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FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

JACK UPPAL
3802&3812 GREENBANK ROAD

CITY OF OTTAWA

PROJECT NO.: 18-1060

DECEMBER 2018

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1.0 INTRODUCTION

David Schaeffer Engineering Ltd. (DSEL) has been retained by Jack Uppal to prepare a Functional Servicing and Stormwater Management Report in support of a Site Plan Control Application (SPC) and Zoning By-Law Amendment (ZBLA) for the proposed development at 3802 &3812 Greenbank Road.

The subject property is located within the City of Ottawa urban boundary, in the Barrhaven Ward. As illustrated in ***Figure 1***, below, the subject property is bounded by Greenbank Road to the east and existing residential lots to the north, west and south. The subject property measures approximately ***0.29 ha*** and is designated Development Reserve Zone (DR) under the current City of Ottawa zoning by-law.

Figure 1: Site Location

The proposed development involves the construction of an ***848 m²,*** 1-storey retail building with a designated parking lot.

The objective of this report is to support the application for SPC & ZBLA 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 is currently undeveloped and consists of mainly grassed area with gravel in areas where there was previously an existing driveway.

Sewer system and watermain distribution mapping collected from the City of Ottawa indicate that the following services exist across the property frontage, within the adjacent municipal road:

Greenbank Road:

- 406 mm diameter PVC watermain;
- 600 mm diameter HDPE sanitary sewer; and
- 1800 mm diameter concrete storm 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 designs, drawings and reports prepared to support the proposed development plan before the issuing of SPC.

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
  2016 Edition.
  (NFPA 25)

- **Drainage Management Manual**
  Ministry of Transportation of Ontario (MTO), 1997.
  (MTO Drainage Manual)

- **Barrhaven South Master Servicing Study Addendum**
  Stantec Consulting Ltd., October 12, 2017
  (BS-MSSA)

- ***Corrigan SWM Facility Stormwater Management Report and Design Brief***
  IBI Group, July 2010
  (CSWMF-SMRDB)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa BARR pressure zone, as shown by the Pressure Zone map, located in ***Appendix B.*** A 406 mm diameter watermain exists within Greenbank Road right-of-way.

3.2 Water Supply Servicing Design

The subject property is proposed to be serviced via a 50 mm diameter service lateral connected to the existing 406 mm municipal watermain located within Greenbank Road.

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
Commercial Retail	2.5 L/m^2/d
Commercial Maximum Daily Demand	1.5 x avg. day
Commercial Maximum Hour Demand	1.8 x max. day
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
*** Table updated to reflect **ISDTB-2018-02***	

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] (m H_2O / kPa)	
Average Daily Demand	1.5	50.0	490.8
Max Day + Fire Flow (per FUS)	2.2 + 4,000 = 4,002.2	47.9	470.2
Peak Hour	4.0	47.2	463.3

1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.
2) Boundary conditions above for connection 1 to Greenbank Road assumed ground elevation equal to 97.67 m.

The City of Ottawa was contacted to obtain boundary conditions associated with the estimated water demand, as indicated in the boundary request correspondence included in ***Appendix B***.

Based on recommendations from the City of Ottawa Water Resources Department, fire flow was determined in accordance with ***ISTB-2018-02***. The required fire flow was estimated to be ***4,000 L/min***, refer to supporting calculation in ***Appendix B.***

There is an existing fire hydrant on Greenbank Road, across from the site and within 75 m of the proposed building. Based on ***Table 18.5.4.3*** of **ISTB-2018-02,** the available fire flow for the hydrant is equal to ***5,700 L/min*** sufficient to provide adequate fire flow for the proposed development.

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***. The minimum and maximum pressures fall within the required range identified in ***Table 2.***

3.3 Water Supply Conclusion

It is proposed to service the subject property via a 50 mm service lateral connected to the existing 406 mm watermain located within Greenbank Road.

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 demonstrated by ***Table*** 2 which was based on the City's model, the municipal system is capable of delivering water within the pressure range prescribed in the ***Water Supply Guidelines***.

It is proposed that the development will be serviced by the existing fire hydrant located on Greenbank Road, located across from the subject property. Based on ***Table 18.5.4.3*** of **ISTB-2018-02,** the available fire flow for the hydrant is equal to ***5,700 L/min*** sufficient to provide adequate fire flow for the proposed development.

The proposed water supply design conforms to all relevant City Guidelines and Policies.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject property lies within the South Nepean Trunk catchment area, as shown by the ***Trunk Sanitary Sewers and Collection Areas Map,*** included in ***Appendix C***. An existing 600 mm sanitary trunk sewer exists within Greenbank Road.

4.2 Wastewater Design

The development is proposed to connect to the 600 mm sanitary sewer within Greenbank Road via a 200 mm sanitary sewer connection, refer to drawing ***SSP-1*** for sanitary layout and connection points. Wastewater flow from the development is proposed to ultimately discharge into the South Nepean Trunk within the local sanitary sewer system.

Table 3, below, summarizes the ***City Standards*** employed in the calculation of wastewater flow rates for the proposed development.

Table 3
Wastewater Design Criteria

Design Parameter	Value
Commercial Floor Space	5 L/m^2/d
Commercial Peaking Factor	1.5 x Average ICI Flow
Residential Daily Demand	280 L/person/day
Peaking Factor	Harmon's Peaking Factor. Max 3.8
Infiltration and Inflow Allowance	0.33L/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	135mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s

Anticipated sanitary flows from the subject site were included in the **Barrhaven South Master Servicing Study Addendum *(BS-MSSA).*** This subject site was included in the area of MSS-A-14 in the ***BS-MSSA*** sanitary servicing plan provided in ***Appendix C***.

A population of ***107 pers/ha*** was used to represent the subject property in the ***BS-MSSA***, therefore, the subject property was allocated a population of approximately ***31 persons*** (0.29 ha x 107 pers/ha). ***Table 4***, below, demonstrates the wastewater flow from the subject property as per the anticipated population in ***BS-MSSA*** and the criteria laid out in ***Table 3***, see ***Appendix C*** for associated calculations.

Table 4
Summary of Anticipated Wastewater Flows

Design Parameter	Anticipated Sanitary Flow[1] (L/s)
Average Dry Weather Flow Rate	0.10
Peak Dry Weather Flow Rate	0.37
Peak Wet Weather Flow Rate	0.47
*1) Based on criteria shown in **Table 4*** and population based on 107 pers/ha as per ***BS-MSSA***.	

Table 5, below, 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[1] (L/s)
Average Dry Weather Flow Rate	0.10
Peak Dry Weather Flow Rate	0.15
Peak Wet Weather Flow Rate	0.24
*2) Based on criteria shown in **Table 3***	

The estimated peak wet weather sanitary flow, based on the ***Site Plan,*** provided in ***Drawings/Figures,*** is ***0.24 L/s***, which results in a ***0.23 L/s*** decrease from the anticipated flow contemplated in the ***BS-MSSA***.

4.3 Wastewater Servicing Conclusions

The site is tributary to the South Nepean Trunk Sewer. The proposed development is anticipated to generate a peak wet weather flow of ***0.24 L/s,*** to be directed to the 600 mm sanitary trunk sewer within Greenbank Road and ultimately discharging into the South Nepean Trunk.

The wastewater discharge for the subject property is less than contemplated in the ***BS-MSSA***, thus the local sewers downstream of the subject site have sufficient capacity to accommodate the flow from the proposed development.

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 City of Ottawa. As such, approvals for the proposed development 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 Jock River watershed and is therefore, subject to review by the Rideau Valley Conservation Authority (RVCA). Consultation with the RVCA is located in ***Appendix A***.

The existing stormwater runoff from the site area generally drains north towards Greenbank Road. There is an existing ***1800 mm*** diameter storm sewer within Greenbank Road, adjacent to the subject property.

The site area is serviced by the Corrigan Stormwater Management (SWM) Facility, referred to as Corrigan SWM Facility, per the ***Corrigan SWM Facility Stormwater Management Report and Design Brief (CSWMF-SMRDB)***. The site area lies within area ID *Private Property 2,* per the Stormwater Drainage Schematic provided in ***Appendix D***. The pond is designed to accommodate minor flow from the site area and provide both water quantity control in the minor event and quality control to an “Enhanced” level of treatment (80% total suspended solids removal) as per ***CSWMF-SMRDB***. The pond was designed to accept minor flow at a rate of ***85 L/s/ha*** from the subject site and adjacent site.

The 100-year HGL at ***MH103*** north-west of the property and located within Greenbank Road is estimated to be ***92.7 m*** and ***MH102*** to be free flowing as per ***CSWMF-SMRDB***. Refer to ***Appendix D*** for 100-year HGL estimations per ***CSWMF-SMRDB*** and drawing ***EX-1*** for location of the above noted manholes.

An estimate of the pre-development peak flow directed to Corrigan SWM Facility has been completed. The time of concentration using the Federal Aviation Administration method has been calculated with the following parameters 0.29 Ha; 0.35 RC; 75 m flow length; slope equal to 1.1%; and resulting in a time of concentration of ***19.5 minutes***.

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

Table 6
Summary of Existing Peak Storm Flow Rates

City of Ottawa Design Storm	Estimated Peak Flow Rate (L/s)
2-year	14.9
5-year	20.1
100-year	42.9

5.2 Post-development Stormwater Management Targets

Stormwater management requirements for the proposed development were reviewed with the City of Ottawa and RVCA and are summarized below:

- Meet an allowable release rate based on the existing Rational Method Coefficient no greater than 0.50, employing the City of Ottawa IDF parameters for a 5-year storm with a calculated time of concentration equal to or greater than 10 minutes;
- Attenuate all storms up to and including the City of Ottawa 100-year design event on site; and
- Based on coordination with the RVCA, no quality control will be required.

Refer to city pre-consultation correspondence in ***Appendix A.***

Based on the above criteria, the allowable stormwater release rate is equal to ***20.1 L/s.***

5.3 Proposed Stormwater Management System

The proposed development consists of a 1-storey retail building, associated parking and landscaping. It is proposed that the stormwater for the development be serviced through a connection to the ***1800 mm*** diameter storm sewer within Greenbank Road.

To achieve the allowable post-development stormwater runoff release rate identified in ***Section 5.2,*** the proposed development will employ flow attenuation using onsite storage through the use of underground storage chambers. An Inlet Control Device (ICD) IPEX LMF 100 is proposed at the outlet of ***STM MH 101*** to attenuate flow to the allowable release rate.

Table7, below***,*** estimates post-development flow rates and storage requirements.

Table 7
Stormwater Flow Rate Summary

Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	2.1	0.0	4.5	0.0
Attenuated Areas	6.2	39.3	14.0	81.4
Total	**8.3**	**39.3**	**18.5**	**81.4**

It is estimated that a total of ***81.4 m^3*** of on-site storage is required to attenuate flow to a release rate of ***18.5 L/s***. Storage calculations are included in ***Appendix D***.

As per the ***Corrigan SWM Facility Stormwater Management Report and Design Brief***, the Corrigan SWM Facility is designed to accept minor flow at a rate of ***85 L/s/ha*** or ***24.65 L/s*** (0.29 Ha x 0.85 L/s/ha). As the attenuated release rate from the subject fall below the anticipated flow rate outlined in the ***CSWMF-SMRDB***, the local storm system and SWM pond have sufficient capacity to convey the proposed flows from the subject development.

5.4 Stormwater Servicing Conclusions

Post development stormwater runoff will be required to be restricted to the allowable 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 for the site was calculated to be ***20.1 L/s***. It was determined that an ***IPEX LMF 100 ICD*** and ***81.4 m^3*** of storage will be required to attenuate flows to this release rate.

No quality control is required for the proposed development, as per correspondence with RVCA, located in ***Appendix A.***

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

6.0 UTILITIES

Bell and Streetlighting services exist within Greenbank Road right-of-way.

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

7.0 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.

8.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained by Jack Uppal to prepare a Functional Servicing and Stormwater Management Report in support of Site Plan Control and Zoning By-Law Amendment for the proposed development at 3802&3812 Greenbank Road. 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 ***0.24 L/s*** directed to the 600 mm sanitary sewer within Greenbank Road, to be ultimately discharged into the West Nepean Collector Trunk. Based on the ***BS-MSSA***, the proposed works result in ***0.23 L/s*** less sanitary flow than anticipated, thus the municipal sanitary system will have sufficient capacity to support the development;
- Based on the consultation with the City, the proposed development is proposed to attenuate flow to a release rate of ***20.1 L/s***;
- It is proposed to attenuate flow through the combined use of underground storage and an IPEX LMF 100 ICD at MH101. It is anticipated that ***81.4 m³*** of onsite storage will be required to attenuate flow to the established release rate above; and
- No quality control measures are required, per correspondence with the RVCA.

Prepared by,
David Schaeffer Engineering Ltd.

Per: Brandon Chow

Reviewed by,
David Schaeffer Engineering Ltd.

Per: Steven L. Merrick, P.Eng.

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

18-1060 11/12/2018

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.	Drawings/Figures
☐	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.	Section 4.2
☐	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.	N/A
☒	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.	Section 5.3
☒	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.	Section 7.0
☐	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

Brandon Chow

From: Eric Lalande <eric.lalande@rvca.ca>
Sent: November 23, 2018 4:20 PM
To: Brandon Chow
Subject: RE: 18-1060_ 3802-3812 Greenbank Rd - Quality Requirement

Hi Brandon,

Best management practices are encouraged on site. Quality control measures are not required as the RVCA will rely on the downstream swm facility for water quality protection.

Thank you,

Eric Lalande, MCIP, RPP
Planner, Rideau Valley Conservation Authority
613-692-3571 x1137

From: Brandon Chow <BChow@dsel.ca>
Sent: Friday, November 23, 2018 4:17 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Subject: 18-1060_ 3802-3812 Greenbank Rd - Quality Requirement

Good afternoon Eric,

We would like to touch base with you regarding a development we are working on located at 3802-3812 Greenbank Road.

The proposed development involves the construction of a 1-storey 848m² retail building with associated parking as shown by the attached site plan.
Stormwater collected from the site will outlet to the existing 1800mm storm sewer within Greenbank Rd and travel approximately 2,125m to the Corrigan Pond. As indicated in the attached design brief, the pond provides treatment to the enhanced level (80% TSS removal) before discharging to the Jock River.

Can you provide any comments regarding quality controls required for this site?

Thank you,

Brandon Chow
Project Coordinator / Intermediate Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext.532
fax: (613) 836-7183
email: bchow@DSEL.ca

MEMO

Date: 21-08-2018

To / Destinataire	Kelby, Lodoen Unseth	
From / Expéditeur	Golam Sharif, Project Manager, Infrastructure Approvals	
Subject / Objet	**Pre-Application Consultation** **3802-3812 Greenbank, Ward No 3,** *A zoning by law amendment and site plan control to transition from a development reserve zone to a neighborhood commercial zone to permit a single storey commercial/retail building with an approximate building footprint of 9,123sq ft. The proposal contains 28 surface parking spaces.*	File No. PC2018-0207

Please note the following information regarding the engineering design submission for the above noted site:

1. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/city-hall/planning-and-development/how-develop-property/development-application-review-process-2/guide-preparing-studies-and-plans

2. Servicing and site works shall be in accordance with the following documents:

   - ⇨ Ottawa Sewer Design Guidelines (October 2012) and Technical Bulletin PIEDTB-2016-01
   - ⇨ Ottawa Design Guidelines – Water Distribution (2010) and Technical Bulletins ISD-2010-2 and ISDTB-2014-02
   - ⇨ Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
   - ⇨ City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
   - ⇨ City of Ottawa Environmental Noise Control Guidelines (January, 2016)

- ⇨ City of Ottawa Park and Pathway Development Manual (2012)
- ⇨ City of Ottawa Accessibility Design Standards (2012)
- ⇨ Ottawa Standard Tender Documents (latest version)
- ⇨ Ontario Provincial Standards for Roads & Public Works (2013)

3. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).

4. The Stormwater Management Criteria, for the subject site, is to be based on the following:

   i. The 5-yr storm event using the IDF information derived from the Meteorological Services of Canada rainfall data, taken from the MacDonald Cartier Airport, collected 1966 to 1997.

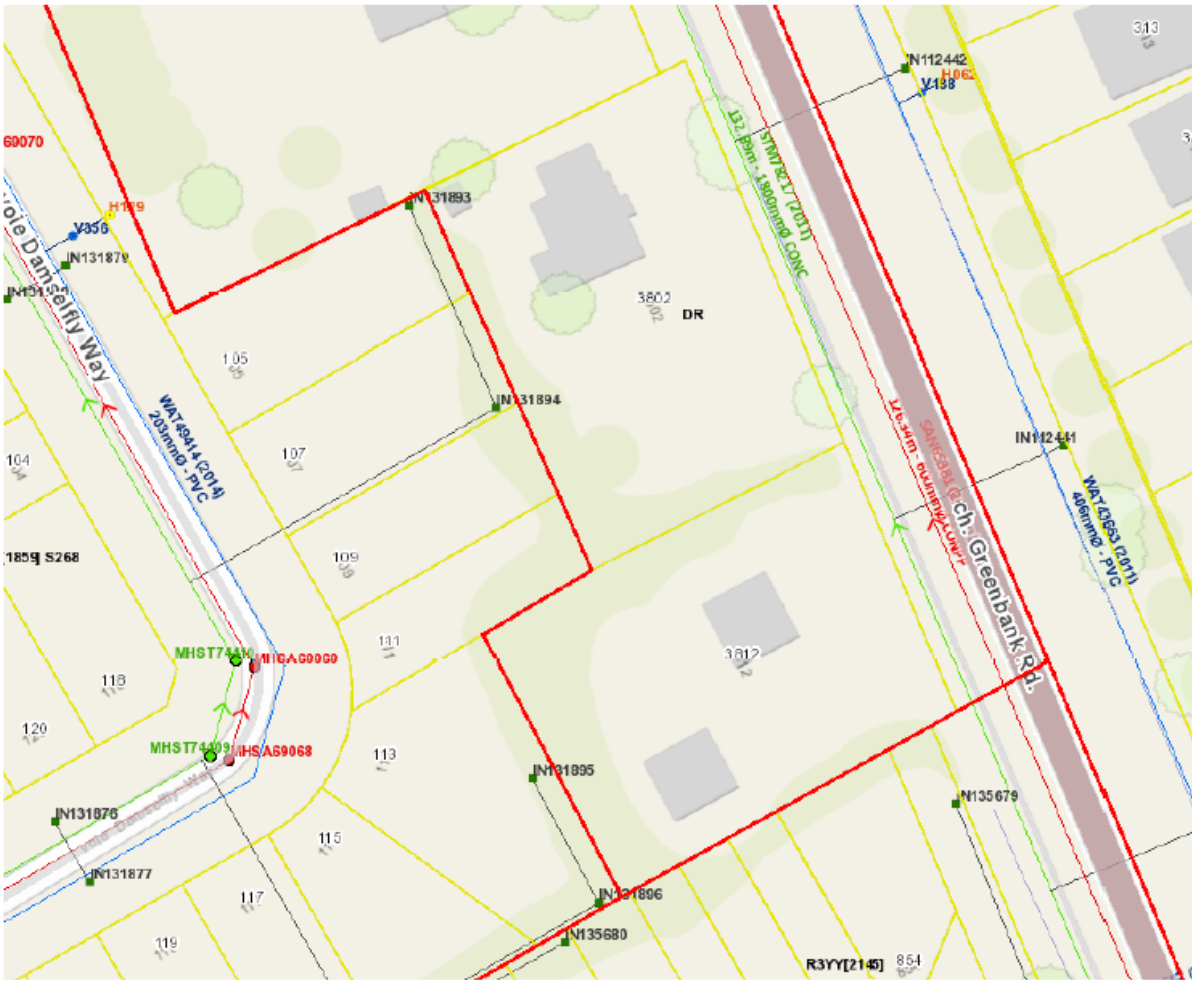
   ii. The pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less (§ 8.3.7.3).

   iii. A calculated time of concentration (Cannot be less than 10 minutes).

   iv. Flows to the storm sewer in excess of the 5-year storm release rate, up to and including the 100-year storm event, must be detained on site.

   v. Barrhaven South Master Servicing Study is available for this area. Therefore, follow the requirement from the MSS and provide reference.

5. Deep Services (Storm, Sanitary & Water Supply)



i. A plan view of the existing services may be seen above. Services should ideally be grouped in a common trench to minimize the number of road cuts. The sizing of existing services is:

   a. Greenbank Road:

      i. Sanitary – 600 Concrete (2011).

ii. Storm – 1800 mm Concrete (2011).

iii. Water – 406 mm PVC (2011).

ii. As per City's Sewer Design guideline a monitoring manhole shall be required just inside the property line located in an accessible location (ie. Not in a parking area) for all non-residential and multi residential buildings connections from a private sewer to a public sewer.

iii. As per City's Sewer Design guideline it is expected that the alternative of a high level sewer in a public right-of-way and connected to the collector sewer is the preferred method of servicing properties.

iv. New connections to sewer or watermain services within the City right of way is subject to City approval and are to be made above the springline of the sewermain as per:

a. Std Dwg S11.1 for flexible main sewers – *connections made using approved tee or wye fittings.*

b. Std Dwg S11 (For rigid main sewers) – *lateral must be less that 50% the diameter of the sewermain,*

c. Std Dwg S11.2 (for rigid main sewers using bell end insert method) – *for larger diameter laterals where manufactured inserts are not available; lateral must be less that 50% the diameter of the sewermain,*

d. Connections to manholes permitted when the connection is to rigid main sewers where the lateral exceeds 50% the diameter of the sewermain. – Connect obvert to obvert with the outlet pipe unless pipes are a similar size.

e. No submerged outlet connections.

6. Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:

i. Location of service

ii. Type of development and the amount of fire flow required (as per FUS, 1999).

iii. Average daily demand: ___ l/s.

iv. Maximum daily demand: ___l/s.

v. Maximum hourly daily demand: ___ l/s.

vi. Hydrant location and spacing to meet City's Water Design guidelines.

vii. The water main on McGarry Terrace is a dead end main. Future water servicing may be required to connect the water servicing from McGarry Terrace to Marketplace Ave.

7. General comments –

i. Consult with RVCA for quality control measures for stormwater discharge.

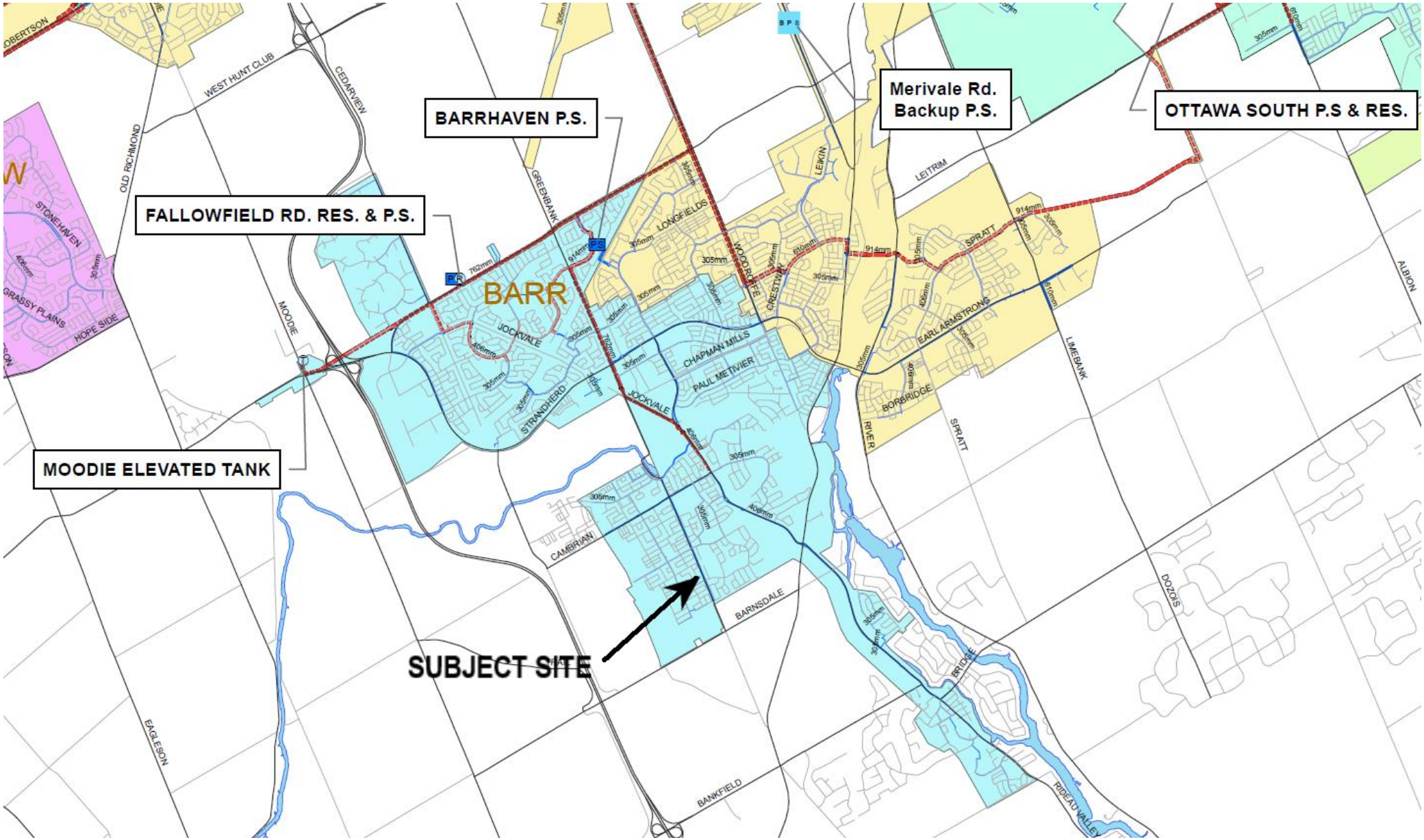
ii. Provide reference including excerpt to the Barrhaven Master Servicing Study in the Site Servicing report.

Should you have any questions or require additional information, please contact me directly at (613) 580-2424, x 20763 or by email at sharif.sharif@ottawa.ca.

Golam Sharif
Project Manager – Infrastructure Approvals
Development Review, South Branch

APPENDIX B

Water Supply


BARRHAVEN P.S.
Merivale Rd.
Backup P.S.
OTTAWA SOUTH P.S & RES.
FALLOWFIELD RD. RES. & P.S.
MOODIE ELEVATED TANK
SUBJECT SITE
BARR
WEST HUNT CLUB
CEDARVIEW
OLD RICHMOND
GREENBANK
MOODIE
STONEHAVEN
GRASSY PLAINS
HOPE SIDE
LONGFIELDS
HOOPOLEE
CRESTWAY
LEIKIN
LEITRIM
SPRATT
EARL ARMSTRONG
BORBRIDGE
RIVER
LIMEBANK
ALBION
JOCKVALE
STRANDHERD
CHAPMAN MILLS
PAUL METIVIER
CAMBRIAN
BARNSDALE
BRIDGE
DOZOS
EAGLESON
BANKFIELD
RIDEAU VALLEY

3802-3812 Greenbank Road
Proposed Site Conditions

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	-	0
1 Bedroom	1.4	-	0
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	0	0.0	0.0	0.0	0.0	0.0	0.0

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
Commercial floor space	2.5 $L/m^2/d$	848	2.12	1.5	3.2	2.2	5.7	4.0
Office	75 $L/9.3m^2/d$	-	0.00	0.0	0.0	0.0	0.0	0.0
Restaurant*	125 L/seat/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	2.1	1.5	3.2	2.2	5.7	4.0
		Total Demand	**2.1**	**1.5**	**3.2**	**2.2**	**5.7**	**4.0**

* Estimated number of seats at 1 seat per $9.3m^2$

3802-3812 Greenbank Road
FUS-Fire Flow 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	848.0	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	5125.2	L/min	
	5000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Limited Combustible	-15%		
Fire Flow	**4250.0**	**L/min**	

3. Reduction for Sprinkler Protection

Sprinklered - Supervised	-50%		
Reduction	**-2125**	**L/min**	

4. Increase for Separation Distance

	Cons. of Exposed Wall	S.D	Lw	Ha	LH	EC	
N	Non-Combustible	10.1m-20m	17	1	17	12%	
S	Non-Combustible	20.1m-30m	14	2	28	8%	
E	Non-Combustible	>45m	59	2	118	0%	
W	Non-Combustible	10.1m-20m	58	2	116	15%	
		% Increase				**35%**	*value not to exceed 75%*

Increase	**1487.5**	**L/min**	

Lw = Length of the Exposed Wall
Ha = number of storeys of the adjacent structure. Max 5 stories
LH = Length-height factor of exposed wall. Value rounded up.
EC = Exposure Charge

Total Fire Flow

Fire Flow	3612.5	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	4000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by S.J. Lawrence Architects.
-Calculations based on Fire Underwriters Survey - Part II

BOUNDARY CONDITIONS

Boundary Conditions For: 3802-3812 Greenbank Rd

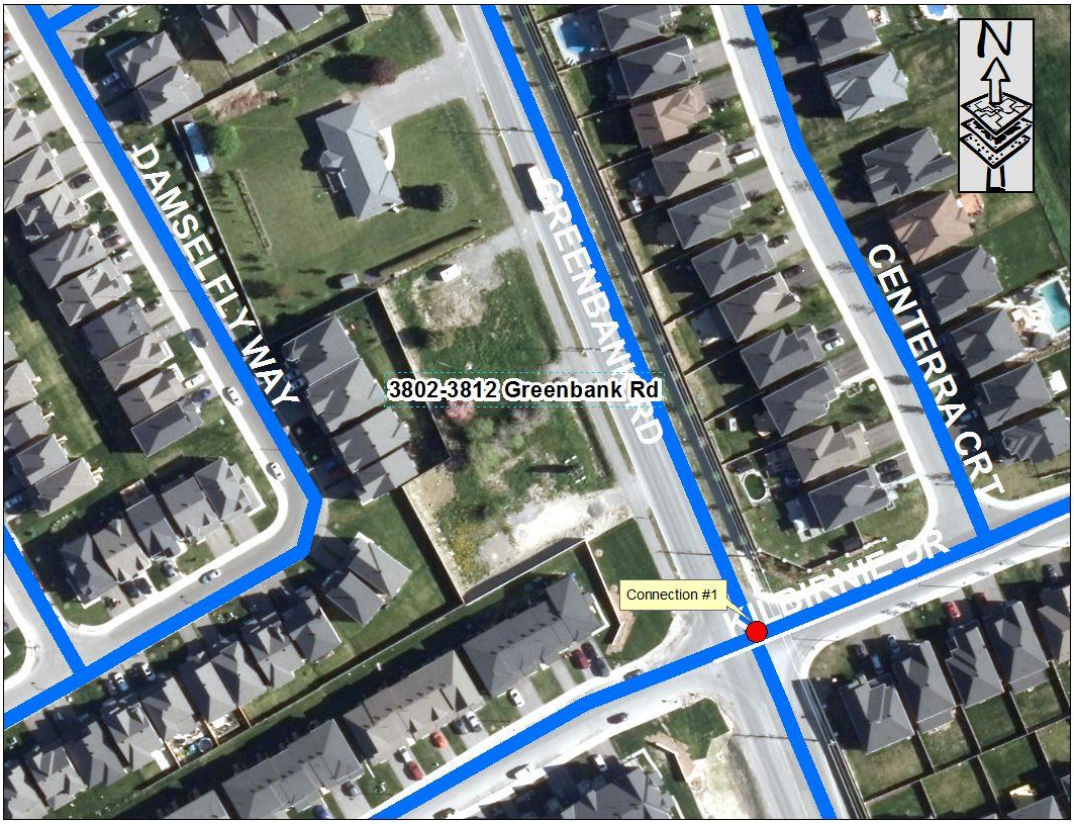
Date of Boundary Conditions: 2018-Nov-22

Provided Information:

Scenario	Demand	
	L/min	L/s
Average Daily Demand	1.5	0.02
Maximum Daily Demand	2.2	0.04
Peak Hour	4.0	0.07
Fire Flow #1 Demand	4,000	66.7

Number Of Connections: 1

Location:



BOUNDARY CONDITIONS

Results:

Pre-Configuration

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	159.0	87.1
Peak Hour	142.1	63.1
Max Day Plus Fire (4,000) L/min	136.9	55.8

[1]Elevation: **97.670 m**

Post-Configuration

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	147.7	72.8
Peak Hour	144.9	68.8
Max Day Plus Fire (4,000) L/min	145.6	69.7

[1]Elevation: **97.670 m**

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:

a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

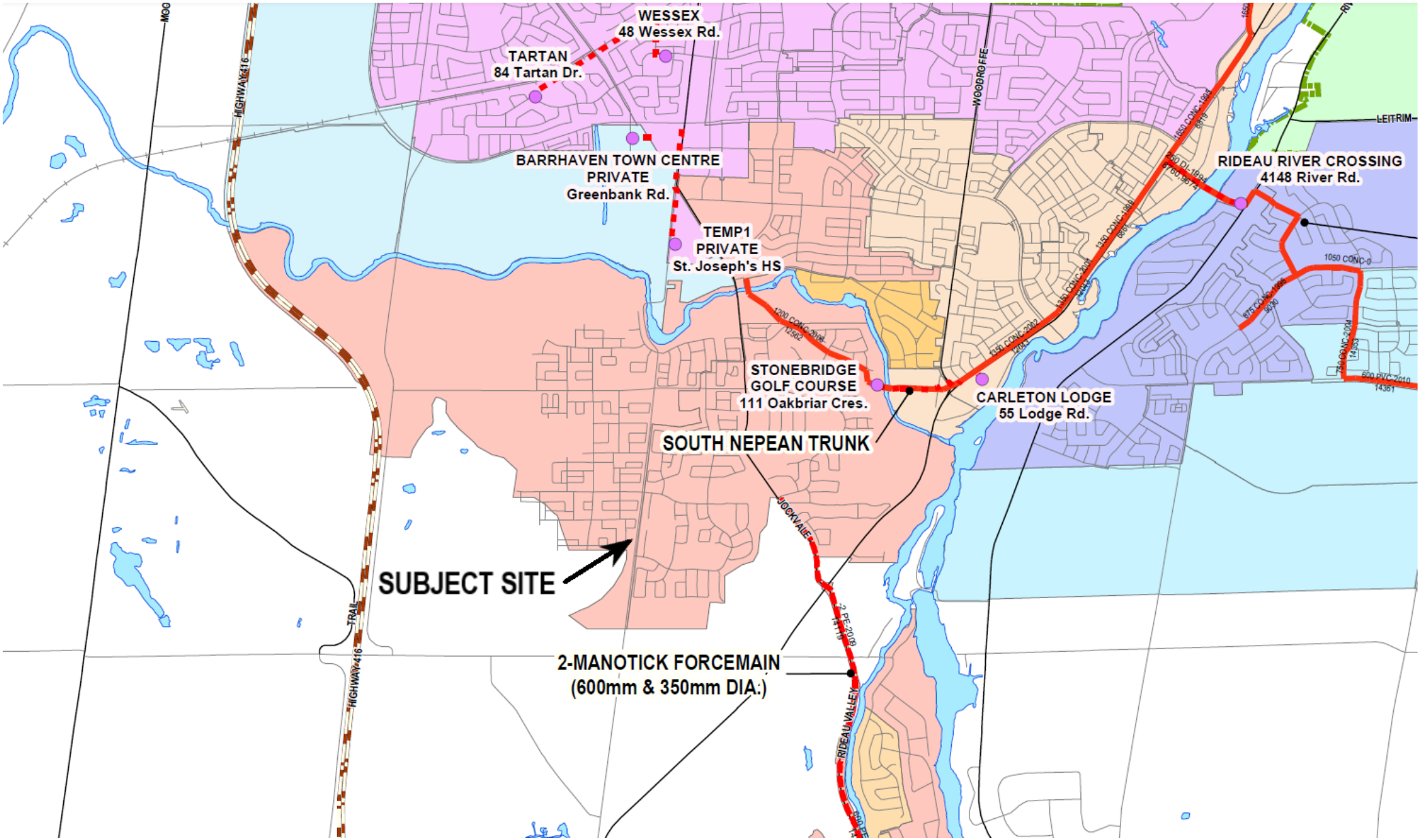
Disclaimer

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. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

APPENDIX C

Wastewater Collection


WESSEX
48 Wessex Rd.
TARTAN
84 Tartan Dr.
BARRHAVEN TOWN CENTRE
PRIVATE
Greenbank Rd.
TEMP1
PRIVATE
St. Joseph's HS
RIDEAU RIVER CROSSING
4148 River Rd.
STONEBRIDGE
GOLF COURSE
111 Oakbriar Cres.
CARLETON LODGE
55 Lodge Rd.
SOUTH NEPEAN TRUNK
SUBJECT SITE
2-MANOTICK FORCEMAIN
(600mm & 350mm DIA.)
HIGHWAY 416
TRAIL
WOODROFFE
JOCKVALE
RIDEAU VALLEY
LEITRIM

3802-3812 Greenbank Road
Anticipated Site Conditions
per Barrhaven South Master Servicing Study Addendum

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

Site Area 0.290 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **0.10 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		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop **31**

Average Domestic Flow **0.10 L/s**

Peaking Factor **3.68**

Peak Domestic Flow **0.37 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**		**No. of Units**	**Avg Wastewater (L/s)**
Commercial floor space*	5	$L/m^2/d$		0.00
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Ex. Industrial - Light**	35,000	L/gross ha/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	**0.10 L/s**
Total Estimated Peak Dry Weather Flow Rate	**0.37 L/s**
Total Estimated Peak Wet Weather Flow Rate	**0.47 L/s**

3802-3812 Greenbank Road
Proposed Site Conditions

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

Site Area 0.290 **ha**

Extraneous Flow Allowances

Infiltration / Inflow	**0.10**	**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		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**0**	
Average Domestic Flow	**0.00**	**L/s**
Peaking Factor	**3.80**	
Peak Domestic Flow	**0.00**	**L/s**

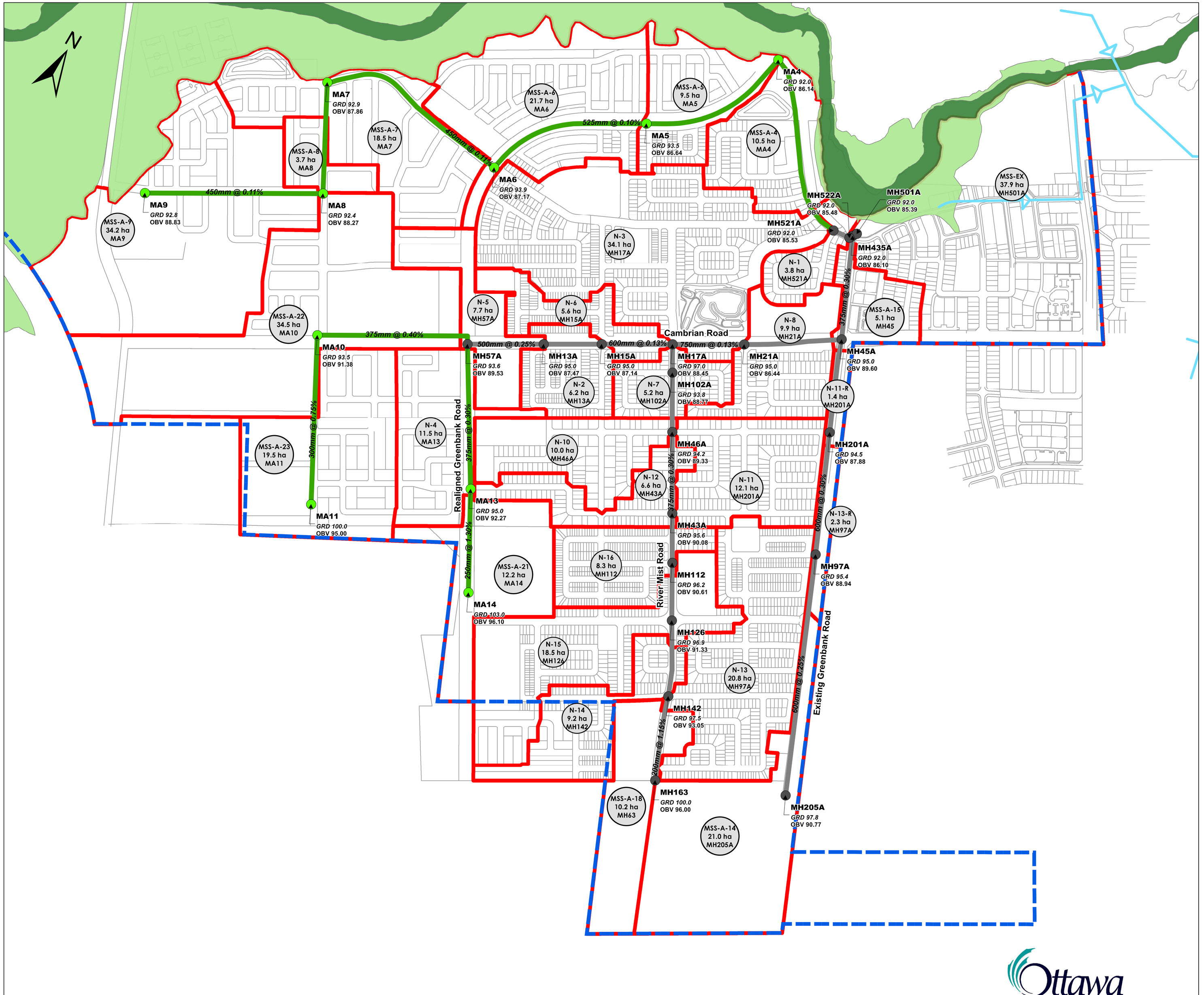
Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate		No. of Units	Avg Wastewater (L/s)
Commercial floor space*	5	$L/m^2/d$	848	0.10
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Ex. Industrial - Light**	35,000	L/gross ha/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	**0.10**
Peak Institutional / Commercial Flow	0.15
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**0.15**

** 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	**0.10**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**0.15**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**0.24**	**L/s**



W:\active\1634_00999_Barrhaven_SUC_MSS_Update\planning\drawing\Sanitary\163400999-SAN-DRAWING4.mxd

Stantec

Stantec Consulting Ltd.
400 - 1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

Legend

- BARRHAVEN SOUTH COMMUNITY BOUNDARY
- EXISTING NODES
- FUTURE NODES
- EXISTING SEWER
- FUTURE SEWER
- EXISTING SEWER (FROM 2007 MSS)
- RIVER
- 100 YEAR FLOOD PLAIN
- SANITARY DRAINAGE CATCHMENTS
- Area Name / Area (ha) / Manhole — SANITARY CATCHMENT INFORMATION

Node Name
Ground Elevation
Top Obvert Elevation

Notes

1	ISSUED FOR MSS ADDENDUM	LP	AP	14.11.28
	Revision	By	Appd.	YY.MM.DD

File Name: 163400999-SAN-DRAWING4.MXD	LP	AP	LP	14.11.28
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

CITY OF OTTAWA

BARRHAVEN SOUTH MASTER SERVICING STUDY ADDENDUM

Ottawa, ON

Title

SANITARY SERVICING PLAN

Project No.	Scale	Drawing No.	Sheet	Revision
163400999	1:5,000 (0 75 150 300 Meters)	A-4	4 of 9	1

Area:

BARRHAVEN SOUTH
MASTER SERVICING STUDY

DATE: 2017/09/29
REVISION: 2
DESIGNED BY: LP
CHECKED BY: /

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 163400999

Colour code:
- HMB values
- Hard coded values — Most US MH
- Caculated value — Estimated value
- updated value — Value from subdivision design — MH receiving flow from 2 or more sewers

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	350	L/p/day	MINIMUM VELOCITY	0.60 m/s	As per CDP (units/ha)
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	50,000	L/ha/day	MAXIMUM VELOCITY	3.00 m/s	LOW DENSITY RESIDENTIAL 26
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000	L/ha/day	MANNINGS n	0.013	SEMI-DETACHED 52
PEAKING FACTOR (COMM., INST.):	1.5	INDUSTRIAL (LIGHT)	35,000	L/ha/day	BEDDING CLASS	B	TOWN HOUSES 82
PERSONS / SINGLE UNIT	3.4	INSTITUTIONAL	50,000	L/ha/day	MINIMUM COVER	2.50 m	APARTMENTS 120
PERSONS / TOWNHOME	2.7	INFILTRATION	0.28	L/s/ha			COMMUNITY CORE 60
PERSONS / APARTMENT	1.8						AVERAGE PERSONS/ha 107

LOCATION				RESIDENTIAL AREA AND POPULATION										COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE						
AREA ID NUMBER	Source	FROM M.H.	TO M.H.	DEV AREA (ha)	DEV POP	ADD'N RES AREA (ha)	ADD'N POP	TOTAL AREA (ha)	TOTAL POP	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (L/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (L/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (L/s)	FLOW (L/s)	LENGTH (m)	DIA (mm)	MATERIAL	SLOPE (%)	CAP. (FULL) (L/s)	CAP. V PEAK FLOW (%)	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
MSS-A-23		MA11	MA10	0.00	0	14.2	1,523	14.2	1,523	14.20	1,523	3.67	22.6	0.0	0.0	0.0	0.0	0.0	0.0	2.8	2.8	2.5	2.5	2	19.5	19.5	5.5	30.1	482.1	300	PVC	0.75	87.6	34%	1.20	1.08
MSS-A-22		**MA10**	MH57A	0.00	0	12.8	1,371	12.8	1,371	27.00	2,894	3.46	40.6	0.0	0.0	0.0	0.0	0.0	0.0	7.2	10.0	14.5	17.0	8.7	34.5	54.0	15.1	64.4	449.7	375	PVC	0.40	115.1	56%	1.01	1.04
Realigned Greenbank Road																																			
MSS-A-21		MA14	MA13	0.0	0	4.8	513	4.8	513	4.8	513	3.97	8.3	0.0	0.0	0.0	0.0	0.0	0.0	7.5	7.5	0.0	0.0	6.5	12.3	12.3	3.4	18.2	295.0	250	PVC	1.30	71.4	25%	1.40	1.12
N-4		**MA13**	MH57A	0.0	0	11.0	1,176	11.0	1,176	15.8	1,689	3.64	24.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5	0.5	0.5	6.5	11.5	23.8	6.7	38.1	413.1	375	PVC	0.30	100.3	38%	0.88	0.81
Cambrian Road																																			
N-5		**MH57A**	MH13A	0.0	0	4.3	458	4.3	458	47.1	5,041	3.24	66.2	3.4	3.4	0.0	0.0	0.0	0.0	0.0	17.5	0.0	17.5	18.1	7.7	85.5	23.9	108.2	216.5	500	CPP	0.25	188.2	57%	0.96	0.99
N-2		**MH13A**	MH15A	6.2	631	0.0	3	6.2	634	53.3	5,675	3.19	73.3	0.0	3.4	0.0	0.0	0.0	0.0	0.0	17.5	0.0	17.5	18.1	6.2	91.7	25.7	117.1	165.2	500	CPP	0.20	168.6	69%	0.86	0.93
N-6		**MH15A**	MH17A	5.6	868	0.0	2	5.6	870	58.9	6,545	3.13	83.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	17.5	0.0	17.5	18.1	5.6	97.3	27.2	128.3	202.0	600	CPP	0.13	230.7	56%	0.79	0.81
River Mist Road																																			
MSS-A-18	Stantec	MH163	162	6.5	543	0.0	0	6.5	543	6.5	543	3.96	8.7	0.0	0.0	0.0	0.0	0.0	0.0	2.8	2.8	0.9	0.9	2.4	10.2	10.2	2.9	14.0	36.3	200	PVC	1.15	35.8	39%	1.12	1.04
	Stantec	162	161	0.0	0	0.0	0	0.0	0	6.5	543	3.96	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.9	2.4	0.0	10.2	2.9	14.0	87.2	250	PVC	1.15	67.3	21%	1.32	1.00
	Stantec	161	EX151	0.0	0	0.0	0	0.0	0	6.5	543	3.96	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.9	2.4	0.0	10.2	2.9	14.0	75.6	250	PVC	1.15	67.3	21%	1.32	1.00
	Stantec	EX151	MH142	0.0	0	0.0	0	0.0	0	6.5	543	3.96	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.9	2.4	0.0	10.2	2.9	14.0	44.4	300	PVC	1.40	119.0	12%	1.63	1.08
N-14	Stantec	**MH142**	EX139	8.2	825	1.0	102	9.2	927	15.7	1,470	3.69	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.9	2.4	9.2	19.4	5.4	29.8	74.8	300	PVC	0.40	63.5	47%	0.87	0.85
	Stantec	EX139	EX136	0.0	0	0.0	0	0.0	0	15.7	1,470	3.69	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.9	2.4	0.0	19.4	5.4	29.8	64.7	300	PVC	0.40	63.5	47%	0.87	0.85
	Stantec	EX136	MH126	0.0	0	0.0	0	0.0	0	15.7	1,470	3.69	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.0	0.9	2.4	0.0	19.4	5.4	29.8	78.9	300	PVC	0.41	64.2	46%	0.88	0.86
N-15	Stantec	**MH126**	EX123	16.5	954	0.0	0	16.5	954	32.2	2,424	3.52	34.6	0.0	0.0	0.0	0.0	0.0	0.0	2.1	4.9	0.0	0.9	4.3	18.6	38.0	10.6	49.5	71.3	375	PVC	0.45	122.0	41%	1.07	1.01
	Stantec	EX123	MH112	0.0	0	0.0	0	0.0	0	32.2	2,424	3.52	34.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0	0.9	4.3	0.0	38.0	10.6	49.5	90.3	375	PVC	0.42	118.6	42%	1.04	0.99
N-16	Stantec	**MH112**	EX102	8.3	689	0.0	0	8.3	689	40.5	3,113	3.43	43.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0	0.9	4.3	8.3	46.3	13.0	60.6	68.0	375	PVC	0.31	101.5	60%	0.89	0.93
	Stantec	EX102	EX101	0.0	0	0.0	0	0.0	0	40.5	3,113	3.43	43.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0	0.9	4.3	0.0	46.3	13.0	60.6	34.0	375	PVC	0.29	98.0	62%	0.86	0.91
	IBI	EX101	MH43A	0.0	0	0.0	0	0.0	0	40.5	3,113	3.43	43.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0	0.9	4.3	0.0	46.3	13.0	60.6	38.0	375	PVC	0.30	100.3	60%	0.88	0.92
N-12	IBI	**MH43A**	MH44A	6.6	352	0.0	0	6.6	352	47.1	3,465	3.39	47.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0	0.9	4.3	6.6	52.9	14.8	66.7	81.0	375	PVC	0.30	100.3	67%	0.88	0.95
	IBI	MH44A	MH45A	0.0	0	0.0	0	0.0	0	47.1	3,465	3.39	47.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0	0.9	4.3	0.0	52.9	14.8	66.7	64.0	375	PVC	0.30	100.3	67%	0.88	0.95
	IBI	MH45A	MH46A	0.0	0	0.0	0	0.0	0	47.1	3,465	3.39	47.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0	0.9	4.3	0.0	52.9	14.8	66.7	85.0	375	PVC	0.30	100.3	67%	0.88	0.95
N-10	IBI	**MH46A**	MH47A	8.4	562	0.0	0	8.4	562	55.5	4,027	3.33	54.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	1.6	2.5	4.3	10.0	62.9	17.6	76.2	41.0	375	PVC	0.30	100.3	76%	0.88	0.98
	DSEL	MH47A	MH101A	0.0	0	0.0	0	0.0	0	55.5	4,027	3.33	54.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0	2.5	4.3	0.0	62.9	17.6	76.2	64.0	375	PVC	0.30	100.3	76%	0.88	0.98
	DSEL	MH101A	MH102A	0.0	0	0.0	0	0.0	0	55.5	4,027	3.33	54.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0	2.5	4.3	0.0	62.9	17.6	76.2	64.0	375	PVC	0.30	100.3	76%	0.88	0.98
N-7	DSEL	**MH102A**	MH17A	4.0	291	1.2	129	5.2	420	60.7	4,447	3.29	59.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0	2.5	4.3	5.2	68.1	19.1	82.7	81.0	375	PVC	0.30	100.3	82%	0.88	0.99
Cambrian Road																																			
N-3		**MH17A**	MH21A	26.0	1,956	0.0	0	26.0	1,956	145.6	12,948	2.84	149.0	0.0	3.4	0.0	0.0	0.0	0.0	3.0	25.4	5.1	25.1	25.0	34.1	199.5	55.9	229.9	204.3	750	CPP	0.13	419.5	55%	0.92	0.94
N-8		**MH21A**	MH45	7.0	408	0.0	0	7.0	408	152.6	13,356	2.83	153.1	0.0	3.4	0.0	0.0	0.0	0.0	0.0	25.4	2.9	28.0	25.0	9.9	209.4	58.6	236.7	277.8	750	CPP	0.13	419.5	56%	0.92	0.95
Greenbank Road																																			
MSS-A-14	IBI	MH205A	MH98A	0.0	0	21.0	2,246	21.0	2,246	21.0	2,246	3.55	32.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	21.0	5.9	38.2	126.0	600	CPP	0.25	321.2	12%	1.10	0.73
	IBI	MH98A	MH99A	0.0	0	0.0	0	0.0	0	21.0	2,246	3.55	32.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	5.9	38.2	125.0	600	CPP	0.25	321.2	12%	1.10	0.73
	IBI	MH99A	MH100A	0.0	0	0.0	0	0.0	0	21.0	2,246	3.55	32.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	5.9	38.2	108.0	600	CPP	0.25	321.2	12%	1.10	0.73
	IBI	MH100A	MH204A	0.0	0	0.0	0	0.0	0	21.0	2,246	3.55	32.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	5.9	38.2	105.0	600	CPP	0.25	321.2	12%	1.10	0.73
	IBI	MH204A	MH206A	0.0	0	0.0	0	0.0	0	21.0	2,246	3.55	32.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	5.9	38.2	103.0	600	CPP	0.25	321.2	12%	1.10	0.73
	IBI	MH206A	MH97A	0.0	0	0.0	0	0.0	0	21.0	2,246	3.55	32.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	5.9	38.2	125.0	600	CPP	0.25	321.2	12%	1.10	0.73
N-13, N-13-R	IBI	**MH97A**	MH96A	19.9	1,625	0.1	6	20.0	1,631	41.0	3,877	3.35	52.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.0	20.8	41.8	11.7	64.3	98.0	600	CPP	0.30	350.4	18%	1.20	0.89
	IBI	MH96A	MH95A	0.0	0	0.0	0	0.0	0	41.0	3,877	3.35	52.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	41.8	11.7	64.3	129.0	600	CPP	0.30	350.4	18%	1.20	0.89
	IBI	MH95A	MH201A	0.0	0	0.0	0	0.0	0	41.0	3,877	3.35	52.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	41.8	11.7	64.3	123.0	600	CPP	0.30	350.4	18%	1.20	0.89
N-11, N-11-R	IBI	**MH201A**	MH201B	12.1	787	0.0	0	12.1	787	53.1	4,664	3.27	61.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	12.1	53.9	15.1	76.9	124.0	600	CPP	0.30	350.4	22%	1.20	0.94
	IBI	MH201B	MH200A	0.0	0	0.0	0	0.0	0	53.1	4,664	3.27	61.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	53.9	15.1	76.9	68.0	600	CPP	0.30	350.4	22%	1.20	0.94
	IBI	MH200A	MH200C	0.0	0	0.0	0	0.0	0	53.1	4,664	3.27	61.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	53.9	15.1	76.9	48.0	600	CPP	0.50	452.6	17%	1.55	1.12
	IBI	MH200C	MH45	0.0	0	0.0	0	0.0	0	53.1	4,664	3.27	61.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	53.9	15.1	76.9	26.0	600	CPP	0.12	221.9	35%	0.76	0.68
MSS-A-15		**MH45**	MH435A	0.0	0	5.1	548	5.1	548	210.8	18,568	2.68	201.6	0.0	3.4	0.0	0.0	0.0	0.0	0.0	25.4	0.0	28.8	25.0	5.1	268.4	75.2	301.8	296.6	900	CPP	0.10	597.0	51%	0.91	0.91
North																																			
MSS-A-9		MA9	MA8	0.0	0	22.2	2,378	22.2	2,378	22.2	2,378	3.53	34.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.5	9.5	9.5	2.2	34.2	34.2	9.6	45.8	507.5	450	CPP	0.11	98.4	47%	0.60	0.59
MSS-A-8		**MA8**	MA7	0.0	0	2.9	308	2.9	308	25.1	2,686	3.48	37.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.8	10.3	2.2	3.7	37.9	10.6	50.7	317.1	450	CPP	0.11	98.4	52%	0.60	0.61
MSS-A-7		**MA7**	MA6	0.0	0	18.5	1,979	18.5	1,979	43.6	4,665	3.27	61.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	10.3	2.2	18.5	56.4	15.8	79.8	573.1	450	CPP	0.11	98.4	81%	0.60	0.67
MSS-A-6		**MA6**	MA5	0.0	0	21.7	2,320	21.7	2,320	65.3	6,985	3.11	88.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	10.3	2.2	21.7	78.1	21.9	112.1	473.9	600	CPP	0.10	201.5	56%	0.69	0.71
MSS-A-5		**MA5**	M27A	0.0	0	9.5	1,020	9.5	1,020	74.8	8,005	3.05	98.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	10.3	2.2	9.5	87.6	24.5	125.6	220.0	600	CPP	0.10	201.5	62%	0.69	0.73
MSS-A-4		**M27A**	MH5200A	0.0	0	8.1	863	8.1	863	82.9	8,868	3.01	108.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	10.3	2.2	8.1	95.7	26.8	137.1	501.5	600	CPP	0.15	248.2	55%	0.85	0.87
		MH5200A	MH520A	0.0	0	0.0	0	0.0	0	82.9	8,868	3.01	108.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	10.3	2.2	0.0	95.7	26.8	137.1	46.0	600	CPP	0.08	181.0	76%	0.62	0.69
		MH520A	MH521A	0.0	0	0.0	0	0.0	0	82.9	8,868	3.01	108.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	10.3	2.2	0.0	95.7	26.8	137.1	44.4	600	CPP	0.10	201.5	68%	0.69	0.75
N-1		**MH521A**	MH522A	3.3	177	0.5	54	3.8	231	86.7	9,099	3.00	110.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	10.3	2.2	3.8	99.5	27.9	140.7	50.1	600	CPP	0.09	192.7	73%	0.66	0.73
		MH522A	MH435A	0.0	0	0.0	0	0.0	0	86.7	9,099	3.00	110.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	10.3	2.2	0.0	99.5	27.9	140.7	10.8	600	CPP	0.21	292.0	48%	1.00	0.99
		MH435A	MH501A	0.0	0	0.0	0	0.0	0	297.5	27,667	2.51	281.3	0.0	3.4	0.0	0.0	0.0	0.0	0.0	27.9	0.0	39.1	27.2	0.0	367.9	103.0	411.5	13.3	900	CPP	0.11	623.2	66%	0.95	1.02

APPENDIX D

Stormwater Management

ADVANCED DRAINAGE SYSTEMS, INC.

SiteASSIST by StormTech
FOR STORMTECH INSTRUCTIONS, DOWNLOAD THE INSTALLATION APP

3802-3812 Greenbank Rd

3802-3812 Greenbank Rd

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-4500 OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-4500 CHAMBER SYSTEM

1. STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTITIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm) MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
10. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
11. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-4500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

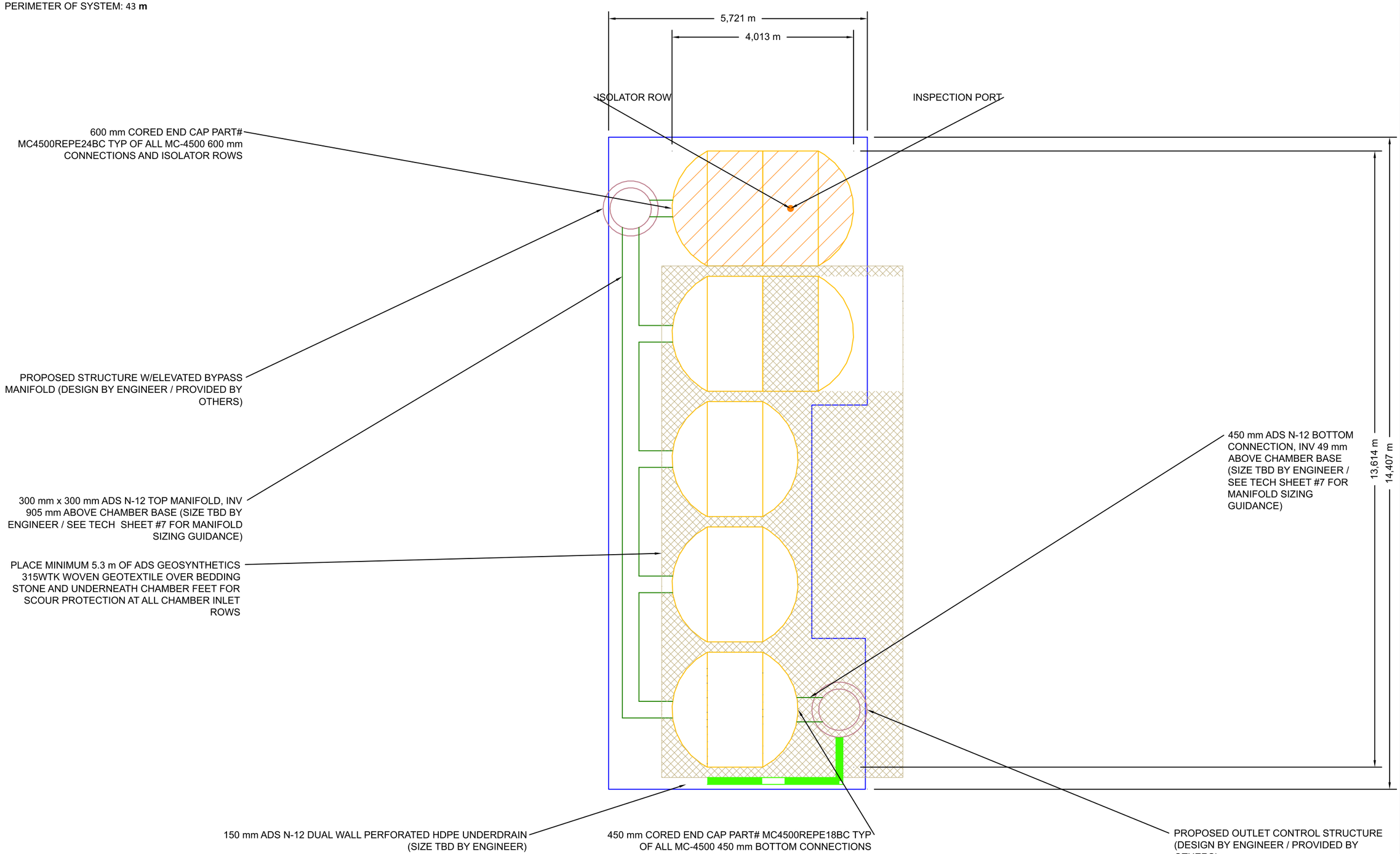
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

(7) STORMTECH MC-4500 CHAMBERS
(10) STORMTECH MC-4500 END CAPS
INSTALLED WITH 305 mm COVER STONE, 229 mm BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 81 m³
AREA OF SYSTEM: 76 **m²**
PERIMETER OF SYSTEM: 43 **m**

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION



3802-3812 Greenbank Rd
3802-3812 Greenbank Rd

DATE: 12/05/2018 | DRAWN: BC | CHECKED: ---
PROJECT #: Tool

REV	DRW	CHK	DESCRIPTION

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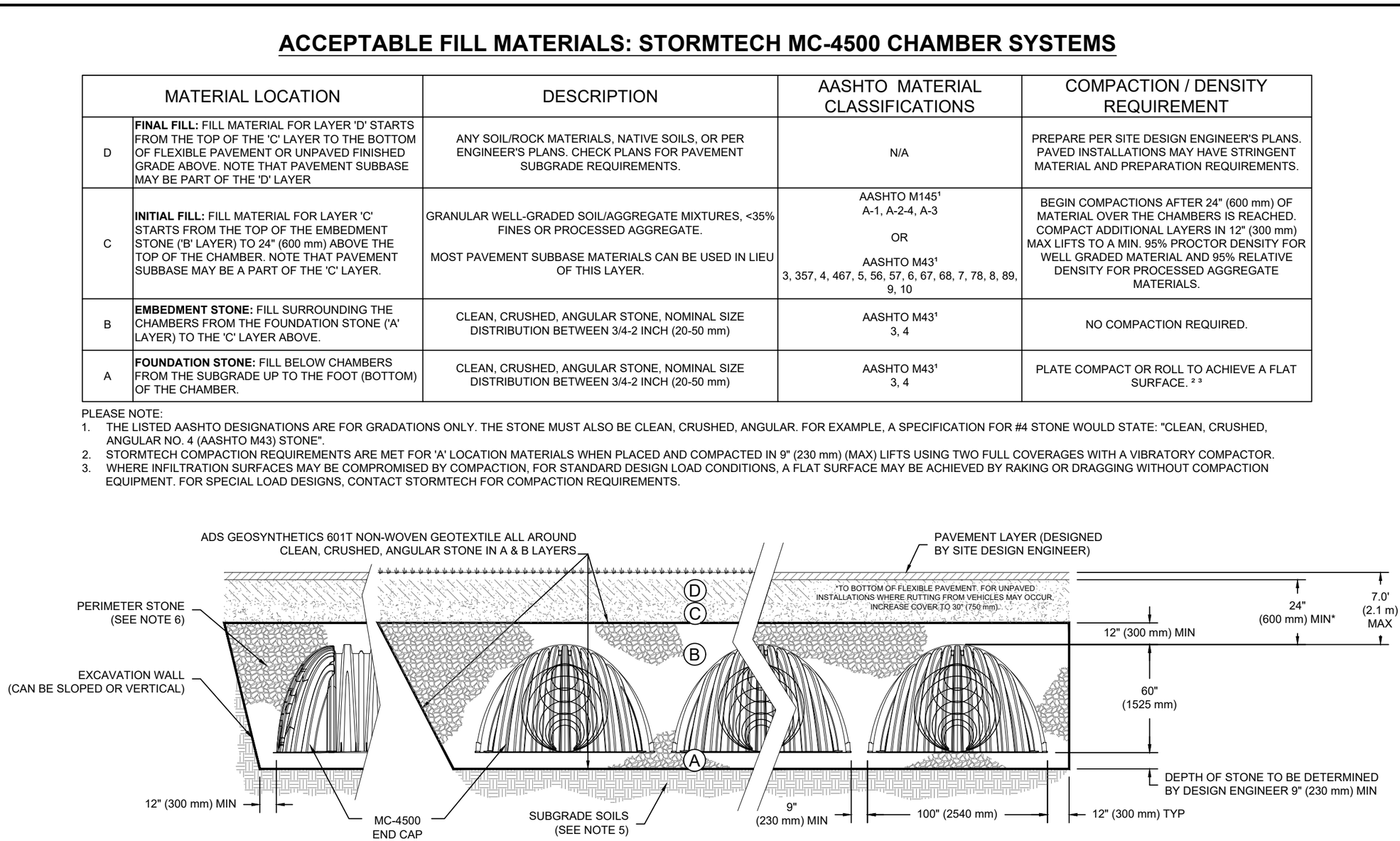
NOT TO SCALE

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2] [3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. MC-4500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

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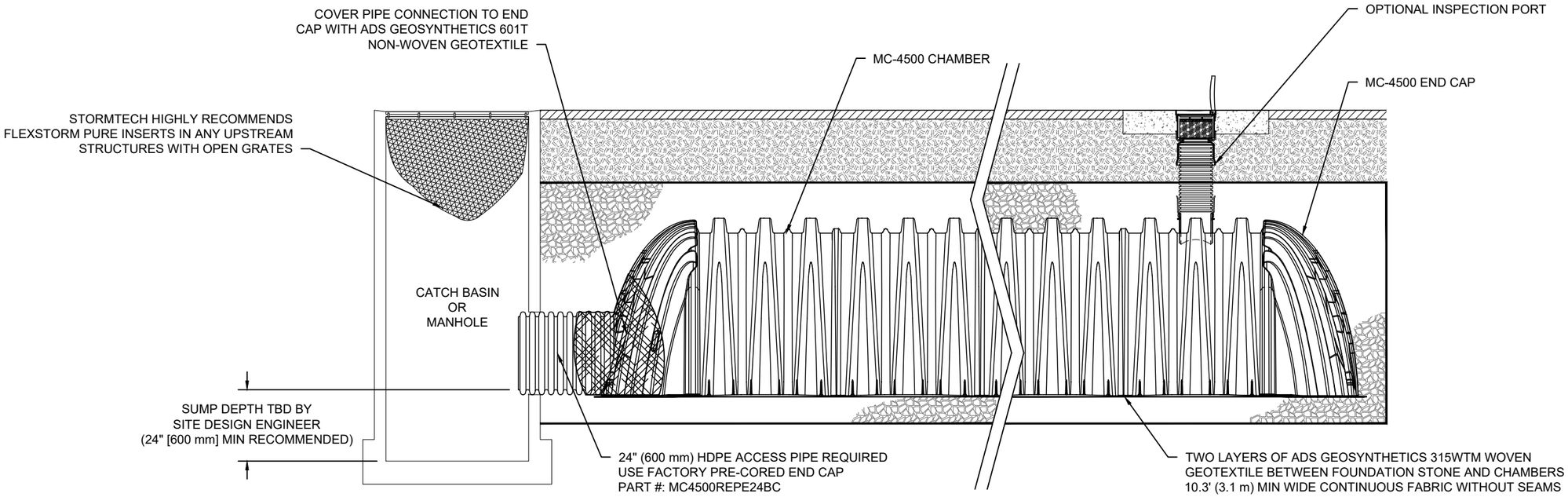


MC-4500 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45" (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

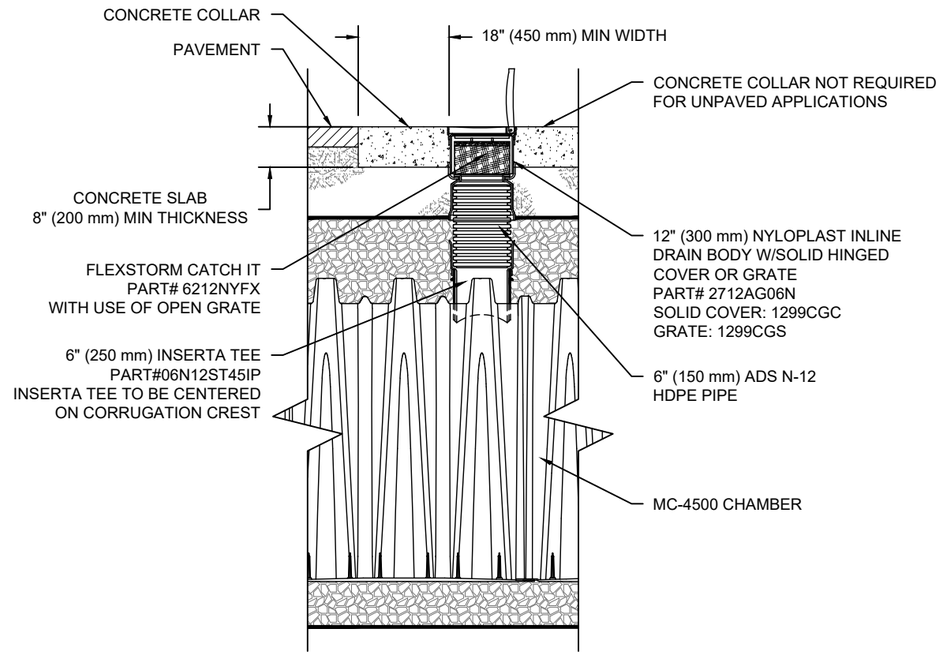
STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



MC-4500 6" INSPECTION PORT DETAIL
NTS

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PROJECT #: Tool

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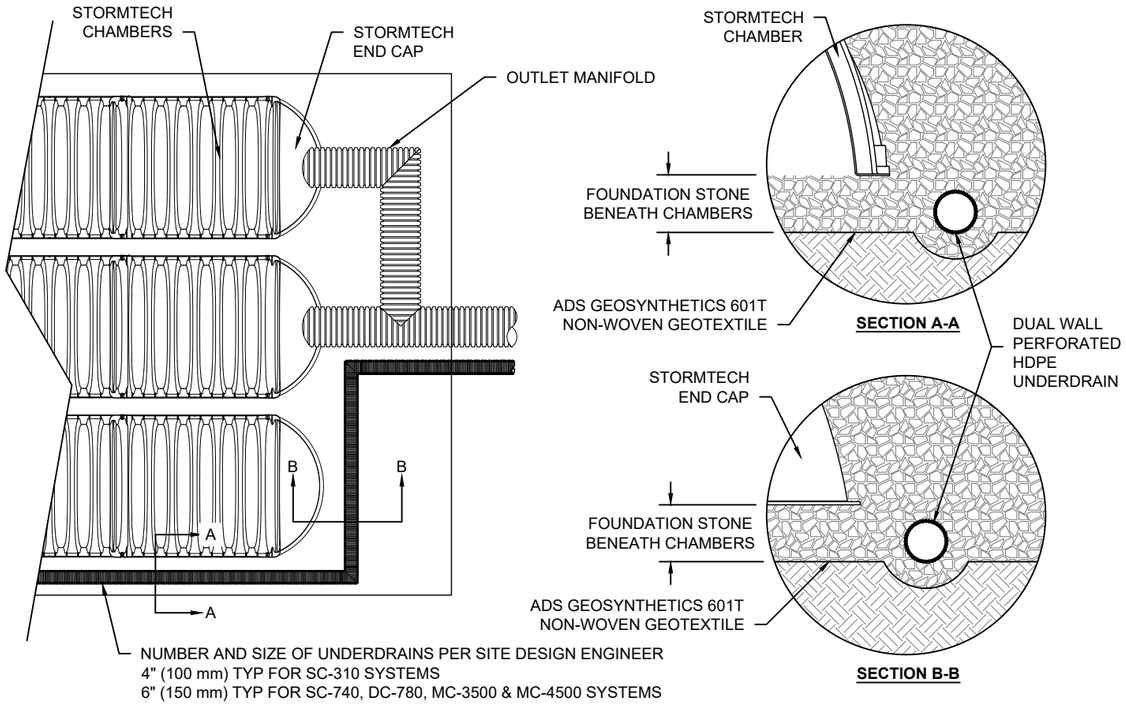
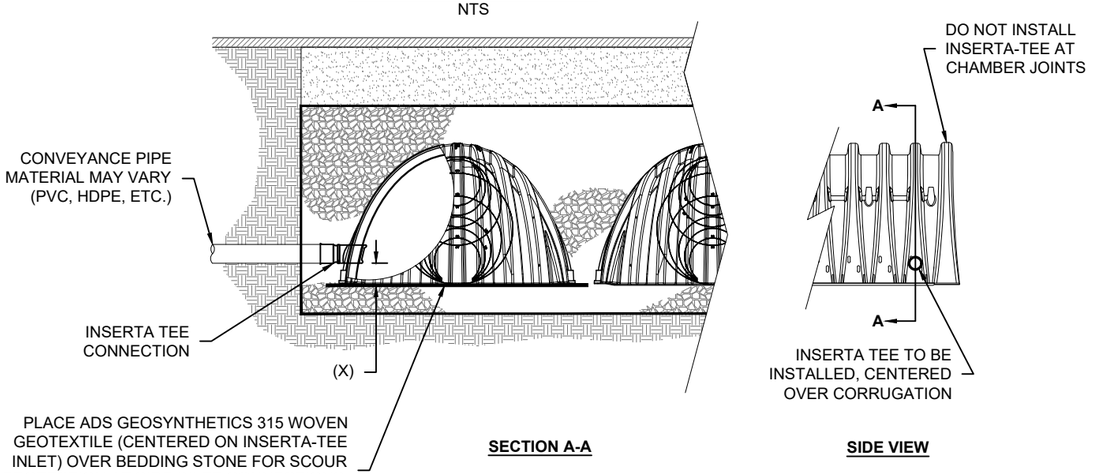
UNDERDRAIN DETAIL

NTS



INSERTA TEE DETAIL

NTS

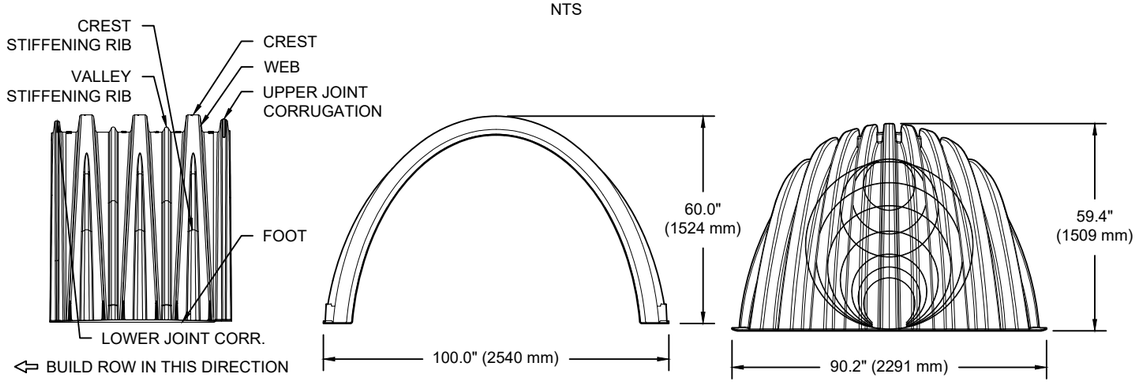


NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS.
CONTACT STORMTECH FOR MORE INFORMATION.

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

MC-4500 TECHNICAL SPECIFICATION

NTS



NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m³)
WEIGHT	130.0 lbs.	(59.0 kg)

NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	90.2" X 59.4" X 30.7"	(2291 mm X 1509 mm X 781 mm)
END CAP STORAGE	35.7 CUBIC FEET	(1.01 m³)
MINIMUM INSTALLED STORAGE*	108.7 CUBIC FEET	(3.08 m³)
WEIGHT	135.0 lbs.	(61.2 kg)

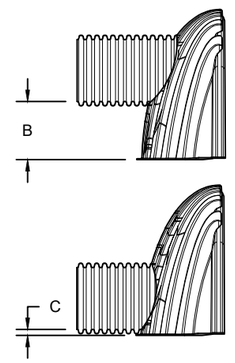
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	B	C
MC4500REPE06T	6" (150 mm)	42.54" (1.081 m)	---
MC4500REPE06B		---	0.86" (22 mm)
MC4500REPE08T	8" (200 mm)	40.50" (1.029 m)	---
MC4500REPE08B		---	1.01" (26 mm)
MC4500REPE10T	10" (250 mm)	38.37" (975 mm)	---
MC4500REPE10B		---	1.33" (34 mm)
MC4500REPE12T	12" (300 mm)	35.69" (907 mm)	---
MC4500REPE12B		---	1.55" (39 mm)
MC4500REPE15T	15" (375 mm)	32.72" (831 mm)	---
MC4500REPE15B		---	1.70" (43 mm)
MC4500REPE18TC	18" (450 mm)	29.36" (746 mm)	---
MC4500REPE18BC		---	1.97" (50 mm)
MC4500REPE24TC	24" (600 mm)	23.05" (585 mm)	---
MC4500REPE24BC		---	2.26" (57 mm)
MC4500REPE30BC	30" (750 mm)	---	2.95" (75 mm)
MC4500REPE36BC	36" (900 mm)	---	3.25" (83 mm)
MC4500REPE42BC	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL

CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS.
CUSTOM INVERT LOCATIONS ON THE MC-4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm)
THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHTEST POSSIBLE FOR THE PIPE SIZE.



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MC-SERIES END CAP INSERTION DETAIL

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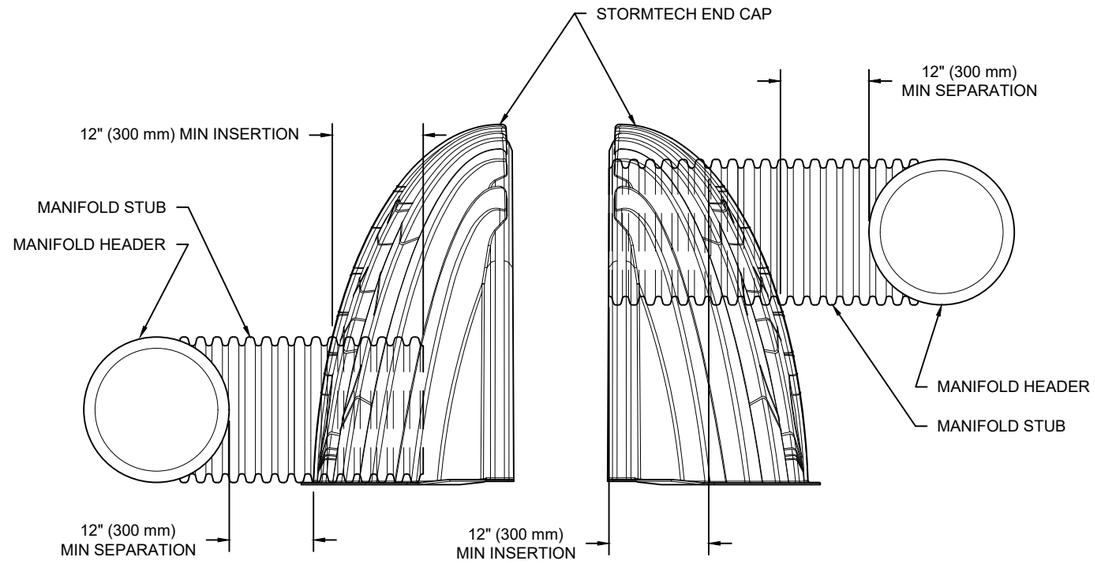

NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL
FOR A PROPER FIT IN END CAP OPENING.

3802-3812 Greenbank Rd
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3802-3812 Greenbank Rd
Existing Conditions

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

Existing Drainage Charateristics From Internal Site

Area	0.2900	ha
C	0.35	Rational Method runoff coefficient
L	75	m
Up Elev	97.82	m
Dn Elev	96.86	m
Slope	1.3	%
Tc	19.5	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	52.8	71.4	121.9	mm/hr
Q	14.9	20.1	42.9	L/s

3802-3812 Greenbank Rd
Proposed Conditions

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

Target Flow Rate

Area	0.29	ha
C	0.35	Rational Method runoff coefficient
t_c	19.5	min

5-year

i	71.4	mm/hr
Q	20.1	L/s

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area	0.01	ha
C	0.58	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	2.1	2.1	0.0	0.0	178.6	4.5	4.5	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)

3802-3812 Greenbank Rd
Proposed Conditions

Estimated Post Development Peak Flow from Attenuated Areas

Area ID A101
Available Sub-surface Storage
Maintenance Structures

ID	STM101	STM102	CB102A	CB102B
Structure Dia./Area (mm/mm^2)	1200	1200	360	360
T/L*	97.33	97.33	97.33	97.33
INV	94.76	95.19	96.25	96.30
Depth	2.57	2.14	1.08	1.03
$V_{structure}$ (m^3)	2.9	2.4	0.1	0.1

Sewers

ID	250mm	300mm	U/G STORG.	
Storage Pipe Dia (mm)	250	300		
L (m)	132.8	25.7		
V_{sewer} (m^3)	6.5	1.8	67.7	

*Top of lid or max ponding elevation = __ 97.33

Total Subsurface Storage (m^3) 81.6

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	94.76		0.00			0.0	0.0	0.00
Storage Pipe OBV	96.72		1.96	1.96	78.3	78.3	12.3	1.77
Max Ponding	97.33		2.57	0.61	3.3	81.6	14.1	1.61

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **STM101** **IPEX LFM 100**
Total Area 0.27 ha
C 0.67 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	53.1	6.2	47.0	28.2	178.6	113.8	14.0	99.8	59.9
15	83.6	42.6	6.2	36.4	32.8	142.9	91.1	14.0	77.1	69.4
20	70.3	35.8	6.2	29.7	35.6	120.0	76.5	14.0	62.5	75.0
25	60.9	31.1	6.2	24.9	37.3	103.8	66.2	14.0	52.2	78.3
30	53.9	27.5	6.2	21.3	38.4	91.9	58.6	14.0	44.6	80.2
35	48.5	24.7	6.2	18.6	39.0	82.6	52.6	14.0	38.7	81.2
40	44.2	22.5	6.2	16.4	39.3	75.1	47.9	14.0	33.9	81.4
45	40.6	20.7	6.2	14.5	39.3	69.1	44.0	14.0	30.0	81.1
50	37.7	19.2	6.2	13.0	39.1	64.0	40.8	14.0	26.8	80.4
55	35.1	17.9	6.2	11.7	38.7	59.6	38.0	14.0	24.0	79.3
60	32.9	16.8	6.2	10.6	38.3	55.9	35.6	14.0	21.7	77.9
65	31.0	15.8	6.2	9.7	37.7	52.6	33.6	14.0	19.6	76.4
70	29.4	15.0	6.2	8.8	37.0	49.8	31.7	14.0	17.8	74.6
75	27.9	14.2	6.2	8.1	36.2	47.3	30.1	14.0	16.1	72.6
80	26.6	13.5	6.2	7.4	35.4	45.0	28.7	14.0	14.7	70.6
85	25.4	12.9	6.2	6.8	34.5	43.0	27.4	14.0	13.4	68.3
90	24.3	12.4	6.2	6.2	33.6	41.1	26.2	14.0	12.2	66.0
95	23.3	11.9	6.2	5.7	32.6	39.4	25.1	14.0	11.2	63.6
100	22.4	11.4	6.2	5.3	31.5	37.9	24.2	14.0	10.2	61.1
105	21.6	11.0	6.2	4.8	30.5	36.5	23.3	14.0	9.3	58.5
110	20.8	10.6	6.2	4.4	29.4	35.2	22.4	14.0	8.5	55.8

5-year $Q_{attenuated}$ **6.17 L/s** **100-year $Q_{attenuated}$** **13.98 L/s**
5-year Max. Storage Required **39.3 m^3** **100-year Max. Storage Required** **81.4 m^3**
Est. 5-year Storage Elevation **95.74 m** **Est. 100-year Storage Elevation** **97.29 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	2.1	0.0	4.5	0.0	0.0
Attenutated Areas	6.2	39.3	14.0	81.4	81.6
Total	**8.3**	**39.3**	**18.5**	**81.4**	**81.6**

										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**
			(ha)	**(-)**			**(min)**	**(mm/hr)**	**(L/s)**	**(mm)**	**(%)**	**(m)**	**(m^2)**	**(m)**	**(m/s)**	**(L/s)**	**(min)**
A1	STM102	STM101	0.274	0.64	0.18	0.18	10.0	104.2	50.8	300	0.50	25.7	0.071	0.075	0.97	68.4	0.4
	STM101	EX. STM SEWER			0.00	0.18	10.4	101.9	49.6	300	2.00	4.8	0.071	0.075	1.93	136.8	0.0

Area ID	Drainage Area (ha)	"Level of Service" Maximum Minor Inflow Rates (l/s)	Weighted On-Site Detention Available Storage [Required Storage] (m^3)
A11	10.0	5 year flow	(10.0 ha x 56 m^3/ha) = 556 m^3
A12	12.1	(12.1 ha x 85 l/s/ha) = 1029 l/s	(12.1 ha x 56 m^3/ha) = 672 m^3
A13	2.88	(2.88 ha x 238 l/s/ha*) = 685 l/s	N/A[2]
A14	0.14	(0.14 ha x 120 l/s/ha) = 17 l/s	N/A[2]
A15	0.11	(0.11 ha x 120 l/s/ha) = 13 l/s	N/A[2]
B1	2.6	N/A[1]	N/A[2]
B2	12.3	(12.3 ha x 85 l/s/ha) = 1046 l/s	540 m^3
B3	4.1	(4.1 ha x 85 l/s/ha) = 349 l/s	257 m^3
B4A	5.7	(5.7 ha x 85 l/s/ha) = 485 l/s	196 m^3
B4B	5.2	(5.2 ha x 85 l/s/ha) = 442 l/s	185 m^3
B5A	1.93	5 year flow	[261 m^3]
B5B	2.43	5 year flow	[258 m^3]
B5C	0.81	5 year flow	[183 m^3]
B5D	0.92	5 year flow	(0.92 ha x 300 m^3/ha) = 276 m^3
B6	0.35	(0.35 ha x 20 l/s/ha) = 7 l/s	[4541 m^3]
B7A	1.12	N/A[1]	N/A[2]
B7B	0.76	5 year flow	N/A[2]
B7C	1.06	N/A[1]	N/A[2]
Private Property 1	0.12	N/A[1]	N/A[2]
Private Property 2	0.62	(0.62 ha x 85 l/s/ha) = 53 l/s	N/A[2]
Private Property 3	0.17	N/A[1]	N/A[2]
Ext. Lands	31.9	(31.9 ha x 70 l/s/ha) = 2233 l/s	(31.9 ha x 42 m^3/ha) = 1340 m^3

Note:
N/A[1] total flow captured by minor system
N/A[2] no surface storage
* 10 year flow

the HGL analysis for the 100 year 24 hour SCS Type II are summarized in Table 7 (the HGL results have been rounded to the nearest tenth of a meter). Results for the 100 year 3 hour Chicago and July 1, 1979 storm events are presented in Appendix D.

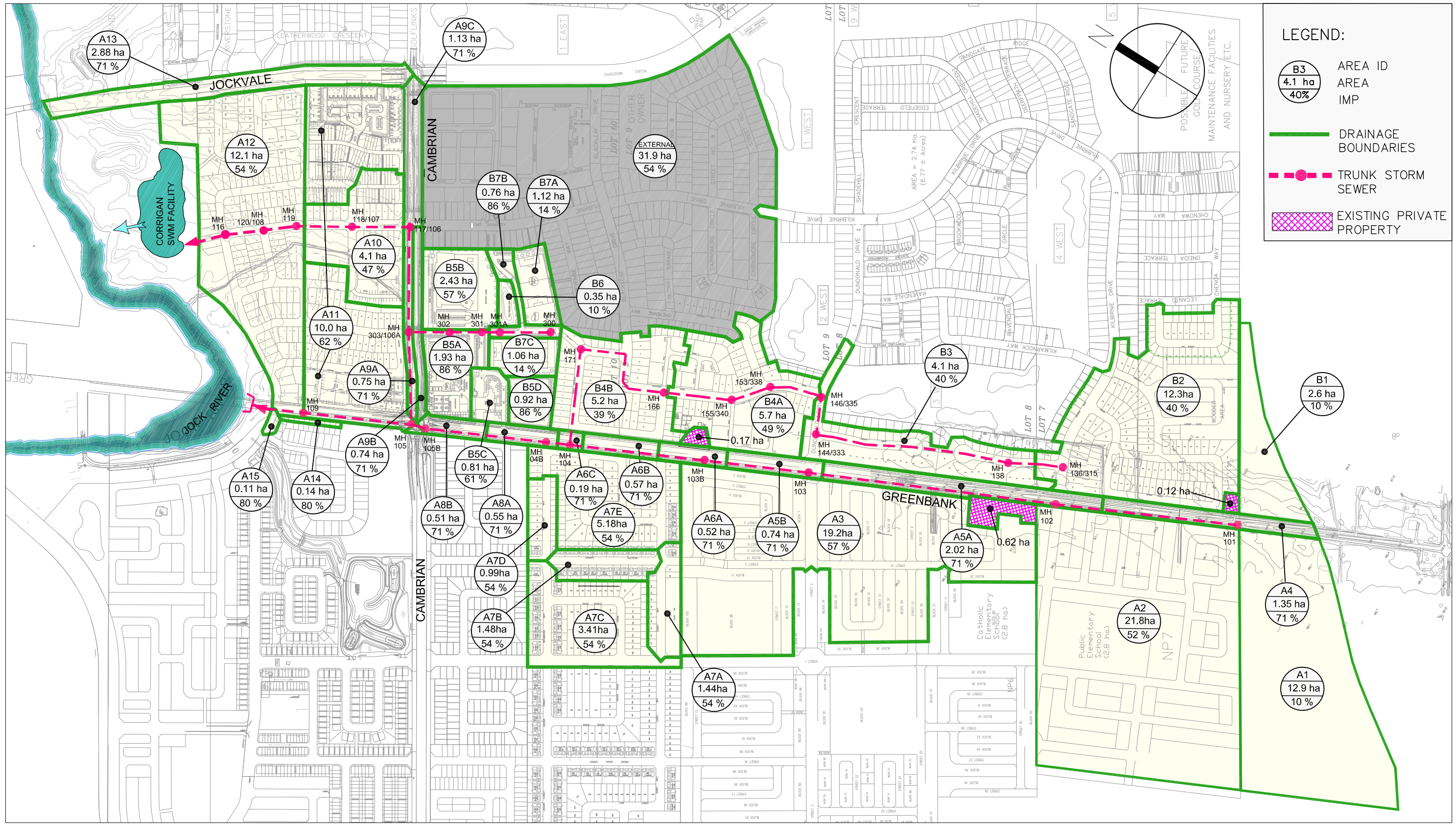
Table 7. Estimation of Hydraulic Grade Line Elevations for Trunk Sewer

MH	HGL (m)
SWM	90.1
116	N/A*
120/108	N/A*
119	N/A*
118/107	90.8
117/106	91.0
106A	91.4
105	N/A*
105B	91.8
104B	92.0
104	92.2
103B	92.7
103	92.7
102	N/A*
101	N/A*
171	92.3
166	N/A*
155/340	N/A*
153/338	N/A*
146/335	N/A*
144	N/A*
138	N/A*
136	N/A*
302	91.5
301A	91.5
301	N/A*
300	N/A*
109	N/A*

N/A* Flowing free

As shown in Figure 4, the proposed minor system consists of two trunk sewers that connect at MH 104 and continue to the stormwater management facility. The sewer trunks are generally designed to operate at full capacity with no surcharge. Present design indicates some surcharge and therefore all USFs have to be constructed at a minimum of 0.3 m above the HGL or storm sewer obvert, whichever is higher. For areas that have been constructed or for which detailed design is underway, this level of service has been confirmed. For areas yet to be designed, grading plans versus HGL should be confirmed during the detailed design stage.

To determine the effect of the Jock River flood levels on the stormwater management facility, the finalized HEC-RAS model of the Jock River floodplain mapping was obtained from the RVCA. The trunk overflow outlet to the



J:\13931_CorriganSWM\5.9 Drawings\59civil\current\Servicing Figures\CIV-stmwaterbase-2010-06-28.dwg Layout Name: figure2

Plot Style: ---- Plot Scale: 1:1 Plotted At: Jul. 30, 10 11:44 AM Printed By: MICHEL BEAUCHEMIN Last Saved By: MBEAUCHEMIN Last Saved At: Jul. 30, 10

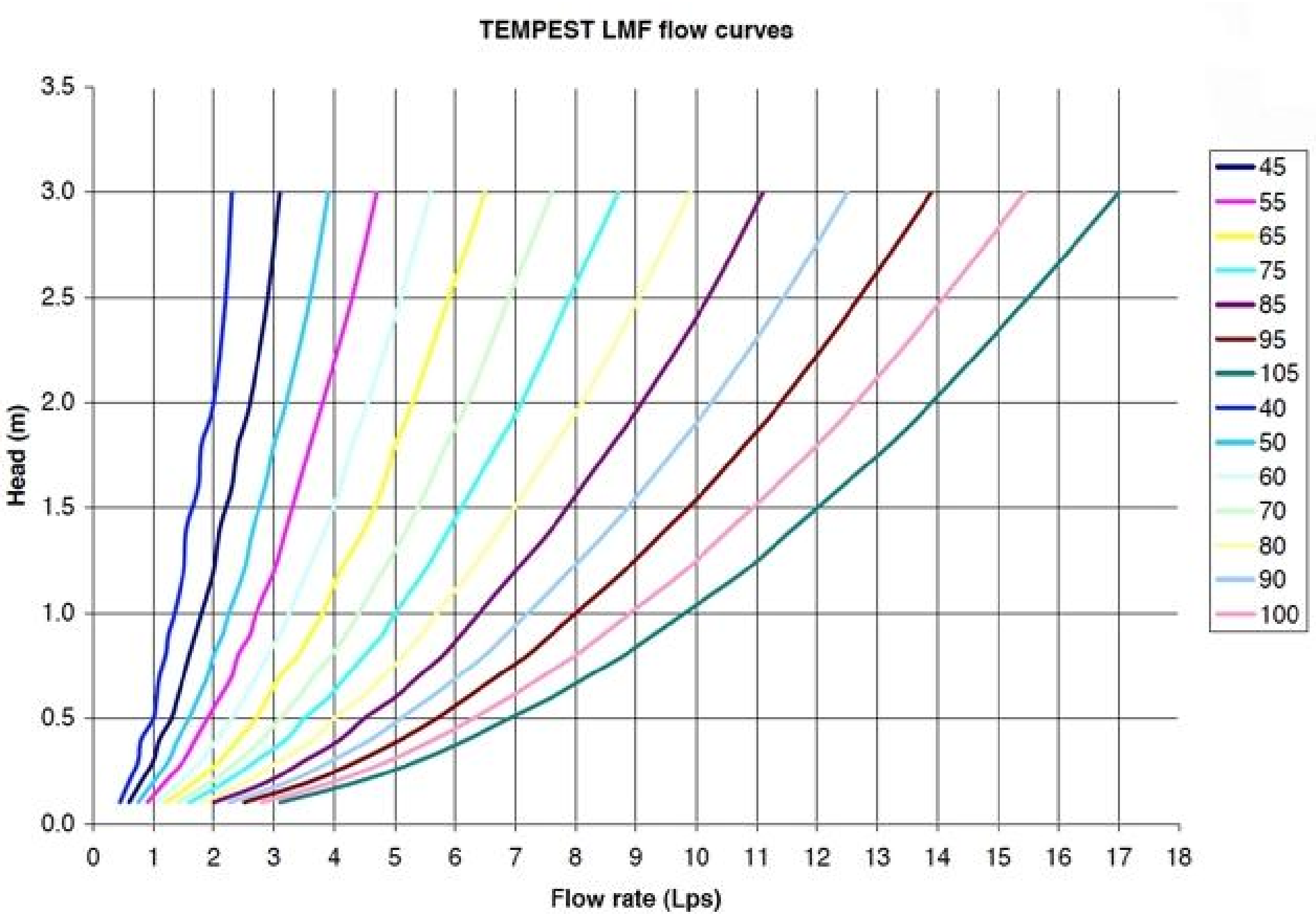
IBI GROUP

Scale: 1:7500

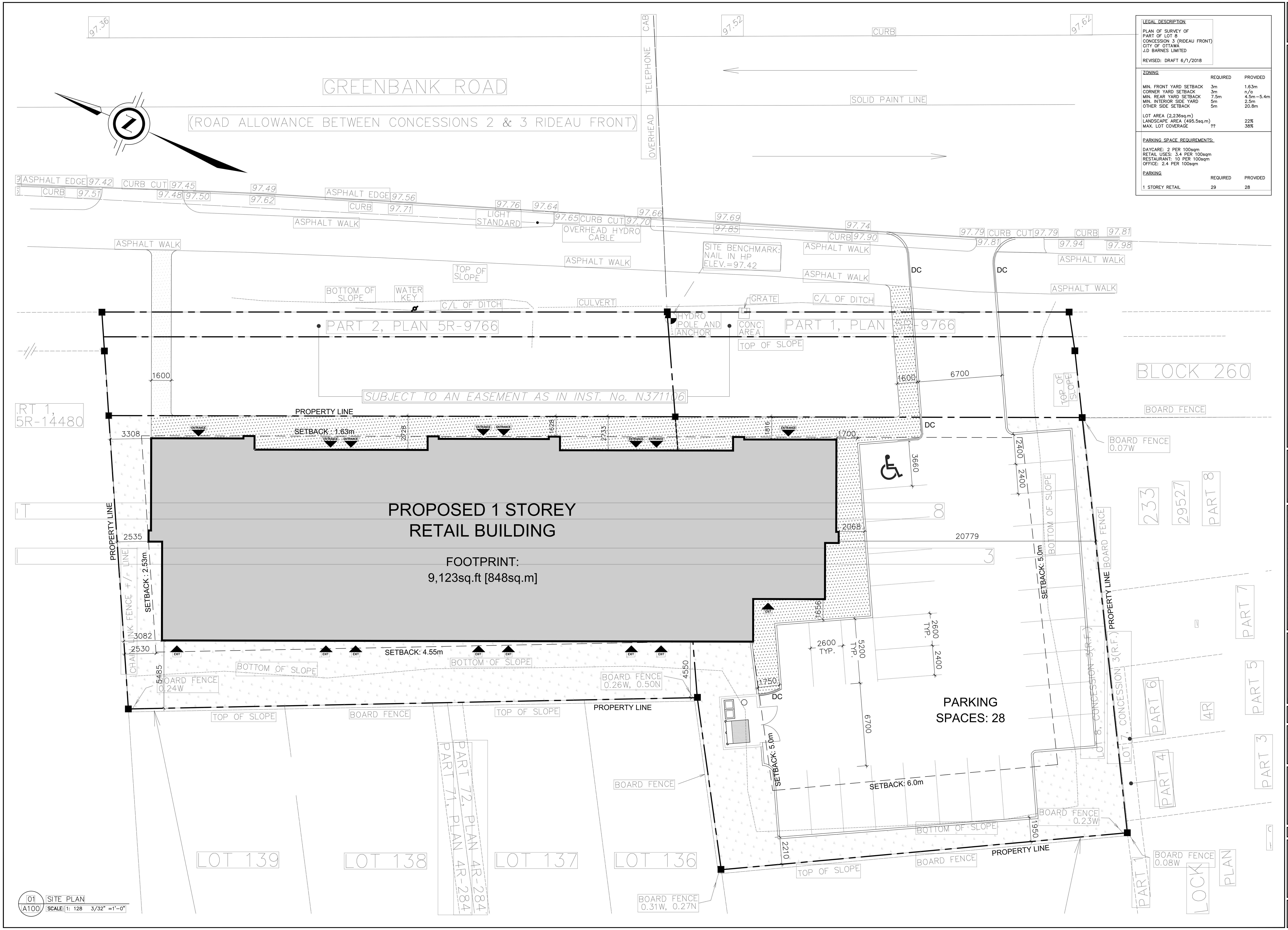
Project Title: CORRIGAN STORMWATER MANAGEMENT FACILITY

Drawing Title: DRAINAGE SCHEMATIC

Sheet No.: FIGURE 2


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

DRAWINGS / FIGURES



LEGAL DESCRIPTION

PLAN OF SURVEY OF
PART OF LOT 8
CONCESSION 3 (RIDEAU FRONT)
CITY OF OTTAWA
J.D BARNES LIMITED

REVISED: DRAFT 6/1/2018

ZONING	REQUIRED	PROVIDED
MIN. FRONT YARD SETBACK	3m	1.63m
CORNER YARD SETBACK	3m	n/a
MIN. REAR YARD SETBACK	7.5m	4.5m–5.4m
MIN. INTERIOR SIDE YARD	5m	2.5m
OTHER SIDE SETBACK	5m	20.8m
LOT AREA (2,236sq.m)		
LANDSCAPE AREA (495.5sq.m)		22%
MAX. LOT COVERAGE	??	38%

PARKING SPACE REQUIREMENTS:

DAYCARE: 2 PER 100sqm
RETAIL USES: 3.4 PER 100sqm
RESTAURANT: 10 PER 100sqm
OFFICE: 2.4 PER 100sqm

PARKING	REQUIRED	PROVIDED
1 STOREY RETAIL	29	28

NOTES:

1) ALL WORKTO BE IN COMPLIANCE WITH LOCAL BUILDING CODES, REGULATIONS AND BY-LAWS.

2) ADDITIONAL DRAWINGS MAY BE ISSUED FOR CLARIFICATION TO ASSISTPROPER EXECUTION OF WORK. SUCH DRAWINGS WILL HAVE THE SAME MEANING AND INTENT AS IF THEY WERE INCLUDED WITH PLANS IN CONTRACT DOCUMENTS.

3) DO NOT SCALE DRAWINGS.

4) ALL SUB-CONTRACTORS TO TAKE THEIR OWN ON-SITE MEASUREMENTS AND BE RESPONSIBLE FOR THEIR ACCURACY

5) NOTIFY SHAWN J. LAWRENCE ARCHITECT FOR ANY ERRORS AND/OR OMMISSIONS PRIOR TO START OF WORK.

FIRE RESISTANCE RATING LEGEND:

45 MIN. - FIRE RESISTANCE RATING
1 HOUR - FIRE RESISTANCE RATING
2 HOUR - FIRE RESISTANCE RATING

LEGEND:

LANDSCAPE
SIDEWALK
PROPERTY LINES
REQUIRED SETBACKS

NORTH

PRELIMINARY

No.	DATE:	REVISION:
01	2018-11-12	PRELIMINARY REVIEW

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sjl@sjlarchitect.com

DRAWN BY: A.L	DESIGNED BY: S.J.L.
DATE: 2018-11-08	CHECKED BY: S.J.L.
SCALE: AS NOTED	PLOT DATE: 2018-11-12

PROJECT:
GREENBANK DEVELOPMENT
3802 GREENBANK
OTTAWA, ON.

JOB NUMBER: SL - 921 - 18

DRAWING TITLE:
SITE PLAN

SHEET:
A 100

APPLICATION NUMBER: XX – 000 – 00