david schaeffer engineering ltd

120 Iber Road, Suite 103
Ottawa, Ontario K2S 1E9
Tel. (613)836-0856
Fax (613) 836-7183
www.DSEL.ca

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

811 GLADSTONE AVENUE OTTAWA COMMUNITY HOUSING

CITY OF OTTAWA

PROJECT NO.: 17-963

DECEMBER 2018 – REV 1

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DECEMBER 2018 – REV 1

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1.0 INTRODUCTION

David Schaeffer Engineering Ltd. (DSEL) has been retained by Ottawa Community Housing to prepare a Functional Servicing and Stormwater Management Report in support of the Site Plan Control Application for the proposed development of 811 Gladstone Avenue.

The subject property is located within the City of Ottawa urban boundary, in the Somerset Ward. As illustrated in ***Figure 1***, below, the subject property is bounded by Balsam Street to the north, St. Anthony's Children's Centre and Booth Street to the east, Gladstone Avenue to the south and Rochester Street to the west. The subject property measures approximately ***0.472 ha*** and is designated Residential Fourth Density Zone (R4A), as well as, Traditional Main Street Zone (TM) under the current City of Ottawa zoning by-law and is within the Mature Neighbourhoods Area.

Figure 1: Site Location

The proposed development involves the construction of 32 stacked townhome units, as well as, a 6-storey residential apartment building consisting of 108 residential units. A copy of the proposed site plan is included in ***Drawings/Figures.***

The objective of this report is to support the application for Site Plan Control by providing sufficient detail to demonstrate that the proposed development is supported by existing and proposed municipal servicing infrastructure and to demonstrate that the site design conforms to current City of Ottawa design standards.

1.1 Existing Conditions

The subject site currently consists of 25 townhome units and one single family residence with a communal above ground parking lot which is accessed from Balsam Street.

Sewer system and watermain distribution mapping collected from the City of Ottawa indicate that the following services exist across the property frontages within the adjacent municipal right-of-ways:

Balsam Street:

- 203 mm diameter PVC watermain;
- 375 mm diameter PVC combined sewer.

Booth Street:

406 mm diameter watermain;

300 mm diameter PVC combined sewer.

Gladstone Avenue:

203 mm diameter PVC watermain;

450 mm diameter PVC combined sewer.

Rochester Street:

203 mm diameter PVC watermain;

375 mm diameter concrete combined sewer.

1.2 Required Permits / Approvals

Development of the site is subject to the City of Ottawa Planning and Development Approvals process. The City of Ottawa must approve detailed engineering design drawings and reports, prepared to support the proposed development plan.

It is proposed that both sanitary and storm flow from the site will discharge to an existing combined sewer. As such, it is anticipated that an Environmental Compliance Approval

(ECA) through a direct submission to the Ministry of the Environment, Conservation and Parks (MOECP) will be required.

1.3 Pre-consultation

Pre-consultation correspondence and the servicing guidelines checklist are located in ***Appendix A***.

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following studies were utilized in the preparation of this report:

- **Ottawa Sewer Design Guidelines**,
  City of Ottawa, *SDG002,* October 2012.
  (City Standards)

  - **Technical Bulletin ISDTB-2014-01**
    City of Ottawa, February 5, 2014.
    (ITSB-2014-01)

  - **Technical Bulletin PIEDTB-2016-01**
    City of Ottawa, September 6, 2016.
    (PIEDTB-2016-01)

  - **Technical Bulletin ISTB-2018-01**
    City of Ottawa, March 21, 2018.
    (ISTB-2018-01)

- **Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, October 2012.
  (Water Supply Guidelines)

  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010.
    (*ISD-2010-2*)

  - **Technical Bulletin ISDTB-2014-02**
    City of Ottawa, May 27, 2014.
    (*ISDTB-2014-02*)

  - **Technical Bulletin ISDTB-2018-02**
    City of Ottawa, March 21, 2018.
    (ISDTB-2018-02)

- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)

- **Ontario Building Code Compendium**
  Ministry of Municipal Affairs and Housing Building Development Branch, January 1, 2010 Update.
  (OBC)

- **Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems**
  National Fire Protection Association
  2014 Edition.
  (NFPA 25)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa 1W pressure zone, as shown by the Pressure Zone map in ***Appendix B.*** Watermains exist within Gladstone Avenue, Balsam Street, Booth Street and Rochester Street.

3.2 Water Supply Servicing Design

The subject property is proposed to be serviced through a looped service with connections to both the existing 203 mm diameter municipal watermain within Balsam Street and the 203 mm diameter municipal watermain within Rochester Street. The site is proposed to be serviced via a 150 mm watermain looped between the above-mentioned connection points. Refer to the ***SSP-1*** for proposed water servicing.

Table 1, below, summarizes the ***Water Supply Guidelines*** employed in the preparation of the water demand estimate.

Table 1
Water Supply Design Criteria

Design Parameter	Value
Residential Demand	280 L/p/d
Residential Maximum Daily Demand	3.6 x Average Daily *
Residential Maximum Hourly	5.4 x Average Daily *
Minimum Watermain Size	150 mm diameter
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350 kPa and 480 kPa
During normal operating conditions pressure must not drop below	275 kPa
During normal operating conditions pressure shall not exceed	552 kPa
During fire flow operating pressure must not drop below	140 kPa
** Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.* *** Table updated to reflect ISD-2018-2*	

Table 2, below, summarizes the anticipated water demand and boundary conditions for the proposed development, and was calculated using the ***Water Supply Guidelines.***

Table 2
Proposed Water Demand

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Conditions[2] Balsam Street (m H_2O / kPa)		Boundary Conditions[3] Rochester Street (m H_2O / kPa)	
Average Daily Demand	53.7	48.3	473.3	49.6	486.5
Max Day + Fire Flow (Townhomes)	193.2 + 17,000	34.3	336.0	35.6	349.1
Max Day + Fire Flow (Apartments)	193.2 + 14,000	34.3	336.0	35.6	349.1
Peak Hour	289.8	40.7	398.8	42.0	411.9

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.
2) Boundary conditions supplied for the connection to Balsam Street by the City of Ottawa for the demands indicated in the correspondence; assumed ground elevation 66.75 m at the connection to the municipal watermain. See ***Appendix B.***
3) Boundary conditions supplied for the connection to Rochester Street by the City of Ottawa for the demands indicated in the correspondence; assumed ground elevation 65.41 m at the connection to the municipal watermain. See ***Appendix B.***

A ***0.6 kPa*** pressure loss along the service was estimated using the Darcy-Weisbach equation; corresponding calculation are included in ***Appendix B***. Using the pressures from the boundary conditions provided in ***Table 2*** and the pressure loss calculated, the resulting pressures are within the range outlined in ***Table 1***.

The required fire flow (RFF) was estimated in accordance with **ISTB-2018-02**; the resulting highest flows for each building type were sent to the City of Ottawa for boundary conditions. The following parameters, below, were provided by the Architect, see ***Appendix A*** for collaborating correspondence:

- Type of construction – Wood frame for townhouse style homes, and non-combustible construction for the apartment building;
- Occupancy type –Limited combustible;
- Sprinkler Protection – Sprinklered system for the apartment building and non-combustible construction for the townhomes.

Table 3, below, summarizes the fire flow for each building, per the above assumptions***.*** Calculation sheets per the ***ISTB-2018-02*** can be found in ***Appendix B.***

Table 3
Anticipated Fire Flow Demand

Building Type	Anticipated Fire Demand (L/min)	Available Fire Flow per Table 18.5.4.3 of ISTB-2018-02 (L/min)
Townhomes 1 (West)	16,000	18,926
Townhomes 2 (East)	17,000	20,819
Apartment Building (6-Storey)	14,000	22,712

The property has four (4) adjacent hydrants listed below:

1. Located on Rochester Street;

2. Located on Gladstone Avenue, between Booth Street and Rochester Street;

3. Located on Gladstone Avenue at the intersection of Booth Street and Gladstone Avenue; and

4. Located on Booth Street at the intersection of Booth Street and Balsam Street.

According to ***Table 18.5.4.3*** of **ISTB-2018-02** and the resulting pressure during the fire flow scenario provided by the City of Ottawa, the existing hydrants are able to meet the required fire flow demands of the proposed development at minimum pressure.

3.4 Water Supply Conclusion

It is proposed to service the development through a looped watermain with one connection to the existing 203 mm diameter watermain within Balsam Street and the other to the existing 203 mm watermain within Rochester Street.

The anticipated water demand was submitted to the City of Ottawa for establishing boundary conditions. The City provided both the anticipated minimum and maximum water pressures, as well as, the estimated water pressure during fire flow, as indicated by the correspondence in ***Appendix B***.

It is proposed that the development will be serviced by four existing fire hydrants on the adjacent streets. Based on ***Table 18.5.4.3*** of **ISTB-2018-02,** the fire flow demands of the proposed buildings fall within a range that can be supplied through the existing hydrants.

The design of the water distribution system conforms to all relevant City Guidelines and Policies.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject property lies within the Preston Street Trunk sewer catchment area, as shown by the ***Trunk Sanitary Sewers and Collection Areas Map,*** included in ***Appendix C***. There are existing combined sewers within Gladstone Avenue, Balsam Street, Booth Street and Rochester Street. The existing site consists of 25 townhomes and one single family residence and existing wastewater flow is summarized in ***Table 4,*** below:

Table 4
Summary of Existing Wastewater Flows

Design Parameter	Anticipated Sanitary Flow[1] (L/s)
Average Dry Weather Flow Rate	0.23
Peak Dry Weather Flow Rate	0.85
Peak Wet Weather Flow Rate	1.00
1) Based on criteria shown in ***Table 5***	

4.2 Wastewater Design

It is proposed that the development will be serviced via a connection to the existing 375 mm sanitary sewer within Rochester Street. Refer to the drawing ***SSP-1*** for sanitary servicing layout.

Table 5, below, summarizes the ***City Standards*** employed in the calculation of wastewater flow rates for the proposed development.

Table 5
Wastewater Design Criteria

Design Parameter	Value
Residential Demand	280 L/p/d
Peaking Factor	Harmon's Peaking Factor. Max 3.8, Min 2.0
Infiltration and Inflow Allowance	0.33 L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sanitary Sewer Lateral	135 mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6 m/s
Maximum Full Flowing Velocity	3.0 m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012.	

Table 6, below demonstrates the peak sanitary flow from the proposed development to the combined sewer within Rochester Street. See ***Appendix C*** for associated calculations.

Table 6
Summary of Proposed Wastewater Flows

Design Parameter	Anticipated Sanitary Flow[1] (L/s)
Average Dry Weather Flow Rate	0.89
Peak Dry Weather Flow Rate	3.11
Peak Wet Weather Flow Rate	3.26
1) Based on criteria shown in ***Table 5***	

The estimated sanitary flow based on the ***Site Plan*** provided in ***Drawings/Figures,*** results in a peak wet weather flow of ***3.26 L/s*** to the combined sewer within Rochester Street.

The peak wastewater flow generated from the proposed development to the local Rochester Street combined sewer and ultimately the Preston Trunk sewer has been estimated to be ***3.26 L/s***; thus resulting in a ***2.22 L/s*** increase from existing conditions. Detailed calculations are included in ***Appendix C***. The increase in wastewater discharge will be compensated for by a reduction in stormwater flow, as per City of Ottawa criteria, and is detailed in ***Section 5.0 & Section 6.0*** of this report.

4.3 Wastewater Servicing Conclusions

The site is tributary to the Preston Trunk sewer. It is proposed to discharge the subject property's wastewater via a connection to the existing 375 mm combined sewer within Rochester Street.

The sanitary flow analysis for the proposed development results in an estimated increase, from existing conditions, of ***2.22 L/s*** to the Rochester Street combined sewer. This increase in wastewater discharge will be compensated for by a reduction in stormwater flow, as per City of Ottawa Criteria.

The proposed wastewater design conforms to all relevant ***City Standards***.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

Stormwater runoff from the subject property is tributary to the City of Ottawa sewer system and is located within the Ottawa Central sub-watershed. As such, approvals for proposed developments within this area are under the approval authority of the City of Ottawa.

Flows that influence the watershed in which the subject property is located are further reviewed by the principal authority. The subject property is located within the Ottawa River watershed and is therefore, subject to review by the Rideau Valley Conservation Authority (RVCA).

It is anticipated that no stormwater management controls for flow attenuation exist on-site. The estimated pre-development peak flows for the 2, 5, and 100-year events are summarized in ***Table 7,*** below:

Table 7
Summary of Existing Peak Storm Flow Rates

City of Ottawa Design Storm	Estimated Peak Flow Rate (L/s)
2-year	68.5
5-year	92.9
100-year	199.0

5.2 Post-development Stormwater Management Targets

Stormwater management quantity control requirements for the proposed development were reviewed with the City of Ottawa, correspondence is included in ***Appendix A***and summarized below:

- Meet a combined allowable release rate based on existing sanitary flow in addition to storm flow equal to a calculated Rational Method Coefficient determined as per existing conditions but no more than 0.4, employing the City of Ottawa IDF parameters for a 2-year storm with a calculated time of concentration no less than10 minutes;
- The stormwater release rate is equal to the allowable combined flow subtract the proposed sanitary flow;
- Attenuate storms up to and including the City of Ottawa 100-year design event on site;
- Quality controls are not required for the development since stormwater is tributary to a combined sewer. Correspondence with the RVCA is included in ***Appendix A***.

Based on the above criteria, the allowable combined flow rate equals ***41.1 L/s*** and the allowable stormwater release rate is equal to ***38.0 L/s.*** (41.1 – 3.11= 38.0 L/s).

5.3 Proposed Stormwater Management System

It is proposed that the stormwater for the development be serviced through a connection to the 375 mm diameter combined sewer within Rochester Street.

To achieve the allowable post-development stormwater runoff release rate identified in ***Section 5.2*** above, the proposed development will employ flow attenuation using onsite storage through the combined use of underground storage chambers as well as roof storage on both the apartment building and the townhomes. An Inlet Control Device (ICD) IPEX LMF 105 is proposed at STM MH 101A to attenuate flow to the allowable release rate.

Roof drainage is proposed to be controlled using Zurn Model Z-105-5 (or approved equivalent) control drains. The controlled roof drainage is proposed to be directed to the storm sewer system or downspouts directed to surface, upstream of the proposed ICD at STM MH 101A. The flow is further controlled by the ICD at STM MH 101A and

Table 8, below***,*** estimates post-development flow rates and storage requirements.

Table 8
Stormwater Flow Rate Summary

Control Area	5-Year Release Rate	5-Year Storage	100-Year Release Rate	100-Year Storage
	(L/s)	(m^3)	(L/s)	(m^3)
Unattenuated Areas	9.3	0.0	20.0	0.0
Roof Storage Apt.	12.0	19.3	15.9	44.9
Roof Storage Townhomes 1	3.2	4.6	4.3	10.9
Roof Storage Townhomes 2	3.2	4.6	4.3	10.9
Attenuated Areas	11.9	45.3	15.5	100.5
Sanitary Flow	3.1	0.0	3.1	0.0
Total	**20.9**	**71.9**	**38.6**	**167.2**

It is estimated that a total of ***66.7m^3*** of rooftop storage, ***92m^3*** of underground storage and ***8.5m^3*** of storage in storm sewers and structures is required to attenuate flow to a release rate of ***38.6 L/s***. Storage calculations are contained within ***Appendix D***.

5.5 Stormwater Servicing Conclusions

Post development stormwater runoff will be required to be restricted to the allowable target release rate for storm events up to and including the 100-year storm, in accordance with City of Ottawa ***City Standards***. The post-development stormwater allowable release rate to the combined sewer within Rochester Street was calculated to be ***38.6 L/s***. It is estimated that ***167.2 m^3*** of storage will be required to meet this release rate.

Quantity controls will be provided through the combined use of underground storage chambers, roof storage on the apartment building, a cistern and an ICD.

The proposed stormwater design conforms to all relevant ***City Standards*** and Policies for approval.

6.0 COMBINED SEWER SYSTEM FLOW

Based on criteria outlined in ***Section 5.2***, the combined stormwater and sanitary flow is not to exceed ***41.1 L/s***.

Table 9, below, summarizes the pre-development and post-development flow rates to the combined sewershed.

Table 9
Summary of Release Rates to the Combined Sewer

Flow Type	5-Year		100-year	
	Pre-Development (L/s)	**Post-Development (L/s)**	**Pre-Development (L/s)**	**Post-Development (L/s)**
Sanitary*	0.85	3.11	0.85	3.11
Storm	68.5	21.2	199.0	35.5
Combined Flow	**69.4**	**24.3**	**199.9**	**38.6**
*Infiltration flows have been taken into account in stormwater calculations. Sanitary flow is equal to the peak dry weather flow.				

As shown by ***Table 9,*** the post-development combined flow meets the target objective described in section 5.2. In addition, the development proposes to decrease the discharge to the existing combined sewer by approximately 81% in the 100-year storm event.

7.0 UTILITIES

Utility servicing will be coordinated with the individual utility companies prior to site development.

8.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. The extent of erosion losses is exaggerated during construction where vegetation has been removed and the top layer of soil becomes agitated.

Prior to topsoil stripping, earthworks or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

Silt fence will be installed around the perimeter of the site and will be cleaned and maintained throughout construction. Silt fence will remain in place until the working areas have been stabilized and re-vegetated.

Catch basins will have SILTSACKs installed under the grate during construction to protect from silt entering the storm sewer system.

A mud mat will be installed at the construction access, in order to prevent mud tracking onto adjacent roads.

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents:

- Limit extent of exposed soils at any given time;
- Re-vegetate exposed areas as soon as possible;
- Minimize the area to be cleared and grubbed;
- Protect exposed slopes with plastic or synthetic mulches;
- Install silt fence to prevent sediment from entering existing ditches;
- No refueling or cleaning of equipment near existing watercourses;
- Provide sediment traps and basins during dewatering;
- Install filter cloth between catch basins and frames;
- Plan construction at proper time to avoid flooding; and
- Establish material stockpiles away from watercourses, so that barriers and filters may be installed.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

- Verification that water is not flowing under silt barriers; and
- Clean and change filter cloth at catch basins.

9.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained by Ottawa Community Housing to prepare a Functional Servicing and Stormwater Management Report in support of the Site Plan Control application for 811 Gladstone Avenue. The preceding report outlines the following:

- Based on boundary conditions provided by the City, the existing municipal water infrastructure is capable of providing the proposed development with water within the City's required pressure range;
- Fire flow demands for the building will be met through existing hydrants on the adjacent streets;
- The proposed development is anticipated to have a peak wet weather flow of ***3.26 L/s*** directed to the Rochester Street combined sewer. Based on the sanitary analysis that was conducted, the existing municipal sewer infrastructure has sufficient capacity to support the development;
- Based on the ***City Standards***, the proposed development will attenuate flow to a release rate of ***41.1 L/s*** and will not have an impact on peak flows to the combined sewer within Rochester Street;
- It is proposed to attenuate flow through underground and roof storage. It is anticipated that ***167.2 m^3*** of onsite storage will be required to attenuate flow to the established release rate above.

Prepared by,
David Schaeffer Engineering Ltd.

Per: Genavieve G. Melatti

Reviewed by,
David Schaeffer Engineering Ltd.

Per: Steven L. Merrick, P.Eng.

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

17-963 22/11/2018

4.1 General Content

☐	Executive Summary (for larger reports only).	N/A
☒	Date and revision number of the report.	Report Cover Sheet
☒	Location map and plan showing municipal address, boundary, and layout of proposed development.	Drawings/Figures
☒	Plan showing the site and location of all existing services.	Figure 1
☒	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.0
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.3
☒	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Section 2.1
☒	Statement of objectives and servicing criteria.	Section 1.0
☒	Identification of existing and proposed infrastructure available in the immediate area.	Sections 3.1, 4.1, 5.1
☐	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	N/A
☒	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	GP-1
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☐	Proposed phasing of the development, if applicable.	N/A
☒	Reference to geotechnical studies and recommendations concerning servicing.	Section 1.4
☒	All preliminary and formal site plan submissions should have the following information: -Metric scale -North arrow (including construction North) -Key plan -Name and contact information of applicant and property owner -Property limits including bearings and dimensions -Existing and proposed structures and parking areas -Easements, road widening and rights-of-way -Adjacent street names	SSP-1

4.2 Development Servicing Report: Water

☐	Confirm consistency with Master Servicing Study, if available	N/A
☒	Availability of public infrastructure to service proposed development	Section 3.1
☒	Identification of system constraints	Section 3.1
☒	Identify boundary conditions	Section 3.1, 3.2
☒	Confirmation of adequate domestic supply and pressure	Section 3.3

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 3.2
☐	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☐	Address reliability requirements such as appropriate location of shut-off valves	N/A
☐	Check on the necessity of a pressure zone boundary modification	N/A
☒	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Section 3.2, 3.3
☐	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	N/A
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☒	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

☒	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 4.2
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☒	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 4.1
☒	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Section 4.2
☒	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 4.2, Appendix C
☒	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 4.2
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐	Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

☒	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 5.1
☒	Analysis of available capacity in existing public infrastructure.	Section 5.1, Appendix D
☒	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Drawings/Figures
☒	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 5.2
☐	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	N/A
☒	Description of the stormwater management concept with facility locations and descriptions with references and supporting information	Section 5.3
☐	Set-back from private sewage disposal systems.	N/A
☐	Watercourse and hazard lands setbacks.	N/A
☒	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Appendix A
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
☒	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 5.3
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A
☒	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 5.1, 5.3
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	N/A
☐	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	N/A
☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A
☐	Identification of potential impacts to receiving watercourses	N/A
☐	Identification of municipal drains and related approval requirements.	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 5.3
☐	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	N/A
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A
☒	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 6.0
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

☒	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement ct. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	Section 1.2
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐	Changes to Municipal Drains.	N/A
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

☒	Clearly stated conclusions and recommendations	Section 8.0
☐	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	
☐	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

Genavieve Melatti

From: Jamie Batchelor <jamie.batchelor@rvca.ca>
Sent: Thursday, November 29, 2018 9:42 AM
To: Genavieve Melatti
Cc: Steve Merrick
Subject: RE: 811 Gladstone Avenue

Good Morning Genavieve,

I can confirm that if the stormwater is being directed to a combined sewer then additional onsite water quality controls are not required.

Jamie Batchelor, MCIP,RPP
Planner
jamie.batchelor@rvca.ca

Rideau Valley Conservation Authority
3889 Rideau Valley Drive
PO Box 599, Manotick ON K4M 1A5
T 613-692-3571 | 1-800-267-3504 F 613-692-0831 | www.rvca.ca

From: Genavieve Melatti <GMelatti@dsel.ca>
Sent: Thursday, November 08, 2018 2:34 PM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Cc: Steve Merrick <SMerrick@dsel.ca>
Subject: 811 Gladstone Avenue

Good afternoon Jamie,

I wanted to touch base with you regarding a development at 811 Gladstone Avenue shown in the map below.

The development proposes to construct 32 stacked townhomes and a 6-storey apartment building with 15 above ground parking spaces as well as underground parking. Stormwater from site will be discharged the existing 375mm diameter combined sewer within Rochester Avenue.

I wanted to confirm that quality controls would not be required as it will be discharging into a combined sewer.

Please let me know if there is any further information that you might need from me.

Thank you,

Genavieve Melatti
Project Coordinator/ Junior Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 569
email: gmelatti@DSEL.ca

Genavieve Melatti

From: Genavieve Melatti
Sent: Thursday, November 8, 2018 3:55 PM
To: 'Emily.Diamond@ontario.ca'
Cc: Steve Merrick
Subject: 811 Gladstone Avenue - ECA Application Requirement

Good afternoon Emily,

I would like to confirm that an ECA will be required for the contemplated development at 811 Gladstone Avenue.

The proposed development would be discharging into the 375mm combined sewer within Rochester Street. The design will be controlling to the 2-year storm event with a time of concentration of 20 minutes and a runoff coefficient of 0.4.

There is no exemption for this project as per O.Reg. 525/98 as the development would be discharging to a combined sewer.

Please let me know if there is any additional information that you require.

Thank you,

Genavieve Melatti
Project Coordinator/ Junior Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 569
email: gmelatti@DSEL.ca

Genavieve Melatti

From: Genavieve Melatti
Sent: Tuesday, November 13, 2018 12:17 PM
To: Genavieve Melatti
Subject: FW: 811 Gladstone Avenue - Combined Sewer Servicing and Criteria

From: Mottalib, Abdul [mailto:Abdul.Mottalib@ottawa.ca]
Sent: Tuesday, November 13, 2018 11:52 AM
To: Steve Merrick <SMerrick@dsel.ca>
Cc: Wu, John <John.Wu@ottawa.ca>; Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: RE: 811 Gladstone Avenue - Combined Sewer Servicing and Criteria

Hi Steve,

I am the project manager for this site. Please see SWM criteria below for connecting into a combined sewer. For option, two please call me to discuss.

Stormwater Management criteria connecting into the combined sewer system (Quantity control criteria)

- Total (storm +sanitary) allowable release rate will be 2 year pre-development rate.
- C Coefficient of runoff will need to be determined **as per existing conditions** but in no case more than 0.4
- TC =20 minutes or can be calculated ,
- TC should not be less than 10 minute, since the IDF curves become unrealistic less than 10min.
- Any storm events greater than 2 year, up to 100 year, and including 100-year storm event must be detained on site.
- Two separate service laterals (one for sanitary and the other for storm) will be required for a single unit

--

Thanks,

Abdul Mottalib, P. Eng.

From: Wu, John
Sent: November 08, 2018 10:50 AM
To: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: FW: 811 Gladstone Avenue - Combined Sewer Servicing and Criteria

Abdul:
I am not the person who is doing the pre-consultation for this.

John

From: Steve Merrick <SMerrick@dsel.ca>
Sent: Tuesday, November 06, 2018 3:38 PM
To: Wu, John <John.Wu@ottawa.ca>
Cc: Genavieve Melatti <GMelatti@dsel.ca>
Subject: 811 Gladstone Avenue - Combined Sewer Servicing and Criteria

Hi John,

I understand that you were the contact for the above noted site during the pre-consultation. We would like to confirm a few servicing items with you, if you are no longer the contact please forward on the request to the appropriate contact. We are contemplating connecting to the existing 375mm diameter combined sewer on Rochester Street as well as the possibility of connecting to the existing 375mm combined sewer on Balsam Street shown in Option #2 attached. We would like to confirm the combined release rate will be equal to the existing sanitary flow + 2-year storm event at a maximum runoff coefficient of 0.40 and a TC equal to 20 minutes for both potential connection points. Can you also confirm the proposed sanitary flow should be included in the target release rate.

As for the 2 options, we would like to confirm if the City of Ottawa would allow direct connections to be made to the Balsam combined and watermain from the back 2 back townhomes as shown. The benefit of this layout would be to allow us to retain existing trees along Balsam, we would like to pursue this option and want the City's input on the proposal.

Look forward to hearing back from you on the release rates and your thoughts on the 2 servicing options attached.

Thanks in advance,

Steve Merrick, P.Eng.
Project Manager / Intermediate Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 561
cell: (613) 222-7816
email: smerrick@DSEL.ca

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'

Genavieve Melatti

From: Leila Emmrys <lemmrys@hobinarc.com>
Sent: Tuesday, November 13, 2018 12:53 PM
To: Genavieve Melatti
Cc: glorimer@hobinarc.com; Steve Merrick
Subject: Re: 811 Gladstone - FUS Calculations
Attachments: Unit Areas.pdf

Hi Genavieve,

There are 32 units within the stacked townhouses which are broken down as follows: 8 x 4-bedroom, 8 x 3-bedroom, 16 x 2-bedroom
There are 108 units within the 6 storey building broken down as follows: 15 x bachelor, 59 x 1-bedroom, 22 x 2-bedroom and 12 x 3-bedroom.
Total unit count when you include both the stacked towns and the 6 storey building do match the numbers you had listed in your email.
I have attached a spreadsheet with all the area information for each type of suite.

The 6 storey building will be sprinklered and will be of noncombustible construction. The stacks are wood frame and will not be sprinklered.

Let me know if ive missed anything.
Cheers,
Leila

On 11/12/2018 9:29 AM, Genavieve Melatti wrote:

> Good morning Leila and Gord,
>
> I was wondering if you would be able to provide some information required in order to complete the FUS calculations for this project.
>
> Based on the provided site plan, there are to be 32 stacked townhomes and a 6-storey residential building that would include 15 bachelor apartments, 58 1-bedroom, 38 2-bedroom, 20 3-bedroom, and 8 4-bedroom apartments. Can you confirm that these counts are correct and if possible confirm the total floor area for each type of unit as well as townhomes?
>
> Would you be able to please confirm the sprinkler systems for the buildings?
>
> I have included the ISO Guide in which sections 1, 2 and 3 on pages 3 to 10 provides definitions to clarify as well as the section from the City's technical bulletin. Note that ISO refers only to fire-resistive for fire ratings not less than 1-hour. Would you be able to provide the ISO class for each building.

A. *Determine the type of construction.*

- Coefficient *C* in the FUS method is equivalent to coefficient *F* in the ISO method:

Correspondence between FUS and ISO construction coefficients

FUS type of construction	ISO class of construction	Coefficient *C*
Fire-resistive construction	Class 6 (fire resistive)	0.6
	Class 5 (modified fire resistive)	0.6
Non-combustible construction	Class 4 (masonry non-combustible)	0.8
	Class 3 (non-combustible)	0.8
Ordinary construction	Class 2 (joisted masonry)	1.0
Wood frame construction	Class 1 (frame)	1.5

However, the FUS definition of fire-resistive construction is more restrictive than those of ISO construction classes 5 and 6 (modified fire resistive and fire resistive). FUS requires structural members and floors in buildings of fire-resistive construction to have a fire-resistance rating of 3 hours or longer.

- With the exception of fire-resistive construction that is defined differently by FUS and ISO, practitioners can refer to the definitions of the ISO construction classes (and the supporting definitions of the types of materials and assemblies that make up the ISO construction classes) found in the current ISO guide [4] (see Annex i) to help select coefficient *C*.
- To identify the most appropriate type of construction for buildings of mixed construction, the rules included in the current ISO guide [4] can be followed (see Annex i). For a building to be assigned a given classification, the rules require ⅔ (67%) or more of the total wall area and ⅔ (67%) or more of the total floor and roof area of the building to be constructed according to the given construction class or a higher class.
- New residential developments (less than 4 storeys) are predominantly of wood frame construction ($C = 1.5$) or ordinary construction ($C = 1.0$) if exterior walls are of brick or masonry. Residential buildings with exterior walls of brick or masonry veneer and those with less than ⅔ (67%) of their exterior walls made of brick or masonry are considered wood frame construction ($C = 1.5$).

If you have any questions at all please feel free to contact me.

Thank you,

Genavieve Melatti
Project Coordinator/ Junior Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 569
email: gmelatti@DSEL.ca

--
Leila Emmrys

OAA | M.Arch

Hobin Architecture Incorporated
63 Pamilla Street
Ottawa, Ontario
Canada K1S 3K7

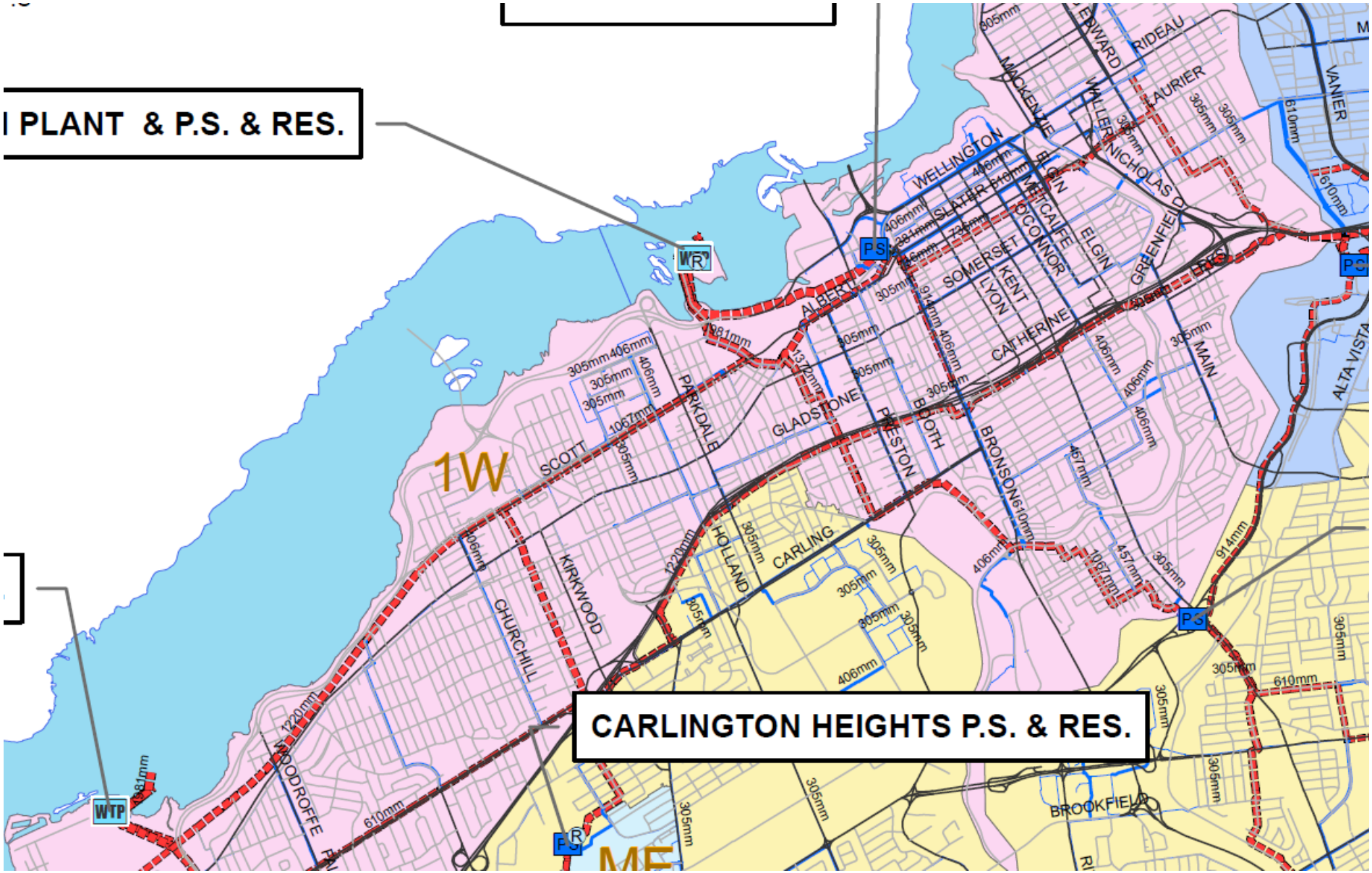
t 613-238-7200 x129
f 613-235-2005
e lemmrys@hobinarc.com

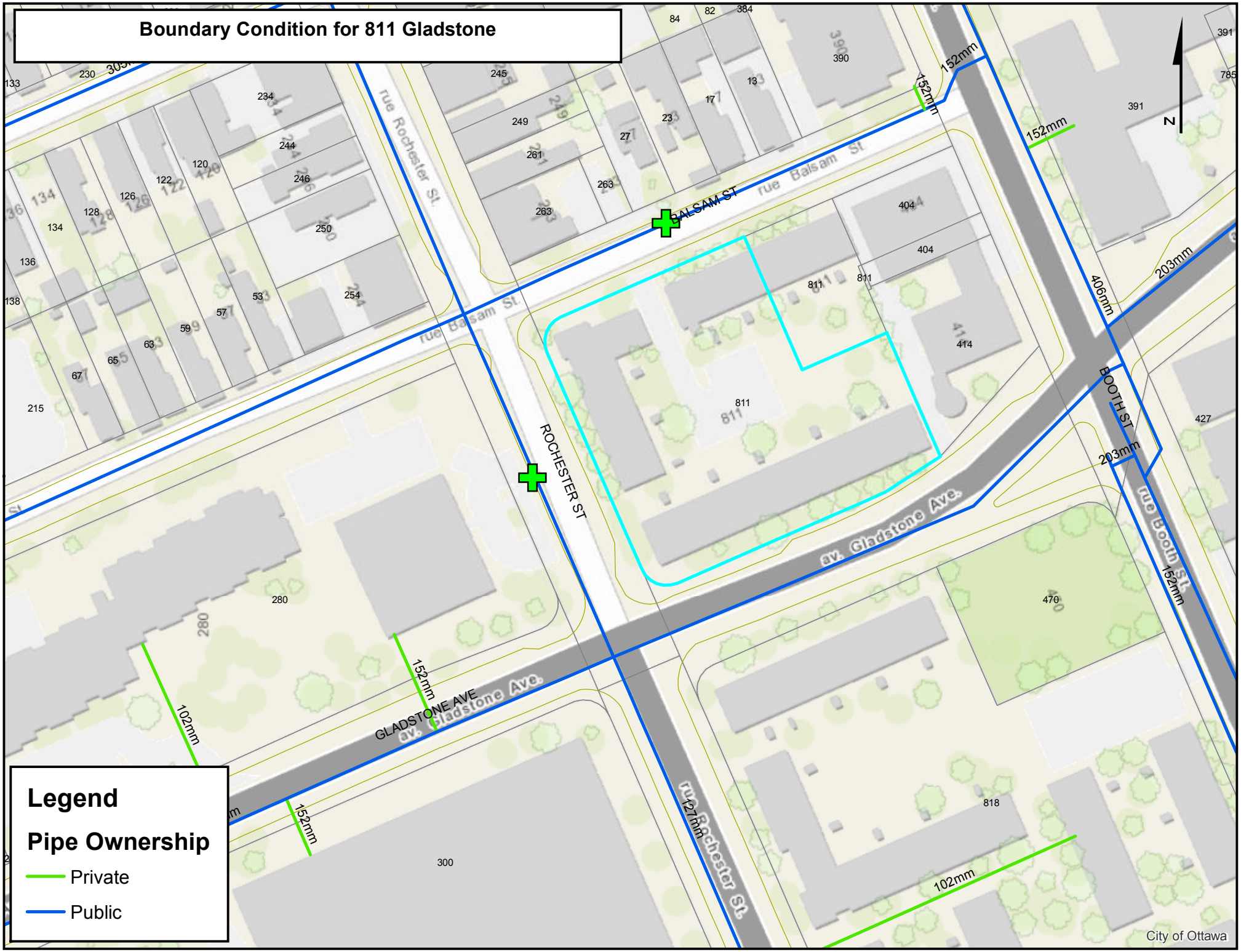
hobinarc.com

APPENDIX B

Water Supply

Pressure Zone Map




Boundary Condition for 811 Gladstone
BALSAM ST
rue Balsam St
ROCHESTER ST
rue Rochester St.
av. Gladstone Ave.
GLADSTONE AVE
BOOTH ST
rue Booth St
811
404
414
280
300
470
818
427
391
152mm
203mm
406mm
102mm
127mm
N
Legend
Pipe Ownership
Private
Public
City of Ottawa

Genavieve Melatti

From: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Sent: Monday, November 19, 2018 3:58 PM
To: Genavieve Melatti
Cc: Mottalib, Abdul
Subject: FW: 811 Gladstone - Boundary Condition Request
Attachments: 811 Gladstone Nov 2018.pdf

Please see below as requested.

--

Thanks,

Abdul Mottalib, P. Eng.

From: ……..
Sent: November 19, 2018 2:17 PM
To: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: RE: 811 Gladstone - Boundary Condition Request

The following are boundary conditions, HGL, for hydraulic analysis at 811 Gladstone (zone 1W) assumed to be connected to the 203mm on Balsam and 203mm on Rochester (see attached PDF for location).

Minimum HGL = 107.4m, same at both connections

Maximum HGL = 115.0m, same at both connections

MaxDay + FireFlow (283 L/s) = 101.0m, same at both connections

HGL has been provided for the higher fire flow since that would govern the design.

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

From: Genavieve Melatti <GMelatti@dsel.ca>
Sent: November 16, 2018 3:37 PM
To: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Cc: Steve Merrick <SMerrick@dsel.ca>
Subject: RE: 811 Gladstone - Boundary Condition Request

Hey Abdul,

In follow up to our phone conversation, to clarify the last line of the boundary condition request, we would like to amend the statement to the below:

- We are looking for the boundary conditions at the two proposed connection points shown.

Please disregard the mention of the existing hydrants.

Thank you,

Genavieve Melatti
Project Coordinator/ Junior Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 569
email: gmelatti@DSEL.ca

From: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Sent: Friday, November 16, 2018 2:42 PM
To: Genavieve Melatti <GMelatti@dsel.ca>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: RE: 811 Gladstone - Boundary Condition Request

Hi Genavieve,

I lefty a message for you on your voice mailbox. Please can you call me to discuss?

--

Thanks,

Abdul Mottalib, P. Eng.

From: Genavieve Melatti <GMelatti@dsel.ca>
Sent: November 13, 2018 1:50 PM
To: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Cc: Steve Merrick <SMerrick@dsel.ca>
Subject: 811 Gladstone - Boundary Condition Request

Good afternoon Abdul,

Would we be able to request boundary conditions for the proposed redevelopment of the existing building at 811 Gladstone Avenue using the following proposed development demands:

1. Location of Service / Street Number: 811 Gladstone Avenue

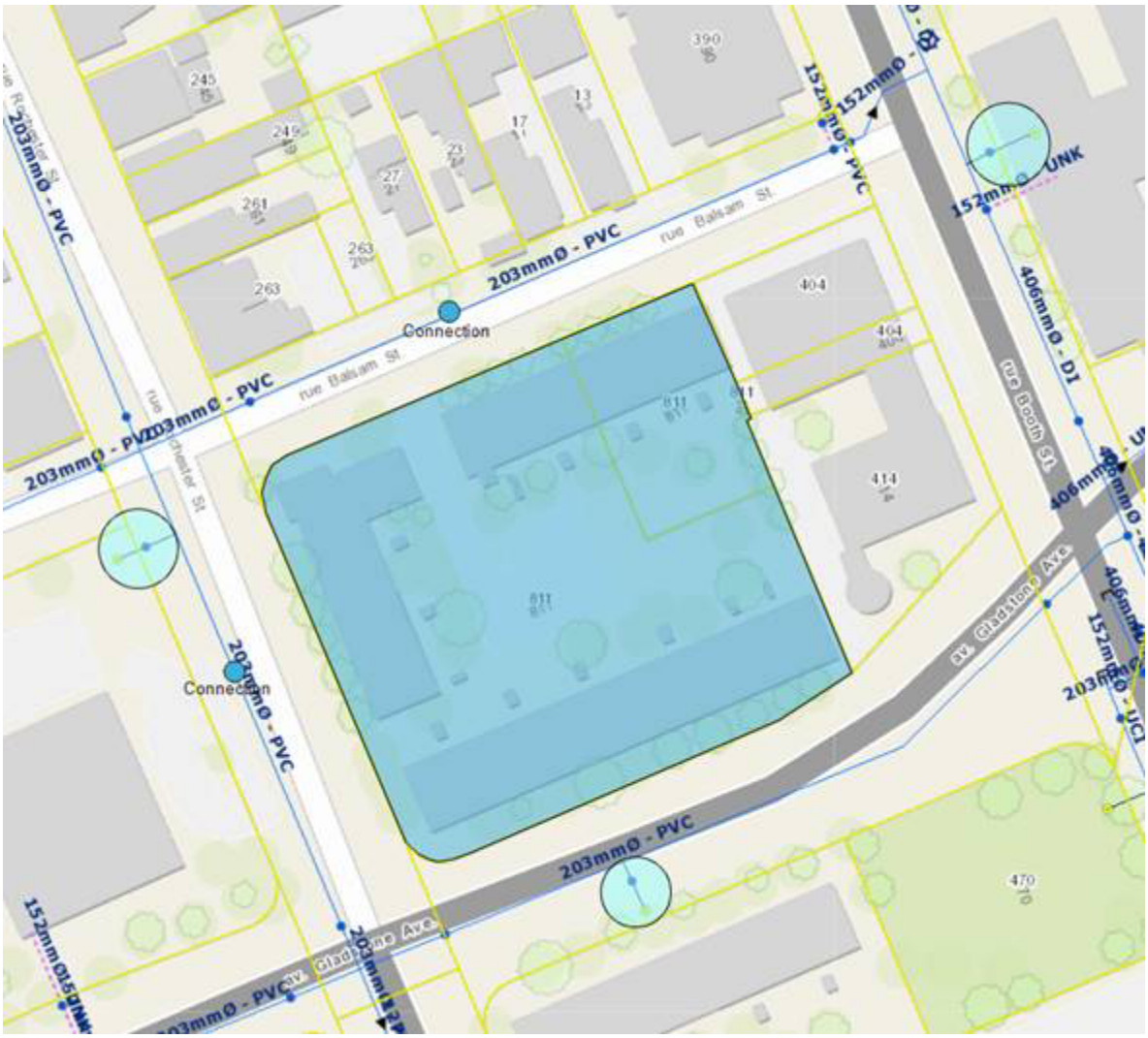
2. Type of development and the fire flow required for the proposed development:

- The proposed development is residential, consisting of 32 stacked townhome units as well as a 6-storey residential building consisting of 15 bachelor apartments, 58 1-bedroom apartments, 38 2-bedroom apartments and 28 3 or 4-bedroom apartments.
- We are proposing a looped connection with one connection to the existing 203mm diameter watermain within Balsam Street and the other to the existing 203mm diameter watermain within Rochester Street.
- The maximum fire flow demand for the proposed development is 17,000L/min for the townhomes that are contemplated along Balsam Street and 14,000L/min for the proposed residential apartment building along Gladstone Avenue. The calculations and parameters used in these calculations are in the attached FUS calculation sheet.
- We are looking for the boundary conditions at the two proposed connection points shown below, as well as the boundary conditions for the existing hydrants shown below.

3.

	L/min	L/s
Avg. Daily	53.7	0.89
Max Day	193.2	3.22
Peak Hour	289.8	4.83

It you have any questions please feel free to contact me.



Thank you,

Genavieve Melatti
Project Coordinator/ Junior Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext. 569
email: gmelatti@DSEL.ca

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811 Gladstone Avenue
Existing Site Conditions
Water Demand

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	1	4
Semi-detached	2.7		0
Townhouse	2.7	25	68
Apartment			0
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Type of Housing	Per/Bed	Beds	Pop
Boarding*	1		0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	68	19.0	13.2	93.3	64.8	140.9	97.8

Institutional / Commercial / Industrial Demand

				Avg. Daily		Max Day		Peak Hour	
Property Type	**Unit Rate**		**Units**	m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Restaurant	125.0	L/seat/d		0.00	0.0	0.0	0.0	0.0	0.0
Commercial floor space**	28,000.0	L/ha/d		0.00	0.0	0.0	0.0	0.0	0.0
Laundry	1,200.0	L/machine/d		0.00	0.0	0.0	0.0	0.0	0.0
School	70	L/student/d		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Light	35,000	L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Heavy	55,000	L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
			Total I/CI Demand	0.0	0.0	0.0	0.0	0.0	0.0
			Total Demand	**19.0**	**13.2**	**93.3**	**64.8**	**140.9**	**97.8**

* Based on a daily demand of 200L/day per person as identified by Appendix 4-A of the Sewer design guidelines
**Assuming a 12 hour commercial operation

811 Gladstone Avenue
Proposed Site Conditions
Water Demand

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4		0
Semi-detached	2.7		0
Townhouse	2.7	32	87
Apartment			0
Bachelor	1.4	15	21
1 Bedroom	1.4	59	83
2 Bedroom	2.1	22	47
3 Bedroom	3.1	12	38
Average	1.8		0

Type of Housing	Per/Bed	Beds	Pop
Boarding*	1		0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	276	77.3	53.7	278.2	193.2	417.3	289.8

Institutional / Commercial / Industrial Demand

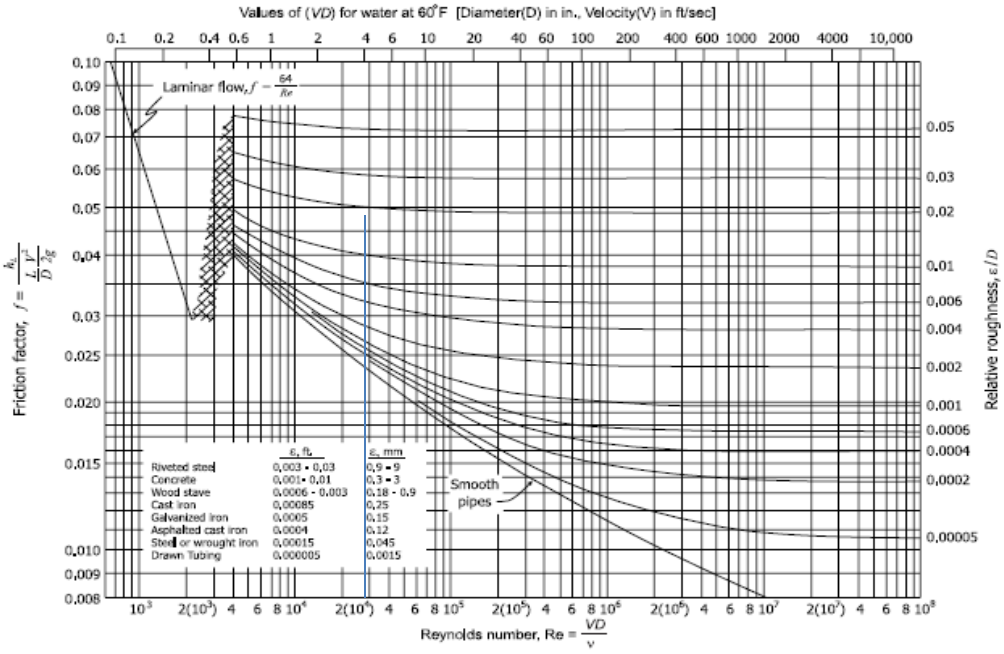
				Avg. Daily		Max Day		Peak Hour	
Property Type	**Unit Rate**		**Units**	m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Restaurant	125.0	L/seat/d		0.00	0.0	0.0	0.0	0.0	0.0
Commercial floor space**	28,000.0	L/ha/d		0.00	0.0	0.0	0.0	0.0	0.0
Laundry	1,200.0	L/machine/d		0.00	0.0	0.0	0.0	0.0	0.0
School	70	L/student/d		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Light	35,000	L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Heavy	55,000	L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
			Total I/CI Demand	0.0	0.0	0.0	0.0	0.0	0.0
			Total Demand	**77.3**	**53.7**	**278.2**	**193.2**	**417.3**	**289.8**

* Based on a daily demand of 200L/day per person as identified by Appendix 4-A of the Sewer design guidelines
**Assuming a 12 hour commercial operation

811 Gladstone Avenue
Proposed Site Conditions
Water Demand

Estimated Head Loss per Darcy-Weisbach

Service Size	150	mm	0.5ft
Service Length	82.55	m	
Peak Demand	4.83	L/s	
Relative Roughness	0.001		
Kinematic Viscosity @ 4^{O}C, v	0.00000151	m^2/s	
Velocity, V	0.27	m/s	
Re	27,151		



Friction Factor, f 0.028 (From Moody Diagram)

Head Loss

$$h_f = \frac{fL}{D}\frac{V^2}{2g}$$

h_f 0.06 m H_2O

h_f 0.6 kPa

811 Gladstone Avenue
Proposed Site Conditions
Water Demand

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$$F = 220C\sqrt{A}$$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Wood Frame

C	1.5		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1378.7	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	12253.2	L/min	
	12000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%	
Fire Flow	**10200.0**	**L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered	0%	
Reduction	**0**	**L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC	
N	Wood Frame	10.1m-20m	30.5	2	61	14%	
S	Wood Frame	10.1m-20m	30.5	6	183	15%	
E	Wood Frame	3.1m-10m	13.6	3	41	18%	
W	Wood Frame	30.1m-45m	13.6	21	286	5%	
		% Increase				**52%**	*value not to exceed 75%*

Increase	**5304.0**	**L/min**

Lw = Length of the Exposed Wall
Ha = number of storeys of the adjacent structure
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	15504.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section*
	16000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _Hobin Architecture_.
-Calculations based on Fire Underwriters Survey - Part II

811 Gladstone Avenue
Proposed Site Conditions
Water Demand

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Wood Frame

C	1.5		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1378.7	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	12253.2	L/min	
	12000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%
Fire Flow	**10200.0 L/min**

3. Reduction for Sprinkler Protection

Non-Sprinklered	0%
Reduction	**0 L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC
N	Wood Frame	10.1m-20m	30.5	2	61	14%
S	Wood Frame	10.1m-20m	30.5	6	183	15%
E	Wood Frame	3.1m-10m	13.6	2.5	34	18%
W	Wood Frame	3.1m-10m	13.6	3	41	18%
		% Increase				**65%** *value not to exceed 75%*

Increase	**6630.0 L/min**

Lw = Length of the Exposed Wall
Ha = number of storeys of the adjacent structure
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	16830.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	17000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _Hobin Architecture_.
-Calculations based on Fire Underwriters Survey - Part II

811 Gladstone Avenue
Proposed Site Conditions
Water Demand

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$$F = 220C\sqrt{A}$$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	8903.1	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	16606.7	L/min	
	17000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%	
Fire Flow	**14450.0**	**L/min**

3. Reduction for Sprinkler Protection

Sprinklered - Supervised	-50%	
Reduction	**-7225**	**L/min**

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC	
N	Non-Combustible	10.1m-20m	66.5	3	200	15%	
S	Non-Combustible	20.1m-30m	66.5	2	133	10%	
E	Non-Combustible	3.1m-10m	27	2.5	68	19%	
W	Non-Combustible	30.1m-45m	27	21	567	5%	
		% Increase				**49%**	*value not to exceed 75%*

Increase	**7080.5**	**L/min**

Lw = Length of the Exposed Wall
Ha = number of storeys of the adjacent structure
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

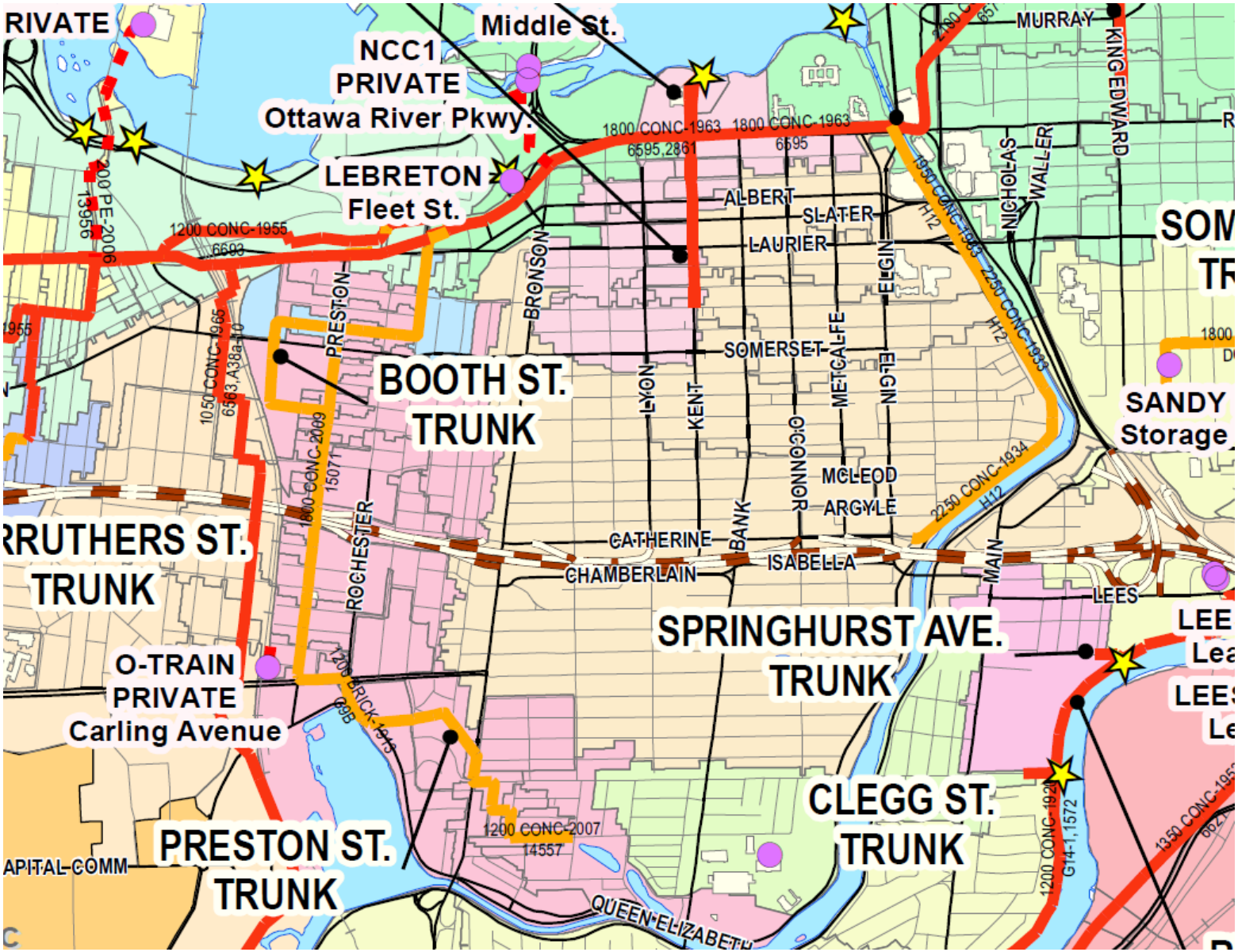
Fire Flow	14305.5	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section*
	14000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _Hobin Architecture_.
-Calculations based on Fire Underwriters Survey - Part II

APPENDIX C

Wastewater Collection

Trunk Sanitary Sewers and Collection Areas Map



811 Gladstone Avenue
Existing Conditions

Existing Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 0.472 **ha**

Extraneous Flow Allowances

Infiltration / Inflow	**0.16**	**L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4	1	4
Semi-detached and duplex	2.7		0
Duplex	2.3		0
Townhouse	2.7	25	68
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**72**	
Average Domestic Flow	**0.23**	**L/s**
Peaking Factor	**3.62**	
Peak Domestic Flow	**0.85**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate		No. of Units	Avg Wastewater (L/s)
Commercial floor space*	28,000	L/ha/d		0.00
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Industrial - Light**	35,000	L/gross ha/d		0.00
Industrial - Heavy**	55,000	L/gross ha/d		0.00

Average I/C/I Flow	**0.00**
Peak Institutional / Commercial Flow	0.00
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**0.00**

** assuming a 12 hour commercial operation*

*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**0.23**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**0.85**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**1.00**	**L/s**

811 Gladstone Avenue
Proposed Development

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2012

Site Area 0.472 **ha**

Extraneous Flow Allowances

Infiltration / Inflow	**0.16**	**L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7	32	87
			0
Apartment			
Bachelor	1.4	15	21
1 Bedroom	1.4	59	83
2 Bedroom	2.1	22	47
3 Bedroom	3.1	12	38
Average	1.8		0

Total Pop	**276**	
Average Domestic Flow	**0.89**	**L/s**
Peaking Factor	**3.47**	
Peak Domestic Flow	**3.11**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Dining room	125 L/seat/d		0.00
Commercial floor space	28,000.0 L/ha/d		0.00
Water Closets**	150 L/hr		0.00
Laundry Facility	1,200 L/unit/d		0.00

Average I/C/I Flow	**0.00**
Peak Institutional / Commercial Flow	0.00
Peak I/C/I Flow	**0.00**

Total Estimated Average Dry Weather Flow Rate	**0.89**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**3.11**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**3.26**	**L/s**

** Water closets demand of 150 L/hour from Appendix 4-A of the Sewer design guidelines, assuming a 12 hour operation

APPENDIX D

Stormwater Management

811 Gladstone Avenue
Existing Conditions

Estimated Peak Stormwater Flow Rate
City of Ottawa Sewer Design Guidelines, 2012

Existing Drainage Charateristics From Internal Site

Area	0.472	ha
C	0.68	Rational Method runoff coefficient
L	64.41	m
Up Elev	66.66	m
Dn Elev	65.38	m
Slope	2.0	%
Tc	10.00	min

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$ 4.11

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	76.8	104.2	178.6	mm/hr
Q	68.5	92.89	198.99	L/s

811 Gladstone Avenue
Proposed Development
Roof Control Underground Storage

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area	0.472	ha	
C	0.40	Rational Method runoff coefficient	
t_c	10.0	min	
	2-year		
i	76.8	mm/hr	
Q	40.3	L/s	
Ex. Sanitary Flow Total Combined	0.85	L/s	*Based on an assumption of 26 existing units, dry weather release.
Allowable Release	**41.1**	**L/s**	**<---- 2-Year Release (27.3 L/s) + Ex. Sanitary Flow (1.06 L/s)**
Proposed Sanitary Total Allowable Stormwater Release	3.11	L/s	*Based on an assumption of 171 proposed units.
	38.0	**L/s**	**<---- Total Combined Release (28.3 L/s) - Proposed Sanitary Flow (4.97 L/s)**

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area	0.08	ha	
C	0.43	Rational Method runoff coefficient	

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10.0	104.2	9.3	9.3	0.0	0.0	178.6	20.0	20.0	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Roof Storage Apartment Building

Building ID	BLDG3		
Roof Area	0.160	ha	
Avail Storage Area	0.152		
C	0.90	Rational Method runoff coefficient	*Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*
t_c	10	min, tc at outlet without restriction	

Estimated Number of Roof Drains

Building Length	66	
Building Width	22	
Number of Drains	11	
m^2 / Drain	138.2	max 232.25m^2/notch as recommended by Zurn for Ottawa

Roof Top Rating Curve per Zurn Model Z-105-5

d (m)	A (m^2)	V_{acc} (m^3)	V_{avail} (m^3)	Q_{notch} (L/s)	Q_{roof} (L/s)	$V_{drawdown}$ (hr)
0.000	0	0.0	0.0	0.00	0.00	0.00
0.025	95.0	0.8	0.8	0.38	4.18	0.05
0.050	380.0	5.5	6.3	0.77	8.47	0.23
0.075	855.0	15.0	21.4	1.14	12.54	0.57
0.100	1520.0	29.3	50.7	1.52	16.72	1.05
0.125	1520.0	38.0	88.7	1.90	20.90	1.56
0.150	1520.0	38.0	126.7	2.28	25.08	1.98

* Assumes one notch opening per drain, assumes maximum slope of 10cm

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	41.7	12.0	29.7	17.8	178.6	79.4	15.9	63.5	38.1
20	70.3	28.1	12.0	16.1	19.3	120.0	53.3	15.9	37.4	44.9
30	53.9	21.6	12.0	9.6	17.2	91.9	40.8	15.9	24.9	44.9
40	44.2	17.7	12.0	5.7	13.6	75.1	33.4	15.9	17.5	42.0
50	37.7	15.1	12.0	3.1	9.2	64.0	28.4	15.9	12.5	37.6
60	32.9	13.2	12.0	1.2	4.3	55.9	24.8	15.9	8.9	32.2
70	29.4	11.7	11.7	0.0	0.0	49.8	22.1	15.9	6.2	26.2
80	26.6	10.6	10.6	0.0	0.0	45.0	20.0	15.9	4.1	19.7
90	24.3	9.7	9.7	0.0	0.0	41.1	18.3	15.9	2.4	12.8
100	22.4	9.0	9.0	0.0	0.0	37.9	16.8	15.9	1.0	5.7
110	20.8	8.3	8.3	0.0	0.0	35.2	15.6	15.6	0.0	0.0
120	19.5	7.8	7.8	0.0	0.0	32.9	14.6	14.6	0.0	0.0
130	18.3	7.3	7.3	0.0	0.0	30.9	13.7	13.7	0.0	0.0
140	17.3	6.9	6.9	0.0	0.0	29.2	13.0	13.0	0.0	0.0
150	16.4	6.5	6.5	0.0	0.0	27.6	12.3	12.3	0.0	0.0
160	15.6	6.2	6.2	0.0	0.0	26.2	11.7	11.7	0.0	0.0
170	14.8	5.9	5.9	0.0	0.0	25.0	11.1	11.1	0.0	0.0
180	14.2	5.7	5.7	0.0	0.0	23.9	10.6	10.6	0.0	0.0
190	13.6	5.4	5.4	0.0	0.0	22.9	10.2	10.2	0.0	0.0
200	13.0	5.2	5.2	0.0	0.0	22.0	9.8	9.8	0.0	0.0

5-year Q_{roof}	**11.99 L/s**	**100-year Q_{roof}**	**15.90 L/s**
5-year Max. Storage Required	**19.3 m^3**	**100-year Max. Storage Required**	**44.9 m^3**
5-year Storage Depth	**0.072 m**	**100-year Storage Depth**	**0.095 m**
5-year Estimated Drawdown Time	**0.52 hr**	**00-year Estimated Drawdown Time**	**0.96 hr**

811 Gladstone Avenue
Proposed Development
Roof Control Underground Storage

Estimated Roof Storage Townhomes 1

Building ID	TH1	
Roof Area	0.040	ha
Avail Storage Area	0.038	
C	0.90	Rational Method runoff coefficient
t_c	10	min, tc at outlet without restriction

Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations

Estimated Number of Roof Drains

Building Length	30	
Building Width	13	
Number of Drains	3	
m^2 / Drain	126.7	max 232.25m^2/notch as recommended by Zurn for Ottawa

Roof Top Rating Curve per Zurn Model Z-105-5

d	A	V_{acc}	V_{avail}	Q_{notch}	Q_{roof}	$V_{drawdown}$
(m)	(m^2)	(m^3)	(m^3)	(L/s)	(L/s)	(hr)
0.000	0	0.0	0.0	0.00	0.00	0.00
0.025	23.8	0.2	0.2	0.38	1.14	0.05
0.050	95.0	1.4	1.6	0.77	2.31	0.21
0.075	213.8	3.8	5.3	1.14	3.42	0.52
0.100	380.0	7.3	12.7	1.52	4.56	0.97
0.125	380.0	9.5	22.2	1.90	5.70	1.43
0.150	380.0	9.5	31.7	2.28	6.84	1.82

* Assumes one notch opening per drain, assumes maximum slope of 10cm

	5-year					100-year				
t_c	i	Q_{actual}	$Q_{release}$	Q_{stored}	V_{stored}	i	Q_{actual}	$Q_{release}$	Q_{stored}	V_{stored}
(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)
10	104.2	10.4	3.2	7.2	4.3	178.6	19.8	4.3	15.6	9.3
15	83.6	8.4	3.2	5.1	4.6	142.9	15.9	4.3	11.6	10.4
20	70.3	7.0	3.2	3.8	4.6	120.0	13.3	4.3	9.0	10.9
25	60.9	6.1	3.2	2.9	4.3	103.8	11.5	4.3	7.3	10.9
30	53.9	5.4	3.2	2.2	3.9	91.9	10.2	4.3	5.9	10.7
35	48.5	4.9	3.2	1.6	3.4	82.6	9.2	4.3	4.9	10.3
40	44.2	4.4	3.2	1.2	2.9	75.1	8.3	4.3	4.1	9.8
45	40.6	4.1	3.2	0.9	2.3	69.1	7.7	4.3	3.4	9.2
50	37.7	3.8	3.2	0.6	1.7	64.0	7.1	4.3	2.8	8.5
55	35.1	3.5	3.2	0.3	1.0	59.6	6.6	4.3	2.3	7.7
60	32.9	3.3	3.2	0.1	0.3	55.9	6.2	4.3	1.9	7.0
65	31.0	3.1	3.1	0.0	0.0	52.6	5.8	4.3	1.6	6.1
70	29.4	2.9	2.9	0.0	0.0	49.8	5.5	4.3	1.3	5.3
75	27.9	2.8	2.8	0.0	0.0	47.3	5.3	4.3	1.0	4.4
80	26.6	2.7	2.7	0.0	0.0	45.0	5.0	4.3	0.7	3.5
85	25.4	2.5	2.5	0.0	0.0	43.0	4.8	4.3	0.5	2.5
90	24.3	2.4	2.4	0.0	0.0	41.1	4.6	4.3	0.3	1.6
95	23.3	2.3	2.3	0.0	0.0	39.4	4.4	4.3	0.1	0.6
100	22.4	2.2	2.2	0.0	0.0	37.9	4.2	4.2	0.0	0.0
105	21.6	2.2	2.2	0.0	0.0	36.5	4.1	4.1	0.0	0.0

5-year Q_{roof}	**3.21 L/s**	**100-year Q_{roof}**	**4.28 L/s**
5-year Max. Storage Required	**4.6 m^3**	**100-year Max. Storage Required**	**10.9 m^3**
5-year Storage Depth	**0.070 m**	**100-year Storage Depth**	**0.094 m**
5-year Estimated Drawdown Time	**0.46 hr**	**00-year Estimated Drawdown Time**	**0.86 hr**

811 Gladstone Avenue
Proposed Development
Roof Control Underground Storage

Estimated Roof Storage Townhomes 2

Building ID	TH2		
Roof Area	0.040	ha	
Avail Storage Area	0.038		
C	0.90	Rational Method runoff coefficient	*Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*
t_c	10	min, tc at outlet without restriction	

Estimated Number of Roof Drains

Building Length	30	
Building Width	13	
Number of Drains	3	
m^2 / Drain	126.7	max 232.25m^2/notch as recommended by Zurn for Ottawa

Roof Top Rating Curve per Zurn Model Z-105-5

d	A	V_{acc}	V_{avail}	Q_{notch}	Q_{roof}	$V_{drawdown}$
(m)	(m^2)	(m^3)	(m^3)	(L/s)	(L/s)	(hr)
0.000	0	0.0	0.0	0.00	0.00	0.00
0.025	23.8	0.2	0.2	0.38	1.14	0.05
0.050	95.0	1.4	1.6	0.77	2.31	0.21
0.075	213.8	3.8	5.3	1.14	3.42	0.52
0.100	380.0	7.3	12.7	1.52	4.56	0.97
0.125	380.0	9.5	22.2	1.90	5.70	1.43
0.150	380.0	9.5	31.7	2.28	6.84	1.82

* Assumes one notch opening per drain, assumes maximum slope of 10cm

	5-year					100-year				
t_c	i	Q_{actual}	$Q_{release}$	Q_{stored}	V_{stored}	i	Q_{actual}	$Q_{release}$	Q_{stored}	V_{stored}
(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)	(mm/hr)	(L/s)	(L/s)	(L/s)	(m^3)
10	104.2	10.4	3.2	7.2	4.3	178.6	19.8	4.3	15.6	9.3
15	83.6	8.4	3.2	5.1	4.6	142.9	15.9	4.3	11.6	10.4
20	70.3	7.0	3.2	3.8	4.6	120.0	13.3	4.3	9.0	10.9
25	60.9	6.1	3.2	2.9	4.3	103.8	11.5	4.3	7.3	10.9
30	53.9	5.4	3.2	2.2	3.9	91.9	10.2	4.3	5.9	10.7
35	48.5	4.9	3.2	1.6	3.4	82.6	9.2	4.3	4.9	10.3
40	44.2	4.4	3.2	1.2	2.9	75.1	8.3	4.3	4.1	9.8
45	40.6	4.1	3.2	0.9	2.3	69.1	7.7	4.3	3.4	9.2
50	37.7	3.8	3.2	0.6	1.7	64.0	7.1	4.3	2.8	8.5
55	35.1	3.5	3.2	0.3	1.0	59.6	6.6	4.3	2.3	7.7
60	32.9	3.3	3.2	0.1	0.3	55.9	6.2	4.3	1.9	7.0
65	31.0	3.1	3.1	0.0	0.0	52.6	5.8	4.3	1.6	6.1
70	29.4	2.9	2.9	0.0	0.0	49.8	5.5	4.3	1.3	5.3
75	27.9	2.8	2.8	0.0	0.0	47.3	5.3	4.3	1.0	4.4
80	26.6	2.7	2.7	0.0	0.0	45.0	5.0	4.3	0.7	3.5
85	25.4	2.5	2.5	0.0	0.0	43.0	4.8	4.3	0.5	2.5
90	24.3	2.4	2.4	0.0	0.0	41.1	4.6	4.3	0.3	1.6
95	23.3	2.3	2.3	0.0	0.0	39.4	4.4	4.3	0.1	0.6
100	22.4	2.2	2.2	0.0	0.0	37.9	4.2	4.2	0.0	0.0
105	21.6	2.2	2.2	0.0	0.0	36.5	4.1	4.1	0.0	0.0

5-year Q_{roof}	**3.21 L/s**	**100-year Q_{roof}**	**4.28 L/s**
5-year Max. Storage Required	**4.6 m^3**	**100-year Max. Storage Required**	**10.9 m^3**
5-year Storage Depth	**0.070 m**	**100-year Storage Depth**	**0.094 m**
5-year Estimated Drawdown Time	**0.46 hr**	**00-year Estimated Drawdown Time**	**0.86 hr**

811 Gladstone Avenue
Proposed Development
Roof Control Underground Storage

Estimated Post Development to UG Storage

Area ID A1

Available Sub-surface Storage
Maintenance Structures

ID	STM101A	STM102	DCB1	
Structure Dia./Area (mm/mm^2)	1200	1200	1220	
T/L*	65.28	65.31	65.22	
INV	62.70	63.48	62.91	
Depth	2.58	1.83	2.31	
$V_{structure}$ (m^3)	2.9	2.1	1.7	

Sewers

ID	150mm	250mm	300mm	375mm	450mm	525mm	750mm	825mm	U/G STORG.
Storage Pipe Dia (mm)	150	250	300	0	0	0	0	0	
L (m)		38.5	0	0	10	10	10	10	
V_{sewer} (m^3)	0.0	1.9	0.0	0.0	0.0	0.0	0.0	0.0	92.0

*Top of lid or max ponding elevation = 65.31

Total Subsurface Storage (m^3) 100.6

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	Ponding	h_o	delta d	V*	V_{acc}**	$Q_{release}$†	$V_{drawdown}$
	(m)	(m^2)	(m)	(m)	(m^3)	(m^3)	(L/s)	(hr)
Orifice INV	62.70	-	0.00			0.0	0.0	0.00
UG Storage INV	64.17	-	1.47	1.47	4.8	4.8	11.5	0.12
UG Storage Spring Line	64.74	-	2.04	0.57	47.9	52.7	13.9	1.05
Top of UG Storage/Max Ponding	65.31	-	2.61	0.57	47.9	100.6	15.5	1.80

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate per Manufacturer flow rate vs head graph Tempest LMF 105 flow curves

Orifice Location **STM101 Ipex LMF 105**
Total Area 0.15 ha
C 0.61 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}‡ (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	45.4	11.9	33.5	20.1	178.6	82.3	15.5	66.8	40.1
15	83.6	40.1	11.9	28.1	25.3	142.9	70.8	15.5	55.3	49.7
20	70.3	36.6	11.9	24.7	29.6	120.0	63.3	15.5	47.8	57.4
25	60.9	34.2	11.9	22.3	33.4	103.8	58.1	15.5	42.6	63.9
30	53.9	32.4	11.9	20.5	36.8	91.9	54.2	15.5	38.7	69.7
35	48.5	31.0	11.9	19.1	40.0	82.6	51.2	15.5	35.7	75.0
40	44.2	29.9	11.9	17.9	43.0	75.1	48.8	15.5	33.3	79.9
45	40.6	28.7	11.9	16.8	45.3	69.1	46.8	15.5	31.3	84.6
50	37.7	26.8	11.9	14.9	44.6	64.0	45.2	15.5	29.7	89.0
55	35.1	25.2	11.9	13.3	43.9	59.6	43.8	15.5	28.3	93.3
60	32.9	23.9	11.9	12.0	43.2	55.9	42.6	15.5	27.1	97.4
65	31.0	22.8	11.9	10.9	42.4	52.6	41.3	15.5	25.8	100.5
70	29.4	21.6	11.9	9.7	40.6	49.8	39.3	15.5	23.8	100.0
75	27.9	20.4	11.9	8.5	38.2	47.3	37.6	15.5	22.1	99.5
80	26.6	19.4	11.9	7.4	35.7	45.0	36.1	15.5	20.6	98.9
85	25.4	18.4	11.9	6.5	33.1	43.0	34.7	15.5	19.3	98.2
90	24.3	17.6	11.9	5.7	30.5	41.1	33.5	15.5	18.0	97.4
95	23.3	16.8	11.9	4.9	27.9	39.4	32.5	15.5	17.0	96.6
100	22.4	16.1	11.9	4.2	25.2	37.9	31.5	15.5	16.0	95.8
105	21.6	15.5	11.9	3.6	22.5	36.5	30.4	15.5	14.9	94.1

‡ includes flow from drainage areas A1, BLDG1, TH1 and TH2. Drainage boundaries can be found in drawing ***SWM-1.***

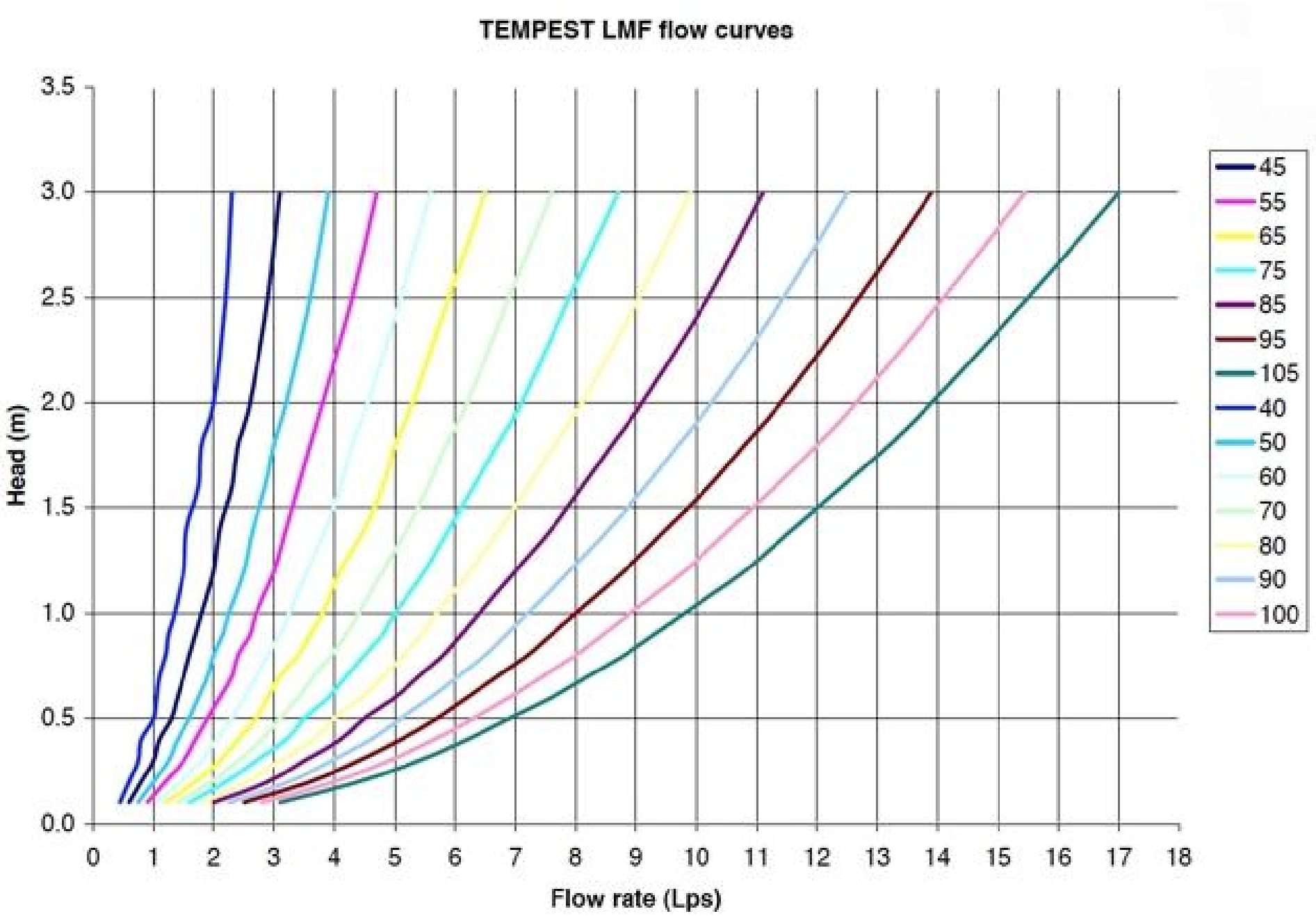
5-year $Q_{attenuated}$ **11.94 L/s** **100-year $Q_{attenuated}$** **15.50 L/s**
5-year Max. Storage Required **45.3 m^3** **100-year Max. Storage Required** **100.5 m^3**
Est. 5-year Storage Elevation **64.45 m** **Est. 100-year Storage Elevation** **65.31 m**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Required Storage (m^3)	100-Year Release Rate (L/s)	100-Year Required Storage (m^3)	100-Year Available Storage (m^3)
Unattenuated Areas	9.3	0.0	20.0	0.0	0.0
Roof Storage Apt.	12.0	19.3	15.9	44.9	126.7
Roof Storage Townhomes 1	3.2	4.6	4.3	10.9	31.7
Roof Storage Townhomes 2	3.2	4.6	4.3	10.9	31.7
Attenutated Areas	11.9	45.3	15.5	100.5	100.6
Sanitary Flow	3.1	0.0	3.1	0.0	0.0
Total	**24.4**	**73.9**	**38.6**	**167.2**	**290.6**
Allowable Combined			**41.1**		

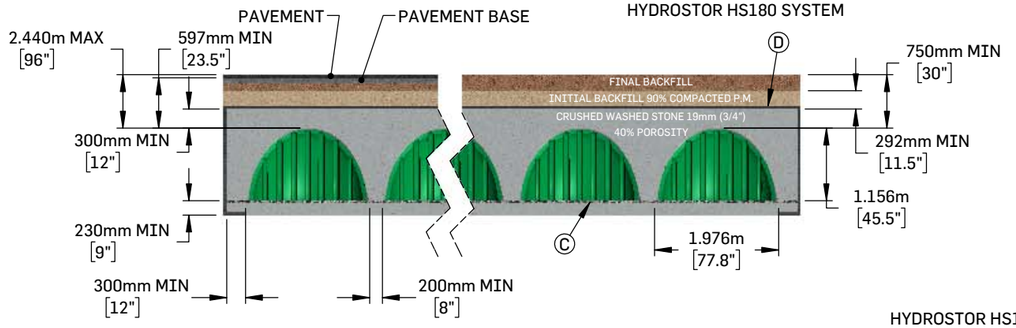
811 Gladstone Avenue
Existing Conditions

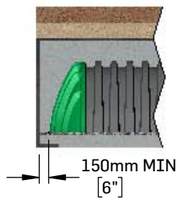
										Sewer Data								
Area ID	**Up**	**Down**	**Area**	**C**	**Indiv AxC**	**Acc AxC**	**T_C**	**I**	**Q**	**DIA**	**Slope**	**Length**	**$A_{hydraulic}$**	**R**	**Velocity**	**Qcap**	**Time Flow**	**Q / Q full**
			(ha)	**(-)**			**(min)**	**(mm/hr)**	**(L/s)**	**(mm)**	**(%)**	**(m)**	**(m^2)**	**(m)**	**(m/s)**	**(L/s)**	**(min)**	**(-)**
A1, BLDG 3	STM102	STM101A	0.39	0.79	0.31	0.31	10.0	76.8	65.7	250	2.90	33.8	0.049	0.063	2.06	101.3	0.3	0.65
	STM101A	STM101			0.00	0.31	10.3	75.8	64.8	250	3.50	0.6	0.049	0.063	2.27	111.3	0.0	0.58
	STM101	STM100			0.00	0.31	10.3	75.8	64.8	250	3.50	10.8	0.049	0.063	2.27	111.3	0.1	0.58


TEMPEST LMF flow curves
Head (m)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
Flow rate (Lps)
45
55
65
75
85
95
105
40
50
60
70
80
90
100

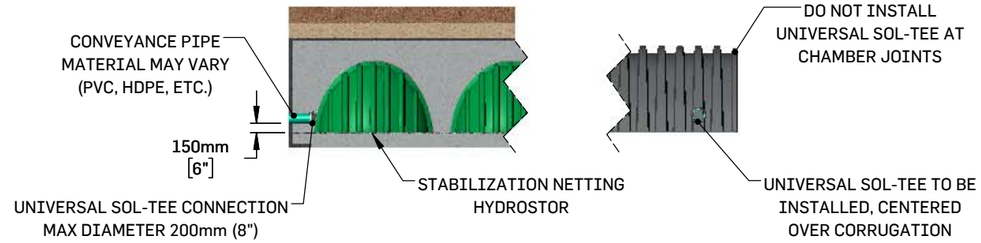
SOLENO HYDROSTOR HS180 SYSTEM

RECOMMENDED INSTALLATION OF HYDROSTOR HS180 SYSTEM

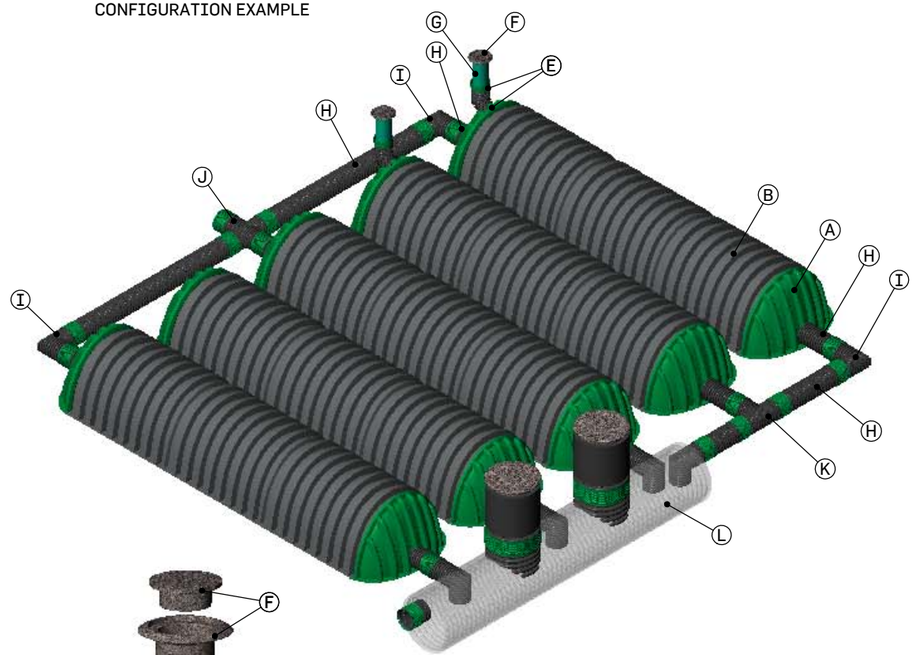


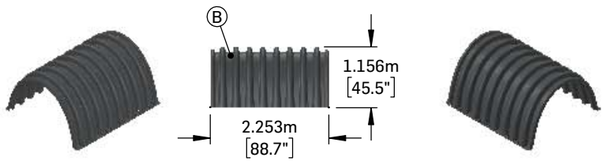


LATERAL UNIVERSAL SOL-TEE DETAIL

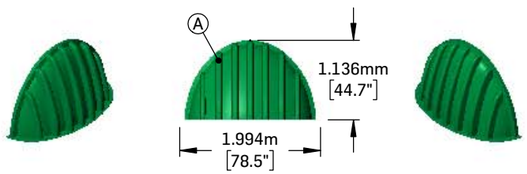


HYDROSTOR HS180 CONFIGURATION EXAMPLE

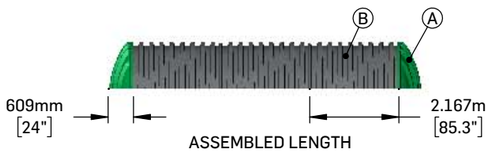




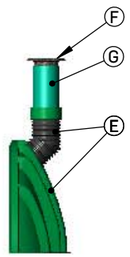
HYDROSTOR CHAMBER HS180



HYDROSTOR END CAP HS180



ASSEMBLED LENGTH



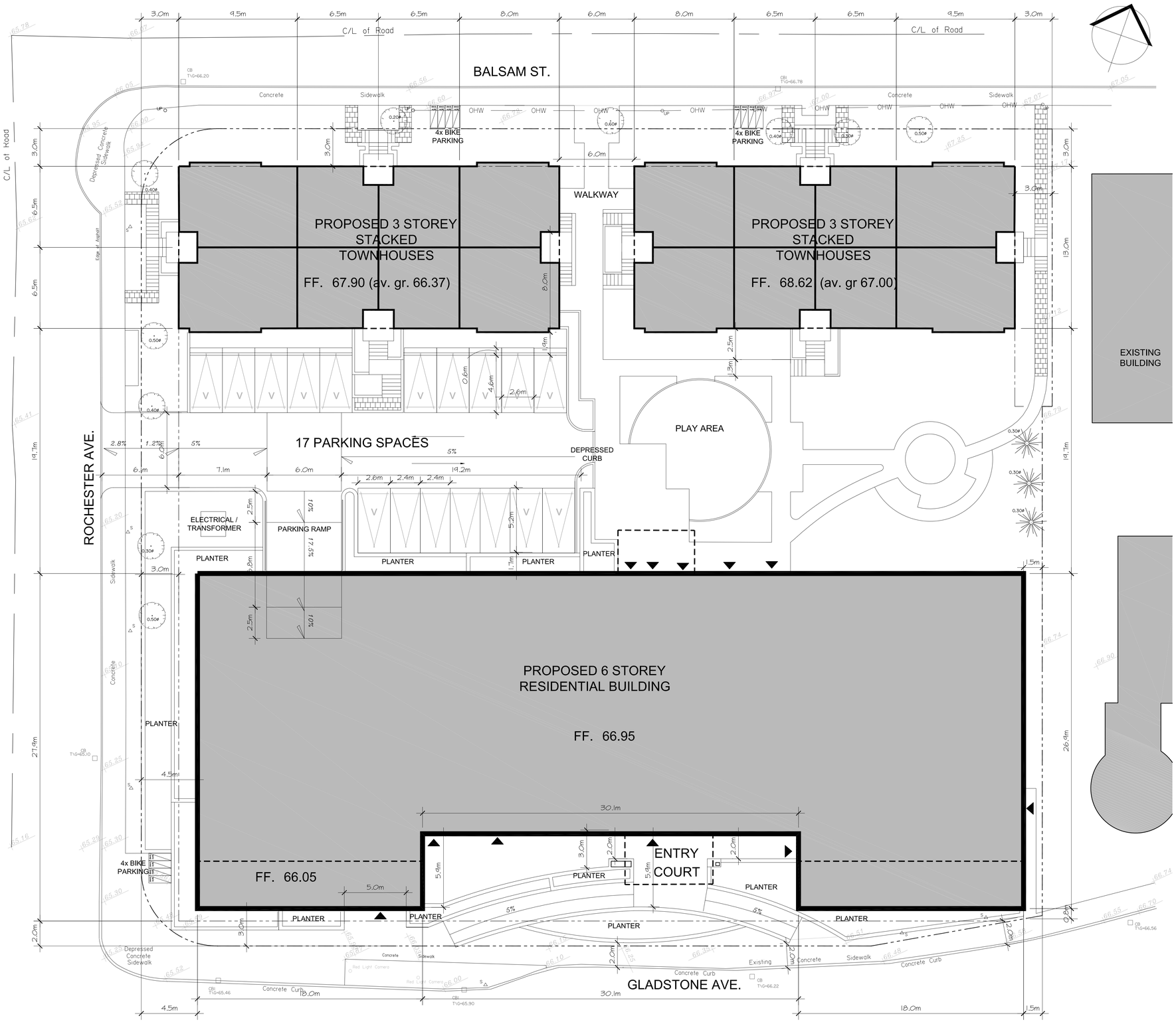
HYDROSTOR END CAP HS180 WITH WELDED ELBOW SOLFLO MAX 250mm (10") FOR ACCESS WELL

ADJUSTABLE FRAME AND COVER 250mm (10")

PART	DESCRIPTION
A	HYDROSTOR END CAP HS180
B	HYDROSTOR CHAMBER HS180
C	STABILIZATION NETTING HYDROSTOR
D	SOLENO TX-90 SEPARATION NONWOVEN GEOTEXTILE, ABOVE AND ON THE SIDES
E	HYDROSTOR END CAP HS180 WITH WELDED ELBOW SOLFLO MAX 250mm (10") FOR ACCESS WELL
F	ADJUSTABLE FRAME AND COVER 250mm (10")
G	PVC PIPE ACCESS WELL 250mm (10") (PROVIDED BY OTHERS)
H	STD LENGTH 6m (236") SOLFLO MAX 300mm (12")
I	ELBOW SOLFLO MAX 300mm (12")
J	CROSS SOLFLO MAX 300mm (12")
K	TEE SOLFLO MAX 300mm (12")
L	PRETREATEMENT UNIT

1. INSTALLATION MUST BE MADE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
2. SYSTEM IS DESIGNED TO WITHSTAND TRAFFIC LOAD CSA CL-625 AND AASHTO H-20.
3. HS180 CHAMBERS MUST BE MINIMALLY BACKFILLED WITH 300mm (12") OF CRUSHED STONE AND 292mm (11.5") OF GRANULAR MATERIAL COMPACTED AT 90% P.M.
4. HYDROSTOR GEOGRID FOR FOUNDATION STABILIZATION IS CONSIDERED UNDER ALL THE CHAMBERS.

DRAWINGS / FIGURES



PROJECT INFORMATION

ZONING BY-LAW 2008-250	
(City of Ottawa)	TM & R4A
SITE AREA:	51,224 SQ.FT

ZONING REQUIREMENTS	
BUILDING HEIGHT:	6 FLRS (20M)
MAX FRONT YARD	
(GLADSTONE):	2.0M
MIN INTERIOR YARD:	**1.2M**
MIN CORNER SIDE YARD	
(ROCHESTER):	**3.0M**
	(5.0M ABOVE 15M)
MIN REAR YARD:	**7.5M**
PARKING REQUIRED (RES):	**0.5/UNIT**
	(AFTER 12 UNITS)
	TOTAL: 64
PARKING REQUIRED (VIS):	**0.1/UNIT**
	(AFTER 12 UNITS)
	TOTAL: 13
BICYCLE PARKING:	**0.5/UNIT**
	TOTAL: 70
AMENITY AREA:	**6 SQM/UNIT**
	834 SQM

PROJECT STATISTICS	
BUILDING HEIGHT (FLAT ROOF):	6 FLRS
FRONT YARD	
(GLADSTONE):	0.8 M
INTERIOR YARD:	**1.5 M**
CORNER SIDE YARD	
(ROCHESTER):	**3.0 M**
REAR YARD:	**3.0 M**
VISITOR PARKING PROVIDED:	**13 SPACES**
PARKING PROVIDED:	**24 SPACES**
BICYCLE PARKING:	**78**
AMENITY AREA:	**1,722 SQM**

UNIT STATISTICS		
BACHELOR:	**15**	**(11%)**
1 BEDROOM:	**58**	**(42%)**
2 BEDROOM:	**38**	**(27%)**
3 BEDROOM:	**20**	**(14%)**
4 BEDROOM:	**8**	**(6%)**

no.	date	revision

Hobin Architecture Incorporated
63 Pamilla Street
Ottawa, Ontario
Canada K1S 3K7
T: 613-288-7200
F: 613-288-2005
E: mail@hobinarc.com
hobinarc.com

HOBIN ARCHITECTURE

PROJECT/LOCATION:

DRAWING TITLE:

DRAWN BY:	DATE:	SCALE:
NAME	DATE	1:150

PROJECT: 0822

DRAWING NO.: ASK #

REVISION NO.:

None
None