

EDENSHAW ANN DEVELOPMENTS LIMITED

STORMWATER MANAGEMENT REPORT

22-28 ANN STREET & 78 PARK STREET EAST

MAY 10, 2019





STORMWATER MANAGEMENT REPORT

22-28 ANN STREET & 78 PARK STREET EAST

EDENSHAW ANN DEVELOPMENTS LIMITED

REZONING APPLICATION

PROJECT NO.: 19M-00253-00
DATE: MAY 2019

WSP
100 COMMERCE VALLEY DRIVE WEST
THORNHILL, ON, CANADA L3T 0A1

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QUALITY MANAGEMENT

ISSUE/REVISION FIRST ISSUE

Remarks	Rezoning Application
Date	2019/05/10
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Signature	
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Signature	
Project number	19M-00253-00-SW1

SIGNATURES

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Project Engineer



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1 INTRODUCTION

1.1 SCOPE

WSP has been retained by Edenshaw Ann Developments Limited to prepare a Stormwater Management (SWM) Report to support the rezoning application for the proposed redevelopment of the properties located at 22, 24, 26, 28 Ann Street and 78 Park Street East in the City of Mississauga. The proposed development will replace the existing buildings with a 22-storey residential building at 22-28 Ann Street and 78 Park Street East.

This SWM report examines the potential water quality, quantity, balance, and erosion impacts of the proposed residential development and summarizes how each will be addressed in accordance with the City of Mississauga's Development Requirements (2016) and the Credit Valley Conservation Authority (CVC) Stormwater Management Criteria (2012).

1.2 SITE LOCATION

The site occupies an area of approximately 0.26 ha. It is bound to the north by Ann Street, to the east by Park Street East, and to the west by a private property. The site is located northwest of the intersection of Ann street and Park Street East. The location of the proposed re-development is illustrated in Figure 1.

1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

The objectives of the stormwater management plan are as follows:

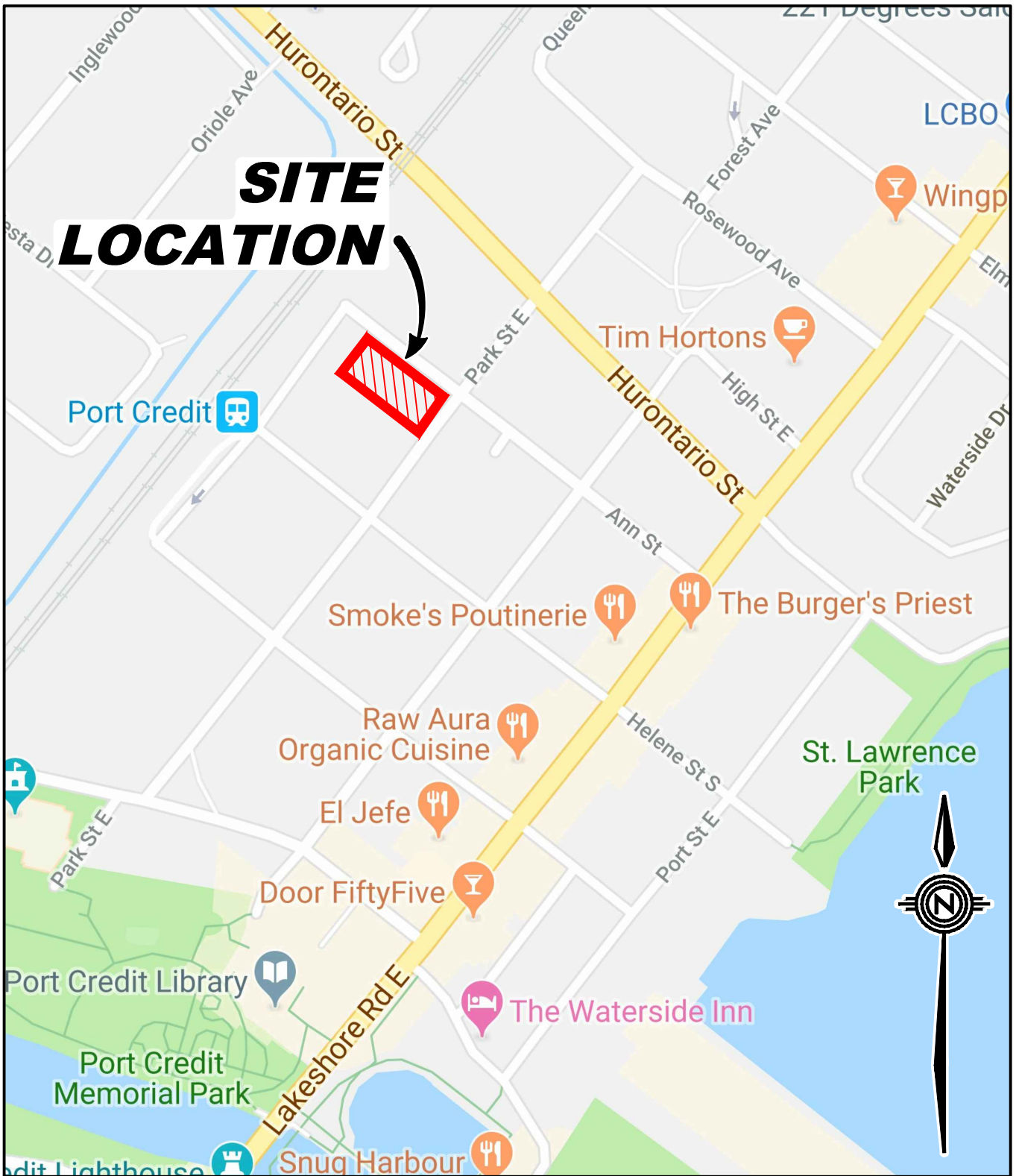
- Determine the site-specific stormwater management requirements to ensure that the development is in conformance with the City of Mississauga and CVC SWM criteria;
 - Evaluate various stormwater management practices that meet the requirements of the City and the conservation authority and recommend a preferred strategy; and
 - Prepare a stormwater management report documenting the strategy along with the technical information necessary for the justification and sizing of the proposed stormwater management facilities.
-

1.4 DESIGN CRITERIA

The City of Mississauga issued a Development Requirements Manual in 2016 to provide direction on the management of rainfall and runoff inside the City's jurisdiction. A summary of the stormwater management criteria applicable to this project follows:

- **Runoff Volume Reduction** – The City's Design Manual requires the first 5 mm of runoff shall be retained on-site and managed by way of infiltration, evapotranspiration or reuse. There are no applicable subwatershed studies or master drainage plans for the subject site area published that indicates any higher minimum requirement.
- **Water Quality** – The City's Design Requirements specify that water quality control is to be implemented in accordance with the applicable Master Drainage Plan or Subwatershed Plan, the City's Stormwater Quality Control Strategy (January 1996) and the MECP (formerly MOECC) Stormwater Management Practices Planning and Design Manual. Based on the MECP 's Manual, the long-term removal of 80% of the TSS loading is required for this site.
- **Erosion Control** – As indicated in the City of Mississauga's Development Requirements, sites under one hectare are not required to provide long term erosion control measures.
- **Water Quantity Control and Discharge to Municipal Infrastructure** – Through use of Table 2.01.03.03a of The City of Mississauga's Development Requirements and correspondence with City, it has been determined that water

quantity control for this site will limit the 100 year post-development release rate to the 2 year pre-development release rate.



@2019 Google, Map data @2019 Tele Atlas

CLIENT

EDENSHAW ANN DEVELOPMENTS LIMITED

TITLE

22-28 ANN STREET & 78 PARK STREET EAST

SITE LOCATION



Checked A.M.B.	Drawn AutoCAD/S.C.	
Date MAY 2019	Proj. No. 19M-00253-00	
Scale N.T.S.	Figure No. 1	Gr.No.

2 PRE-DEVELOPMENT CONDITIONS

2.1 GENERAL

Under pre-development conditions, the 0.26 ha site is currently occupied by four 1 to 2-storey detached units at 24, 26, 28 Ann Street and 78 Park Street East and a 3-storey brick detached unit at 22 Ann Street. These properties have individually paved driveways and grassed yards. The pre-development runoff coefficient is estimated at 0.55. Under pre-development conditions, the site drains partially to the north and partially to the east. Ultimately, all flows from the site are collected by the storm sewer along the Park Street East and Ann Street. The site does not receive any external runoff from adjacent properties. The existing condition of the site is shown in Figure 2.

2.2 RAINFALL INFORMATION

The rainfall intensity for the site was calculated using the following equation: $I = A/(T + B)^C$

Where;

I = rainfall intensity in mm/hour

T = time of concentration in hours

A, B, and C = constant parameters (see below)

The parameters (A, B, C) for use in the City of Mississauga are summarized in Table 2.1.

Table 2.1 Rainfall Parameters

RETURN PERIOD (years)	2	5	10	25	50	100
A	610	820	1010	1160	1300	1450
B	4.60	4.60	4.60	4.60	4.70	4.90
C	0.78	0.78	0.78	0.78	0.78	0.78

Source: City of Mississauga's Development Requirements (2016)

An initial time of concentration, T_C , of 15 minutes (or 0.25 hours) is recommended in the City of Mississauga's Development Requirements.

2.3 ALLOWABLE FLOW RATES

The site is located within the Credit River – Norval to Port Credit sub-watershed, within the CVC's jurisdiction. The CVC does not regulate the area in which the site is located and defers to The City of Mississauga's quantity control requirements. Table 2.01.03.03a of The City of Mississauga's Development Requirements states that in all cases, storm sewer capacity constraints may govern. The Functional Service Report's downstream analysis of the local storm sewer indicates that the system is surcharged and has no capacity. Given that the storm sewer was designed to accept up to the 10-year storm event, the allowable release rate to the municipal storm sewer system from the development site will be limited to the 2-year pre-development flow rate based on a runoff coefficient of 0.50. This decision has been made in order to provide relief to the storm sewer system.

The calculated peak flow rates for the site under pre-development conditions are summarized below in Table 2.2. Detailed calculations are contained within Appendix A.

Table 2.2 Pre-Development Peak Discharge Rates and Allowable Release Rates

RETURN PERIOD (years)	RAINFALL INTENSITY, I (mm/hour)	EXISTING PEAK FLOW RATE (C=0.55), Q (L/s)	ALLOWABLE RELEASE RATE, Q _A (L/s)*
2	59.9	24.3	22.0
5	80.5	32.6	
10	99.2	40.2	
25	113.9	50.7	
50	127.1	61.8	
100	140.7	71.2	

* Maximum runoff coefficient C=0.50, area of 0.26 ha and time of concentration of 15 minutes

3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

The proposed development consists of the construction of a new 22-storey residential condominium building at 22-28 Ann Street and 78 Park Street East. The building provides an estimated 313 residential units, 3 live/work units, and four levels of underground parking. The parking structure underlies the full footprint of the site. Vehicular access to the site will be provided via the proposed laneway connecting to Ann Street. The loading area and ramp to the underground parking will be covered by the canopy of the building above.

An area breakdown for the proposed site layout is provided below in Table 3.1. Please refer to Figure 3 for details of the post-development conditions.

Table 3.1 Proposed Land-Use Area Breakdown

Captured & Controlled	LAND-USE	AREA (m ²)	2-YEAR RUNOFF COEFFICIENT, C	IMPERVIOUSNESS
	Impervious Roof Area	2,054	0.90	100%
	Soft/Pervious Landscaping	226	0.25	0%
	At-Grade Impervious	271	0.90	100%
	Uncontrolled At-Grade Impervious	87	0.90	100%
	Total (or Average):	2,638	0.84	91%

3.2 RUNOFF VOLUME REDUCTION

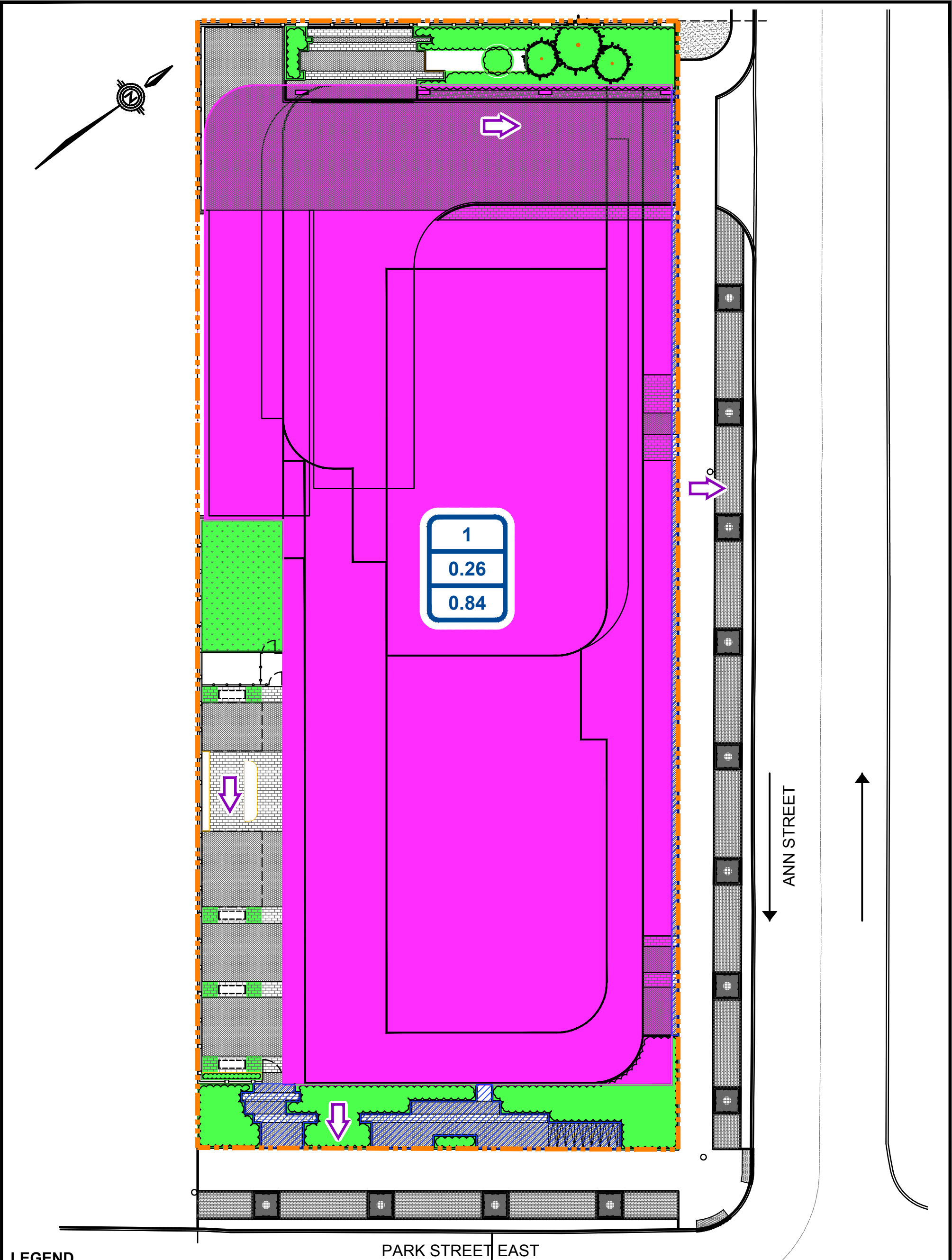
As noted in section 2.01.03.02, The City of Mississauga's Development Requirements states that the proponent should target the retention of 5 mm of stormwater runoff from all surfaces. A sump at the base of the rainwater cistern to capture water on site for re-use to address water balance requirements is the proposed mechanism.

When a rainfall event occurs, surfaces offer some retention or absorption of rainfall before runoff occurs. Generally, soft-landscaped surfaces retain up to 5 mm of rainfall and hard surfaces retain 1 mm of rainfall. Through discussion with the City, it was determined that the use of initial abstractions as a method to satisfy water balance requirements would not be accepted. This is a conservative approach and ensures that the existing water balance is preserved. Correspondence with the City of Mississauga have been documented and can be found in Appendix C of this report. The resulting water balance volume for the development site is 13.2 m³.

The re-use methods for the captured stormwater are still being assessed in conjunction with the mechanical design of the building's water supply systems. It is assumed that sufficient opportunities exist within the development to re-use the full volume of retained stormwater within the required drawdown time. The mechanical design of the rainwater re-use pump systems from the cistern will ensure that the cistern is empty prior to switching to the City's water supply. A summary of the water balance calculation is provided in Table 3.2.

Table 3.2 Water Balance Summary

SURFACE TYPE	AREA (m ²)	5 MM RE-USE VOLUME (m ³)
Impervious Roof Area	2,054	10.27
Soft/Pervious Landscaping	226	1.13
Controlled At-Grade Impervious	271	1.36
Uncontrolled At-Grade Impervious	87	0.44
Total Site Area	2,638	13.19



LEGEND

- ID

A.REA

C.OE

SUB-CATCHMENT ID.

DRAINAGE AREA (ha)

'c' VALUE
- OVERLAND FLOW ROUTE

PERVIOUS LANDSCAPING

IMPERVIOUS ROOF

UNCONTROLLED AT-GRADE IMPERVIOUS AREA

CONTROLLED AT-GRADE IMPERVIOUS AREA

CLIENT					
EDENSHAW ANN DEVELOPMENTS LIMITED					
TITLE					
22-28 ANN STREET & 78 PARK STREET EAST		Checked A.M.B.		Drawn AutoCAD/S.C.	
PROPOSED CONDITIONS		Date MAY 2019		Proj. No. 19M-00253-00	
		Scale 1:250		Figure No. 3	
				Gr.No.	

3.3 WATER QUALITY CONTROL

CVC and The City of Mississauga require that water quality of the runoff discharging from the development site should be treated to enhanced level as defined by the MOECC SWM Planning and Design Manual, such that a minimum of 80% Total Suspended Solids (TSS) removal is provided. Impervious roofs, walkways, and soft/pervious landscaping within the site are not prone to sediment generation and therefore, considered clean for the purpose of water quality control. Stormwater runoff from the at-grade impervious areas will require water quality treatment.

A StormFilter SFPD0806 is recommended to meet TSS removal requirements. This oil-grit separator has two 18-inch high cartridges and a removal rate of 80%. The treatment unit will be installed immediately upstream of the SWM storage system. The unit will treat the site's controlled, at-grade vehicular surfaces. The remainder of the site will be captured and sent to the cistern directly. Treatment unit specifications as provided by Echelon Environmental are located in Appendix D of this report.

3.4 EROSION CONTROL

CVC and The City of Mississauga require a minimum on-site detention of 5 mm. The City of Mississauga Design Guidelines do not specify long term in-stream erosion control requirements for sites under 1.0 ha. Since the site area for this application is 0.26 ha, no additional long term site-specific erosion controls are recommended. However, the measures of erosion and sediment control during construction should be installed. The details will be outlined in the Erosion and Sediment Control Plan and should conform to the City and CVC Requirements. Therefore, erosion control is satisfied for this site as a result of the 5 mm on-site detention achieved in the runoff volume reduction section of this report.

3.5 WATER QUANTITY CONTROL

The City of Mississauga requires that water quantity control be designed in accordance with the capacity of the local municipal storm sewer. Due to the downstream storm sewer being surcharged under current conditions, the allowable release rate to the municipal storm sewer system from the development site will be limited to the 2-year pre-development flow rate based on a runoff coefficient of 0.50. Under these conditions the target discharge rate to the municipal sewer system from the site is 22.0 L/s.

A HydroCAD model of the project was developed and utilized to determine the required storage volume in the stormwater cistern, and to calculate the discharge rates achieved by the proposed flow controls under all storm events. The Modified Rational Method (an inherent subroutine of the HydroCAD software) has been used for the modelling exercise. The model assumes that the sump volume of the SWM cistern is full at the start of the storm event.

An emergency overflow manhole will be provided at the top of the cistern, with discharge to street level and the adjacent right of way. This will prevent flow backing up into the building pipework if the primary outlet is blocked, or if a storm event in excess of the 100-year return period occurs.

The cistern was designed to provide a storage volume of 88.4 m³, with a base area of 23.9 m², a height of 3.7 m, and a pump set to 18.0 L/s discharge rate for water above 0.56 m within the cistern. Based on the tank dimensions, this will provide sufficient volume to retain the 5 mm runoff volume target of 13.2 m³.

Uncontrolled at-grade areas were modelled to ensure they were considered in the allowable release rate. The results show that the site's combined discharge rate does not exceed the allowable release rate.

A summary of the modelling results is provided in Table 3.3. Full HydroCAD modelling output is provided in Appendix B.

Table 3.3 Summary of Modelling Results

RETURN PERIOD (YEARS)	POST- DEVELOPMENT CISTERN DISCHARGE RATE (L/s)	POST- DEVELOPMENT TOTAL DISCHARGE RATE (L/s)	TARGET RELEASE RATE (L/s)	UTILIZED CISTERN STORAGE (m ³)	PEAK WATER ELEVATION IN CISTERN (m)
2	15.0	15.9	22.0	25.8	1.078
5	15.8	16.7		36.1	1.512
10	16.9	17.7		46.4	1.942
25	18.0	19.7		62.1	2.600
50	18.0	20.4		72.7	3.043
100	18.0	20.9		83.5	3.492

* Depth is from the internal cistern bottom.

The modelling results demonstrate that the post-development peak flow rates for all events up to the 100-year storm are lower than the target release rate established in accordance with the City of Mississauga's Development Requirements Manual. The maximum required storage volume to control the 100-year post-development runoff is 83.5 m³.

The rainfall intensity and storm duration resulting in the site's peak discharge rate has been iteratively determined at t_d = 18 minutes (for the 100-year event).

4 CONCLUSIONS

A stormwater management plan has been prepared to support the rezoning application for the proposed redevelopment of 22, 24, 26, 28 Ann Street and 78 Park Street East in The City of Mississauga. The key points are summarized below.

RUNOFF VOLUME REDUCTION

The site is required to retain 5 mm of runoff from each rainfall event to be for reuse on site. Water balance will be addressed through a 13.2 m³ sump volume (equivalent to the post-development 5 mm runoff volume) within the proposed cistern.

WATER QUALITY

Stormwater runoff from proposed impervious roof areas is considered clean and expected to leave the site effectively unchanged in terms of water quality. 80% TSS removal of the runoff produced by the at-grade impervious surfaces on the site will be achieved through installation of an oil and grit separator. The recommended model is a StormFilter SFPD0806 with two 18-inch high cartridges.

EROSION CONTROL

The 5 mm on-site retention for storage used for water balance will meet The City of Mississauga's minimum 5 mm retention requirement to satisfy erosion control.

WATER QUANTITY

Runoff from all areas of the site will be directed to a 88.4 m³ stormwater cistern. Post-development flows have been controlled to below 22.0 L/s in compliance with the target release rate to the municipal storm sewer system by use of a pump with a maximum controlled rate of 18.0 L/s.

The report has demonstrated that the proposed stormwater management strategy will address stormwater management related impacts from this project in adherence with The City of Mississauga's Development Requirements Manual (2016).

Respectfully submitted,


WSP Canada Group Limited

BIBLIOGRAPHY

- City of Mississauga. (2016, September). Development Requirements Manual.
- Toronto and Region Conservation Authority. (2012, August). Stormwater Management Criteria Version 1.0, Toronto, Ontario, Final Report. Ontario, Canada
- Credit Valley Conservation Authority and Toronto and Region Conservation Authority. (2010). Low Impact Development Stormwater Management Planning and Design Guideline Version 1.0, Toronto, Ontario, Final Report. Ontario, Canada.

APPENDIX

A STORMWATER MANAGEMENT CALCULATIONS

	Stormwater Management Calculations	Project: 22-28 Ann Street	No.: 19M-00253-00	Page: 1
	Area Takeoffs	By: SC	Date: 01/05/2019	
		Checked: AMB	Checked: 01/05/2019	

Existing			
Land Use	Area (m ²)	Runoff C	% Coverage
Impervious Roof Area	505	0.90	19%
Soft/Pervious Landscaping	1,412	0.25	54%
At-Grade Impervious	722	0.90	27%
Total Site Area:	2,638	0.55	100%

Proposed						
Land Use	Area (m ²)	Runoff C, 2, 5, 10	Runoff C, 25	Runoff C, 50	Runoff C, 100	Imperviousness
Impervious Roof Area	2,054	0.90	0.99	1.00	1.00	100%
Soft/Pervious Landscaping	226	0.25	0.28	0.30	0.31	0%
Controlled At Grade Impervious	271	0.90	0.99	1.00	1.00	100%
Uncontrolled At Grade Impervious	87	0.90	0.99	1.00	1.00	100%
Total Site Area:	2,638	0.84	0.93	0.94	0.94	91%

Controlled
and
Captured



Project:	22-28 Ann Street	No.:	19M-00253-00	Page: 2
By:	SC	Date:	01/05/2019	
Checked:	AMB	Checked:	01/05/2019	

Subject: Stormwater Management Calculations - Existing Peak Flows

Calculation of existing runoff rate is undertaken using the Rational Method: $Q = 2.78CIA$

Where: Q = Peak flow rate (litres/second)
C = Runoff coefficient
I = Rainfall intensity (mm/hour)
A = Catchment area (hectares)

Site Area, A **0.26** hectares
Pre-Development
Runoff Coefficient, C 0.55

Rainfall Intensity is calculated based on City of Mississauga Intensity-Duration-Frequency (IDF) Equations:

Where: I = Rainfall Intensity in mm/hr
T = Time of Concentration in minutes, use
a, b, c = Rainfall parameters used by City of Mississauga

$$I = \frac{a}{(t + b)^c}$$

Return Period (Years)	2	5	10	25	50	100
a	610	820	1010	1160	1300	1450
b	4.60	4.60	4.60	4.60	4.70	4.90
c	0.78	0.78	0.78	0.78	0.78	0.78
Runoff Coefficient C*	0.55	0.55	0.55	0.61	0.66	0.69
T (mins) **	15	15	15	15	15	15
T (hrs)	0.250	0.250	0.250	0.250	0.250	0.250
I (mm/hr)	59.9	80.5	99.2	113.9	127.1	140.7
Q (litres/sec)	24.3	32.6	40.2	50.7	61.8	71.2
Q (m ³ /sec)	0.024	0.033	0.040	0.051	0.062	0.071

* Note that adjustment factors are applied to the runoff coefficient for larger, less frequent storms for 10 to 100 year events as per City of Mississauga Development Requirements Manual

** Note recommended minimum value for time of concentration for small sites (<2.0ha) is 15 minutes.



Project:	22-28 Ann Street	No.:	19M-00253-00	Page: 3
By:	SC	Date:	01/05/2019	
Checked:	AMB	Checked:	01/05/2019	

Subject: Stormwater Management Calculations - Allowable Release Rate

Calculation of existing runoff rate is undertaken using the Rational Method: $Q = 2.78CIA$

Where: Q = Peak flow rate (litres/second)
C = Runoff coefficient
I = Rainfall intensity (mm/hour)
A = Catchment area (hectares)

Site Area, A **0.26** hectares
Pre-Development
Runoff Coefficient, C* 0.50

*Section 2.01.03.03 of The City of Mississauga's Development Requirements Manual (2016) states a maximum of 0.5 may be used for the pre-development runoff coefficient.

Rainfall Intensity is calculated based on City of Mississauga Intensity-Duration-Frequency (IDF) Equations: $I = \frac{a}{(t + b)^c}$

Where: I = Rainfall Intensity in mm/hr
T = Time of Concentration in minutes, use
a, b, c = Rainfall parameters used by City of Mississauga

Return Period (Years)	2	5	10	25	50	100
a	610	820	1010	1160	1300	1450
b	4.60	4.60	4.60	4.60	4.70	4.90
c	0.78	0.78	0.78	0.78	0.78	0.78
T (mins) **	15	15	15	15	15	15
T (hrs)	0.250	0.250	0.250	0.250	0.250	0.250
I (mm/hr)	59.9	80.5	99.2	113.9	127.1	140.7
Q (litres/sec)	22.0	29.5	36.4	41.8	46.6	51.6
Q (m ³ /sec)	0.022	0.030	0.036	0.042	0.047	0.052

* Note that adjustment factors are applied to the runoff coefficient for larger, less frequent storms for 10 to 100 year events as per City of Mississauga Development Requirements Manual

** Note recommended minimum value for time of concentration for small sites (<2.0ha) is 15 minutes.

Through review of the CVC's guidelines, City of Mississauga's Development Requirements Manual (2016), correspondence with City Staff and through downstream analysis, it was determined that the downstream sewer capacity was the governing factor. Downstream analysis showed that the local storm sewer system is surcharged and has no capacity during a 10 year storm event. It was decided that the release rate to the municipal storm sewer system would be limited to the 2 year pre-development release rate to provide relief to the municipal storm sewer system.

Resulting release rate to municipal storm sewer system is therefore 22.0 litres/second.



Project:	22-28 Ann Street	No.:	19M-00253-00
By:	SC	Date:	01/05/2019
Checked:	AMB	Checked:	01/05/2019
			Page: 4

Subject: Stormwater Management Calculations - Water Balance Calculations

In this case, best efforts on-site runoff retention will be provided such that the site retains all runoff from 5 mm storm event for rainwater reuse.

The current area measurements and land use types for the site are as follows:

Controlled and Captured	Land Use	Area (m ²)	2,5,10 Year Runoff C	Imperviousness	CN
	Impervious Roof Area	2,054	0.90	100%	98
	Soft/Pervious Landscaping	226	0.25	0%	81
	Controlled At Grade Impervious	271	0.90	100%	74
	Uncontrolled At Grade Impervious	87	0.90	100%	98
	Totals	2,638	0.84	91%	94

Surface Type	Area (m ²)	5 mm Water Balance Volume (m3)
Impervious Roof Area	2,054	10.269
Soft/Pervious Landscaping	226	1.132
Controlled At Grade Impervious	271	1.356
Uncontrolled At Grade Impervious	87	0.435
Totals	2,638	13.19

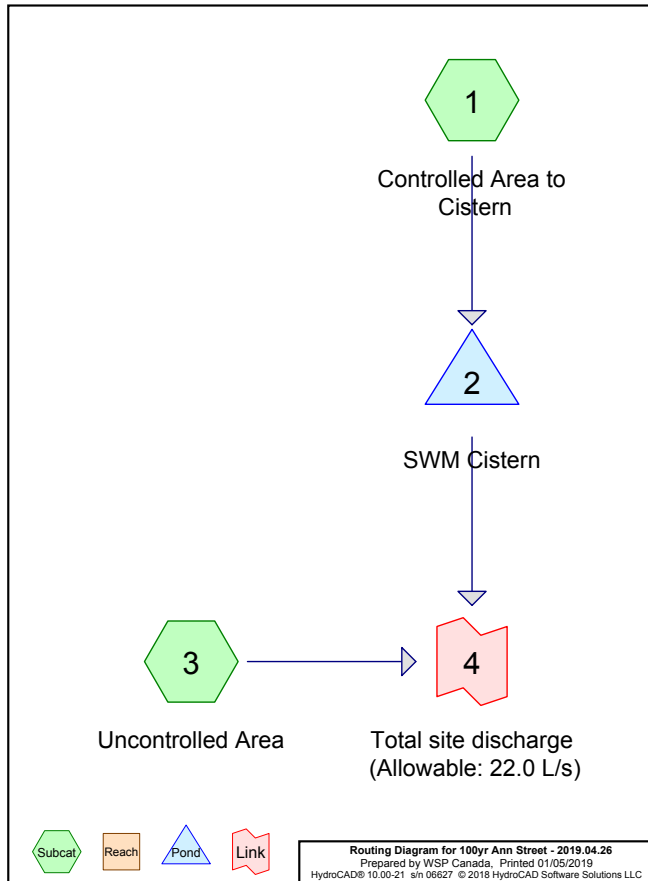
Therefore, volume of runoff during a 5 mm storm event: 13.19 m³

APPENDIX

B HYDROLOGIC MODEL OUTPUT (HydroCAD)

Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
87.1	1.00	*100yr coefficient value (3)
271.2	1.00	At grade impervious (1)
2,053.8	1.00	Impervious Roof (1)
226.4	0.31	Soft landscaping (1)
2,638.5	0.94	TOTAL AREA



100yr Ann Street - 2019.04.26 Mississauga IDF 100-Year Duration=18 min, Inten=126.1 mm/hr
 Prepared by WSP Canada Printed 01/05/2019
 HydroCAD® 10.00-21 s/n 06627 © 2018 HydroCAD Software Solutions LLC Page 3

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
 Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Controlled Area to Runoff Area=2,551.4 m² 91.13% Impervious Runoff Depth=36 mm
 Tc=15.0 min C=0.94 Runoff=0.0840 m³/s 90.7 m³

Subcatchment 3: Uncontrolled Area Runoff Area=87.1 m² 100.00% Impervious Runoff Depth=38 mm
 Tc=15.0 min C=1.00 Runoff=0.0031 m³/s 3.3 m³

Pond 2: SWM Cistern Peak Elev=3.144 m Storage=75.1 m³ Inflow=0.0840 m³/s 90.7 m³
 Outflow=0.0180 m³/s 90.7 m³

Link 4: Total site discharge (Allowable: 22.0 L/s) Inflow=0.0209 m³/s 94.0 m³
 Primary=0.0209 m³/s 94.0 m³

Total Runoff Area = 2,638.5 m² Runoff Volume = 94.0 m³ Average Runoff Depth = 36 mm
8.58% Pervious = 226.4 m² 91.42% Impervious = 2,412.1 m²

100yr Ann Street - 2019.04.26 Mississauga IDF 100-Year Duration=18 min, Inten=126.1 mm/hr
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Summary for Subcatchment 1: Controlled Area to Cistern

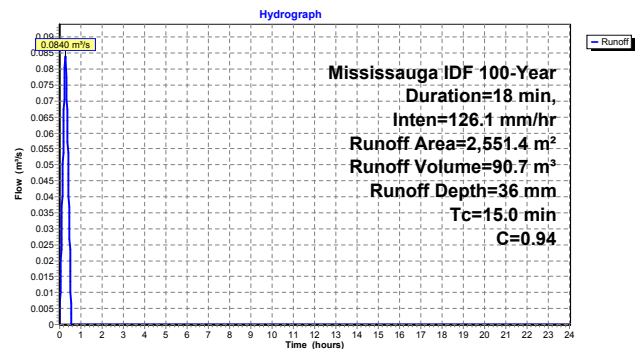
Runoff = 0.0840 m³/s @ 0.25 hrs, Volume= 90.7 m³, Depth= 36 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Mississauga IDF 100-Year Duration=18 min, Inten=126.1 mm/hr

Area (m²)	C	Description
2,053.8	1.00	Impervious Roof
226.4	0.31	Soft landscaping
271.2	1.00	At grade impervious
2,551.4	0.94	Weighted Average
226.4		8.87% Pervious Area
2,325.0		91.13% Impervious Area

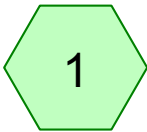
Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern

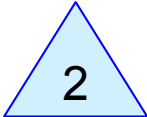


Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
271.2	0.90	At grade impervious (1)
2,053.8	0.90	Impervious Roof (1)
226.4	0.25	Soft landscaping (1)
2,551.4	0.84	TOTAL AREA



Controlled Area to
Cistern



SWM Cistern



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Ground Covers (selected nodes)

HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover
0.0	0.0	0.0	0.0	271.2	271.2	At grade impervious
0.0	0.0	0.0	0.0	2,053.8	2,053.8	Impervious Roof
0.0	0.0	0.0	0.0	226.4	226.4	Soft landscaping
0.0	0.0	0.0	0.0	2,551.4	2,551.4	TOTAL AREA

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Controlled Area to Runoff Area=2,551.4 m² 0.00% Impervious Runoff Depth=14 mm
Tc=15.0 min C=0.84 Runoff=0.0299 m³/s 35.8 m³

Pond 2: SWM Cistern Peak Elev=1.078 m Storage=25.8 m³ Inflow=0.0299 m³/s 35.8 m³
Outflow=0.0150 m³/s 35.8 m³

Total Runoff Area = 2,551.4 m² Runoff Volume = 35.8 m³ Average Runoff Depth = 14 mm
100.00% Pervious = 2,551.4 m² 0.00% Impervious = 0.0 m²

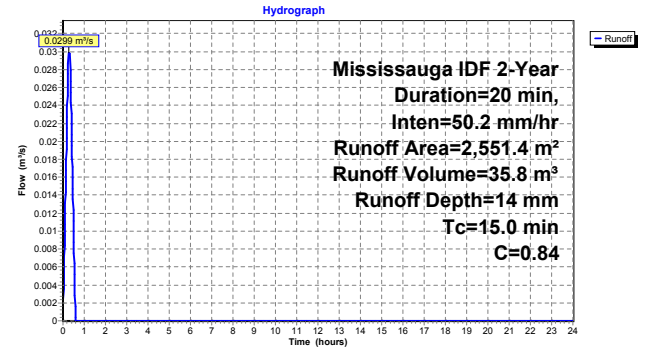
Summary for Subcatchment 1: Controlled Area to Cistern

Runoff = 0.0299 m³/s @ 0.25 hrs, Volume= 35.8 m³, Depth= 14 mm
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 2-Year Duration=20 min, Inten=50.2 mm/hr

Area (m²)	C	Description
2,053.8	0.90	Impervious Roof
226.4	0.25	Soft landscaping
271.2	0.90	At grade impervious
2,551.4	0.84	Weighted Average
2,551.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern



Summary for Pond 2: SWM Cistern

Inflow Area = 2,551.4 m², 0.00% Impervious, Inflow Depth = 14 mm for 2-Year event
Inflow = 0.0299 m³/s @ 0.25 hrs, Volume= 35.8 m³
Outflow = 0.0150 m³/s @ 0.46 hrs, Volume= 35.8 m³, Atten= 50%, Lag= 12.5 min
Primary = 0.0150 m³/s @ 0.46 hrs, Volume= 35.8 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
Peak Elev= 1.078 m @ 0.46 hrs Surf.Area= 23.9 m² Storage= 25.8 m³ (12.4 m³ above start)

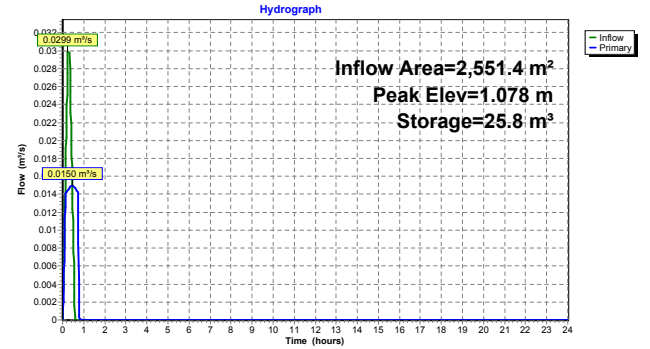
Plug-Flow detention time= 19.8 min calculated for 22.5 m³ (63% of inflow)
Center-of-Mass det. time= 7.4 min (25.0 - 17.5)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH Prismatoid

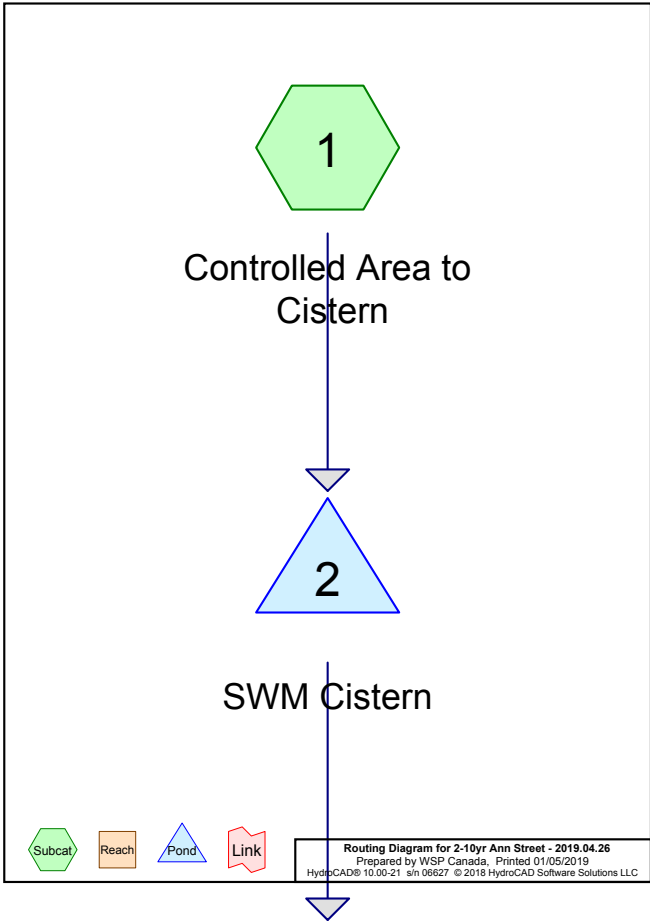
Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

Primary OutFlow Max=0.0150 m³/s @ 0.46 hrs HW=1.077 m (Free Discharge)
1=Pump (Pump Controls 0.0150 m³/s)

Pond 2: SWM Cistern



Area Listing (selected nodes)		
Area (sq-meters)	C	Description (subcatchment-numbers)
271.2	0.90	At grade impervious (1)
2,053.8	0.90	Impervious Roof (1)
226.4	0.25	Soft landscaping (1)
2,551.4	0.84	TOTAL AREA



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Ground Covers (selected nodes)							Subc Numt
HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover	
0.0	0.0	0.0	0.0	271.2	271.2	At grade impervious	
0.0	0.0	0.0	0.0	2,053.8	2,053.8	Impervious Roof	
0.0	0.0	0.0	0.0	226.4	226.4	Soft landscaping	
0.0	0.0	0.0	0.0	2,551.4	2,551.4	TOTAL AREA	

2-10yr Ann Street - 2019.04.26 Mississauga IDF 5-Year Duration=24 min, Inten=60.0 mm/hr
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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points Runoff by Rational method, Rise/Fall=1.0/1.0 xTc Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method	
Subcatchment 1: Controlled Area to	Runoff Area=2,551.4 m² 0.00% Impervious Runoff Depth=20 mm Tc=15.0 min C=0.84 Runoff=0.0357 m³/s 51.4 m³
Pond 2: SWM Cistern	Peak Elev=1.512 m Storage=36.1 m³ Inflow=0.0357 m³/s 51.4 m³ Outflow=0.0158 m³/s 51.4 m³
Total Runoff Area = 2,551.4 m² Runoff Volume = 51.4 m³ Average Runoff Depth = 20 mm 100.00% Pervious = 2,551.4 m² 0.00% Impervious = 0.0 m²	

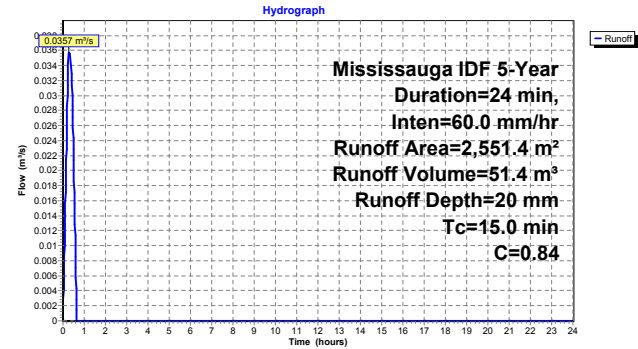
Summary for Subcatchment 1: Controlled Area to Cistern

Runoff = 0.0357 m³/s @ 0.25 hrs, Volume= 51.4 m³, Depth= 20 mm
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 5-Year Duration=24 min, Inten=60.0 mm/hr

Area (m²)	C	Description
2,053.8	0.90	Impervious Roof
226.4	0.25	Soft landscaping
271.2	0.90	At grade impervious
2,551.4	0.84	Weighted Average
2,551.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern



Summary for Pond 2: SWM Cistern

Inflow Area = 2,551.4 m², 0.00% Impervious, Inflow Depth = 20 mm for 5-Year event
Inflow = 0.0357 m³/s @ 0.25 hrs, Volume= 51.4 m³
Outflow = 0.0158 m³/s @ 0.54 hrs, Volume= 51.4 m³, Atten= 56%, Lag= 17.4 min
Primary = 0.0158 m³/s @ 0.54 hrs, Volume= 51.4 m³

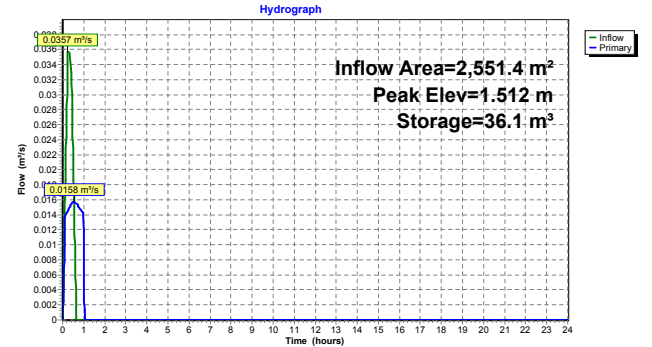
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
Peak Elev= 1.512 m @ 0.54 hrs Surf.Area= 23.9 m² Storage= 36.1 m³ (22.8 m³ above start)

Plug-Flow detention time= 24.1 min calculated for 38.0 m³ (74% of inflow)
Center-of-Mass det. time= 13.0 min (32.5 - 19.5)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH Prismatoid
Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

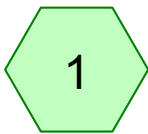
Primary OutFlow Max=0.0158 m³/s @ 0.54 hrs HW=1.512 m (Free Discharge)
1=Pump (Pump Controls 0.0158 m³/s)

Pond 2: SWM Cistern

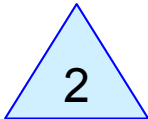


Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
271.2	0.90	At grade impervious (1)
2,053.8	0.90	Impervious Roof (1)
226.4	0.25	Soft landscaping (1)
2,551.4	0.84	TOTAL AREA



Controlled Area to
Cistern



SWM Cistern



Reach



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Ground Covers (selected nodes)

HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover
0.0	0.0	0.0	0.0	271.2	271.2	At grade impervious
0.0	0.0	0.0	0.0	2,053.8	2,053.8	Impervious Roof
0.0	0.0	0.0	0.0	226.4	226.4	Soft landscaping
0.0	0.0	0.0	0.0	2,551.4	2,551.4	TOTAL AREA

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Controlled Area to Runoff Area=2,551.4 m² 0.00% Impervious Runoff Depth=26 mm
Tc=15.0 min C=0.84 Runoff=0.0407 m³/s 65.9 m³

Pond 2: SWM Cistern Peak Elev=1.942 m Storage=46.4 m³ Inflow=0.0407 m³/s 65.9 m³
Outflow=0.0169 m³/s 65.9 m³

Total Runoff Area = 2,551.4 m² Runoff Volume = 65.9 m³ Average Runoff Depth = 26 mm
100.00% Pervious = 2,551.4 m² 0.00% Impervious = 0.0 m²

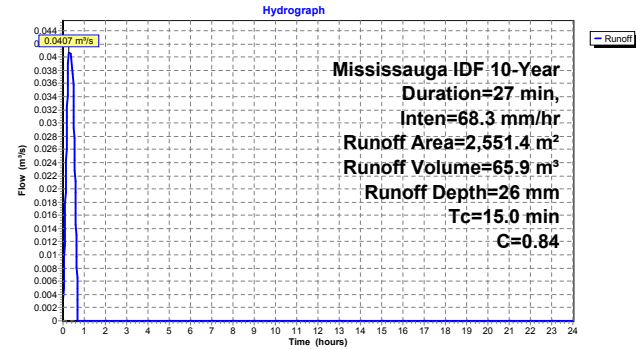
Summary for Subcatchment 1: Controlled Area to Cistern

Runoff = 0.0407 m³/s @ 0.25 hrs, Volume= 65.9 m³, Depth= 26 mm
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 10-Year Duration=27 min, Inten=68.3 mm/hr

Area (m²)	C	Description
2,053.8	0.90	Impervious Roof
226.4	0.25	Soft landscaping
271.2	0.90	At grade impervious
2,551.4	0.84	Weighted Average
2,551.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern



Summary for Pond 2: SWM Cistern

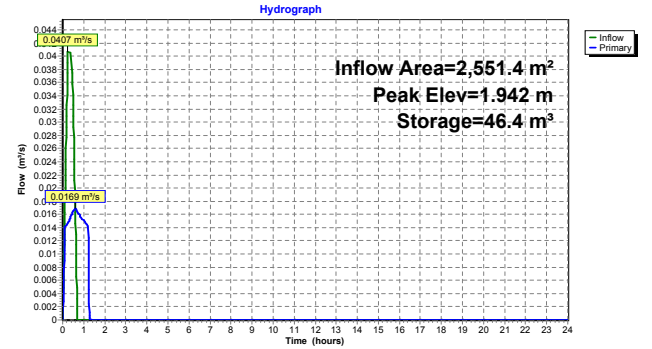
Inflow Area = 2,551.4 m², 0.00% Impervious, Inflow Depth = 26 mm for 10-Year event
Inflow = 0.0407 m³/s @ 0.25 hrs, Volume= 65.9 m³
Outflow = 0.0169 m³/s @ 0.60 hrs, Volume= 65.9 m³, Atten= 58%, Lag= 20.8 min
Primary = 0.0169 m³/s @ 0.60 hrs, Volume= 65.9 m³
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
Peak Elev= 1.942 m @ 0.60 hrs Surf.Area= 23.9 m² Storage= 46.4 m³ (33.0 m³ above start)
Plug-Flow detention time= 28.4 min calculated for 52.5 m³ (80% of inflow)
Center-of-Mass det. time= 18.1 min (39.1 - 21.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH Prismatoid

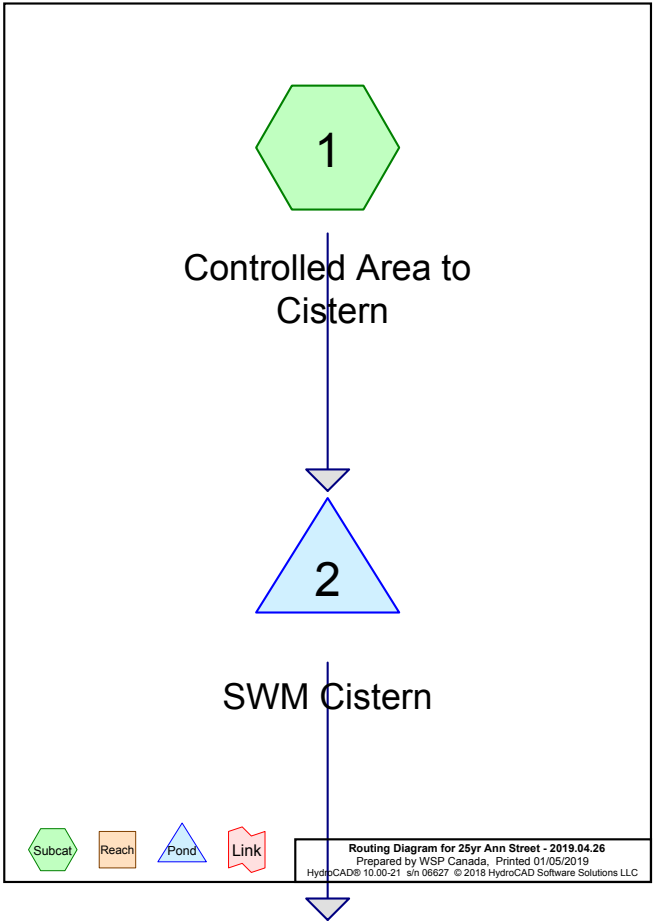
Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

Primary OutFlow Max=0.0169 m³/s @ 0.60 hrs HW=1.941 m (Free Discharge)
1=Pump (Pump Controls 0.0169 m³/s)

Pond 2: SWM Cistern



Area Listing (selected nodes)		
Area (sq-meters)	C	Description (subcatchment-numbers)
271.2	0.99	At grade impervious (1)
2,053.8	0.99	Impervious Roof (1)
226.4	0.28	Soft landscaping (1)
2,551.4	0.93	TOTAL AREA



Ground Covers (selected nodes)						
HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover
0.0	0.0	0.0	0.0	271.2	271.2	At grade impervious
0.0	0.0	0.0	0.0	2,053.8	2,053.8	Impervious Roof
0.0	0.0	0.0	0.0	226.4	226.4	Soft landscaping
0.0	0.0	0.0	0.0	2,551.4	2,551.4	TOTAL AREA

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points		
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc		
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method		
Subcatchment 1: Controlled Area to	Runoff Area=2,551.4 m ² 91.13% Impervious Runoff Depth=35 mm Tc=15.0 min C=0.93 Runoff=0.0452 m ³ /s 89.4 m ³	
Pond 2: SWM Cistern	Peak Elev=2,600 m Storage=62.1 m ³ Inflow=0.0452 m ³ /s 89.4 m ³ Outflow=0.0180 m ³ /s 89.4 m ³	
Total Runoff Area = 2,551.4 m ² Runoff Volume = 89.4 m ³ Average Runoff Depth = 35 mm		
8.87% Pervious = 226.4 m ² 91.13% Impervious = 2,325.0 m ²		

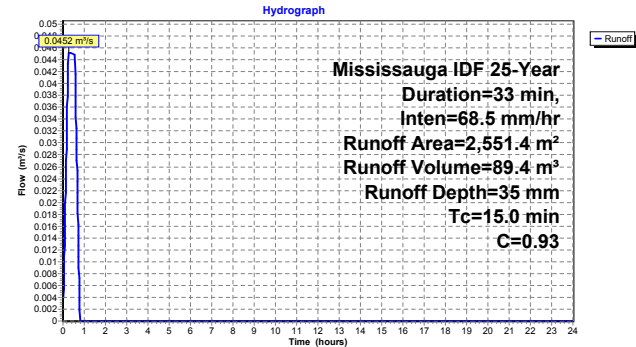
Summary for Subcatchment 1: Controlled Area to Cistern

Runoff = 0.0452 m³/s @ 0.25 hrs, Volume= 89.4 m³, Depth= 35 mm
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 25-Year Duration=33 min, Inten=68.5 mm/hr

Area (m²)	C	Description
2,053.8	0.99	Impervious Roof
226.4	0.28	Soft landscaping
271.2	0.99	At grade impervious
2,551.4	0.93	Weighted Average
226.4		8.87% Pervious Area
2,325.0		91.13% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern



Summary for Pond 2: SWM Cistern

Inflow Area = 2,551.4 m², 91.13% Impervious, Inflow Depth = 35 mm for 25-Year event
Inflow = 0.0452 m³/s @ 0.25 hrs, Volume= 89.4 m³
Outflow = 0.0180 m³/s @ 0.54 hrs, Volume= 89.4 m³, Atten= 60%, Lag= 17.4 min
Primary = 0.0180 m³/s @ 0.54 hrs, Volume= 89.4 m³
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
Peak Elev= 2.600 m @ 0.70 hrs Surf.Area= 23.9 m² Storage= 62.1 m³ (48.7 m³ above start)

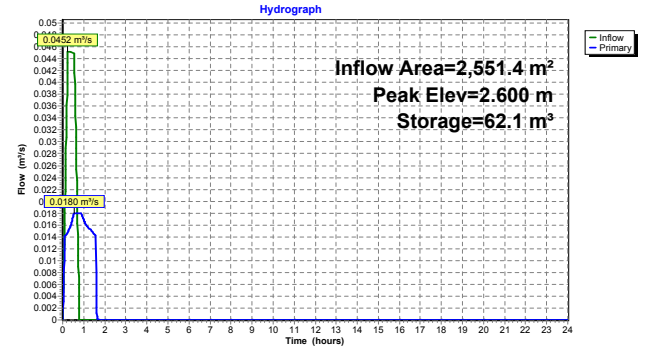
Plug-Flow detention time= 34.7 min calculated for 76.0 m³ (85% of inflow)
Center-of-Mass det. time= 25.2 min (49.2 - 24.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

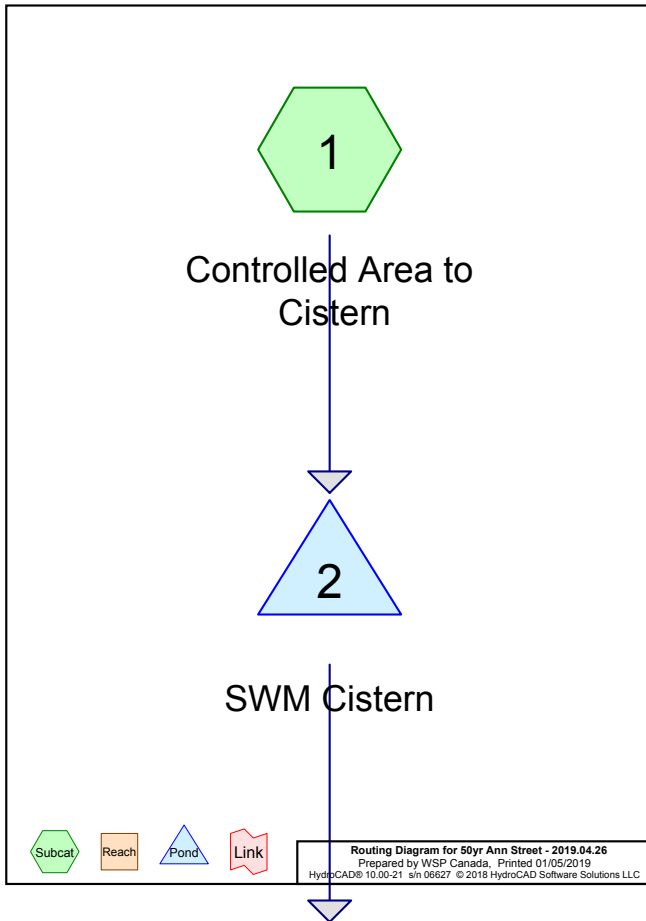
Primary OutFlow Max=0.0180 m³/s @ 0.54 hrs HW=2.251 m (Free Discharge)
1=Pump (Pump Controls 0.0180 m³/s)

Pond 2: SWM Cistern



Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
271.2	1.00	At grade impervious (1)
2,053.8	1.00	Impervious Roof (1)
226.4	0.30	Soft landscaping (1)
2,551.4	0.94	TOTAL AREA



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Ground Covers (selected nodes)

HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover
0.0	0.0	0.0	0.0	271.2	271.2	At grade impervious
0.0	0.0	0.0	0.0	2,053.8	2,053.8	Impervious Roof
0.0	0.0	0.0	0.0	226.4	226.4	Soft landscaping
0.0	0.0	0.0	0.0	2,551.4	2,551.4	TOTAL AREA

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Mississauga IDF 50-Year Duration=36 min, Inten=72.2 mm/hr

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Controlled Area to Runoff Area=2,551.4 m² 91.13% Impervious Runoff Depth=41 mm
Tc=15.0 min C=0.94 Runoff=0.0481 m³/s 103.9 m³

Pond 2: SWM Cistern Peak Elev=3.043 m Storage=72.7 m³ Inflow=0.0481 m³/s 103.9 m³
Outflow=0.0180 m³/s 103.9 m³

Total Runoff Area = 2,551.4 m² Runoff Volume = 103.9 m³ Average Runoff Depth = 41 mm
8.87% Pervious = 226.4 m² 91.13% Impervious = 2,325.0 m²

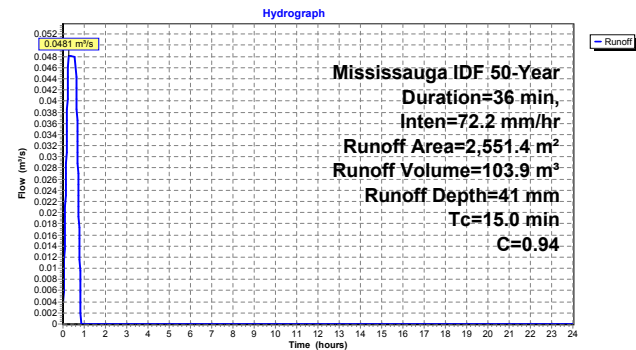
Summary for Subcatchment 1: Controlled Area to Cistern

Runoff = 0.0481 m³/s @ 0.25 hrs, Volume= 103.9 m³, Depth= 41 mm
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 50-Year Duration=36 min, Inten=72.2 mm/hr

Area (m²)	C	Description
2,053.8	1.00	Impervious Roof
226.4	0.30	Soft landscaping
271.2	1.00	At grade impervious
2,551.4	0.94	Weighted Average
226.4		8.87% Pervious Area
2,325.0		91.13% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern



Summary for Pond 2: SWM Cistern

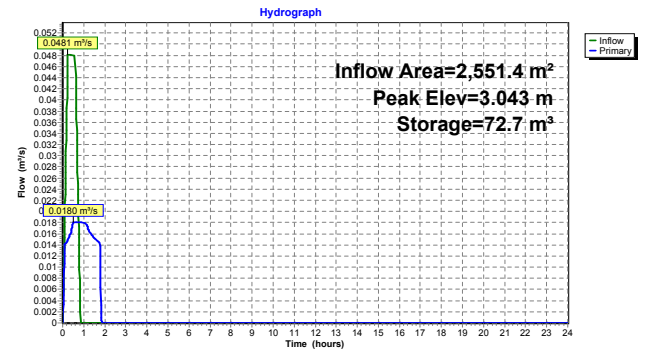
Inflow Area = 2,551.4 m², 91.13% Impervious, Inflow Depth = 41 mm for 50-Year event
Inflow = 0.0481 m³/s @ 0.25 hrs, Volume= 103.9 m³
Outflow = 0.0180 m³/s @ 0.51 hrs, Volume= 103.9 m³, Atten= 63%, Lag= 15.6 min
Primary = 0.0180 m³/s @ 0.51 hrs, Volume= 103.9 m³
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
Peak Elev= 3.043 m @ 0.76 hrs Surf.Area= 23.9 m² Storage= 72.7 m³ (59.3 m³ above start)
Plug-Flow detention time= 39.3 min calculated for 90.5 m³ (87% of inflow)
Center-of-Mass det. time= 30.0 min (55.5 - 25.5)

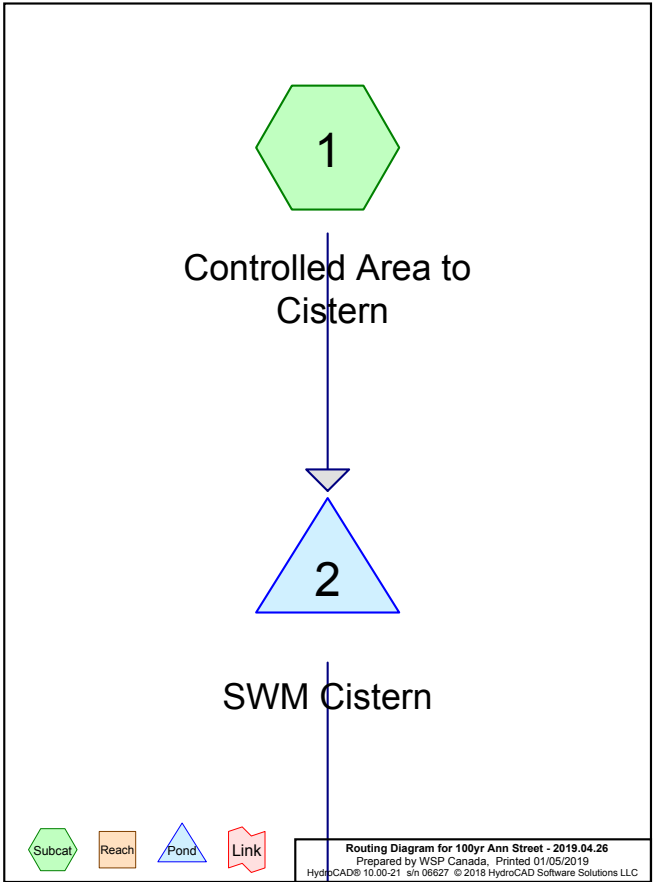
Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

Primary OutFlow Max=0.0180 m³/s @ 0.51 hrs HW=2.280 m (Free Discharge)
1=Pump (Pump Controls 0.0180 m³/s)

Pond 2: SWM Cistern





100yr Ann Street - 2019.04.26 Mississauga IDF 100-Year Duration=39 min, Inten=75.9 mm/hr
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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Controlled Area to Pond Runoff Area=2,551.4 m² 91.13% Impervious Runoff Depth=46 mm
Tc=15.0 min C=0.94 Runoff=0.0506 m³/s 118.3 m³

Pond 2: SWM Cistern Peak Elev=3.492 m Storage=83.5 m³ Inflow=0.0506 m³/s 118.3 m³
Outflow=0.0180 m³/s 118.3 m³

Total Runoff Area = 2,551.4 m² Runoff Volume = 118.3 m³ Average Runoff Depth = 46 mm
8.87% Pervious = 226.4 m² 91.13% Impervious = 2,325.0 m²

Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
271.2	1.00	At grade impervious (1)
2,053.8	1.00	Impervious Roof (1)
226.4	0.31	Soft landscaping (1)
2,551.4	0.94	TOTAL AREA

100yr Ann Street - 2019.04.26 Mississauga IDF 100-Year Duration=39 min, Inten=75.9 mm/hr
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Summary for Subcatchment 1: Controlled Area to Cistern

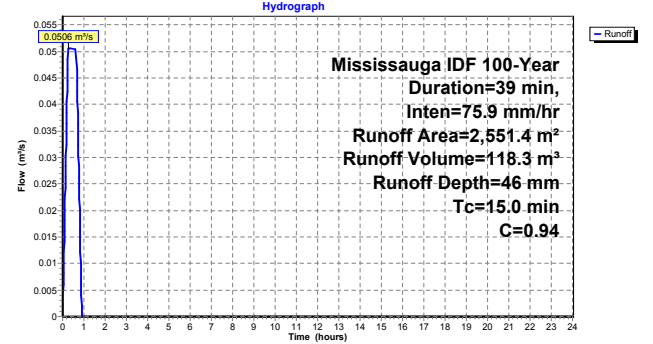
Runoff = 0.0506 m³/s @ 0.25 hrs, Volume= 118.3 m³, Depth= 46 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 100-Year Duration=39 min, Inten=75.9 mm/hr

Area (m²)	C	Description
2,053.8	1.00	Impervious Roof
226.4	0.31	Soft landscaping
271.2	1.00	At grade impervious
2,551.4	0.94	Weighted Average
226.4		8.87% Pervious Area
2,325.0		91.13% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern



Summary for Pond 2: SWM Cistern

Inflow Area = 2,551.4 m², 91.13% Impervious, Inflow Depth = 46 mm for 100-Year event
Inflow = 0.0506 m³/s @ 0.25 hrs, Volume= 118.3 m³
Outflow = 0.0180 m³/s @ 0.48 hrs, Volume= 118.3 m³, Atten= 64%, Lag= 13.8 min
Primary = 0.0180 m³/s @ 0.48 hrs, Volume= 118.3 m³

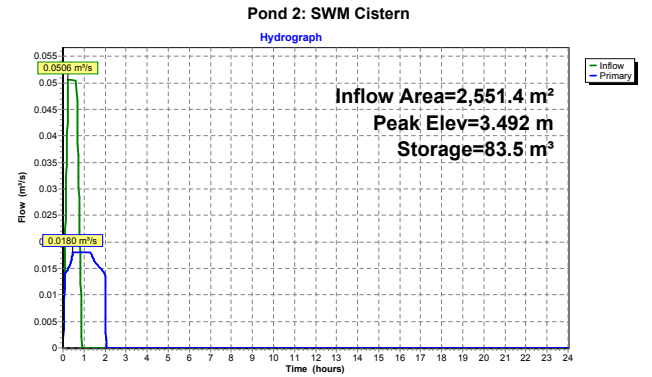
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
Peak Elev= 3.492 m @ 0.81 hrs Surf.Area= 23.9 m² Storage= 83.5 m³ (70.1 m³ above start)

Plug-Flow detention time= 43.8 min calculated for 104.9 m³ (89% of inflow)
Center-of-Mass det. time= 34.8 min (61.8 - 27.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH PrismaToid

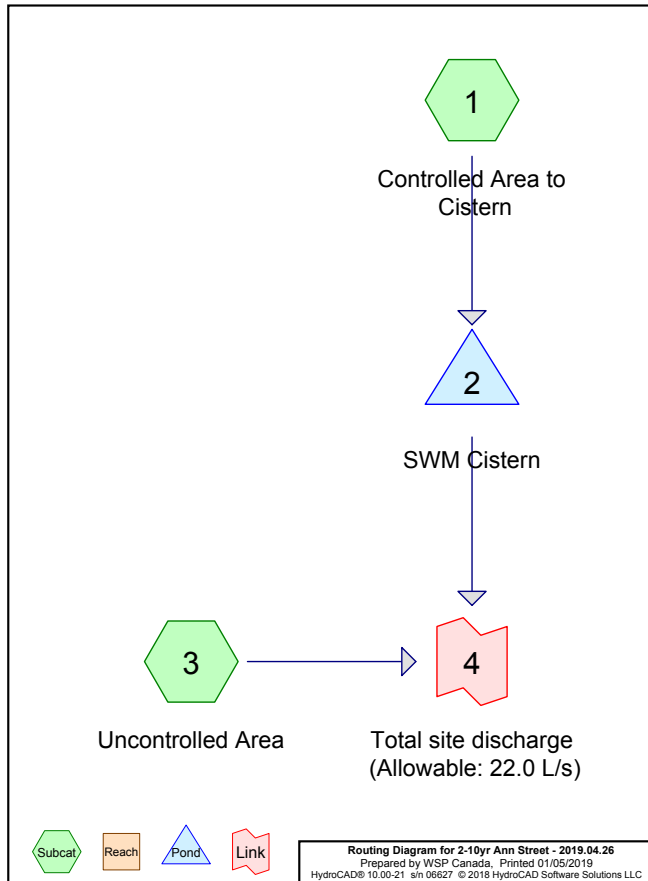
Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

Primary OutFlow Max=0.0180 m³/s @ 0.48 hrs HW=2.263 m (Free Discharge)
1=Pump (Pump Controls 0.0180 m³/s)



Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
87.1	0.90	*2-10yr coefficient value (3)
271.2	0.90	At grade impervious (1)
2,053.8	0.90	Impervious Roof (1)
226.4	0.25	Soft landscaping (1)
2,638.5	0.84	TOTAL AREA



2-10yr Ann Street - 2019.04.26

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Ground Covers (selected nodes)

HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover
0.0	0.0	0.0	0.0	87.1	87.1	*2-10yr coefficient value
0.0	0.0	0.0	0.0	271.2	271.2	At grade impervious
0.0	0.0	0.0	0.0	2,053.8	2,053.8	Impervious Roof
0.0	0.0	0.0	0.0	226.4	226.4	Soft landscaping
0.0	0.0	0.0	0.0	2,638.5	2,638.5	TOTAL AREA

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2-10yr Ann Street - 2019.04.26 Mississauga IDF 2-Year Duration=15 min, Inten=59.9 mm/hr

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Controlled Area to Runoff Area=2,551.4 m² 0.00% Impervious Runoff Depth=13 mm
Tc=15.0 min C=0.84 Runoff=0.0357 m³/s 32.1 m³

Subcatchment 3: Uncontrolled Area Runoff Area=87.1 m² 0.00% Impervious Runoff Depth=13 mm
Tc=15.0 min C=0.90 Runoff=0.0013 m³/s 1.2 m³

Pond 2: SWM Cistern Peak Elev=1.061 m Storage=25.3 m³ Inflow=0.0357 m³/s 32.1 m³
Outflow=0.0150 m³/s 32.1 m³

Link 4: Total site discharge (Allowable: 22.0 L/s) Inflow=0.0159 m³/s 33.3 m³
Primary=0.0159 m³/s 33.3 m³

Total Runoff Area = 2,638.5 m² Runoff Volume = 33.3 m³ Average Runoff Depth = 13 mm
100.00% Pervious = 2,638.5 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 1: Controlled Area to Cistern

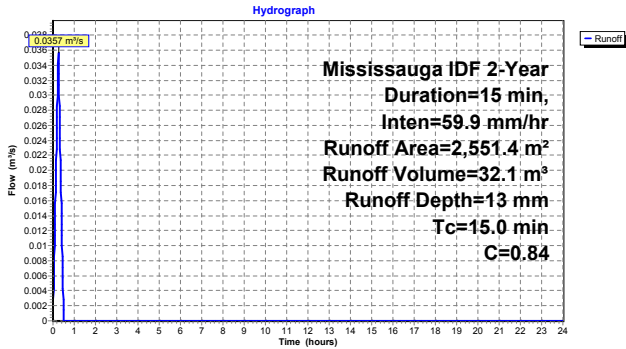
Runoff = 0.0357 m³/s @ 0.25 hrs, Volume= 32.1 m³, Depth= 13 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 2-Year Duration=15 min, Inten=59.9 mm/hr

Area (m²)	C	Description
2,053.8	0.90	Impervious Roof
226.4	0.25	Soft landscaping
271.2	0.90	At grade impervious
2,551.4	0.84	Weighted Average
2,551.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern



Summary for Subcatchment 3: Uncontrolled Area

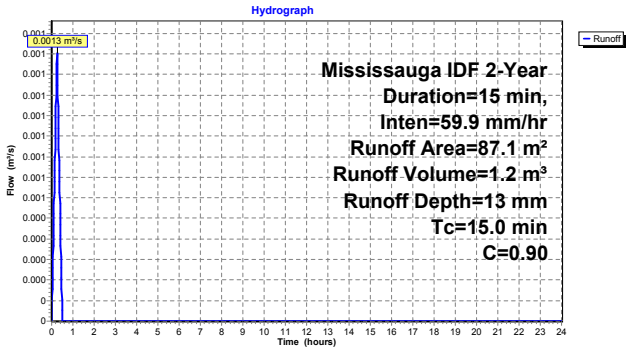
Runoff = 0.0013 m³/s @ 0.25 hrs, Volume= 1.2 m³, Depth= 13 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 2-Year Duration=15 min, Inten=59.9 mm/hr

Area (m²)	C	Description
87.1	0.90	*2-10yr coefficient value
87.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 3: Uncontrolled Area



Summary for Pond 2: SWM Cistern

Inflow Area = 2,551.4 m², 0.00% Impervious, Inflow Depth = 13 mm for 2-Year event
Inflow = 0.0357 m³/s @ 0.25 hrs, Volume= 32.1 m³
Outflow = 0.0150 m³/s @ 0.40 hrs, Volume= 32.1 m³, Atten= 58%, Lag= 8.7 min
Primary = 0.0150 m³/s @ 0.40 hrs, Volume= 32.1 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
Peak Elev= 1.061 m @ 0.40 hrs Surf.Area= 23.9 m² Storage= 25.3 m³ (12.0 m³ above start)

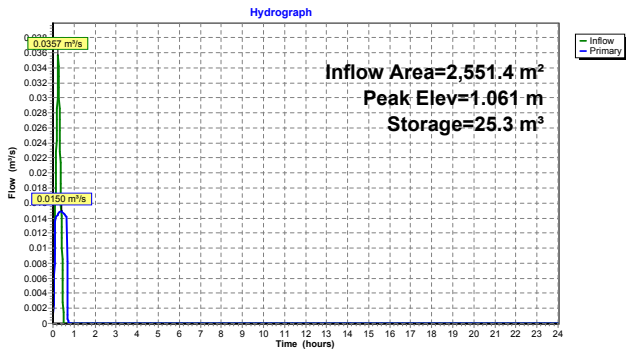
Plug-Flow detention time= 19.4 min calculated for 18.7 m³ (58% of inflow)
Center-of-Mass det. time= 7.2 min (22.2 - 15.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

Primary OutFlow Max=0.0150 m³/s @ 0.40 hrs HW=1.060 m (Free Discharge)
1=Pump (Pump Controls 0.0150 m³/s)

Pond 2: SWM Cistern

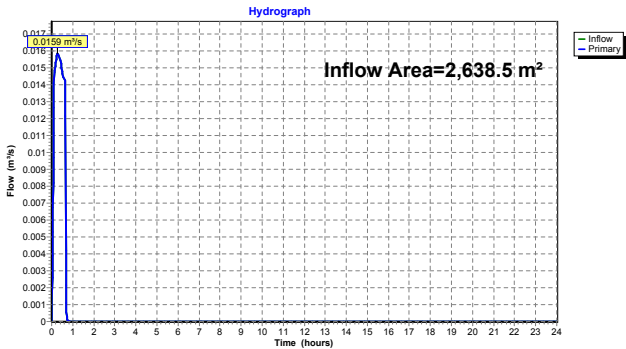


Summary for Link 4: Total site discharge (Allowable: 22.0 L/s)

Inflow Area = 2,638.5 m², 0.00% Impervious, Inflow Depth = 13 mm for 2-Year event
Inflow = 0.0159 m³/s @ 0.26 hrs, Volume= 33.3 m³
Primary = 0.0159 m³/s @ 0.26 hrs, Volume= 33.3 m³, Atten= 0%, Lag= 0.0 min

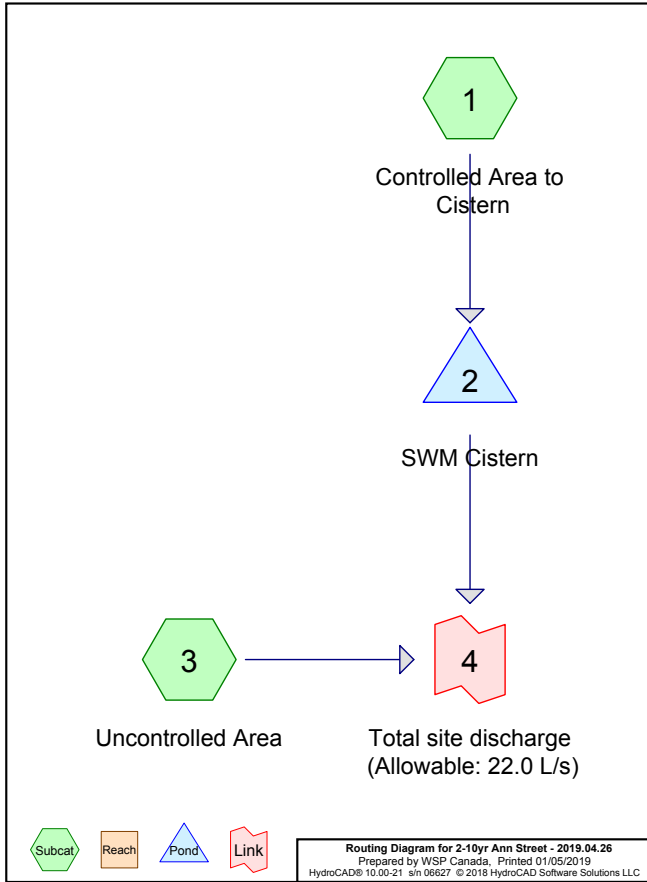
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 4: Total site discharge (Allowable: 22.0 L/s)



Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
87.1	0.90	*2-10yr coefficient value (3)
271.2	0.90	At grade impervious (1)
2,053.8	0.90	Impervious Roof (1)
226.4	0.25	Soft landscaping (1)
2,638.5	0.84	TOTAL AREA



Ground Covers (selected nodes)

HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover
0.0	0.0	0.0	0.0	87.1	87.1	*2-10yr coefficient value
0.0	0.0	0.0	0.0	271.2	271.2	At grade impervious
0.0	0.0	0.0	0.0	2,053.8	2,053.8	Impervious Roof
0.0	0.0	0.0	0.0	226.4	226.4	Soft landscaping
0.0	0.0	0.0	0.0	2,638.5	2,638.5	TOTAL AREA

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Controlled Area to Runoff Area=2,551.4 m² 0.00% Impervious Runoff Depth=19 mm
Tc=15.0 min C=0.84 Runoff=0.0415 m³/s 47.3 m³

Subcatchment 3: Uncontrolled Area Runoff Area=87.1 m² 0.00% Impervious Runoff Depth=20 mm
Tc=15.0 min C=0.90 Runoff=0.0015 m³/s 1.7 m³

Pond 2: SWM Cistern Peak Elev=1.495 m Storage=35.7 m³ Inflow=0.0415 m³/s 47.3 m³
Outflow=0.0157 m³/s 47.3 m³

Link 4: Total site discharge (Allowable: 22.0 L/s) Inflow=0.0167 m³/s 49.0 m³
Primary=0.0167 m³/s 49.0 m³

Total Runoff Area = 2,638.5 m² Runoff Volume = 49.0 m³ Average Runoff Depth = 19 mm
100.00% Pervious = 2,638.5 m² 0.00% Impervious = 0.0 m²

Summary for Subcatchment 1: Controlled Area to Cistern

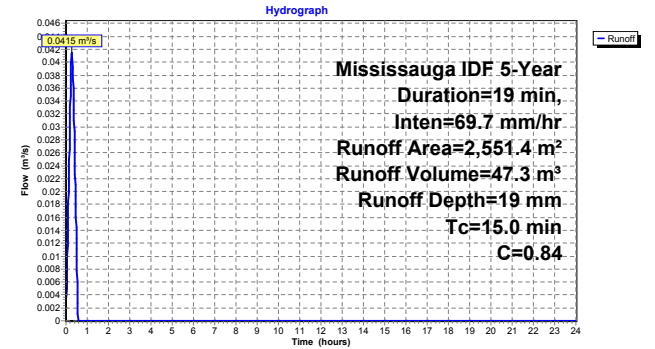
Runoff = 0.0415 m³/s @ 0.25 hrs, Volume= 47.3 m³, Depth= 19 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 5-Year Duration=19 min, Inten=69.7 mm/hr

Area (m²)	C	Description
2,053.8	0.90	Impervious Roof
226.4	0.25	Soft landscaping
271.2	0.90	At grade impervious
2,551.4	0.84	Weighted Average
2,551.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern



Summary for Subcatchment 3: Uncontrolled Area

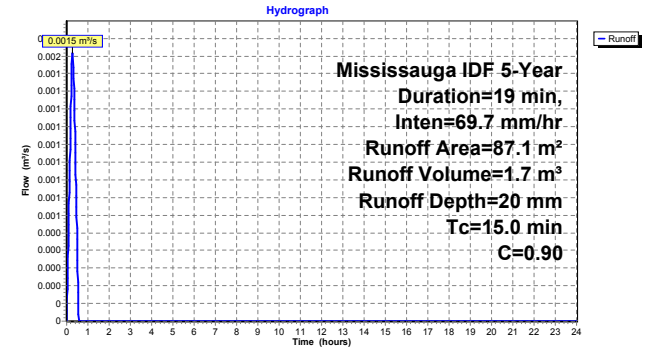
Runoff = 0.0015 m³/s @ 0.25 hrs, Volume= 1.7 m³, Depth= 20 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 5-Year Duration=19 min, Inten=69.7 mm/hr

Area (m²)	C	Description
87.1	0.90	*2-10yr coefficient value
87.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 3: Uncontrolled Area



Summary for Pond 2: SWM Cistern

Inflow Area = 2,551.4 m², 0.00% Impervious, Inflow Depth = 19 mm for 5-Year event
Inflow = 0.0415 m³/s @ 0.25 hrs, Volume= 47.3 m³
Outflow = 0.0157 m³/s @ 0.47 hrs, Volume= 47.3 m³, Atten= 62%, Lag= 13.3 min
Primary = 0.0157 m³/s @ 0.47 hrs, Volume= 47.3 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
Peak Elev= 1.495 m @ 0.47 hrs Surf.Area= 23.9 m² Storage= 35.7 m³ (22.3 m³ above start)

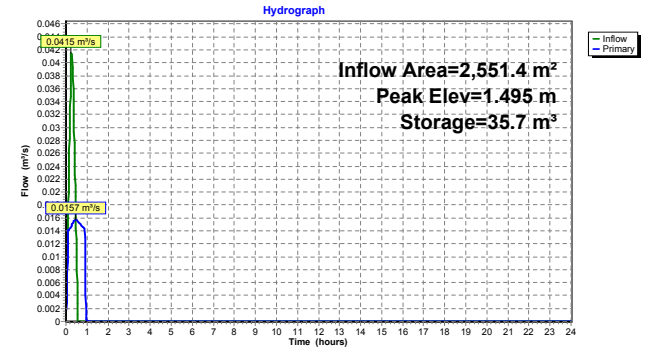
Plug-Flow detention time= 23.5 min calculated for 33.9 m³ (72% of inflow)
Center-of-Mass det. time= 12.8 min (29.8 - 17.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

Primary OutFlow Max=0.0157 m³/s @ 0.47 hrs HW=1.495 m (Free Discharge)
1=Pump (Pump Controls 0.0157 m³/s)

Pond 2: SWM Cistern

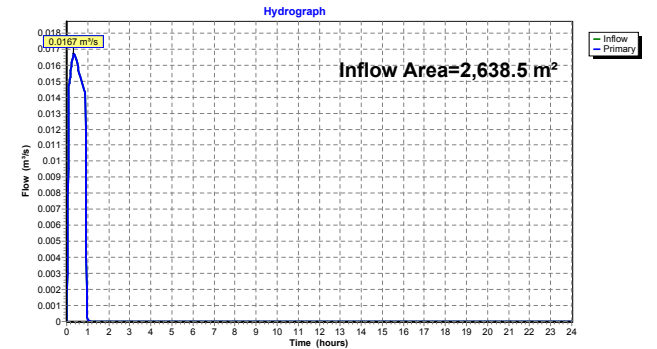


Summary for Link 4: Total site discharge (Allowable: 22.0 L/s)

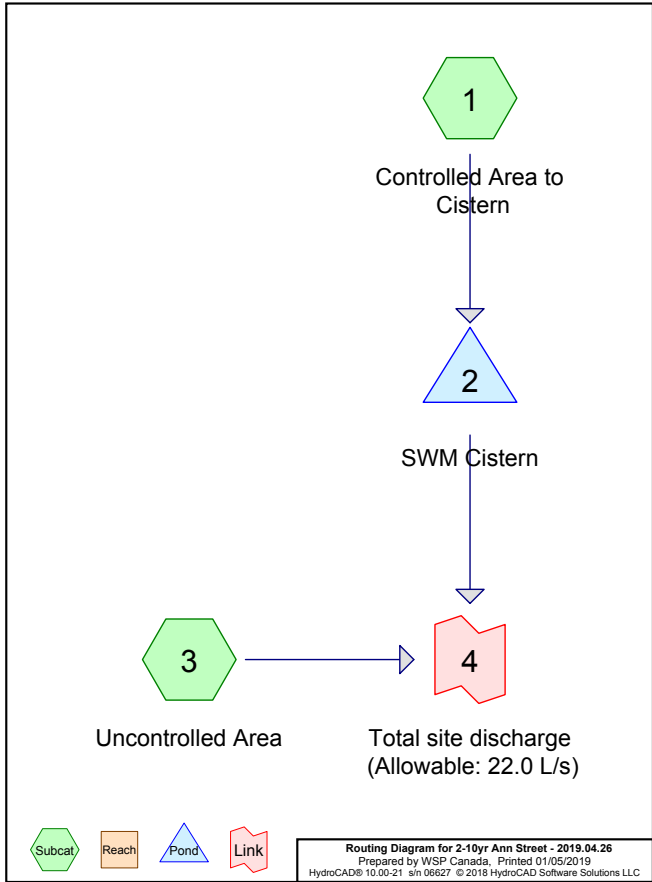
Inflow Area = 2,638.5 m², 0.00% Impervious, Inflow Depth = 19 mm for 5-Year event
Inflow = 0.0167 m³/s @ 0.34 hrs, Volume= 49.0 m³
Primary = 0.0167 m³/s @ 0.34 hrs, Volume= 49.0 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 4: Total site discharge (Allowable: 22.0 L/s)



Area Listing (selected nodes)		
Area (sq-meters)	C	Description (subcatchment-numbers)
87.1	0.90	*2-10yr coefficient value (3)
271.2	0.90	At grade impervious (1)
2,053.8	0.90	Impervious Roof (1)
226.4	0.25	Soft landscaping (1)
2,638.5	0.84	TOTAL AREA



Ground Covers (selected nodes)						
HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover
0.0	0.0	0.0	0.0	87.1	87.1	*2-10yr coefficient value
0.0	0.0	0.0	0.0	271.2	271.2	At grade impervious
0.0	0.0	0.0	0.0	2,053.8	2,053.8	Impervious Roof
0.0	0.0	0.0	0.0	226.4	226.4	Soft landscaping
0.0	0.0	0.0	0.0	2,638.5	2,638.5	TOTAL AREA

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points			
Runoff by Rational method, Rise/Fall=1.0/1.0 x Tc			
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method			
Subcatchment 1: Controlled Area to	Runoff Area=2,551.4 m ²	0.00% Impervious	Runoff Depth=26 mm Tc=15.0 min C=0.84 Runoff=0.0407 m ³ /s 65.9 m ³
Subcatchment 3: Uncontrolled Area	Runoff Area=87.1 m ²	0.00% Impervious	Runoff Depth=28 mm Tc=15.0 min C=0.90 Runoff=0.0015 m ³ /s 2.4 m ³
Pond 2: SWM Cistern	Peak Elev=1.942 m Storage=46.4 m ³	Inflow=0.0407 m ³ /s 65.9 m ³	Outflow=0.0169 m ³ /s 65.9 m ³
Link 4: Total site discharge (Allowable: 22.0 L/s)		Inflow=0.0177 m ³ /s 68.3 m ³	Primary=0.0177 m ³ /s 68.3 m ³
Total Runoff Area = 2,638.5 m ² Runoff Volume = 68.3 m ³ Average Runoff Depth = 26 mm			
100.00% Pervious = 2,638.5 m ² 0.00% Impervious = 0.0 m ²			

Summary for Subcatchment 1: Controlled Area to Cistern

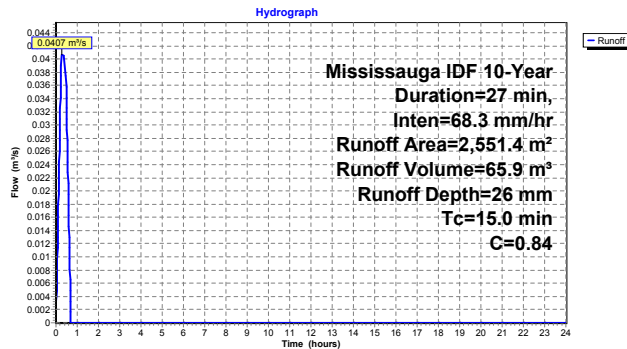
Runoff = 0.0407 m³/s @ 0.25 hrs, Volume= 65.9 m³, Depth= 26 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Mississauga IDF 10-Year Duration=27 min, Inten=68.3 mm/hr

Area (m²)	C	Description
2,053.8	0.90	Impervious Roof
226.4	0.25	Soft landscaping
271.2	0.90	At grade impervious
2,551.4	0.84	Weighted Average
2,551.4		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern



Summary for Subcatchment 3: Uncontrolled Area

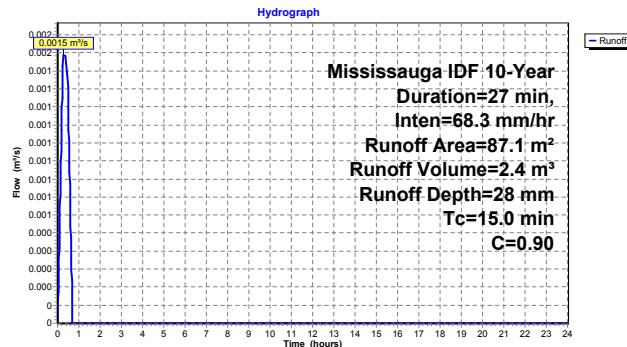
Runoff = 0.0015 m³/s @ 0.25 hrs, Volume= 2.4 m³, Depth= 28 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Mississauga IDF 10-Year Duration=27 min, Inten=68.3 mm/hr

Area (m²)	C	Description
87.1	0.90	*2-10yr coefficient value
87.1		100.00% Pervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 3: Uncontrolled Area



Summary for Pond 2: SWM Cistern

Inflow Area = 2,551.4 m², 0.00% Impervious, Inflow Depth = 26 mm for 10-Year event
 Inflow = 0.0407 m³/s @ 0.25 hrs, Volume= 65.9 m³
 Outflow = 0.0169 m³/s @ 0.60 hrs, Volume= 65.9 m³, Atten= 58%, Lag= 20.8 min
 Primary = 0.0169 m³/s @ 0.60 hrs, Volume= 65.9 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
 Peak Elev= 1.942 m @ 0.60 hrs Surf.Area= 23.9 m² Storage= 46.4 m³ (33.0 m³ above start)

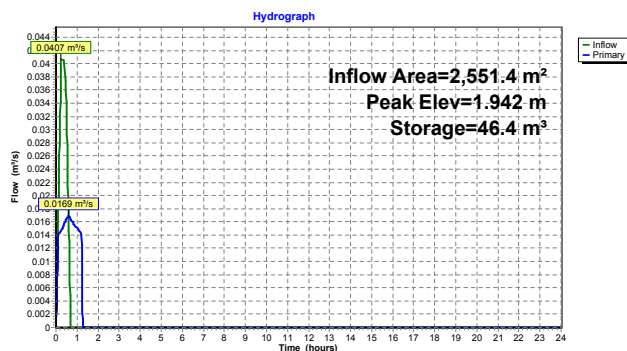
Plug-Flow detention time= 28.4 min calculated for 52.5 m³ (80% of inflow)
 Center-of-Mass det. time= 18.1 min (39.1 - 21.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

Primary OutFlow Max=0.0169 m³/s @ 0.60 hrs HW=1.941 m (Free Discharge)
 1=Pump (Pump Controls 0.0169 m³/s)

Pond 2: SWM Cistern

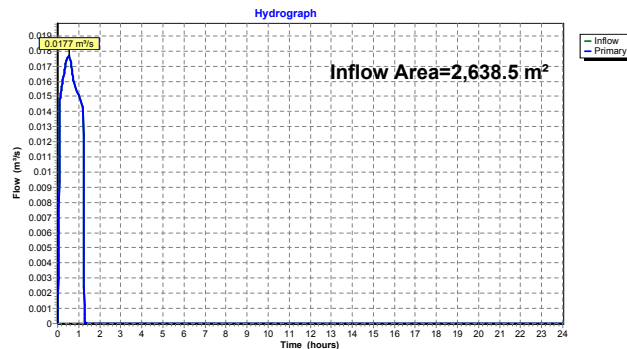


Summary for Link 4: Total site discharge (Allowable: 22.0 L/s)

Inflow Area = 2,638.5 m², 0.00% Impervious, Inflow Depth = 26 mm for 10-Year event
 Inflow = 0.0177 m³/s @ 0.53 hrs, Volume= 68.3 m³
 Primary = 0.0177 m³/s @ 0.53 hrs, Volume= 68.3 m³, Atten= 0%, Lag= 0.0 min

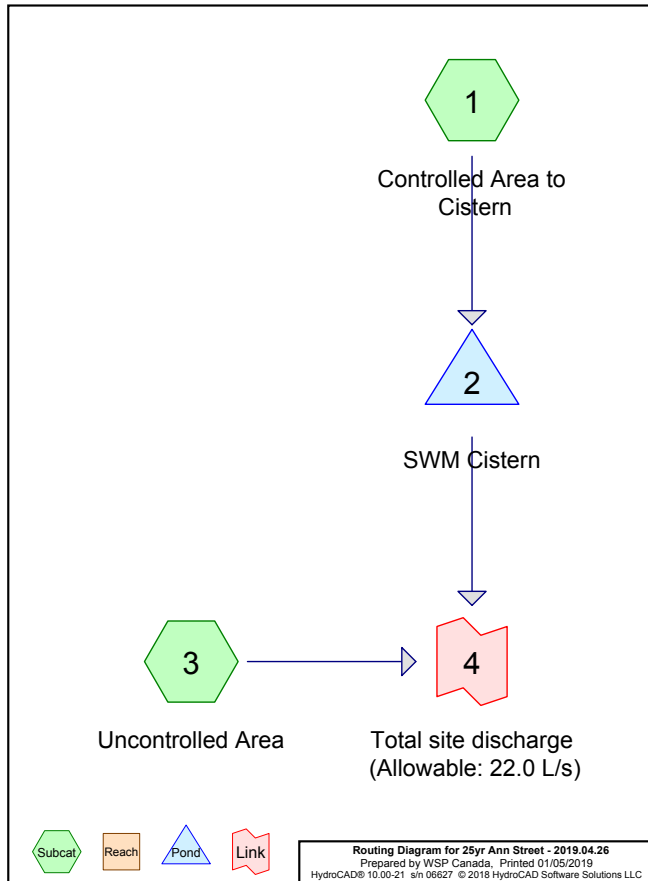
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 4: Total site discharge (Allowable: 22.0 L/s)



Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
87.1	0.99	*25yr coefficient value (3)
271.2	0.99	At grade impervious (1)
2,053.8	0.99	Impervious Roof (1)
226.4	0.28	Soft landscaping (1)
2,638.5	0.93	TOTAL AREA



25yr Ann Street - 2019.04.26

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Ground Covers (selected nodes)

HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover
0.0	0.0	0.0	0.0	87.1	87.1	*25yr coefficient value
0.0	0.0	0.0	0.0	271.2	271.2	At grade impervious
0.0	0.0	0.0	0.0	2,053.8	2,053.8	Impervious Roof
0.0	0.0	0.0	0.0	226.4	226.4	Soft landscaping
0.0	0.0	0.0	0.0	2,638.5	2,638.5	TOTAL AREA

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25yr Ann Street - 2019.04.26

Prepared by WSP Canada

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Mississauga IDF 25-Year Duration=29 min, Inten=74.8 mm/hr

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Controlled Area to Runoff Area=2,551.4 m² 91.13% Impervious Runoff Depth=34 mm
Tc=15.0 min C=0.93 Runoff=0.0493 m³/s 85.8 m³

Subcatchment 3: Uncontrolled Area Runoff Area=87.1 m² 100.00% Impervious Runoff Depth=36 mm
Tc=15.0 min C=0.99 Runoff=0.0018 m³/s 3.1 m³

Pond 2: SWM Cistern Peak Elev=2.592 m Storage=61.9 m³ Inflow=0.0493 m³/s 85.8 m³
Outflow=0.0180 m³/s 85.8 m³

Link 4: Total site discharge (Allowable: 22.0 L/s) Inflow=0.0197 m³/s 88.9 m³
Primary=0.0197 m³/s 88.9 m³

Total Runoff Area = 2,638.5 m² Runoff Volume = 88.9 m³ Average Runoff Depth = 34 mm
8.58% Pervious = 226.4 m² 91.42% Impervious = 2,412.1 m²

Summary for Subcatchment 1: Controlled Area to Cistern

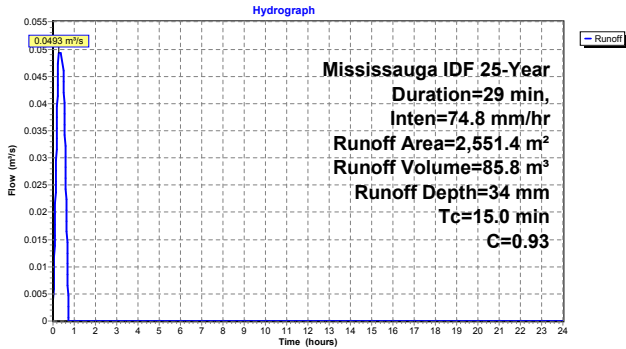
Runoff = 0.0493 m³/s @ 0.25 hrs, Volume= 85.8 m³, Depth= 34 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 25-Year Duration=29 min, Inten=74.8 mm/hr

Area (m²)	C	Description
2,053.8	0.99	Impervious Roof
226.4	0.28	Soft landscaping
271.2	0.99	At grade impervious
2,551.4	0.93	Weighted Average
226.4		8.87% Pervious Area
2,325.0		91.13% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern



Summary for Subcatchment 3: Uncontrolled Area

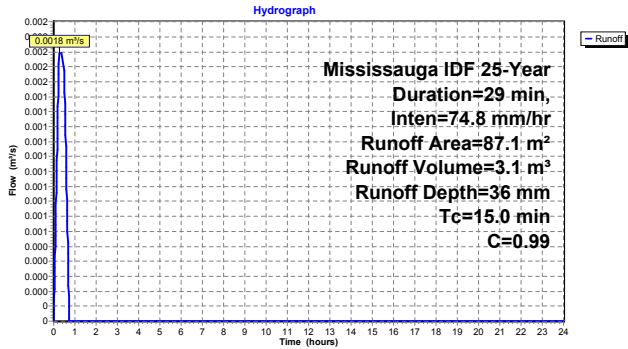
Runoff = 0.0018 m³/s @ 0.25 hrs, Volume= 3.1 m³, Depth= 36 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 25-Year Duration=29 min, Inten=74.8 mm/hr

Area (m²)	C	Description
87.1	0.99	*25yr coefficient value
87.1		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 3: Uncontrolled Area



Summary for Pond 2: SWM Cistern

Inflow Area = 2,551.4 m², 91.13% Impervious, Inflow Depth = 34 mm for 25-Year event
Inflow = 0.0493 m³/s @ 0.25 hrs, Volume= 85.8 m³
Outflow = 0.0180 m³/s @ 0.50 hrs, Volume= 85.8 m³, Atten= 63%, Lag= 15.0 min
Primary = 0.0180 m³/s @ 0.50 hrs, Volume= 85.8 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
Peak Elev= 2.592 m @ 0.64 hrs Surf.Area= 23.9 m² Storage= 61.9 m³ (48.6 m³ above start)

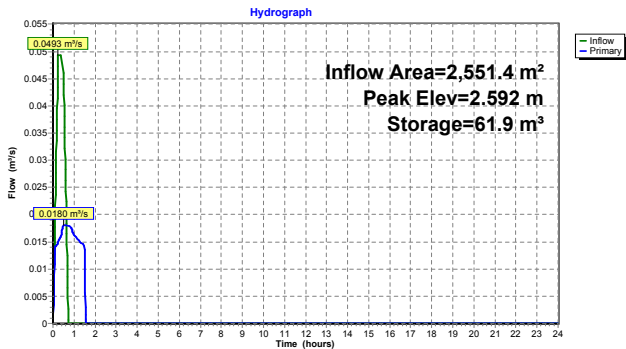
Plug-Flow detention time= 34.4 min calculated for 72.4 m³ (84% of inflow)
Center-of-Mass det. time= 25.1 min (47.1 - 22.0)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

Primary OutFlow Max=0.0180 m³/s @ 0.50 hrs HW=2.292 m (Free Discharge)
1=Pump (Pump Controls 0.0180 m³/s)

Pond 2: SWM Cistern

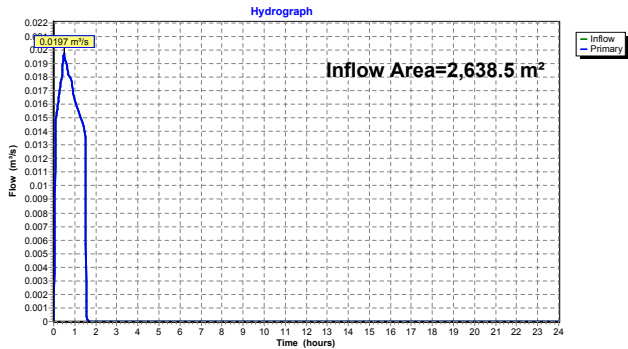


Summary for Link 4: Total site discharge (Allowable: 22.0 L/s)

Inflow Area = 2,638.5 m², 91.42% Impervious, Inflow Depth = 34 mm for 25-Year event
Inflow = 0.0197 m³/s @ 0.49 hrs, Volume= 88.9 m³
Primary = 0.0197 m³/s @ 0.49 hrs, Volume= 88.9 m³, Atten= 0%, Lag= 0.0 min

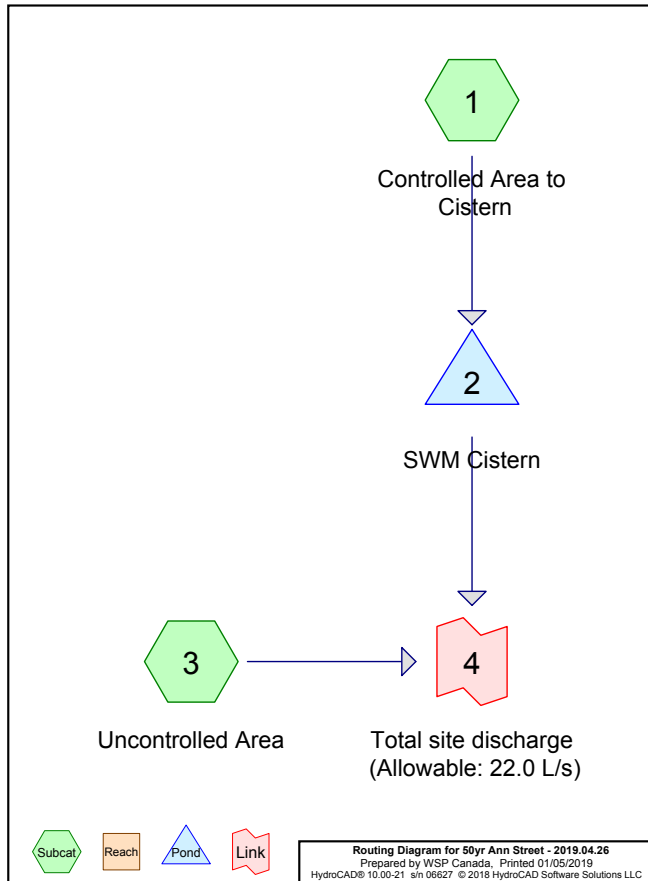
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 4: Total site discharge (Allowable: 22.0 L/s)



Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
87.1	1.00	*50yr coefficient value (3)
271.2	1.00	At grade impervious (1)
2,053.8	1.00	Impervious Roof (1)
226.4	0.30	Soft landscaping (1)
2,638.5	0.94	TOTAL AREA



Ground Covers (selected nodes)

HSG-A (sq-meters)	HSG-B (sq-meters)	HSG-C (sq-meters)	HSG-D (sq-meters)	Other (sq-meters)	Total (sq-meters)	Ground Cover
0.0	0.0	0.0	0.0	87.1	87.1	*50yr coefficient value
0.0	0.0	0.0	0.0	271.2	271.2	At grade impervious
0.0	0.0	0.0	0.0	2,053.8	2,053.8	Impervious Roof
0.0	0.0	0.0	0.0	226.4	226.4	Soft landscaping
0.0	0.0	0.0	0.0	2,638.5	2,638.5	TOTAL AREA

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Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Controlled Area to Runoff Area=2,551.4 m² 91.13% Impervious Runoff Depth=34 mm
Tc=15.0 min C=0.94 Runoff=0.0688 m³/s 86.7 m³

Subcatchment 3: Uncontrolled Area Runoff Area=87.1 m² 100.00% Impervious Runoff Depth=36 mm
Tc=15.0 min C=1.00 Runoff=0.0025 m³/s 3.1 m³

Pond 2: SWM Cistern Peak Elev=2.888 m Storage=69.0 m³ Inflow=0.0688 m³/s 86.7 m³
Outflow=0.0180 m³/s 86.7 m³

Link 4: Total site discharge (Allowable: 22.0 L/s) Inflow=0.0204 m³/s 89.9 m³
Primary=0.0204 m³/s 89.9 m³

Total Runoff Area = 2,638.5 m² Runoff Volume = 89.9 m³ Average Runoff Depth = 34 mm
8.58% Pervious = 226.4 m² 91.42% Impervious = 2,412.1 m²

Summary for Subcatchment 1: Controlled Area to Cistern

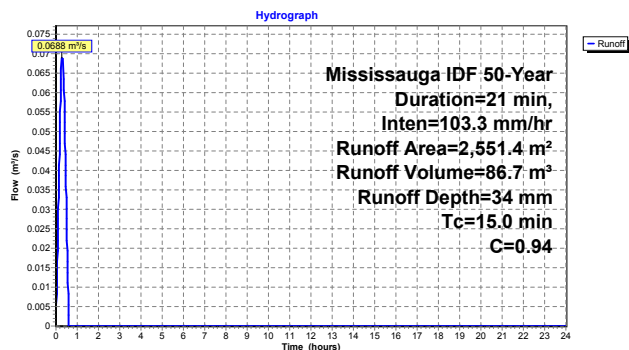
Runoff = 0.0688 m³/s @ 0.25 hrs, Volume= 86.7 m³, Depth= 34 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Mississauga IDF 50-Year Duration=21 min, Inten=103.3 mm/hr

Area (m²)	C	Description
2,053.8	1.00	Impervious Roof
226.4	0.30	Soft landscaping
271.2	1.00	At grade impervious
2,551.4	0.94	Weighted Average
226.4		8.87% Pervious Area
2,325.0		91.13% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 1: Controlled Area to Cistern



Summary for Subcatchment 3: Uncontrolled Area

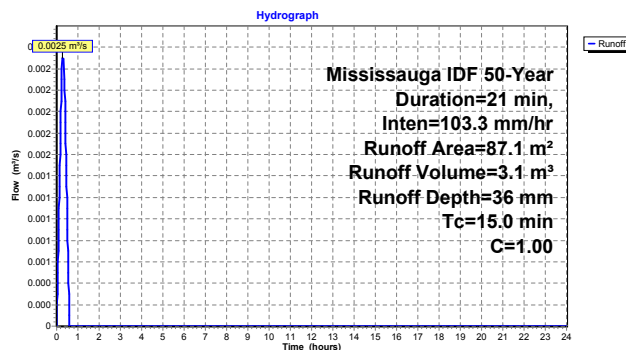
Runoff = 0.0025 m³/s @ 0.25 hrs, Volume= 3.1 m³, Depth= 36 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Mississauga IDF 50-Year Duration=21 min, Inten=103.3 mm/hr

Area (m²)	C	Description
87.1	1.00	*50yr coefficient value
87.1		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 3: Uncontrolled Area



Summary for Pond 2: SWM Cistern

Inflow Area = 2,551.4 m², 91.13% Impervious, Inflow Depth = 34 mm for 50-Year event
 Inflow = 0.0688 m³/s @ 0.25 hrs, Volume= 86.7 m³
 Outflow = 0.0180 m³/s @ 0.36 hrs, Volume= 86.7 m³, Atten= 74%, Lag= 6.6 min
 Primary = 0.0180 m³/s @ 0.36 hrs, Volume= 86.7 m³

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
 Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
 Peak Elev= 2.888 m @ 0.53 hrs Surf.Area= 23.9 m² Storage= 69.0 m³ (55.6 m³ above start)

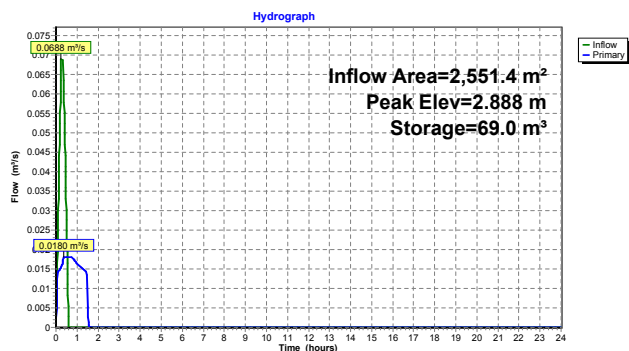
Plug-Flow detention time= 36.8 min calculated for 73.3 m³ (85% of inflow)
 Center-of-Mass det. time= 28.1 min (46.1 - 18.0)

Volume	Invert	Avail. Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

Primary OutFlow Max=0.0180 m³/s @ 0.36 hrs HW=2.255 m (Free Discharge)
 1=Pump (Pump Controls 0.0180 m³/s)

Pond 2: SWM Cistern

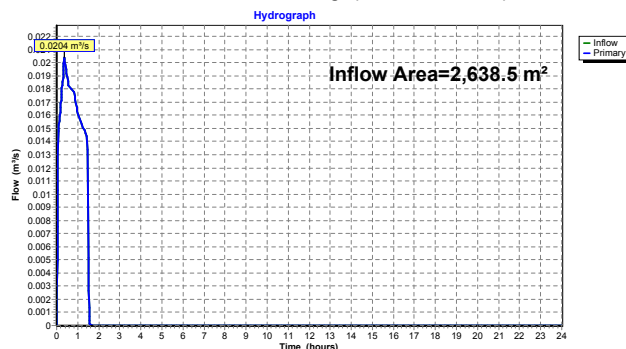


Summary for Link 4: Total site discharge (Allowable: 22.0 L/s)

Inflow Area = 2,638.5 m², 91.42% Impervious, Inflow Depth = 34 mm for 50-Year event
 Inflow = 0.0204 m³/s @ 0.36 hrs, Volume= 89.9 m³
 Primary = 0.0204 m³/s @ 0.36 hrs, Volume= 89.9 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 4: Total site discharge (Allowable: 22.0 L/s)



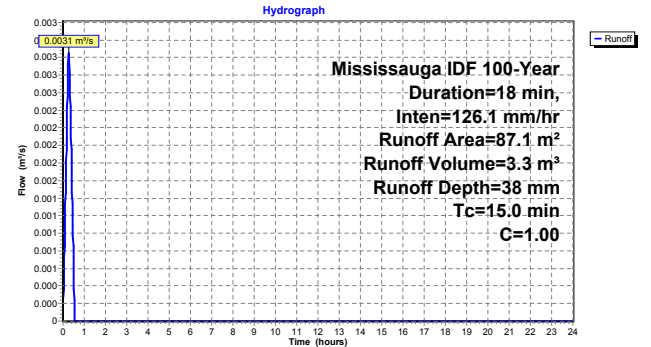
Summary for Subcatchment 3: Uncontrolled Area

Runoff = 0.0031 m³/s @ 0.25 hrs, Volume= 3.3 m³, Depth= 38 mm
Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Mississauga IDF 100-Year Duration=18 min, Inten=126.1 mm/hr

Area (m²)	C	Description
87.1	1.00	*100yr coefficient value
87.1		100.00% Impervious Area

Tc (min)	Length (meters)	Slope (m/m)	Velocity (m/sec)	Capacity (m³/s)	Description
15.0					Direct Entry,

Subcatchment 3: Uncontrolled Area



Summary for Pond 2: SWM Cistern

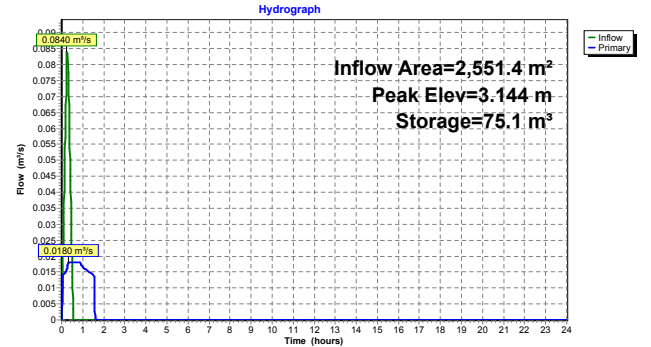
Inflow Area = 2,551.4 m², 91.13% Impervious, Inflow Depth = 36 mm for 100-Year event
Inflow = 0.0840 m³/s @ 0.25 hrs, Volume= 90.7 m³
Outflow = 0.0180 m³/s @ 0.31 hrs, Volume= 90.7 m³, Atten= 79%, Lag= 3.6 min
Primary = 0.0180 m³/s @ 0.31 hrs, Volume= 90.7 m³
Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs / 3
Starting Elev= 0.560 m Surf.Area= 23.9 m² Storage= 13.4 m³
Peak Elev= 3.144 m @ 0.50 hrs Surf.Area= 23.9 m² Storage= 75.1 m³ (61.8 m³ above start)
Plug-Flow detention time= 39.2 min calculated for 77.3 m³ (85% of inflow)
Center-of-Mass det. time= 30.8 min (47.3 - 16.5)

Volume	Invert	Avail.Storage	Storage Description
#1	0.000 m	88.4 m³	1.00 mW x 23.90 mL x 3.70 mH Prismatoid

Device	Routing	Invert	Outlet Devices
#1	Primary	0.560 m	Pump Discharges@2.250 m Flow (l/min)= 810.0 972.0 1,080.0 Head (meters)= 2.000 0.500 0.000

Primary OutFlow Max=0.0180 m³/s @ 0.31 hrs HW=2.264 m (Free Discharge)
1=Pump (Pump Controls 0.0180 m³/s)

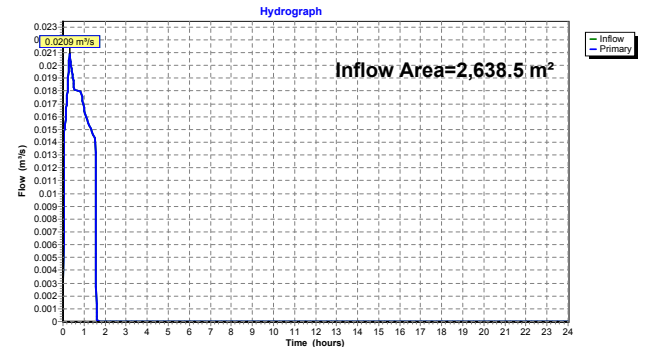
Pond 2: SWM Cistern



Summary for Link 4: Total site discharge (Allowable: 22.0 L/s)

Inflow Area = 2,638.5 m², 91.42% Impervious, Inflow Depth = 36 mm for 100-Year event
Inflow = 0.0209 m³/s @ 0.31 hrs, Volume= 94.0 m³
Primary = 0.0209 m³/s @ 0.31 hrs, Volume= 94.0 m³, Atten= 0%, Lag= 0.0 min
Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Link 4: Total site discharge (Allowable: 22.0 L/s)



APPENDIX

C

CORRESPONDENCE

Chen, Sharon

From: Ghazwan Yousif <Ghazwan.Yousif@mississauga.ca>
Sent: February-28-19 1:49 PM
To: Chen, Sharon
Cc: Mohino-Barrie, Alyssa
Subject: RE: Stormwater Management Inquiry: 22-28 Ann St. and 78 Park Street East

Hi Sharon,

In general, please note that the sewer around this area at capacity, so I am asking if you can provide us with a downstream analysis to verify there is capacity for your site to discharge to this sewer. For your questions see below my response in red

Regards,



Ghazwan Yousif M.Sc., P. Eng.
Storm Drainage Technologist, Environmental Services Team
T 905-615-3200 ext.3526
ghazwan.yousif@mississauga.ca

[City of Mississauga](#) | Transportation and Work Department,
Transportation & Infrastructure Planning Division

From: Chen, Sharon [mailto:Sharon.Chen@wsp.com]
Sent: Thursday, February 28, 2019 10:47 AM
To: Ghazwan Yousif
Cc: Mohino-Barrie, Alyssa
Subject: Stormwater Management Inquiry: 22-28 Ann St. and 78 Park Street East

Hello Ghazwan,

I am preparing the SWM Report for a redevelopment site near Ann Street and 78 Park Street E in Port Credit. The site is in the **Norval to Port Credit Subwatershed**, for which a Subwatershed Study is partially complete.

I have a few questions regarding the SWM criteria Mississauga's Development Requirements Manual summarized below.

- Quality Control
 - Is a stand-alone OGS or filter-based unit acceptable as water quality treatment? **Sure**
- Runoff Volume Reduction (Erosion Control/Water Balance)
 - First 5 mm of runoff to be retained on-site and managed by way of infiltration, evapotranspiration, or re-use. **Yes**
 - Is the use of initial abstractions to reduce amount of re-use required accepted by the City? (i.e. 5 mm initial abstraction for soft-landscapes, 1 mm for impervious surfaces) **No We don't allow Initial abstractions to be part of the 5mm**
 - Does the City accept irrigation of soft-landscaping and water for cleaning and maintenance as an acceptable method of water reuse? If not, what methods are accepted? **Yes**
- Quantity Control

- As per Table 2.01.03.03a of the City Development Requirements, no quantity control is required. In this case, the available storm sewer capacity would govern. **Based on the downstream analysis that requested above, we will have see what the best practise. Kepp in mind the sewer by your site is only 300mm storm.**
 - **If not, what would the quantity control requirement be?**
100-year post controlled to 2-year pre-development, or post to pre for all events up to the 100-year?
- Is the site subject to the partially complete Subwatershed Study? If so, are there any additional criteria required?

If you can provide any feedback, it would be greatly appreciated. Please do not hesitate to contact me if you have any questions

Warm Regards,

Sharon Chen, EIT
Designer
Water Resources
WSP Canada Inc.



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APPENDIX

D WATER QUALITY UNIT SPECIFICATIONS

Determining Number of Cartridges for Flow Based Systems

Date

20/03/2019

Black Cells = Calculation

Site Information

Project Name	22-28 Ann Street
Project Location	Mississauga, ON
OGS ID	OGS
Drainage Area, Ad	0.07 ac (0.0271 ha)
Impervious Area, Ai	0.07 ac
Pervious Area, Ap	0.00
% Impervious	100%
Runoff Coefficient, Rc	0.90
Treatment storm flow rate, Q_{treat}	0.03 cfs (0.9 L/s)
Peak storm flow rate, Q_{peak}	0.37 cfs (10.6 L/s)

Filter System

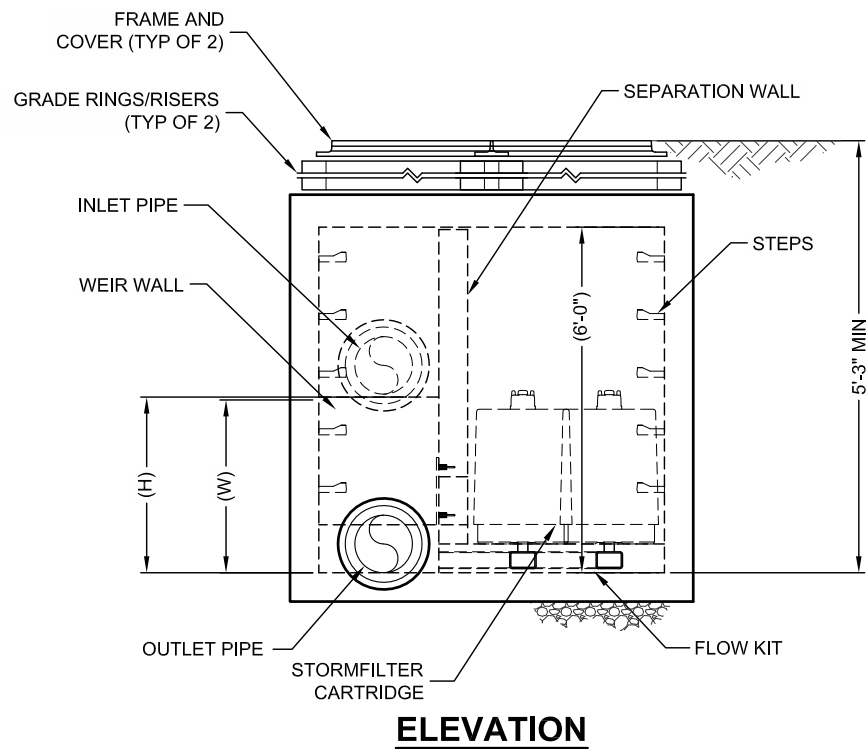
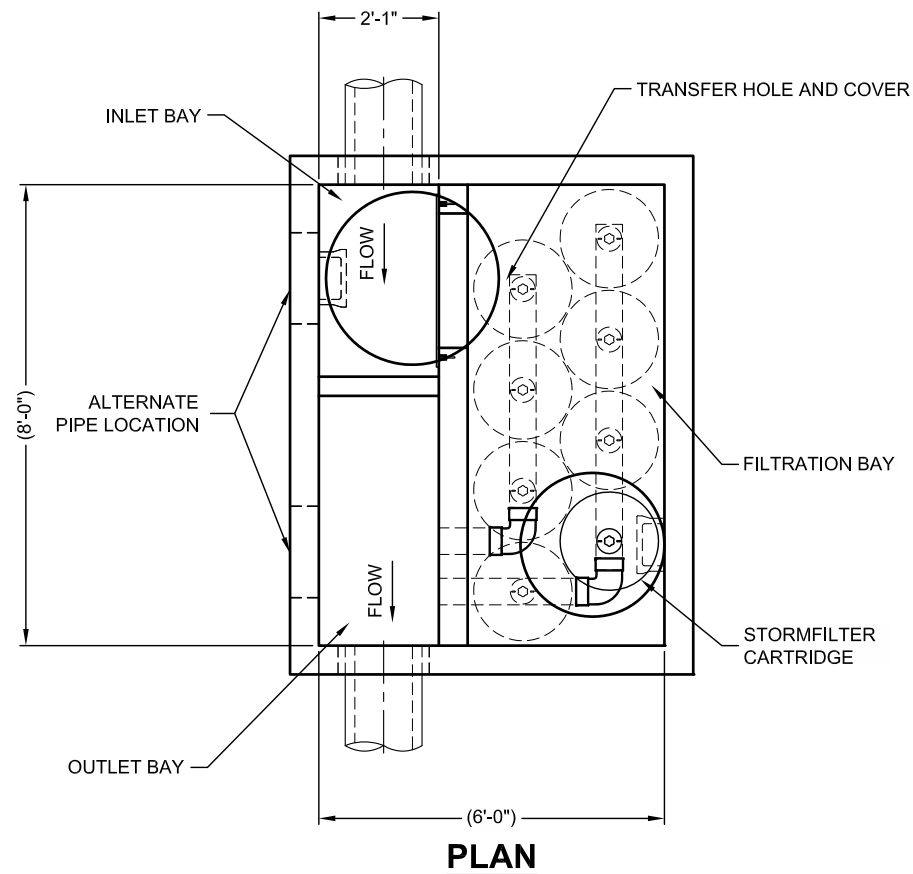
Filtration brand	StormFilter
Cartridge height	18 in
Specific Flow Rate	2.00 gpm/ft ²
Flow rate per cartridge	15.00 gpm

SUMMARY

Number of Cartridges	2
Media Type	Perlite

Event Mean Concentration (EMC)	150 mg/L
Annual TSS Removal	80%
Percent Runoff Capture	90%

Recommend SFPD0806 vault or CIP

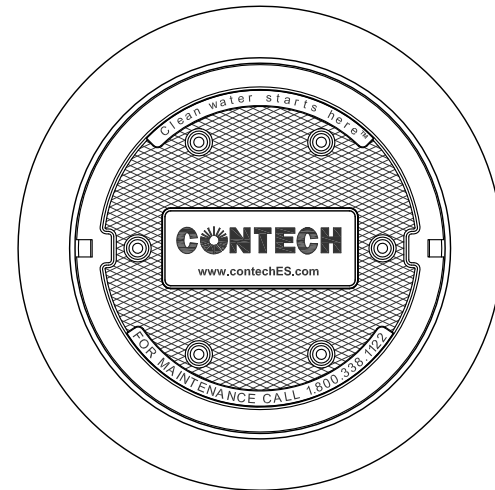


THE PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING:
U.S. PATENTS: 5,322,229; 5,344,476; 5,757,071; 5,846,185; 6,102,439; 6,149,040;
RELATED FOREIGN PATENTS, OR OTHER PATENTS PENDING.

STORMFILTER DESIGN TABLE

- THE 8' x 6' PEAK DIVERSION STORMFILTER TREATMENT CAPACITY VARIES BY CARTRIDGE COUNT AND LOCALLY APPROVED SURFACE AREA SPECIFIC FLOW RATE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD.
- THE PEAK DIVERSION STORMFILTER IS AVAILABLE IN A LEFT INLET (AS SHOWN) OR RIGHT INLET CONFIGURATION.
- ALL PARTS AND INTERNAL ASSEMBLY PROVIDED BY CONTECH UNLESS OTHERWISE NOTED.

CARTRIDGE HEIGHT	27"		18"		LOW DROP	
SYSTEM HYDRAULIC DROP (H - REQ'D. MIN.)	3.05'		2.3'		1.8'	
HEIGHT OF WEIR (W)	3.00'		2.25'		1.75'	
TREATMENT BY MEDIA SURFACE AREA	2 gpm/ft ²	1 gpm/ft ²	2 gpm/ft ²	1 gpm/ft ²	2 gpm/ft ²	1 gpm/ft ²
CARTRIDGE FLOW RATE (gpm)	22.5	11.25	15	7.5	10	5



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*		
WATER QUALITY FLOW RATE (cfs)	*		
PEAK FLOW RATE (cfs)	*		
RETURN PERIOD OF PEAK FLOW (yrs)	*		
# OF CARTRIDGES REQUIRED	*		
CARTRIDGE FLOW RATE	*		
MEDIA TYPE (CSF, PERLITE, ZPG)	*		
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE	*	*	*
OUTLET PIPE	*	*	*
INLET BAY RIM ELEVATION		*	
FILTER BAY RIM ELEVATION		*	
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

PERFORMANCE SPECIFICATION

FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. **RADIAL MEDIA DEPTH SHALL BE 7-INCHES**. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST **37 SECONDS**. SPECIFIC FLOW RATE SHALL BE **2 GPM/SF (MAXIMUM)**. SPECIFIC FLOW RATE IS THE MEASURE OF THE FLOW (GPM) DIVIDED BY THE MEDIA SURFACE CONTACT AREA (SF). MEDIA VOLUMETRIC FLOW RATE SHALL BE **6 GPM/CF OF MEDIA (MAXIMUM)**.

GENERAL NOTES

1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH () ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com
4. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
5. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.

INSTALLATION NOTES

- A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE (LIFTING CLUTCHES PROVIDED).
- C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL SECTIONS AND ASSEMBLE STRUCTURE.
- D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH OUTLET PIPE INVERT WITH OUTLET BAY FLOOR.
- E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.
- F. CONTRACTOR TO REMOVE THE TRANSFER HOLE COVER WHEN THE SYSTEM IS BROUGHT ONLINE.

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THE STORMWATER MANAGEMENT STORMFILTER
8' x 6' PEAK DIVERSION STORMFILTER
STANDARD DETAIL