McINTOSH PERRY

# MEMORANDUM

Date: November 28th, 2019 revised November 10th, 2020

Re: PP-19-9576 - 143 Marshall Street - 5-Unit Townhouse Development - Servicing Memo

## 1.0 INTRODUCTION

McIntosh Perry (MP) has been retained by 2672445 Ontario Inc. to prepare this Memorandum in support of the proposed 5-unit townhouse development located at 143 Marshall Street within the Municipality of Mississippi Mills (Municipality). The main purpose of this memorandum is to present and discuss the servicing design. The land in question covers approximately 0.10 ha. The property is currently developer as a single-family home. There is an existing 200mm diameter sanitary sewer and a 150mm diameter watermain within Adelaide Street.

## 2.0 WATERMAIN

There will be five new 19 mm watermain services connected to the existing 150 mm diameter watermain within Adelaide Street each complete with a water valve located 0.3m off the property line. An existing municipal hydrant will service the proposed development. The watermain is designed to have a minimum of 2.4m cover.

The Ontario Building Code (OBC) was utilized to determine the required fire flow for the site. The required fire protection from the OBC is 2,700 L/min. The required fire protection from the Fire Underwriters Survey (FUS) is 8,000 L/min (provided for information purposes only). The detailed calculations for the OBC and FUS can be found in Appendix 'A'.

The water demands for the 5-unit townhouse have been calculated as per the Ottawa Design Guidelines – Water Distribution and are as follows: the average and maximum daily demands are 0.02 L/s and 0.05 L/s respectively. The maximum hourly demand was calculated as 0.11 L/s (Refer to Appendix 'A' for details).

Boundary conditions have been provided by the Municipality and can be found in Appendix 'A'. It was determined there is a maximum available fire flow of 3,300 L/min (55 L/s) for the existing fire hydrant close to the subject property. Based on the boundary conditions provided by the Municipality the existing 150 mm watermain within Adelaide Street can adequately service the proposed development and can provide adequate fire flow in accordance with OBC 3.2.5.7.

## 3.0 SANITARY SEWER

There will be five new 135 mm diameter gravity sanitary services connected to the existing 200 mm diameter sanitary sewer within Adelaide Street. The subject site is a proposed 5-unit townhouse. The total area of the building is 505 $m^2$. The peak design flows for each of the proposed units were calculated using criteria from the City of Ottawa – Sewer Design Guidelines, October 2012. The proposed site area (0.10ha) with 5 townhouse

units results in a population of 13.5 and a peak flow of 0.18 L/s. An infiltration allowance of 0.03 L/s (0.10ha), the total flow for the site can be anticipated to be 0.21 L/s.

The proposed services for the development will be connected to existing 200 mm diameter sanitary sewer on Adelaide Street and as per correspondence with the Municipality it is anticipated that there will be no capacity issues within the existing downstream sanitary infrastructure.

# 4.0 STORMWATER MANAGEMENT

## 4.1 Design Criteria and Methodology

Stormwater management for the proposed site will be maintained through positive drainage away from the proposed building and into a new swale that connects to Marshall which ultimately drains to the SWM Pond within the Finner Court Subdivision, which will provide the required quality control for the subject property as per the *Creekside Towns Stormwater Management Report* by Novatech dated August 13, 2012. Quantity control will be provide through a proposed rearyard swale.

## 4.2 Runoff Calculations

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

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

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 result, the conservative calculation of runoff ensures that any SWM facility sized using this method is expected to function as intended.

The following coefficients were used to develop an average C for each area:

| | |
|---|---|
| Roofs/Concrete/Asphalt | 0.90 |
| Gravel | 0.60 |
| Undeveloped and Grass | 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.

## 4.3 Pre-Development Drainage

The existing site drainage limits is the entire 143 Marshall Street property. A summary of the Pre-Development Runoff Calculations can be found below. See Appendix 'B' for calculations

**Table 1: Pre-Development Runoff Summary**

| Drainage Area | Area (ha) | C-Value (5-Year) | C-Value (100-Year) | 5-year Peak Flow (L/s) | 100-year Peak Flow (L/s) |
|---|---|---|---|---|---|
| A1 | 0.10 | 0.27 | 0.32 | 7.8 | 16.1 |
| **Total** | **0.10** | | | **7.8** | **16.1** |

## 4.4 Post-Development Drainage

The proposed site drainage limits are demonstrated on the *Post-Development Drainage Plan* in Appendix 'B'. A summary of the Post-Development Runoff Calculations can be found below.

**Table 2: Post-Development Runoff Summary**

| Drainage Area | Area (ha) | C-Value (5-Year) | C-Value (100-Year) | 5-year Peak Flow (L/s) | 100-year Peak Flow (L/s) |
|---|---|---|---|---|---|
| B1 | 0.07 | 0.71 | 0.79 | 14.7 | 28.3 |
| B2 | 0.03 | 0.43 | 0.50 | 3.7 | 7.2 |
| **Total** | **0.10** | | | **18.4** | **35.5** |

See Appendix 'B' for calculations. Runoff for area B1 will drain to a proposed swale along the property line for 143 Marshall Street. See design drawing in Appendix 'B', cross section A-A for more details on the proposed swale. The proposed swale then outlets to Marshall Street and ultimately to the existing stormwater management pond within the Finner Court Subdivision as per pre-development conditions.

## 4.5 Quantity Control

The total 5 and 100-year post-development runoff for this site has been restricted to match the 5 and 100-year pre-development flow rate. Reducing site flows will be achieved using a concrete weir and will create the need for onsite storage. Runoff from area B1 will be restricted as shown in the table below.

**Table 3: Post-Development Restricted Runoff Summary**

| Area | Unrestricted Flow (L/s) | | Restricted Flow (L/s) | | |
|---|---|---|---|---|---|
| | 5-Year | 100-Year | 5-Year | 100-Year | |
| B1 | 14.7 | 28.3 | 4.0 | 8.8 | Restricted |
| B2 | 3.7 | 7.2 | 3.7 | 7.2 | Unrestricted |
| **Total** | **18.4** | **35.5** | **7.7** | **16.1** | |

See Appendix 'B' for calculations.

Runoff from Area B1 will be restricted within the rearyard swale through a concrete weir before discharging to Marshall Street. The total flow leaving the will be 4.0 L/s and 8.8 L/s during the 5 and 100-year storm events, respectively. This will result in ponding depths of 39 and 48 mm for the 5 and 100-year storm events, respectively. All of the storage required for this area will be located within the proposed rear yard swale.

### 4.6 Quality Control

After discussing the stormwater management criteria for the site with the Municipality, quality control will be provided in the existing subdivision adjacent to the site. The proposed swale within 143 Marshall as detailed above will convey flow to Marshall Street as per pre-development conditions and then to the existing swale and ultimately to a storm sewer system and a stormwater management pond downstream.

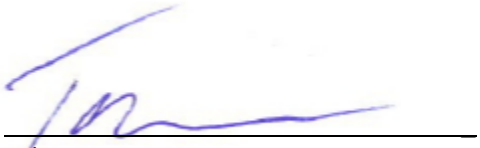
## 5.0 CONCLUSION

Based on the information presented in this memorandum, we recommend that Municipality of Mississippi Mills approve this Servicing Brief.

This memorandum is respectfully being submitted for approval.

Regards,

**McIntosh Perry Consulting Engineers Ltd.**



Tyler Ferguson, P.Eng.
Project Engineer, Land Development
T: 613.903.4426
E: t.ferguson@mcintoshperry.com

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# APPENDIX A
# WATERMAIN CALCULATIONS

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# PP-19-9576 - 143 Marshall Street - Water Demands

| | |
|---|---|
| Project: | 143 Marshall Street |
| Project No.: | PP-19-9576 |
| Designed By: | N.B.V. |
| Checked By: | T.D.F. |
| Date: | 11/13/2019 |
| Site Area: | 0.10 gross ha |
| Number of Units: | 5 Units |

## 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 |
| Othe Commercial | 28,000 | L/gross ha/d |
| AVERAGE DAILY DEMAND | 0.02 | 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 | 0.05 | 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 | 0.11 | L/s |

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

# PP-19-9576 - 143 Marshall Street - OBC Fire Calculations

| | |
|---|---|
| Project: | 143 Marshall Street |
| Project No.: | PP-19-9576 |
| Designed By: | N.B.V. |
| Checked By: | T.D.F. |
| Date: | 11/13/2019 |

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

### Water Supply for Fire-Fighting - 2 Storey Townhouse

Building is classified as Group : C (from table 3.2.2.55)
Building is of noncombustible construction with fire separations and fire-resistance ratings provided in accordance with subsections 3.2.2., including loadbearing walls, columns and arches

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 | 10 | (from Table 1 pg A-31) (Worst case occupancy {E / F2} 'K' value used) |
| V | 404 | (Total building volume in m³.) |
| Stot | 2.0 | (From figure 1 pg A-32 ) |
| Q = | 8,080.00 L | |

→

| | | | From Figure 1 (A-32) |
|---|---|---|---|
| Snorth | 23 | m | 0.0 |
| Seast | 0 | m | 0.5 |
| Ssouth | 7.8 | m | 0.2 |
| Swest | 0 | m | 0.5 |

*approximate distances

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

2700 L/min (if Q <108,000 L)
713 gpm

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# PP-19-9576 - 143 Marshall Street - Fire Underwriters Survey (FUS) Fire Calculations



| | |
|---|---|
| Project: | 143 Marshall Street |
| Project No.: | PP-19-9576 |
| Designed By: | N.B.V. |
| Checked By: | T.D.F. |
| Date: | 11/13/2019 |

## 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.

## A. Determine The Coefficient Related To The Type Of Construction

The building is considered to be of ordinary construction type. Therefore,

C = 1.50

## B. Determine Ground Floor Area

As provided by the Architect:

Floor Area (One Floor) = 101.00 m²

A = 202.00 m²

Note: The area was calculated based on two units as an appropriately rated fire wall will be installed every two units.

## C. Determine Height in Storeys

From Architectural Drawings:

Number of Storeys = 2.00

## D. Calculate Required Fire Flow

F = 220 x C x √A

F = 220.00 X 1.50 X √ 202.00

F = 4,690.18 L/min.

## E. Determine Increase or Decrease Based on Occupancy

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

Low Hazard - Residential

No Change

Occupancy Decrease = 0.00 L/min.

F = 4,690.18 L/min.

## F. 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 building will have no sprinkler system
- Therefore the value obtained in Step E is reduced by 0% (The building is sprinklered with a standard system and fire department hose lines)

Reduction = 4,690.18 L/min. X 0%

Reduction = 0.00 L/min.

## G. Determine the Total Increase for Exposures

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

- Exposure distance to the existing buildings to the north & south of the proposed building is approximately 23m & 7.8m respectfully.
- There are units within the same building with fire seperation to the east and west. Therefore distance to those units will be considered 0m
- Therefore the charge for exposure is 80% of the value obtained in Step E.

Increase = 4,690.18 L/min. X 80%

Increase = 3,752.14 L/min.

## H. Determine the Total Fire Demand

- To the answer obtained in E, substract the value obtained in F and add the value obtained in G
- Fire flow should be no less than 2,000L/min. and the maximum value shoul not exceed 45,000L/min.

F = 4,690.18 L/min. - 0.00 L/min. + 3,752.14 L/min.
F = 8,442.32 L/min.

Therefore, after rounding to the nearest 1,000 L/min, the total required fire flow for the development is 8,000 L/min (1,057 GPM).

Tyler Ferguson

From: Guy Bourgon <gbourgon@mississippimills.ca>
Sent: November 19, 2019 4:59 PM
To: Tyler Ferguson
Subject: FW: Hydraulic Boundary Conditions for 143 Marshall Street
Attachments: MMills_143MarshallSt_ModelOutputs.pdf; FW: Boundary Condition Request - 143 Marshall Street

Please see attached.

From: Annie Williams <awilliams@jlrichards.ca>
Sent: November-15-19 12:58 PM
To: Guy Bourgon <gbourgon@mississippimills.ca>
Cc: Mark Buchanan <mbuchanan@jlrichards.ca>
Subject: Hydraulic Boundary Conditions for 143 Marshall Street

Hello Guy,

The proposed Development ("143 Marshall Street"), located at the intersection of Adelaide Street and Marshall Street in the Municipality of Mississippi Mills (Municipality), was simulated using the Municipality's existing hydraulic water model (2017) to determine hydraulic boundary conditions based on theoretical water demands and fire flows provided by the Developer's Engineer (refer to attached). Table 1 summarizes the theoretical water demands that were included in the model at junction node J-111. Table 2 summarizes the required fire flows as calculated by the Developer's Engineer.

**Table 1: Theoretical Water Demands**

| Scenario | Demand (L/s) |
|---|---|
| Average Day | 0.02 |
| Maximum Day | 0.05 |
| Peak Hour | 0.11 |

**Table 2: Fire Flow Calculations**

| OBC (L/s) | FUS (L/s) |
|---|---|
| 45.00 | 133.33 |

The hydraulic boundary conditions have been generated at the intersection location labelled as junction node J-111 in the model and are summarized in Table 3 (refer to attached WaterCAD model outputs). The average day scenario assumes the maximum elevated tank level of 180.84 m with all well pumps off. The peak hour scenario assumes the maximum elevated tank level of 180.84 m with all well pumps on. The maximum day plus fire flow scenarios assume an elevated tank level of 180.00 m with all well pumps on. From these parameters, it is anticipated that the **maximum available fire flow is limited to 55 L/s** based on the minimum pressure requirement of 140 kPa.

**Table 3: 143 Marshall Street Boundary Conditions**

| Demand Scenario | Connection 1 | |
|---|---|---|
| | Junction Node J-111 (Elev 140.20 m) | |
| | Pressure (kPa) | HGL (m) |
| Average Day (0.02 L/s) | 395 | 180.52 |
| Max Day (0.05 L/s) + OBC Fire Flow (45.00 L/s) | 225 | 163.18 |
| Max Day (0.05 L/s) + Max. Available Fire Flow (55.93 L/s) | 148 | 155.35 |
| Peak Hour (0.11 L/s) | 387 | 179.78 |

Note that the foregoing model results are for current conditions and are based on computer model simulation. We have not reviewed the adequacy of the domestic demand nor the fire flow requirements for the proposed development, which remains the responsibility of the Developer's Engineer.

Disclaimer: The model results are based on current simulated operation of the Municipality's water distribution system. The computer model simulation is based on the best information available at this time. The operation of the water distribution system can change on a regular basis, resulting in a variation in the boundary conditions. It is further noted that the operational characteristics of the water supply system and physical properties of the watermains can change and/or deteriorate over time. These changes may affect the supply characteristics of the system and the assumptions made in developing the model, which in turn could lead to variations in the simulation results. This should be considered by any third party undertaking simulation of system upgrades.

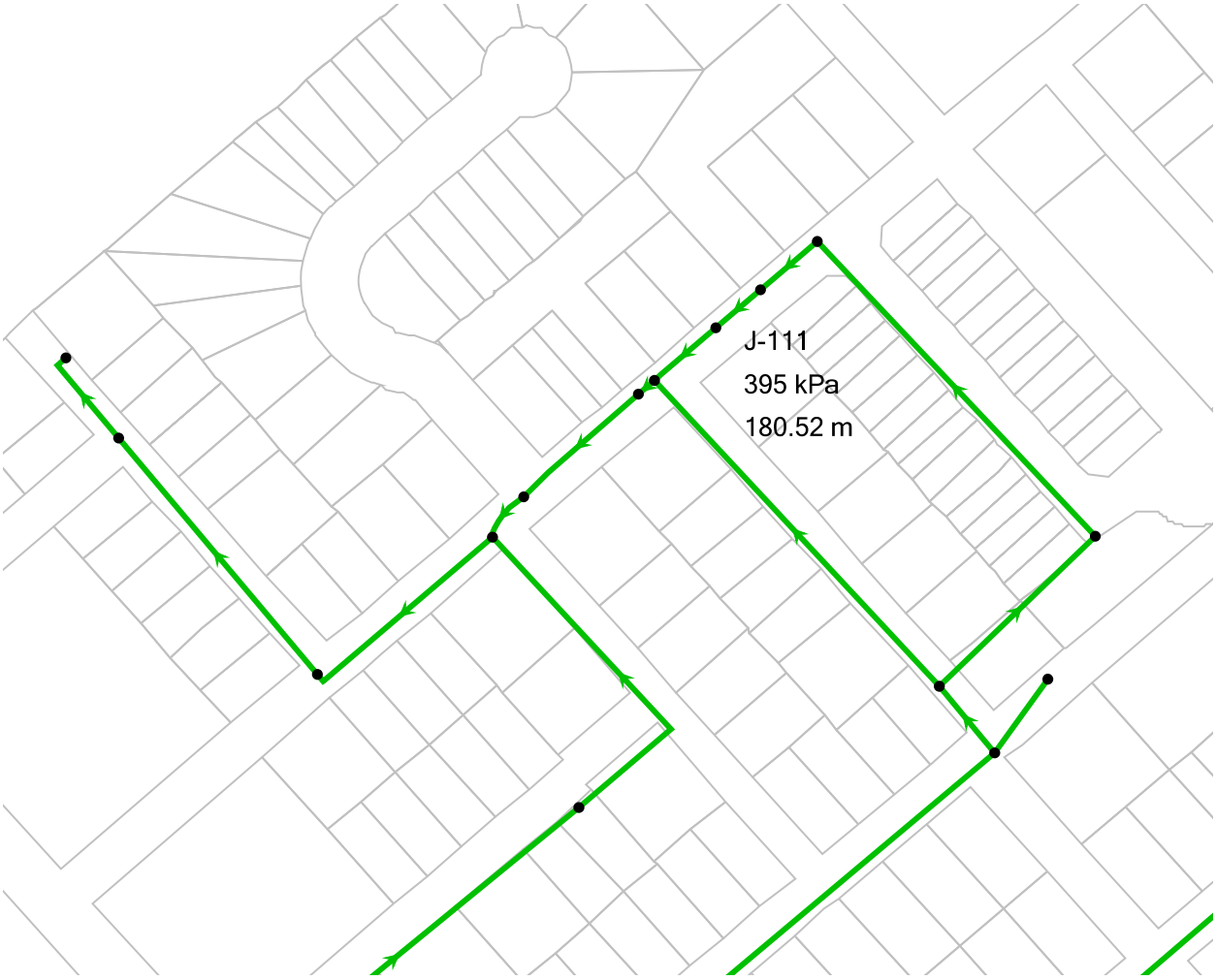
Please do not hesitate to contact me should you have any questions regarding the foregoing.

Regards,

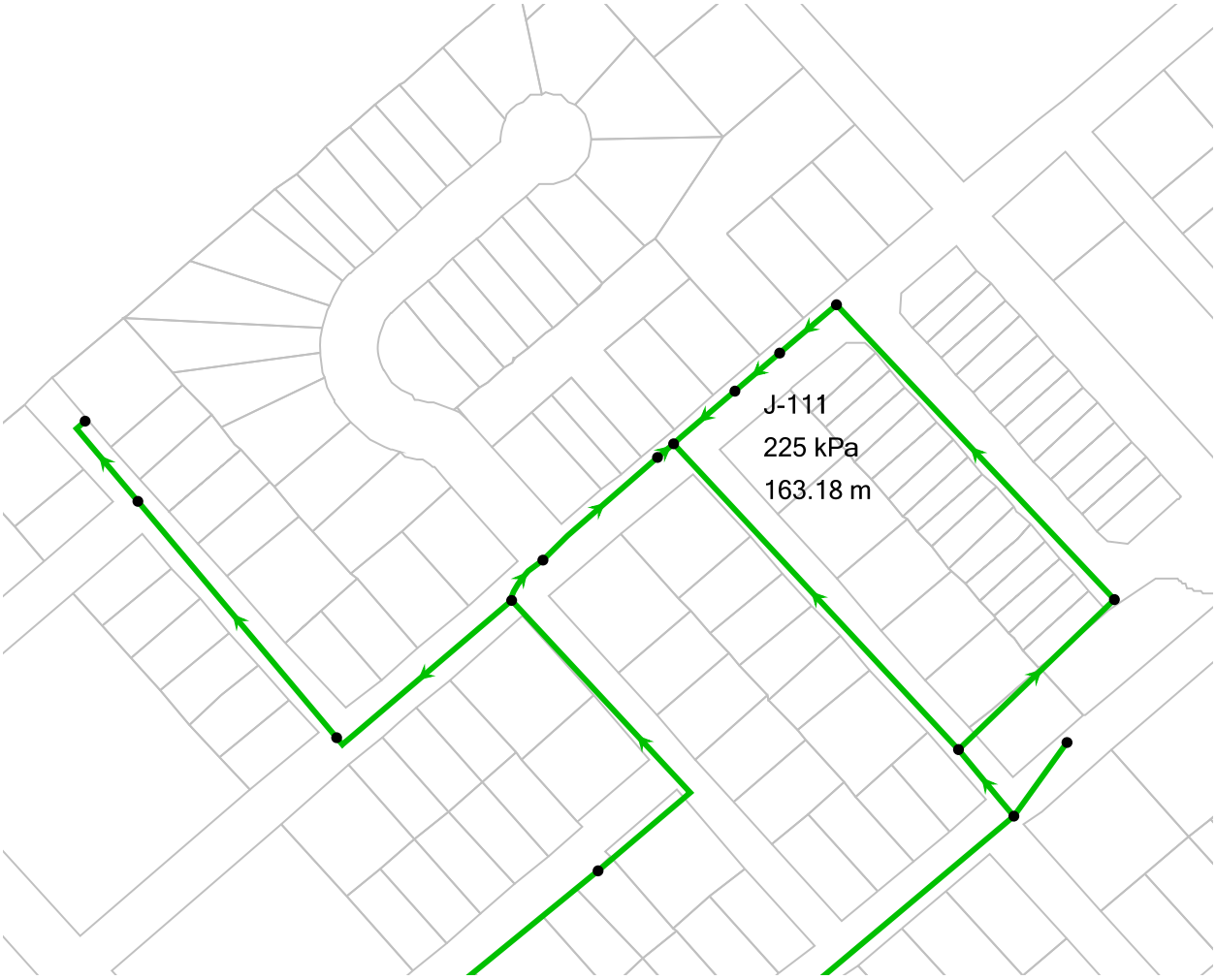
**Annie Williams**, P.Eng.
Civil Engineer

J.L. Richards & Associates Limited
700 - 1565 Carling Avenue, Ottawa, ON K1Z 8R1
Tel: 613-728-3571 Fax: 613-728-6012

# Mississippi Mills - 143 Marshall St
## Average Day



# Mississippi Mills - 143 Marshall St
# Maximum Day + Fire Flow (45 L/s)

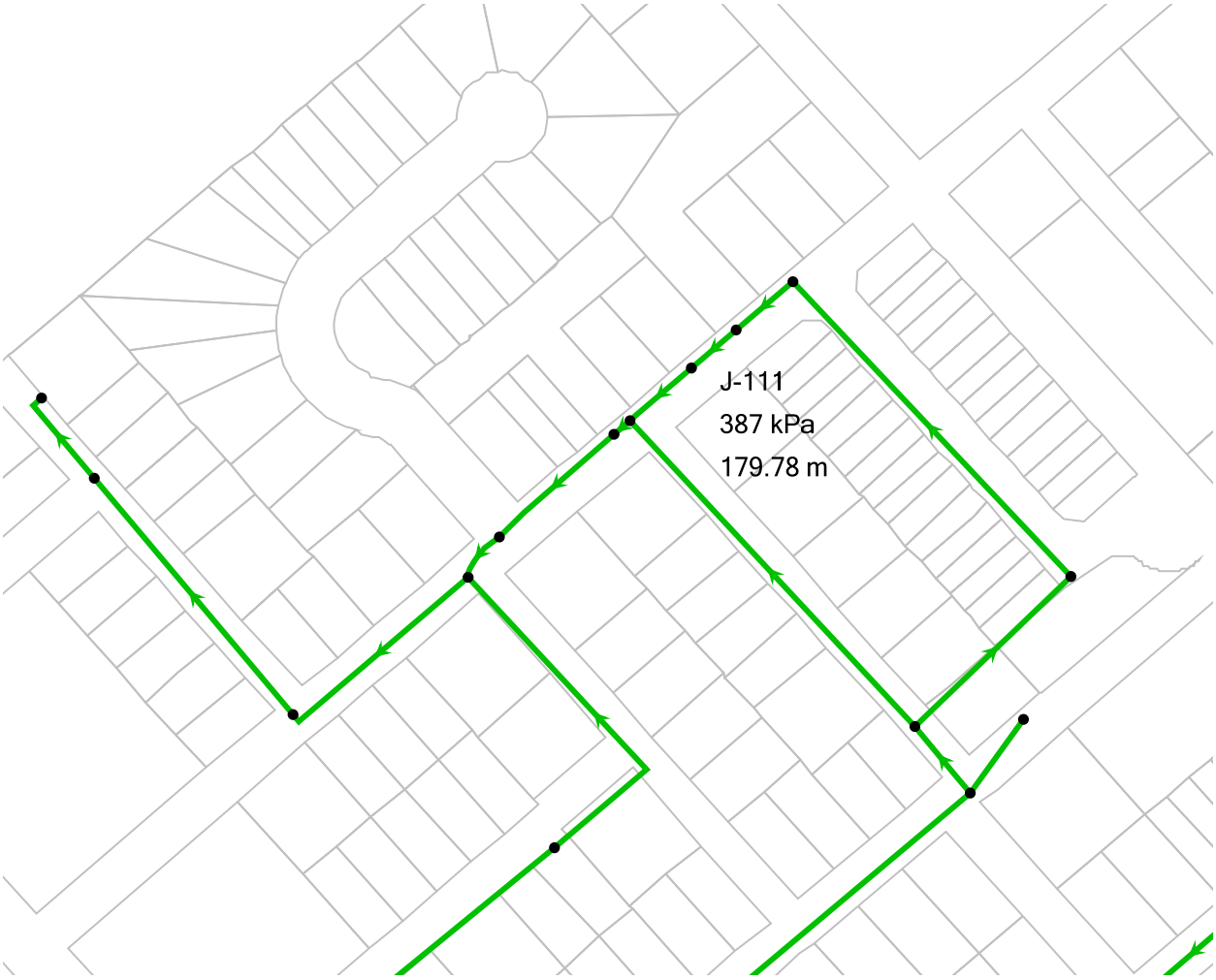


# Mississippi Mills - 143 Marshall St
# Maximum Day + Fire Flow (55.93 L/s)



Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

# Mississippi Mills - 143 Marshall St
## Peak Hour



# APPENDIX B
# SWM CALCULATION & DRAWING

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## PP-19-9576 - 143 Marshall Street - Runoff Calculations



| Tc (min) | 5-Year (mm/hr) | 100-Year (mm/hr) | |
|---|---|---|---|
| 10 | 104.2 | 178.6 | PRE-DEVELOPMENT |
| 10 | 104.2 | 178.6 | POST-DEVELOPMENT |

| Area | Roof/Asphalt/ Concrete ($m^2$) | Gravel ($m^2$) | Treed/Grass Area ($m^2$) | Average C (5-year) | Average C (100-year) |
|---|---|---|---|---|---|
| A1 | 90 | 15 | 905 | 0.27 | 0.32 |

| | | | | | Q (L/s) | |
|---|---|---|---|---|---|---|
| Area | Drainage Area (ha) | C (5-Year) | C (100-Year) | Tc (min) | 5-Year | 100-Year |
| A1 | 0.10 | 0.27 | 0.32 | 10 | 7.9 | 16.3 |
| Total | 0.10 | | | | 7.9 | 16.3 |

| Area | Roof/Asphalt/ Concrete ($m^2$) | Gravel ($m^2$) | Treed/Grass Area ($m^2$) | Average C (5-year) | Average C (100-year) |
|---|---|---|---|---|---|
| B1 | 474 | 0 | 267 | 0.65 | 0.73 |
| B2 | 143 | 0 | 127 | 0.57 | 0.65 |

| | | | | | Q (L/s) | | |
|---|---|---|---|---|---|---|---|
| Area | Drainage Area (ha) | C (5-Year) | C (100-Year) | Tc (min) | 5-Year | 100-Year | |
| B1 | 0.07 | 0.65 | 0.73 | 10 | 13.9 | 26.9 | Restricted |
| B2 | 0.03 | 0.57 | 0.65 | 10 | 4.5 | 8.6 | Unrestricted |
| Total | 0.10 | | | | 18.4 | 35.5 | |

### Post-Development Restricted Runoff Calculations

| | Post-Development | | | | |
|---|---|---|---|---|---|
| Area | Unrestricted Flow (L/S) | | Restricted Flow (L/S) | | |
| | 5-year | 100-Year | 5-Year | 100-Year | |
| B1 | 13.9 | 26.9 | 3.4 | 7.2 | Restricted |
| B2 | 4.5 | 8.6 | 4.5 | 8.6 | Unrestricted |
| Total | 18.4 | 35.5 | 7.9 | 15.8 | |

| | | |
|---|---|---|
| Swale Length | 30 | m |
| Invert at Bottom end | 138.50 | m |
| Slope on Swale Bottom | 1.00% | |
| Bottom Width | 0 | m |
| Side Slope | 3 | :1 |
| Side Slope | 3 | :1 |

| Water Level (m) | Depth (m) | Dist to "0" height (m) | X-Sect area at bottom ($m^2$) | X-Sect area at top ($m^2$) | Avg. X Sect Area ($m^2$) | Storage Volume ($m^3$) | |
|---|---|---|---|---|---|---|---|
| 138.50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | |
| 138.75 | 0.25 | 25.00 | 0.19 | 0.00 | 0.09 | 2.34 | |
| 138.80 | 0.30 | 30.00 | 0.27 | 0.00 | 0.14 | 4.05 | |
| 138.85 | 0.35 | 30.00 | 0.37 | 0.01 | 0.19 | 5.63 | |
| 138.88 | 0.38 | 30.00 | 0.43 | 0.02 | 0.23 | 6.79 | 5-Year |
| 138.90 | 0.40 | 30.00 | 0.48 | 0.03 | 0.26 | 7.65 | |
| 138.95 | 0.45 | 30.00 | 0.61 | 0.07 | 0.34 | 10.13 | |
| 138.98 | 0.48 | 30.00 | 0.69 | 0.10 | 0.39 | 11.83 | 100-Year |
| 139.00 | 0.50 | 30.00 | 0.75 | 0.12 | 0.44 | 13.05 | |

5-Year Storm Event Storage Summary

| Water Elev. (m) = | | 138.88 | |
|---|---|---|---|
| INV. (out) | Area ($m^2$) | Depth (m) | Volume ($m^3$) |
| 138.50 | N/A | 0.38 | 6.8 |

| | |
|---|---|
| Storage Available ($m^3$) = | 6.8 |
| Storage Required ($m^3$) = | 6.8 |

100-Year Storm Event Storage Sumamry

| Water Elev. (m) = | | 138.98 | |
|---|---|---|---|
| INV. (out) | Area ($m^2$) | Depth (m) | Volume ($m^3$) |
| 138.50 | N/A | 0.48 | 11.8 |

| | |
|---|---|
| Storage Available ($m^3$) = | 11.8 |
| Storage Required ($m^3$) = | 11.8 |

Storage Requirements for Area B1

5-Year Storm Event

| Tc (min) | I (mm/hr) | Runoff (L/s) B1 | Allowable Outflow (L/s) | Runoff to be Stored (L/s) | Storage Required ($m^3$) |
|---|---|---|---|---|---|
| 10 | 104.2 | 13.91 | 3.74 | 10.18 | 6.1 |
| 20 | 70.3 | 9.39 | 3.74 | 5.65 | 6.8 |
| 30 | 53.9 | 7.20 | 3.74 | 3.46 | 6.2 |
| 40 | 44.2 | 5.90 | 3.74 | 2.17 | 5.2 |
| 50 | 37.7 | 5.03 | 3.74 | 1.30 | 3.9 |

| | | |
|---|---|---|
| Maximum Storage Required 5-year = | 6.8 | $m^3$ |

100-Year Storm Event

| Tc (min) | I (mm/hr) | Runoff (L/s) B1 | Allowable Outflow (L/s) | Runoff to be Stored (L/s) | Storage Required ($m^3$) |
|---|---|---|---|---|---|
| 10 | 178.6 | 26.87 | 7.17 | 19.70 | 11.8 |
| 20 | 120.0 | 16.02 | 7.17 | 8.85 | 10.6 |
| 30 | 91.9 | 12.27 | 7.17 | 5.10 | 9.2 |
| 40 | 75.1 | 10.03 | 7.17 | 2.86 | 6.9 |
| 50 | 64.0 | 8.55 | 7.17 | 1.37 | 4.1 |

| | | |
|---|---|---|
| Maximum Storage Required 100-year = | 11.8 | $m^3$ |

For Weir Flow, C= 0.55



| | Weir 1 | Weir 2 |
|---|---|---|
| invert elevation | 138.50 | 138.90 |
| center of crest elevation | | |
| orifice width / weir length | 0.029 m | 0.150 m |
| weir height | | |
| orifice area ($m^2$) | x | X |

Elevation Discharge Table - Storm Routing

| Elevation | Weir 1 | | Weir 2 | | Total | |
|---|---|---|---|---|---|---|
| | H [m] | Q [$m^3/s$] | H [m] | Q [$m^3/s$] | Q [L/s] | |
| 138.50 | x | x | x | x | 0.00 | |
| 138.55 | 0.05 | 0.18 | x | x | 0.18 | |
| 138.60 | 0.10 | 0.50 | x | x | 0.50 | |
| 138.65 | 0.15 | 0.93 | x | x | 0.93 | |
| 138.70 | 0.20 | 1.43 | x | x | 1.43 | |
| 138.75 | 0.25 | 1.99 | x | x | 1.99 | |
| 138.80 | 0.30 | 2.62 | x | x | 2.62 | |
| 138.85 | 0.35 | 3.30 | x | x | 3.30 | |
| 138.86 | 0.36 | 3.45 | x | x | 3.45 | |
| 138.87 | 0.37 | 3.59 | x | x | 3.59 | |
| 138.88 | 0.38 | 3.74 | x | x | 3.74 | 5-Year |
| 138.89 | 0.39 | 3.88 | x | x | 3.88 | |
| 138.90 | 0.40 | 4.04 | x | x | 4.04 | |
| 138.91 | 0.41 | 4.19 | 0.01 | 0.08 | 4.27 | |
| 138.92 | 0.42 | 4.34 | 0.02 | 0.23 | 4.57 | |
| 138.93 | 0.43 | 4.50 | 0.03 | 0.43 | 4.93 | |
| 138.94 | 0.44 | 4.66 | 0.04 | 0.66 | 5.32 | |
| 138.95 | 0.45 | 4.81 | 0.05 | 0.92 | 5.74 | |
| 138.96 | 0.46 | 4.98 | 0.06 | 1.21 | 6.19 | |
| 138.97 | 0.47 | 5.14 | 0.07 | 1.53 | 6.67 | |
| 138.98 | 0.48 | 5.30 | 0.08 | 1.87 | 7.17 | 100-Year |
| 138.99 | 0.49 | 5.47 | 0.09 | 2.23 | 7.70 | |
| 139.00 | 0.50 | 5.64 | 0.10 | 2.61 | 8.25 | |

Notes:
1. For Orifice Flow, User is to Input an Elevation Higher than Crown of Orifice.
2. Orifice Equation: $Q = cA(2gh)^{1/2}$
3. Weir Equation: $Q = CLH^{3/2}$
4. These Computations Do Not Account for Submergence Effects Within the Pond Riser.
5. H for orifice equations is depth of water above the centroide of the orifice.
6. H for weir equations is depth of water above the weir crest.

Time of Concentration Pre-Development

| Drainage Area ID | Sheet Flow Distance (m) | Slope of Land (%) | Tc (min) (5-Year) | Tc (min) (100-Year) |
|---|---|---|---|---|
| A1 | 28 | 4.00 | 9 | 8 |

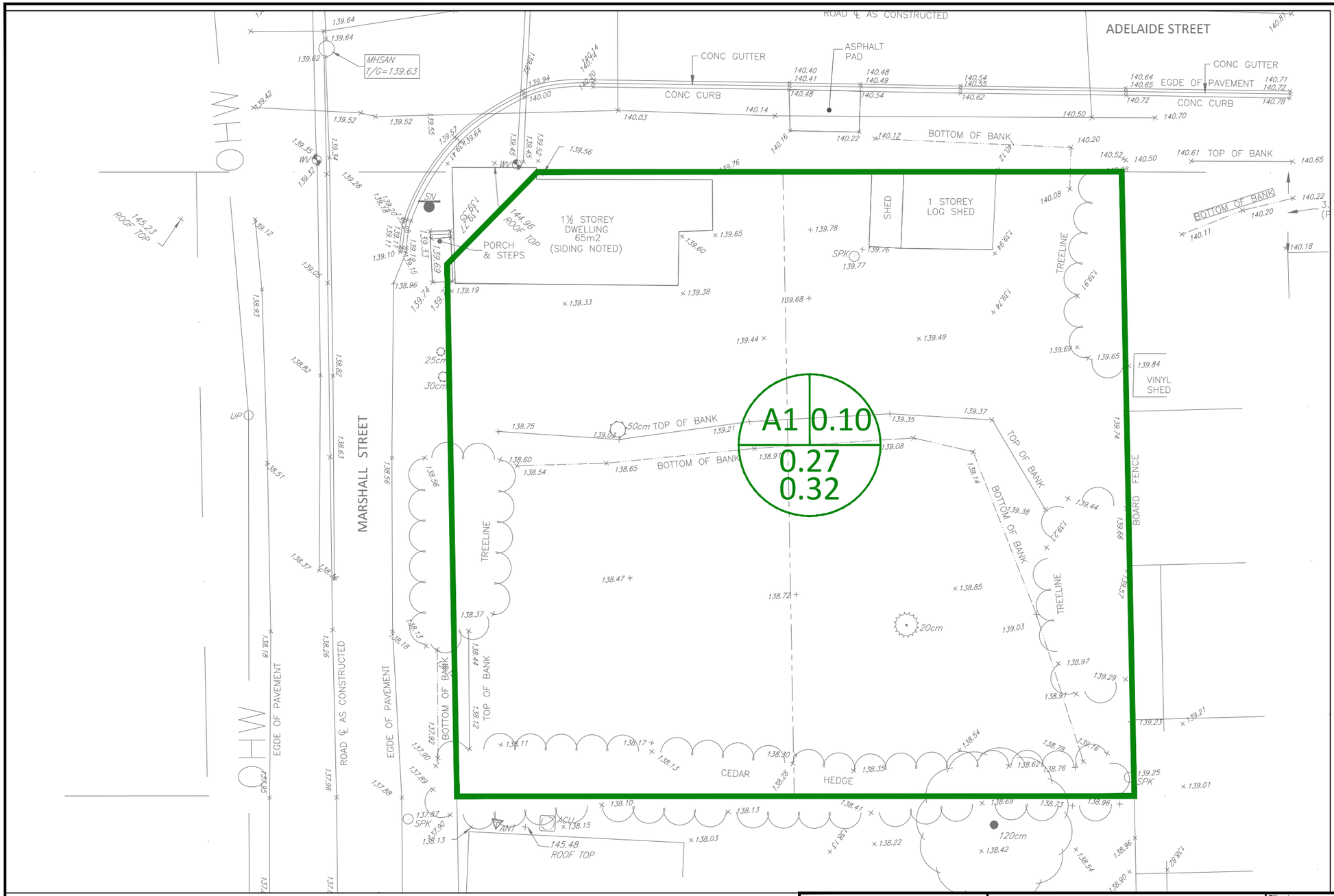
Therefore, a Tc of 10 can be used

Tc= (3.26(1.1-c)L^0.5/S^0.33)

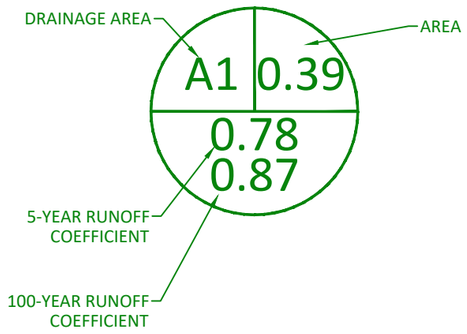
c= Blanced Runoff Coefficient

L= Length of drainage area

S= Average slope of watershed




LEGEND




SCALE 1 : 200

0 10 20 Metres

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

Client: 2672445 ONTARIO INC.
1814 9TH LINE ROAD CARLETON PLACE ON

Project: 5 UNIT TOWNHOUSE PROJECT
143 MARSHALL STREET

Drawing Title: PRE DEVELOPMENT DRAINAGE PLAN

| Drawn by: | Checked By: | | | | Drawing Number: |
|---|---|---|---|---|---|
| N.B.V. | T.D.F. | | | | PRE |
| Scale: 1:200 | Project Number: CP-19-9576 | 1 | ISSUED FOR REVIEW | OCT. 8, 2020 | |
| | | No. | Revisions | Date | |

FILENAME: U:\Ottawa\01 Project - Proposals\2019 Jobs\PP\0PP-Projects\0PP-19-9576 2672445 Ontario Inc._145 Marshall St, Almonte\12 - Drawings\PP-19-9576 PRESENTATION.dwg
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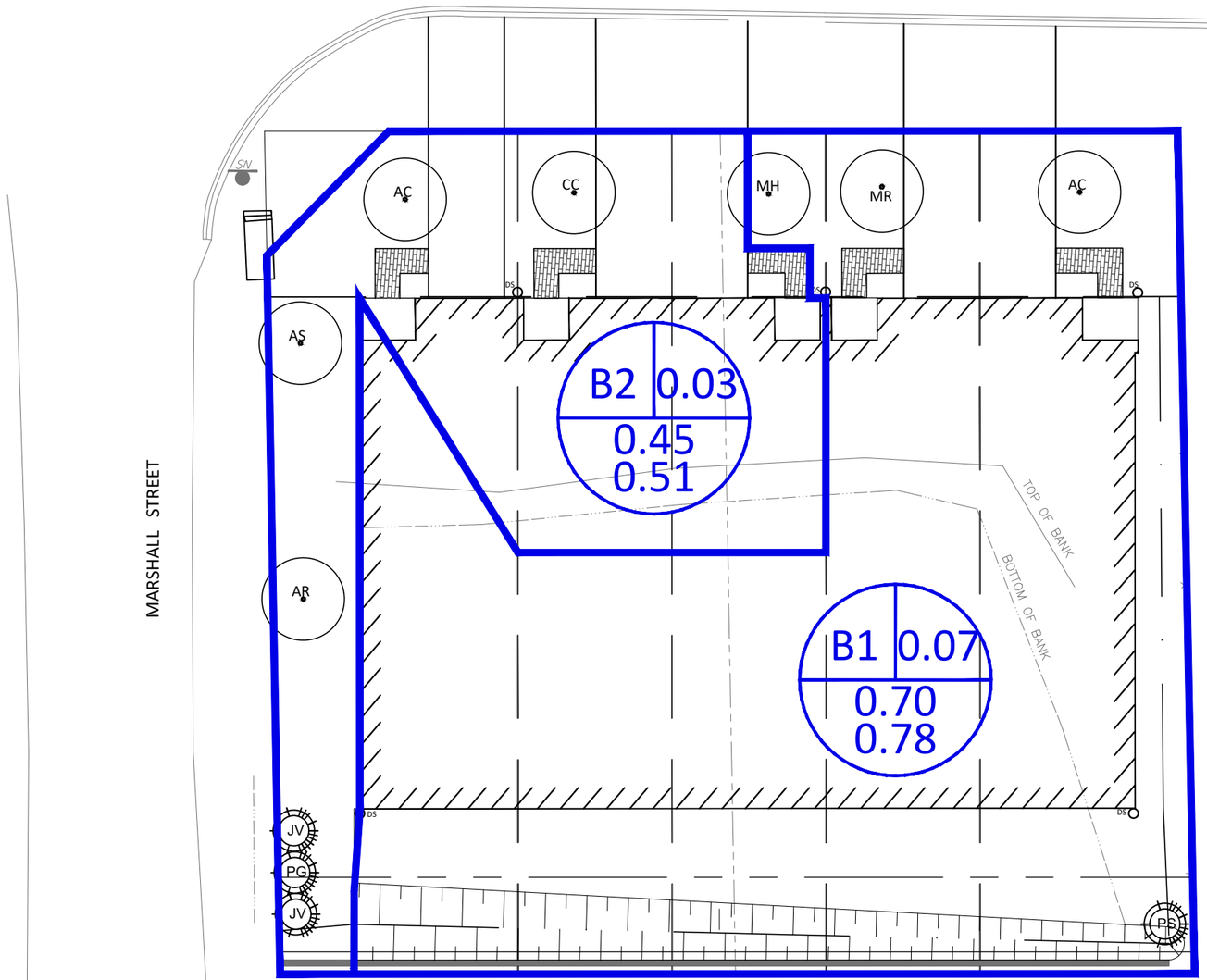
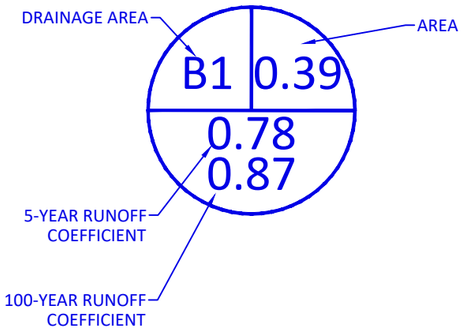
ADELAIDE STREET

MARSHALL STREET




## LEGEND




SCALE 1 : 200

0 10 20 Metres

N

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Client: 2672445 ONTARIO INC.
1814 9TH LINE ROAD CARLETON PLACE ON

Project: 5 UNIT TOWNHOUSE PROJECT
143 MARSHALL STREET

Drawing Title: POST DEVELOPMENT DRAINAGE PLAN

| Drawn by: | Checked By: |
|---|---|
| N.B.V. | T.D.F. |
| Scale: 1:200 | Project Number: CP-19-9576 |

| No. | Revisions | Date |
|---|---|---|
| 2 | REVISED PER COMMENTS | OCT. 8, 2020 |
| 1 | ISSUED FOR REVIEW | AUG. 6, 2020 |

Drawing Number: POST

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