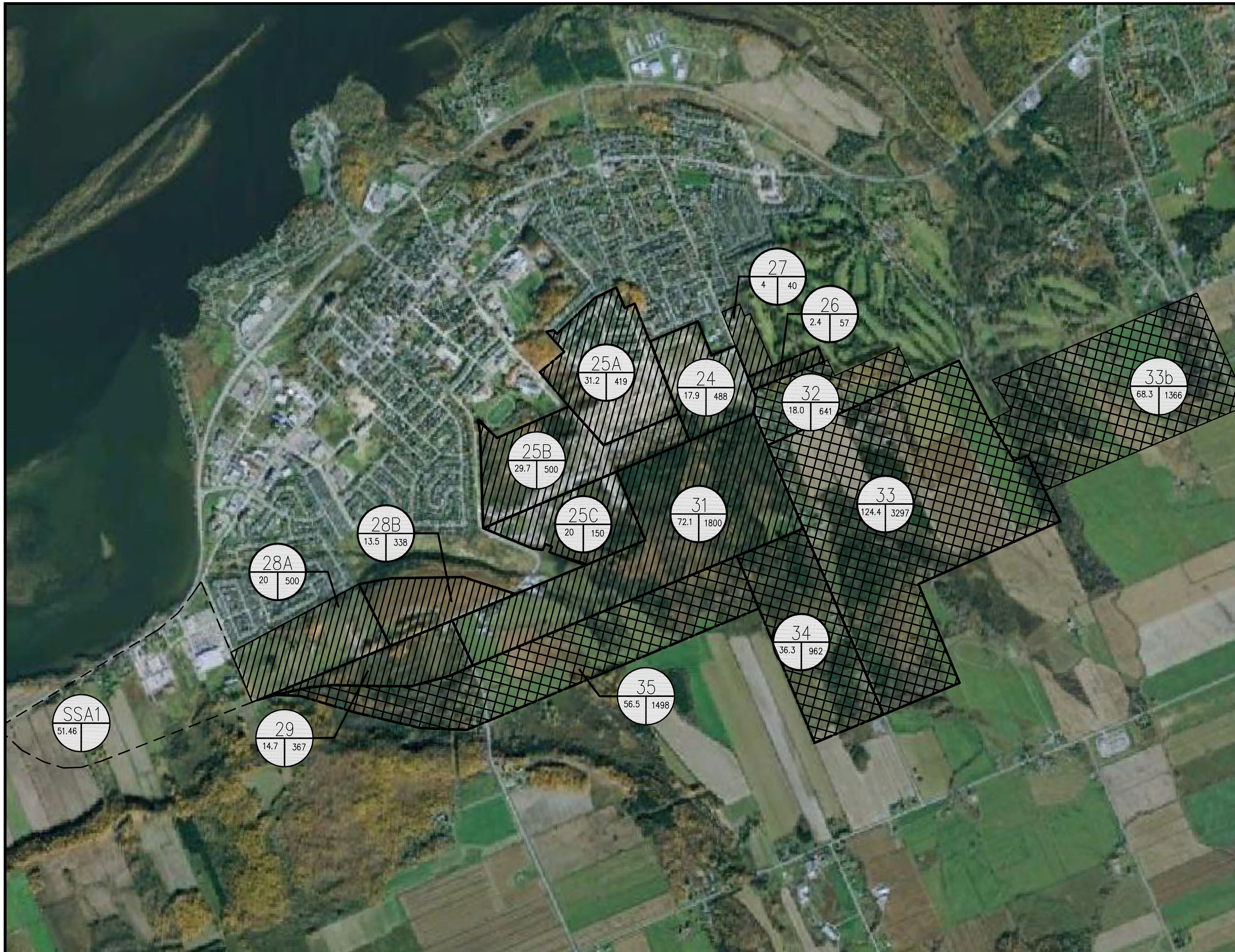




C4

Appendix C

Caron Street Sanitary Sewer Catchment Area, Sewer Calculation Sheet and As-Built Drawings



GENIVAR
1224 GARDINERS ROAD, SUITE 201
KINGSTON, ONTARIO
CANADA K7P 0G2
PHONE: 613-634-7373 FAX: 613-634-3523
WWW.GENIVAR.COM

CLIENT:
CITY OF
CLARENCE-ROCKLAND

CLIENT REF. #:

PROJECT:
CARON STREET
RECONSTRUCTION

ISSUED FOR – REVISION:

IS	RE	DATE	DESCRIPTION
1		2013/01/23	ISSUED FOR ECA

PROJECT NO: 065038

DATE: MAY, 2010

ORIGINAL SCALE: 1:20000

DESIGNED BY: MS

DRAWN BY: MF/MS

CHECKED BY: MM

IF THIS BAR IS NOT 1" LONG, ADJUST YOUR PLOTTING SCALE.

1"

DISCIPLINE: CIVIL

TITLE:
PROPOSED SANITARY
SERVICING AREAS

SHEET NUMBER: SK1.23

SHEET #: -- OF --

ISSUE: ISSUED FOR ECA

DATE OF: JANUARY 23, 2013

REV #: 0

Sanitary Sewer Calculation Sheet

	DRAINAGE AREA DESCRIPTION																OUTLET PIPE DATA						
	MANHOLE				CONTRIBUTING	POPULATION			Σ	q	M	Peak Flow	Σ	IA	Q *(INCOMMING FROM SIDE STREET)*	Q	SIZE	Slope	CAP	Q/Qfull	VEL	LENGTH	FALL
LOCATION	FROM	TO	No.	Ha	AREAS	Ppha	P	P(1000)	P(1000)	l/cap/d)		(l/s)	AREA (ha)	(l/s)	(l/s)	(l/s)	(mm)	(%)	(l/s)		(m/s)	(m)	(m)
Caron St	SAM250	SAM251	26	2.40		67.50	162	0.162	0.162	400	4.00	3.00	2.4	0.67	-	3.83	200	2.10%	47.53	0.08	1.51	22.8	0.479
Caron St	SAM251	SAM252	32	24.20	26,32	67.50	1633.5	1.6335	1.7955	400	3.62	30.11	26.6	7.45	-	38.97	250	1.16%	64.05	0.61	1.30	55.5	0.644
Caron St	SAM252	SAM253			26,32				1.7955	400	3.62	30.11	26.6	7.45	-	38.97	250	1.29%	67.54	0.58	1.38	33.8	0.436
Caron St	SAM253	SAM254			26,32				1.7955	400	3.62	30.11	26.6	7.45	-	38.97	250	0.60%	46.06	0.85	0.94	62.5	0.375
Caron St	SAM254	SAM255			26,32				1.7955	400	3.62	30.11	26.6	7.45	-	38.97	300	0.40%	61.16	0.64	0.87	96.7	0.387
Caron St	SAMH201	SAMH202	26,32,33,33b,34,35	312.10		67.50	21066.8	21.0668	21.06675	400	2.63	256.49	312.1	87.39	-	343.88	750	0.15%	431.17	0.80	0.98	95.1	0.143
Caron St	SAMH202	SAMH203													241.00	584.88	750	0.40%	704.10	0.83	1.59	100.2	0.401
Caron St	SAMH203	SAMH204													0.00	584.88	750	0.40%	704.10	0.83	1.59	100.2	0.401
Caron St	SAMH204	SAMH205													0.00	584.88	750	0.40%	704.10	0.83	1.59	99.9	0.400
Caron St	SAMH205	SAMH206													0.00	584.88	750	0.40%	704.10	0.83	1.59	99.8	0.399
Caron St	SAMH206	SAMH207													0.00	584.88	750	0.50%	787.20	0.74	1.78	100.1	0.501
Caron St	SAMH207	SAMH208													0.00	584.88	750	0.50%	787.20	0.74	1.78	100.1	0.501
Caron St	SAMH208	SAMH209	Refer to CH2MHILL Master Sanitary Servicing Plan for the South Development Area for respective calculations												16.00	600.88	750	0.50%	787.20	0.76	1.78	100.2	0.501
Caron St	SAMH209	SAMH210													1.00	601.88	750	0.50%	787.20	0.76	1.78	75.8	0.379
Caron St	SAMH210	SAMH211													8.00	609.88	750	0.50%	787.20	0.77	1.78	105.0	0.525
Caron St	SAMH211	SAMH212													1.00	610.88	750	0.50%	787.20	0.78	1.78	99.8	0.499
Caron St	SAMH212	SAMH213													0.00	610.88	900	0.20%	809.59	0.75	1.27	102.3	0.205
Caron St	SAMH213	SAMH214													92.00	702.88	900	0.20%	809.59	0.87	1.27	70.7	0.141
Caron St	SAMH214	SAMH215													21.00	723.88	675	1.00%	840.59	0.86	2.35	93.3	0.933
EXISTING PIPE	SAMH215	EX SAMH216																					
EXISTING PIPE	EX SAMH216	EX SAMH217	Existing Pipes (Covered Under Seperate ECA)																				
EXISTING PIPE	EX SAMH217	MH608																					
Caron St	MH608	PS1														732.80	675	1.00%	840.59	0.87	2.35	94.9	0.949

DESIGN PARAMETER

Mannings n = 0.0130
Average Daily Flow (q)= 400 l/cap/d
Infiltration Rate (I) = 0.28 l/s/ha

Designed By:
Matt Scanlan, EIT

Checked By:
Matt Morkem, P.Eng

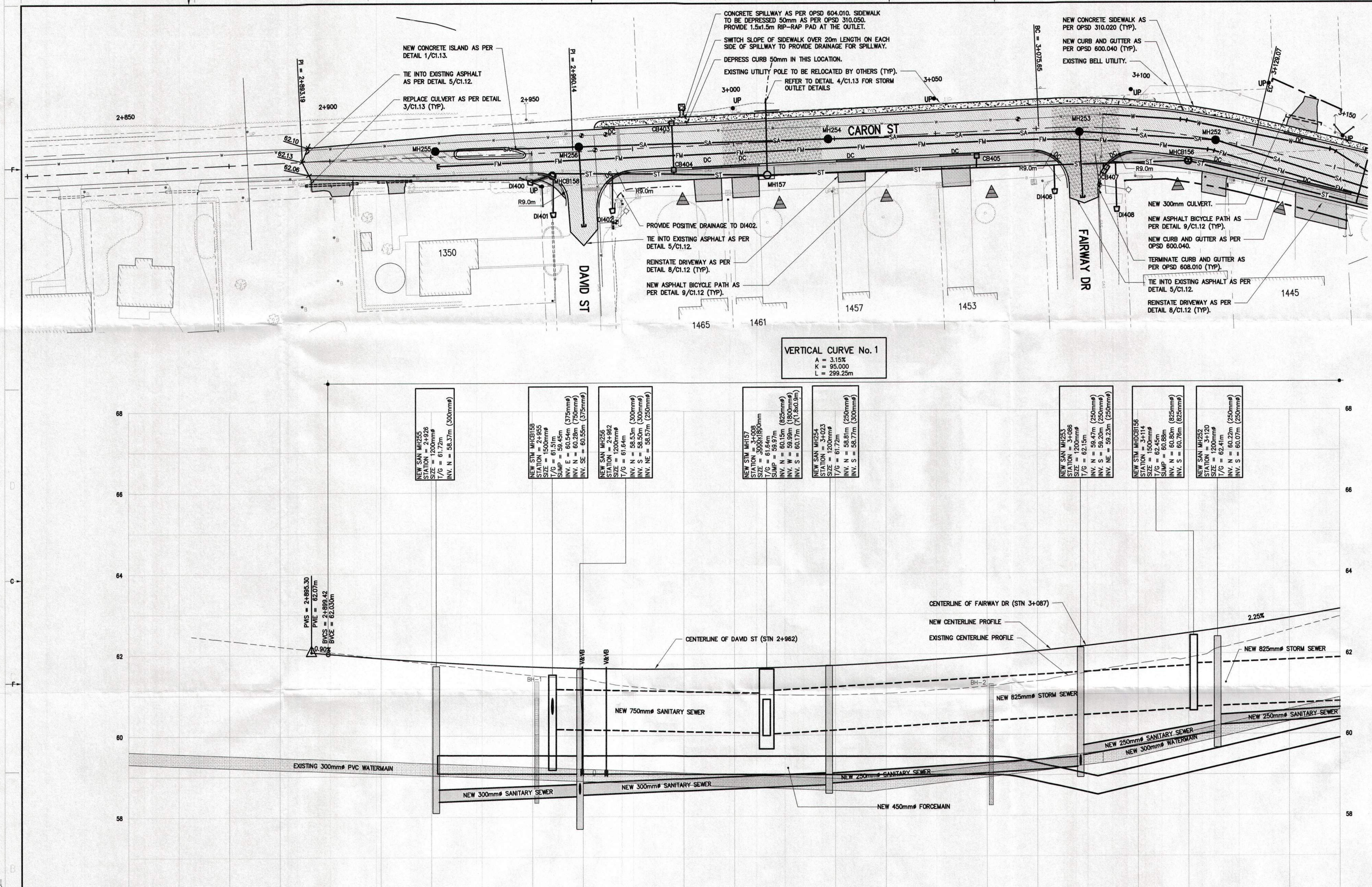
Dwg. Reference:
SK1-23rev1 -Sanitary Area

PROJECT:
Caron St. Reconstruction

LOCATION:
Rockland, Ontario

Project Number: 65038

Date: 29-Apr-13



NOTES:

1. CONTRACTOR TO VERIFY LOCATION OF ALL BURIED SERVICES PRIOR TO START OF CONSTRUCTION.
2. TOPOGRAPHIC INFORMATION PROVIDED BY ARPENTAGE DUTRISAC SURVEYING INC.
3. ALL DISTURBED AREAS TO BE REINSTATED USING 100mm OF TOP SOIL AND SOD (UNLESS OTHERWISE NOTED).
4. SEE DRAWINGS C1.11 TO C1.15 FOR LINE PAINTING AND SIGNAGE DETAILS.

LEGEND:

EXISTING PROPERTY LINE
NEW CENTERLINE OF ROAD
NEW EDGE OF PAVEMENT
EXISTING EDGE OF PAVEMENT
NEW CURB
NEW DEPRESSED CURB
EXISTING CURB
NEW EDGE OF SHOULDER
EXISTING EDGE OF SHOULDER
NEW DITCH
EXISTING DITCH
NEW BOTTOM OF SLOPE
EXISTING BOTTOM OF SLOPE
EXISTING TOP OF SLOPE
EXISTING FENCE
NEW SANITARY FORCEMAIN
NEW SANITARY SEWER
EXISTING SANITARY SEWER
NEW STORM SEWER
EXISTING STORM SEWER
NEW WATERMAIN
EXISTING WATERMAIN
EXISTING COMBINED SEWER
EXISTING GAS LINE
EXISTING BELL LINE
NEW GUIDERAIL
EXISTING GUIDERAIL
NEW SANITARY MANHOLE
EXISTING SANITARY MANHOLE
NEW STORM MANHOLE
EXISTING STORM MANHOLE
NEW CATCHBASIN
NEW DOUBLE CATCHBASIN
NEW CATCHBASIN DITCH INLET
EXISTING CATCHBASIN
NEW HYDRANT
EXISTING HYDRANT
NEW VALVE
EXISTING VALVE
EXISTING REDUCER
EXISTING UTILITY POLE
NEW UTILITY POLE
UTILITY POLE TO BE RELOCATED
NEW LIGHT STANDARD
EXISTING LIGHT STANDARD
NEW HAND HOLE
EXISTING HAND HOLE
EXISTING GAS VALVE
EXISTING BELL MANHOLE
EXISTING BELL/CABLE PEDESTAL
BELL PEDESTAL TO BE MOVED (BY OTHERS)
EXISTING TREES/HEDGES
NEW TREES/HEDGES
NEW BACKFLOW PREVENTOR ON STORM SERVICE @ ℞
EXISTING BORE HOLE
SANITARY & WATER SERVICE
STORM, SANITARY & WATER SERVICE
NEW TOP OF WALL GRADE
NEW BOTTOM OF WALL GRADE
NEW CULVERT
EXISTING CULVERT
NEW SIDEWALK
EXISTING SIDEWALK
NEW ASPHALT ROADWAY
NEW ASPHALT DRIVEWAY / PATH
NEW GRANULAR DRIVEWAY
NEW FROST TAPER

	2+875	2+900	2+925	2+950	2+975	3+000	3+025	3+050	3+075	3+100	3+125	3+150
CENTERLINE GRADE – FINISHED		62.02	61.83	61.71	61.65	61.66	61.73	61.87	62.07	62.34	62.68	63.08
CENTERLINE GRADE – EXISTING	62.36	62.07	61.78	61.49	61.21	61.03	60.99	61.11	61.33	61.75	62.24	62.90
TOP OF FORCEMAIN				59.51	59.50	59.49	59.48	59.47	59.30	59.19	59.77	60.35

SANITARY SEWER INVERT: 58.37 — NEW 35.55m 300mmø SANITARY SEWER @ 0.37% — 58.50 / 58.53 — NEW 61.71m 300mmø SANITARY SEWER @ 0.39% — 58.77 / 58.81 — NEW 62.27m 250mmø SANITARY SEWER @ 0.63% — 59.20 / 59.47 — NEW 33.86m 250mmø SANITARY SEWER @ 1.77% — 60.07 / 60.22 — NEW 55.56m 250mmø SANITARY SEWER @ 0.61% — 60.56

STORM SEWER INVERT: 60.28 — NEW 53.00m 750mmø STORM SEWER @ 0.21% — 60.17 / 60.15 — NEW 51.76m 825mmø STORM SEWER @ 0.58% — 60.45 / 60.45 — NEW 52.57m 825mmø STORM SEWER @ 0.58% — 60.76 / 60.80 — NEW 78.96m 825mmø STORM SEWER @ 0.38% — 61.10

SUPERELEVATION: CURVE 1 −3.00% −3.00% 3+021.25; CURVE 1 0.00% −3.00% 3+055.25; CURVE 1 3.00% −3.00% 3+089.25; CURVE 1 3.00% −3.00% 3+115.46

GENIVAR
2611 QUEENSVIEW DRIVE
OTTAWA, ONTARIO
CANADA K7P 0G2
PHONE: 613-829-2800 FAX: 613-829-8299
WWW.GENIVAR.COM

CONSULTANT:

SEAL:

CLIENT:
CITY OF CLARENCE-ROCKLAND

CLIENT REF. #:

PROJECT:
RECONSTRUCTION OF CARON STREET

KEY PLAN:
NORTH

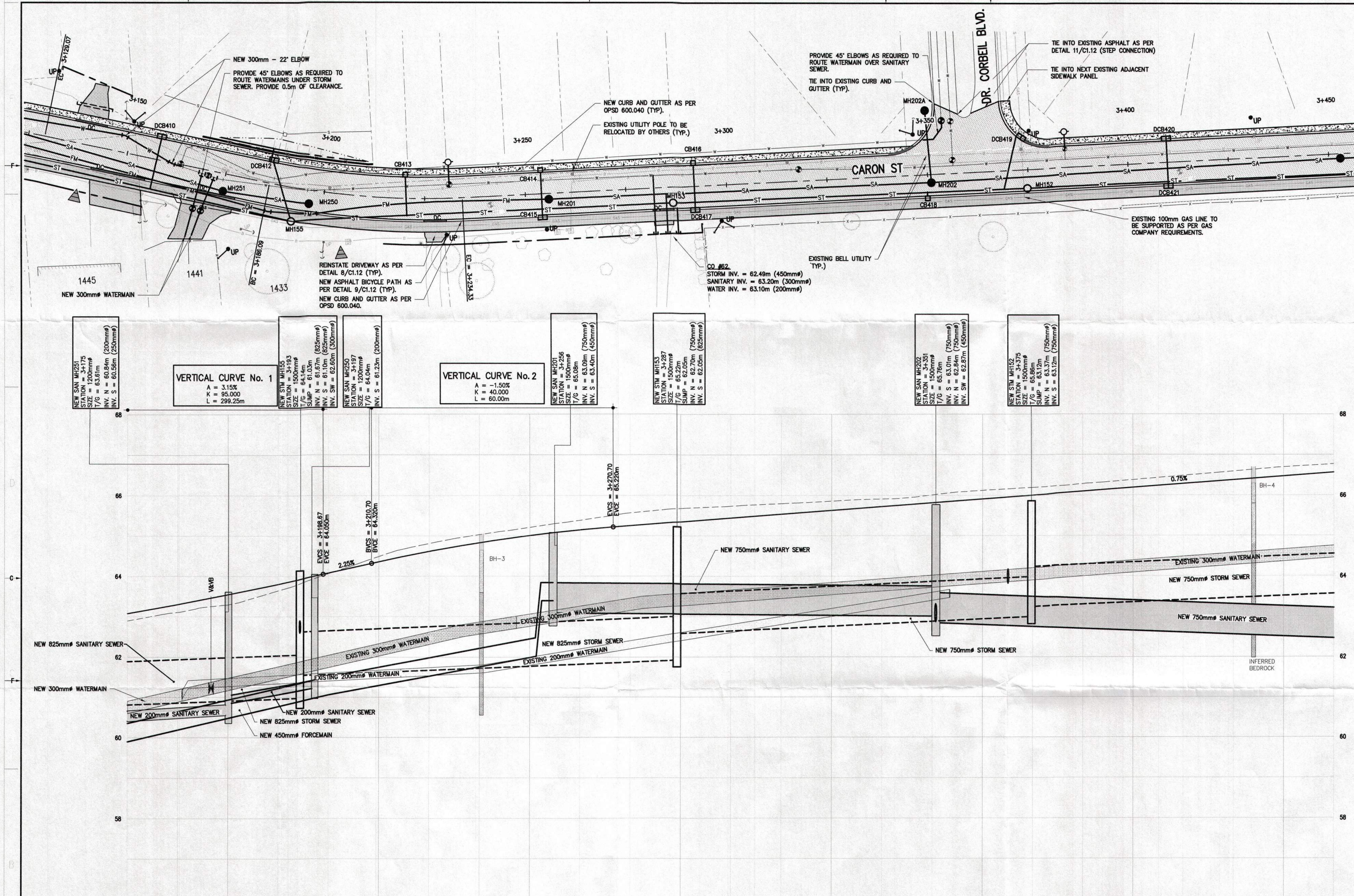
ISSUED FOR – REVISION:

IS	RE	DATE	DESCRIPTION
2		NOV 25, 2015	AS-BUILTS
1		AUG 22, 2013	ISSUED FOR CONSTRUCTION

PROJECT NO: 065038/111-55504-00
DATE: NOVEMBER 2015
ORIGINAL SCALE: H: 1:500 V: 1:50
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: MM/MS
DRAWN BY: MS/STR
CHECKED BY: MM
DISCIPLINE: MUNICIPAL
TITLE:
PLAN & PROFILE OF CARON STREET FROM STA. 2+850 TO STA. 3+150
SHEET NUMBER: C1.1
SHEET #: 1 OF 13
ISSUE: AS-BUILTS
DATE OF: 11/25/2015
REV #: 0

M:\2006\065038\MUN\Complete_CARON\065038C1_1_7_combined.dwg – 18.09.13 12:47pm

@ DAVID ST.



NOTES:

1. CONTRACTOR TO VERIFY LOCATION OF ALL BURIED SERVICES PRIOR TO START OF CONSTRUCTION.
2. TOPOGRAPHIC INFORMATION PROVIDED BY ARPENTAGE DUTRISAC SURVEYING INC.
3. ALL DISTURBED AREAS TO BE REINSTATED USING 100mm OF TOP SOIL AND SOD (UNLESS OTHERWISE NOTED).
4. SEE DRAWINGS C1.11 TO C1.15 FOR LINE PAINTING AND SIGNAGE DETAILS.

LEGEND:

EXISTING PROPERTY LINE
NEW CENTERLINE OF ROAD
NEW EDGE OF PAVEMENT
EXISTING EDGE OF PAVEMENT
NEW CURB
DC NEW DEPRESSED CURB
EXISTING CURB
NEW EDGE OF SHOULDER
EXISTING EDGE OF SHOULDER
NEW DITCH
EXISTING DITCH
NEW BOTTOM OF SLOPE
EXISTING BOTTOM OF SLOPE
EXISTING TOP OF SLOPE
EXISTING FENCE
FM NEW SANITARY FORCEMAIN
SA NEW SANITARY SEWER
SA EXISTING SANITARY SEWER
ST NEW STORM SEWER
ST EXISTING STORM SEWER
W NEW WATERMAIN
W EXISTING WATERMAIN
COMB EXISTING COMBINED SEWER
GAS EXISTING GAS LINE
B EXISTING BELL LINE
NEW GUIDERAIL
EXISTING GUIDERAIL
NEW SANITARY MANHOLE
EXISTING SANITARY MANHOLE
NEW STORM MANHOLE
EXISTING STORM MANHOLE
NEW CATCHBASIN
NEW DOUBLE CATCHBASIN
NEW CATCHBASIN DITCH INLET
EXISTING CATCHBASIN
NEW HYDRANT
EXISTING HYDRANT
NEW VALVE
EXISTING VALVE
EXISTING REDUCER
EXISTING UTILITY POLE
UP NEW UTILITY POLE
UTILITY POLE TO BE RELOCATED
NEW LIGHT STANDARD
EXISTING LIGHT STANDARD
NEW HAND HOLE
EXISTING HAND HOLE
EXISTING GAS VALVE
EXISTING BELL MANHOLE
EXISTING BELL/CABLE PEDESTAL
BELL PEDESTAL TO BE MOVED (BY OTHERS)
EXISTING TREES/HEDGES
NEW TREES/HEDGES
BFP NEW BACKFLOW PREVENTOR ON STORM SERVICE
EXISTING BORE HOLE
SANITARY & WATER SERVICE
STORM, SANITARY & WATER SERVICE
TW–54.35 NEW TOP OF WALL GRADE
BW–53.35 NEW BOTTOM OF WALL GRADE
NEW CULVERT
EXISTING CULVERT
NEW SIDEWALK
EXISTING SIDEWALK
NEW ASPHALT ROADWAY
NEW ASPHALT DRIVEWAY / PATH
NEW GRANULAR DRIVEWAY
NEW FROST TAPER

STATION		3+175	3+200	3+225	3+250	3+275	3+300	3+325	3+350	3+375	3+400	3+425	3+450
CENTERLINE GRADE – FINISHED	63.08	63.55	64.08	64.62	65.01	65.25	65.44	65.63	65.82	66.00	66.19	66.38	66.57
CENTERLINE GRADE – EXISTING	62.90	63.30	64.06	64.81	65.21	65.57	65.73	65.86	66.01	66.19	66.38	66.59	66.77

SANITARY SEWER INVERT: 60.22 – NEW 55.56m 250mm# SANITARY SEWER @ 0.61% – 60.56 / 60.84 – NEW 21.68m 200mm# SANITARY SEWER @ 1.80% – 61.23; 63.09 – NEW 95.09m 750mm# SANITARY SEWER @ 0.08% – 63.01 / 62.84 – NEW 102.03m 750mm# SANITARY SEWER @ 0.39% – 62.45

STORM SEWER INVERT: 60.80 – NEW 78.96m 825mm# STORM SEWER @ 0.38% – 61.10 / 61.87 – NEW 95.14m 825mm# STORM SEWER @ 0.40% – 62.05 / 62.70 – NEW 88.06m 750mm# STORM SEWER @ 0.48% – 63.12 / 63.37 – NEW 108.57m 750mm# STORM SEWER @ 0.41% – 63.82

TOP OF FORCEMAIN: 61.68, 62.24, 62.80, 63.36, 63.79, 63.84

SUPERELEVATION: CURVE 1/2 0.00% 0.00% 3+157.58; CURVE 2 –3.00% 3.00% 3+199.69; CURVE 2 –3.00% 3.00% 3+220.72; CURVE 2 –3.00% 0.00% 3+254.72; CURVE 2 –3.00% –3.00% 3+288.72

GENIVAR
2611 QUEENSVIEW DRIVE
OTTAWA, ONTARIO
CANADA K7P 0G2
PHONE: 613–829–2800 FAX: 613–829–8299
WWW.GENIVAR.COM

CONSULTANT:

SEAL:

CLIENT: CITY OF CLARENCE–ROCKLAND

CLIENT REF. #:

PROJECT: RECONSTRUCTION OF CARON STREET

KEY PLAN: NORTH

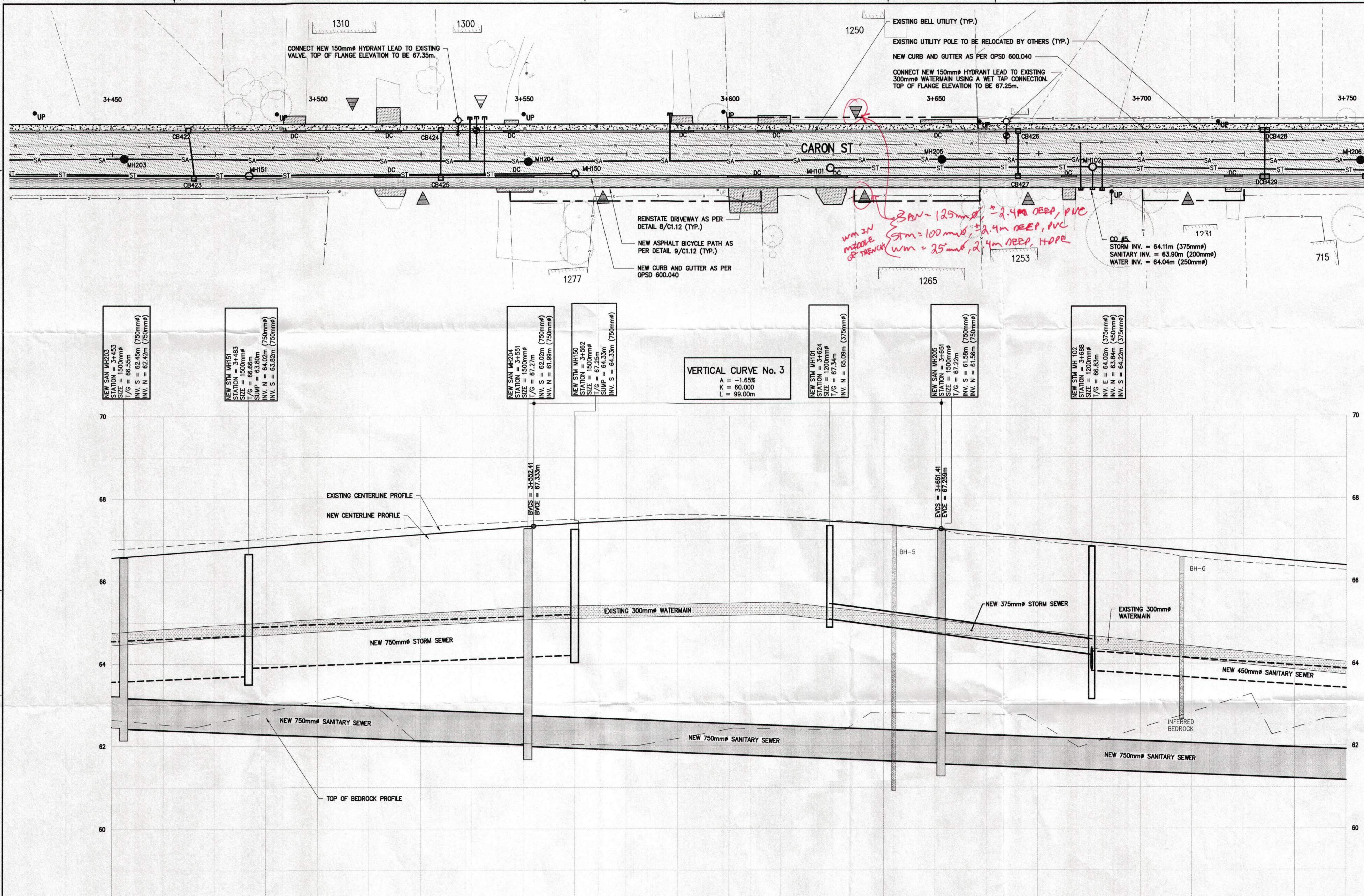
ISSUED FOR – REVISION:

IS	RE	DATE	DESCRIPTION
2		NOV 25, 2015	AS–BUILTS
1		AUG 22, 2013	ISSUED FOR CONSTRUCTION

PROJECT NO: 065038/111–55504–00
DATE: NOVEMBER 2015
ORIGINAL SCALE: H: 1:500 V: 1:50
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE. 25mm
DESIGNED BY: MM/MS
DRAWN BY: MS/STR
CHECKED BY: MM
DISCIPLINE: MUNICIPAL
TITLE: PLAN & PROFILE OF CARON STREET FROM STA. 3+150 TO STA. 3+450
SHEET NUMBER: C1.2
SHEET #: 2 OF 13
ISSUE: AS–BUILTS
DATE OF: 11/25/2015
REV #: 0

M:\2006\065038\MUN\Complete_CARON\065038C1_1_7_combined.dwg – 18.09.13 12:47pm

@ DR. CORBEIL BLVD



STATION		3+475	3+500	3+525	3+550	3+575	3+600	3+625	3+650	3+675	3+700	3+725	3+750	STATION
CENTERLINE GRADE FINISHED / EXISTING	66.57 / 66.77	66.75 / 66.94	66.94 / 67.14	67.13 / 67.31	67.32 / 67.44	67.46 / 67.54	67.50 / 67.58	67.44 / 67.47	67.27 / 67.26	67.05 / 66.97	66.82 / 66.74	66.60 / 66.44	66.37 / 66.26	FINISHED / EXISTING CENTERLINE GRADE
SANITARY SEWER INVERT	62.45 / 62.42		NEW 98.15m 750mmø SANITARY SEWER @ 0.41%		62.02 / 61.99		NEW 100.42m 750mmø SANITARY SEWER @ 0.40%		61.58 / 61.56		NEW 101.86m 750mmø SANITARY SEWER @ 0.40%		61.15	SANITARY SEWER INVERT
STORM SEWER INVERT	63.37	NEW 108.57m 750mmø STORM SEWER @ 0.41%	63.82 / 64.02	NEW 79.18m 750mmø STORM SEWER @ 0.39%	64.33			65.09	NEW 63.75m 375mmø STORM SEWER @ 1.36%		64.22			STORM SEWER INVERT
SUPERELEVATION														SUPERELEVATION

NOTES:

1. CONTRACTOR TO VERIFY LOCATION OF ALL BURIED SERVICES PRIOR TO START OF CONSTRUCTION.
2. TOPOGRAPHIC INFORMATION PROVIDED BY ARPENTAGE DUTRISAC SURVEYING INC.
3. ALL DISTURBED AREAS TO BE REINSTATED USING 100mm OF TOP SOIL AND SOD (UNLESS OTHERWISE NOTED).
4. SEE DRAWINGS C1.11 TO C1.15 FOR LINE PAINTING AND SIGNAGE DETAILS.

LEGEND:

- EXISTING PROPERTY LINE
- NEW CENTERLINE OF ROAD
- NEW EDGE OF PAVEMENT
- EXISTING EDGE OF PAVEMENT
- NEW CURB
- DC NEW DEPRESSED CURB
- EXISTING CURB
- NEW EDGE OF SHOULDER
- EXISTING EDGE OF SHOULDER
- NEW DITCH
- EXISTING DITCH
- NEW BOTTOM OF SLOPE
- EXISTING BOTTOM OF SLOPE
- EXISTING TOP OF SLOPE
- EXISTING FENCE
- FM NEW SANITARY FORCEMAIN
- SA NEW SANITARY SEWER
- SA EXISTING SANITARY SEWER
- ST NEW STORM SEWER
- ST EXISTING STORM SEWER
- W NEW WATERMAIN
- W EXISTING WATERMAIN
- COMB EXISTING COMBINED SEWER
- GAS EXISTING GAS LINE
- B EXISTING BELL LINE
- NEW GUIDERAIL
- EXISTING GUIDERAIL
- NEW SANITARY MANHOLE
- EXISTING SANITARY MANHOLE
- NEW STORM MANHOLE
- EXISTING STORM MANHOLE
- NEW CATCHBASIN
- NEW DOUBLE CATCHBASIN
- NEW CATCHBASIN DITCH INLET
- EXISTING CATCHBASIN
- NEW HYDRANT
- EXISTING HYDRANT
- NEW VALVE
- EXISTING VALVE
- EXISTING REDUCER
- UP EXISTING UTILITY POLE
- UP NEW UTILITY POLE
- UP UTILITY POLE TO BE RELOCATED
- LS NEW LIGHT STANDARD
- LS EXISTING LIGHT STANDARD
- HH NEW HAND HOLE
- HH EXISTING HAND HOLE
- GV EXISTING GAS VALVE
- B EXISTING BELL MANHOLE
- B C EXISTING BELL/CABLE PEDESTAL
- BELL PEDESTAL TO BE MOVED (BY OTHERS)
- EXISTING TREES/HEDGES
- NEW TREES/HEDGES
- BFP NEW BACKFLOW PREVENTOR ON STORM SERVICE @ PL
- BH 1 EXISTING BORE HOLE
- SANITARY & WATER SERVICE
- STORM, SANITARY & WATER SERVICE
- TW-54.35 NEW TOP OF WALL GRADE
- BW-53.35 NEW BOTTOM OF WALL GRADE
- NEW CULVERT
- EXISTING CULVERT
- NEW SIDEWALK
- EXISTING SIDEWALK
- NEW ASPHALT ROADWAY
- NEW ASPHALT DRIVEWAY / PATH
- NEW GRANULAR DRIVEWAY
- NEW FROST TAPER

GENIVAR
2611 QUEENSVIEW DRIVE
OTTAWA, ONTARIO
CANADA K7P 0G2
PHONE: 613-829-2800 FAX: 613-829-8299
WWW.GENIVAR.COM

CONSULTANT:

SEAL:

CLIENT:

CITY OF CLARENCE-ROCKLAND

CLIENT REF. #:

PROJECT:

RECONSTRUCTION OF CARON STREET

KEY PLAN:

NORTH

ISSUED FOR – REVISION:

IS	RE	DATE	DESCRIPTION
2		NOV 25, 2015	AS-BUILTS
1		AUG 22, 2013	ISSUED FOR CONSTRUCTION

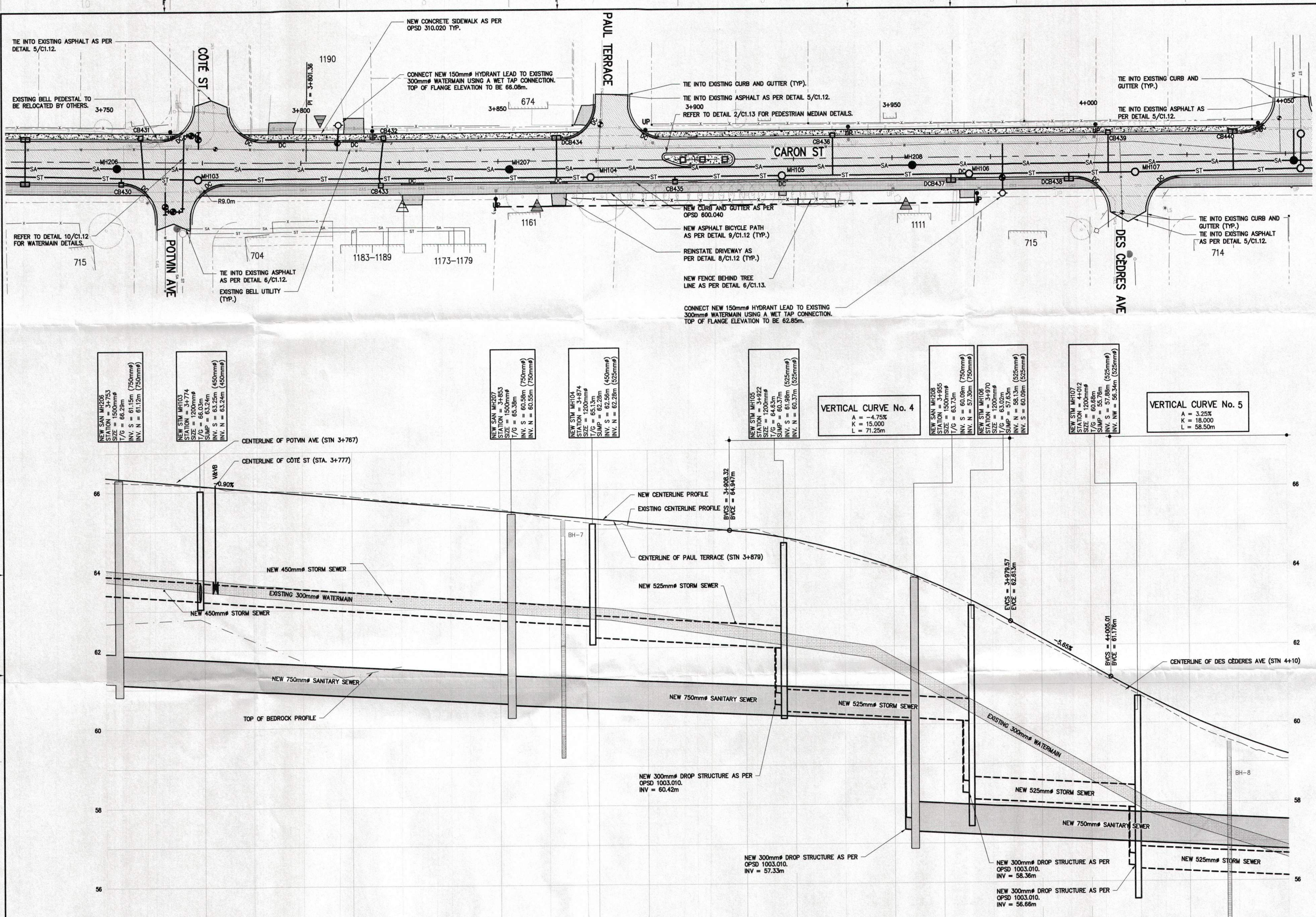
PROJECT NO: 065038/111-55504-00
DATE: NOVEMBER 2015
ORIGINAL SCALE: H: 1:500 V: 1:50
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: MM/MS
DRAWN BY: MS/STR
CHECKED BY: MM
DISCIPLINE: MUNICIPAL

TITLE:

PLAN & PROFILE OF CARON STREET FROM STA. 3+450 TO STA. 3+750

SHEET NUMBER: C1.3
SHEET #: 3 OF 13
ISSUE: AS-BUILTS
DATE OF: 11/25/2015
REV #: 0

M:\2006\065038\MUN\Complete_CARON\065038C1_1_7_combined.dwg – 18.09.13 12:47pm



STATION		3+775	3+800	3+825	3+850	3+875	3+900	3+925	3+950	3+975	4+000	4+025	4+050	STATION
CENTERLINE GRADE (FINISHED / EXISTING)	66.37 / 66.26	66.15 / 66.13	65.92 / 65.97	65.70 / 65.72	65.47 / 65.51	65.25 / 65.13	65.02 / 64.92	64.70 / 64.66	63.99 / 63.96	62.86 / 62.73	61.46 / 61.37	60.16 / 59.98	59.20 / 59.06	CENTERLINE GRADE
SANITARY SEWER INVERT	61.15 / 61.12		NEW 99.60m 750mmø SANITARY SEWER @ 0.55%		60.58 / 60.55		NEW 102.23m 750mmø SANITARY SEWER @ 0.45%		60.09 / 57.30		NEW 97.01m 750mmø SANITARY SEWER @ 0.53%		56.78	SANITARY SEWER INVERT
STORM SEWER INVERT		63.24		NEW 99.64m 450mmø STORM SEWER @ 0.68%		62.56 / 62.28	NEW 48.51m 525mmø STORM SEWER @ 0.62%	61.98 / 60.37	NEW 47.51m 525mmø STORM SEWER @ 0.59%	60.09 / 58.13	NEW 42.21m 525mmø STORM SEWER @ 0.59% / 57.88 / 56.34	NEW 42.08m 525mmø STORM SEWER @ 0.52%	56.12	STORM SEWER INVERT
SUPERELEVATION														SUPERELEVATION

NOTES:

1. CONTRACTOR TO VERIFY LOCATION OF ALL BURIED SERVICES PRIOR TO START OF CONSTRUCTION.
2. TOPOGRAPHIC INFORMATION PROVIDED BY ARPENTAGE DUTRISAC SURVEYING INC.
3. ALL DISTURBED AREAS TO BE REINSTATED USING 100mm OF TOP SOIL AND SOD (UNLESS OTHERWISE NOTED).
4. SEE DRAWINGS C1.11 TO C1.15 FOR LINE PAINTING AND SIGNAGE DETAILS.

LEGEND:

EXISTING PROPERTY LINE
NEW CENTERLINE OF ROAD
NEW EDGE OF PAVEMENT
EXISTING EDGE OF PAVEMENT
NEW CURB
DC NEW DEPRESSED CURB
EXISTING CURB
NEW EDGE OF SHOULDER
EXISTING EDGE OF SHOULDER
NEW DITCH
EXISTING DITCH
NEW BOTTOM OF SLOPE
EXISTING BOTTOM OF SLOPE
EXISTING TOP OF SLOPE
EXISTING FENCE
FM NEW SANITARY FORCEMAIN
SA NEW SANITARY SEWER
SA EXISTING SANITARY SEWER
ST NEW STORM SEWER
ST EXISTING STORM SEWER
W NEW WATERMAIN
W EXISTING WATERMAIN
COMB EXISTING COMBINED SEWER
GAS EXISTING GAS LINE
B EXISTING BELL LINE
NEW GUIDERAIL
EXISTING GUIDERAIL
NEW SANITARY MANHOLE
EXISTING SANITARY MANHOLE
NEW STORM MANHOLE
EXISTING STORM MANHOLE
NEW CATCHBASIN
NEW DOUBLE CATCHBASIN
NEW CATCHBASIN DITCH INLET
EXISTING CATCHBASIN
NEW HYDRANT
EXISTING HYDRANT
NEW VALVE
EXISTING VALVE
EXISTING REDUCER
EXISTING UTILITY POLE
UP NEW UTILITY POLE
UTILITY POLE TO BE RELOCATED
NEW LIGHT STANDARD
EXISTING LIGHT STANDARD
NEW HAND HOLE
EXISTING HAND HOLE
GV EXISTING GAS VALVE
EXISTING BELL MANHOLE
EXISTING BELL/CABLE PEDESTAL
BELL PEDESTAL TO BE MOVED (BY OTHERS)
EXISTING TREES/HEDGES
NEW TREES/HEDGES
BFP NEW BACKFLOW PREVENTOR ON STORM SERVICE @ ℄
BH EXISTING BORE HOLE
SANITARY & WATER SERVICE
STORM, SANITARY & WATER SERVICE
TW=54.35 NEW TOP OF WALL GRADE
BW=53.35 NEW BOTTOM OF WALL GRADE
NEW CULVERT
EXISTING CULVERT
NEW SIDEWALK
EXISTING SIDEWALK
NEW ASPHALT ROADWAY
NEW ASPHALT DRIVEWAY / PATH
NEW GRANULAR DRIVEWAY
NEW FROST TAPER

GENIVAR
2611 QUEENSVIEW DRIVE
OTTAWA, ONTARIO
CANADA K7P 0G2
PHONE: 613-829-2800 FAX: 613-829-8299
WWW.GENIVAR.COM

CONSULTANT:

SEAL:

CLIENT:

CITY OF CLARENCE-ROCKLAND

CLIENT REF. #:

PROJECT:

RECONSTRUCTION OF CARON STREET

KEY PLAN:

NORTH

ISSUED FOR - REVISION:

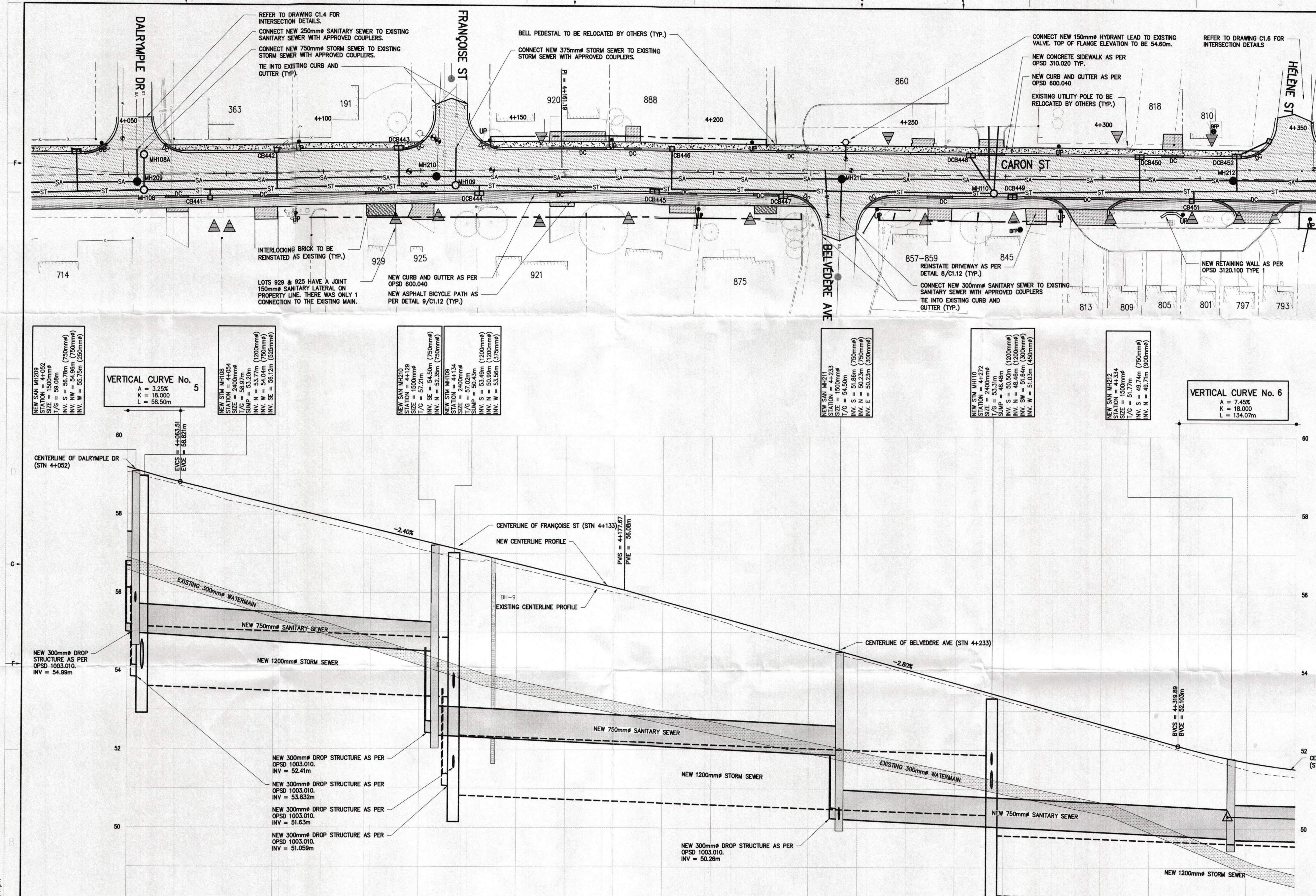
IS	RE	DATE	DESCRIPTION
2		NOV 25, 2015	AS-BUILTS
1		AUG 22, 2013	ISSUED FOR CONSTRUCTION

PROJECT NO: 065038/111-55504-00
DATE: NOVEMBER 2015
ORIGINAL SCALE: H: 1:500 V: 1:50
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: MM/MS
DRAWN BY: MS/STR
CHECKED BY: MM
DISCIPLINE: MUNICIPAL

TITLE:

PLAN & PROFILE OF CARON STREET FROM STA. 3+750 TO STA. 4+050

SHEET NUMBER: C1.4
SHEET #: 4 OF 13
ISSUE: AS-BUILTS
DATE OF: 11/25/2015
REV #: 0



STATION	4+075	4+100	4+125	4+150	4+175	4+200	4+225	4+250	4+275	4+300	4+325	4+350
CENTERLINE GRADE FINISHED / EXISTING (4+052: 59.20 / 59.06)	58.55 / 58.37	57.95 / 57.78	57.35 / 57.11	56.75 / 56.62	56.15 / 56.02	55.46 / 55.37	54.76 / 54.64	54.06 / 53.98	53.36 / 53.27	52.66 / 52.58	51.97 / 51.85	51.51 / 51.32

SANITARY SEWER INVERT: 56.78 / 54.96 — NEW 76.88m 750mm⌀ SANITARY SEWER @ 0.60% — 54.50 / 52.35 — NEW 103.88m 750mm⌀ SANITARY SEWER @ 0.47% — 51.86 / 50.23 — NEW 100.65m 750mm⌀ SANITARY SEWER @ 0.49% — NEW 100.01m 900mm⌀ SANITARY SEWER @ 0.21% — 49.74 / 49.71 — 49.50

STORM SEWER INVERT: 56.34 / 54.12 / 53.77 — NEW 80.07m 1200mm⌀ STORM SEWER @ 0.35% — 53.49 / 50.69 — NEW 138.03m 1200mm⌀ STORM SEWER @ 0.35% — 50.50 / 48.46 — NEW 110.05m 1200mm⌀ STORM SEWER @ 0.35% — 48.07

SUPERELEVATION: NEW 42.08m 525mm⌀ STORM SEWER @ 0.52%

NOTES:

1. CONTRACTOR TO VERIFY LOCATION OF ALL BURIED SERVICES PRIOR TO START OF CONSTRUCTION.
2. TOPOGRAPHIC INFORMATION PROVIDED BY ARPENTAGE DUTRISAC SURVEYING INC.
3. ALL DISTURBED AREAS TO BE REINSTATED USING 100mm OF TOP SOIL AND SOD (UNLESS OTHERWISE NOTED).
4. SEE DRAWINGS C1.11 TO C1.15 FOR LINE PAINTING AND SIGNAGE DETAILS.

LEGEND:

EXISTING PROPERTY LINE
NEW CENTERLINE OF ROAD
NEW EDGE OF PAVEMENT
EXISTING EDGE OF PAVEMENT
NEW CURB
NEW DEPRESSED CURB
EXISTING CURB
NEW EDGE OF SHOULDER
EXISTING EDGE OF SHOULDER
NEW DITCH
EXISTING DITCH
NEW BOTTOM OF SLOPE
EXISTING BOTTOM OF SLOPE
EXISTING TOP OF SLOPE
EXISTING FENCE
NEW SANITARY FORCEMAIN
NEW SANITARY SEWER
EXISTING SANITARY SEWER
NEW STORM SEWER
EXISTING STORM SEWER
NEW WATERMAIN
EXISTING WATERMAIN
EXISTING COMBINED SEWER
EXISTING GAS LINE
EXISTING BELL LINE
NEW GUIDERAIL
EXISTING GUIDERAIL
NEW SANITARY MANHOLE
EXISTING SANITARY MANHOLE
NEW STORM MANHOLE
EXISTING STORM MANHOLE
NEW CATCHBASIN
NEW DOUBLE CATCHBASIN
NEW CATCHBASIN DITCH INLET
EXISTING CATCHBASIN
NEW HYDRANT
EXISTING HYDRANT
NEW VALVE
EXISTING VALVE
EXISTING REDUCER
EXISTING UTILITY POLE
NEW UTILITY POLE
UTILITY POLE TO BE RELOCATED
NEW LIGHT STANDARD
EXISTING LIGHT STANDARD
NEW HAND HOLE
EXISTING HAND HOLE
EXISTING GAS VALVE
EXISTING BELL MANHOLE
EXISTING BELL/CABLE PEDESTAL
BELL PEDESTAL TO BE MOVED (BY OTHERS)
EXISTING TREES/HEDGES
NEW TREES/HEDGES
NEW BACKFLOW PREVENTOR ON STORM SERVICE @ ℄
EXISTING BORE HOLE
SANITARY & WATER SERVICE
STORM, SANITARY & WATER SERVICE
NEW TOP OF WALL GRADE
NEW BOTTOM OF WALL GRADE
NEW CULVERT
EXISTING CULVERT
NEW SIDEWALK
EXISTING SIDEWALK
NEW ASPHALT ROADWAY
NEW ASPHALT DRIVEWAY / PATH
NEW GRANULAR DRIVEWAY
NEW FROST TAPER

GENIVAR
2611 QUEENSVIEW DRIVE
OTTAWA, ONTARIO
CANADA K2B 8K2
PHONE: 613-829-2800 FAX: 613-829-8299
WWW.GENIVAR.COM

CONSULTANT:

SEAL:

CLIENT:

CITY OF CLARENCE-ROCKLAND

CLIENT REF. #:

PROJECT:

RECONSTRUCTION OF CARON STREET

KEY PLAN:

NORTH

ISSUED FOR – REVISION:

IS	RE	DATE	DESCRIPTION
2		NOV 25, 2015	AS-BUILTS
1		AUG 22, 2013	ISSUED FOR CONSTRUCTION

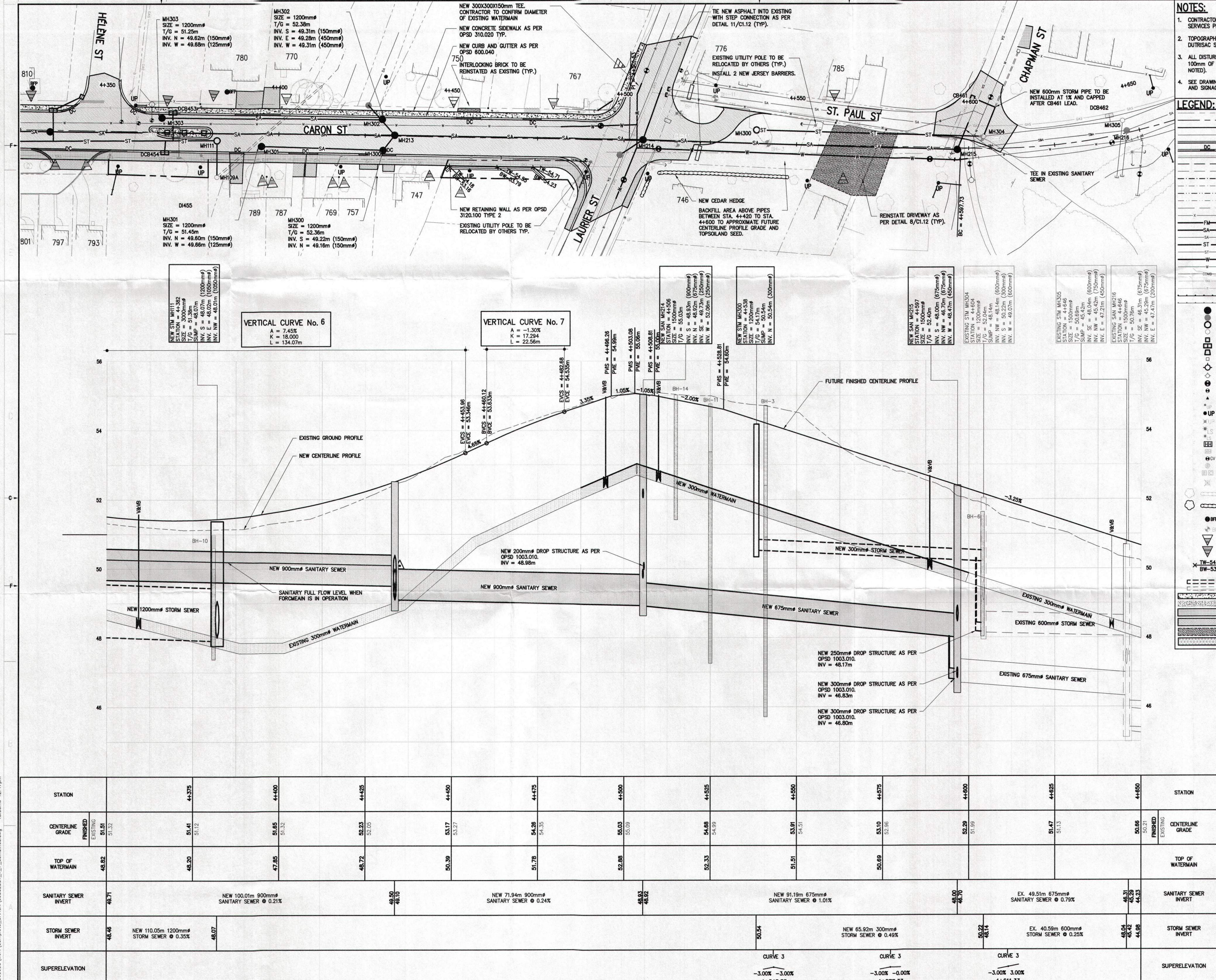
PROJECT NO.: 065038/111-55504-00
DATE: NOVEMBER 2015
ORIGINAL SCALE: H: 1:500 V: 1:50
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE. 25mm
DESIGNED BY: MM/MS
DRAWN BY: MS/STR
CHECKED BY: MM
DISCIPLINE: MUNICIPAL

TITLE:

PLAN & PROFILE OF CARON STREET FROM STA. 4+050 TO STA. 4+350

SHEET NUMBER: C1.5
SHEET #: 5 OF 13
ISSUE: AS-BUILTS
REV #: 0
DATE OF: 11/25/2015

M:\2006\065038\MUN\Complete_CARON\065038C1_1_7_combined.dwg - 18.09.13 12:47pm



NOTES:

1. CONTRACTOR TO VERIFY LOCATION OF ALL BURIED SERVICES PRIOR TO START OF CONSTRUCTION.
2. TOPOGRAPHIC INFORMATION PROVIDED BY ARPENTAGE DUTRISAC SURVEYING INC.
3. ALL DISTURBED AREAS TO BE REINSTATED USING 100mm OF TOP SOIL AND SOD (UNLESS OTHERWISE NOTED).
4. SEE DRAWINGS C1.11 TO C1.15 FOR LINE PAINTING AND SIGNAGE DETAILS.

LEGEND:

EXISTING PROPERTY LINE
NEW CENTERLINE OF ROAD
NEW EDGE OF PAVEMENT
EXISTING EDGE OF PAVEMENT
NEW CURB
NEW DEPRESSED CURB
EXISTING CURB
NEW EDGE OF SHOULDER
EXISTING EDGE OF SHOULDER
NEW DITCH
EXISTING DITCH
NEW BOTTOM OF SLOPE
EXISTING BOTTOM OF SLOPE
EXISTING TOP OF SLOPE
EXISTING FENCE
NEW SANITARY FORCEMAIN
NEW SANITARY SEWER
EXISTING SANITARY SEWER
NEW STORM SEWER
EXISTING STORM SEWER
NEW WATERMAIN
EXISTING WATERMAIN
EXISTING COMBINED SEWER
EXISTING GAS LINE
EXISTING BELL LINE
NEW GUIDERAIL
EXISTING GUIDERAIL
NEW SANITARY MANHOLE
EXISTING SANITARY MANHOLE
NEW STORM MANHOLE
EXISTING STORM MANHOLE
NEW CATCHBASIN
NEW DOUBLE CATCHBASIN
NEW CATCHBASIN DITCH INLET
EXISTING CATCHBASIN
NEW HYDRANT
EXISTING HYDRANT
NEW VALVE
EXISTING VALVE
EXISTING REDUCER
EXISTING UTILITY POLE
NEW UTILITY POLE
UTILITY POLE TO BE RELOCATED
NEW LIGHT STANDARD
EXISTING LIGHT STANDARD
NEW HAND HOLE
EXISTING HAND HOLE
EXISTING GAS VALVE
EXISTING BELL MANHOLE
EXISTING BELL/CABLE PEDESTAL
BELL PEDESTAL TO BE MOVED (BY OTHERS)
EXISTING TREES/HEDGES
NEW TREES/HEDGES
NEW BACKFLOW PREVENTOR ON STORM SERVICE
EXISTING BORE HOLE
SANITARY & WATER SERVICE
STORM, SANITARY & WATER SERVICE
TW-54.35 NEW TOP OF WALL GRADE
BW-53.35 NEW BOTTOM OF WALL GRADE
NEW CULVERT
EXISTING CULVERT
NEW SIDEWALK
EXISTING SIDEWALK
NEW ASPHALT ROADWAY
NEW ASPHALT DRIVEWAY / PATH
NEW GRANULAR DRIVEWAY
NEW FROST TAPER

GENIVAR
2611 QUEENSVIEW DRIVE
OTTAWA, ONTARIO
CANADA K7P 0G2
PHONE: 613-829-2800 FAX: 613-829-8299
WWW.GENIVAR.COM

CONSULTANT:

SEAL:

CLIENT:

CITY OF CLARENCE-ROCKLAND

CLIENT REF. #:

PROJECT:

RECONSTRUCTION OF CARON STREET

KEY PLAN:

NORTH

ISSUED FOR – REVISION:

IS	RE	DATE	DESCRIPTION
2		NOV 25, 2015	AS-BUILTS
1		AUG 22, 2013	ISSUED FOR CONSTRUCTION

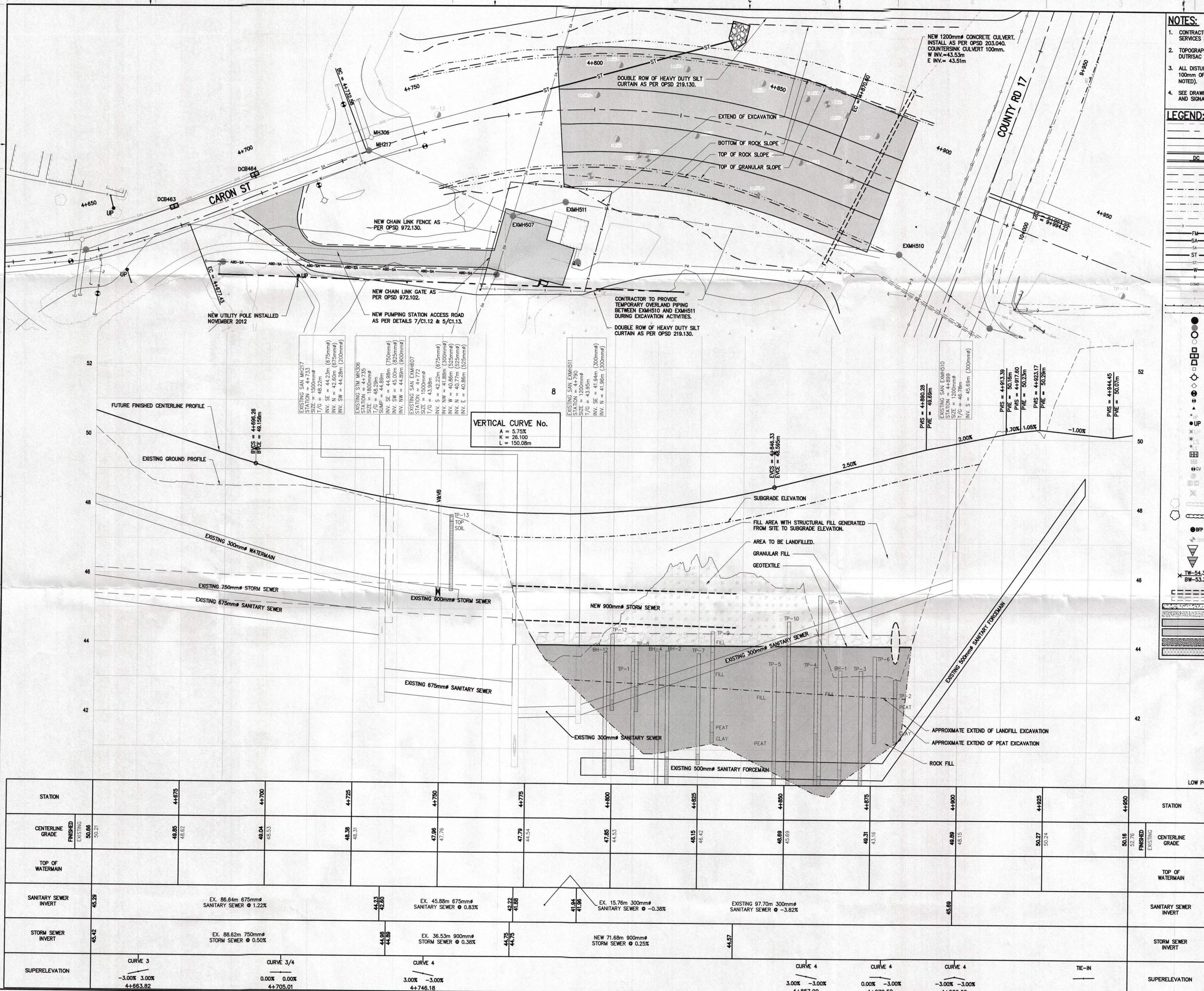
PROJECT NO: 065038/111-55504-00
DATE: NOVEMBER 2015
ORIGINAL SCALE: H: 1:500 V: 1:50
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: MM/MS
DRAWN BY: MS/STR
CHECKED BY:
DISCIPLINE: MUNICIPAL
TITLE:

PLAN & PROFILE OF CARON STREET FROM STA. 4+350 TO STA. 4+650

SHEET NUMBER: C1.6
SHEET #: 6 OF 13
ISSUE: AS-BUILTS
DATE OF: 11/25/2015
REV #: 0

M:\2006\065038\MUN\Complete_CARON\065038C1_1_7_combined.dwg – 18.09.13 12:47pm

@ LAURIER



NOTES:

1. CONTRACTOR TO VERIFY LOCATION OF ALL BURIED SERVICES PRIOR TO START OF CONSTRUCTION.
2. TOPOGRAPHIC INFORMATION PROVIDED BY ARPENTAGE DUTRISAC SURVEYING INC.
3. ALL DISTURBED AREAS TO BE REINSTATED USING 100mm OF TOP SOIL AND SOD (UNLESS OTHERWISE NOTED).
4. SEE DRAWINGS C1.11 TO C1.15 FOR LINE PAINTING AND SIGNAGE DETAILS.

LEGEND:

EXISTING PROPERTY LINE
NEW CENTERLINE OF ROAD
NEW EDGE OF PAVEMENT
EXISTING EDGE OF PAVEMENT
NEW CURB
NEW DEPRESSED CURB
EXISTING CURB
NEW EDGE OF SHOULDER
EXISTING EDGE OF SHOULDER
NEW DITCH
EXISTING DITCH
NEW BOTTOM OF SLOPE
EXISTING BOTTOM OF SLOPE
EXISTING TOP OF SLOPE
EXISTING FENCE
NEW SANITARY FORCEMAIN
NEW SANITARY SEWER
EXISTING SANITARY SEWER
NEW STORM SEWER
EXISTING STORM SEWER
NEW WATERMAIN
EXISTING WATERMAIN
EXISTING COMBINED SEWER
EXISTING GAS LINE
EXISTING BELL LINE
NEW GUIDERAIL
EXISTING GUIDERAIL
NEW SANITARY MANHOLE
EXISTING SANITARY MANHOLE
NEW STORM MANHOLE
EXISTING STORM MANHOLE
NEW CATCHBASIN
NEW DOUBLE CATCHBASIN
NEW CATCHBASIN DITCH INLET
EXISTING CATCHBASIN
NEW HYDRANT
EXISTING HYDRANT
NEW VALVE
EXISTING VALVE
EXISTING REDUCER
EXISTING UTILITY POLE
NEW UTILITY POLE
UTILITY POLE TO BE RELOCATED
NEW LIGHT STANDARD
EXISTING LIGHT STANDARD
NEW HAND HOLE
EXISTING HAND HOLE
EXISTING GAS VALVE
EXISTING BELL MANHOLE
EXISTING BELL/CABLE PEDESTAL
BELL PEDESTAL TO BE MOVED (BY OTHERS)
EXISTING TREES/HEDGES
NEW TREES/HEDGES
NEW BACKFLOW PREVENTOR ON STORM SERVICE
EXISTING BORE HOLE
SANITARY & WATER SERVICE
STORM, SANITARY & WATER SERVICE
TW=54.35 BW=53.35 NEW TOP OF WALL GRADE
NEW BOTTOM OF WALL GRADE
NEW CULVERT
EXISTING CULVERT
NEW SIDEWALK
EXISTING SIDEWALK
NEW ASPHALT ROADWAY
NEW ASPHALT DRIVEWAY / PATH
NEW GRANULAR DRIVEWAY
NEW FROST TAPER

VERTICAL CURVE #8

STA.	ELEVATION
4+694.89	49.221
4+700	49.06
4+710	48.77
4+720	48.53
4+730	48.32
4+740	48.15
4+750	48.01
4+760	47.92
4+770	47.86
4+780	47.84
4+790	47.86
4+800	47.92
4+810	48.02
4+820	48.16
4+830	48.33
4+840	48.54
4+844.89	48.658

GENIVAR
2611 QUEENSVIEW DRIVE
OTTAWA, ONTARIO
CANADA K7P 0G2
PHONE: 613-829-2800 FAX: 613-829-8299
WWW.GENIVAR.COM

CONSULTANT:

SEAL:

CLIENT:

CITY OF CLARENCE–ROCKLAND

CLIENT REF. #:

PROJECT:

RECONSTRUCTION OF CARON STREET

KEY PLAN:

ISSUED FOR – REVISION:

IS	RE	DATE	DESCRIPTION
2		NOV 25, 2015	AS-BUILTS
1		AUG 22, 2013	ISSUED FOR CONSTRUCTION

PROJECT NO: 065038/111-55504-00
DATE: NOVEMBER 2015
ORIGINAL SCALE: H: 1:500 V: 1:50
IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
25mm
DESIGNED BY: MM/MS
DRAWN BY: MS/STR
CHECKED BY: MM
DISCIPLINE: MUNICIPAL

TITLE:

PLAN & PROFILE OF CARON STREET FROM STA. 4+650 TO STA. 4+950

SHEET NUMBER: C1.7
SHEET #: 7 OF 13
ISSUE: AS-BUILTS
DATE OF: 11/25/2015
REV #: 0

C5

Appendix C

Sewage Pumping Station Capacity and Condition Assessment and Sanitary Treatment Facility Capacity and

Capital Investment

Report Excerpt

3. Pumping Station Capacity Assessment

3.1 Capacity

The detailed pump test data and flow calculation are included in Appendix G. A summary of the station capacities, average flows & firm capacity are presented below. In cases where data was inconclusive and inconsistent, SCADA information was gathered to supplement the pump tests.

Pump capacities were determined by running the pumps and measuring the drop in the wet well level over a measured time period. The volume pumped was calculated using the difference in level and the area of the wet well. This was divided by the elapsed time to determine the pump capacity. The inflow immediately before and/or after the pump test was also recorded, averaged and added to the pump capacity to determine the total pump capacity.

Pump test that appear to have inaccurate and inconsistent results due to unavailability of pumps, level sensor inaccuracies and other issues were reviewed against SCADA level and time data provided by the OCWA to correlate pump capacities.

Table 3-1 presents the results from the recent pump tests as well as the previous test completed in 2005 (CH2MHILL)

Table 3-1: Pump Station Capacities

Pumping Station	Pump Number	Rated Capacity	2005 Pump Test (L/s)	2005 Average for all Pumps (L/s)	2013 Pump Test (L/s)	2013 Average for all Pumps	Firm Capacity (L/s)
1	1	170.5	130.1	104.1	143.8	124.2	200[5]
	2	170.5	110.4		139.7		
	3	94.7	71.9		89.1		
2	1	63.0	81.0	79.1	50.09[1]	73.9[2]	70.7[4]
	2	63.0	77.1		73.93		
3	1	28.4	23.1	31.5	N/A[3]	33.9[2]	31.8[4]
	2	28.4	26.6		39.8		
4	1	49.0	25.7	31.5	22.0[1]	31.2[2]	28.1[4]
	2	49.0	37.2		37.4		
5	1	31.0	29.8	31.7	26.9	25.6	24.3
	2	31.0	33.6		24.3		
6	1	19.5	24.8	24.5	9.5[1]	21.7[2]	18.6[4]
	2	19.5	24.1		N/A[3]		
7	1	65.4	New PS - No flow sources connected to PS				
	2	65.4					

Inflow and infiltration for the ultimate build out was reviewed and varied to account for the actually flows, topography and age of infrastructure to ensure that projected flows are accurate. The Peak Instantaneous Flows values are compared to the current firm capacities to indicate the short, intermediate and ultimate effects on the pumping stations.

Table 3-8 presents the firm capacity of each pumping station in relation to the projected Peak Instantaneous flow data and the required Increase to meet the project time period.

Table 3-8: 2018 Flow Data Summary

Pump Station	Firm Capacity	2018		2023		Ultimate	
		Peak Inst. Flow (L/s)	Required Increase (L/s)	Peak Inst. Flow (L/s)	Required Increase (L/s)	Peak Inst. Flow (L/s)	Required Increase (L/s)
1	200±	233.65	33.65	267.72	67.72	837.2	637.2
2	70.7	111.84	41.14	128.15	57.45	121.6	50.9
3	31.8	85.48	53.68	97.95	66.15	107.5	75.7
4	28.1	87.33	59.23	100.07	71.97	98.1	70.0
5	24.3	39.18	14.88	44.89[1]	20.59	74.1	49.8
6	18.6	49.86	31.26	57.13	38.53	50.0	31.4
7	59.0[2]	N/A	N/A	N/A	N/A	74.3	15.3

1. Max. Daily Flow shown for minimum required increase. Flow monitoring should be conducted to determine Peak Instantaneous Flow
2. Design value from CofA permit

The current size of the forcemain's would allow upgrades to the pumping station equipment alone without increasing the size of the forcemain's (i.e. velocities <3m/s), except pumping station No. 1. Pumping station No.1 would be able to be upgraded to the intermediate date and beyond but the forcemain would need further upgrades to handle to ultimate flows.

3.4 Recommended Upgrades

In general, the stations typically operate effectively; however the majority of the pumping station have reached or exceeded their anticipated design flows and life expectancy. Below are some recommendations with regards to capacity issues but does not relate to the maintenance and repair items identified in the above section

Pumping Station #1

It appears that some maintenance and repairs have been completed to the pumping station and have increased the firm capacity from 170L/s (2005) to approximately 200L/s (2013). These modifications bring the firm capacity in conformance with the MOE guidelines for 2013; however there is no further room for growth at this pumping station. It appears that the station will require an upgrade to continue to services this catchment area and provide room for growth. Modifications to the pumps and piping could be accommodated to increase firm capacity at an approximate cost ranging from $350K to 2 million. Refer to the Appendix C for a detailed review of the pumping station and recommended.

6. Capital Investment Plan

6.1 Pumping Stations

During the condition assessment items were identified that required maintenance and repairs. These items were prioritized and the summary of the combined costs for each level of maintenance and repair costs for each pumping station is provided in Table 6.1.

Table 6.1 – Summary of Maintenance and Repair Costs

Maintenance/Repair		PS#1	PS#2	PS#3	PS#4	PS#5	PS#6	PS#7	Total
LEVEL 1 ITEMS	1	$40,000	$39,750	$20,500	$21,300	$28,500	$19,500	$50,000	$219,550
LEVEL 2 ITEMS	2	$49,150	$29,750	$23,250	$26,800	$15,250	$27,000	$12,250	$183,650
LEVEL 3 ITEMS	3	$80,850	$8,500	$18,500	$2,050	$5,150	$7,500	$13,500	$136,050
LEVEL 4 ITEMS	4	$7,000	$600	$10,200	$0	$1,500	$0	$0	$19,300
TOTAL		$135,000	$78,600	$72,950	$50,150	$50,400	$54,000	$75,750	$516,850

Additionally, capacity upgrades are required to meet the current and future growth.

Table 6.2 – Capital Upgrades at Pumping Stations

Pumping Station	Cost
No.1	$350,000 – $2,000,000
No. 2	$600,00 – $800,000
No. 3	$600,000 – $800,000
TOTAL	$1,550,000 – $3,600,000

6.2 SCADA Upgrades

It order to monitor and control the pumping stations from one central location, the Township can upgrade all of the sewage pumping stations with PLC based control panels. An estimate for this cost is presented in Table 6.2.

Table 5.2 – SCADA Upgrade

Component	# Units	Unit Price	Total Cost
PS PLC Control Panels	7	$20,000	$140,000
HUB Computer, Software, and Printer	1	$20,000	$20,000
Integration of Hub Computer with WTP or WWTP SCADA System	1	$20,000	$20,000
	Total Construction SCADA Upgrade		$180,000
Engineering	LS	%15	$27,000
		Total SCADA Cost	$207,000

AMENDED CERTIFICATE OF APPROVAL
SEWAGE
NUMBER 3-0466-93-967

Town of Rockland
1560 Laurier Street
Rockland, Ontario
K4K 1L5

RECEIVED
FEB 14 1996
ONTARIO CLEAN
WATER AGENCY

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

Expansion of the existing sewage treatment plant (consisting of an aerated lagoon system) having a rated capacity of 3,340 m^3/d to a new modified plant consisting of a Sequential Batch Reactor (SBR) treatment process and associated appurtenances having a rated capacity of 6,800 m^3/d, located on part of Lots 21, 22, and 23 in the Town of Rockland (formerly Township of Clarence) as follows:

DESIGN CRITERIA

Average daily flow	= 6,800 m^3/d
Maximum day flow rate	= 17,340 m^3/d
Peak flow rate	= 20,400 m^3/d

ARON STREET SEWAGE PUMPING STATION

Upgrading of the existing instrumentation system to incorporate the station controls with a new plant wide Supervisory Control and Data Acquisition (SCADA) system;

TREATMENT PLANT

construction of a below grade concrete structure having overall dimensions 76.15 m x 28.65 m x 6.1 m depth, located north of the existing sludge storage lagoon area, divided into five (5) equal cells consisting of Sequential Batch Reactors (3 cells), an effluent decant/equalization tank (1 cell) and an aerobic digestion tank (1 cell) as follows:

Sequential Batch Reactor

Three (3) parallel SBR tanks each 28.6 m x 14.6 m with a side water depth (SWD) of 5.49 m to provide a complete mix batch treatment with an automatic control of cyclic sequence to operate each reactor in a six hour cycle, with each cycle consisting of "Fill", "Aeration", "Settle" and "Decant" modes and equipped with:

- a jet aeration system consisting of a single jet header with 22 jets per tank (total of three) to provide a total Standard Oxygen Requirement of 2,621 Kg oxygen per day, GENIVAR

TECHNICAL MEMORANDUM

To: Yves Rousselle, CET, Director of Physical Services, City of Clarence-Rockland
Date: December 18, 2013
From: Matt Morkem, P.Eng.
Project: Rockland PS Evaluation
Subject: **Pumping Station 1** GENIVAR Project #:121-20569

The purpose of this technical memorandum is to provide a comprehensive analysis of Pumping Station #1 (PS#1) with regards to capacity, upgrade for the future to optimize its capacity, phasing of the proposed future upgrade and associated costs to accommodate the proposed flows from the new proposed Rockland urban expansion area.

1. Pumping Station Capacity

Based on a review of the current Pumping Station #1 equipment, data provided by the City of Clarence-Rockland, and discussion with Ontario Clean Water Agency (O.C.W.A) the pumping station control logic operates with a small pump (middle) as lead pump until the lag pump level is reached, at which time the lead pump is shut off and one of the lag pumps (east or west) is started. If the next set point is reached while there is one lag pump in operation, then the other lag pump will activate. If this second lag pump is out of commission, then the lead pump will start again to help the first lag pump.

The theoretical capacity of the pumps based on the pumps currently installed in PS#1 are as follows:

Table 1.1

Pump Number	Rated Capacity (L/s)
West	170
East	170
Middle	95

The current pump capacities were determined by running the pumps and measuring the drop in the wet well level over a measured time period. The volume pumped was calculated using the difference in level and the area of the wet well. This was divided by the elapsed time to determine the pump capacity. The inflow immediately before and/or after the pump test was also recorded, averaged and added to the pump capacity to determine the total pump capacity. The current pump capacities are as follows:

Table 1.2

Pump Number	Rated Capacity (L/s)
West	145
East	140
Middle	90

Table 2.1

2005			Stats Canada Annual Growth Rate (%)	2013		
Avg. Daily Flow (L/s)	Max. Daily Flow (L/s)	Peak Inst. Flow (L/s)		Avg. Daily Flow (L/s)	Max. Daily Flow (L/s)	Peak Inst. Flow (L/s)
35.5	66.1	164	2.76	44.14	82.19	203.91

It should be noted that flows in excess of 200L/s from PS#1 have been reported by O.W.C.A. in the past 5 years.

Based on the current status of PS#1 and a review of the MOE guidelines indicated in the previous section, it would suggest that the Pumping Station #1 is currently operating at or even beyond its firm capacity.

3. Future Pumping Station Flows

For the purpose of projecting flows for the total build out of the Clarence Rockland area, a detailed analysis of each pumping station land use and estimated flows was completed. The following assumptions were made for growth component that are serviced by the collection system:

- Assumed Population Per Unit: 2.7
- Rural Density (units/ha): 2
- Low Density (units/ha): 20
- Medium Density (units/ha): 35
- High Density (units/ha): 55
- Residential low generation (l/cap/day): 350
- Commercial flow generation (l/ha/day): 15000
- Inflow and Infiltration (l/s/ha): 0.28,0.56,1.12

The table below summarizes the total build out flows for PS#1 of the Clarence Rockland area based on updates to the 2003 Master Plan in conjunction with the official plan and discussions with the City of Clarence Rockland Planner. Refer to Appendix 1 for ultimate servicing map.

Table 3.1

Pump Station	Land Use	Area (ha)	Residential Average Daily Flow (m^3/day)	Commercial Average Daily Flow (m^3/day)	Peak Daily Flow (l/s)
PS 1	Commercial Core	9.46	-	141.92	6.8
	Service Commercial	77.16	-	1157.46	55.1
	Business Park	0.00	-	0.00	0.0
	Community Facilities	30.42	-	456.26	21.7
	Tourist Recreational	0.00	-	0.00	0.0
	Low Density Residential	106.55	2013.86		104.14
	Medium Density Residential	3.15	104.12		5.70
	High Density Residential	0.00	0.00		0.00
	Contributing PS: 2,3,4,5,6,7,8,South of David				643.8
	Total				**837.2**
PS 2	Commercial Core	3.95	-	59.19	2.8
	Service Commercial	1.24	-	18.65	0.9
	Business Park	0.00	-	0.00	0.0
	Community Facilities	12.32	-	184.75	8.8
	Tourist Recreational	0.00	-	0.00	0.0
	Low Density Residential	103.45	1955.13		101.38
	Medium Density Residential	4.28	141.66		7.76
	High Density Residential	0.00	0.00		0.00
	Contributing PS:	None			0.0
	Total				**121.6**
PS 3	Commercial Core	3.20	-	48.01	2.3
	Service Commercial	79.87	-	1198.02	57.0
	Business Park	0.00	-	0.00	0.0
	Community Facilities	2.27	-	34.11	1.6
	Tourist Recreational	0.00	-	0.00	0.0
	Low Density Residential	27.07	511.64		29.42
	Medium Density Residential	9.83	325.17		17.13
	High Density Residential	0.00	0.00		0.00
	Contributing PS:	None			0.0
	Total				**107.5**
PS 4	Commercial Core	2.16	-	32.36	1.5
	Service Commercial	0.00	-	0.00	0.0
	Business Park	0.00	-	0.00	0.0
	Community Facilities	0.00	-	0.00	0.0
	Tourist Recreational	0.00	-	0.00	0.0
	Low Density Residential	18.35	346.79		20.40
	Medium Density Residential	1.15	38.06		2.08
	High Density Residential	0.00	0.00		0.00
	Contributing PS:	5			74.1
	Total				**98.1**
PS 5	Commercial Core	0.00	-	0.00	0.0
	Service Commercial	2.72	-	40.79	2.7
	Business Park	0.00	-	0.00	0.0
	Community Facilities	0.31	-	4.62	0.3
	Tourist Recreational	4.82	-	72.34	4.0
	Special Study Area #1	25.53	-		0.0
	Low Density Residential	49.48	935.13		65.42
	Medium Density Residential	0.81	26.63		1.68
	High Density Residential	0.00	0.00		0.00
	Contributing PS:	None			0.0
	Total				**74.1**

Pump Station	Land Use	Area (ha)	Residential Average Daily Flow (m^3/day)	Commercial Average Daily Flow (m^3/day)	Peak Daily Flow (l/s)
PS 6	Commercial Core	0.00			0.0
	Service Commercial	3.48	-	52.17	5.4
	Business Park	0.00	-	0.00	0.0
	Community Facilities	1.14	-	17.12	1.8
	Tourist Recreational	2.57	-	38.48	4.0
	Low Density Residential	19.92	376.58	-	38.79
	Medium Density Residential	0.00	0.00	-	0.00
	High Density Residential	0.00	0.00	-	0.00
	Contributing PS:	None			0.0
	Total				**50.0**
PS 7	Commercial Core	0.00	-	0.00	0.0
	Service Commercial	0.00	-	0.00	0.0
	Business Park	0.00	-	0.00	0.0
	Community Facilities	0.00	-	0.00	0.0
	Tourist Recreational	0.00	-	0.00	0.0
	Low Density Residential	73.59	1390.91		74.31
	Medium Density Residential	0.00	0.00		0.00
	High Density Residential	0.00	0.00		0.00
	Contributing PS:	None			0.0
	Total				**74.3**
PS 8	Commercial Core	0.00	-	0.00	0.0
	Service Commercial	0.00	-	0.00	0.0
	Business Park	0.00	-	0.00	0.0
	Community Facilities	0.00	-	0.00	0.0
	Tourist Recreational	0.00	-	0.00	0.0
	Low Density Residential	245.09	4632.12		220.51
	Medium Density Residential	0.00	0.00		0.00
	High Density Residential	0.00	0.00		0.00
	Contributing PS:	None			0.0
	Total				**220.5**
PS Clearance Point	Commercial Core	0.00	-	0.00	0.0
	Service Commercial	0.00	-	0.00	0.0
	Highway Commercial	10.99	-	164.84	9.8
	Business Park	0.00	-	0.00	0.0
	Community Facilities	0.00	-	0.00	0.0
	Tourist Recreational	20.91	-	313.70	14.9
	Low Density Residential	540.96	10224.08		445.96
	Medium Density Residential	0.00	0.00		0.00
	High Density Residential	0.00	0.00		0.00
	Contributing PS:	None			0.0
	Total				**470.6**
PS South of David	Commercial Core	0.00	-	0.00	0.0
	Service Commercial	0.00	-	0.00	0.0
	Business Park	0.00	-	0.00	0.0
	Community Facilities	0.00	-	0.00	0.0
	Tourist Recreational	0.00	-	0.00	0.0
	Rural	0.00	0.00		0.00
	Low Density Residential	210.34	3975.47		192.31
	Medium Density Residential	0.00	0.00		0.00
	High Density Residential	0.00	0.00		0.00
	Contributing PS:	None			0.0
	Total				**192.3**

Based on a similar method that was used to project the flows from 2005 to 2013, the current flows were projected to the ultimate scenario to provide a timeline for reaching the ultimate build out. These results are indicated in the table below:

Table 3.2

Year	Avg. Daily Flow (L/s)	Max. Daily Flow (L/s)	Peak Inst. Flow (L/s)	Stats Canada Annual Growth Rate (%)
2013	44.14	82.19	203.91	2.76
2018	50.58	94.17	233.65	
2023	57.95	107.90	267.72	
2033	89.59	166.81	413.87	
2043	117.62	219.01	543.38	
2053	154.43	287.54	713.42	
2059	181.83	338.57	840.02	

4. Pumping Station Upgrades

1. Modifications

The following section reviews potential modifications that could be made to the existing pumping station to gain additional capacity. Refer to Appendix 2 for preliminary pumping station capacity analysis

a) Replace existing middle pump with an equivalent to the west and east pumps.
The existing smaller (40hp - 90L/s) pump could be replaced with a pump of similar capacity to the other pumps. This would increase the firm capacity to approximately 275L/s as it would mean that it would be based on 2 -145l/s pumps (less allowance for losses with two pumps running). Variable Frequency Drives (VFD's) should also be installed to ensure that with the removal of the smaller pump average day or low flow conditions can still be pumped while minimizing the start/stops of the pumps. MOE guidelines also indicated that if a pumping station discharges into a WWTP they should be equipped with VFD's to minimize flow surges and provide flow pacing. Additionally, due to the increase flow from the new pump, the grinder and grit removal capacity will need to be increased. A third grinder (120L/s) and second grit removal system (236L/S) is recommended to be installed. It should be noted that if screening is install at PS#1 then the third grinder would not be required.

b) Installed a 4th pump using the current pump intakes locations
The current pumping station configuration could be modified to allow for a forth pump to be installed of equal capacity to the other 3 pumps. This would increase the firm capacity

to approximately 400L/s. A VFD should also be installed as indicated above. Additionally, a fourth grinder (120L/s) would need to be installed to handle the increase flow. It should be noted that if screening is install at PS#1 then the forth grinder would not be required.

c) Install four (4) new pumps with increase capacity

Remove and replace all four (4) pumps (approximately 90HP – 290L/s@21m TDH) with larger pumps to increase the capacity and maximize the velocity in the forcemain (i.e. ≈3m/s)**.** This would increase the firm capacity to approximately 600L/s. A VFD should also be installed as indicated above. The flow meter would also need to be replaced as this flow rate exceeds the maximum capacity. As indicated above additional grit removal would be required to accommodate this upgrade; however further plant upgrades would also be required to treat this flow and therefore these aspect have not been included in the upgrades.

d) Increase and/or Twin Forcemain to Sewage Plant

Replace and/or twin the existing forcemain with a 900mm (or equivalent) to provide additional capacity. The pumps and flow meter from the previous expansion could be reused to provide the additional capacity to meet the ultimate building. This would increase the firm capacity to approximately 850L/s. As indicated above additional grit removal would be required to accommodate this upgrade; however further plant upgrades would also be required to treat this flow and therefore these aspect have not been included in the upgrades.

2. Forcemain

Based on the above modifications, the velocity in the forcemain would be 1.4m/s, 2m/s, 3m/s and 1.3m/s, respectively. Although maintaining a velocity above 1.1m/s is not an ideal operating condition, such a velocity would be a result of peak instantaneous flows and would not be maintained for long periods of time. These velocities would still be below the maximum velocity of 3m/s stipulated by the MOE guidelines for a forcemain.

3. Modification Phasing

Based on the current firm capacity as defined by the MOE, PS#1 has reached its capacity. The projected flows anticipated at PS#1 indicate that the following timelines for upgrades are required:

Table 4.1

Year	Peak Inst. Flow (L/s)	Required Upgrade	Firm Capacity (L/s)	Expansion
2013	203.91	none	200	N/A
2018	233.65	a	275	2014/2015
2023	267.72	none	275	N/A
2033	413.87	b	400	2024/2025
2043	543.38	c	600	2034/2035

2053	713.42	d	840	2045/2046
2059	840.02	none	840	N/A

It should also be noted that the plant capacity of ADF = 6800m3/d (79L/s) and MDF = 17,340m3/d (200L/s) would be reached around 2030 that will require further upgrades not discussed in this report. Some upgrades to the Peak Flow Rate have been incorporated into this report (i.e. grit removal system). A detail flow analysis should be completed on a regular basis to verify the projected flows

4. Upgraded Servicing

As it is difficult to determine the exact type of growth that will occur in the City of Clarence-Rockland, it is difficult to state the number of units that the above indicated upgrades will provide. However, as it is anticipated that the majority of growth will be low density the following table provides the additional number (beyond current levels) of units for each upgrade based on low density residential growth using the design parameters indicated in section 3:

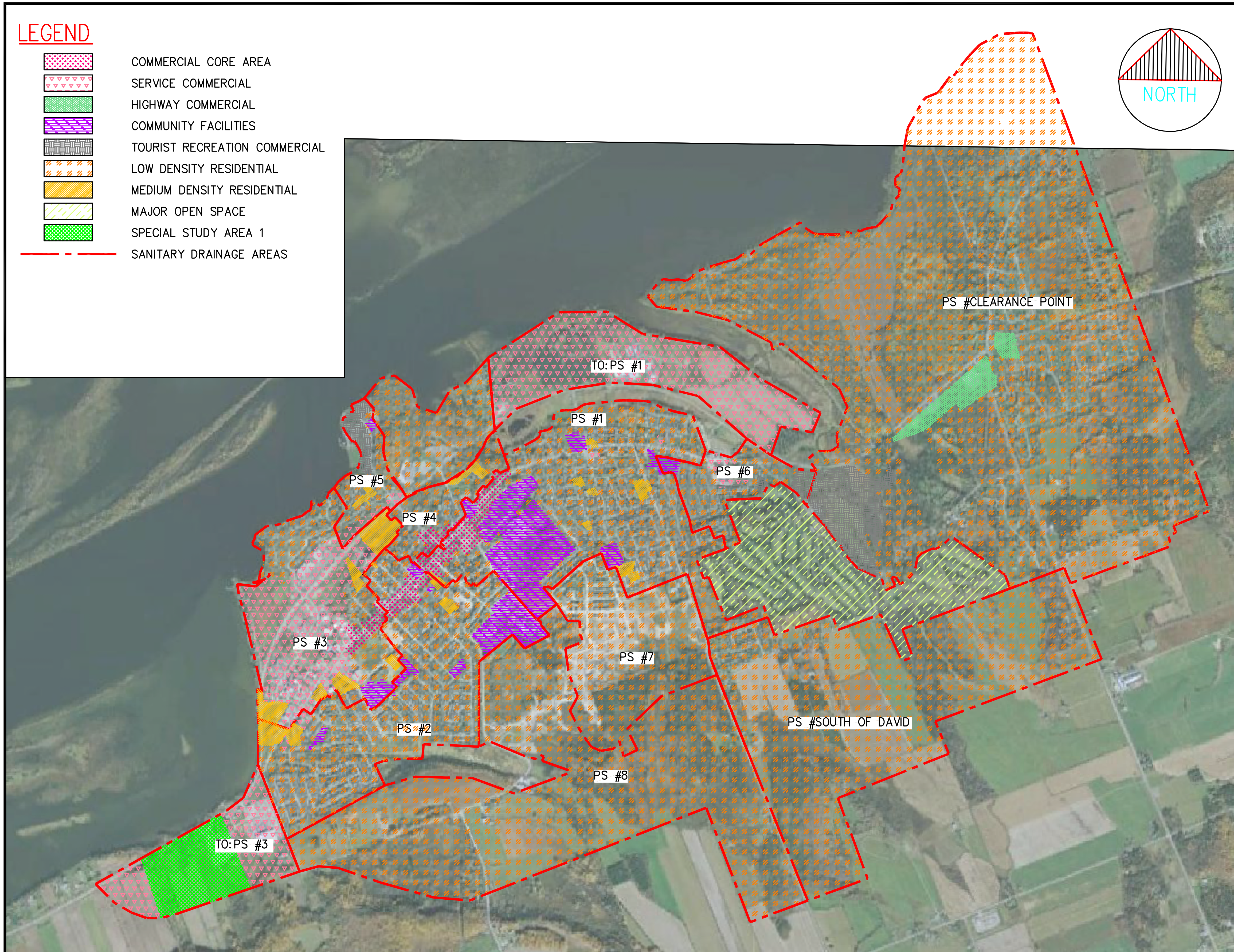
Table 4.2

Expansion	No. of Units	Population Increase	Additional Peak Flow (L/S)
a	2100	5,670	75
b	6600	17,820	215
c	16000	43,200	400
d	28500	76,950	650

It should be noted that not all growth in the City of Clarence Rockland will be low density residential and the total number of units will vary based on the variety of growth type that is experienced.

5. Modifications Cost

The following section provides cost estimates for the modifications indicated in section one (1):



GENIVAR
1224 GARDINERS ROAD, SUITE 201
KINGSTON, ONTARIO
CANADA K7P 0G2
PHONE: 613-634-7373 FAX: 613-634-3523
WWW.GENIVAR.COM

CLIENT:
CITY OF CLARENCE-ROCKLAND

CLIENT REF. #:

PROJECT:
CLARENCE-ROCKLAND
PUMPING STATION EVALUATION

ISSUED FOR - REVISION:

IS	RE	DATE	DESCRIPTION

PROJECT NO: 121-20569-00

DATE: MAY 2013

ORIGINAL SCALE: 1:25000

IF THIS BAR IS NOT 1" LONG, ADJUST YOUR PLOTTING SCALE.

1"

DESIGNED BY: MS

DRAWN BY: STR

CHECKED BY: MM/MS

DISCIPLINE: CIVIL

TITLE:
PUMP STATION CATCHMENT
AREA PLAN

SHEET NUMBER: SK1.1

SHEET #: OF

ISSUE: ISSUED FOR REVIEW

DATE OF: MAY 22, 2013

REV #: 0

M:\2012\121-20569-00 - Rockland PS Evaluation\121-20569-00_SK1_CatchmentAreas.dwg - 22.05.13 4:48pm

C6

Appendix C

Morris Village Pumping Station No. 9 Design Brief Excerpt

DESIGN BRIEF

1.0 INTRODUCTION

1.1 General

The residential development associated with this new pumping station consists of approximately 219.87 ha and is located along St-Jean Street, mid-way between Poupart Road and Docteur Corbeil Boulevard in the City of Clarence-Rockland (see location map SK-1, in Appendix “A”). The proposed sanitary drainage area serviced by pumping station No. 9 includes over 5600 residential units.

The first four stages of the Morris Village development are currently serviced by gravity sewers and directed to the pumping station No.7 located at the intersection of Sterling Avenue and Platinum Drive. As was previously planned, the western parts of Stage 4 will be redirected to the pumping station No. 9 and allow for the northern part of Stage 5 as well as an external area located between Caron Street and Stage 5 to be directed to the existing pumping Station No.7 (see sketch 110704-SANPS in Appendix ‘B’). Pumping Station No.7 was approved under MOECC Certificate #0402-78NQJ9.

2.0 SANITARY FLOWS AND HYDRAULICS

2.1 Sanitary Sewer

2.1.1 Proposed Site

The portion of the proposed subdivision that is directed by gravity towards pumping station No.7 is then pumped to the sanitary sewers at the intersection of Crystal Crescent and Quartz Street and directed by gravity towards Avenue des Pins.

On the other hand, the majority of the proposed Morris Village Stage 5 along with external areas located east and future lands located west of St-Jean Street will drain towards pumping station No. 9. The sewage shall then be pumped via a twin 400mm diameter forcemain through the Hydro Corridor, Sterling Avenue, Docteur Corbeil Boulevard before reaching the existing gravity sanitary sewers on Caron Street (see sketch 110704-SANPS in Appendix ‘B’).

2.1.2 Tributary Area Characteristics

The sanitary drainage area as shown on plan 110704-PSSANM1, is divided into several sub-catchments area. The plan shows the total areas, populations to be directed to each pumping station.

6.0 ELECTRICAL SPECIFICATIONS

The pumping station has been designed to allow for a communication space on the wall in order to communicate to the City of Clarence-Rockland information centre. In summary, a system will be installed by OCWA to properly communicate with the City's information center. The proposed system will control and provide information on such equipment as the pumps, water levels, the security system and system failures. The power supply for this site will be provided by a proposed transformer adjacent to the pumping station; a 600 volts, 3 phase service line will be provided for this pumping station. The electrical design specifications can be found on plan E1 to E9 separate from this report. A backup power system (UPS) will be installed to allow continuous communication in case of failure.

7.0 CONCLUSION

The proposed pumping station has the capacity to accommodate the flows for a proposed development up to 260 l/s. In case of failure, the following events could occur.

i. The standby generator will start to allow the pumps to run as usual, and a signal will be sent to a city representative.

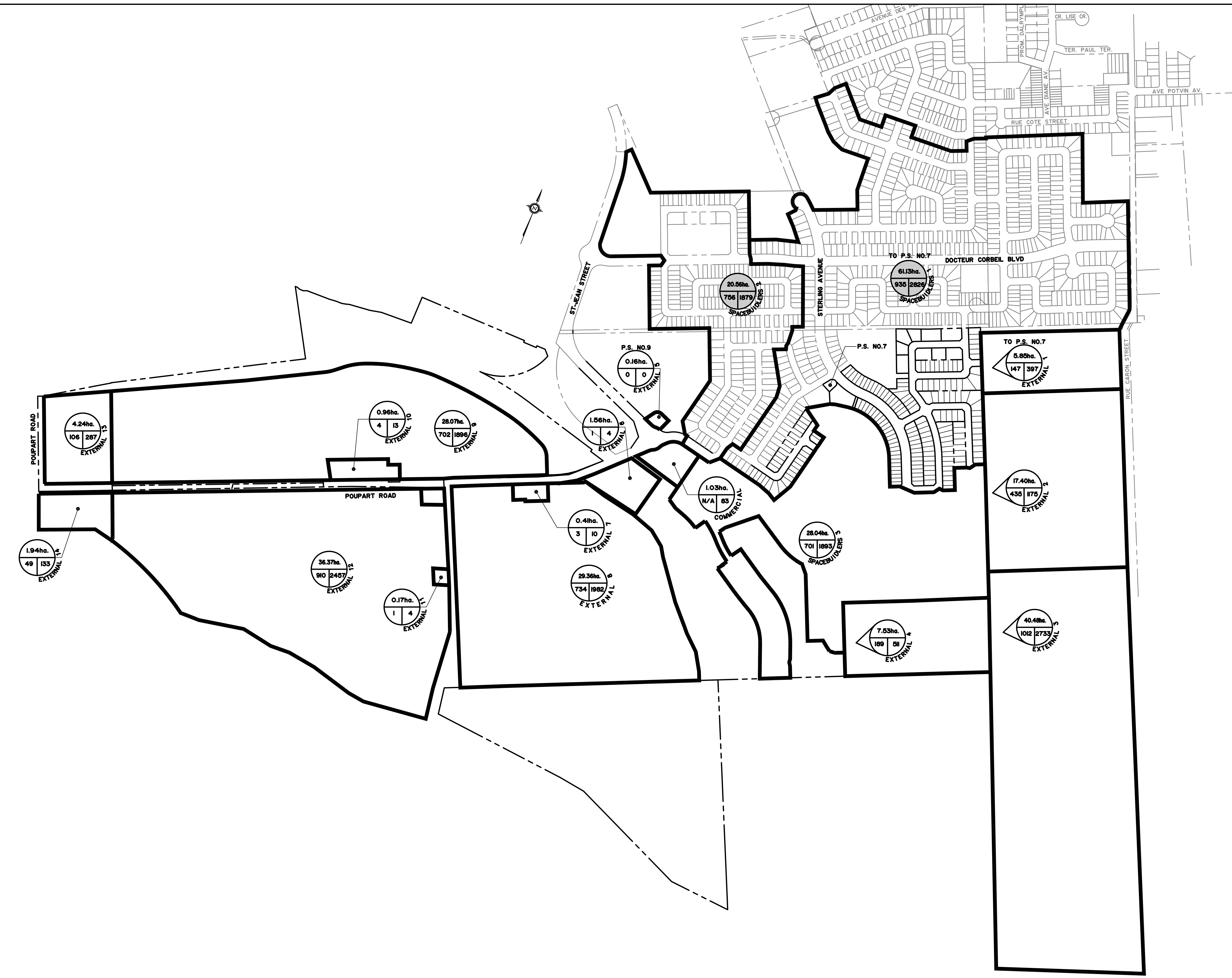
ii. A sewage pump could be used with the by-pass forcemain.

iii. The overflow pipe would carry the sewage towards the closeby storm water management pond and would keep the hydraulic grade line of the sanitary system below the basement levels of the proposed Stage 5.

Prepared by:

ATREL ENGINEERING LTD

Jean M. Décoeur, P.Eng.
President



SUBMITTED FOR APPROVAL ONLY NOVEMBER 16/2018

LEGEND

7.53ha. 189 511 — SANITARY DRAINAGE SUB AREA; POPULATION EQUIVALENT; NUMBER OF UNITS IN SUB AREA

7.53ha. 189 511 (shaded) — DATA BASED ON ACTUAL COUNTS

DRAINAGE AREA BOUNDARY

SUMMARY

	TO P.S. No. 7	TO P.S. No. 9
RESIDENTIAL AREA (ha)	66.98	217.25
UNITS (25 UNITS/ha)	1082	5613
POPULATION (2.7 persons/unit)	3223	14967
COMMERCIAL AREA (ha)	N/A	1.03
EQUIVALENT COMMERCIAL POPULATION	N/A	83
OUTLET TO	PAYER ST.	CARON ST.
PUMPED FLOW	64 L/s	260 L/s (Design)

THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION △-APPLIES WHEN DRAWING MODIFIED	DATE	BY
△	AS PER CITY COMMENTS	NOV. 16/18	JMD

SCALE 1 : 5 000 (50m 0 150m)

DESIGN JMD
CHECKED
DRAWN PNC
CHECKED
APPROVED JMD

LICENSED PROFESSIONAL ENGINEER J.M.J.DECOEUR Nov 16/2018 PROVINCE OF ONTARIO

ATREL Engineering Ltd Ltée
Engineers - Ingénieurs
1-2884 CHAMBERLAND STREET, ROCKLAND, ONTARIO K4K 1M6
TEL.: (613) 446-7423

CITY OF ROCKLAND
MORRIS VILLAGE PUMPING STATION No. 9

SPACE BUILDERS

PLAN
SANITARY DRAINAGE AREA MASTER PLAN

CLIENT No. 168
PROJECT No. 110704
DATE OCTOBER 2017
DRAWING No. 110704-PSSANM1

C7

Appendix C

RVA Equalization Tank

Conceptual Design Report Excerpt

CIMA+

1.0 INTRODUCTION

Municipal wastewater from the City of Clarence-Rockland (City) is treated at the Clarence Rockland Sewage Treatment Sewage Treatment Plant (CRSTP), located at 700 Industrial Road, in Clarence-Rockland, Ontario. Currently, all wastewater from the urbanized areas of the City of Clarence-Rockland is pumped directly from Pumping Station No. 1 into the treatment plant. The plant has pre-treatment (grit removal only) and operates as a sequencing batch reactor (SBR) activated sludge plant followed by chlorine disinfection, prior to undergoing dechlorination and discharging into the Ottawa River.

The facility has a Rated Capacity of 6,800 m^3/day under Environmental Compliance Approval Number 1990-3P3PRG. The rated peak flow capacity is currently 20,400 m^3/day.

The City of Clarence Rockland is undertaking upgrades to the wastewater treatment plant to include:

- Increase the pumping capacity and conveyance capacity of PS#1 to 400 L/s;
- Twinning the force main to convey an ultimate peak flow capacity of 850 L/s and for operational redundancy;
- Construction of a new headworks facility, complete with fine screening and grit removal system to improve both pre-treatment and secondary treatment effectiveness; and,
- Concrete repairs to the suspended floor slab in the main treatment building.

As part of the preliminary design investigation, it was noted that the City may achieve some long-term advantages and potential cost savings by combining the design and construction of a proposed equalization tank with the headworks facility. The concept would be to have the equalization tank constructed directly underneath the headworks facility and be combined with the tender package for the upgrades to the plant. Construction of a new equalization tank has been previously identified within the long-term plan for the Rockland Sewage Treatment plant (within the next 2-3 years) to normalize peak flows from inflow and infiltration.

This proposed approach of including the equalization tank underneath the headworks facility would offer the following benefits:

- Provides the best use of existing land at the STP to free up space for future additional plant upgrades;

2.0 EQUALIZATION STORAGE BELOW HEADWORKS BUILDING

The *Rockland Wastewater Treatment Plant Review* (OCWA, 2015) noted that equalization storage constructed in the next few years would alleviate peak flows to the STP and delay plant wide capacity expansion until average daily flows reach 90% flow capacity (6,120m^3/d). This finding was echoed based on the hydraulic modeling described in the Hydraulic Flow Technical Memorandum (RVA August 2016), which noted that some form of bypass, modifications or equalization storage is required to convey the new proposed peak pumping flows from PS#1.

An overview of the proposed storage scenario is shown below in **Figure 2-1** through **Figure 2-3** below.

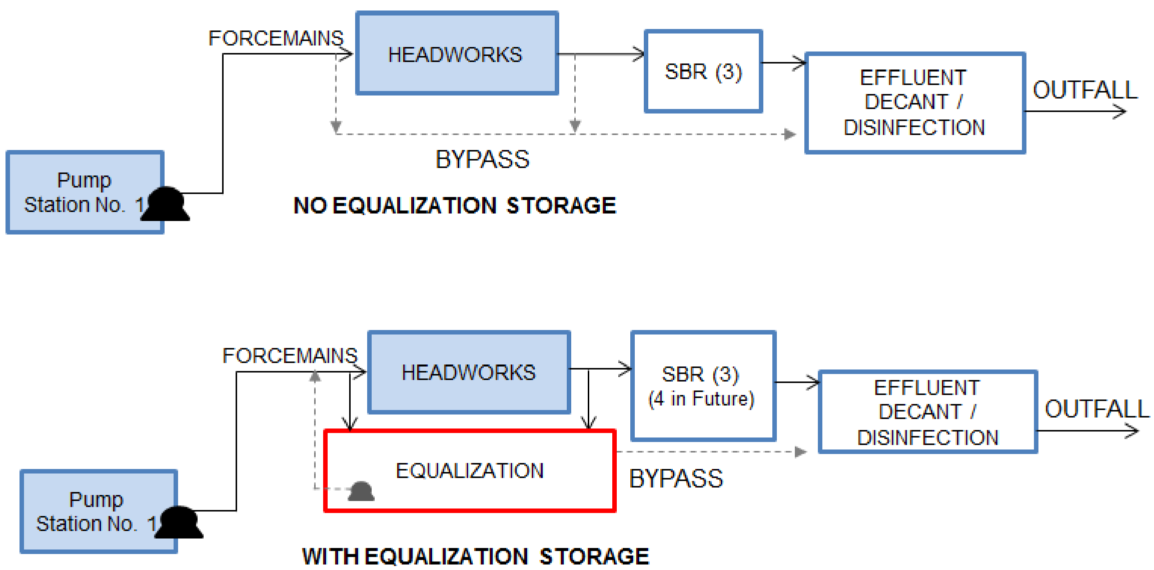


Figure 2-1: Potential Equalization Storage Below Headworks Building

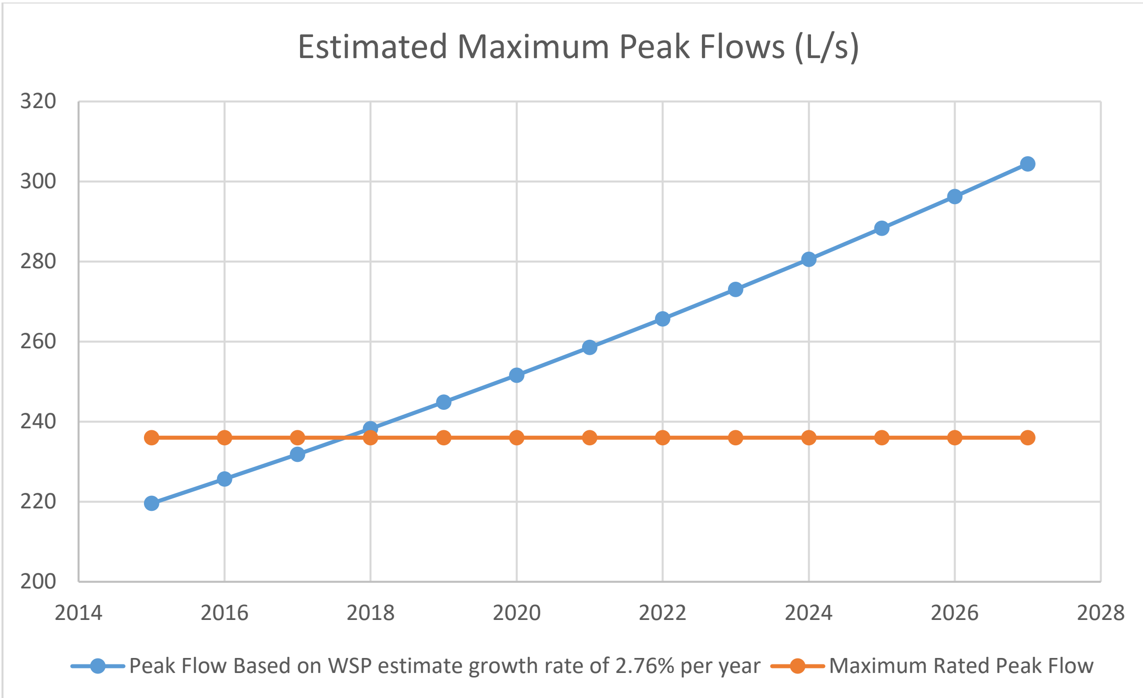


Figure 2-5: Estimated Maximum Peak Flows at Plant Over Time

3.0 GEOTECHNICAL AND STRUCTURAL CONSIDERATIONS

A Geotechnical Investigation Report has been prepared by DST Consulting Engineers, which discusses the ground conditions in the vicinity of the proposed headworks facility, and makes recommendations related to founding the building, both with and without the equalization tank. Refer to Appendix A for the full report.

In summary, the soils at the proposed location of the headworks facility is generally silty clay, Rock was not reached in any boreholes, but local well records indicate it is in the order of 60m below grade in the area.

Based on the Report and discussions with the geotechnical engineer, it has been determined that the soils do not have enough bearing capacity to support the headworks facility and equalization tank using conventional strip or spread footings, or a raft foundation. The increase in stress imposed on the soil by the foundations and slab of the structure, and by placement of backfill around the structure, will result in large compression of the clay, which leads to significant consolidation settlements and damage to the structure.

5.0 ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Adding the equalization tank to the project will mean the works will be classified as a Schedule ‘B’ activity. From the Municipal Class EA document prepared by the Municipal Engineers Association:

> **“Schedule B:**
>
> Establish sewage flow equalization tankage in existing sewer system or at an existing sewage treatment plants, or at existing pumping stations for influent and/or effluent control.”

As such the project would be subject to the requirements of a Schedule B EA process. This will require documentation of the planning process (assess alternative solutions and their impacts) followed by a Notice of Completion, and allowing 30 days for public input.

The schedule impacts will include the allowance for public input for 30 calendar days. During this time, it would be expected that other design elements of the project would continue.

6.0 COST ESTIMATE

The intention of combining the equalization tank below the headworks facility is to offer operational and space savings, with the potential to offer cost savings over installing the tank at a later date as part of a separate contract. The tables below serve to provide a cost estimate for the two options: 1) the equalization tank constructed below the headworks facility, or 2) headworks facility constructed as per the original scope of work, with the tank constructed at a later date as a separate contract.

Table 6-1: Cost Estimate: Equalization Tank Below Headworks Facility

	Structure	Equipment	Electrical	Yard Works	Capital Cost
Pump Station	$200,000	$574,500	$373,500	$19,500	$1,167,500
Equalization Tank	$94,000	$190,000	$123,000	$2,500	$410,000
Headworks	$3,943,500	$1,107,000	$719,500	$30,500	$5,800,500
Forcemain	-	-	-	$400,000	$400,000
Slab Repairs	$125,000	-	-	-	$125,000
SUB TOTAL	$4,362,500	$1,872,000	$1,216,000	$452,500	**$7,903,000**
				Bonding and Insurance	$158,000
				Mobilization and Demobilization	$118,500
				Contractor Markup	$1,185,500
				Scope and Construction Contingency	$2,371,000
				Engineering (Equalization Tank)	$200,000
				TOTAL CAPITAL COST	**$11,936,000**

Table 6-2: Cost Estimate: Separate Contracts

	Structure	Equipment	Electrical	Yard Works	Capital Cost
Pump Station	$200,000	$574,500	$373,500	$19,500	$1,167,500
Headworks	$1,904,000	$1,079,000	$701,500	$30,500	$3,715,000
Forcemain	-	-	-	$400,000	$400,000
Slab Repairs	$125,000	-	-	-	$125,000
SUB TOTAL	$2,229,000	$1,653,500	$1,075,000	$450,000	**$5,407,500**
				Bonding and Insurance	$108,000
				Mobilization and Demobilization	$81,000
				Contractor Markup	$810,000
				Scope and Construction Contingency	$1,622,000
				TOTAL CAPITAL COST	**$8,028,500**
Equalization Tank	$1,970,000	$190,000	$150,000	$40,000	$2,350,000
				Bonding and Insurance	$57,000
				Mobilization and Demobilization	$42,000
				Contractor Markup	$420,000
				Scope and Construction Contingency	$703,000
				Engineering Design	$250,000
				Separate Contract Administration	$150,000
				TOTAL CAPITAL COST	**$3,972,000**

C8

Appendix C

Caron Street Storm Sewer Catchment Areas and Sewer Calculation Sheet

GENIVAR
1224 GARDINERS ROAD, SUITE 201
KINGSTON, ONTARIO
CANADA K7P 0G2
PHONE: 613-634-7373 FAX: 613-634-3523
WWW.GENIVAR.COM

CLIENT:

CITY OF CLARENCE-ROCKLAND

CLIENT REF. #:

PROJECT:

CARON STREET RECONSTRUCTION

ISSUED FOR – REVISION:

IS	RE	DATE	DESCRIPTION
1		2013/01/22	ISSUED FOR ECA

PROJECT NO: 065038	DATE: MAY, 2013
ORIGINAL SCALE: 1:7500	IF THIS BAR IS NOT 1" LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: MS	
DRAWN BY: MF/MS	
CHECKED BY: MM	1"

DISCIPLINE: CIVIL

TITLE:

PROPOSED STORM CATCHMENT AREAS

SHEET NUMBER: SK1.32

SHEET #: -- OF --

ISSUE: ISSUED FOR ECA

DATE OF: JANUARY 22, 2013

REV # 0

C:\Documents and Settings\kwhite\Desktop\Genivar\Title_Blocks\finished title block\For Cornwall\Geni_MET.dwt – 21.09.10 3:03pm

Storm Sewer Calculation Sheet

Caron Street Reconstruction

STREET	MANHOLE		AREA		CONTRIBUTING	RUNOFF DATA C	AC	Σ	Tc	I	Q	PIPE DATA Size	Slope	Capacity	Q/Q_{full}	Velocity	Length	FALL
	From	To	No	Ha	AREAS			AC	(min.)	(mm/hr)	(L/s)	(mm)	(%)	(L/s)		(m/s)	(m)	(m)
CARON ST	STM300	STM304	S1	0.220	S1	0.75	0.165	0.165	15.000	83.56	38.33	300	0.50%	68.4	0.56	0.97	65.92	0.330
CHAPMAN ST	-	STM304																
CARON ST	STM304	STM305																
ATREL ST CUL DE SAC EAST	-	STM305																
CARON ST	STM305	STM306							Existing Pipes									
ATREL ST	STM103	STM306																
CARON ST	STM306	STM307																
CARON ST	STM307	STM309																
CARON ST	STM308	STM309	S6	0.240	S6	0.75	0.180	0.180	15.000	83.56	41.81	300	0.50%	68.4	0.61	0.97	44.04	0.220
CARON ST	STM307	STM309	-	-	A1,A2,A3,S1,S2,S3,S4,S5	-	-	4.041	18.228	74.40	835.67	900	0.40%	1144.9	0.73	1.80	41.59	0.166
CARON ST	STM309	OUTLET	-	-	A1,A2,A3,S1,S2,S3,S4,S5,S6	-	-	4.221	18.613	73.45	861.80	900	0.35%	1071.0	0.80	1.68	20.00	0.070
CARON ST	MH101	MH102	G	1.308	G	0.40	0.523	0.523	15.0	84	122.45	375	0.70%	146.7	0.83	1.33	82.53	0.578
CARON ST	MH102	MH103	F	0.915	F,G	0.40	0.366	0.889	15.8	81	201.86	450	0.70%	238.5	0.85	1.50	72.3	0.506
CARON ST	MH103	MH104	F		F,G		0.000	0.889	16.5	79	196.77	450	0.70%	238.5	0.82	1.50	62.7	0.439
CARON ST	MH104	MH105	E	1.039	E,F,G	0.40	0.416	1.305	17.0	78	283.44	525	0.60%	333.1	0.85	1.54	47.5	0.285
	MH105	MH106					0.000	1.305	17.5	76	278.40	525	0.60%	333.1	0.84	1.54	47.5	0.285
	MH106	MH107					0.000	1.305	18.0	75	274.08	525	0.60%	333.1	0.82	1.54	42.2	0.253
CARON ST	MH107	MH108			E,F,G		0.000	1.305	18.5	74	269.73	525	0.55%	318.9	0.85	1.47	42.2	0.232
CARON ST	MH108	MH109	C+D	20.296	C,D,E,F,G	0.40	8.118	9.423	19.1	72	1906.36	1200	0.35%	2306.5	0.83	2.04	80	0.280
CARON ST	MH109	MH110	B	1.671	B,C,D,E,F	0.40	0.668	10.092	20.2	70	1974.94	1200	0.35%	2306.5	0.86	2.04	128.1	0.448
CARON ST	MH110	MH111	A	0.979	A,B,C,D,E,F,G	0.40	0.392	10.483	21.1	68	1991.48	1200	0.35%	2306.5	0.86	2.04	119.32	0.418
CARON ST	MH111	MH112			A,B,C,D,E,F,G		0.000	10.483	21.2	68	1989.28	1050	1.00%	2730.7	0.73	3.15	7	0.070
CARON ST	MH150	MH151	H	4.038	H	0.40	1.615	1.615	15.0	84	377.94	750	0.40%	704.1	0.54	1.59	70.96	0.284
CARON ST	MH151	MH152	I	1.553	H,I	0.40	0.621	2.237	16.0	80	503.21	750	0.45%	746.8	0.67	1.69	105.0	0.473
CARON ST	MH152	MH153	J	1.460	H,I,J	0.40	0.584	2.821	16.9	78	615.60	750	0.50%	787.2	0.78	1.78	90.0	0.450
CARON ST	MH153	MH155	K	1.843	H,I,J,K	0.40	0.737	3.558	17.8	75	751.44	825	0.40%	907.8	0.83	1.70	96.1	0.384
CARON ST	MH155	MH156			H,I,J,K		0.000	3.558	18.7	73	728.86	825	0.39%	896.4	0.81	1.68	91.7	0.358
CARON ST	MH156	MH157	L	2.905	H,I,J,K,L	0.40	1.162	4.720	19.5	71	944.59	825	0.60%	1111.9	0.85	2.08	89.8	0.539
CARON ST	MH158	MH157	M	4.338	M	0.40	1.735	1.735	15.0	84	406.00	750	0.20%	497.9	0.82	1.13	54	0.108
	MH157	HEADWALL			H,I,J,K,L,M						1350.59	1200	0.20%	1743.6	0.77	1.54	14	0.028

DESIGN PARAMETER

Mannings n = 0.013

Infiltration Rate (I) = 0.28 l/s/ha

Designed By: Matt Scanlan

Checked By: Matt Morkem

Dwg. Reference:
SK1-6rev1 - Storm Area North Caron
SK.32rev1 - Storm Areas South Caron

PROJECT: Caron St. Reconstruction

LOCATION: Rockland, Ontario

Project Number: 65038

Date: 20-Jun-13

C9

Appendix C

Sanitary Master Plan 2009 Update Excerpt

2. Sanitary Sewer System

2.1 Sanitary Sewer Model Update

In the context of this report, “existing sanitary sewer system” refers to the system as of October 2008. The City’s wastewater collection system has seven (7) pump stations and a trunk sewer system network that convey sewage to the wastewater treatment plant in the north end of the City via PS #1.

Sewer flows, including sanitary dry-weather flow plus I/I (Inflow/Infiltration), have been estimated using the Harmon Formula for residential flows based on:

- 350 litres per capita per day (Lpcd)
- extraneous residential flows of 0.28 L/s/ha

Industrial, commercial, and industrial flows have been estimated based on the following:

- extraneous ICI flows of 0.14 l/s/ha
- industrial/commercial/institutional sanitary flows of 15,000 L/ha/d
- a peaking factor of 2.5

Sewers identified as being near, at, or beyond capacity based on current development and estimates of current flows are shown in Table 2-1 and use the current system including new sewers with sanitary pump station flows as measured in the 2005 Sanitary Pump Station Assessment Report. For modeling purposes the pump station capacity was taken to be the highest flowrate pump from each of the pump stations. The use of the higher capacity pump was used as it was assumed to represent the serviced condition of both pumps. This scenario seeks to identify existing issues given the 2005 status of the pump stations and the existing development condition and does not rely on future upgrades to pump stations. Pipe capacity has been calculated based on Manning’s equation assuming full pipe flow.

As noted in Table 2-1 some gravity sewers upstream of PS #2 have a condition of marginal to poor, meaning they are operating above their theoretical capacity limit. Close being defined as 90-100% of capacity, marginal as 100-110% of capacity and poor as being greater than 110% of capacity. Additional areas with capacity issues are located on the central portion of Laurier Street, near the discharge of the forcemains from PS #2 and 3, as well as locations on the eastern portion of Laurier at the discharge of PS #6. Critical north-south sewer segments at Caron Street and Laurier Street and at Simoneau Street and Laurier Street also indicate operation beyond capacity.

C10

Appendix C

Topographic Mapping

Arpentages SCHULTZ BARRETTE Surveying
Ontario Land Surveyors
Hawkesbury, Ontario
Tel: 613-632-7611 Fax: 613-632-2897

Job No. 16227(5)	Ref. No. CON. 2(O.S.)-28

1M CONTOUR DATA AND AERIAL IMAGE OF PROPOSED EXPANSION LANDS

C11

Appendix C

Water Demand

CIMA+

May 2, 2019

City of Clarence Rockland
Expansion Lands - Seconday Plan
A000817 (360)
DESIGN FLOWS - WATER DEMAND

Low Density Residential Design Parameters:

Base flow:	350	L/pers/d
Ratio pers/residence	3.4	pers/residence
Daily peak flow factor	2	
Hourly peak flow factor	3	
Hourly minimum factor	0.5	

Institutional / Commercial Design Parameters:

Base flow:	28000	L/(1000m^2-d)
Gross hectares	5.1223	ha
Daily peak flow factor	1.5	
Hourly peak flow factor	1.8	
Hourly minimum factor	0.5	

Medium Density Residential Design Parameters:

Base flow:	350	L/pers/d
Ratio pers/residence	2.7	pers/residence
Daily peak flow factor	2	
Hourly peak flow factor	3	
Hourly minimum factor	0.5	

High Density Residential Design Parameters:

Base flow:	350	L/pers/d
Ratio pers/residence	1.8	pers/residence
Daily peak flow factor	2	
Hourly peak flow factor	3	
Hourly minimum factor	0.5	

Water Demand - Ultimate Build Out

Phase	Number of Residences units	Average Daily Consumption		Daily Peak Flow		Hourly Peak Flow		Hourly Minimum Flow	
Low Density Residential	688	9.48	l/s	18.95	l/s	28.43	l/s	4.74	l/s
		150.20	galUS/min	300.39	galUS/min	450.59	galUS/min	75.10	galUS/min
Medium Density Residential	203	2.22	l/s	4.44	l/s	6.66	l/s	1.11	l/s
		35.19	galUS/min	70.39	galUS/min	105.58	galUS/min	17.60	galUS/min
High Density Residential	100	0.73	l/s	1.46	l/s	2.19	l/s	0.36	l/s
		11.56	galUS/min	23.12	galUS/min	34.67	galUS/min	5.78	galUS/min
Institutional / Commercial	1	16.60	l/s	24.90	l/s	29.88	l/s	8.30	l/s
		263.12	galUS/min	394.67	galUS/min	473.61	galUS/min	131.56	galUS/min
Total		29.03	l/s	49.75	l/s	67.16	l/s	14.51	l/s
		460.06	galUS/min	788.57	galUS/min	1064.45	galUS/min	230.03	galUS/min

Prepare by: Brian O'Dell, P.Eng. PEO No.: 100529918 Date: 2019-05-02

Verified by: Brian O'Dell, P.Eng. PEO No.: 100529918 Date: 2019-05-02

* Design parameters from City of Clarence-Rockland Design Guidelines 2018

C12

Appendix C

Sanitary Calculations

CITY OF CLARENCE-ROCKLAND EXPANSION LANDS - SECONDARY PLAN
A000817 (360)

SANITARY SEWER FLOWS - COMMERCIAL & INSTITUTIONAL SECTORS

Table 4-2 Commercial & Industrial Flow Allowances

Development Type	Average Flow
Commercial, average	28 m^3/ha per day
Industrial, light	35 m^3/ha per day
Industrial, heavy	55 m^3/ha per day

Source: City of Ottawa Design Guidelines - Water Distribution

Base Flow: 28000 L/ha/d
Peaking factor: 1.5
Infiltration: 0.14 L/s/ha

See Section 1.4 of the Sanitary Master Plan Update, dated November 2009

Sewershed Area	Proportional Area ha	Average Daily Flow (L/s)	Peaking Factor	Peak Flow (L/s)	Extraneous Flow (L/s)	Maximum Flow (L/s)
33_5	0.94	0.31	1.50	0.46	0.13	0.59
33_6	1.09	0.35	1.50	0.53	0.15	0.68
33_9	1.95	0.63	1.50	0.95	0.27	1.22
34_5	1.13	0.37	1.50	0.55	0.16	0.71
				Qmax - Total (L/s) =		**3.20**

NOTES:

1. Base sanitary flow is based on City of Clarence-Rockland design guidelines and shown in Table 4-2 above.
2. Peaking factor is based on City of Clarence-Rockland design guidelines Section 4.1.3.
3. Infiltration rate is based on Section 1.4 of the Sanitary Master Plan Update, dated November 2009.
4. See Proposed Sanitary Servicing Sketch in Appendix A for identification of sewershed area.

Prepared by: Brian O'Dell, P.Eng.
PEO # 100529918

Date: 2019-05-29

Verified by: Brian O'Dell, P.Eng.
PEO # 100529918

Date: 2019-05-29

Z:\Cima-C10\Ott_Projects\A\A000817_Clarence-Rockland – Expansion Lands Secondary Plan\300_CALCULATIONS\360\sanitary\spreadsheets\[190321_C10-05 360 CIMA+ Sanitary Sewer Flow - Commercial.xlsx]SANITARY FLOWS

CITY OF CLARENCE-ROCKLAND EXPANSION LANDS - SECONDARY PLAN
A000817 (360)

Harmon Equation:

$$P.F. = 1 + \left(\frac{14}{4 + \left(\frac{P}{1000} \right)^{\frac{1}{2}}} \right) * K$$

where:
P=Population
K=Correction Factor =0.8

SANITARY SEWER FLOWS - RESIDENTIAL SECTOR

Base Flow: 350 L/cap/day
Ratio pers/dwelling: See Table 4-1
Infiltration: 0.28 L/s/ha

Land Use Designation	Gross Area (ha)	Projected Units (ea)
Low Density	76.46	688
Medium Density	22.55	203
High Density	11.14	100

Table 4-1 Average Persons per Unit (Residential Uses)

Unit Type	Persons per unit
Residential, single family	3.4
Residential, semi-detached	2.7
Residential, duplex	2.3
Residential, townhouse (row)	2.7
Apartment, bachelor	1.4
Apartment, 1 bedroom	1.4
Apartment, 2 bedroom	2.1
Apartment, 3 bedroom	3.1
Apartment, average	1.8

Source: City of Ottawa Design Guidelines - Water Distribution

Sewershed Area	Number of dwellings	Proportional Area	Ratio	Equivalent Population	Peaking Factor	Average Daily Flow	Peak Flow	Extraneous Flow	Maximum Flow
	units	ha	pers/dwelling	pers		(L/s)	(L/s)	(L/s)	(L/s)
33_1	42	4.64	3.4	142	3.56	0.58	2.05	1.30	3.35
33_2	25	2.80	3.4	86	3.61	0.35	1.26	0.78	2.04
33_3	44	4.92	3.4	151	3.55	0.61	2.17	1.38	3.55
33_4	16	1.77	3.4	54	3.65	0.22	0.80	0.50	1.29
33_7	44	4.88	1.8	79	3.62	0.32	1.16	1.37	2.52
33_8	51	5.69	2.7	138	3.56	0.56	1.99	1.59	3.58
33_10	31	3.50	1.8	57	3.64	0.23	0.84	0.98	1.82
33_11	27	3.04	1.8	49	3.65	0.20	0.73	0.85	1.58
33_12	85	9.45	2.7	230	3.50	0.93	3.26	2.65	5.91
33_13	31	3.47	2.7	84	3.61	0.34	1.23	0.97	2.20
33_14	176	19.52	3.4	597	3.35	2.42	8.09	5.47	13.56
33_15	164	18.25	3.4	558	3.36	2.26	7.59	5.11	12.70
33_16	14	1.51	2.7	37	3.67	0.15	0.55	0.42	0.97
33_17	57	6.34	3.4	194	3.52	0.79	2.77	1.78	4.54
34_1	92	10.20	3.4	312	3.46	1.26	4.37	2.86	7.23
34_2	8	0.90	2.7	22	3.70	0.09	0.33	0.25	0.58
34_3	74	8.21	3.4	251	3.49	1.02	3.55	2.30	5.85
34_4	14	1.51	2.7	37	3.67	0.15	0.55	0.42	0.97
							Qmax - Total (L/s) =		**74.25**

NOTES:

1. Base sanitary flow, population densities and infiltration rate are based on City of Clarence-Rockland design guidelines.
2. Harmon Equation has been used to calculate the residential peak factor for sanitary flows (see above) - Maximum 4.0.
3. Population densities specified by the City of Clarence-Rockland are shown in Table 4-1 above.
4. See Proposed Sanitary Servicing Sketch in Appendix A for identification of sewershed area.

Prepared by: Brian O'Dell, P.Eng. Date: 2019-05-29
PEO # 100529918

Verified by: Brian O'Dell, P.Eng. Date: 2019-05-29
PEO # 1000529918

CLARENCE-ROCKLAND EXPANSION LANDS
A000817 (360)
HYDRAULIC CALCULATIONS FOR SANITARY SEWERS

Manning's 'n' :	0.013
Maximum permitted velocity :	3.00
Minimum permitted velocity :	0.60

Section	Dia.	Slope	Capacity (full)	Velocity (full)	Flow	Velocity (actual)	Error Message Flow Velocity		Error Message Pipe Capacity	% Full
	mm	%	m³/s	m/s	m³/s	m/s	maximum	minimum		
34_5	200	0.32%	0.019	0.59	0.00071	0.28	O.K.	increase velocity	O.K.	4%
34_4	200	0.32%	0.019	0.59	0.00168	0.36	O.K.	increase velocity	O.K.	9%
34_3	200	0.50%	0.023	0.74	0.00585	0.61	O.K.	O.K.	O.K.	25%
34_1	200	0.32%	0.019	0.59	0.01308	0.63	O.K.	O.K.	O.K.	69%
34_2	200	0.32%	0.019	0.59	0.01366	0.64	O.K.	O.K.	O.K.	72%
33_17	200	0.60%	0.025	0.81	0.00454	0.60	O.K.	O.K.	O.K.	18%
33_15	250	0.24%	0.029	0.59	0.01728	0.61	O.K.	O.K.	O.K.	60%
33_16	250	0.24%	0.029	0.59	0.01825	0.62	O.K.	O.K.	O.K.	63%
33_13	300	0.19%	0.042	0.59	0.03579	0.66	O.K.	O.K.	O.K.	85%
33_10	375	0.14%	0.065	0.59	0.03761	0.61	O.K.	O.K.	O.K.	58%
33_9	375	0.14%	0.065	0.59	0.03883	0.61	O.K.	O.K.	O.K.	60%
33_5	375	0.14%	0.065	0.59	0.03942	0.62	O.K.	O.K.	O.K.	61%
33_6	375	0.14%	0.065	0.59	0.04010	0.62	O.K.	O.K.	O.K.	62%
33_1	200	0.75%	0.028	0.90	0.00335	0.60	O.K.	O.K.	O.K.	12%
33_2	200	0.55%	0.024	0.77	0.00539	0.62	O.K.	O.K.	O.K.	22%
33_14	200	0.32%	0.019	0.59	0.01356	0.64	O.K.	O.K.	O.K.	71%
33_7	450	0.11%	0.094	0.59	0.06157	0.63	O.K.	O.K.	O.K.	66%
33_11	450	0.11%	0.094	0.59	0.06315	0.63	O.K.	O.K.	O.K.	67%
33_12	450	0.11%	0.094	0.59	0.06906	0.64	O.K.	O.K.	O.K.	73%
33_8	450	0.11%	0.094	0.59	0.07264	0.65	O.K.	O.K.	O.K.	77%

CLARENCE-ROCKLAND EXPANSION LANDS
A000817 (360)
HYDRAULIC CALCULATIONS FOR SANITARY SEWERS

Manning's 'n' :	**0.013**
Maximum permitted velocity :	**3.00**
Minimum permitted velocity :	**0.60**

Section	Dia.	Slope	Capacity (full)	Velocity (full)	Flow	Velocity (actual)	Error Message Flow Velocity			% Full
							maximum	minimum	Pipe Capacity	
	mm	%	m^3/s	m/s	m^3/s	m/s				
33_3	525	0.10%	0.136	0.63	0.07619	0.65	O.K.	O.K.	O.K.	56%
33_4	525	0.10%	0.136	0.63	0.07748	0.65	O.K.	O.K.	O.K.	57%

Remarks :

1. Minimum pipe sizes and slopes were obtained from Table 4-3 of the City of Clarence-Rockland Design Guidelines.
2. Sections 34_5 and 34_4 utilized the minimum slope as an effort to mitigate the need for deep sanitary sewers. These sections will require a flushing program for maintenance. For all other sewers, if the minimum velocity requirement was not met, the pipe slope was increased incrementally by 0.05% until the minimum velocity requirement was met.
3. See Proposed Sanitary Servicing Sketch in Appendix A for identification of sewershed area (Section).

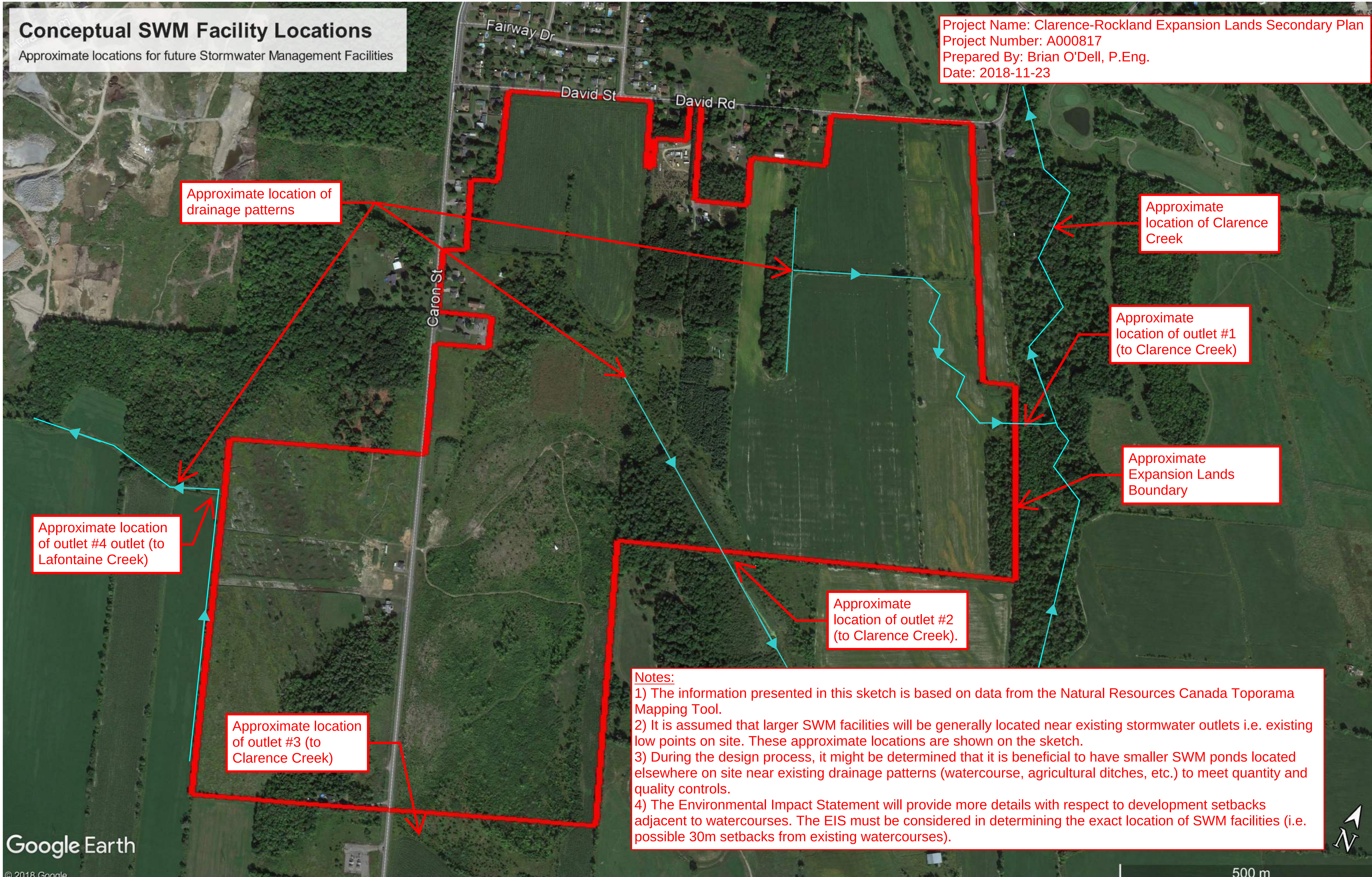
Prepared by: Brian O'Dell, P.Eng. Date: 2019-05-29
PEO # 100529918

Verified by: Brian O'Dell, P.Eng. Date: 2019-05-29
PEO # 100529918

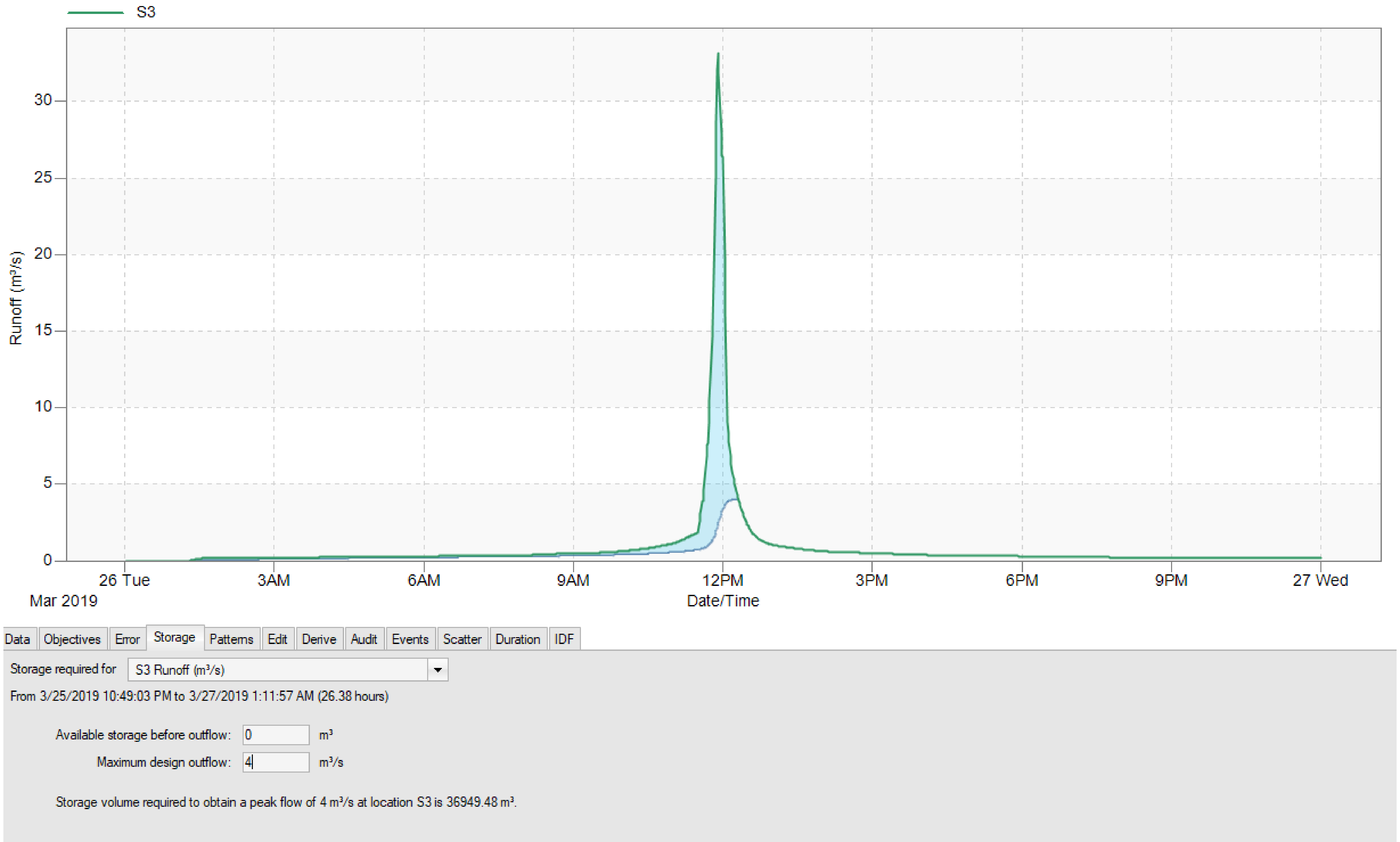
C13

Appendix C

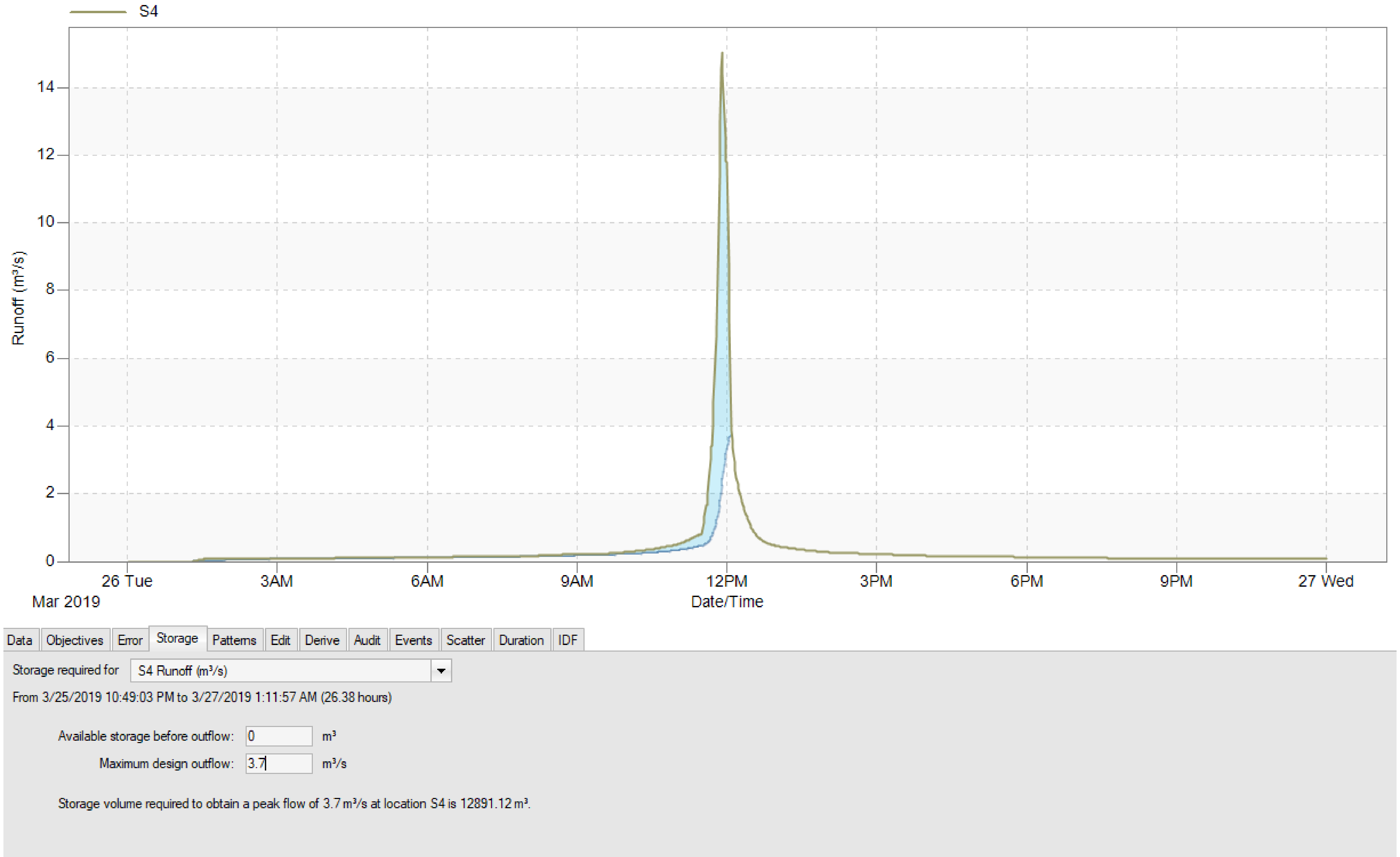
Stormwater Calculations


Conceptual SWM Facility Locations
Approximate locations for future Stormwater Management Facilities
Project Name: Clarence-Rockland Expansion Lands Secondary Plan
Project Number: A000817
Prepared By: Brian O'Dell, P.Eng.
Date: 2018-11-23
Fairway Dr
David St
David Rd
Caron St
Approximate location of drainage patterns
Approximate location of Clarence Creek
Approximate location of outlet #1 (to Clarence Creek)
Approximate Expansion Lands Boundary
Approximate location of outlet #4 outlet (to Lafontaine Creek)
Approximate location of outlet #2 (to Clarence Creek).
Approximate location of outlet #3 (to Clarence Creek)
Notes:
1) The information presented in this sketch is based on data from the Natural Resources Canada Toporama Mapping Tool.
2) It is assumed that larger SWM facilities will be generally located near existing stormwater outlets i.e. existing low points on site. These approximate locations are shown on the sketch.
3) During the design process, it might be determined that it is beneficial to have smaller SWM ponds located elsewhere on site near existing drainage patterns (watercourse, agricultural ditches, etc.) to meet quantity and quality controls.
4) The Environmental Impact Statement will provide more details with respect to development setbacks adjacent to watercourses. The EIS must be considered in determining the exact location of SWM facilities (i.e. possible 30m setbacks from existing watercourses).
Google Earth
© 2018 Google
N
500 m

455,175.4 sq m
547,030.3 sq m
250,288.9 sq m
264,271.5 sq m
PRE-DEVELOPMENT AREAS
B. Tardioli
2019-04-04



Hydrograph curve generated from the computer software PCSWMM approximating storage volume requirements for Subcatchment S3 during a 24 hour 100-year SCS Type II design storm.



Hydrograph curve generated from the computer software PCSWMM approximating storage volume requirements for Subcatchment S4 during a 24 hour 100-year SCS Type II design storm.

STORM SEWER HYDRAULIC DESIGN SHEET (SSDS) - RATIONAL METHOD

Client: City of Clarence-Rockland
Project: Expansion Lands
Location: City of Clarence-Rockland
Project #: A000817

Manning Coefficient: 0.013
Maximum Permitted Velocity: 3.00 m/s
Minimum Permitted Velocity: 0.80 m/s
Return Frequency: 5 years

LOCATION			AREA		FLOW					SEWER DATA								
Street/Catchment Name	From MH/CB	To MH/CB	Area (ha)	C =	Section 2.78*AC (ha)	Accum 2.78*AC (ha)	Time of Conc (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Diameter (mm)	Material Type	Slope (%)	Length (m)	Capacity (full) (L/s)	Velocity (full) (m/s)	Velocity (actual) (m/s)	Time of Flow (min)	Ratio (%)
To SWM #1 (Catchment S3)																		
P2			2.94	0.400	3.27	3.27	15.00	83.557	273.17									
S0			1.27	0.400	1.41	1.41	15.00	83.557	118.00									
SC4	340	330	0.55	0.700	1.07	5.75	15.00	83.557	480.61	975	CONC	0.10%	235.00	708.68	0.95	1.02	3.85	68%
V3			0.72	0.400	0.80	0.80	15.00	83.557	66.90									
R3			2.95	0.400	3.28	3.28	15.00	83.557	274.10									
SC3	350	330	0.42	0.700	0.82	4.90	15.00	83.557	409.29	900	CONC	0.10%	170.00	572.47	0.90	0.98	2.90	71%
S2			2.36	0.400	2.62	2.62	15.00	83.557	219.28									
V2			2.33	0.400	2.59	2.62	15.00	83.557	219.28									
CS6	330	331	0.67	0.700	1.30	6.55	18.85	72.891	1367.52	1350	CONC	0.10%	230.00	1687.83	1.18	1.31	2.93	81%
W			1.13	0.800	2.51	2.51	15.00	83.557	209.99									
CS5	331	306	0.50	0.700	0.97	3.49	21.77	66.584	1599.64	1500	CONC	0.10%	240.00	2235.37	1.26	1.37	2.92	72%
P1			7.26	0.400	8.07	8.07	15.00	83.557	674.57									
S1			4.59	0.400	5.10	5.10	15.00	83.557	426.48									
SC5	320	321	1.28	0.700	2.49	15.67	15.00	83.557	1309.18	1500	CONC	0.10%	540.00	2235.37	1.26	1.32	6.83	59%
T			1.51	0.600	2.52	2.52	15.00	83.557	210.45									
Q			0.90	0.600	1.50	1.50	15.00	83.557	125.44									
SC6	321	306	0.22	0.700	0.43	4.45	21.83	66.478	1604.87	1650	CONC	0.10%	120.00	2882.24	1.35	1.38	1.44	56%
G1			2.19	0.700	4.26	4.26	15.00	83.557	356.10									
SA3	310	301	0.41	0.700	0.80	5.06	15.00	83.557	422.77	900	CONC	0.10%	75.00	572.47	0.90	0.98	1.28	74%

LOCATION			AREA		FLOW					SEWER DATA								
Street/Catchment Name	From MH/CB	To MH/CB	Area	C =	Section 2.78*AC	Accum 2.78*AC	Time of Conc	Rainfall Intensity	Peak Flow	Diameter	Material Type	Slope	Length	Capacity (full)	Velocity (full)	Velocity (actual)	Time of Flow	Ratio
DS1	David	300	1.13	0.700	2.20	2.20	15.00	83.557	183.74									
A			4.64	0.400	5.16	5.16	15.00	83.557	431.13									
B			2.80	0.400	3.11	3.11	15.00	83.557	260.16									
SB1	300	301	0.80	0.700	1.56	9.83	15.00	83.557	1005.11	1350	CONC	0.10%	315.00	1687.83	1.18	1.23	4.27	60%
F			1.09	0.800	2.42	2.42	15.00	83.557	202.56									
SA2	301	302	0.26	0.700	0.51	2.93	19.27	71.888	1638.52	1500	CONC	0.10%	95.00	2235.37	1.26	1.38	1.15	73%
E			0.94	0.800	2.09	2.09	15.00	83.557	174.68									
SA1	302	303	0.54	0.700	1.05	3.14	20.42	69.338	1856.34	1500	CONC	0.10%	210.00	2235.37	1.26	1.41	2.48	83%
CS1	Caron	303	0.62	0.700	1.21	1.21	15.00	83.557	100.81									
J			1.95	0.800	4.34	4.34	15.00	83.557	362.37									
CS2	303	304	0.25	0.700	0.49	4.82	22.91	64.457	2268.05	1650	CONC	0.10%	115.00	2882.24	1.35	1.49	1.29	79%
K			3.50	0.700	6.81	6.81	15.00	83.557	569.11									
CS3	304	305	0.18	0.700	0.35	7.16	24.20	62.211	2713.55	1800	CONC	0.10%	90.00	3634.96	1.43	1.56	0.96	75%
M			3.47	0.600	5.79	5.79	15.00	83.557	483.63									
CS4	305	306	0.63	0.700	1.23	7.01	25.16	60.648	3138.94	1950	CONC	0.10%	325.00	4499.86	1.51	1.63	3.33	70%
U			1.51	0.600	2.52	2.52	15.00	83.557	210.45									
SC1	306	307	0.39	0.700	0.76	3.28	28.49	55.842	4921.60	2250	CONC	0.10%	200.00	6590.62	1.66	1.81	1.84	75%
V1			3.29	0.400	3.66	3.66	15.00	83.557	305.69									
R2			8.55	0.400	9.51	9.51	15.00	83.557	794.43									
SC2	360	307	0.94	0.700	1.83	15.00	15.00	83.557	1252.97	1350	CONC	0.10%	415.00	1687.83	1.18	1.29	5.36	74%
R1			6.75	0.400	7.51	7.51	15.00	83.557	627.18									
N	307	SWM#1	5.55	0.200	3.09	10.59	30.33	53.534	6741.59	2550	CONC	0.10%	225.00	9201.96	1.80	1.96	1.91	73%
To SWM#2 (Catchment S4)																		
DS2	David	400	0.80	0.700	1.56	1.56	15.00	83.557	130.08									
C			4.92	0.400	5.47	5.47	15.00	83.557	457.14									
D			1.77	0.400	1.97	1.97	15.00	83.557	164.46									
SA7	400	401	0.50	0.700	0.97	8.41	15.00	83.557	832.99	1200		0.10%	155.00	1232.89	1.09	1.17	2.21	68%
H			5.69	0.600	9.49	9.49	15.00	83.557	793.03									
SA6	401	402	0.27	0.700	0.53	10.02	17.21	77.040	1604.65	1500		0.10%	110.00	2235.37	1.26	1.37	1.34	72%
G2			2.69	0.700	5.23	5.23	15.00	83.557	437.40									
L2			1.32	0.700	2.57	2.57	15.00	83.557	214.64									
SA4	410	411	0.49	0.700	0.95	8.76	15.00	83.557	731.71	1200		0.10%	175.00	1232.89	1.09	1.14	2.57	59%
SA5	411	402	0.90	0.700	1.75	1.75	17.57	76.085	864.97	1350		0.10%	350.00	1687.83	1.18	1.18	4.95	51%
I1	402	403	3.54	0.600	5.90	5.90	22.51	65.174	1249.80	1500		0.10%	270.00	2235.37	1.26	1.30	3.46	56%

LOCATION			AREA		FLOW					SEWER DATA								
Street/Catchment Name	From MH/CB	To MH/CB	Area	C =	Section 2.78*AC	Accum 2.78*AC	Time of Conc	Rainfall Intensity	Peak Flow	Diameter	Material Type	Slope	Length	Capacity (full)	Velocity (full)	Velocity (actual)	Time of Flow	Ratio
L1			1.73	0.700	3.37	3.37	15.00	83.557	281.30									
SB2	420	421	0.55	0.700	1.07	4.44	15.00	83.557	370.73	900		0.10%	200.00	572.47	0.90	0.96	3.49	65%
I3			0.87	0.600	1.45	1.45	15.00	83.557	121.25									
SB3	421	422	0.23	0.700	0.45	1.90	18.49	73.753	510.77	975		0.10%	90.00	708.68	0.95	1.03	1.46	72%
O2			4.55	0.400	5.06	5.06	15.00	83.557	422.77									
SB4	430	422	1.00	0.700	1.95	7.01	15.00	83.557	585.37	1050		0.10%	370.00	863.53	1.00	1.07	5.76	68%
I2	422	403	5.07	0.600	8.46	8.46	20.76	68.620	1676.44	1500		0.10%	490.00	2235.37	1.26	1.38	5.90	75%
O1	403	SWM#2	15.04	0.400	16.72	16.72	26.67	58.361	3902.30	2100		0.10%	75.00	5483.08	1.58	1.72	0.73	71%

Design Parameters:

Rational Formula: $Q_{peak} = 2.78*CIA$

Where: Q = Peak Flow (L/s)

C = Runoff Coefficient

I = Rainfall Intensity (mm/hr) = $A/(Td + C)^B$

(City of Ottawa MacDonald Cartier Airport - See Table Below)

A = Area (ha)

T = Time of Concentration (min)

Time of Concentration: Tc = Ti + Tf (minutes)

Where: Ti = inlet time before pipe (minutes)

Tf = time of flow in pipe (minutes)

Where: Tf = L/(60V)

L = Pipe Length (m)

V = Actual Velocity (m/s)

Manning Equation: $Q_{cap} = 1/n*A*R^{2/3}*S^{1/2}$

Where: n = Manning Roughness Coefficient

A = Area of Flow (m^2)

R = Hydraulic Radius (defined as area of flow (m^2) divided by wetted perimeter (m))

S = Slope of Pipe (%)

Notes:

1. Runoff coefficients used were obatined from Table 4-5 of the City of Clarence-Rockland Design Guidelines.
2. City of Ottawa IDF parameters were used to calculate rainfall intensities.
3. An initial time of concentration of 15 minutes was used as per Section 4.2.3 of the City of Clarence-Rockland Design Guidelines.
4. See Proposed Storm Servicing Sketch SK-01 in Appendix A for identification of Catchment Name.

Prepared by: Benjamin Tardioli, EIT
PEO No.:
Date: 2019-05-29

Verified by: Brian O'Dell, P.Eng.
PEO No.: 100529918
Date: 2019-05-29