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FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

TC UNITED GROUP 440-444 BRONSON AVENUE

CITY OF OTTAWA

PROJECT NO.: 17-968

MAY 2019 - REV 3

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT FOR

TC UNITED GROUP
440-444 BRONSON AVENUE

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TC UNITED GROUP
440-444 BRONSON AVENUE

CITY OF OTTAWA

MAY – REV 3

PROJECT NO.: 17-968

1.0 INTRODUCTION

David Schaeffer Engineering Ltd. (DSEL) has been retained to prepare a Functional Servicing and Stormwater Management Report in support of the Site Plan Control application for the proposed development at 440 to 444 Bronson Avenue.

The subject property is located within the City of Ottawa urban boundary, in the Somerset ward. As illustrated in ***Figure 1***, the subject property is bounded by residences to the north, Bronson Avenue to the east, a mechanic shop to the south and residences to the west. The subject property measures approximately ***0.083 ha*** and is designated Traditional Mainstreet under the current City of Ottawa zoning by-law.

Figure 1: Site Location

The proposed development involves the construction of a 6-storey mixed use building with approximately 51 residential units and 184.7 square metres of commercial space. 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 that the site design conforms to current City of Ottawa design standards.

1.1 Existing Conditions

The subject site currently consists of two townhouse units, an auto service centre and a parking lot. Existing Bell, gas and hydro services are located within the adjacent municipal right-of-ways.

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:

Bronson Avenue

- 914 mm watermain
- 400 mm watermain
- 1050 mm 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.

The subject property contains existing trees. Development, which may require removal of existing trees, may be subject to the City of Ottawa Urban Tree Conservation By-law No. 2009-200.

The development is proposed to discharge to an existing combined sewer and is therefore not exempt under Ontario Regulation 525/98. The development will require an Environmental Compliance Approval (ECA) through a direct submission to the Ministry of the Environment and Climate Change (MOECC).

1.3 Pre-consultation

Pre-consultation correspondence and the servicing guidelines checklist are located in ***Appendix A***. A pre-consultation request has been sent to the MOECC, and the response is 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 Bronson Avenue and Gladstone Avenue.

3.2 Water Supply Servicing Design

The subject property is proposed to be serviced through one connection to the 400 mm watermain within Bronson Avenue.

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

Table 1
Water Supply Design Criteria

Design Parameter	Value
Commercial-Floor space	2.8 L/m^2/d
Residential Average Apartment	1.8 P/unit
Average Daily Demand	280 L/d/per
Residential Maximum Daily Demand	4.9 x Average Daily *
Residential Maximum Hourly	7.4 x Average Daily *
Commercial Maximum Daily Demand	1.0 x avg. day L/gross ha/d
Commercial Maximum Hour Demand	1.8 x avg. day L/gross ha/d
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 ISDTB-2018-02*

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

Table 2
Proposed Water Demand

Design Parameter	Anticipated Demand[1] (L/min)	Boundary Conditions[2] (m H_2O / kPa)	
Average Daily Demand	14.4	47.1	462.1
Max Day + Fire Flow	69.0+8,000	129,840 L/min @ 140 kPa	
Peak Hour	104.2	38.4	376.7

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.
2) Boundary conditions supplied by the City of Ottawa for the demands indicated in the correspondence; assumed ground elevation 69.1m at the connection to the municipal watermain. See ***Appendix A.***

An ***FUS*** calculation was completed for the building. The following assumptions below were provided by the Architect, see ***Appendix A*** for correspondence.

- Type of construction – Non-Combustible Construction
- Occupancy type –Limited combustible
- Sprinkler Protection – Sprinklered system

The above assumptions result in a maximum estimated fire flow of approximately ***8,000 L/min****;* actual building materials selected will affect the estimated flow, see ***Appendix B*** for detailed FUS calculations.

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 A***. Based on boundary conditions provided by the City, ***129,840 L/min*** at ***140 kPa*** is available for fire flow and pressures exceed the minimum required pressures in the Average Day and Peak Hour scenarios as described in the ***Water Supply Guidelines***.

3.3 Water Supply Conclusion

It is proposed to service the development from one connection to the existing 400 mm watermain within Bronson Avenue.

The anticipated water demand was submitted to the City of Ottawa for establishing boundary conditions. As demonstrated by ***Table 2***, based on the City's model, the municipal system is capable of delivering water within the ***Water Supply Guidelines*** pressure range.

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 Rideau Canal Interceptor catchment area, as shown by the Trunk Sanitary Sewers and Collection Areas map included in ***Appendix C***.

The existing site consists of a parking lot, an auto service centre and two townhouse units. ***Table 3*** summarizes the estimated sanitary flow from the existing site.

Table 3
Existing Wastewater Flow

Design Parameter	Total Flow (L/s)
Estimated Average Dry Weather Flow	0.03
Estimated Peak Dry Weather Flow	0.09
Estimated Peak Wet Weather Flow	0.11

4.2 Wastewater Design

The proposed development will be serviced via a connection to the existing 1050 mm diameter combined sewer within Bronson Avenue.

Table 4 summarizes the ***City Standards*** employed in the calculation of wastewater flow rates for the proposed development.

Table 4
Wastewater Design Criteria

Design Parameter	Value
Average Daily Demand	280 L/d/per
Residential Average Apartment	1.8 P/unit
Peaking Factor	Harmon's Peaking Factor. Max 3.8, Min 2.0
Commercial Floor Space	2.8 L/m^2/d
Infiltration and Inflow Allowance	0.33 L/s/ha (0.05 L/s/ha dry + 0.28 L/s/ha wet)
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Commercial Peaking Factor	1.0 per City of Ottawa ISDTB-2018-02
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 5 demonstrates the anticipated peak flow from the proposed development. See ***Appendix C*** for associated calculations.

Table 5
Summary of Proposed Wastewater Flows

Design Parameter	Anticipated Sanitary Flow (L/s)
Average Dry Weather Flow Rate	0.25
Peak Dry Weather Flow Rate	0.95
Peak Wet Weather Flow Rate	0.97

The estimated sanitary flow based on the site plan provided in ***Drawings/Figures*** anticipates a peak wet weather flow of ***0.97 L/s***, which results in a ***0.86 L/s*** increase from the existing conditions. Refer to ***Appendix C*** for associated calculations. The increase in wastewater discharge will be compensated by a reduction in stormwater flow, as per City of Ottawa criteria, detailed in ***Section 5.0 & Section 6.0***.

4.3 Wastewater Servicing Conclusions

The site is tributary to the Rideau Canal Interceptor; it is proposed to discharge wastewater to the existing 1050 mm combined sewer within Bronson Avenue.

The proposed development results in an estimated increase in wastewater flow contribution of ***0.86 L/s*** from the proposed development to the existing Bronson Avenue combined sewer. This increase in wastewater discharge will be compensated 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 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.

The estimated pre-development peak flows for the 2, 5, and 100-year are summarized in ***Table 6***:

Table 6
Summary of Existing Peak Storm Flow Rates

City of Ottawa Design Storm	Estimated Peak Flow Rate (L/s)
2-year	11.8
5-year	16.1
100-year	34.4

It is anticipated that no stormwater management controls for flow attenuation exist on-site.

5.2 Post-development Stormwater Management Targets

Stormwater management requirements for the proposed development were reviewed with the City of Ottawa; correspondence with the City can be found in ***Appendix A***. The development has the following requirements:

- Attenuate to an allowable release rate based on a calculated Rational Method Coefficient of 0.4, employing the City of Ottawa IDF parameters for a 2-year storm with a calculated time of concentration equal to or greater than 10 minutes;
- The allowable stormwater release rate is equal to the allowable combined flow less the proposed sanitary flow;
- Flow attenuation is required up to and including the City of Ottawa 100-year storm event;
- Quality controls are not required for the development since stormwater is tributary to a combined sewer.

Based on the above criteria, the allowable combined flow rate equals ***6.6 L/s*** and the allowable stormwater release rate is equal to ***5.6 L/s***. (6.6 – 0.95 = 5.6 L/s)

5.3 Proposed Stormwater Management System

It is proposed that the stormwater for the development will be serviced from one connection to the existing 1050 mm combined sewer within Bronson Avenue.

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 use of underground storage. It is proposed to direct uncontrolled roof flows upstream of the proposed inlet control device at CBMH101. Flow will be controlled by the inlet control device and attenuated within underground storage chambers located within the rear parking area.

Underground storage is proposed in the form of a Brentwood StormTank ST-36, or approved equivalent. The proposed Brentwood StormTank is 20.0 m long, 1.5 m wide, 0.91 m high and provides a storage volume of ***28.0 m^3*** at a maximum elevation of 68.17 m. Details for the underground storage chambers can be found on drawing ***SSP-1*** and in ***Appendix D***.

Table 7 estimates post-development flow rates.

Table 7
Stormwater Flow Rate Summary

Control Area	2-Year Release Rate	2-Year Storage	100-Year Release Rate	100-Year Storage	100-Year Available Storage
	(L/s)	(m^3)	(L/s)	(m^3)	(m^3)
Unattenuated Areas	0.5	0.0	1.5	0.0	0.0
Attenuated Areas	1.4	10.0	4.0	27.4	28.0
Total	**1.9**	**10.0**	**5.5**	**27.4**	**28.0**
*** Roof outlet is directed upstream of ICD at CBMH101 and controlled in the Attenuated Area, total flow is equal to Unattenuated Areas + Attenuated Areas**					

It is anticipated that approximately ***27.4 m^3*** of storage will be required on site to attenuate flow to a release rate of ***5.5 L/s*** directed to Bronson Avenue. Refer to storage calculations that are contained within ***Appendix D***.

Based on this design, the High Water Level for the site is ***68.13 m.*** The 100-Year Water Level is contained within the underground storage tank.

There are two (2) existing areas located north and west of the site which currently drain into the site under existing and proposed conditions. These existing areas are not contemplated in the minor system design as they currently drain uncontrolled to the Bronson Road right-of-way. Proposed drainage patterns for the site allow for overland flow in excess of the design storm to be conveyed safely to the Bronson Road right-of-way and combined sewer. Refer to drawing ***SWM-1*** for details.

5.4 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 allowable release rate to the combined sewer within Bronson Avenue was calculated to be ***5.5 L/s***, with an estimated ***26.8 m^3*** of storage that will be required to meet this release rate.

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 ***6.6 L/s***.

Table 8 summarizes the pre-development and post-development flow rates to the combined sewershed.

Table 8
Summary of Release Rates to the Combined Sewer

Flow Type	2-Year		100-year	
	Pre-Development (L/s)	Post-Development (L/s)	Pre-Development (L/s)	Post-Development (L/s)
Sanitary*	0.09	0.95	0.09	0.95
Storm	11.8	1.9	34.4	5.5
Combined Flow	**11.9**	**2.9**	**34.5**	**6.5**
*Infiltration flows have been taken into account in stormwater calculations. Sanitary flow is equal to the peak dry weather flow.				

As shown by ***Table 8***, the post-development combined 100-year flow meets the target objective described in ***section 5.2***, and is less than the existing 2 and 100 year flows.

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.

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:

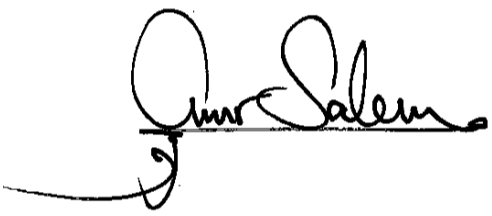
- Verification that water is not flowing under silt barriers.
- Clean and change filter cloth at catch basins.

9.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained to prepare a Functional Servicing and Stormwater Management report in support of the application for Site Plan Control for the proposed development at 440-444 Bronson 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;
- The proposed development is anticipated to have a peak wet weather flow of ***0.97 L/s*** directed to the Bronson Avenue combined sewer, the increase in wastewater discharge will be compensated by a reduction in stormwater flow;
-
- Based on the ***City Standards***, the proposed development will be required to attenuate post development flows to an equivalent release rate of ***5.6 L/s*** to the sewer within Bronson Avenue, for all storms up to and including the 100-year storm event.
- It is proposed that stormwater objectives may be met through storm water retention via underground storage. It is anticipated that **27.4 *m³*** of onsite storage will be required to attenuate flow to the established release rates to the Bronson Avenue sewer;
- Utility services would need to be coordinated with utility companies prior to development.

Prepared by,
David Schaeffer Engineering Ltd.



Per: Amr Salem

Reviewed by,
David Schaeffer Engineering Ltd.

Per: Steven L. Merrick, P.Eng.

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

17-968 01/05/2018

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/Drawing EX-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.	N/A
☐	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.	N/A
☐	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	N/A

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.	N/A
☒	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.	Section 5.2
☒	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.	N/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.	N/A
☐	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.	N/A
☐	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 7.0
☐	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

Hannah Pepper

Subject: FW: 440 Bronson - FUS Calcs

From: Laurie Bouchard [mailto:bouchard@project1studio.ca]
Sent: October 17, 2017 9:57 AM
To: Hannah Pepper <HPepper@dsel.ca>
Cc: Ryan Koolwine <koolwine@project1studio.ca>; dan.boulanger@tcunitedgroup.com
Subject: RE: 440 Bronson - FUS Calcs

Hi Hannah,

1)

Ground Floor: 3220 sq.ft.
2nd Floor: 5014 sq.ft.
3rd Floor: 4929 sq.ft.
4th Floor: 4947 sq.ft.
5th Floor: 4999 sq.ft.
6th Floor: 3874 sq.ft.

2) We will be using the Bailey Comslab system, which is light gauge steel stud framing with a composite poured concrete floor system. It is non-combustible.

3) The building will be sprinklered.

Cheers,

Laurie Bouchard

project1studio | 613 884-3939 x4

From: Hannah Pepper [mailto:HPepper@dsel.ca]
Sent: Tuesday, October 17, 2017 9:40 AM
To: Laurie Bouchard <bouchard@project1studio.ca>
Cc: Ryan Koolwine <koolwine@project1studio.ca>; dan.boulanger@tcunitedgroup.com
Subject: 440 Bronson - FUS Calcs

Hi Laurie,

I'm doing FUS calcs for the proposed 6-storey mixed-use building at 440-444 Bronson Avenue. Could you please confirm some details about the building?

1) Confirm square footage for each floor of the building.

2) Confirm construction type for the building (Wood Frame, Ordinary Construction, Non-combustible, fire resistive)

Extracted from FUS:

C = coefficient related to the type of construction.
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls).
= 0.6 for fire-resistive construction (fully protected frame, floors, roof).

Fire-Resistive Construction - Any structure that is considered fully protected, having at least 3-hour rated structural members and floors. For example, reinforced concrete or protected steel.

Non-combustible Construction - Any structures having all structural members including walls, columns, piers, beams, girders, trusses, floors, and roofs of non-combustible material and not qualifying as fire-resistive construction. For example, unprotected metal buildings.

Ordinary Construction - Any structure having exterior walls of masonry or such non-combustible material, in which the other structural members, including but not limited to columns, floors, roofs, beams, girders, and joists, are wholly or partly of wood or other combustible material.

Wood Frame Construction - Any structure in which the structural members are wholly or partly of wood or other combustible material and the construction does not qualify as ordinary construction.

3) Confirm if the building will be sprinklered.

Thank you,

Hannah Pepper, EIT.
Project Coordinator / Junior Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext. 569
fax: (613) 836-7183
email: hpepper@DSEL.ca

Hannah Pepper

Subject: FW: 440 Bronson Ave - Pre-consultation

From: Mottalib, Abdul [mailto:Abdul.Mottalib@ottawa.ca]
Sent: Wednesday, October 25, 2017 3:19 PM
To: Steve Merrick <SMerrick@dsel.ca>
Cc: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: RE: 440 Bronson Ave - Pre-consultation

Hi Steve,

I just spoke with the Water Resources Group. In terms of SWM criteria, please use combined sewer criteria i.e. C=0.4, 2 year storm events and TC = 10 minute.

Thanks,

Abdul Mottalib, P. Eng.

From: Steve Merrick [mailto:SMerrick@dsel.ca]
Sent: October 25, 2017 11:02 AM
To: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Subject: RE: 440 Bronson Ave - Pre-consultation

Hi Abdul,

Just wanted to follow up on the below, could you advise?

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

From: Steve Merrick
Sent: Monday, October 16, 2017 2:37 PM
To: 'Abdul' <Abdul.Mottalib@ottawa.ca>
Subject: 440 Bronson Ave - Pre-consultation

Hi Abdul,

We pre-consulted on the above noted site on August 2, 2017. I recall from the meeting you asked us to review and send you information on the capacity of the existing combined sewer within Bronson. Unfortunately we don't have a project recently completed connecting to this sewer.

I have worked on many projects on Bank Street, Lebreton Ave and Preston which all have recently constructed combined sewers that have been designed with a 5-year, calculated Tc (no less than 10 mins) and existing RC no greater than 0.5. Can you please confirm how the combined sewer was sized? The sewer was constructed between 2012 and 2014, see attached as-builts.

Thanks in advance,

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

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

Anthony Temelini

From: Steve Merrick
Sent: May 15, 2018 3:16 PM
To: Anthony Temelini
Subject: FW: 440-444 Bronson Avenue - MOECC Pre-Consultation

Importance: High

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

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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

From: Primeau, Charlie (MOECC) [mailto:Charlie.Primeau@ontario.ca]
Sent: Monday, November 27, 2017 12:59 PM
To: Hannah Pepper <HPepper@dsel.ca>; MOECCOttawaSewage (MOECC) <MOECCOttawaSewage@ontario.ca>
Cc: Steve Merrick <SMerrick@dsel.ca>; Abdul <Abdul.Mottalib@ottawa.ca>; Des Rochers, Christina (MOECC) <Christina.Desrochers@ontario.ca>; Mahoney, James (MOECC) <James.Mahoney@ontario.ca>; charles.warnock@ottawa.ca
Subject: RE: 440-444 Bronson Avenue - MOECC Pre-Consultation
Importance: High

Good afternoon Hannah,

Thank you for your email. Please be advised that the ECA application process is to be determined by the City's review engineer – be it ToR Standard Works, ToR Expanded Works or Direct Submission. In instances where the City's review engineer is unsure through which process the ECA application should proceed then a consultation between the City and MOECC should take place.

Once the ECA application process has been determined then a pre-submission consultation can be requested.

Please feel free to call me if you required additional information or further clarification.

Charlie Primeau
Water Inspector / Inspecteur de l'eau, Badge #1420
Safe Drinking Water Branch / Direction du contrôle de la qualité de l'eau potable
Ministry of the Environment and Climate Change/
Ministère de l'Environnement et de l'Action en matière de changement climatique
2430 Don Reid Drive
Ottawa ON K1H 1E1
Tel: 613 521-3450 ext 251 or/ou 1 800 860-2195
Fax 613 521-5437
E-mail: charlie.primeau@ontario.ca
Website/Site Web: www.ene.gov.on.ca

From: Hannah Pepper [mailto:HPepper@dsel.ca]
Sent: November-27-17 12:38 PM
To: MOECCOttawaSewage (MOECC)
Cc: Steve Merrick; Primeau, Charlie (MOECC); Abdul
Subject: 440-444 Bronson Avenue - MOECC Pre-Consultation

To whom it may concern,

Attached is the Pre-Submission Consultation Request Form for a proposed development at 440-444 Bronson Avenue that will involve a connection to the existing 1050mm combined sewer within Bronson Avenue. I have also attached a site plan and the location of the subject property.

Please confirm that an ECA through the direct submission program will be required for the connection to the existing combined sewer.

Thank you,

Hannah Pepper, EIT.
Project Coordinator / Junior Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
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phone: (613) 836-0856 ext. 569
fax: (613) 836-7183
email: hpepper@DSEL.ca

Hannah Pepper

From: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Sent: October 30, 2017 11:37 AM
To: Hannah Pepper
Cc: Mottalib, Abdul
Subject: FW: Boundary Condition Request - 440 Bronson
Attachments: 440 Bronson Oct 2017.pdf

Hi Hannah,

The following are boundary conditions, HGL, for hydraulic analysis at 440-444 Bronson (zone 1W) assumed to be connected to the 406 mm on Bronson (see attached PDF for location).

Minimum HGL = 107.5 m

Maximum HGL = 116.2 m

Available fire flow = 2164 L/s assuming a residual of 20 psi and a ground elevation of 69.1 m

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.

Richard Buchanan, CET

Project Manager, Development Approvals
Planning, Infrastructure and Economic Development Department
Planning & Growth Management Branch
City of Ottawa | Ville d'Ottawa
613.580.2424 ext./poste 27801
ottawa.ca/planning / ottawa.ca/urbanisme

From: Hannah Pepper [mailto:HPepper@dsel.ca]
Sent: Friday, October 27, 2017 3:58 PM
To: Mottalib, Abdul <Abdul.Mottalib@ottawa.ca>
Cc: Buchanan, Richard <Richard.Buchanan@ottawa.ca>
Subject: FW: Boundary Condition Request - 440 Bronson

Hi Richard,

I have another boundary request for Abdul here-hopefully you can help us out with this one too, or let me know who can.

I would like to request water boundary conditions for 440 to 444 Bronson Avenue using the following proposed development demands:

1. It is anticipated that the proposed development will be serviced from one connection to the existing 406mm watermain within Bronson Avenue. Please see the attached asbuilt for the location of the connection point to the municipal system.
2. The proposed development consists of an six-floor mixed-use building of approximately 44 residential units, 4 parking spaces and 180 square metres of commercial space.
3. A summary of the average total demands for the development is as follows:
4.

	L/min	L/s
Avg. Day	20.1	0.3
Max Day	96.2	1.6
Peak Hour	145.6	2.4

5. Could you please give us the maximum available flow at a minimum pressure of 20 psi for fire flow? FUS calculations will be completed at a later date.

Thanks!

Hannah Pepper, EIT.
Project Coordinator / Junior Designer

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
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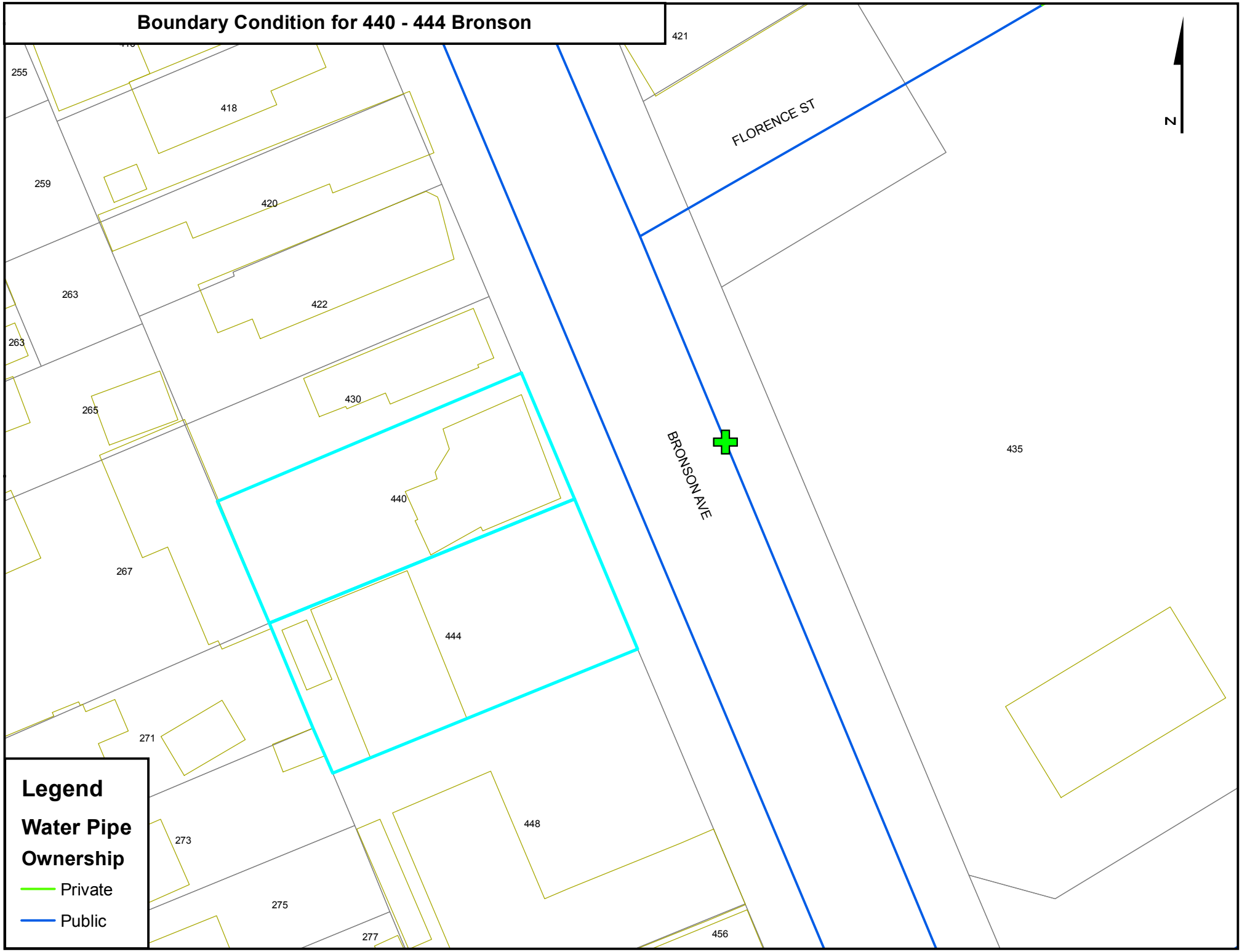
phone: (613) 836-0856 ext. 569
fax: (613) 836-7183
email: hpepper@DSEL.ca

Boundary Condition for 440 - 444 Bronson



APPENDIX B

Water Supply

440-444 Bronson 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		0
Apartment			0
Bachelor	1.4	40	56
1 Bedroom	1.4	11	16
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		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	72	20.2	14.0	98.8	68.6	149.2	103.6

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
Water Closets	150.0	L/hr		0.00	0.0	0.0	0.0	0.0	0.0
Restaurant	125.0	L/seat/d		0.00	0.0	0.0	0.0	0.0	0.0
Commercial floor space**	2.8	$L/m^2/d$	185	0.52	0.4	0.5	0.4	0.9	0.6
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
Total I/CI Demand				0.5	0.4	0.5	0.4	0.9	0.6
Total Demand				**20.7**	**14.4**	**99.3**	**69.0**	**150.1**	**104.2**

* 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

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	2516.0	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	8828.1	L/min	
	9000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%	
Fire Flow	**7650.0**	**L/min**

3. Reduction for Sprinkler Protection

Sprinklered	-50%	
Reduction	**-3825**	**L/min**

4. Increase for Separation Distance

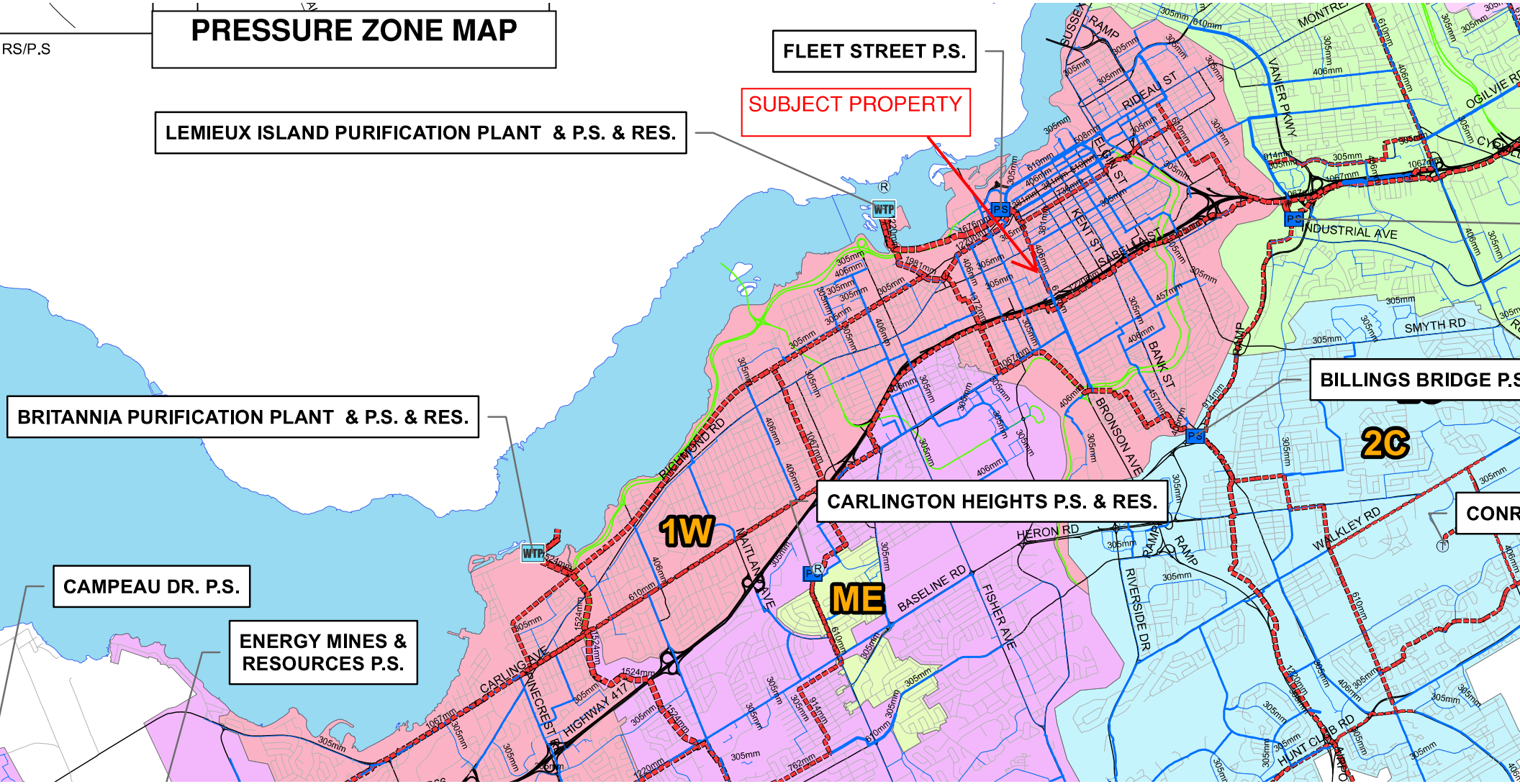
N	>45m	0%	
S	3.1m-10m	20%	
E	3.1m-10m	20%	
W	3.1m-10m	20%	
	% Increase	**60%**	*value not to exceed 75% per FUS Part II, Section 4*
	Increase	**4590.0**	**L/min**

Total Fire Flow

Fire Flow	8415.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	8000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by Project 1 Studio Inc.
-Calculations based on Fire Underwriters Survey - Part II

PRESSURE ZONE MAP



APPENDIX C

Wastewater Collection

TC United Group
440-444 Bronson Avenue
Existing Conditions

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

Site Area 0.083 **ha**

Extraneous Flow Allowances

Infiltration (Dry)	**0.00**	**L/s**
Infiltration (Wet)	**0.02**	**L/s**
Total Infiltration / Inflow	**0.02**	**L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Duplex	2.3		0
Townhouse	2.7	2	6
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	**6**	
Average Domestic Flow	**0.02**	**L/s**
Peaking Factor	**4**	
Peak Domestic Flow	**0.08**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Commercial floor space*	2.8 $L/m^2/d$	106	0.01
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	**0.01**
Peak Institutional / Commercial Flow	0.01
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**0.01**

** 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	**0.03**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**0.09**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**0.11**	**L/s**

TC United Group
440-444 Bronson Avenue
Proposed Conditions

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

Site Area	0.083	**ha**

Extraneous Flow Allowances

Infiltration (Dry)	**0.00**	**L/s**
Infiltration (Wet)	**0.02**	**L/s**
Total Infiltration / Inflow	**0.02**	**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		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4	40	56
1 Bedroom	1.4	11	16
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	**4.00**	
Peak Domestic Flow	**0.93**	**L/s**

Institutional / Commercial / Industrial Contributions

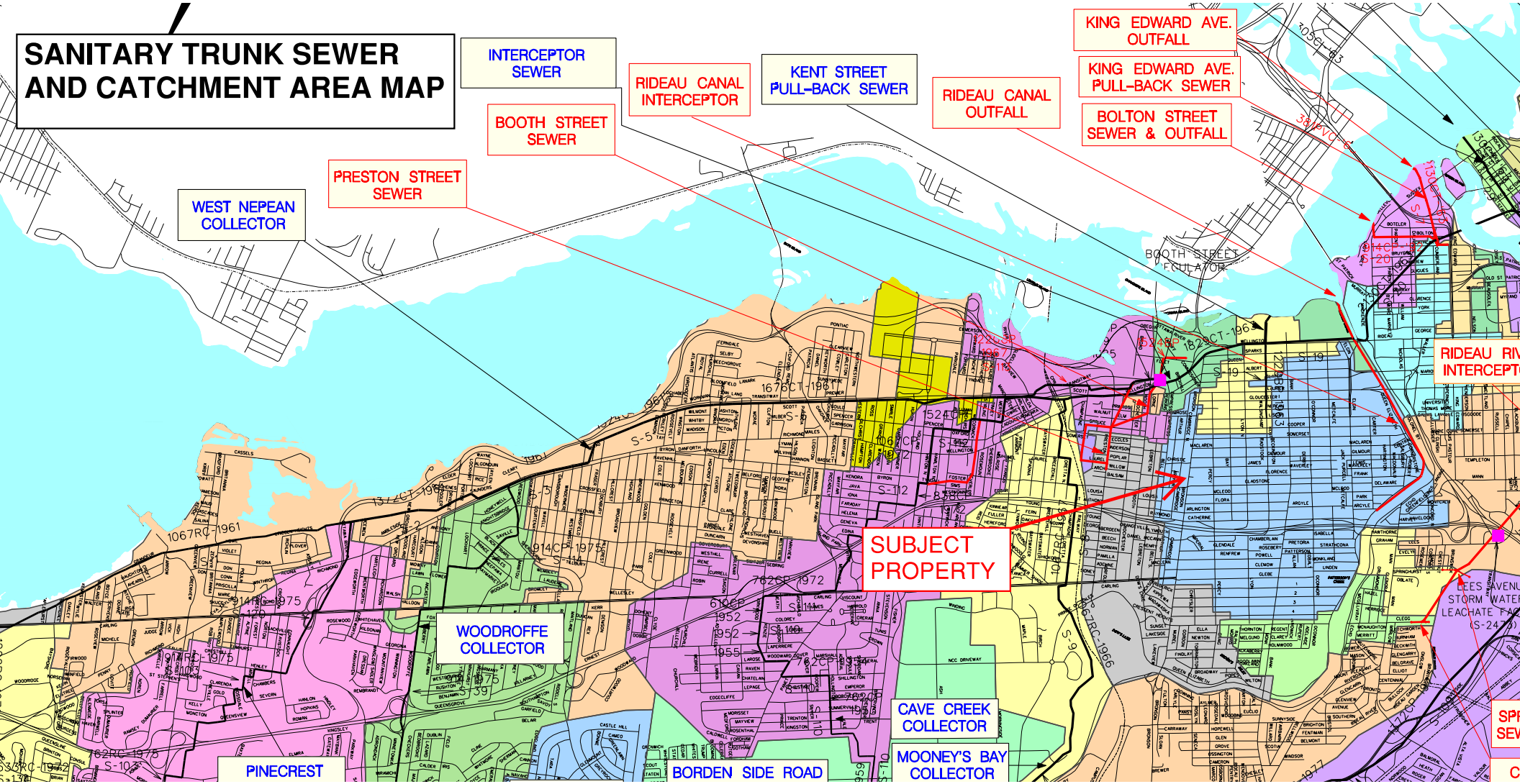
Property Type	Unit Rate	No. of Units	Avg Wastewater (L/s)
Dining room	125 L/seat/d		0.00
Commercial floor space*	2.8 L/m^2/d	185	0.01
Water Closets**	150 L/hr		0.00
Laundry Facility	1,200 L/unit/d		0.00

Average I/C/I Flow	**0.01**
Peak Institutional / Commercial Flow	0.02
Peak I/C/I Flow	**0.02**

Total Estimated Average Dry Weather Flow Rate	**0.25**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**0.95**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**0.97**	**L/s**

* Based on a daily demand of 200L/day per person as identified by Appendix 4-A of the Sewer design guidelines
** Water closets demand of 150 L/hour from Appendix 4-A of the Sewer design guidelines, assuming a 12 hour operation

SANITARY TRUNK SEWER AND CATCHMENT AREA MAP



APPENDIX D

Stormwater Management

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

Existing Drainage Charateristics From Internal Site

Area	0.076	ha
C	0.73	Rational Method runoff coefficient
L	45.7	m
Up Elev	69.5	m
Dn Elev	69	m
Slope	1.1	%
Tc	10.00	min

1) Time of Concentration per Federal Aviation Administration

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

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	11.8	16.1	34.4	L/s

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

Target Flow Rate

Area	0.076	ha	
C	0.40	Rational Method runoff coefficient	
t_c	10.0	min	
	2-year		
i	76.8	mm/hr	
Q	6.5	L/s	
Ex. Sanitary Flow	0.09	L/s	*Based on an assumption of existing units and 106m^2 of commercial space.
Total Combined Allowable Release	**6.6**	**L/s**	**<---- 2-Year Release (6.5 L/s) + Ex. Sanitary Flow (0.09 L/s)**
Flow	0.95	L/s	*Based on an assumption of 44 proposed units and 172m^2 of commercial space.
Total Allowable Stormwater Release	**5.6**	**L/s**	**<---- Total Combined Release (6.6 L/s) - Proposed Sanitary Flow (0.95 L/s)**

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area	0.003	ha
C	0.73	Rational Method runoff coefficient

	2-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	76.8	0.5	0.5	0.0	0.0	178.6	1.5	1.5	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 Post Development Peak Flow from Attenuated Areas

Total Subsurface Storage (m^3) 28.0

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)
ICD INV	66.99		0.00			0.0	0.0	0.00
Storage INV	67.26		0.27	0.27	14.0	14.0	2.0	1.94
Storage OBV	68.17		1.18	0.91	14.0	28.0	4.1	1.90

* V=Incremental storage volume

**V_{acc}=Total surface and sub-surface

† $Q_{release}$ = Release rate calculated from Tempest LMF Flow Curves for LMF65

Orifice Location **CBMH101**

Total Area 0.074 ha

C 0.83 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	2-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	76.8	13.1	1.4	11.6	7.0	178.6	36.6	4.0	32.6	19.6
15	61.7	10.5	1.4	9.1	8.2	142.9	29.3	4.0	25.3	22.8
20	52.0	8.8	1.4	7.4	8.9	120.0	24.6	4.0	20.6	24.7
25	45.1	7.7	1.4	6.2	9.4	103.8	21.3	4.0	17.3	25.9
30	40.0	6.8	1.4	5.4	9.7	91.9	18.8	4.0	14.8	26.7
35	36.0	6.1	1.4	4.7	9.9	82.6	16.9	4.0	12.9	27.1
40	32.8	5.6	1.4	4.2	10.0	75.1	15.4	4.0	11.4	27.3
45	30.2	5.1	1.4	3.7	10.0	69.1	14.2	4.0	10.1	27.4
50	28.0	4.8	1.4	3.3	10.0	64.0	13.1	4.0	9.1	27.3
55	26.2	4.5	1.4	3.0	10.0	59.6	12.2	4.0	8.2	27.1
60	24.5	4.2	1.4	2.7	9.9	55.9	11.5	4.0	7.4	26.8
65	23.1	3.9	1.4	2.5	9.8	52.6	10.8	4.0	6.8	26.5
70	21.9	3.7	1.4	2.3	9.6	49.8	10.2	4.0	6.2	26.0
75	20.8	3.5	1.4	2.1	9.5	47.3	9.7	4.0	5.7	25.6
80	19.8	3.4	1.4	1.9	9.3	45.0	9.2	4.0	5.2	25.0
85	18.9	3.2	1.4	1.8	9.1	43.0	8.8	4.0	4.8	24.5
90	18.1	3.1	1.4	1.7	8.9	41.1	8.4	4.0	4.4	23.9
95	17.4	3.0	1.4	1.5	8.7	39.4	8.1	4.0	4.1	23.2
100	16.7	2.8	1.4	1.4	8.5	37.9	7.8	4.0	3.8	22.6
105	16.1	2.7	1.4	1.3	8.3	36.5	7.5	4.0	3.5	21.9
110	15.6	2.6	1.4	1.2	8.0	35.2	7.2	4.0	3.2	21.2

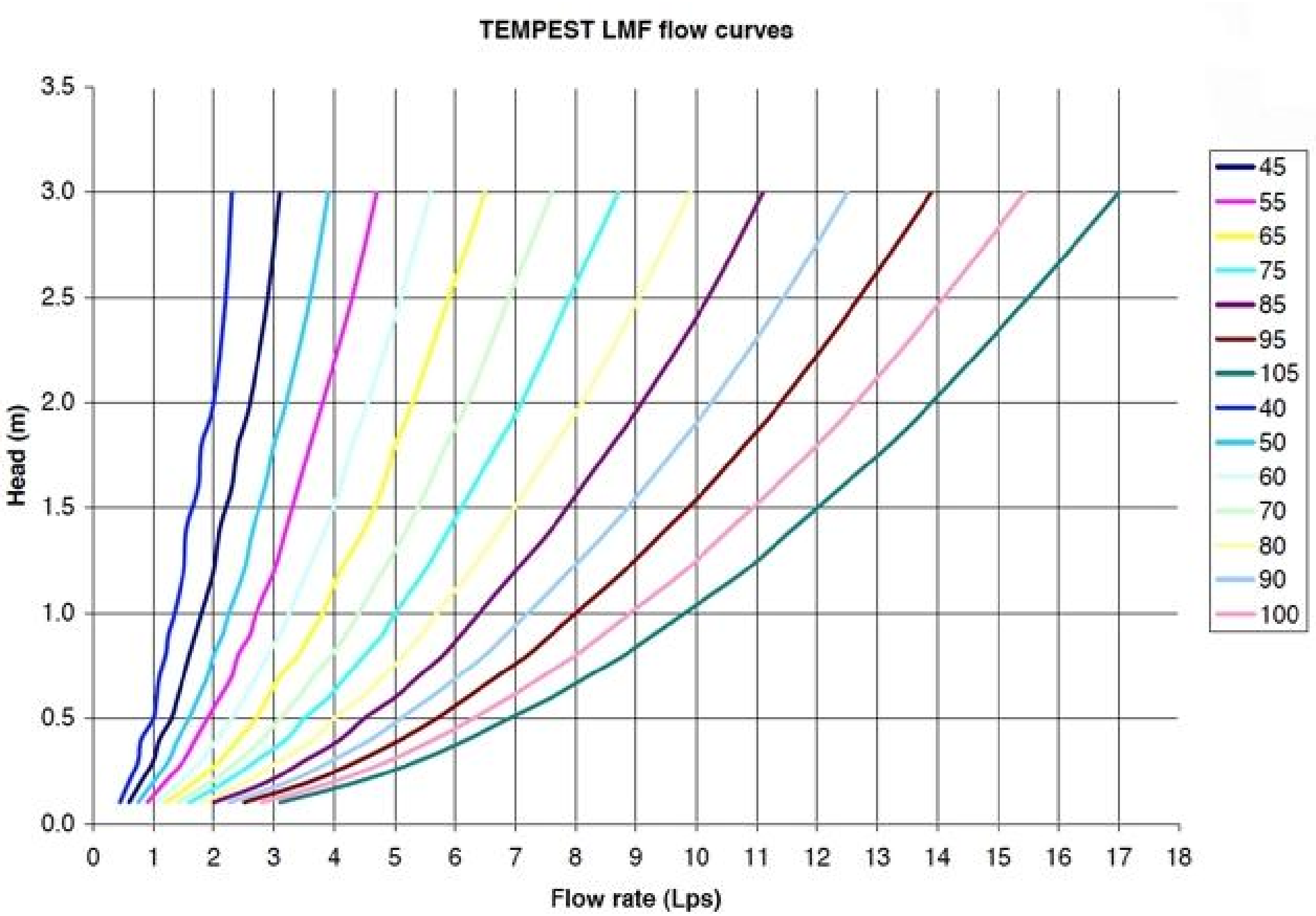
2-year $Q_{attenuated}$ 1.43 L/s **100-year $Q_{attenuated}$ 4.01 L/s**

2-year Max. Storage Required 10.0 m^3 **100-year Max. Storage Required 27.4 m^3**

Est. 2-year Storage Elevation 67.18 m **Est. 100-year Storage Elevation 68.13 m**

Summary of Release Rates and Storage Volumes

Control Area	2-Year Release Rate (L/s)	2-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	0.5	0.0	1.5	0.0	0.0
Attenutated Areas	1.4	10.0	4.0	27.4	28.0
Total	**1.9**	**10.0**	**5.5**	**27.4**	**28.0**


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

STORMTANK® Module Volume Calculator

Inputs

Project Name:	440-444 Bronson Avenue		
Engineer:	AAS	Date:	20/3/2019
Units:	SI	Shape:	Square/Rectangle
Liner:	No	Location:	N/A
Stacking:	Single	Height:	914.4
Stone Storage:	All	Porosity:	40%

Dimensions

Module		
Length:	21	m
Width:	1.5	m
Excavation		
Length:	20.1	m
Width:	1.5	m
Stone		
Leveling Bed:	0	m
Top Backfill:	0	m
Compacted Fill:	0	m

Results

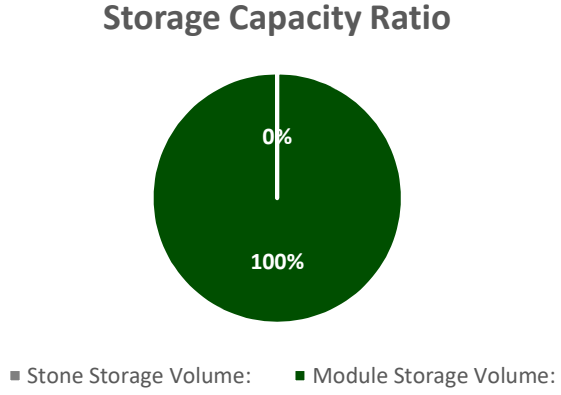
Capacity:

Stone Storage Volume:	0.00	m^3
Module Storage Volume:	27.98	m^3
Total Storage Volume:	27.98	m^3

Quantities:

Required Excavation:	27.57	m^3
Required Stone Volume:	0.00	m^3
Estimated Geotextile:	226.61	m^2
Estimated Liner:	0.00	m^2

(Estimations include 10% for scrap and overlap)

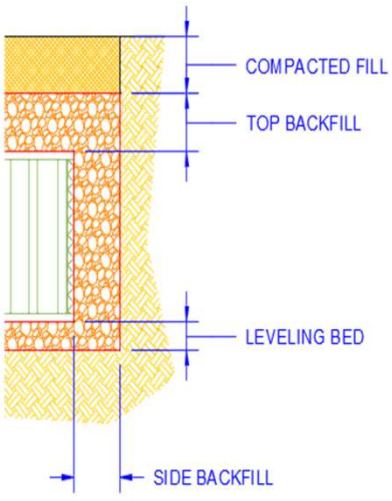


Basin Detail

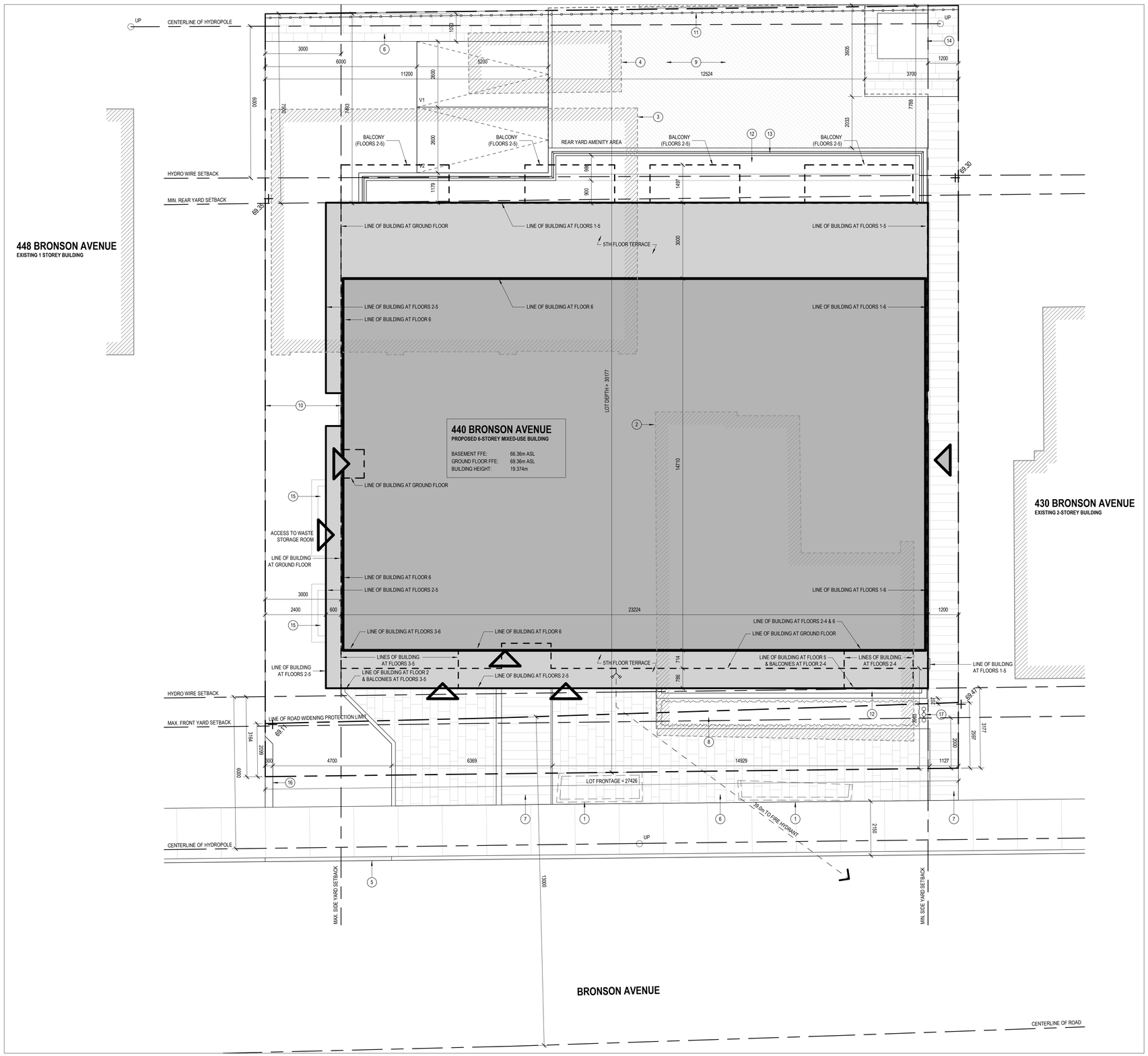
Component Quantities:

	Bottom Layer	Top Layer	Total
Height	914.4	N/A	914.4
# of Modules	75	N/A	75
# of Platens	151	N/A	151
# of Side Panels	98	N/A	98
# of Columns	603	N/A	603
# of Stacking Pins	0	N/A	0

Cross-Section:



DRAWINGS / FIGURES



1 SITE PLAN
SP-01 SCALE: 1 : 75

2 LOCATION PLAN
SP-01 SCALE: N.T.S.

SITE & PROJECT STATISTICS

GENERAL INFORMATION

Zoning:	TM[2214]
Min. Lot Area:	No minimum
Min. Building Height:	6.7m for 20m from front lot line
Max. Building Height:	Front: Must be setback an additional 2.0m from provided setback above 4 storeys or 15m, whichever is lesser Rear: May not project above a 45° angular plane measured 7.5m from rear lot line at 15m height
Max. Front Yard:	2.0m
Min. Rear Yard:	7.5m
Max. Int. Side Yard:	South side: 3.0m
Min. Int. Side Yard:	North side: 1.2m

PROJECT STATISTICS

Lot Area:	828m²
Building Height:	19.374m
Front Yard:	3.177m
Rear Yard:	7.5m
Int. Side Yard:	South side: 3.0m for Levels 1 & 6 & 2.4m for Levels 2-5 North side: 1.2m
Number of Residential Units:	51
Retail GFA:	184.7m²

PARKING CALCULATION

As per Section 101

Required Parking: 0 space
Within Area Y on Schedule 1A
0 space for first 12 res. units - Section 101(4)
0 space for 39 res. units - Table 101
0 space for first 500m² non-residential - Section 101(4)(d)(iii)

Total Parking Provided: 0 space

VISITOR PARKING CALCULATION

As per Section 102

Required Parking: 4 spaces
Within Area Y on Schedule 1A
0 space for first 12 res. units - Section 102(2)
0.1 spaces/unit for 39 res. units - Table 102

Total Parking Provided: 2 spaces

BICYCLE PARKING CALCULATION

As per Table 111A

Required Parking: 27 spaces
Within Area B on Schedule 1
0.5 spaces/res. unit - Table 111A(b)(i)
1 space per 250m² retail

Total Parking Provided: 29 spaces

AMENITY AREA CALCULATION

As per Table 137

Total Amenity Area Required: 306m²
6m²/res. unit

Communal Amenity Required: 153m²
Min. 50% of Total Amenity Area

Private Amenity Area Provided: 216.9m²
Level 02: 28.2m²
Level 03: 34.1m²
Level 04: 34.7m²
Level 05: 31.3m²
Level 06: 88.6m²

Communal Amenity Provided: 183.2m²
Rear Yard: 75.6m²
Roof: 107.6m²

Total Amenity Area Provided: 400.1m²

GLAZING AT FRONT FACADE

Ground Floor - measured to a height of 4.5m: 50.1%

STATISTICS
SCALE: N.T.S.

TOPOGRAPHIC PLAN OF SURVEY OF
PART 1 PLAN OF
PARTS OF LOTS 137 &138
REGISTERED PLAN 3459
CITY OF OTTAWA

ANNIS, O'SULLIVAN, VOLLEBEKK LTD. 2017

SURVEY INFO
SCALE: N.T.S.

- BUILDING ENTRANCE
- BUILDING EXIT
- UP — UTILITY POLE
- SIAMESE CONNECTION
- 0.00 — EXISTING GRADE ELEVATION

SYMBOLS LEGEND
SCALE: N.T.S.

1. EXISTING CONCRETE PLANTER TO BE REMOVED
2. EXISTING 2-STOREY BUILDING TO BE DEMOLISHED
3. EXISTING 1-STOREY BUILDING TO BE DEMOLISHED
4. EXISTING SHIPPING CONTAINER TO BE REMOVED
5. DEPRESSED CURB
6. INTERLOCKED CONCRETE PAVERS
7. CONCRETE WALKWAY
8. INTEGRATED PLANTER
9. SOFT LANDSCAPING
10. ASPHALT DRIVE AISLE
11. BOARD FENCE
12. WINDOW WELL
13. STEEL & CLEAR GLASS GUARD
14. PAD MOUNT TRANSFORMER
15. AREA WELL
16. CONCRETE CURB
17. GAS BLOW-OFF STATION

KEYNOTE LEGEND
SP-01 SCALE: N.T.S.

GENERAL ARCHITECTURAL NOTES:
1. This drawing is the property of the Architect and may not be reproduced or used without the expressed consent of the Architect.
2. Drawings are not to be scaled. The Contractor is responsible for checking and verifying all levels and dimensions and shall report all discrepancies to the Architect and obtain clarification prior to commencing work.
3. Upon notice in writing, the Architect will provide written/graphic clarification or supplementary information regarding the intent of the Contract Documents.
4. The Architectural drawings are to be read in conjuction with all other Contract Documents including Project Manuals and the Structural, Mechanical and Electrical Drawings.
5. Positions of exposed or finished Mechanical or Electrical devices, fittings and fixtures are indicated on the Architectural Drawings. Locations shown on the Architectural Drawings shall govern over Mechanical and Electrical Drawings. Mechanical and Electrical items not clearly located will be located as directed by the Architect.
6. These documents are not to be used for construction unless specifically noted for such purpose.

TCU
TC UNITED GROUP

42	ISSUED FOR COORDINATION	2019-05-14
41	ISSUED FOR COORDINATION	2019-05-10
40	RE-ISSUED FOR SITE PLAN CONTROL	2019-04-04
39	ISSUED FOR BUILDING PERMIT	2019-04-03
37	ISSUED FOR COORDINATION	2019-03-01
36	ISSUED FOR MINOR VARIANCE	2019-01-31
33	ISSUED FOR COORDINATION	2019-01-03
32	RE-ISSUED FOR MINOR VARIANCE	2018-12-20
31	ISSUED FOR COORDINATION	2018-12-19
28	ISSUED FOR COORDINATION	2018-11-21
26	ISSUED FOR COORDINATION	2018-11-09
25	ISSUED FOR COORDINATION	2018-11-08
24	ISSUED FOR COORDINATION	2018-11-02
23	ISSUED FOR COORDINATION	2018-10-29
20	ISSUED FOR COORDINATION	2018-10-01
19	ISSUED FOR COORDINATION	2018-09-21
17	ISSUED FOR MINOR VARIANCE	2018-08-16
16	ISSUED FOR COORDINATION	2018-08-15
15	ISSUED FOR COORDINATION	2018-07-05
14	ISSUED FOR COORDINATION	2018-06-01
13	ISSUED FOR COORDINATION	2018-05-18
11	REVISED FOR SITE PLAN CONTROL	2018-04-09
10	ISSUED FOR SITE PLAN CONTROL	2017-11-30
9	ISSUED FOR COORDINATION	2017-11-29
8	ISSUED FOR COORDINATION	2017-11-28
6	ISSUED FOR COORDINATION	2017-11-17
5	ISSUED FOR COORDINATION	2017-10-30
4	ISSUED FOR COORDINATION	2017-10-12
3	ISSUED FOR COORDINATION	2017-10-02

ISSUE RECORD

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440 BRONSON

440-444 Bronson Avenue
Ottawa, ON

PROJ	SCALE	DRAWN	REVIEWED
1723	NOTED	LB	RMK

SITE PLAN

SP-01