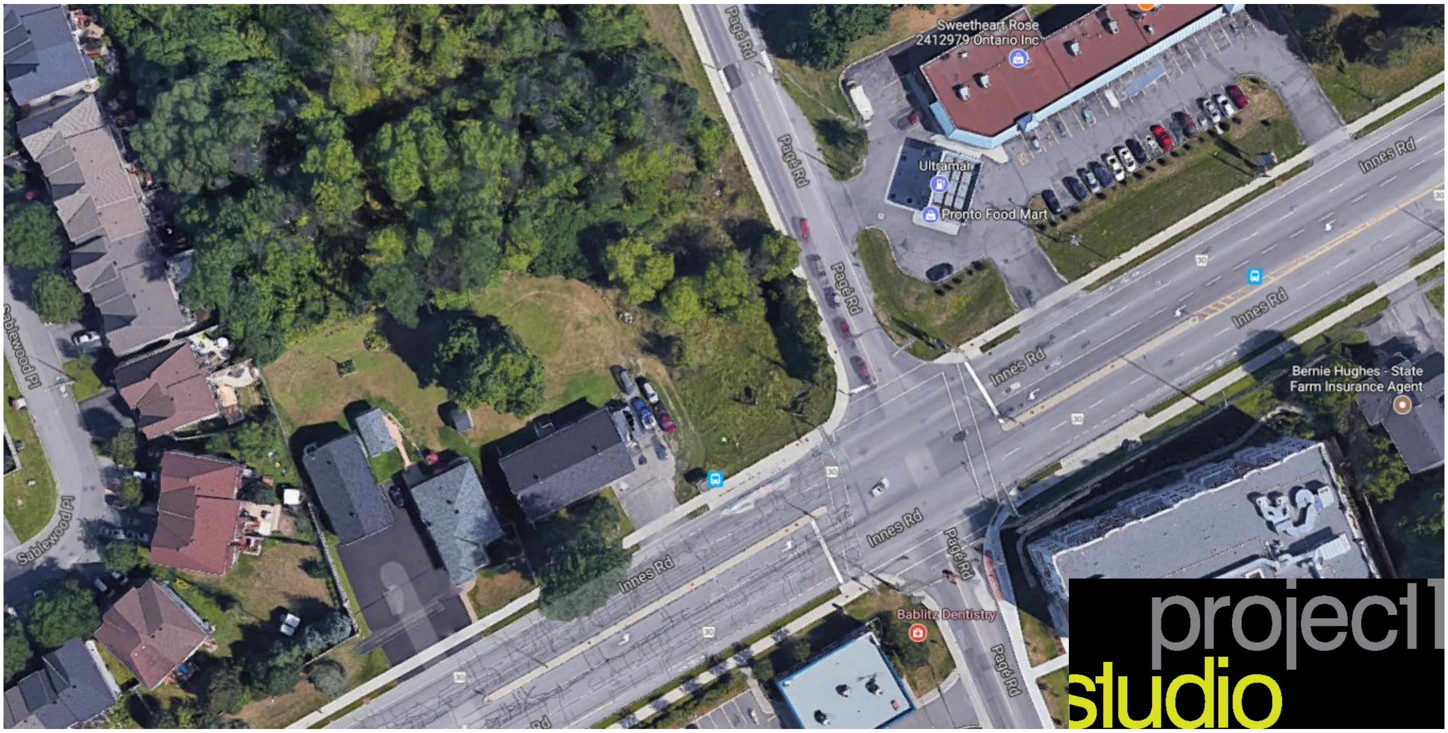
SERVICING AND STORMWATER MANAGEMENT REPORT



Project No.: 0CP-17-0469 – 3443 Innes Road, Ottawa, ON

Prepared for:

Project1 Studio
300 – 260 St. Patrick Street
Ottawa, ON
K1N 5K5

October 27, 2017

Revised: December 13, 2017; Rev04 June 1, 2017.

Executive Summary

Developing a site within the City of Ottawa requires meeting a predefined set of requirements outlined in the City of Ottawa Sewer Design Guidelines (SDG) - 2012 along with meeting the local conservation authority requirements (Rideau Valley Conservation Authority - RVCA) and provincial requirements (Ministry of Environmental and Climate Change – MOECC). Site specific requirements are discussed and outlined in the pre-consultation meeting with the City of Ottawa before the detailed design process is initiated.

This report describes an innovative and cost-efficient design solution for the site servicing (water, sanitary, and storm) and stormwater management (SWM) requirements in order to develop this site. Since there is no SWM facility before discharge into a watercourse, a design plan has been proposed that retains 80% total suspended solids (TSS) before outletting into the existing storm network.

Evaluation of the proposed site plan in addition to a review of the site grading and soil characteristics was completed. Our review identified that parking lot storage is the optimal design solution to meet the SWM requirements. The parking lot storage will contain stormwater runoff from the asphalt areas within the parking lot until the storm event subsides and flows reduce. This is achieved through the use of restriction devices placed within two storm structures within the parking lot. The restricted runoff from the parking lot will drain to the downstream Stormceptor to provide 80%TSS removal. These design elements will ensure that the water quality and quantity concerns are addressed at all stages of development

The evaluation of the proposed development, existing site characteristics and surrounding municipal infrastructure suggests that the SWM design elements consisting of parking lot retention will be a sufficient solution to the site constraints. The proposed sanitary and water services will utilize the existing infrastructure surrounding the site to service the development. Therefore, it is our professional opinion that this site located at 3443 Innes Road is able to be developed and fully serviced for the proposed mixed-use development.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

1.0 PROJECT DESCRIPTION

1.1 Purpose

This report will address the servicing (water, sanitary, and storm) and stormwater management requirements (SWM) associated with the proposed development located at 3443 Innes Road within the City of Ottawa.

1.2 Site Description

The property is located at 3443 Innes Road. It is described as Lot 6, Concession 2, City of Ottawa, Ontario, former Township of Gloucester. The land in question covers approximately 0.33 ha and is located at the northwest corner of the intersection of Pagé Road and Innes Road.

The existing site is currently developed with a single story residential building, and is serviced with storm and water services from infrastructure running along Innes Road which will be cut and capped at the property line. The existing sanitary service runs along the back of the site and drains towards infrastructure on Pagé Road. Due to the planned development of the site the sanitary service will be located, removed and capped at the property line. The current private entrance will be removed and replaced with a typical entrance, as per city standard SC7.1, to match existing conditions on Innes Road.

The proposed development consists of a 627.86 m², six storey mixed-use building. Underground and surface parking will be provided along with drive aisles and landscaping. There are two proposed site accesses located on Innes and Pagé Roads.

Figure 1: Key Map: 3443 Innes Road, Ottawa.

2.0 BACKGROUND STUDIES

Background studies that have been completed for the site include a review of the City of Ottawa as-built drawings, a topographical survey of the site, a geotechnical report and a Phase I Environmental Site Assessment (ESA).

As-built drawings of the existing services within the vicinity of the site were reviewed in order to determine proper servicing and stormwater management schemes for the site.

A topographic survey of the site was completed by Farley, Smith & Denis Surveying Ltd. dated May 25th, 2017 and can be found under separate cover.

The following reports have previously been completed and are available under separate cover:

- Geotechnical Investigation completed by Morey Associates Ltd. dated June 26th, 2017.
- Phase I ESA completed by Morey Associates Ltd. dated June 26th, 2017.

3.0 PRE-CONSULTATION SUMMARY

City of Ottawa Staff have been pre-consulted regarding this proposed development by email on September 14th, 2017. Specific design parameters to be incorporated within this design include the following:

- Control 5 through 100-year post-development flows to the 5-year pre-development flows with a combined C value to a maximum of 0.50.

Correspondence with the City can be found in Appendix 'A'.

4.0 EXISTING SERVICES

The existing site is serviced with sanitary, storm and water connections. The sanitary service crosses the back of the lot and is directed to the sanitary sewer located within Pagé Road. The sanitary service will have to be located onsite to ensure no damage is caused to the connections while excavating. The existing sanitary connection will be removed and replaced with a larger connection to satisfy the peak flow of the proposed building. The existing storm network will require some removals and relocations to ensure functionality of the proposed site. Please see drawing CP-17-0469 REM for details on relocations and removals. The existing water service from Innes Road will be blanked at the main and cut and capped at the property line in favour of service from Pagé Road.

4.1 Innes Road

There is an existing 1,800mm diameter storm sewer located within the eastbound lanes of Innes Road as well as a 525mm diameter storm sewer located within the westbound lanes. The 525mm storm sewer services ditch inlet catch basins on the northern side of the intersection of Innes and Pagé Roads. The 525mm sewer does not continue past Pagé road.

Also located within the westbound lanes of Innes Road is a 400 mm PVC diameter watermain. The watermain services the other properties located on Innes Road as well as the existing site.

Overhead hydro and underground Bell and gas services are also available along the subject section of Innes Road.

4.2 Pagé Road

There is an existing 200mm diameter watermain within Pagé Road that services a fire hydrant approximately 51m from the northern property line of the subject site. A 250mm diameter sanitary sewer is also located on the eastern side of Pagé Road that ends approximately 5m south of the northern property line of the proposed site.

Overhead hydro and an underground gas main that is capped at the southern end of 2275 Pagé Road are available along the subject section of Pagé Road.

5.0 SERVICING PLAN

5.1 Proposed Servicing Overview

The proposed sanitary and water services will be connected via infrastructure within Pagé Road. Services will be located at the back of the lot underneath the pavement of the proposed private entrance off of Pagé Road. The storm service will be connected via existing infrastructure on Innes Road. An existing ditch inlet catch basin will be removed and the proposed 300mm diameter pipe will be connected to the existing service pipe of the same diameter.

5.2 Proposed Water Design

A new 200 mm PVC diameter water lateral will be connected to the existing 200 mm PVC watermain within Pagé Road, complete with a District Metering Area chamber located at the property line. A private hydrant will be located within the northeast portion of the site, serviced by a 150mm lateral via tee connection.

The proposed building will be equipped with a sprinkler system for fire protection. The required fire protection from the Ontario Building Code (OBC) is 9,000 L/min (See Appendix 'B' for calculation). The required fire protection from the Fire Underwriters Survey (FUS) is 12,000 L/min (provided for information purposes only). A water model has been completed and can be found in Appendix 'B'.

The water demands for the new building have been calculated as per the Ottawa Design Guidelines. The demands have been calculated separately for the commercial and residential portions. The commercial demands are as follows: the average and maximum daily demands are 0.11 L/s and 0.16 L/s respectively. The maximum hourly demand was calculated as 0.29 L/s. Residential demands are as follows: the average and maximum daily demands are 0.27 L/s and 0.68 L/s respectively. The maximum hourly demand was calculated as 1.49 L/s (Refer to Appendix 'B' for flow details). Boundary conditions and results can be found in Appendix 'B'.

5.3 Proposed Sanitary Design

A new 200 mm diameter gravity sanitary service will be connected to the existing 250 mm diameter sewer within Pagé Road. The sanitary service will be complete with a maintenance manhole (MH1A) located just inside the property line as per the Ottawa Sewer Design Guidelines (SDG) SD002, October 2012, City of Ottawa, Clause 4.4.4.7 and City of Ottawa Sewer-Use By-Law 2003-514 (14).

The peak design flow for the proposed site was determined to be 0.38 L/s, however, for pipe design, a more conservative peak design flow of 1.44 L/s was used. This flow takes into account the infiltration of the entire area and is also calculated based on a 2.3 p/p/u for residential and 50,000 L/Ha/day for commercial area. Using the greater of the calculated peak design flows, the proposed 200 mm diameter lateral has sufficient capacity to convey the flows (See Appendix 'C' for detailed calculations). It is anticipated that there will be no issues with capacity constraints within the proposed lateral or within the existing sanitary main within Pagé Road as the amount of flow leaving the site is minimal.

5.4 Proposed Storm Design (Conveyance and Management)

Stormwater runoff will be conveyed by way of overland sheet flow within the associated tributary areas into the proposed storm network. The storm network will be situated primarily in the parking lot areas. The proposed storm network will direct the runoff to the south before discharging into the existing 300mm storm sewer located within Innes Road. The runoff is then directed to a 525mm storm sewer, which in turn, discharges to the 1,800mm storm main located within the westbound lane in Innes Road. The site will be constructed with adequate grading to ensure that all areas on the site are able to reach a suitable inlet while maintaining the required amount of storage in case of a 100-year storm event. Post-development flow restriction requirements from the City of Ottawa will be achieved.

5.5 Site Utilities

All relevant utility companies (telephone – Bell and Rogers, gas – Enbridge and hydro – Hydro Ottawa) will be contacted prior to construction in order to confirm adequate utility servicing for the site. The services are anticipated to be connected from the existing infrastructure within the right-of-way.

5.6 Service Locations/Cover

The proposed sanitary, storm and water services will be placed under the parking lot and drive aisle as is typical in an urban development. Hydro, telephone, cable and gas will be primarily placed in a common utility trench connecting to existing infrastructure along Innes Road.

All minimum cover requirements are as per City of Ottawa Standards. Where minimum cover is not provided insulation shall be installed as per OPSD 1109.030. Separation distances between the storm, water and sanitary sewer will be maintained as per Ministry of the Environment and Climate Change requirements.

6.0 PROPOSED STORMWATER MANAGEMENT

6.1 Design Criteria and Methodology

Stormwater management for this site will be maintained through positive drainage away from the proposed buildings and into a new underground storm sewer system within the site. This SWM plan will implement quantity control strategies. The storm runoff will enter the pipe system through catch basins (CB's) and catch basin manholes (CBMH's) located throughout the site. The restricted stormwater runoff will be directed to the existing sewer within Innes Road; similarly, overland flow will also be directed towards Innes Road. The quantitative and qualitative properties of the storm runoff for both the pre- and post-development flows are further detailed below.

6.2 Runoff Calculations

Runoff calculations presented in this report are derived using the Rational Method, given as:

$$Q = 2.78CIA \quad \text{(L/s)}$$

Where C = Runoff coefficient
I = Rainfall intensity in mm/hr (City of Ottawa IDF curves)
A = Drainage area in hectares

It is recognized that the rational method tends to overestimate runoff rates. As a by-product of using extremely conservative prediction method, any facilities that are sized using these results are expected to function as intended in real world conditions.

In conjunction with the City of Ottawa Sewer Design Guidelines the following coefficients were used to develop a balanced 'C' for each drainage area:

Asphalt, Building roofs, Concrete	0.90
Gravel	0.60
Grass, undeveloped areas	0.20

As per the City of Ottawa Sewer Design Guidelines, the 5-year balanced 'C' value must be increased by 25% for a 100-year storm event to a maximum of 1.0.

The pre-development and post-development flows shall be calculated using a time of concentration (Tc) of 20 minutes and 10 minutes respectively.

6.2.1 Pre-Development Drainage

Pre-development drainage consists of the overland sheet flow runoff from the entire site being captured by existing ditch inlet catch basins on Innes Road. There currently no existing flow restrictions for the site. The existing drainage area is demonstrated as area A1 on drawing CP-17-0469 PRE (Appendix 'D').

Table 1: Pre-Development Runoff Summary

Area	Drainage Area (ha)	Balanced Runoff Coefficient (C) 5-yr	Balanced Runoff Coefficient (C) 100-yr	5-Year Flow Rate (l/s)	100-Year Flow Rate (l/s)
A1	0.33	0.29	0.35	18.87	38.94
Total	0.33			18.87	38.94

(See Appendix 'F' for Calculations)

6.2.2 Post-Development Drainage

The post development drainage scheme for the proposed development consists of seven regions describing tributary areas for catch basin manholes (CBMH's) or runoff areas that are unrestricted and will not be captured by the storm network. Drawing CP-17-0469 POST (Appendix 'E') indicates the limits of drainage areas B1-B6. Area B7 is an amalgamation of grassed areas around the property line that are left to flow unrestricted from the site. The individual unrestricted areas that form B7 were subtracted from their respective drainage areas to best depict the restricted flow of each area.

Table 2: Post-Development Runoff Summary

Area ID	Drainage Area (ha)	Balanced Runoff Coefficient (C) 5-yr	Balanced Runoff Coefficient (C) 100-yr	Unrestricted 5-year Peak Flow (L/s)	Unrestricted 100-year Peak Flow (L/s)
B1	0.06	0.90	1.00	16.09	30.64
B2	0.04	0.72	0.80	9.21	17.70
B3	0.05	0.80	0.90	10.57	20.22
B4	0.07	0.79	0.88	16.38	31.36
B5	0.02	0.90	1.00	5.52	10.52
B6	0.07	0.76	0.85	15.35	29.42
B7	0.01	0.20	0.25	0.85	1.81
Total	0.33			73.98	141.68

(See Appendix 'F' for Calculations)

Runoff from area B1 shall be restricted by six roof drains and flows downward through the building to connect with the uncontrolled portion of the storm network. Runoff from areas B2 through B5 will be restricted at CBMH#1 by an IPEX Tempest MHF 91mm ICD before outletting to the existing storm system within Innes Road.

Area B6 will also be restricted before leaving the site by an IPEX Tempest LMF 77mm ICD within CB#1. The total flows leaving the site will not exceed the 5-year pre-development flows. See Appendix 'F' for calculations. The restriction and quality runoff control will be further detailed in Sections 6.3 and 6.4.

6.3 Quantity Control

After discussing the stormwater management criteria for the site with City staff, the total post-development runoff for this site has been restricted to match the 5-year pre-development flow rates with a combined 'C' value of 0.29. (See Appendix 'A' for pre-consultation notes). These values create the following allowable release rates and storage volumes for the development site.

Table 3: Allowable Release Rate

Area ID	Drainage Area (ha)	Balanced Runoff Coefficient (C) 5-yr	Unrestricted 5-year Peak Flow (L/s)
A1	0.33	0.29	18.87

(See Appendix 'F' for Calculations)

Reducing site flows will be achieved using flow restrictions and will create the need for onsite storage. Runoff from areas B1, B2 through B5 and B6 will be restricted as detailed in the table below.

Table 4: Post-Development Restricted Runoff

<table>
<tr><th rowspan="2">Area ID</th><th colspan="2">Post-Development Unrestricted Flow (l/s)</th><th colspan="2">Post-Development Restricted Flow (l/s)</th><th rowspan="2"></th></tr>
<tr><th>5-yr</th><th>100-yr</th><th>5-yr</th><th>100-yr</th></tr>
<tr><td>B1</td><td>16.09</td><td>30.64</td><td>1.44</td><td>2.52</td><td rowspan="6">RESTRICTED</td></tr>
<tr><td>B2</td><td>9.21</td><td>17.70</td><td rowspan="4">8.54</td><td rowspan="4">8.54</td></tr>
<tr><td>B3</td><td>10.57</td><td>20.22</td></tr>
<tr><td>B4</td><td>16.38</td><td>31.36</td></tr>
<tr><td>B5</td><td>5.52</td><td>10.52</td></tr>
<tr><td>B6</td><td>15.35</td><td>29.42</td><td>6.00</td><td>6.00</td></tr>
<tr><td>B7</td><td>0.85</td><td>1.81</td><td>0.85</td><td>1.81</td><td>URESTRICTED</td></tr>
<tr><td>Total</td><td>73.98</td><td>141.68</td><td>16.83</td><td>18.87</td><td></td></tr>
</table>

(See Appendix 'F' for Calculations)

Runoff from Area B1 will be restricted by six roof drains, further detail available in Appendix 'F'. Runoff from Areas B2 through B5 will be restricted at CBMH#1 by an IPEX Tempest MHF 91mm ICD (Design Head of 1.41m). The ICD will restrict areas B2 through B5 to 8.54 L/s for both the 5 and 100-year storm events. The restriction creates a water surface elevation (WSEL) of 91.10 m for the 5-year storm event and 91.17 m for the 100-year storm event. The storage for these areas will be provided above parking lot structures CB#2, CBMH#1, and CBMH#2. Similarly, area B6 will be restricted by an IPEX Tempest LMF 77mm ICD (Design Head of 1.33m) located with CB#1 and will restrict the flow to 6.0 L/s creating a water surface elevation of 91.06 and 91.12 for the 5 and 100-year storm events. Table 5 details the required and provided storage volumes for the development.

In the event that there is a rainfall above the 100-year storm event, or a blockage within the storm network, an emergency overland flow route has been provided such that the stormwater runoff will be conveyed towards the southwest corner of the site away from the building, and into Innes Road. An elevation difference of 0.33 m has been provided from the finished floor (91.50) of the building to the overland flow route elevation (91.17).

The following table summarizes the storage requirements and the depth of the water ponding during the 5 and 100-year storm events to meet the required storage volumes.

Table 5: Storage Summary

Area ID	Depth of Ponding (m)	Storage Required (m^3)	Storage Available (m^3)	Depth of Ponding (m)	Storage Required (m^3)	Storage Available (m^3)
	5-yr			100-yr		
B1-B6	0.10-0.20	35.41	37.78	0.07-0.27	88.88	92.01

(See Appendix 'F' for Calculations)
Note: Post-development area B5 is the ramp area. Therefore, this area does not include ponding storage.

6.4 Quality Control

The development of this lot will employ Best Management Practices (BMP's) wherever possible. The intent of implementing stormwater BMP's is to ensure that water quality and quantity concerns are addressed at all stages of development. Lot level BMP's typically include temporary retention of the parking lot runoff, minimizing ground slopes and maximizing landscaped areas. Some of these BMP's cannot be provided for this site due to site constraints and development requirements.

As per the discussions with the RVCA, the existing storm main within Innes Road does not tie into any SWM Facility. The subject location is approximately 1,800m away from a point source outlet into a watercourse tributary to Bilberry Creek. Therefore, the RVCA will be looking for quality control with 80% total suspended solid removal (TSS).

A quality treatment unit has been sized to provide a TSS removal rate of 80% as per RVCA requirements. The Forterra STC 750 Stormceptor Unit will provide a water quality of at least 80% TSS (See Appendix 'G' for Calculation sheets). The treatment unit shall be placed downstream of the restriction unit in order to provide the required water quality treatment for the site runoff before discharging to the existing storm network.

7.0 SEDIMENT EROSION CONTROL

The site-grading contractor is responsible for ensuring sediment control structures are installed in accordance with the Site Grading and Drainage Plan as indicated. Silt fences shall be installed on site before construction or earth-moving operations begin, as shown on the Site Grading and Drainage Plan.

Geosock is to be installed under the grates of all existing structures along the frontage of the site and any new structures immediately upon installation. The Geosock is to be removed only after all areas have been paved and vegetation has been established. Care shall be taken at the removal stage to ensure that any silt that has accumulated is properly handled and disposed of. Removal of silt fences without prior removal of the sediments shall not be permitted.

At the discretion of the project manager, municipal staff or conservation authority, additional silt control devices shall be installed at designated locations.

8.0 SUMMARY

- A new 627.86 m^2 6-storey multi-use building will be constructed centrally on the site located at 3443 Innes Road.
- A new 200 mm diameter sanitary service and monitoring maintenance hole will be installed and connected to the existing 250 mm diameter sewer within Pagé Road.
- A new 200 mm diameter water lateral will be extended from the existing 200 mm diameter main within Pagé Road.
- A new storm network will be installed onsite and will connect to the existing 300mm diameter storm sewer that services a ditch inlet catch basin (to be removed). The existing storm sewer is then connected to a 525mm diameter sewer flowing into the 1,800mm storm main within Innes Road.
- As discussed with the City of Ottawa staff, the stormwater management design will ensure that the post-development flow rates are restricted to the 5-year pre-development flow rate calculated with a C value of 0.29.
- Storage for the 5- through 100-year storm events will be provided within the parking lot areas above the proposed storm structures.

9.0 RECOMMENDATIONS

Based on the information presented in this report dated October 27, 2017, revised June 1, 2018, we recommend that City of Ottawa approve this Servicing and Stormwater Management Report in support of the proposed 6-storey mixed-use building with underground as well as surface parking located at 3443 Innes Road.

The sediment and erosion control plan outlined in Section 7.0 and detailed in the Grading and Drainage Plan notes are to be implemented by the contractor.

This report is respectfully being submitted for approval.

Ryan Kennedy, P.Eng.
Practice Area Lead, Land Development
McIntosh Perry Consulting Engineers
T: 613.836.2184 x 2243
E: r.kennedy@mcintoshperry.com

Sean Leflar,
Civil Engineering Technologist, Land Development
McIntosh Perry Consulting Engineers
T: 613.836.2184 x 2252
E: s.leflar@mcintoshperry.com

H:\01 PROJECT - PROPOSALS\2017 JOBS\CP\0CP-17-0469 P1S_SPC_3443 INNES ROAD\03 - SERVICING\REPORT\CP-17-0469_SERVICING REPORT_REV04.DOCX

10.0 STATEMENT OF LIMITATIONS

This report was produced for the exclusive use of Project1 Studio (P1S). The purpose of the report is to assess the existing stormwater management system and provide recommendations and designs for the post-construction scenario that are in compliance with the guidelines and standards from the Ministry of the Environment and Climate Change, City of Ottawa and local approval agencies. McIntosh Perry reviewed the site information and background documents listed in Section 2.0 of this report. While the previous data was reviewed by McIntosh Perry and site visits were performed, no field verification/measures of any information were conducted.

Any use of this review by a third party, or any reliance on decisions made based on it, without a reliance report is the responsibility of such third parties. McIntosh Perry accepts no responsibility for damages, if any, suffered by any third party as a result of decisions or actions made based on this review.

The findings, conclusions and/or recommendations of this report are only valid as of the date of this report. No assurance is made regarding any changes in conditions subsequent to this date. If additional information is discovered or becomes available at a future date, McIntosh Perry should be requested to re-evaluate the conclusions presented in this report, and provide amendments, if required.

APPENDIX A
CITY OF OTTAWA PRE-CONSULTATION NOTES

Charissa Hampel

From:	Curry, William <William.Curry@ottawa.ca>
Sent:	September 14, 2017 3:13 PM
To:	Ryan Kennedy
Cc:	Sean Leflar; Curtis Melanson
Subject:	RE: 3443 Innes Road - Stormwater Management Requirements
Follow Up Flag:	Follow up
Flag Status:	Completed

Ryan,

Yes for item 1 below.

Item 2……..on the phone I meant the other CB , A27 that connects to STMH A26. I have nothing to confirm the size other than a site visit and it looked like a 375mm Ø.
I now see on the plan it says 300mm Ø.

So you would need to replace the CB with a CBMH and extend the pipe to have the MH inside the property due to the road widening required.

Also please submit your Watermain Boundary Request.

Thanks
Will

From: Ryan Kennedy [mailto:r.kennedy@mcintoshperry.com]
Sent: Thursday, September 14, 2017 1:04 PM
To: Curry, William <William.Curry@ottawa.ca>
Cc: Sean Leflar <s.leflar@mcintoshperry.com>; Curtis Melanson <c.melanson@mcintoshperry.com>
Subject: 3443 Innes Road - Stormwater Management Requirements

Hi Will,

Just wanted to confirm a couple of things since we spoke on the phone a while back regarding the requirements for this site.

- Stormwater Management – we will match the 100-year post-dev flow to the 5-year pre-dev flow (to a maximum C-value of 0.5)

- We discussed a possible storm outlet for the site being the existing CB lead at the entrance of the site off of Innes Road. You mentioned on the phone that it was a 375mm pipe, but our as-built drawing (attached) shows only a 200mm pipe. Can you confirm if you have more up to date info that we might not have?

Thanks Will.

Ryan Kennedy, P. Eng.

Practice Area Lead | Land Development
115 Walgreen Road, RR 3, Carp, ON K0A 1L0
T. 613.836.2184 (ext 2243) | **F.** 613.836.3742 | **C**. 613.868.5790
r.kennedy@mcintoshperry.com | www.mcintoshperry.com

McINTOSH PERRY

Charissa Hampel

From:	Eric Lalande <eric.lalande@rvca.ca>
Sent:	September 18, 2017 2:22 PM
To:	Curtis Melanson
Subject:	RE: 3443 Innes Road - Quality Control

Hello Curtis,

The RVCA will be looking for Quality control with 80% Total Suspended Solid removal. Please identify in your stormwater management report how this removal will be accomplished. This can be accomplished through on site best management practices and/or through downstream stormwater facilities (which I don't see any for this site other than municipal storm sewers). The site is approximately 1,800 m from outletting into a watercourse tributary to Bilberry Creek. Let me know if you have any other questions.

Thanks,

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

From: Curtis Melanson [mailto:c.melanson@mcintoshperry.com]
Sent: Monday, September 18, 2017 2:13 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Sean Leflar <s.leflar@mcintoshperry.com>
Subject: 3443 Innes Road - Quality Control

Hi Eric,
We are working on a development at 3443 Innes Road at the corner of Page Road in Orleans. The development will consist of a 5 storey mixed-use residential development with commercial on the ground floor and residential units above. We've pre-consulted with the city and we will be providing quantity control, but they've asked us to consult with RVCA as to the quality control requirements.

Can you please review and let me know. I've attached a site plan for your reference.

Thanks,

Curtis Melanson, C.E.T., rcsi

Team Lead – Land Development
115 Walgreen Road, R.R. 3, Carp, ON K0A 1L0
T. 613.836.2184 (ext 2240) | **F.** 613.836.3742 | **C**. 613.857.0784
c.melanson@mcintoshperry.com | www.mcintoshperry.com

McINTOSH PERRY

APPENDIX B
EXISTING WATERMAIN FLOW AND FIRE PROTECTION CALCULATIONS

CP-17-0469 - 3443 INNES ROAD

Project:	3443 Innes Road
Project No.:	CP-17-0469
Designed By:	CDH
Checked By:	CJM
Date:	October 24, 2017

Ontario 2006 Building Code Compendium (Div. B - Part 3)

***Water Supply for Fire-Fighting -* Store/Office & Warhouse Building**

Building is classified as Group : C and E up to 6 Storeys From Table 1

Building is of combustable construction. Floor assemblies are fire seperations but with no fire-resistance rating. Roof assemblies. Mezzanies, loadbearing walls, columns and arches do not have a fire-resistance rating

From Div. B A-3.2.5.7. of the Ontario Building Code - 3. Building On-Site Water Supply:

(a) Q = K x V x Stot

where:

Q = minimum supply of water in litres

K = water supply coefficient from Table 1

V = total building volume in cubic metres

Stot = total of spatial coefficient values from the property line exposures on all sides as obtained from the formula:

Stot = 1.0 + [Sside1+Sside2+Sside3+...etc.]

K	**39**	(from Table 1 pg A-31) (Worst case occupancy {E / F2} 'K' value used)
V	**8,832**	(Total building volume in m^3.)
Stot	**1.1**	(From figure 1 pg A-32)
Q =	**378,892.80 L**	

			From Figure 1 (A-32)
Snorth	9	m	0.05
Seast	17	m	0.00
Ssouth	18	m	0.00
Swest	9	m	0.05

*approximate distances

From Table 2: Required Minimum Water Supply Flow Rate (L/s)

9000 L/min (if Q >270,000 L)
2378 gpm

Table 1					
WATER SUPPLY COEFFICIENT - K					
TYPE OF CONSTRUCTION	Classification by Group or Division in Accordance with Table 3.1.2.1. of the Building Code				
	A-2 B-1 B-2 B-3 C D	A-4 F-3	A-1 A-3	E F-2	F-1
Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2., including loadbearing walls, columns and arches.	10	12	14	17	23
Building is of noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	16	19	22	27	37
Building is of combustible construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2., including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire-resistance rating where permitted in Subsection 3.2.2.	18	22	25	31	41
Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.	23	28	32	39	53
Column 1	2	3	4	5	6

Table 2	
OBC Part 3 Buildings	Required Minimum Water Supply Flow Rate (L/min)
One-storey building with building area not exceeding 600 m²	1800
All other buildings	2700 (if Q ≤ 108,000 L)(1) 3600 (if Q > 108,000 L and ≤ 135,000 L)(1) 4500 (if Q > 135,000 L and ≤ 162,000 L)(1) 5400 (if Q > 162,000 L and ≤ 190,000 L)(1) 6300 (if Q > 190,000 L and ≤ 270,000 L)(1) 9000 (if Q > 270,000 L)(1)

Note to Table 2:

(1) $Q = KVS_{Tot}$ as referenced in Paragraph 3(a)

3443 Innes Road - Fire Underwriters Survey (FUS) Fire Calculations

Project:	3443 Innes Road
Project No.:	CP-17-0469
Designed By:	CJM
Checked By:	CJM
Date:	October 24, 2017

1. From the Fire Underwriters Survey (1999)

From Part II – Guide for Determination of Required Fire Flow Copyright I.S.O.:

F = 220 x C x √A Where:

- F = Required fire flow in liters per minute
- C = Coefficient related to the type of construction.
- A = The total floor area in square meters (including all storey's, but excluding basements at least 50 percent below grade) in the building being considered.

2. Determine Ground Floor Area

As provided by the Architect:

Gross Floor Area = 2,944.00 m²

Total Floor Area = 2,944.00 m²

This floor area represents the final build-out of the development; as outlined on the Site Plan drawing.

3. Calculate Required Fire Flow

F = 220 x C x √A

C = 1.50

A = 2,944.00

F = 220.00 X 1.50 X √ 2944.00

F = 17,905.35 L/min.

4. Determine Height in Storeys

From Architectural Drawings:

Number of Storeys = 6.00

5. Determine Increase or Decrease Based on Occupancy

From note 2, Page 18 of the Fire Underwriter Survey:

Low Hazard - Mixed Use

No Change

F = 17,905.35 L/min.

6. Determine the Decrease, if any for Sprinkler Protection

From note 3, Page 18 of the Fire Underwriter Survey:

- The flow requirement may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of the system.
- The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards.
- Additional credit of 10% if water supply is standard for both the system and fire department hose lines
- If sprinkler system is fully supervised system, an additional 10% credit is granted
- The entire building will be installed with a fully automated, standardized with the City of Ottawa Fire Department and fully supervised.
- Therefore 16,284 L/min – 50% (The building is sprinklered with a standard system and fire department hose lines)

F = 8,952.68 L/min.

7. Determine the Total Increase for Exposures

From note 4, Page 18 of the Fire Underwriter Survey:

- Exposure distance to the existing buildings to the west of the proposed building is approximately 14m respectfully.
- There are no existing buildings surrounding the remainder of the site that are within 45m.
- Therefore the charge for exposure is 15% of the value obtained in Step 5.
- 8,142 L/min + (16,284 L/min x 15%)

F = 11,638.48 L/min.

Therefore, after rounding to the nearest 1,000 L/min, the total required fire flow for the development is 12,000 L/min (3,170 GPM).

Based on the OBC design calculations completed the required demand for the site is 9000 L/min.

3443 INNES ROAD - Water Demands (COMMERCIAL)

Project:	3443 Innes Road
Project No.:	CP-17-0469
Designed By:	CJM
Checked By:	CJM
Date:	September 28, 2017
Site Area:	0.33 gross ha

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	350	L/c/d
Industrial - Light	35,000	L/gross ha/d
Industrial - Heavy	55,000	L/gross ha/d
Shopping Centres	2,500	L/(1000m² /d
Hospital	900	L/(bed/day)
Schools	70	L/(Student/d)
Trailer Parks no Hook-Ups	340	L/(space/d)
Trailer Park with Hook-Ups	800	L/(space/d)
Campgrounds	225	L/(campsite/d)
Mobile Home Parks	1,000	L/(Space/d)
Motels	150	L/(bed-space/d)
Hotels	225	L/(bed-space/d)
Tourist Commercial	28,000	L/gross ha/d
Other Commercial	*28,000*	*L/gross ha/d*
AVERAGE DAILY DEMAND	0.11	L/s

MAXIMUM DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	2.5 x avg. day	L/c/d
Industrial	1.5 x avg. day	L/gross ha/d
Commercial	*1.5 x avg. day*	*L/gross ha/d*
Institutional	1.5 x avg. day	L/gross ha/d
MAXIMUM DAILY DEMAND	0.16	L/s

MAXIMUM HOUR DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	2.2 x max. day	L/c/d
Industrial	1.8 x max. day	L/gross ha/d
Commercial	*1.8 x max. day*	*L/gross ha/d*
Institutional	1.8 x max. day	L/gross ha/d
MAXIMUM HOUR DEMAND	0.29	L/s

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

3443 INNES ROAD - Water Demands (RESIDENTIAL)

Project:	3443 Innes Road		
Project No.:	CP-17-0469		
Designed By:	CJM		
Checked By:	CJM		
Date:	October 24, 2017		
Site Area:	0.33 gross ha		
1 Bedroom:	1.40 persons/unit		10 units
Total=	1.40 x 10 =	14 persons	
2 Bedroom:	2.10 persons/unit		25 units
Total=	2.10 x 25 =	52.5 persons	
Total=	**14 + 52.5 =**	**67 persons**	

AVERAGE DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	***350***	***L/c/d***
Industrial - Light	35,000	L/gross ha/d
Industrial - Heavy	55,000	L/gross ha/d
Shopping Centres	2,500	L/(1000m² /d
Hospital	900	L/(bed/day)
Schools	70	L/(Student/d)
Trailer Parks no Hook-Ups	340	L/(space/d)
Trailer Park with Hook-Ups	800	L/(space/d)
Campgrounds	225	L/(campsite/d)
Mobile Home Parks	1,000	L/(Space/d)
Motels	150	L/(bed-space/d)
Hotels	225	L/(bed-space/d)
Tourist Commercial	28,000	L/gross ha/d
Other Commercial	28,000	L/gross ha/d
AVERAGE DAILY DEMAND	**0.27**	**L/s**

MAXIMUM DAILY DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	***2.5 x avg. day***	***L/c/d***
Industrial	1.5 x avg. day	L/gross ha/d
Commercial	1.5 x avg. day	L/gross ha/d
Institutional	1.5 x avg. day	L/gross ha/d
MAXIMUM DAILY DEMAND	**0.68**	**L/s**

MAXIMUM HOUR DEMAND

DEMAND TYPE	AMOUNT	UNITS
Residential	***2.2 x max. day***	***L/c/d***
Industrial	1.8 x max. day	L/gross ha/d
Commercial	1.8 x max. day	L/gross ha/d
Institutional	1.8 x max. day	L/gross ha/d
MAXIMUM HOUR DEMAND	**1.49**	**L/s**

WATER DEMAND DESIGN FLOWS PER UNIT COUNT
CITY OF OTTAWA - WATER DISTRIBUTION GUIDELINES, JULY 2010

From: Curry, William <William.Curry@ottawa.ca>
Sent: October 27, 2017 9:29 AM
To: Sean Leflar
Subject: As requested
Attachments: 3443 Innes Oct 2017.pdf

The following are boundary conditions, HGL, for hydraulic analysis at 3443 Innes (zone 2E) assumed to be connected to the 203 mm on Page (see attached PDF for location).

Minimum HGL = 126.6 m

Maximum HGL = 131.3 m

Max Day + Fire Flow = 119.9 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.

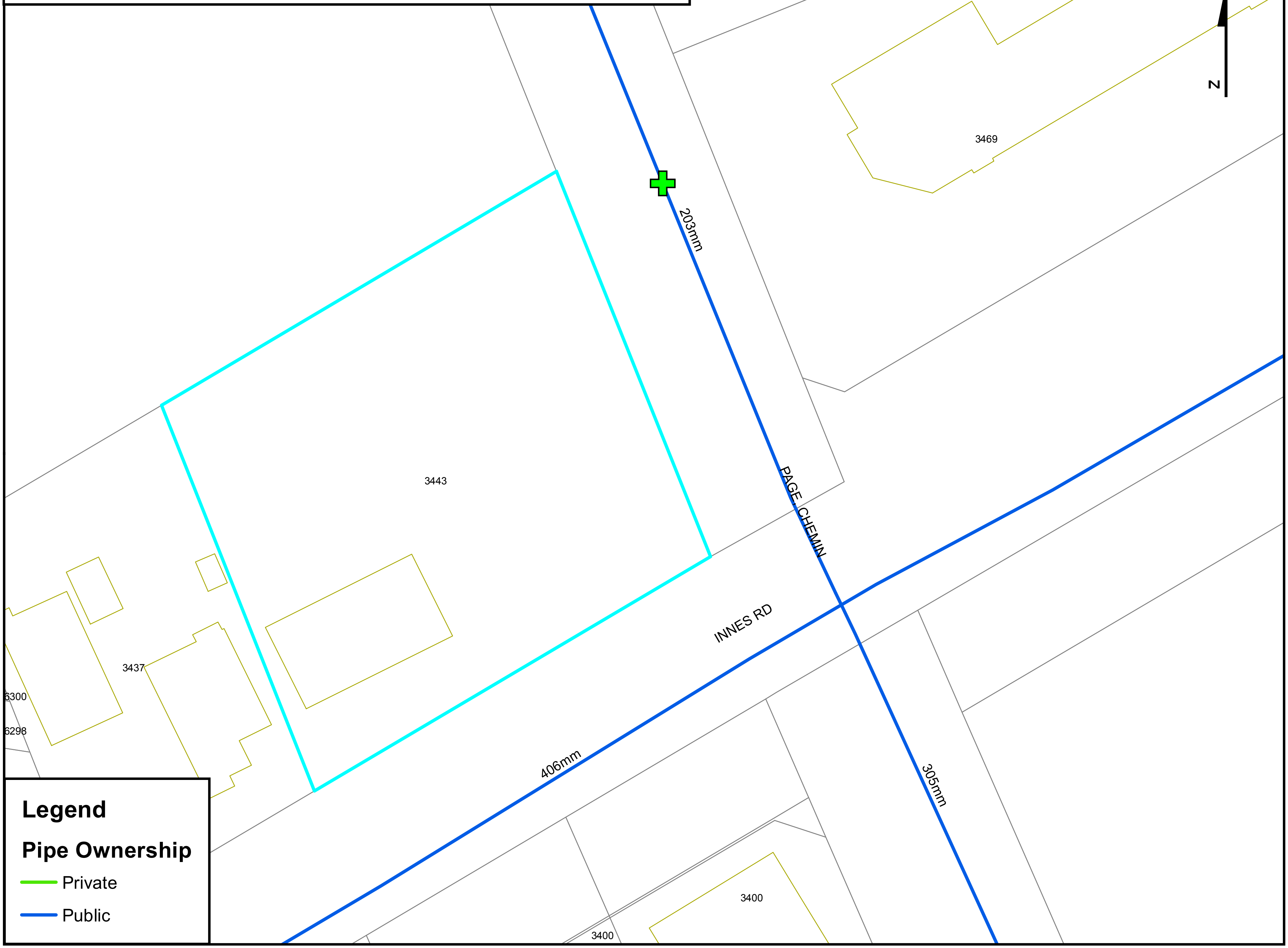
Will Curry, C.E.T.

William.Curry@Ottawa.ca

Planning, Infrastructure and Economic Development Department
Project Manager - Infrastructure Approvals
Development Review - East Branch
110 Laurier Ave., 4th Floor East;
Ottawa ON K1P 1J1
Mail Code 01-14

City of Ottawa
613.580.2424 ext.16214
William.Curry@Ottawa.ca

Boundary Condition for 3443 Innes



Average Day

Current Time: 0.000 hours

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
J-1	91.35	13.33	56.71	131.30

Peak Hourly

Current Time: 0.000 hours

Label	Elevation (m)	Demand (L/min)	Pressure (psi)	Hydraulic Grade (m)
J-1	91.35	72.19	50.04	126.60

Max Day plus Fire Flow

Label	Is Fire Flow Run Balanced?	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (L/min)	Fire Flow (Available) (L/min)	Pressure (psi)	Elevation (m)
H-1	True	True	11,000.00	15,261.28	39.67	91.95
J-1	False	False	11,000.00	(N/A)	40.53	91.35

APPENDIX C
SANITARY SEWER CALCULATIONS

October 24th, 2017

Project Name: Proposed 6-storey mixed development
3443 Innes Road

Re: Urban Sanitary Design Calculations.

1. BUILDING OCCUPANCY

The maximum number of bedroom units will be 35 units and the ground floor will consist of 7 commercial units as per the floors plans and the attached unit break down from the Architect.

2. DAILY VOLUME IN LITRES

As per the extract of the City of Ottawa Sewer Design Guidelines, Appendix 4-A; Daily Sewage Flow for Dwellings;

- Each Dwelling unit of 1 bedrooms
  - 275 Liters/Dwelling/Day
- Each Dwelling unit of 2 bedrooms
  - 1100 Liters/Dwelling/Day
- Each Retail Unit
  - 5 Liters/m^2/Day

3. PEAK FLOW (Q/P)

- $Q_{1\text{-BED}}(p) = F_{1\text{-BED}} \times P_{1\text{-BED}}$ Where:
  $F_{1\text{-BED}}$ = 275 Litres/Dwelling/Day (as per City of Ottawa Sewer Design Guidelines)
  $P_{1\text{-BED}}$ = 10 Units (as per Site Plan)
- Therefore, $Q_{1\text{-BED}}(p)$ = (275) x (10) = <u>2,750 L/Day (0.032 L/sec)</u>
- $Q_{2\text{-BED}}(p) = F_{2\text{-BED}} \times P_{2\text{-BED}}$ Where:
  $F_{2\text{-BED}}$ = 1100Litres/Dwelling/Day (as per City of Ottawa Sewer Design Guidelines)
  $P_{3\text{-BED}}$ = 25 Units (as per Site Plan)
- Therefore, $Q_{2\text{-BED}}(p)$ = (1,100) x (25) = <u>27,500 L/Day (0.318 L/sec)</u>
- $Q_{RET}(p) = F_{RET} \times P_{RET}$ Where:
  F_{RET}= 5Litres/m^2/Day (as per City of Ottawa Sewer Design Guidelines)
  P_{RET}= 499m^2 (as per Design Proposal)
- Therefore, $Q_{RET}(p)$ = (5) x (4999) = <u>2,495 L/Day (0.029 L/sec)</u>
- $Q_{TOTAL}(p) = Q_{1\text{-BED}} + Q_{2\text{-BED}} + Q_{RET}$ Where:
  $Q_{2\text{-BED}}$ = 2,750 L/Day

$Q_{3\text{-}BED}$ = 27,500 L/Day

Q_{RET} = 2,495 L/Day

- Therefore, Q_{TOTAL}(p) = (2,750) + (27,500) + (2,495) = 32,745 L/Day (0.379 L/sec)

It is anticipated that there will be no issues with capacity constraints within the existing sanitary main within Pagé Road.

\\192.168.1.3\MPDOCUMENTS\01 PROJECT - PROPOSALS\2017 JOBS\CP\0CP-17-0469 P1S_SPC_3443 INNES ROAD\03 - SERVICING\SANITARY\CP-17-0469 SANITARY FLOW CALCS.DOCX

APPENDIX 4-A DAILY SEWAGE FLOW FOR VARIOUS ESTABLISHMENTS

ITEM	UNIT OF MEASURE	DAILY VOLUME IN LITRES
DWELLINGS		
- Single family houses, apartments Condominiums, cottages, etc.	per person	350
- Each dwelling unit of -	1 bedroom	275
- Each dwelling unit of -	2 bedrooms	1100
- Each dwelling unit of -	3 bedrooms	1600
- Each dwelling unit of -	4 bedrooms	2000
- Add for each bedroom over 4	per bedroom	300
- Boarding or Rooming houses	per person	200
- Boarding or Rooming houses without meals or laundry	per person	150
- Non resident staff	per person	40
- Luxury homes – 4 bedrooms	per residence	3000
- Luxury homes – 5 bedrooms	per residence	3500
- Luxury homes – add for each bedroom over 5		500
SHOPPING CENTRES		
- Retail stores – washrooms only	per square metre of store area	5
- Retail stores area – parking area	per parking space	6
- Retail store area – employees	per person	40
- Retail store area – toilet rooms	per toilet room	2000

SANITARY SEWER DESIGN SHEET

PROJECT: 3443 Innes Road
LOCATION: City of Ottawa
CLIENT: Project1 Studio

McINTOSH PERRY

LOCATION				RESIDENTIAL									ICI AREAS							INFILTRATION ALLOWANCE			FLOW	SEWER DATA								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	30	31
STREET	AREA ID	FROM MH	TO MH	UNIT TYPES SF	SD	TH	APT	AREA (ha)	POPULATION IND	CUM	PEAK FACTOR	PEAK FLOW (L/s)	AREA (ha) INSTITUTIONAL IND	CUM	COMMERCIAL IND	CUM	INDUSTRIAL IND	CUM	PEAK FLOW (L/s)	AREA (ha) IND	CUM	FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	FLOW DEPTH (mm)	VELOCITY (actual) (m/s)	AVAILABLE CAPACITY L/s	(%)
		BLDG	MH#2A				28		64.4	64.4	4.00	1.04		0.00	0.05	0.05		0.00	0.04	0.33	0.33	0.09	1.18	33.35	3.72	200	0.95	1.028	27.5	0.489	32.17	96.46
		MH#2A	MH#1A						0.0	64.4	4.00	1.04		0.00		0.05		0.00	0.04		0.33	0.09	1.18	34.22	26.70	200	1.00	1.055	27.2	0.498	33.04	96.55
		MH#1A	EX SANMH						0.0	64.4	4.00	1.04		0.00		0.05		0.00	0.04		0.33	0.09	1.18	34.22	5.45	200	1.00	1.055	27.2	0.498	33.04	96.55

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.4	p/p/u				
TH/SD	2.7	p/p/u	INST	50,000	L/Ha/day	1.5
APT	2.3	p/p/u	COM	50,000	L/Ha/day	1.5
Other	60	p/p/Ha	IND	35,000	L/Ha/day	MOE Chart

Notes:

1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: CDH

Checked: CJM

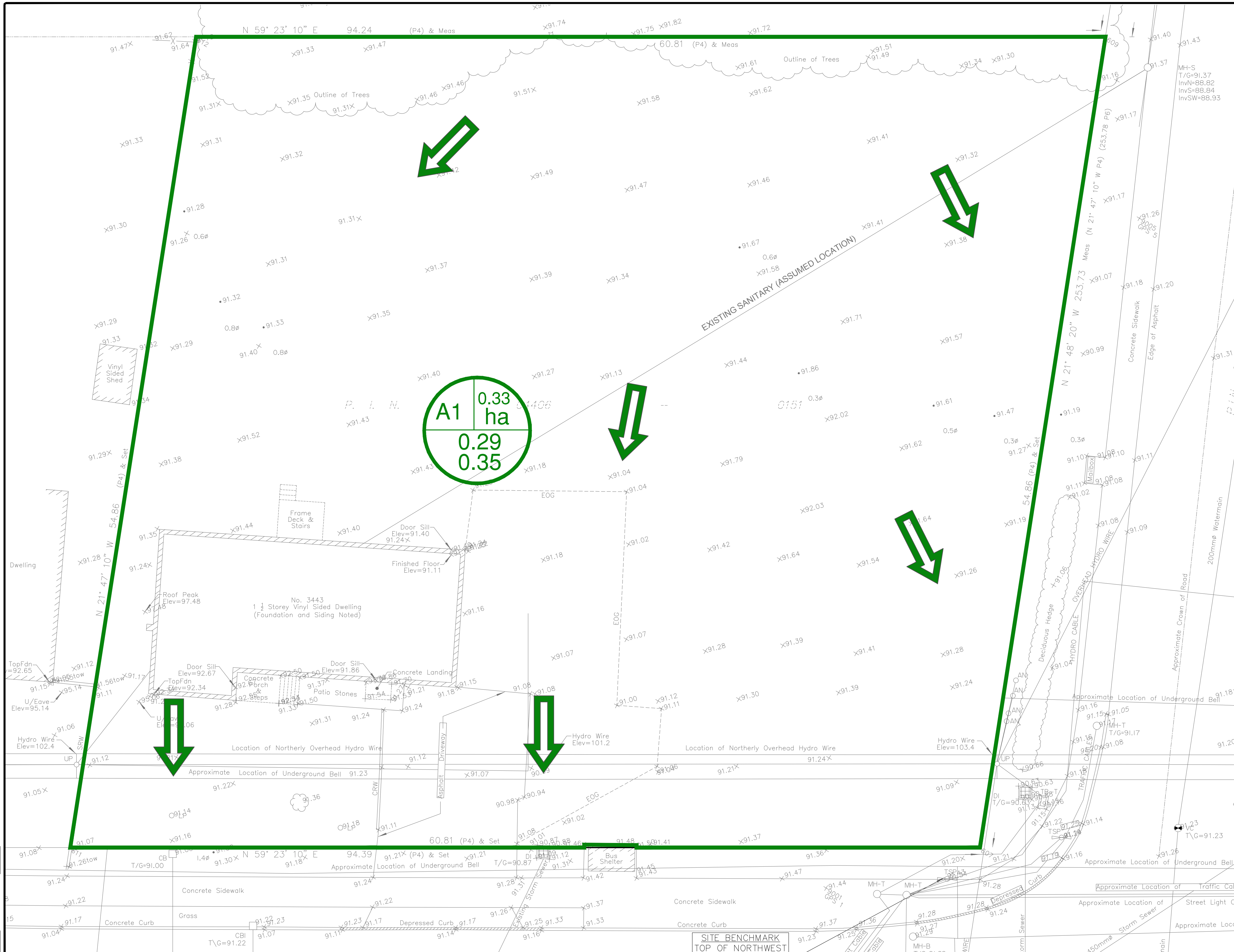
Project No.: CP-17-0469

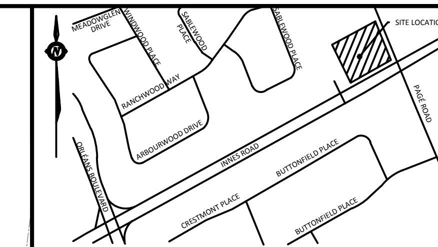
No.	Revision	Date
1	ISSUED FOR REVIEW	

Date: 2017-09-28

Sheet No: 1 of 1

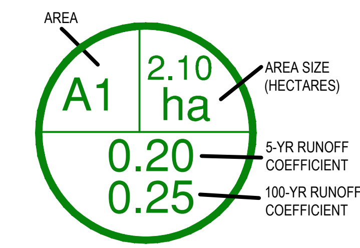
APPENDIX D
PRE-DEVELOPMENT DRAINAGE PLAN





LOCATION PLAN

LEGEND



FOR REVIEW ONLY
NOT FOR CONSTRUCTION

No.	Revision/Issue	Date
2	ISSUED FOR SITE PLAN CONTROL	DEC 13, 2017
1	ISSUED FOR REVIEW	OCT 27, 2017

SCALE 1 : 250
0 5 10 15 20 25 Metres

Check and verify all dimensions before proceeding with the work

Do not scale drawings

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A 1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

Stamp:

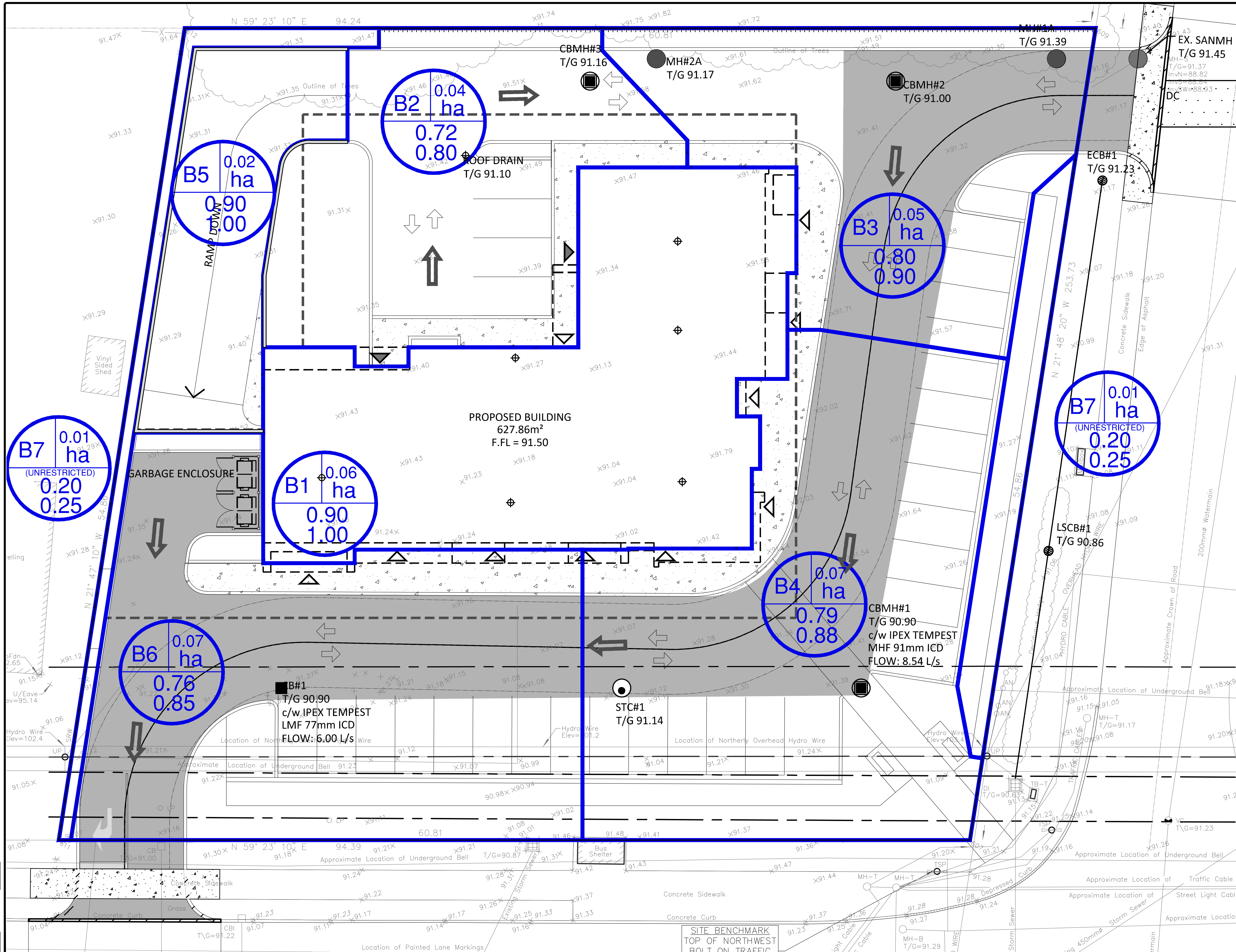
Client:
PROJECT 1 STUDIO INC.
300-260 ST. PATRICK STREET, OTTAWA, ON K1N 5K5

Project:
3443 INNES ROAD
PROPOSED 6 STOREY MIXED USE BLDG.
OTTAWA ONTARIO

Drawing Title:
PRE DEVELOPMENT DRAINAGE

Scale: 1:250	Project Number: CP-17-0469
Drawn by: SVL	
Checked By: RPK	Drawing Number:
Designed By: CJM	
Date: AUG 28/17	SHEET 1of 2 PRE

APPENDIX E
POST-DEVELOPMENT DRAINAGE PLAN



LOCATION PLAN

LEGEND

AREA
B1 2.10 ha 0.20 0.25
AREA SIZE (HECTARES)
5-YR RUNOFF COEFFICIENT
100-YR RUNOFF COEFFICIENT

FOR REVIEW ONLY
NOT FOR CONSTRUCTION

No.	Revision/Issue	Date
3	REVISED AS PER CITY COMMENTS	JUN 01, 2018
2	ISSUED FOR SITE PLAN CONTROL	DEC 13, 2017
1	ISSUED FOR REVIEW	OCT 27, 2017

SCALE 1 : 250
0 5 10 15 20 25 Metres

Check and verify all dimensions before proceeding with the work

Do not scale drawings

McINTOSH PERRY
115 Walgreen Road, RR3, Carp, ON K0A 1L0
Tel: 613-836-2184 Fax: 613-836-3742
www.mcintoshperry.com

Stamp:

Client:
PROJECT 1 STUDIO INC.
300-260 ST. PATRICK STREET, OTTAWA, ON K1N 5K5

Project:
3443 INNES ROAD
PROPOSED 6 STOREY MIXED USE BLDG.

OTTAWA ONTARIO

Drawing Title:
POST DEVELOPMENT DRAINAGE

Scale:	1:250	Project Number:	CP-17-0469
Drawn by:	SVL		
Checked By:	RPK		
Designed By:	CJM	Drawing Number:	
Date:	AUG 28/17	SHEET 1 of 2	POST

APPENDIX F

STORMWATER MANAGEMENT CALCULATIONS

McINTOSH PERRY

CP-17-0469 - 3443 INNES ROAD - RUNOFF CALCULATION

Pre-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	Average C (5-Year)	Average C (100-Year)
A1	0.33	321.06	0.90	206.22	0.60	2768.50	0.20	0.29	0.35

Pre-Development Runoff Calculations

Drainage Area	Area (ha)	C (5-yr)	C (100-yr)	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
A1	0.33	0.29	0.35	20	70.3	120.0	18.87	38.94
Total	**0.33**						**18.87**	**38.94**

Post-Development Runoff Coefficient

Drainage Area	Area (ha)	Impervious Area (m^2)	C	Gravel Area (m^2)	C	Pervious Area (m^2)	C	Average C (5-Year)	Average C (100-Year)
B1	0.06	617.33	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B2	0.04	327.85	0.90	0.00	0.60	115.22	0.20	0.72	0.80
B3	0.05	391.83	0.90	0.00	0.60	61.90	0.20	0.80	0.90
B4	0.07	602.28	0.90	0.00	0.60	118.07	0.20	0.79	0.88
B5	0.02	211.86	0.90	0.00	0.60	0.00	0.20	0.90	1.00
B6	0.07	557.09	0.90	0.00	0.60	142.40	0.20	0.76	0.85
B7	0.01	0.00	0.90	0.00	0.60	146.24	0.20	0.20	0.25

Post-Development Runoff Calculations

Drainage Area	Area (ha)	C (5-yr)	C (100-yr)	Tc (min)	I (mm/hr)		Q (L/s)	
					5-Year	100-Year	5-Year	100-Year
B1	0.06	0.90	1.00	10	104.2	178.6	16.09	30.64
B2	0.04	0.72	0.80	10	104.2	178.6	9.21	17.70
B3	0.05	0.80	0.90	10	104.2	178.6	10.57	20.22
B4	0.07	0.79	0.88	10	104.2	178.6	16.38	31.36
B5	0.02	0.90	1.00	10	104.2	178.6	5.52	10.52
B6	0.07	0.76	0.85	10	104.2	178.6	15.35	29.42
B7	0.01	0.20	0.25	10	104.2	178.6	0.85	1.81
Total	**0.33**						**73.98**	**141.68**

Post-Development Restricted Runoff Calculations

Drainage Area	Unrestricted Flow (L/s)		Restricted Flow (L/s)		Storage Required (m^3)		Storage Provided (m^3)		
	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	5-Year	100-Year	
B1	16.09	30.64	1.44	2.52	5.99	11.91	7.13	12.48	*RESTRICTED*
B2	9.21	17.70	8.54	8.54	23.74	60.32	24.07	61.98	*RESTRICTED*
B3	10.57	20.22							
B4	16.38	31.36							
B5	5.52	10.52							
B6	15.35	29.42	6.00	6.00	5.68	16.65	6.58	17.55	*RESTRICTED*
B7	0.85	1.81	0.85	1.81	-	-	-	-	*UNRESTRICTED*
Total	**73.98**	**141.68**	**16.83**	**18.87**	**35.41**	**88.88**	**37.78**	**92.01**	

MCINTOSH PERRY

CP-17-0469 - 3443 INNES ROAD - STORAGE REQUIREMENTS

Storage Requirements for Area B1

5-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
15	83.6	7.39	1.44	5.95	5.35
20	70.3	6.21	1.44	4.77	5.73
25	60.9	5.39	1.44	3.95	5.92
30	53.9	4.77	1.44	3.33	5.99
35	48.5	4.29	1.44	2.85	5.99
40	44.2	3.91	1.44	2.47	5.92
45	40.6	3.59	1.44	2.15	5.81

Maximum Storage Required 5-Year (m^3) =	5.99

100-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	17.71	2.52	15.19	9.11
15	142.9	14.17	2.52	11.65	10.48
20	120.0	11.90	2.52	9.38	11.25
25	103.8	10.29	2.52	7.77	11.66
30	91.9	9.11	2.52	6.59	11.87
35	82.6	8.19	2.52	5.67	11.91
40	75.1	7.45	2.52	4.93	11.82

Maximum Storage Required 100-Year (m^3) =	11.91

Storage Occupied In Area B1

5-Year Storm Event

Water Elevation (m) =		91.10		75% of Area	Depth	Head	Volume
Structure	T/G	Pipe dia.	INV. (out)	(m^2)	(m)	(m)	(m^3)
CB#1	-	-	-	356.6	0.020	-	7.1

Storage Available (m^3) =	7.1
Storage Required (m^3) =	6.0

100-YEAR STORM EVENT

Water Elevation (m) =		91.17		75% of Area	Depth	Head	Volume
Structure	T/G	Pipe dia.	INV. (out)	(m^2)	(m)	(m)	(m^3)
CB#1	-	-	-	356.6	0.035	-	12.5

Storage Available (m^3) =	12.5
Storage Required (m^3) =	11.9

CP-17-0469 - 3443 INNES ROAD - STORAGE REQUIREMENTS

Storage Requirements for Area B2-B5

5-Year Storm Event

Tc (min)	I (mm/hr)	B2 Runoff (L/s)	B3 Runoff (L/s)	B4 Runoff (L/s)	B5 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
20	70.3	6.21	7.13	11.05	3.72	8.54	19.57	23.49
21	68.1	6.03	6.91	10.71	3.61	8.54	18.72	23.59
22	66.1	5.85	6.71	10.40	3.51	8.54	17.93	23.67
23	64.3	5.69	6.52	10.11	3.41	8.54	17.19	23.72
24	62.5	5.53	6.35	9.83	3.32	8.54	16.49	23.74
25	60.9	5.39	6.18	9.58	3.23	8.54	15.83	23.74
26	59.3	5.25	6.02	9.33	3.15	8.54	15.21	23.72

Maximum Storage Required 5-Year (m^3) =	23.74

100-Year Storm Event

Tc (min)	I (mm/hr)	B2 Runoff (L/s)	B3 Runoff (L/s)	B4 Runoff (L/s)	B5 Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
40	75.1	7.45	8.50	13.19	4.42	8.54	25.02	60.06
41	73.8	7.32	8.36	12.96	4.35	8.54	24.44	60.13
42	72.6	7.20	8.22	12.75	4.28	8.54	23.91	60.24
43	71.4	7.08	8.08	12.54	4.21	8.54	23.37	60.29
44	70.2	6.96	7.95	12.33	4.13	8.54	22.83	60.28
45	69.1	6.85	7.82	12.14	4.07	8.54	22.34	60.32
46	68.0	6.74	7.70	11.94	4.00	8.54	21.85	60.31

Maximum Storage Required 100-Year (m^3) =	60.32

CP-17-0469 - 0.2446327 - STORAGE REQUIREMENTS

Storage Occupied In Area B2-B5

5-Year Storm Event

Water Elevation (m) =			91.10	Area	Depth	Head	Volume
Structure	T/G	Pipe dia.	INV. (out)	(m^2)	(m)	(m)	(m^3)
CBMH#2	91.00	0.250	89.868	85.3	0.10	1.11	7.8

Storage Available (m^3) = 3.1 *

Water Elevation (m) =			91.10	Area	Depth	Head	Volume
Structure	T/G	Pipe dia.	INV. (out)	(m^2)	(m)	(m)	(m^3)
CBMH#1	90.90	0.250	89.633	282.8	0.20	1.34	21.0

Storage Available (m^3) = 21.0 *

Total Storage Available (m^3)=	**24.1**
Storage Required (m^3) =	**23.7**

100-YEAR STORM EVENT

Water Elevation (m) =			91.17	Area	Depth	Head	Volume
Structure	T/G	Pipe dia.	INV. (out)	(m^2)	(m)	(m)	(m^3)
CB#2	91.10	0.200	90.114	91.9	0.07	0.96	2.5

Storage Available (m^3) = 2.5 *

Water Elevation (m) =			91.17	Area	Depth	Head	Volume
Structure	T/G	Pipe dia.	INV. (out)	(m^2)	(m)	(m)	(m^3)
CBMH#2	91.00	0.250	89.868	250.7	0.17	1.18	13.4

Storage Available (m^3) = 13.4 *

Water Elevation (m) =			91.17	Area	Depth	Head	Volume
Structure	T/G	Pipe dia.	INV. (out)	(m^2)	(m)	(m)	(m^3)
CBMH#1	90.90	0.250	89.633	447.4	0.27	1.41	46.1

Storage Available (m^3) = 46.1 *

Total Storage Available (m^3)=	**62.0**
Storage Required (m^3) =	**60.3**

CP-17-0469 - 3443 INNES ROAD - STORAGE REQUIREMENTS

Storage Requirements for Area B6

5-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
15	83.6	12.31	6.00	6.31	5.68
20	70.3	10.35	6.00	4.35	5.22
25	60.9	8.97	6.00	2.97	4.46
30	53.9	7.94	6.00	1.94	3.50
35	48.5	7.15	6.00	1.15	2.41
40	44.2	6.51	6.00	0.51	1.22
45	40.6	5.98	6.00	-0.02	-0.04

Maximum Storage Required 5-Year (m^3) = 5.68

100-Year Storm Event

Tc (min)	I (mm/hr)	Runoff (L/s)	Allowable Outflow (L/s)	Runoff to be Stored (L/s)	Storage Required (m^3)
10	178.6	29.43	6.00	23.43	14.06
15	142.9	23.55	6.00	17.55	15.79
20	120.0	19.77	6.00	13.77	16.53
25	103.8	17.10	6.00	11.10	16.65
30	91.9	15.14	6.00	9.14	16.46
35	82.6	13.61	6.00	7.61	15.98
40	75.1	12.37	6.00	6.37	15.30

Maximum Storage Required 100-Year (m^3) = 16.65

Storage Occupied In Area B6

5-Year Storm Event

Water Elevation (m) =			91.06	Area	Depth	Head	Volume
Structure	T/G	Pipe dia.	INV. (out)	(m^2)	(m)	(m)	(m^3)
CB#1	90.90	0.25	89.67	125.9	0.160	1.27	6.6

Storage Available (m^3) =	6.6
Storage Required (m^3) =	5.7

100-YEAR STORM EVENT

Water Elevation (m) =			91.12	Area	Depth	Head	Volume
Structure	T/G	Pipe dia.	INV. (out)	(m^2)	(m)	(m)	(m^3)
CB#1	90.90	0.25	89.67	245.9	0.220	1.33	17.6

Storage Available (m^3) =	17.6
Storage Required (m^3) =	16.7

CP-17-0469 - 3443 INNES ROAD - RUNOFF CALCULATION

Roof Drain Flow For Flat Roof B1

Flow Rate Vs. Build-Up (One Weir)	
Depth (mm)	Flow (L/s)
15	0.18
20	0.24
25	0.30
30	0.36
35	**0.42**
40	0.48
45	0.54
50	0.60
55	**0.66**

*Roof Drain model to be Accutrol Weirs, See attached sheets
*Roof Drain Flow information taken from Watts Drainage website

CALCULATING ROOF FLOW EXAMPLES

1 roof drain during a 5 year storm
elevation of water = 25mm
Flow leaving 1 roof drain = (1 x 0.30 L/s) = 0.30 L/s

1 roof drain during a 100 year storm
elevation of water = 50mm
Flow leaving 1 roof drain = (1 x 0.60 L/s) = 0.60 L/s

4 roof drains during a 5 year storm
elevation of water = 25mm
Flow leaving 4 roof drains = (4 x 0.30 L/s) = 1.20 L/s

4 roof drains during a 100 year storm
elevation of water = 50mm
Flow leaving 4 roof drains = (4 x 0.60 L/s) = 2.40 L/s

6 Roof Drains

	Roof Drain Flow		
	Flow (L/s)	Storage Depth (mm)	Total Flow (L/s)
	0.18	15	1.08
5-Yr	**0.24**	**20**	**1.44**
	0.30	25	1.80
	0.36	30	2.16
100-Yr	**0.42**	**35**	**2.52**
	0.48	40	2.88
	0.54	45	3.24
	0.60	50	3.60
	0.66	55	3.96
	0.72	60	4.32
	0.78	65	4.68
	0.84	70	5.04
	0.90	75	5.40
	0.96	80	5.76
	1.02	85	6.12
	1.08	90	6.48
	1.14	95	6.84
	1.20	100	7.20
	1.26	105	7.56
	1.32	110	7.92
	1.38	115	8.28
	1.44	120	8.64
	1.50	125	9.00
	1.56	130	9.36
	1.62	135	9.72
	1.68	140	10.08
	1.74	145	10.44
	1.80	150	10.80

Note: The flow leaving through a restricted roof drain is based on flow vs. head information

STORM SEWER DESIGN SHEET

McINTOSH PERRY

PROJECT: 3443 INNES ROAD
LOCATION: OTTAWA, ON
CLIENT: PROJECT 1 STUDIO INC.

LOCATION				CONTRIBUTING AREA (ha)								RATIONAL DESIGN FLOW											SEWER DATA								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
STREET	AREA ID	FROM MH	TO MH	C-VALUE 0.20	0.50	0.60	0.70	0.80	0.90	INDIV AC	CUMUL AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW (L/s)	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	W	H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (5yr) (L/s)	(%)
	B2	CB#2	CBMH#3	0.01					0.03	0.03	0.03	10.00	0.20	10.20	104.19	122.14	178.56	9.21				9.21	26.50	9.67	200			0.60	0.817	17.29	65.23%
	B2	CBMH#3	CBMH#2							0.00	0.03	10.20	0.42	10.62	103.16	120.93	176.78	9.12				9.12	40.78	20.40	250			0.43	0.805	31.65	77.63%
	B3	CBMH#2	CBMH#1	0.01					0.04	0.04	0.07	10.62	0.84	11.46	101.03	118.42	173.09	19.19				19.19	40.78	40.58	250			0.43	0.805	21.59	52.95%
	B4	CBMH#1	STC#1	0.01					0.06	0.06	0.12	11.46	0.33	11.79	97.07	113.75	166.23	33.70				33.70	40.78	15.98	250			0.43	0.805	7.08	17.36%
																	IPEX Tempest ICD to restrict CBMH#1 flows to 8.54 L/s														
	B6	CB#1	STC#1	0.01					0.06	0.05	0.05	10.00	0.46	10.46	104.19	122.14	178.56	15.35				15.35	41.62	22.71	250			0.45	0.821	26.27	63.12%
																	IPEX Tempest ICD to restrict CB#1 flows to 6.00 L/s														
	B1	BLDG	TEE						0.06	0.06	0.06	10.00	0.06	10.06	104.19	122.14	178.56	16.09				16.09	62.04	4.68	250			1.00	1.224	45.95	74.06%
																	6 Roof Drains to restrict flows to 2.52 L/s														
		STC#1	EX.MAIN								0.37	11.79	0.15	11.94	95.60	112.02	163.69	97.10			17.06	17.06	100.88	12.41	300			1.00	1.383	100.88	66.18%

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: S.V.L.

Checked: R.P.K.

Project No.: CP-17-0469

No.	Revision	Date
1.	ISSUED FOR SITE PLAN CONTROL	2017-10-27
2	REVISED AS PER CITY COMMENTS	2018-06-01

Date: 2018-06-01

Sheet No: 7 of 7

TEMPEST Product Submittal Package R1

Date: **May 31, 2018**

Customer: McIntosh Perry

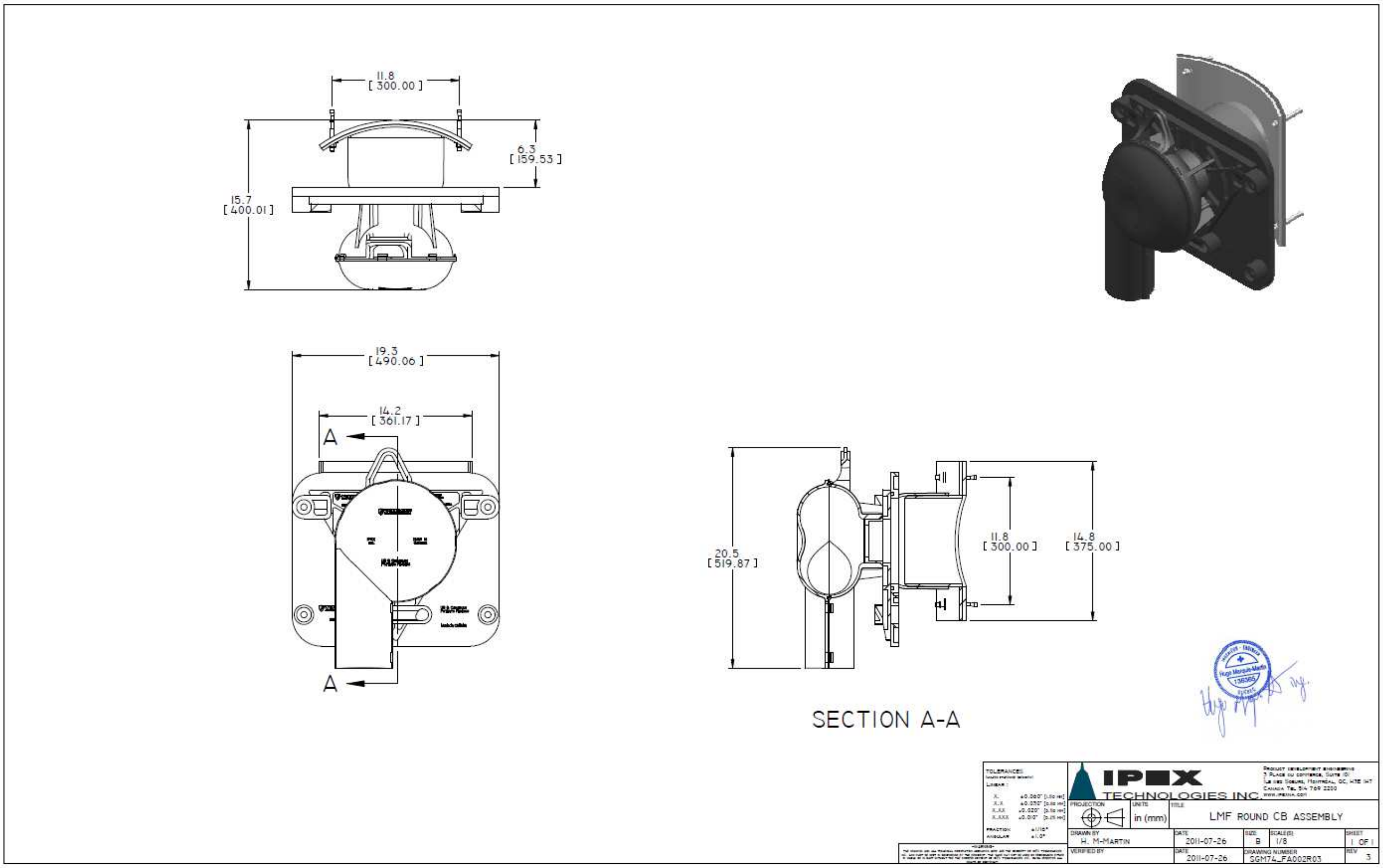
Contact: **Sean Leflar**

Location: **Ottawa**

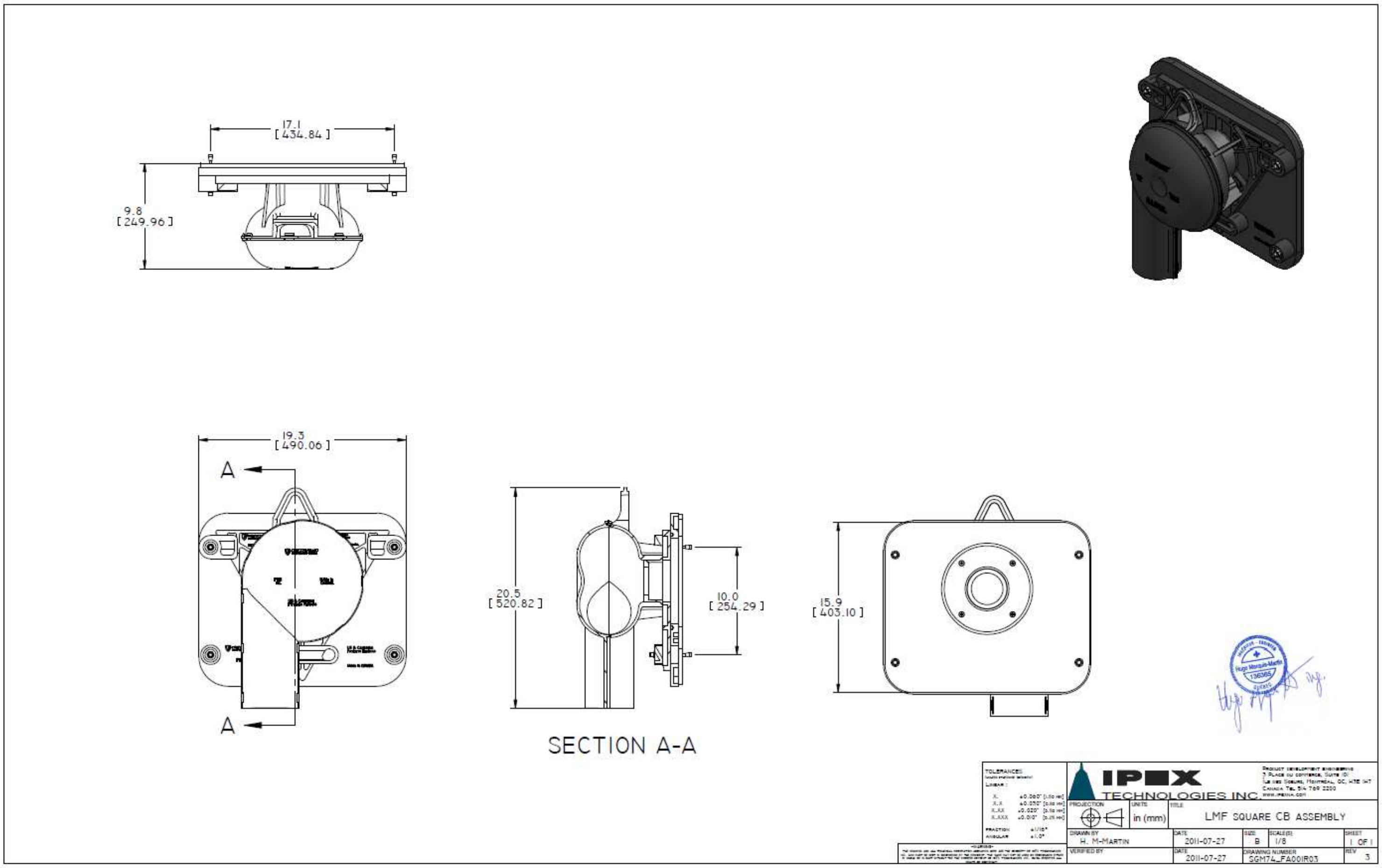
Project Name: **Innes Road**

IPEX

<u>Tempest LMF ICD Rd</u> Shop Drawing

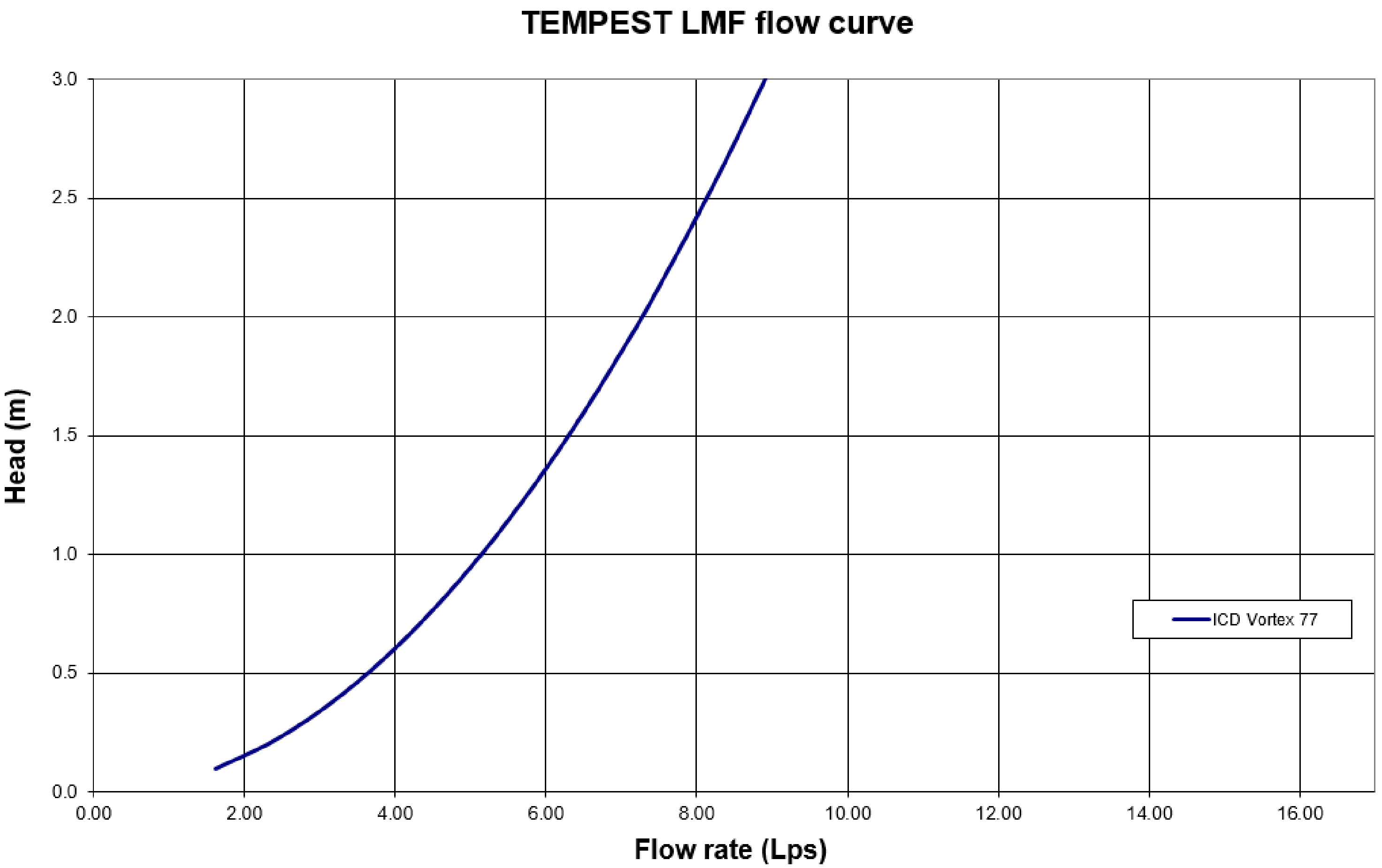


Tempest LMF ICD Sq Shop Drawing



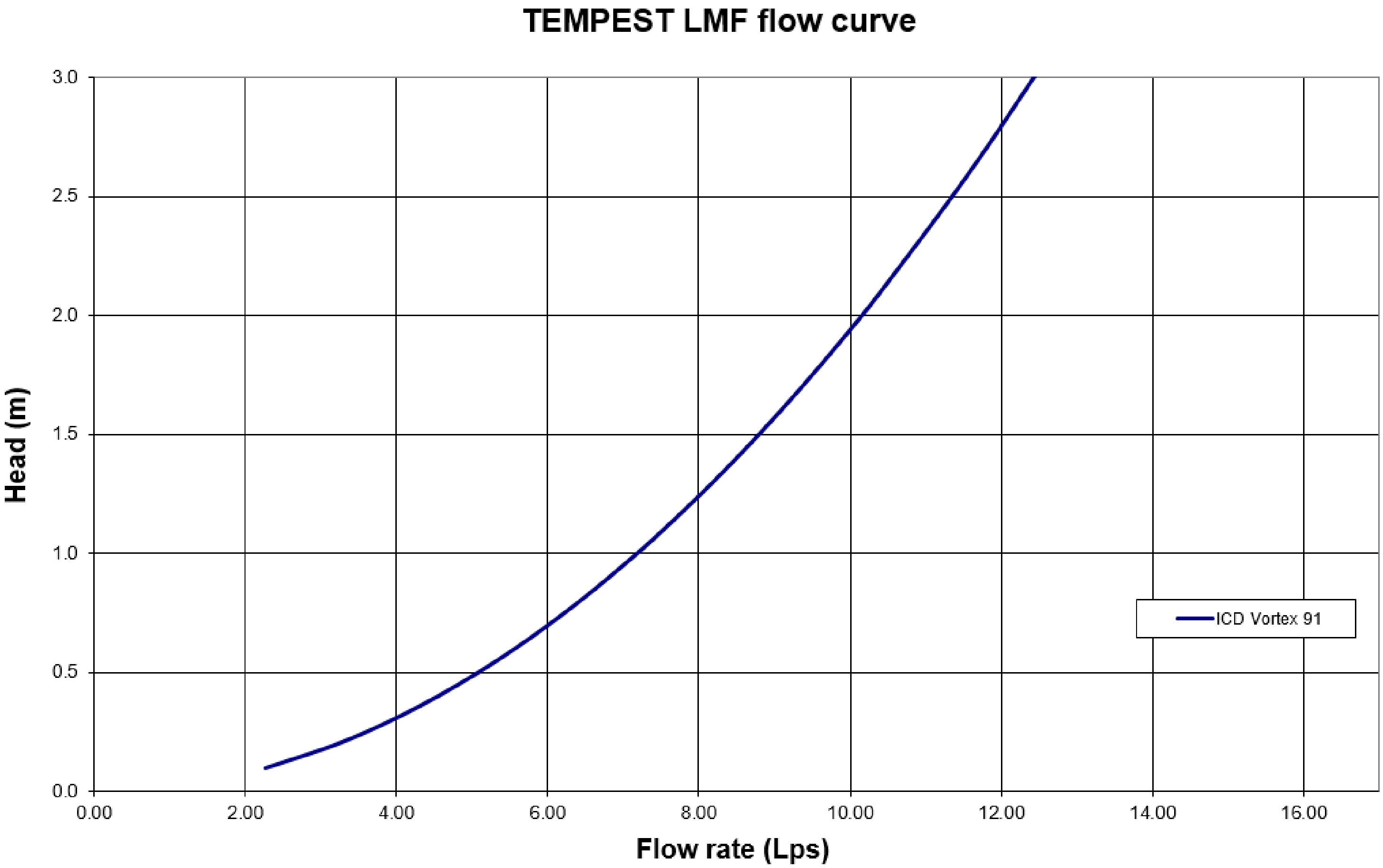
LMF ICD Flow Curve

Flow: 6 L/s
Head: 1.33 m
CB1



LMF ICD Flow Curve

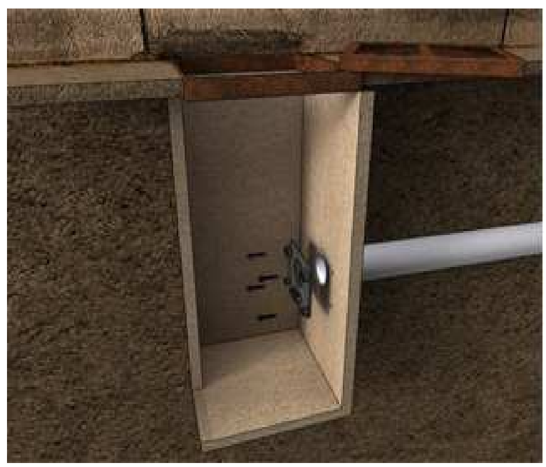
Flow: 8.54 L/s
Head: 1.41 m
CBMH1

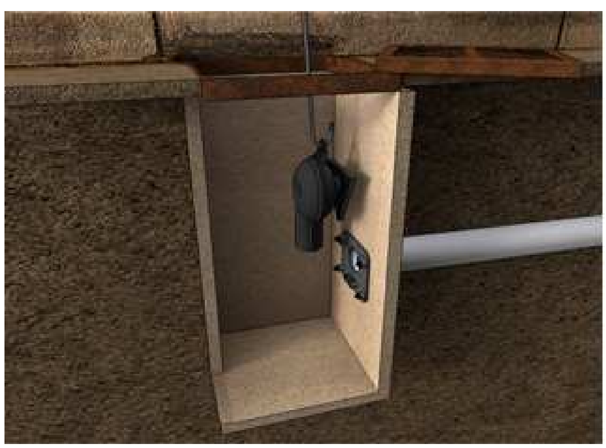


IPEX

Square CB Installation Notes:

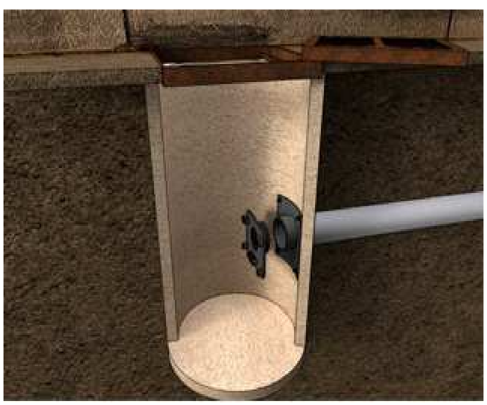
1. Materials and tooling verification:
   - Tooling: impact drill, 3/8'' concrete bit, torque wrench for 9/16''nut, hand hammer, level, and marker.
   - Material: (4) concrete anchor 3/8x3-1/2, (4) washers, (4) nuts
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8'' concrete bit to make the four holes at a minimum of 1-1/2'' depth up to 2-1/2''. Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you will hit the anchors with the hammer. Remove the nuts on the ends of the anchors
5. Install the wall mounting plate on the anchors and screw the nut in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the LMF device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.





Round CB Installation Notes: (Refer to square install notes above for steps 1 , 3, & 4)

2. Use spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lb-ft). There should be no gap between the CB spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate and the spigot of the spigot CB wall plate. Slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered into the mounting plate and has created a seal.



CAUTION/WARNING/DISCLAIM:

- Verify that the inlet(s) pipe(s) is not protruding into the catch basin. If it is, cut it back so that the inlet pipe is flush with the catch basin wall.
- Any required cement in the installation must be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Please refer to the IPEX solvent cement guide to confirm required curing times or attend the IPEX **Online Solvent Cement Training Course**.
- Call your IPEX representative for more information or if you have any questions about our products.

IPEX TEMPEST Inlet Control Devices Technical Specification

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's must have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

APPENDIX G
QUALITY TREATMENT UNIT DESIGN CALCULATIONS

McINTOSH PERRY

Stormceptor®

FORTERRA

Detailed Stormceptor Sizing Report – 3443 Innes Rd

Project Information & Location			
Project Name	3443 Innes Rd	**Project Number**	4763
City	Ottawa	**State/ Province**	Ontario
Country	Canada	**Date**	9/28/2017
Designer Information		**EOR Information (optional)**	
Name	HAL STRATFORD	**Name**	Charissa Hampel
Company	FORTERRA	**Company**	Macintosh Perry
Phone #	226-220-3943	**Phone #**	
Email	hal.stratford@forterrabp.com	**Email**	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	
Recommended Stormceptor Model	STC 750
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	86
PSD	Fine Distribution
Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A

The recommended Stormceptor model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	78	93
STC 750	86	98
STC 1000	87	98
STC 1500	87	98
STC 2000	89	100
STC 3000	90	100
STC 4000	92	100
STC 5000	93	100
STC 6000	94	100
STC 9000	96	100
STC 10000	96	100
STC 14000	97	100
StormceptorMAX	Custom	Custom

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour).
Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

State/Province	Ontario	**Total Number of Rainfall Events**	4819
Rainfall Station Name	OTTAWA MACDONALD-CARTIER INT'L A	**Total Rainfall (mm)**	20978.1
Station ID #	6000	**Average Annual Rainfall (mm)**	567.0
Coordinates	45°19'N, 75°40'W	**Total Evaporation (mm)**	2872.0
Elevation (ft)	370	**Total Infiltration (mm)**	3342.5
Years of Rainfall Data	37	**Total Rainfall that is Runoff (mm)**	14763.6

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

Drainage Area	
Total Area (ha)	0.33
Imperviousness %	84.0

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	0.00000

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	

Site Details

Drainage Area	
Total Area (ha)	0.33
Imperviousness %	84.0

Surface Characteristics	
Width (m)	115.00
Slope %	2
Impervious Depression Storage (mm)	1.57
Pervious Depression Storage (mm)	4.67
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency	
Maintenance Frequency (months) >	12

Infiltration Parameters	
Horton's equation is used to estimate infiltration	
Max. Infiltration Rate (mm/hr)	76.2
Min. Infiltration Rate (mm/hr)	13.2
Decay Rate (1/sec)	0.00115
Regeneration Rate (1/sec)	0.01

Evaporation	
Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow	
Dry Weather Flow (lps)	0

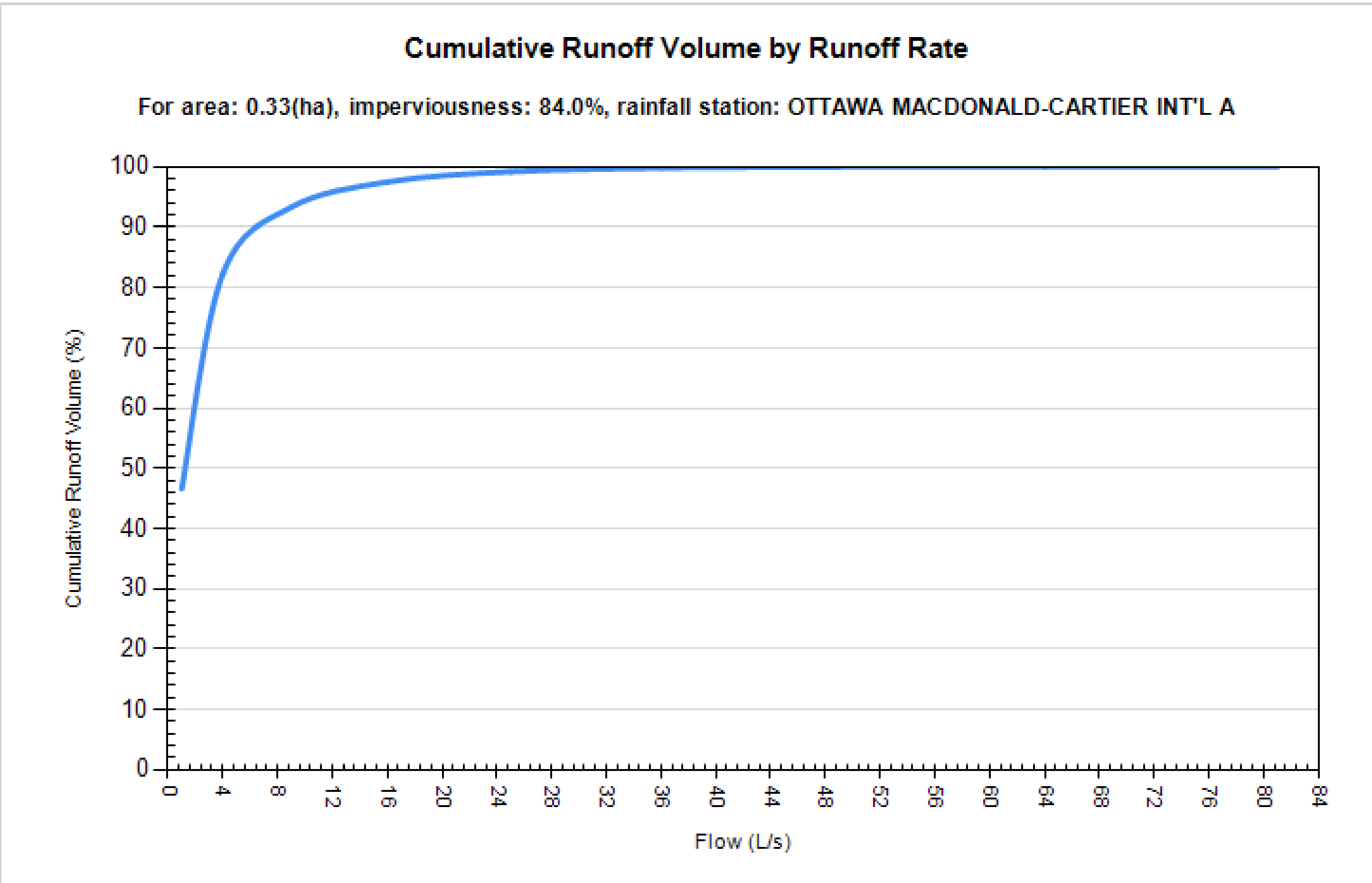
Winter Months	
Winter Infiltration	0

TSS Loading Parameters	
TSS Loading Function	Build Up/ Wash-off

Buildup/Wash-off Parameters	
Target Event Mean Conc. (EMC) mg/L	125
Exponential Buildup Power	0.40
Exponential Washoff Exponent	0.20

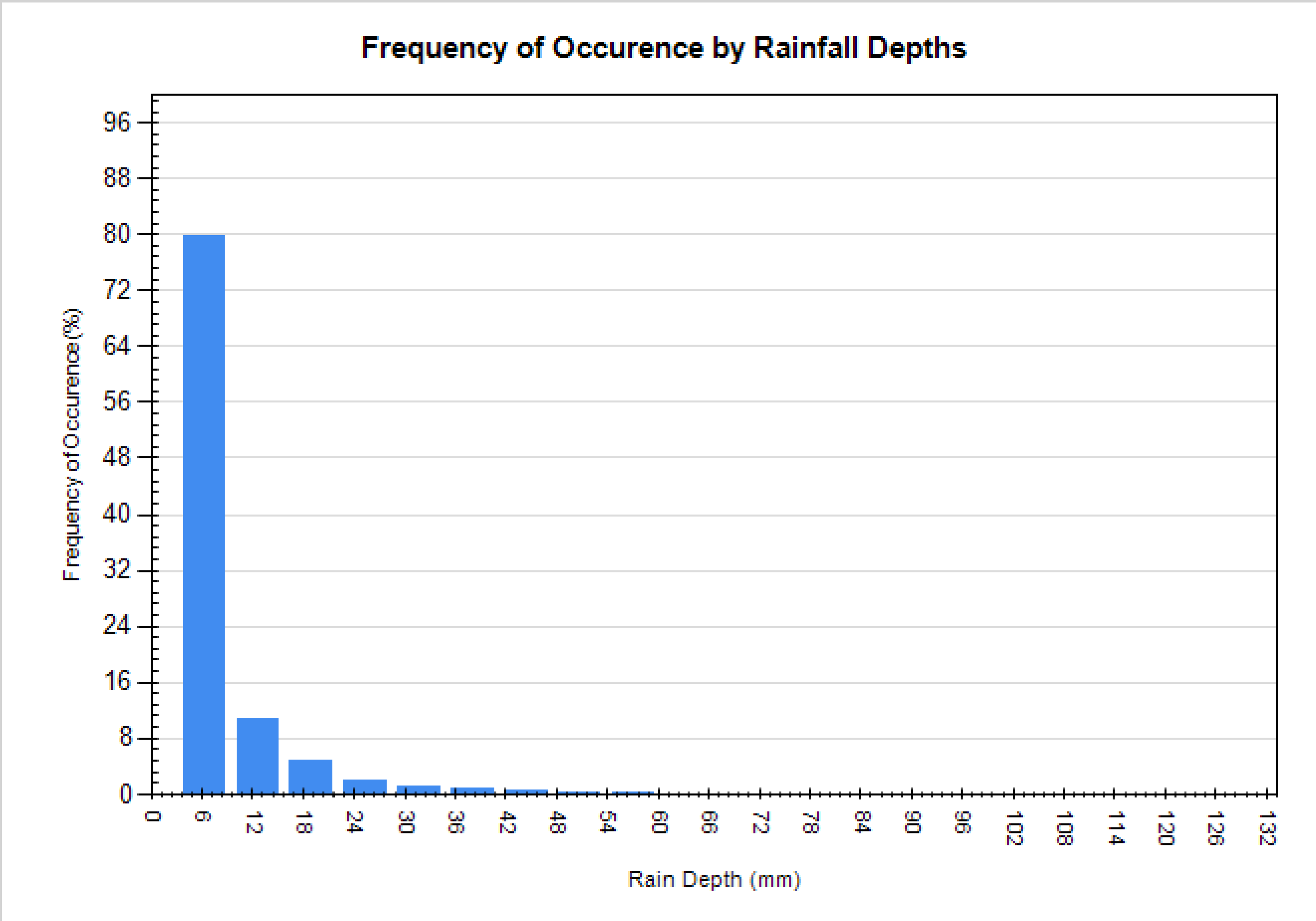
TSS Availability Parameters	
Availability Constant A	0.05
Availability Factor B	0.04
Availability Exponent C	1.10
Min. Particle Size Affected by Availability (micron)	400

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m³)	Volume Over (m³)	Cumulative Runoff Volume (%)
1	22858	26208	46.6
4	40395	8672	82.3
9	45777	3291	93.3
16	47828	1240	97.5
25	48667	402	99.2
36	48988	81	99.8
49	49058	10	100.0
64	49069	0	100.0
81	49069	0	100.0



Rainfall Event Analysis				
Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	3843	79.7	5885	28.1
12.70	520	10.8	4643	22.1
19.05	225	4.7	3470	16.5
25.40	98	2.0	2144	10.2
31.75	58	1.2	1639	7.8
38.10	32	0.7	1118	5.3
44.45	24	0.5	996	4.7
50.80	9	0.2	416	2.0
57.15	5	0.1	272	1.3
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0
114.30	1	0.0	109	0.5
120.65	0	0.0	0	0.0
127.00	0	0.0	0	0.0

Frequency of Occurence by Rainfall Depths



For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications