2705460 ONTARIO INC.

112 MONTREAL ROAD
STORMWATER MANAGEMENT REPORT

SEPTEMBER 13, 2022

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STORMWATER MANAGEMENT REPORT

2705460 ONTARIO INC.

PROJECT NO.: 19M-01935-00
CLIENT REF:
DATE: SEPTEMBER 13, 2022

WSP
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2611 QUEENSVIEW DRIVE
OTTAWA, ON, CANADA K2B 8K2

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FIRST ISSUE

February 21, 2020	Draft for Client review			
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PREPARED BY

September 13, 2022

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Date

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September 13, 2022

Ayham Jadallah, M.A.Sc., P.Eng.
Project Engineer, Water Resources

Date

[1] Approval of this document is an administrative function indicating readiness for release and does not impart legal liability on to the Approver for any technical content contained herein. Technical accuracy and fit-for-purpose of this content is obtained through the review process. The Approver shall ensure the applicable review process has occurred prior to signing the document.

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1 INTRODUCTION

1.1 SCOPE

WSP Canada Group Ltd. was retained by 2705460 Ontario Inc. to conduct a stormwater management study to service the proposed redevelopment of the existing Econolodge site into a new group of residential towers.

1.2 SITE LOCATION

The existing site is located at 112 Montreal Road in Ottawa, Ontario, close to the south-west corner of the Montreal Road and Vanier Parkway intersection. The location of the proposed re-development is illustrated in **Figure 1**.

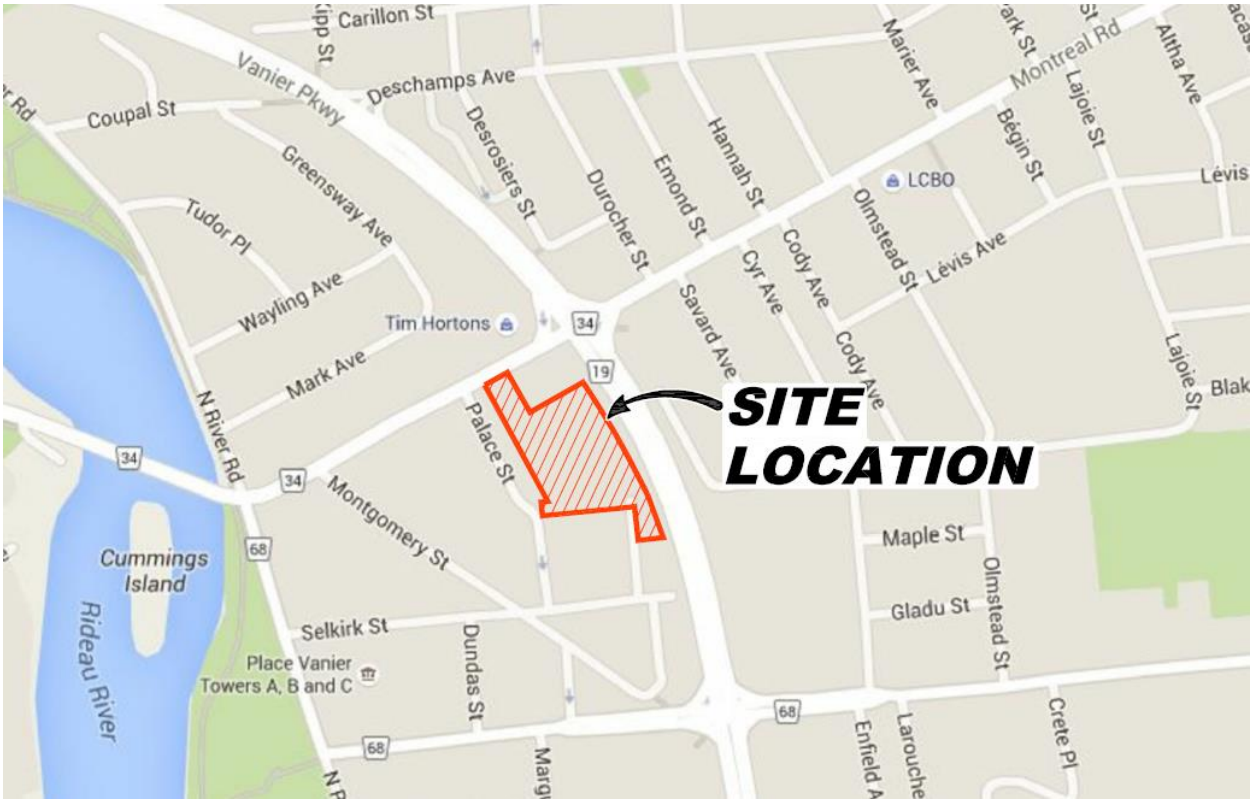

Figure 1: Site Location

1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

The objectives of the stormwater management plan are as follows:

- Determine site specific stormwater management requirements to ensure that the plan is in conformance with the City of Ottawa Sewer Design Guidelines, October 2012.
- 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 Ottawa (the City) was contacted to determine the stormwater management (SWM) requirements for discharge into the local City sewers for the project site. Joshua White at the City specified that flows greater than the 5-year flow generated from a runoff coefficient of 0.50 must be controlled on site up to the 100-year return period (consistent with Section 8.3.7.3 of the Ottawa Sewer Design Guidelines, October 2012).

The runoff coefficient used for design (100-year return period), was increased by 25% to comply with section 5.4.5.2.1 of the Ottawa Sewer Design Guidelines (October 2012).

As per section 8.3.7 of the Ottawa Sewer Design Guidelines "New development draining to an existing system that has no stormwater treatment facility may be subject to on-site treatment (i.e. best management practice, oil grit separators, etc.). Some existing areas within the City may be subject to a cash-in-lieu policy with respect to stormwater treatment. The designer must confirm with the City if the development area in question is subject to this policy". The City directed WSP to contact the Rideau Valley Conservation Authority (RVCA) to determine any applicable water quality criteria to be used in the design. The RVCA specified no treatment criteria for this site. A record of this conversation has been included in **Appendix A**. Similarly, the City has not specified any water quality requirements for use at this site. Therefore, none have been specifically included in the design.

In summary, the design criteria for stormwater management at the site are:

- Control the 100-year outflow from the site to the 5-year flow using a runoff coefficient of 0.50 and a T_c of 20 minutes; and
- No water quality treatment is required.

2 PRE-DEVELOPMENT CONDITIONS

2.1 GENERAL

The subject property pre-development includes an impervious at-grade parking lot, an existing group of commercial buildings (Econolodge) and a pervious landscaped area at the south-east corner of the project site. The total site area is 1.22 ha. Please refer to **Appendix B** for existing site conditions.

2.2 RAINFALL INFORMATION

The rainfall intensity is calculated in accordance with Section 5.4.2 of the Ottawa Sewer Design Guidelines (October 2012):

$$i = \left[\frac{A}{(Td + C)^B}\right]$$

Where;

- A, B, C = regression constants for each return period (defined in section 5.4.2)
- i = rainfall intensity (mm/hour)
- Td = storm duration (minutes)
- The IDF parameters/regression constants are included in **Appendix C**.

2.3 ALLOWABLE FLOW RATES

As noted in section 1.4, the City of Ottawa specified the allowable discharge rate from this site as the 5-year flow generated from a runoff coefficient of 0.50, controlled on site up to the 100-year return period.

The allowable release rate to the municipal storm sewer system from the proposed development is 119 l/sec, based on the 5-year pre-development flow rate calculated with a runoff coefficient value of 0.50.

The calculated peak flow rates for the site in the pre-development condition are summarized below in Table 2-1. Detailed calculations are contained within Appendix C.

Table 2-1: Pre-Development Peak Flow Rate Calculations (Runoff Coefficient, C = 0.50 and T_c=20 min)

RETURN PERIOD (YEARS)	RAINFALL INTENSITY (MM/HOUR)	PEAK FLOW RATE (L/SEC)	TARGET RELEASE RATE (L/SEC)
2	52.0	88.2	**119.0**
5	70.3	**119.0**	
10	82.2	139.3	
25	97.3	164.8	
50	108.5	183.8	
100	120.0	203.2	

3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

The project proposals consist of a mixed-use development with 2 towers; a 37-storey residential tower (Tower B1), and an 8-storey mixed use building (Tower A). A multi-level basement structure is proposed over the majority of the project site area. As described further in subsequent sections of the report, a SWM cistern will be provided at the south end of the site with a connection to Montreal Road. Please refer to **Appendix D** for an illustration of the project (Storm Drainage Area Plan).

The analysis for the site and the sizing of the cistern has been completed with provisions for future development in the southeast quadrant of the site. A runoff coefficient of 0.8 has been assigned to represent the future land-use in this area (S06 and S07 on the Storm Drainage Area Plan).

The following assumptions have been used to quantify stormwater runoff for modelling/analysis purposes: 100% of proposed roof surfaces have been considered as impervious, and the top level of the rooftop area of each tower will be available for temporary surface ponding (via drainage by controlled discharge roof drains).

The entire project area will comply with the target allowable release rate.

3.2 QUANTITY CONTROL

As noted in section 2.3, the target allowable discharge rate to the municipal sewer system from the site is 119 L/sec. This is equivalent to the peak runoff rate under pre-development conditions during a 5-year design storm event with a runoff coefficient of 0.50. Compliance with the target offsite discharge rate will be achieved through use of controlled flow rooftop drains, and the provision of an underground cistern storage structure. Post-development runoff calculations have accounted for uncontrolled runoff from portions of the site that will not drain to storage features.

A cistern was identified as the preferred storage option given the substantial underground parking requirement for the site; surface storage was not considered a viable option and was not accounted for in this analysis.

The cistern is designed to receive runoff (for all events up to and including the 100-year return period), from roof surfaces and at-grade areas within the development area. The controlled and uncontrolled project areas are illustrated in **Appendix E**. The cistern will discharge to the existing municipal storm sewer system via gravity, and peak outflow rates will be controlled via a vortex flow control device (**Appendix F**).

To satisfy net target release rates for controlled and uncontrolled site areas, the recommended peak discharge rate for flow control device is 110 L/sec. If a storm event that occurs fills the cistern, the access hatch at the top of the cistern would allow water to spill to Palace Street. major system. It is noted that the return period associated with an overflow event requiring these facilities to spill would exceed 100-years.

As per the Site Servicing Plan Drawing, discharge from the cistern is proposed to the Montreal Road trunk storm sewer. This trunk storm sewer is 1050mm and it is believed that the City's flow control requirements for the site (which currently drains to this same storm sewer) are sufficient to ensure that there will be no adverse surcharging of the storm sewer.

As noted above, the top level of the rooftop area of each tower will be available for temporary surface ponding (via drainage by controlled discharge roof drains), and the remaining roof areas will drain directly to the cistern without any rooftop storage. Calculations were done based on the roof drain layouts, with four roof drains on Tower A and 6 roof drains on Tower B1. For modelling purposes, these outlets were simulated using rating curves for a *Watts Accutrol* product (in the "fully closed" position) (**Appendix F)**.

Appendix E illustrates the small portions of the project site that will drain offsite uncontrolled in post-development conditions. These uncontrolled runoff rates contribute to the total allowable release rate modelled.

A HydroCAD model of the project was constructed and utilized to include:

- storage and controlled release of stormwater from top level of rooftop areas (Towers A and B1) to the cistern;
- runoff from the remaining rooftop areas (Towers A and B1) directly to the cistern;
- controlled runoff from at-grade areas directed to the cistern; and
- uncontrolled runoff rates generated from at grade areas (S08 and S09)

The Modified Rational Method (an inherent subroutine of the HydroCAD software) has been used for the modelling exercise, and the model has informed the maximum storage volume used in the stormwater cistern based on the proposed flow. Flow rates generated from uncontrolled drainage areas within the project site and controlled flow from the cistern meet the target offsite discharge rate required (119 l/s).

The rainfall intensity and storm duration combination resulting in the largest peak flow discharged to the sewer system occurs at the critical storm duration, t_d= 10 minutes for the 100-year event (determined iteratively using HydroCAD). A summary of the model results and storage controls are listed in Table 3-1 to

Table 3-3 and the full modelling output is included in **Appendix G**.

The modelled post-development peak flow rates comply with the allowable release rate for the 100-year return period (**Table 3-1**).

Table 3-1 Post-Development Modelling Results (A)

RETURN PERIOD (YEARS)	MODELLED POST-DEV.PEAK FLOW RATE (L/SEC)[1]	ALLOWABLE RELEASE RATE (L/SEC)
5	97.8	119
100	106.0	

[1] *Includes flow rates generated from uncontrolled drainage areas within the project site and controlled flow from the cistern*

The HydroCAD analysis completed allows the performance of the SWM drainage system to be verified in all possible storm durations (based on Modified Rational method calculations) and helps identify the critical duration for different components of the system. For example, the critical storm duration for the cistern (resulting in maximum storage utilized) was found to be t_d = 32 minutes. A summary of these modelling results is provided below.

The results show that the maximum utilized storage volume in the Cistern is 309 m^3 to control the 100-year post-development runoff **(Table 3-2**).

Table 3-2 Post-Development Modelling Results (B)

RETURN PERIOD (YEARS)	MAXIMUM UTILIZED STORAGE AND ASSOCIATED PEAK FLOW (L/s)	
	(m^3)	(L/s)
100	309	97.6

[1] *Critical duration resulting in maximum storage utilized in the cistern*

Maximum rooftop storage volumes and release rates (based on the critical duration for each of the different components of the system), in addition to uncontrolled flow rates generated from uncontrolled areas are provided in **Table 3-3**.

Table 3-3 Post-Development Modelling Results (C)

RETURN PERIOD (YEARS)	ROOFTOP MAXIMUM STORAGE VOLUME & PEAK RELEASE RATE[1]				UNCONTROLLED FLOW RATE[2] (L/s)
	TOWER A		TOWER B1		
	(m^3)	(L/s)	(m^3)	(L/s)	
5	6.7	1.2	11.3	1.9	6.1
100	16.2	1.2	26.9	1.9	15.8

[1] *Based on the critical duration resulting in maximum storage utilized on each roof surface*

[2] *Based on the critical duration resulting in the maximum flow released*

3.3 WATER QUALITY CONTROL

As per Section 1.4, no water quality treatment is required.

3.4 EROSION CONTROL

Please refer to the Erosion and Sedimentation Control plan drawing C.05 as part of the Engineering Drawing Set.

4 RIDEAU RIVER FLOOD PLAIN

The RVCA were consulted to obtain flood plain mapping for the Rideau River in the vicinity of the subject site. Please refer to mapping excerpt provided in **Appendix H**.

It is noted that the 100-year flood plain extends onto Montreal Road, to a modelled elevation of 56.52 m (cross section reference 2474). The site design has accounted for this by setting the minimum ground elevation at the project threshold to an elevation of 56.62 m (refer to Grading and Drainage Plan Drawing C.02 for details), and by specifying the use of non-return backflow preventers within the flow control device associated with the cistern.

5 CONCLUSIONS

A stormwater management plan has been prepared to support the site plan application for the 112 Montreal Road development in the City of Ottawa. The key points are summarized below.

WATER QUANTITY

Controlled runoff collected from the project site will be directed to a stormwater cistern with a minimum active storage volume of 309 m^3 to control the 100-year event. Discharge from the cistern to the municipal storm sewer will be controlled using a vortex flow control device (specified with a peak discharge rate of 98 l/sec).

For the 100-year return period, the uncontrolled runoff (A-06 and A-07) and flow control from the cistern directed to the municipal storm sewer system, will comply with the allowable 5-year release rate of 119 l/sec (calculated using a runoff coefficient of 0.50 and a T_c of 20 minutes).

WATER QUALITY

No specific water quality treatment features are required.

This report demonstrates that the proposed SWM strategy will address stormwater management related impacts from this project and meet the requirements of the City of Ottawa.

APPENDIX

A RVCA CORRESPONDENCE

MMM GROUP

1145 Hunt Club Road, Suite 300
Ottawa, Ontario K1V 0Y3
Tel: (613) 736-7200
Fax: (613) 736-8710

TELECOM RECORD

W.O.: 1013081
DATE: August 11, 2014
TIME: 2:30
CALL FROM: Bryan Orendorff
REPRESENTING: MMM
CALL TO: Brandon Williams
REPRESENTING: RVCA

REGARDING: SWM requirements for proposed 112 Montreal Road Development

DISCUSSION: MMM contacted the RVCA to determine if they had any SWM requirements for the proposed site. The City had previously directed MMM to take this action. Brandon replied that the RVCA did not anticipate any involvement was required on their part for this site from a floodplain perspective (the site is outside the floodplain) and that they typically would not comment on a site application until it was circulated to them by the City. He indicated that the RVCA in this case could rely on the City to ensure that all appropriate requirements were being met.

ACTION: No actions required.

CC:

APPENDIX

B EXISTING SITE CONDITIONS

METRIC
DISTANCES AND ELEVATIONS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

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LEGEND

■	– SURVEY MONUMENT FOUND
SIB	– STANDARD IRON BAR
SSIB	– SHORT STANDARD IRON BAR
IB	– IRON BAR
MN&W	– MAGNETIC NAIL & WASHER
ø	– ROUND
(P)	– PLAN 5R–6112
(P1)	– PLAN 5R–258
(M)	– MEASURED
(S)	– SET
(857)	– FAIRHALL, MOFFATT & WOODLAND LIMITED, O.L.S.
(CITY)	– CITY OF OTTAWA
(SU)	– SOURCE UNKNOWN
(WIT)	– WITNESS
PIN	– PROPERTY IDENTIFIER NUMBER
DIA.	– DIAMETER
INV.	– INVERT
BLDG	– BUILDING
E	– EAST
W	– WEST
N	– NORTH
▲	– PROJECT CONTROL MONUMENT
▭ P	– PILLAR
▥ CB	– CATCH BASIN
○ MH	– MANHOLE
● LS	– LAMP STANDARD
⊗ UP	– UTILITY POLE
⌖ FH	– FIRE HYDRANT
⋈ WV	– WATER VALVE
◕ BH	– BOREHOLE
⊠ BP	– BELL PEDESTAL
◎ JB	– JUNCTION BOX
◉ FP	– FLAG POLE
←	– GUY WIRE AND ANCHOR
•	– BOLLARD
⊥	– SIGN
✷	– CONIFEROUS TREE
✿	– DECIDUOUS TREE
☁	– SHRUB
♿	– HANDICAP
▨	– NO PARKING
—W—	– WATERMAIN
— · —	– OVERHEAD UTILITY WIRES
—UH—	– UNDERGROUND HYDRO
—UB—	– UNDERGROUND BELL
—G—	– GAS MAIN
—ST—	– STORM SEWER
—S—	– SANITARY SEWER
—R—	– ROGERS CABLE
═	– CURB

TOPOGRAPHIC SURVEY OF
LOT 5 AND PART OF LOTS 6 AND 7
BLOCK 2
REGISTERED PLAN 29
AND
LOT 88 AND PART OF LOTS 40 & 41
REGISTERED PLAN 49
CITY OF OTTAWA

SCALE 1 : 250
0 5 10 20 25 metres

FAIRHALL, MOFFATT & WOODLAND LIMITED
ONTARIO LAND SURVEYORS

ELEVATION NOTES

1. ELEVATIONS SHOWN HEREON ARE REFERRED TO GEODETIC DATUM.

2. ELEVATIONS FOR MANHOLE COVERS AND CATCH BASINS HAVE TO BE INDEPENDENTLY CONFIRMED BEFORE THEY CAN BE ACCEPTED FOR FINAL DESIGN OR CONSTRUCTION PURPOSES.

3. IT IS THE RESPONSIBILITY OF THE USER OF THIS INFORMATION TO VERIFY THAT THE JOB BENCHMARKS HAVE NOT BEEN ALTERED OR DISTURBED AND THAT THEIR RELATIVE ELEVATION AND DESCRIPTION AGREE WITH THE INFORMATION SHOWN ON THIS DRAWING.

UTILITY NOTES

1. THIS DRAWING CANNOT BE ACCEPTED AS ACKNOWLEDGING ALL OF THE UNDERGROUND UTILITIES AND IT WILL BE THE RESPONSIBILITY OF THE USER TO CONTACT THE RESPECTIVE UTILITY AUTHORITIES FOR CONFIRMATION OR LOCATION.

2. UNDERGROUND UTILITIES, AS REPORTED ON THIS DRAWING, ARE NOT BASED ON AN ACTUAL 'FIELD LOCATE' BY THE RESPECTIVE UTILITY AGENCIES BUT HAVE BEEN COMPILED FROM DATA OBTAINED FROM THE FOLLOWING SOURCE:
   a) CITY OF OTTAWA PUBLIC UTILITIES REGISTRY

3. BEFORE ANY WORK INVOLVING PROBING, EXCAVATING, ETC., A FIELD LOCATION OF UNDERGROUND PLANT BY THE PERTINENT UTILITY AUTHORITY IS MANDATORY.

NOTES

1. BEARINGS ARE ASTRONOMIC AND ARE DERIVED FROM THE WESTERLY LIMIT OF PART 1, PLAN 5R–6112 SHOWN AS HAVING A BEARING OF N 28°27'30" W.

2. REVISION: JULY 16, 2014 – ADDED UTILITIES ALONG VANIER PARKWAY AND INTERSECTION OF VANIER PARKWAY AND MONTREAL ROAD.

THIS IS NOT A VALID COPY UNLESS EMBOSSED WITH SEAL

SURVEYOR'S CERTIFICATE

I CERTIFY THAT:
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT, THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.

2. THE SURVEY WAS COMPLETED ON JULY 12, 2014.

DATE

JOHN H. GUTRI
ONTARIO LAND SURVEYOR

INVERT TABLE

NUMBER	ELEVATION	INVERTS	NUMBER	ELEVATION	INVERTS
MH#1	56.52	53.86 North	CB#11	56.21	55.55 Northwest
		53.89 South			Full of Debris
MH#2	56.37	54.24 North	CB#12	56.71	55.40 South
		54.44 South	CB#13	56.73	55.74 East
		54.34 South			Full of Debris & Water
MH#3	56.06	53.42 North			
		Full of Water	MH#14	56.81	55.41 North
MH#4	56.11	53.69 East			55.38 South
		53.65 North	CB#15	56.90	Inaccessible
CB#5	56.00	Invert Inaccessible	MH#16	57.45	55.13 North
CB#6	56.11	Northeast Inaccessible			55.12 South
		55.01 Southeast	CB#17	57.31	55.52 Inv.
MH#7	56.22	West Inaccessible			55.87 West
		54.05 East	MH#18	56.70	54.07 North
CB#8	55.80	54.86 North			54.06 South
		54.80 West	MH#19	56.50	53.89 North
CB#9	55.79	Inaccessible			53.90 South
CB#10	55.82	Inaccessible	CB#20	56.33	55.52 West

Fairhall Moffatt & Woodland
LIMITED
OTTAWA
ONTARIO LAND SURVEYORS
Surveying and Land Information Services
100–600 TERRY FOX DRIVE, KANATA, ONTARIO K2L 4B6
TEL: (613) 591–2580 FAX: (613) 591–1495
www.fmw.on.ca

JOB No.
T 2 5 6 0 0

E 370053, N 5032955

REFERENCE No.
21(a)–49, 15(a)–29

S:\JOBS\T25600\DWG 2014–07–17
TP256T.DWG (nj)

APPENDIX

C PRE-DEVELOPMENT CALCULATIONS

	Stormwater Management Calculations	Project: 112 Montreal Road	No.: 19M-01935-00	
	Pre-Dev Release Rates	By: JW Checked: MH	Date: 5/7/2021	Page: 1

Step 1: Determine Pre-development Flow using Rational Formula

* Runoff Coefficient, C in accordance with City of Ottawa Sewer Design Guidelines (section 8.3.7.3)

Runoff Coefficient, C = 0.5 -

Rainfall intensity calculated in accordance with City of Ottawa Sewer Design Guidelines (section 5.4.2):

$$i = \left[\frac{A}{(Td + C)^B}\right]$$

Where: A, B, C = regression constants for each return period (defined in section 5.4.2)
i = rainfall intensity (mm/hour)
Td = storm duration (minutes) 180 minutes

Time of Concentration = 20 minutes
Catchment Area = 1.22 ha

Return Period	2	5	10	25	50	100
a =	733.0	998.1	1,174.2	1,402.9	1,569.6	1,735.7
b =	0.810	0.814	0.816	0.819	0.820	0.820
c =	6.199	6.053	6.014	6.018	6.014	6.014
$Intensity_{peak}$ (mm/hr) =	52.0	70.3	82.2	97.3	108.5	120.0
Q_{peak} (L/s) =	88.2	119.0	139.3	164.8	183.8	203.2
Q_{peak} (m^3/s) =	0.088	0.119	0.139	0.165	0.184	0.203

Return Period = 5 year
Q = 119.0 L/s Pre-development flow rate

Conclusion:

The 5-year pre-development flow rate for a 20 minute Tc governs the 100-year maximum post-development release rate and is 120.5 L/s.

Filepath:

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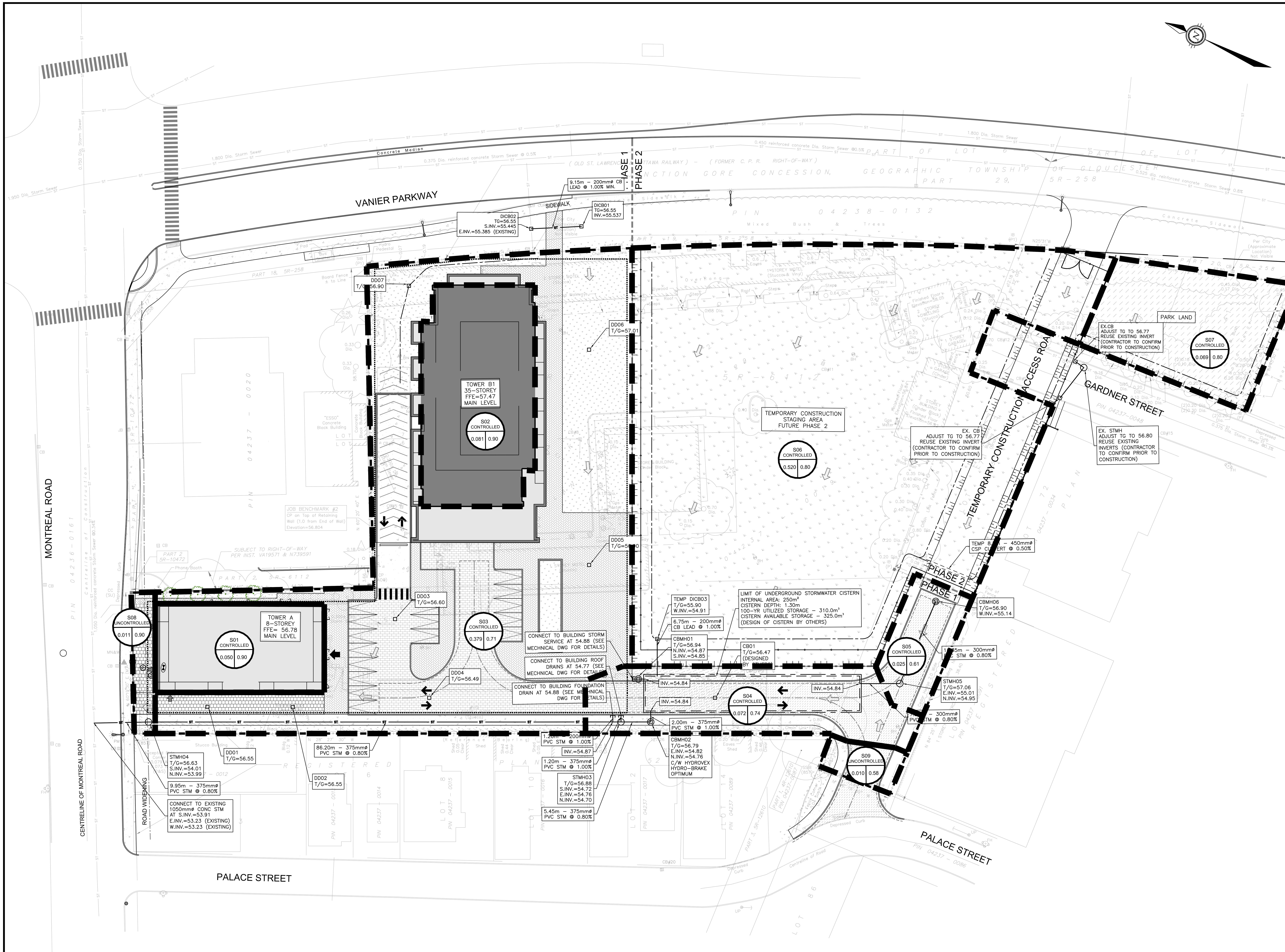
APPENDIX

D PROPOSED SITE DRAWINGS

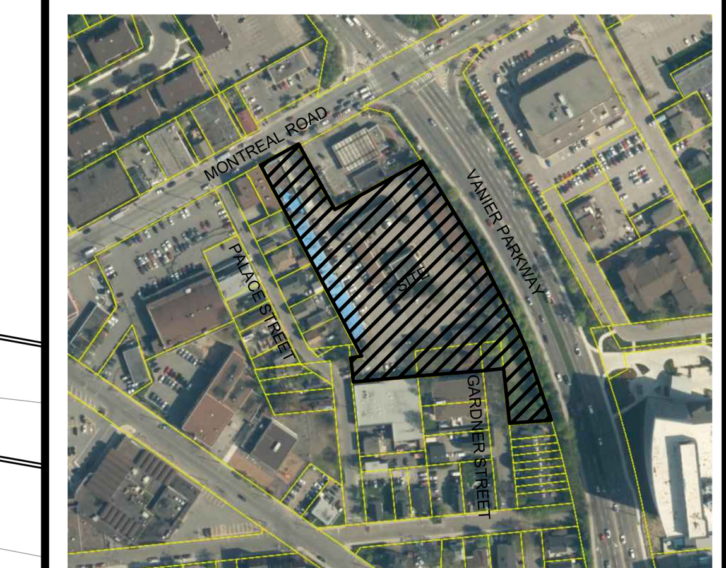


VANIER PARKWAY
MONTREAL ROAD
PALACE STREET
GARDNER STREET
PHASE 1
PHASE 2
TOWER B1
35-STOREY
FFE=57.47
MAIN LEVEL
TOWER A
8-STOREY
FFE= 56.78
MAIN LEVEL
TEMPORARY CONSTRUCTION STAGING AREA FUTURE PHASE 2
TEMPORARY CONSTRUCTION ACCESS ROAD
PARK LAND
S01 CONTROLLED 0.050 0.90
S02 CONTROLLED 0.081 0.90
S03 CONTROLLED 0.379 0.71
S04 CONTROLLED 0.072 0.74
S05 CONTROLLED 0.025 0.61
S06 CONTROLLED 0.520 0.80
S07 CONTROLLED 0.069 0.80
S08 UNCONTROLLED 0.011 0.90
S09 UNCONTROLLED 0.010 0.58
LIMIT OF UNDERGROUND STORMWATER CISTERN
INTERNAL AREA: 250m²
CISTERN DEPTH: 1.30m
100-YR UTILIZED STORAGE – 310.0m³
CISTERN AVAILABLE STORAGE – 325.0m³
(DESIGN OF CISTERN BY OTHERS)
DICB02 TG=56.55 S.INV.=55.445 E.INV.=55.385 (EXISTING)
DICB01 TG=56.55 INV.=55.537
9.15m – 200mmø CB LEAD @ 1.00% MIN.
CBMH01 T/G=56.94 N.INV.=54.87 S.INV.=54.85
CBMH02 T/G=56.79 E.INV.=54.82 N.INV.=54.76 C/W HYDROVEX HYDRO-BRAKE OPTIMUM
CBMH06 T/G=56.90 W.INV.=55.14
STMH03 T/G=56.88 S.INV.=54.72 E.INV.=54.76 N.INV.=54.70
STMH04 T/G=56.63 S.INV.=54.01 N.INV.=53.99
STMH05 T/G=57.06 E.INV.=55.01 N.INV.=54.95
CONNECT TO EXISTING 1050mmø CONC STM AT S.INV.=53.91 E.INV.=53.23 (EXISTING) W.INV.=53.23 (EXISTING)
CONNECT TO BUILDING STORM SERVICE AT 54.88 (SEE MECHANICAL DWG FOR DETAILS)
CONNECT TO BUILDING ROOF DRAINS AT 54.77 (SEE MECHANICAL DWG FOR DETAILS)
CONNECT TO BUILDING FOUNDATION DRAIN AT 54.88 (SEE MECHANICAL DWG FOR DETAILS)
EX. CB ADJUST TG TO 56.77 REUSE EXISTING INVERT (CONTRACTOR TO CONFIRM PRIOR TO CONSTRUCTION)
EX. STMH ADJUST TG TO 56.80 REUSE EXISTING INVERTS (CONTRACTOR TO CONFIRM PRIOR TO CONSTRUCTION)
ROAD WIDENING
CENTRELINE OF MONTREAL ROAD

GENERAL NOTES:

THE ENGINEER WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS WHICH ARISE FROM FAILURE TO FOLLOW THE PLANS, SPECIFICATIONS AND THE DESIGN INTENT THEY CONVEY, OR FOR PROBLEMS WHICH ARISE FROM OTHERS' FAILURE TO OBTAIN AND/OR FOLLOW THE ENGINEER'S GUIDANCE WITH RESPECT TO ANY ERRORS, OMISSIONS, INCONSISTENCIES AMBIGUITIES OR CONFLICTS WHICH ARE ALLEGED.

CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.



KEY PLAN
(N.T.S)

No.	REVISIONS	BY	DATE
01	ISSUED FOR SPA	D.Y.	2022-09-08

HORIZONTAL SCALE:
SCALE: 1:300

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

LICENSED PROFESSIONAL ENGINEER
D. B. YANG
100230568
2022-09-08
PROVINCE OF ONTARIO

NOT VALID UNLESS SIGNED AND DATED

wsp
2611 Queensview Dr. Ottawa, ON Canada K2B 8K2
t: 613.829.2800 f: 613.829.8299 www.wspgroup.com

CLIENT

2705460 ONTARIO INC.
C/O ANAND AGGARWAL
MANOR PARK MANAGEMENT
231 BRITTANY DRIVE, SUITE D
OTTAWA, ON K1K 0R8

rla/architecture
roderick lahey architect inc.
56 beech street, ottawa, ontario K1S 3J6
t. 613.724.9932 f. 613.724.1209 rlaarchitecture.ca

ANNIS,O'SULLIVAN, VOLLEBEKK
Ontario Land Surveyors
14 CONCOURSE GATE, SUITE 500, NEPEAN, ONTARIO, K2E 7S6
TEL.(613)727-0850 FAX(613)727-1079

DESIGNED BY:	DRAWN BY:	APPROVED BY:
D.Y.	J.T.	D.Y.

PROJECT

112 MONTREAL ROAD
RESIDENTIAL DEVELOPMENT

DRAWING TITLE

STORM DRAINAGE
AREA PLAN

PROJECT NO.
19M-01935-00

DRAWING NO.
C04

D07-XX-XX-XXXX

#XXXX

APPENDIX

E CATCHMENT PLAN

GENERAL NOTES:

THE ENGINEER WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS WHICH ARISE FROM FAILURE TO FOLLOW THE PLANS, SPECIFICATIONS AND THE DESIGN INTENT THEY CONVEY, OR FOR PROBLEMS WHICH ARISE FROM OTHERS' FAILURE TO OBTAIN AND/OR FOLLOW THE ENGINEER'S GUIDANCE WITH RESPECT TO ANY ERRORS, OMISSIONS, INCONSISTENCIES AMBIGUITIES OR CONFLICTS WHICH ARE ALLEGED.

CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.

KEY PLAN
(N.T.S)

No.	REVISIONS	BY	DATE
01	ISSUED FOR SPA	D.Y.	2022-09-08

HORIZONTAL SCALE:
5m 2 0 5 10m
SCALE: 1:300

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

LICENSED PROFESSIONAL ENGINEER
D. B. YANG
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2022-09-08
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TEL.(613)727-0850 FAX(613)727-1079

DESIGNED BY:	DRAWN BY:	APPROVED BY:
D.Y.	J.T.	D.Y.

PROJECT
112 MONTREAL ROAD
RESIDENTIAL DEVELOPMENT

DRAWING TITLE
STORM DRAINAGE
AREA PLAN

PROJECT NO.: 19M-01935-00
DRAWING NO.: C04

D07-XX-XX-XXXX

#XXXX

FILENAME: V:\1b-13 MILO\19M-01935-00 - 112 Montreal Road - Site Plan\3. Drawings\Working drawings\19M-01935-00_C_NEW.dwg
PLOTDATE: Sep 07, 2022 - 5:34pm, cawy069741

APPENDIX

F SUPPORTING DOCUMENTS

APPENDIX

F-1 HYDRO-BRAKE RATING CURVE

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	2.000	98.000
Flush-Flo™	0.671	97.653
Kick-Flo®	1.418	82.712
Mean Flow		82.694

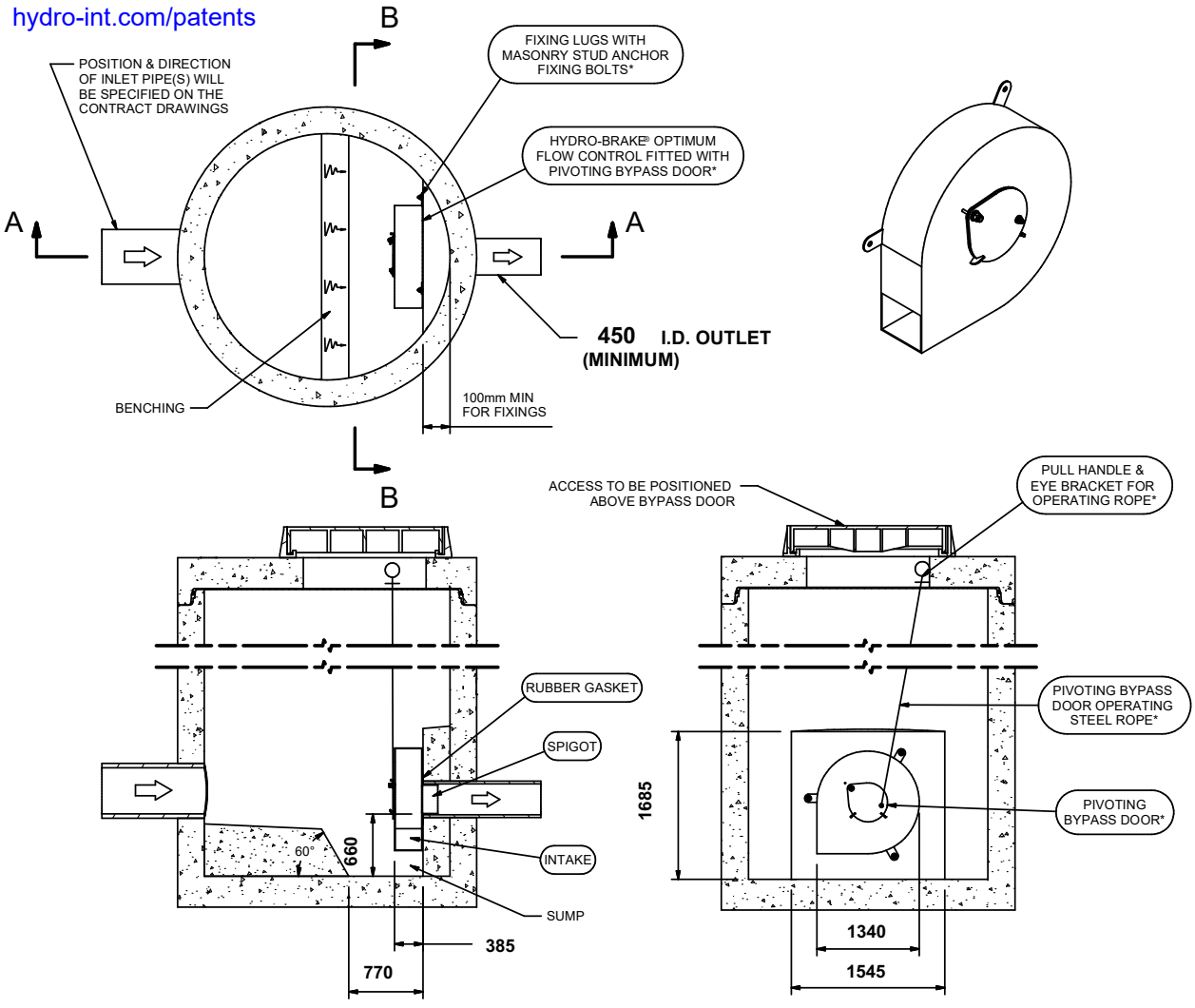
Hydro-Brake® Optimum Flow Control including:

- **5 mm** grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet

BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE 08/4596

WRc Approved PT/329/0412

hydro-int.com/patents



SECTION A-A

SECTION B-B

IMPORTANT: LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE

The head/flow characteristics of this SHE-0379-9800-2000-9800 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.
The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International®

DATE	3/3/2020 9:29 PM
SITE	
DESIGNER	**Michael Stewart**
REF	

SHE-0379-9800-2000-9800

Hydro-Brake® Optimum

 Hydro International Ltd, 94 Hutchins Drive, Portland, Maine, 04102-1930. Tel; +1 (207) 756 6200 Fax; +1 (207) 756 6212 Web; www.hydro-int.com Email; enquiries@hydro-int.com

michael.stewart@wsp.com

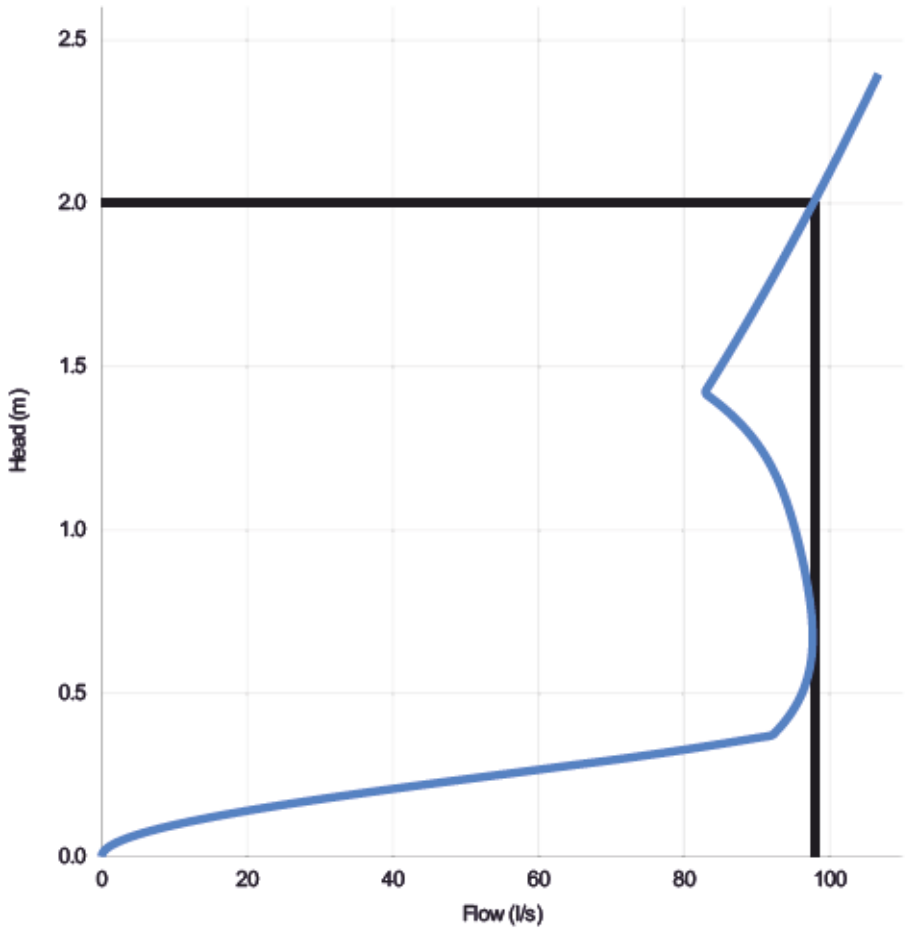
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	2.000	98.000
Flush-Flo	0.671	97.653
Kick-Flo®	1.418	82.712
Mean Flow		82.694

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

WRc APPROVED
PT/329/0412

hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.069	5.223
0.138	19.426
0.207	39.978
0.276	63.440
0.345	85.082
0.414	93.850
0.483	95.829
0.552	96.996
0.621	97.547
0.690	97.641
0.759	97.411
0.828	96.960
0.897	96.359
0.966	95.642
1.034	94.799
1.103	93.775
1.172	92.463
1.241	90.714
1.310	88.336
1.379	85.109
1.448	83.571
1.517	85.475
1.586	87.335
1.655	89.154
1.724	90.936
1.793	92.681
1.862	94.393
1.931	96.073
2.000	97.723

DESIGN ADVICE

The head/flow characteristics of this SHE-0379-9800-2000-9800 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modeling evaluates the full head/flow characteristic curve.

! **The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.**

Hydro International

DATE	3/3/2020 9:29 PM
Site	
DESIGNER	Michael Stewart
Ref	

SHE-0379-9800-2000-9800

Hydro-Brake Optimum®

APPENDIX

F-2 WATTS ACUTROL ROOF DRAIN

WATTS®	Adjustable Accutrol Weir Tag: _____	Adjustable Flow Control for Roof Drains

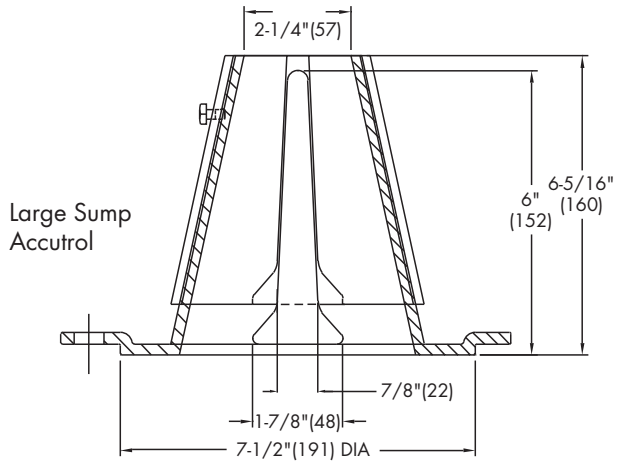
ADJUSTABLE ACCUTROL (for Large Sump Roof Drains only)

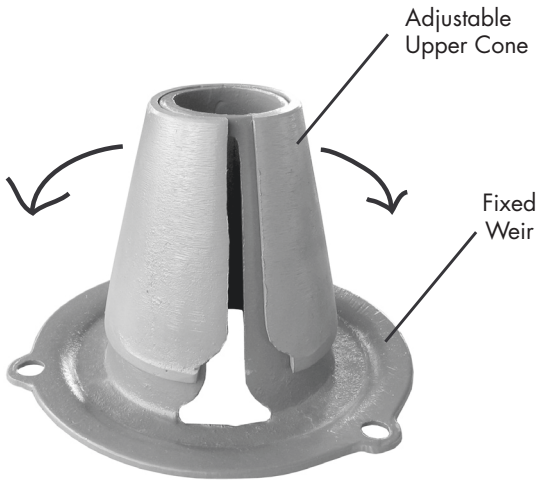
For more flexibility in controlling flow with heads deeper than 2", Watts Drainage offers the Adjustable Accutrol. The Adjustable Accutrol Weir is designed with a single parabolic opening that can be covered to restrict flow above 2" of head to less than 5 gpm per inch, up to 6" of head. To adjust the flow rate for depths over 2" of head, set the slot in the adjustable upper cone according to the flow rate required. Refer to Table 1 below.
Note: Flow rates are directly proportional to the amount of weir opening that is exposed.

EXAMPLE:

For example, if the adjustable upper cone is set to cover 1/2 of the weir opening, flow rates above 2"of head will be restricted to 2-1/2 gpm per inch of head.

Therefore, at 3"of head, the flow rate through the Accutrol Weir that has 1/2 the slot exposed will be:
[5 gpm (per inch of head) x 2 inches of head] + 2-1/2 gpm (for the third inch of head) = 12-1/2 gpm.





1/2 Weir Opening Exposed Shown Above

TABLE 1. Adjustable Accutrol Flow Rate Settings

Weir Opening Exposed	1"	2"	3"	4"	5"	6"
	Flow Rate (gallons per minute)					
Fully Exposed	5	10	15	20	25	30
3/4	5	10	13.75	17.5	21.25	25
1/2	5	10	12.5	15	17.5	20
1/4	5	10	11.25	12.5	13.75	15
Closed	5	5	5	5	5	5

Job Name _____ Contractor _____

Job Location _____ Contractor's P.O. No. _____

Engineer _____ Representative _____

WATTS®
A Watts Water Technologies Company

USA: Tel: (800) 338-2581 • Fax: (828) 248-3929 • Watts.com
Canada: Tel: (905) 332-4090 • Fax: (905) 332-7068 • Watts.ca
Latin America: Tel: (52) 81-1001-8600 • Fax: (52) 81-8000-7091 • Watts.com

APPENDIX

G HYDROCAD MODEL OUTPUT

	Stormwater Management Calculations	Project: 112 Montreal Road	No.: 19M-01935-00	
	HydroCAD Model Build	By: KK Checked: AJ	Date: 2022-09-06	Page: 1

Catchment Information

Catchment ID	Status	Area (ha.)	Area (m^2)	C_5-year	C_100-year	Routing	HydroCAD Node
S01	Controlled	0.05	500	0.9	1.00	Cistern	11S/10S
S02	Controlled	0.081	810	0.9	1.00	Cistern	12S/10S
S03	Controlled	0.379	3,790	0.71	0.89	Cistern	9S
S04	Controlled	0.072	720	0.74	0.93	Cistern	9S
S05	Controlled	0.025	250	0.61	0.76	Cistern	9S
S06	Controlled	0.52	5,200	0.8	1.00	Cistern	9S
S07	Controlled	0.069	690	0.8	1.00	Cistern	9S
S08	Uncontrolled	0.011	110	0.9	1.00	Outlet	14S
S09	Uncontrolled	0.01	100	0.58	0.73	Outlet	14S
	TOTAL	*1.217*	*12,170*	*0.77*	*0.95*		

Total Site Area 1.22 ha

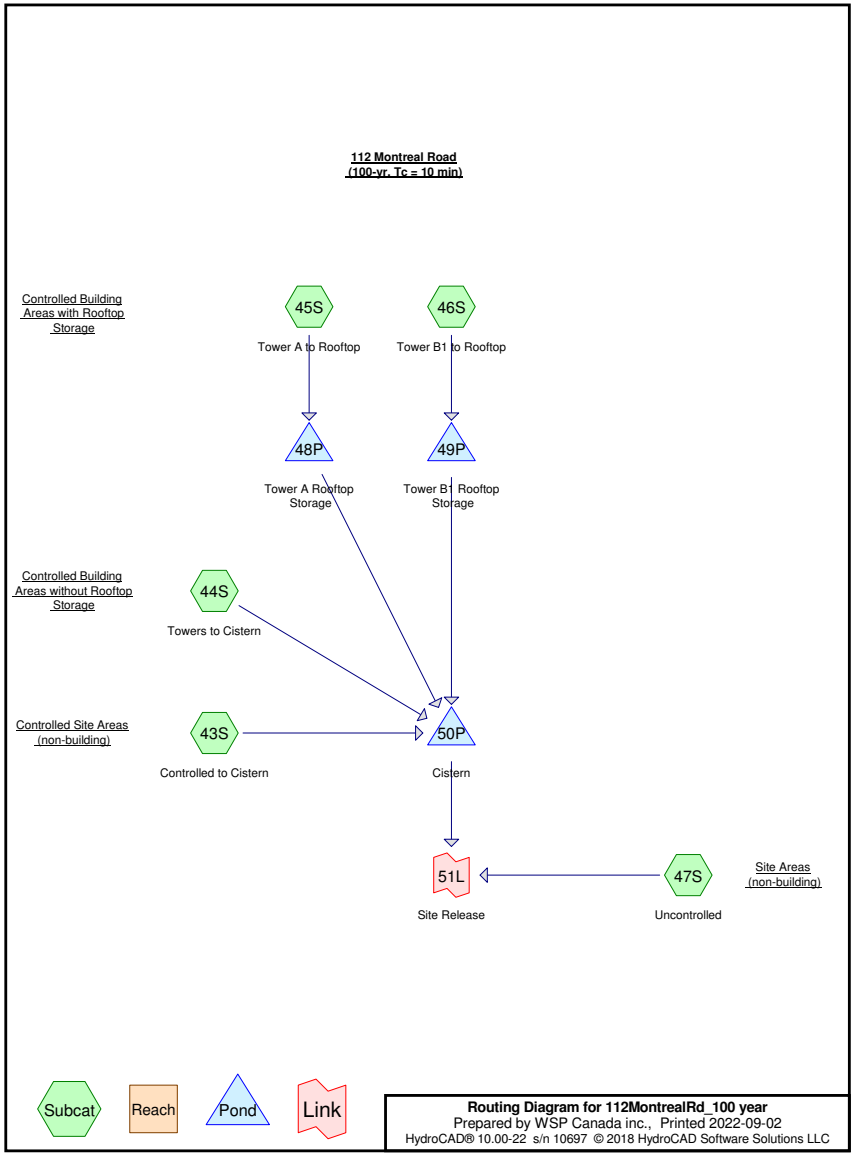
Roof Drains

							WATT Drains	
Catchment ID	Status	Common Name	Area (ha.)	Area (m^2)	Area to Cistern 1 (m^2)	Area controlled by Rooftop (m^2)	Number of Drains	Area Per Drain
S01	Controlled	Building	0.05	500	125	**375**	4	93.8
S02	Controlled	Building	0.081	810	200	**610**	6	101.7

METRIC	Flow Rate (m3/sec)					
Water Depth (mm)	**25.4**	**50.8**	**76.2**	**101.6**	**127.0**	**152.4**
Water Depth (m)	**0.02540**	**0.05080**	**0.07620**	**0.10160**	**0.12700**	**0.15240**
Fully Exposed	0.000315451	0.000630902	0.000946353	0.001261804	0.001577255	0.001892706
3/4	0.000315451	0.000630902	0.00086749	0.001104079	0.001340667	0.001577255
1/2	0.000315451	0.000630902	0.000788628	0.000946353	0.001104079	0.001261804
1/4	0.000315451	0.000630902	0.000709765	0.000788628	0.00086749	0.000946353
Closed	0.000315451	0.000315451	0.000315451	0.000315451	0.000315451	0.000315451

APPENDIX

G-1 *5-YEAR ANALYSIS (PEAK DISCHARGE)*



Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
3,790.0	0.71	S03 (43S)
720.0	0.74	S04 (43S)
250.0	0.61	S05 (43S)
5,200.0	0.80	S06 (43S)
690.0	0.80	S07 (43S)
105.0	0.90	S08 (47S)
99.0	0.58	S09 (47S)
500.0	0.90	Tower A (44S, 45S)
810.0	0.90	Tower B1 (44S, 46S)
12,164.0	**0.77**	**TOTAL AREA**

Time span=0.00-4.00 hrs, dt=0.01 hrs, 401 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 43S: Controlled to Cistern Runoff Area=10,650.0 m² Runoff Depth=17 mm
Tc=10.0 min C=0.76 Runoff=0.1686 m³/s 182.0 m³

Subcatchment 44S: Towers to Cistern Runoff Area=325.0 m² Runoff Depth=20 mm
Tc=10.0 min C=0.90 Runoff=0.0061 m³/s 6.6 m³

Subcatchment 45S: Tower A to Rooftop Runoff Area=375.0 m² Runoff Depth=20 mm
Tc=10.0 min C=0.90 Runoff=0.0070 m³/s 7.6 m³

Subcatchment 46S: Tower B1 to Rooftop Runoff Area=610.0 m² Runoff Depth=20 mm
Tc=10.0 min C=0.90 Runoff=0.0114 m³/s 12.3 m³

Subcatchment 47S: Uncontrolled Runoff Area=204.0 m² Runoff Depth=17 mm
Tc=10.0 min C=0.74 Runoff=0.0031 m³/s 3.4 m³

Pond 48P: Tower A Rooftop Storage Peak Elev=100.068 m Storage=5.8 m³ Inflow=0.0070 m³/s 7.6 m³
Outflow=0.0012 m³/s 7.6 m³

Pond 49P: Tower B1 Rooftop Storage Peak Elev=100.069 m Storage=9.7 m³ Inflow=0.0114 m³/s 12.3 m³
Outflow=0.0019 m³/s 12.3 m³

Pond 50P: Cistern Peak Elev=55.237 m Storage=99.2 m³ Inflow=0.1777 m³/s 208.6 m³
Primary=0.0957 m³/s 208.6 m³ Secondary=0.0000 m³/s 0.0 m³ Outflow=0.0957 m³/s 208.6 m³

Link 51L: Site Release Inflow=0.0978 m³/s 212.0 m³
Primary=0.0978 m³/s 212.0 m³

Total Runoff Area = 12,164.0 m² Runoff Volume = 212.0 m³ Average Runoff Depth = 17 mm

Summary for Subcatchment 43S: Controlled to Cistern

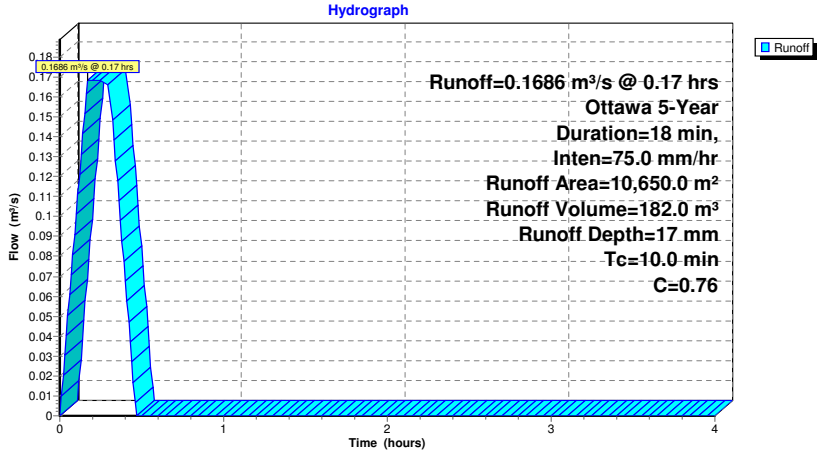
Runoff = 0.1686 m³/s @ 0.17 hrs, Volume= 182.0 m³, Depth= 17 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 5-Year Duration=18 min, Inten=75.0 mm/hr

Area (m²)	C	Description
3,790.0	0.71	S03
5,200.0	0.80	S06
720.0	0.74	S04
250.0	0.61	S05
690.0	0.80	S07
10,650.0	0.76	Weighted Average

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

Subcatchment 43S: Controlled to Cistern



Summary for Subcatchment 44S: Towers to Cistern

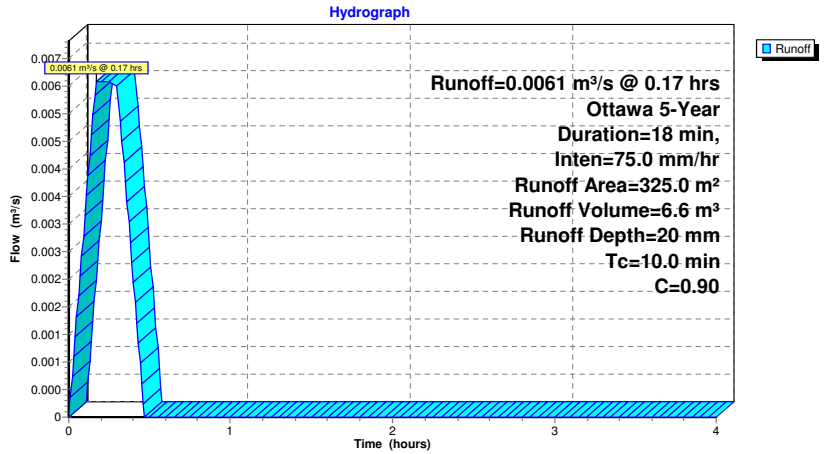
Runoff = 0.0061 m³/s @ 0.17 hrs, Volume= 6.6 m³, Depth= 20 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 5-Year Duration=18 min, Inten=75.0 mm/hr

Area (m²)	C	Description
125.0	0.90	Tower A
200.0	0.90	Tower B1
325.0	0.90	Weighted Average

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

Subcatchment 44S: Towers to Cistern



Summary for Subcatchment 45S: Tower A to Rooftop

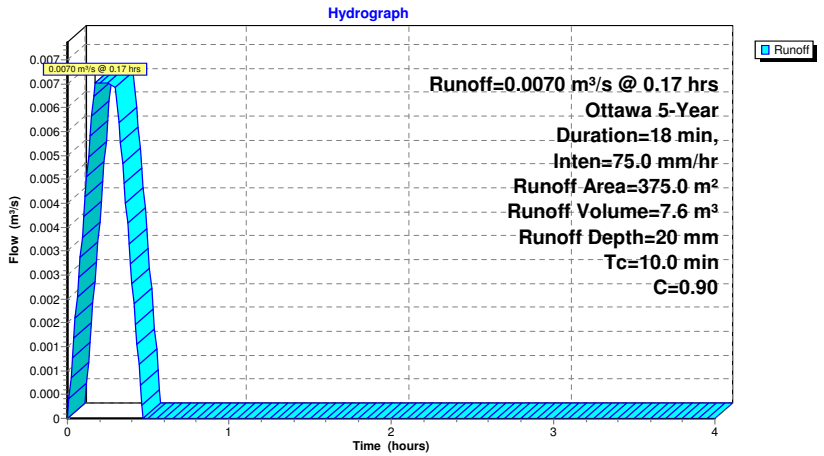
Runoff = 0.0070 m³/s @ 0.17 hrs, Volume= 7.6 m³, Depth= 20 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 5-Year Duration=18 min, Inten=75.0 mm/hr

Area (m²)	C	Description
375.0	0.90	Tower A

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

Subcatchment 45S: Tower A to Rooftop



Summary for Subcatchment 46S: Tower B1 to Rooftop

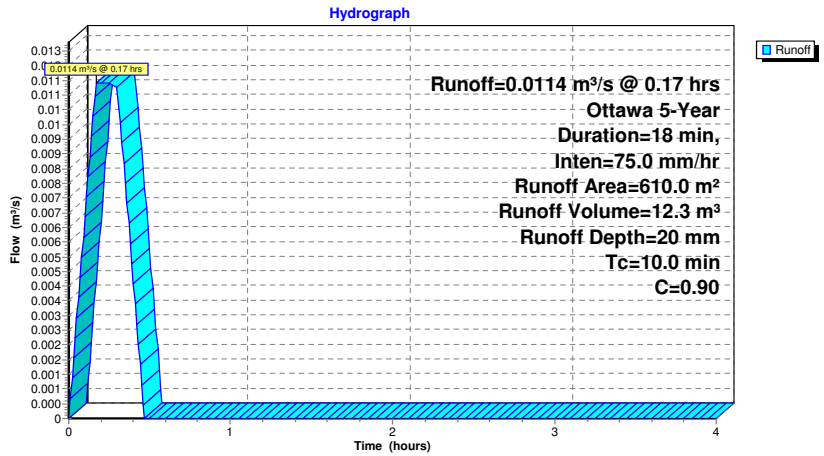
Runoff = 0.0114 m³/s @ 0.17 hrs, Volume= 12.3 m³, Depth= 20 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 5-Year Duration=18 min, Inten=75.0 mm/hr

Area (m²)	C	Description
610.0	0.90	Tower B1

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

Subcatchment 46S: Tower B1 to Rooftop



Summary for Subcatchment 47S: Uncontrolled

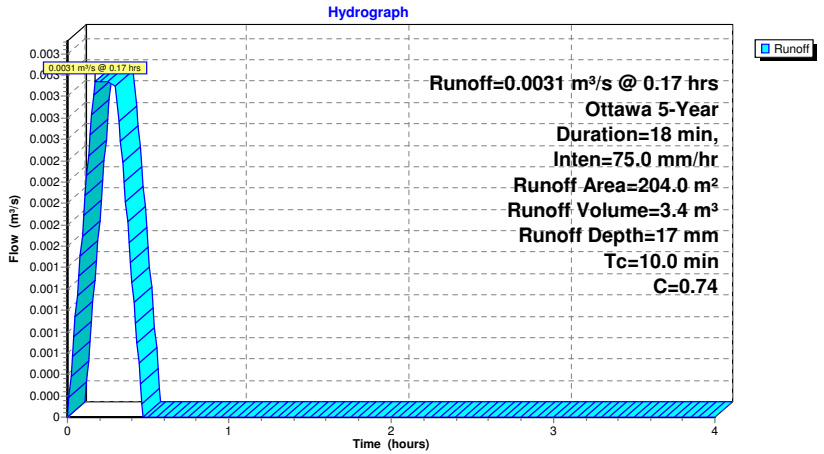
Runoff = 0.0031 m³/s @ 0.17 hrs, Volume= 3.4 m³, Depth= 17 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 5-Year Duration=18 min, Inten=75.0 mm/hr

Area (m²)	C	Description
99.0	0.58	S09
105.0	0.90	S08
204.0	0.74	Weighted Average

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

Subcatchment 47S: Uncontrolled



Summary for Pond 48P: Tower A Rooftop Storage

Inflow Area = 375.0 m², Inflow Depth = 20 mm for 5-Year event
Inflow = 0.0070 m³/s @ 0.17 hrs, Volume= 7.6 m³
Outflow = 0.0012 m³/s @ 0.12 hrs, Volume= 7.6 m³, Atten= 82%, Lag= 0.0 min
Primary = 0.0012 m³/s @ 0.12 hrs, Volume= 7.6 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 100.068 m @ 0.44 hrs Surf.Area= 170.7 m² Storage= 5.8 m³

Plug-Flow detention time= 40.7 min calculated for 7.6 m³ (100% of inflow)
Center-of-Mass det. time= 40.7 min (54.7 - 14.0)

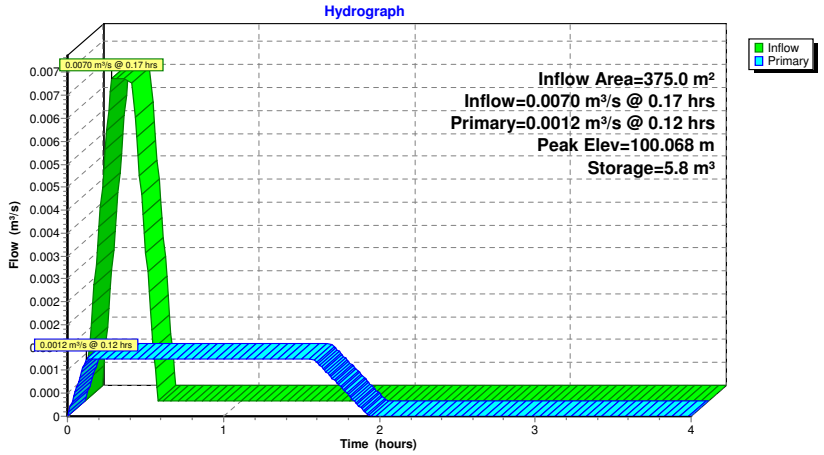
Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	28.1 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 4

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
100.000	0.0	0.0	0.0
100.150	93.7	7.0	7.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.000 m	**WATTS Accutrol_5-Closed X 4.00** Head (meters) 0.000 0.025 0.051 0.076 0.102 0.127 0.152 Disch. (m³/s) 0.00000 0.00031 0.00031 0.00031 0.00031 0.00031 0.00031

Primary OutFlow Max=0.0012 m³/s @ 0.12 hrs HW=100.026 m (Free Discharge)
↳**1=WATTS Accutrol_5-Closed** (Custom Controls 0.0012 m³/s)

Pond 48P: Tower A Rooftop Storage



Summary for Pond 49P: Tower B1 Rooftop Storage

Inflow Area = 610.0 m², Inflow Depth = 20 mm for 5-Year event
Inflow = 0.0114 m³/s @ 0.17 hrs, Volume= 12.3 m³
Outflow = 0.0019 m³/s @ 0.12 hrs, Volume= 12.3 m³, Atten= 84%, Lag= 0.0 min
Primary = 0.0019 m³/s @ 0.12 hrs, Volume= 12.3 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 100.069 m @ 0.44 hrs Surf.Area= 280.8 m² Storage= 9.7 m³

Plug-Flow detention time= 44.9 min calculated for 12.3 m³ (100% of inflow)
Center-of-Mass det. time= 45.0 min (59.0 - 14.0)

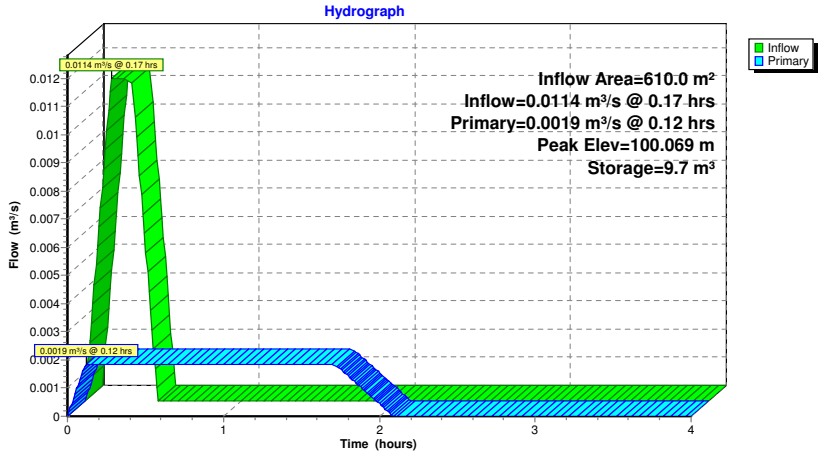
Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	45.7 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 6

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
100.000	0.0	0.0	0.0
100.150	101.6	7.6	7.6

Device	Routing	Invert	Outlet Devices
#1	Primary	100.000 m	**WATTS Accutrol_5-Closed X 6.00** Head (meters) 0.000 0.025 0.051 0.076 0.102 0.127 0.152 Disch. (m³/s) 0.00000 0.00031 0.00031 0.00031 0.00031 0.00031 0.00031

Primary OutFlow Max=0.0019 m³/s @ 0.12 hrs HW=100.026 m (Free Discharge)
↳**1=WATTS Accutrol_5-Closed** (Custom Controls 0.0019 m³/s)

Pond 49P: Tower B1 Rooftop Storage



Summary for Pond 50P: Cistern

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 11,960.0 m², Inflow Depth = 17 mm for 5-Year event
Inflow = 0.1777 m³/s @ 0.17 hrs, Volume= 208.6 m³
Outflow = 0.0957 m³/s @ 0.38 hrs, Volume= 208.6 m³, Atten= 46%, Lag= 12.5 min
Primary = 0.0957 m³/s @ 0.38 hrs, Volume= 208.6 m³
Secondary = 0.0000 m³/s @ 0.00 hrs, Volume= 0.0 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 55.237 m @ 0.38 hrs Surf.Area= 250.0 m² Storage= 99.2 m³

Plug-Flow detention time= 13.3 min calculated for 208.0 m³ (100% of inflow)
Center-of-Mass det. time= 13.3 min (31.4 - 18.1)

Volume	Invert	Avail.Storage	Storage Description
#1	54.840 m	325.0 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

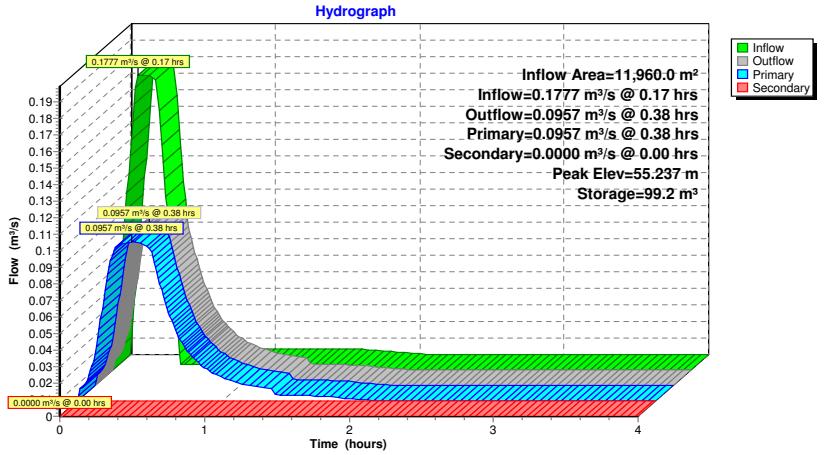
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
54.840	250.0	0.0	0.0
56.140	250.0	325.0	325.0

Device	Routing	Invert	Outlet Devices
#1	Primary	54.760 m	**Hydrovex Hydro-Break Optimum SHE-0379-9800-2000-9800**
#2	Secondary	56.790 m	***Overflow Check**
			Head (meters) 0.000 0.010
			Disch. (m³/s) 0.00000 10.00000

Primary OutFlow Max=0.0957 m³/s @ 0.38 hrs HW=55.237 m (Free Discharge)
└**1=Hydrovex Hydro-Break Optimum SHE-0379-9800-2000-9800** (Custom Controls 0.0957 m³/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=54.840 m (Free Discharge)
└**2=***Overflow Check** (Controls 0.0000 m³/s)

Pond 50P: Cistern

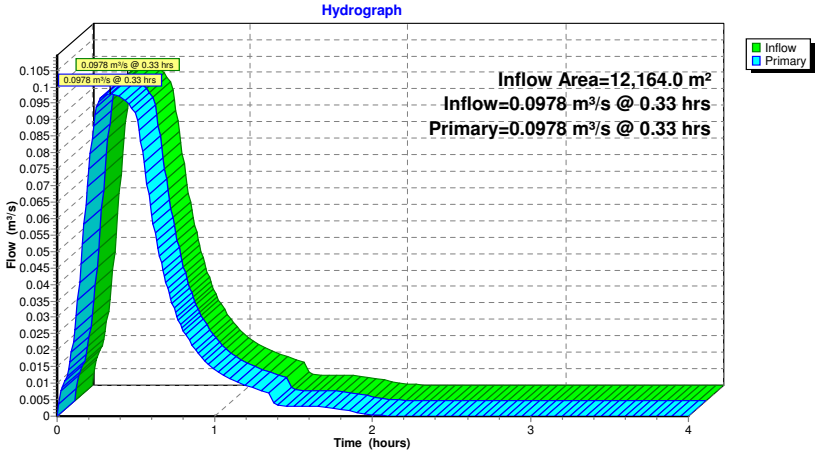


Summary for Link 51L: Site Release

Inflow Area = 12,164.0 m², Inflow Depth = 17 mm for 5-Year event
Inflow = 0.0978 m³/s @ 0.33 hrs, Volume= 212.0 m³
Primary = 0.0978 m³/s @ 0.33 hrs, Volume= 212.0 m³, Atten= 0%, Lag= 0.0 min

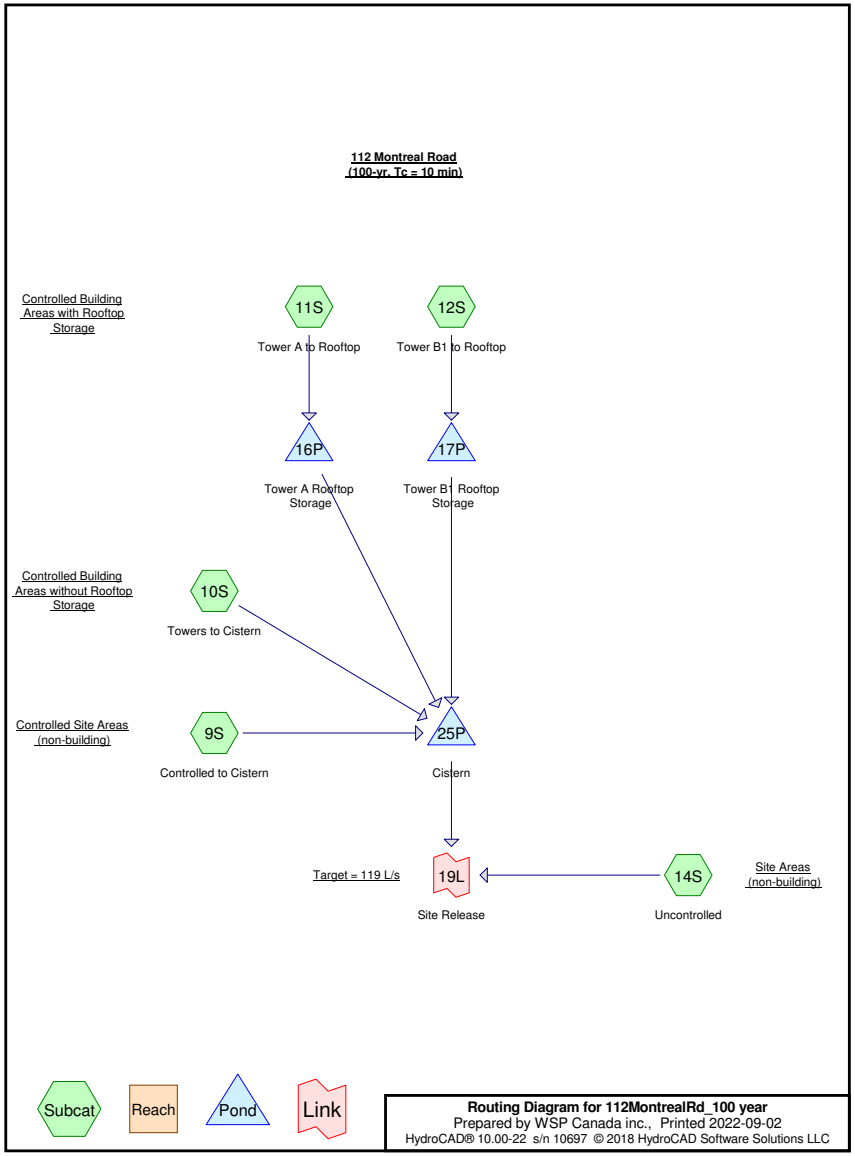
Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

Link 51L: Site Release



APPENDIX

G-2 *100-YEAR ANALYSIS (PEAK DISCHARGE)*



Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
3,790.0	0.89	S03 (9S)
720.0	0.93	S04 (9S)
250.0	0.76	S05 (9S)
5,200.0	1.00	S06 (9S)
690.0	1.00	S07 (9S)
105.0	1.00	S08 (14S)
99.0	0.72	S09 (14S)
500.0	1.00	Tower A (10S, 11S)
810.0	1.00	Tower B1 (10S, 12S)
12,164.0	**0.95**	**TOTAL AREA**

Time span=0.00-4.00 hrs, dt=0.01 hrs, 401 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 9S: Controlled to Cistern Runoff Area=10,650.0 m² Runoff Depth=28 mm
Tc=10.0 min C=0.95 Runoff=0.4930 m³/s 301.0 m³

Subcatchment 10S: Towers to Cistern Runoff Area=325.0 m² Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.0158 m³/s 9.7 m³

Subcatchment 11S: Tower A to Rooftop Runoff Area=375.0 m² Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.0183 m³/s 11.2 m³

Subcatchment 12S: Tower B1 to Rooftop Runoff Area=610.0 m² Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.0297 m³/s 18.1 m³

Subcatchment 14S: Uncontrolled Runoff Area=204.0 m² Runoff Depth=26 mm
Tc=10.0 min C=0.86 Runoff=0.0085 m³/s 5.2 m³

Pond 16P: Tower A Rooftop Storage Peak Elev=100.089 m Storage=9.8 m³ Inflow=0.0183 m³/s 11.2 m³
Outflow=0.0012 m³/s 11.2 m³

Pond 17P: Tower B1 Rooftop Storage Peak Elev=100.121 m Storage=16.0 m³ Inflow=0.0297 m³/s 18.1 m³
Outflow=0.0019 m³/s 18.2 m³

Pond 25P: Cistern Peak Elev=55.766 m Storage=231.6 m³ Inflow=0.5120 m³/s 340.0 m³
Primary=0.0976 m³/s 340.0 m³ Secondary=0.0000 m³/s 0.0 m³ Outflow=0.0976 m³/s 340.0 m³

Link 19L: Site Release Inflow=0.1060 m³/s 345.2 m³
Primary=0.1060 m³/s 345.2 m³

Total Runoff Area = 12,164.0 m² Runoff Volume = 345.2 m³ Average Runoff Depth = 28 mm

Summary for Subcatchment 9S: Controlled to Cistern

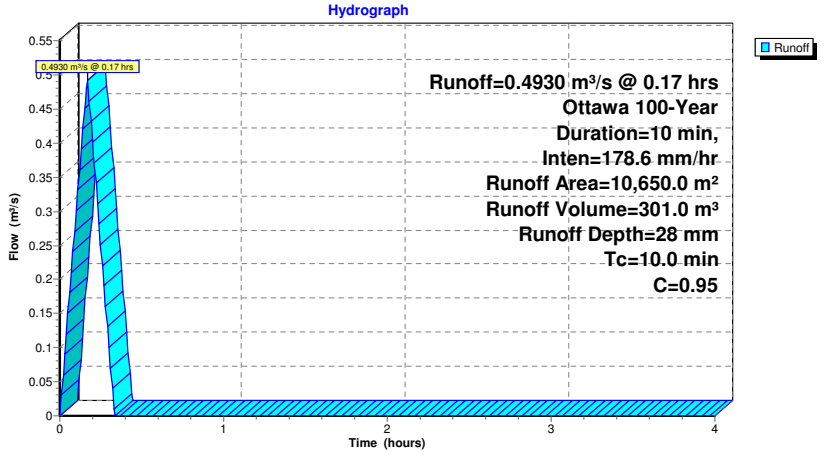
Runoff = 0.4930 m³/s @ 0.17 hrs, Volume= 301.0 m³, Depth= 28 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (m²)	C	Description
3,790.0	0.89	S03
5,200.0	1.00	S06
720.0	0.93	S04
250.0	0.76	S05
690.0	1.00	S07
10,650.0	0.95	Weighted Average

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

Subcatchment 9S: Controlled to Cistern



Summary for Subcatchment 10S: Towers to Cistern

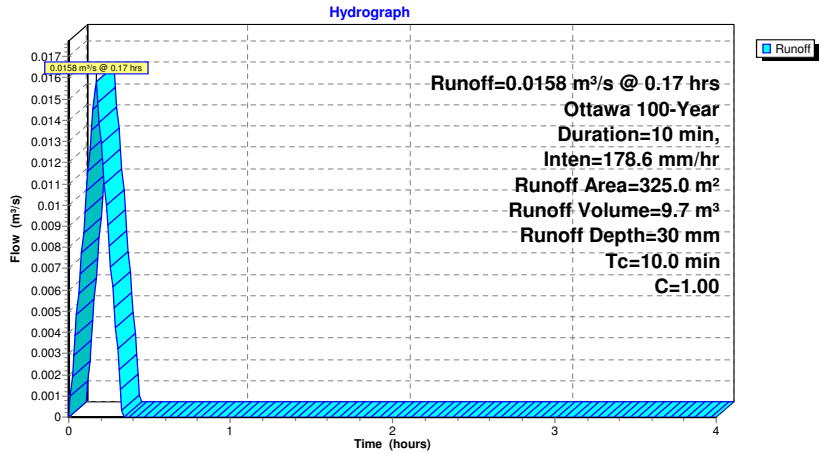
Runoff = 0.0158 m³/s @ 0.17 hrs, Volume= 9.7 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (m²)	C	Description
125.0	1.00	Tower A
200.0	1.00	Tower B1
325.0	1.00	Weighted Average

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

Subcatchment 10S: Towers to Cistern



Summary for Subcatchment 11S: Tower A to Rooftop

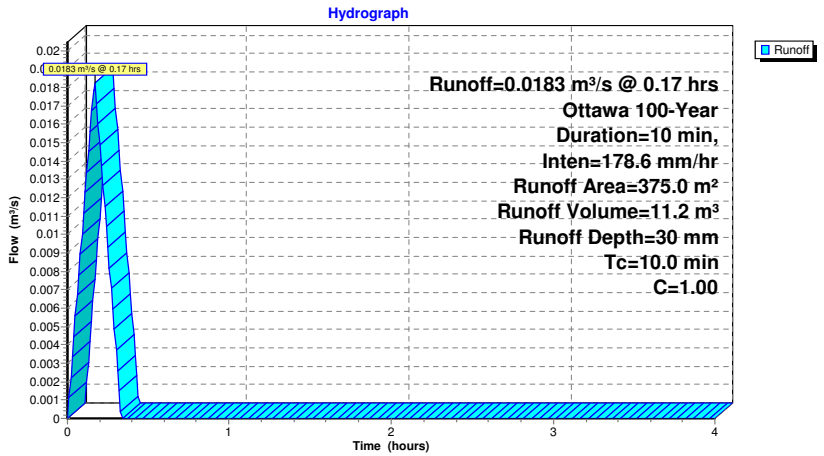
Runoff = 0.0183 m³/s @ 0.17 hrs, Volume= 11.2 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (m²)	C	Description
375.0	1.00	Tower A

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

Subcatchment 11S: Tower A to Rooftop



Summary for Subcatchment 12S: Tower B1 to Rooftop

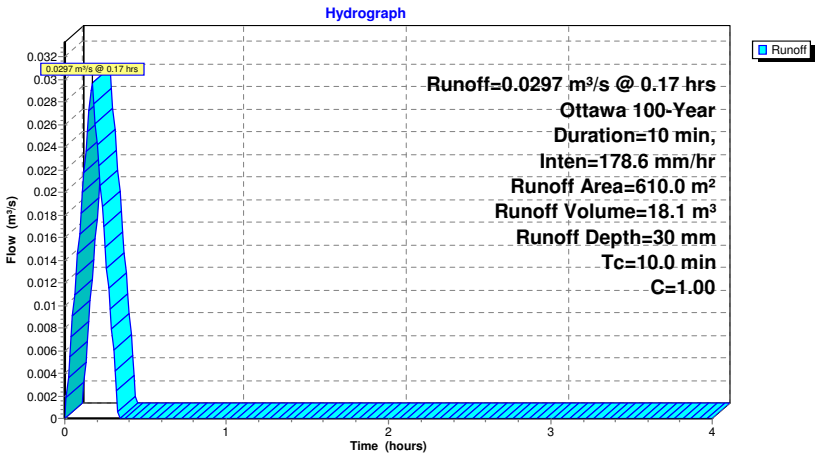
Runoff = 0.0297 m³/s @ 0.17 hrs, Volume= 18.1 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (m²)	C	Description
610.0	1.00	Tower B1

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

Subcatchment 12S: Tower B1 to Rooftop



Summary for Subcatchment 14S: Uncontrolled

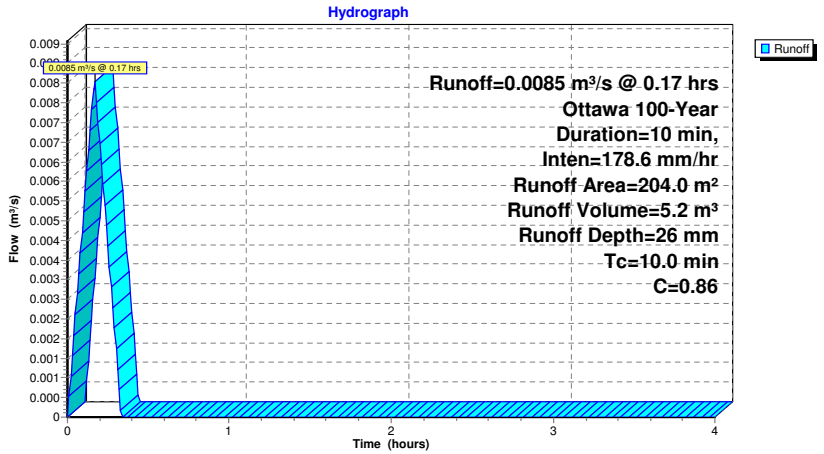
Runoff = 0.0085 m³/s @ 0.17 hrs, Volume= 5.2 m³, Depth= 26 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (m²)	C	Description
99.0	0.72	S09
105.0	1.00	S08
204.0	0.86	Weighted Average

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

Subcatchment 14S: Uncontrolled



Summary for Pond 16P: Tower A Rooftop Storage

Inflow Area = 375.0 m², Inflow Depth = 30 mm for 100-Year event
Inflow = 0.0183 m³/s @ 0.17 hrs, Volume= 11.2 m³
Outflow = 0.0012 m³/s @ 0.07 hrs, Volume= 11.2 m³, Atten= 93%, Lag= 0.0 min
Primary = 0.0012 m³/s @ 0.07 hrs, Volume= 11.2 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 100.089 m @ 0.32 hrs Surf.Area= 221.8 m² Storage= 9.8 m³

Plug-Flow detention time= 67.0 min calculated for 11.1 m³ (100% of inflow)
Center-of-Mass det. time= 67.1 min (77.1 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	28.1 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 4

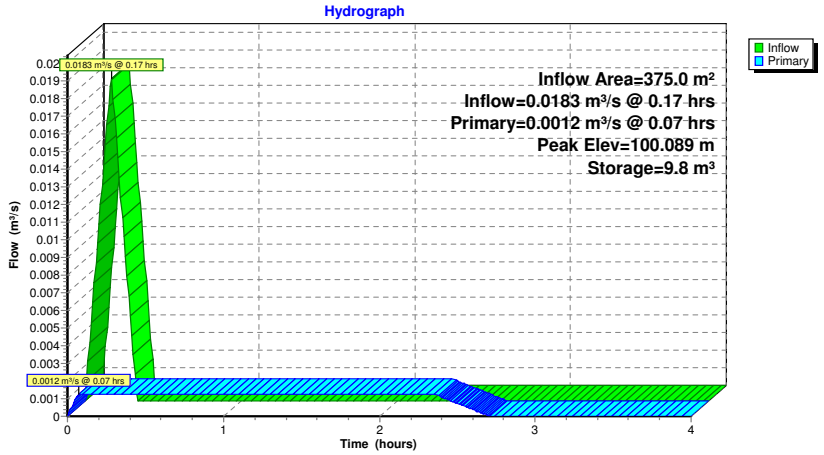
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
100.000	0.0	0.0	0.0
100.150	93.7	7.0	7.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.000 m	**WATTS Accutrol_5-Closed X 4.00**

Head (meters) 0.000 0.025 0.051 0.076 0.102 0.127 0.152
Disch. (m³/s) 0.00000 0.00031 0.00031 0.00031 0.00031 0.00031 0.00031

Primary OutFlow Max=0.0012 m³/s @ 0.07 hrs HW=100.026 m (Free Discharge)
↳**1=WATTS Accutrol_5-Closed** (Custom Controls 0.0012 m³/s)

Pond 16P: Tower A Rooftop Storage



Summary for Pond 17P: Tower B1 Rooftop Storage

Inflow Area = 610.0 m², Inflow Depth = 30 mm for 100-Year event
Inflow = 0.0297 m³/s @ 0.17 hrs, Volume= 18.1 m³
Outflow = 0.0019 m³/s @ 0.03 hrs, Volume= 18.2 m³, Atten= 94%, Lag= 0.0 min
Primary = 0.0019 m³/s @ 0.03 hrs, Volume= 18.2 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 100.121 m @ 0.32 hrs Surf.Area= 397.0 m² Storage= 16.0 m³

Plug-Flow detention time= 71.9 min calculated for 18.1 m³ (100% of inflow)
Center-of-Mass det. time= 72.1 min (82.1 - 10.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	30.5 m³	**Custom Stage Data (Pyramidal)** Listed below (Recalc) x 6

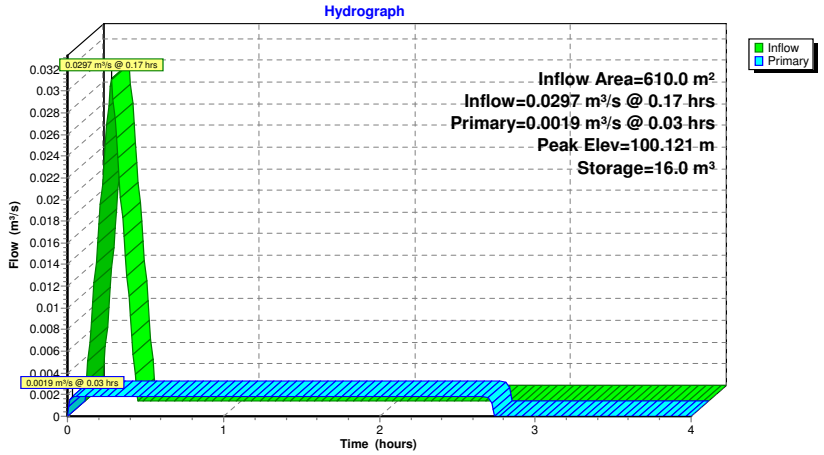
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
100.000	0.0	0.0	0.0	0.0
100.150	101.6	5.1	5.1	101.6

Device	Routing	Invert	Outlet Devices
#1	Primary	100.000 m	**WATTS Accutrol_5-Closed X 6.00**

Head (meters) 0.000 0.025 0.051 0.076 0.102 0.127 0.152
Disch. (m³/s) 0.00000 0.00031 0.00031 0.00031 0.00031 0.00031 0.00031

Primary OutFlow Max=0.0019 m³/s @ 0.03 hrs HW=100.027 m (Free Discharge)
↳**1=WATTS Accutrol_5-Closed** (Custom Controls 0.0019 m³/s)

Pond 17P: Tower B1 Rooftop Storage



Summary for Pond 25P: Cistern

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 11,960.0 m², Inflow Depth = 28 mm for 100-Year event
Inflow = 0.5120 m³/s @ 0.17 hrs, Volume= 340.0 m³
Outflow = 0.0976 m³/s @ 0.57 hrs, Volume= 340.0 m³, Atten= 81%, Lag= 24.1 min
Primary = 0.0976 m³/s @ 0.57 hrs, Volume= 340.0 m³
Secondary = 0.0000 m³/s @ 0.00 hrs, Volume= 0.0 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 55.766 m @ 0.30 hrs Surf.Area= 250.0 m² Storage= 231.6 m³

Plug-Flow detention time= 22.2 min calculated for 340.0 m³ (100% of inflow)
Center-of-Mass det. time= 22.2 min (38.3 - 16.1)

Volume	Invert	Avail.Storage	Storage Description
#1	54.840 m	325.0 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

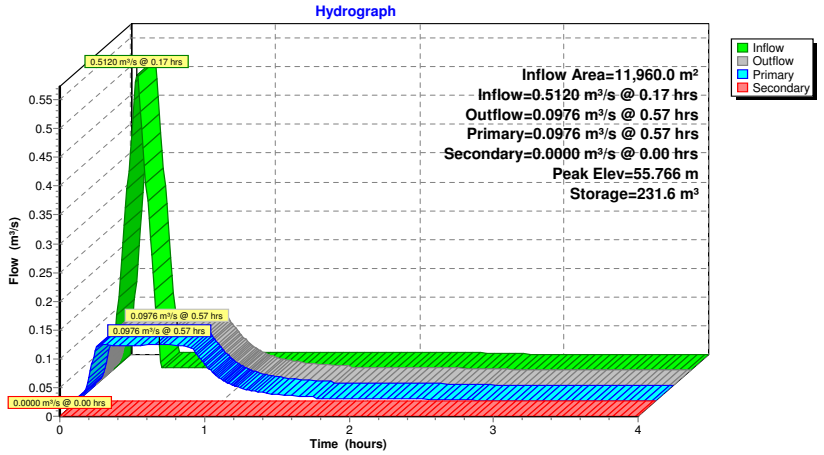
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
54.840	250.0	0.0	0.0
56.140	250.0	325.0	325.0

Device	Routing	Invert	Outlet Devices
#1	Primary	54.760 m	**Hydrovex Hydro-Break Optimum SHE-0379-9800-2000-9800**
#2	Secondary	56.790 m	***Overflow Check**
			Head (meters) 0.000 0.010
			Disch. (m³/s) 0.00000 10.00000

Primary OutFlow Max=0.0976 m³/s @ 0.57 hrs HW=55.430 m (Free Discharge)
└**1=Hydrovex Hydro-Break Optimum SHE-0379-9800-2000-9800** (Custom Controls 0.0976 m³/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=54.840 m (Free Discharge)
└**2=***Overflow Check** (Controls 0.0000 m³/s)

Pond 25P: Cistern

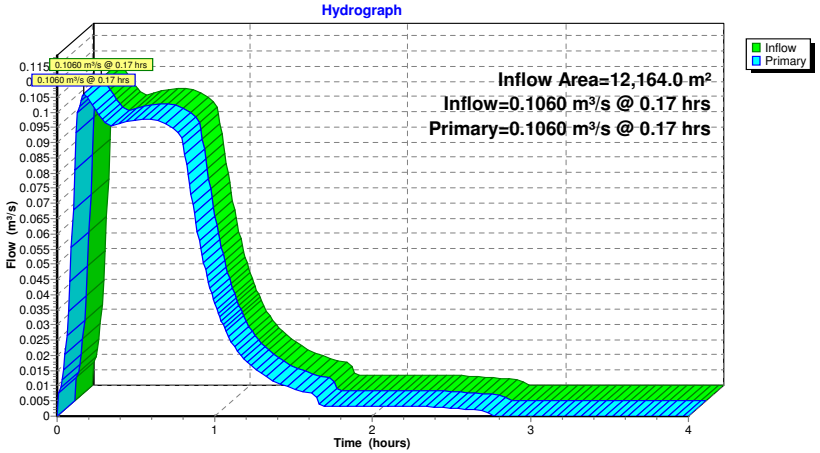


Summary for Link 19L: Site Release

Inflow Area = 12,164.0 m², Inflow Depth = 28 mm for 100-Year event
Inflow = 0.1060 m³/s @ 0.17 hrs, Volume= 345.2 m³
Primary = 0.1060 m³/s @ 0.17 hrs, Volume= 345.2 m³, Atten= 0%, Lag= 0.0 min

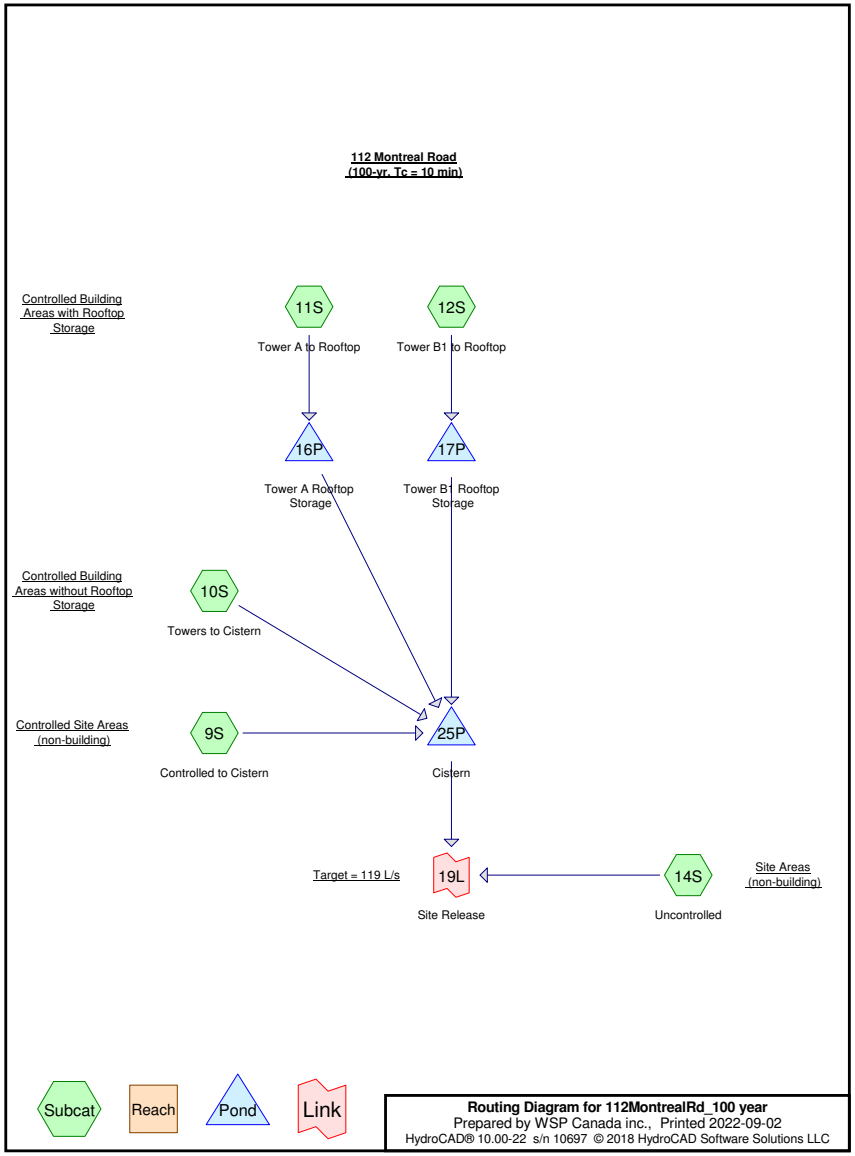
Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

Link 19L: Site Release



APPENDIX

G-3 *100-YEAR ANALYSIS (PEAK CISTERN STORAGE)*



Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
3,790.0	0.89	S03 (9S)
720.0	0.93	S04 (9S)
250.0	0.76	S05 (9S)
5,200.0	1.00	S06 (9S)
690.0	1.00	S07 (9S)
105.0	1.00	S08 (14S)
99.0	0.72	S09 (14S)
500.0	1.00	Tower A (10S, 11S)
810.0	1.00	Tower B1 (10S, 12S)
12,164.0	**0.95**	**TOTAL AREA**

Time span=0.00-4.00 hrs, dt=0.01 hrs, 401 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 9S: Controlled to Cistern Runoff Area=10,650.0 m² Runoff Depth=45 mm
Tc=10.0 min C=0.95 Runoff=0.2470 m³/s 474.1 m³

Subcatchment 10S: Towers to Cistern Runoff Area=325.0 m² Runoff Depth=47 mm
Tc=10.0 min C=1.00 Runoff=0.0079 m³/s 15.2 m³

Subcatchment 11S: Tower A to Rooftop Runoff Area=375.0 m² Runoff Depth=47 mm
Tc=10.0 min C=1.00 Runoff=0.0092 m³/s 17.6 m³

Subcatchment 12S: Tower B1 to Rooftop Runoff Area=610.0 m² Runoff Depth=47 mm
Tc=10.0 min C=1.00 Runoff=0.0149 m³/s 28.6 m³

Subcatchment 14S: Uncontrolled Runoff Area=204.0 m² Runoff Depth=40 mm
Tc=10.0 min C=0.86 Runoff=0.0043 m³/s 8.2 m³

Pond 16P: Tower A Rooftop Storage Peak Elev=100.109 m Storage=14.7 m³ Inflow=0.0092 m³/s 17.6 m³
Outflow=0.0012 m³/s 17.4 m³

Pond 17P: Tower B1 Rooftop Storage Peak Elev=100.139 m Storage=24.1 m³ Inflow=0.0149 m³/s 28.6 m³
Outflow=0.0019 m³/s 26.7 m³

Pond 25P: Cistern Peak Elev=56.075 m Storage=308.6 m³ Inflow=0.2580 m³/s 533.4 m³
Primary=0.0976 m³/s 533.4 m³ Secondary=0.0000 m³/s 0.0 m³ Outflow=0.0976 m³/s 533.4 m³

Link 19L: Site Release Inflow=0.1019 m³/s 541.6 m³
Primary=0.1019 m³/s 541.6 m³

Total Runoff Area = 12,164.0 m² Runoff Volume = 543.7 m³ Average Runoff Depth = 45 mm

Summary for Subcatchment 9S: Controlled to Cistern

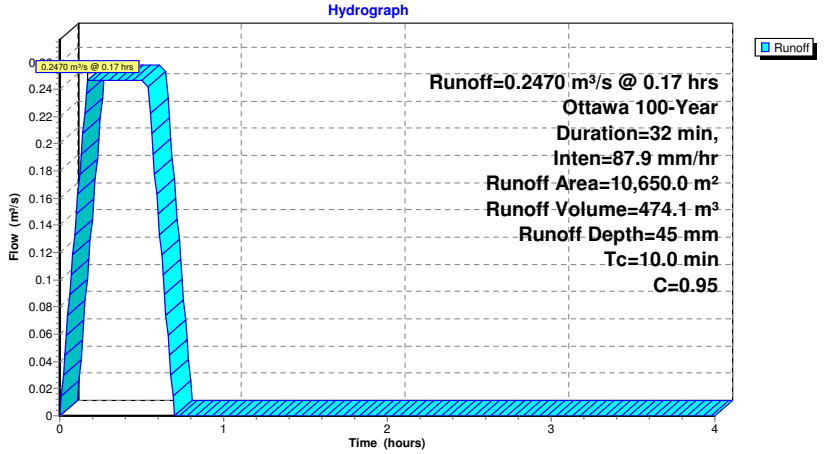
Runoff = 0.2470 m³/s @ 0.17 hrs, Volume= 474.1 m³, Depth= 45 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=32 min, Inten=87.9 mm/hr

Area (m²)	C	Description
3,790.0	0.89	S03
5,200.0	1.00	S06
720.0	0.93	S04
250.0	0.76	S05
690.0	1.00	S07
10,650.0	0.95	Weighted Average

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

Subcatchment 9S: Controlled to Cistern



Summary for Subcatchment 10S: Towers to Cistern

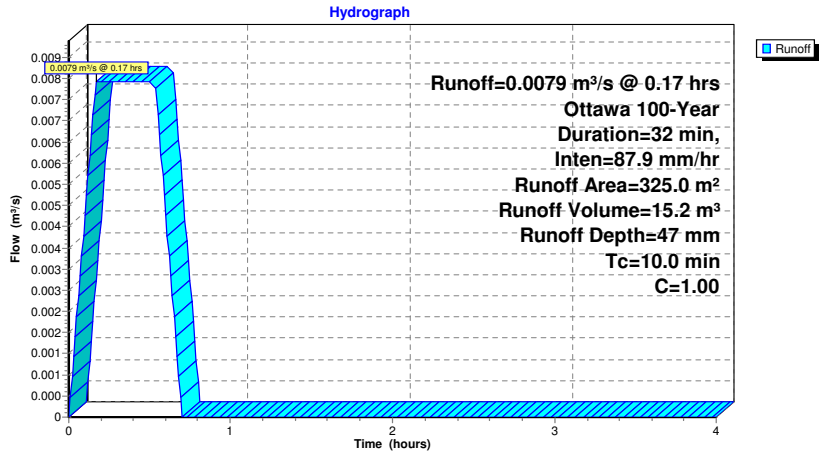
Runoff = 0.0079 m³/s @ 0.17 hrs, Volume= 15.2 m³, Depth= 47 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=32 min, Inten=87.9 mm/hr

Area (m²)	C	Description
125.0	1.00	Tower A
200.0	1.00	Tower B1
325.0	1.00	Weighted Average

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

Subcatchment 10S: Towers to Cistern



Summary for Subcatchment 11S: Tower A to Rooftop

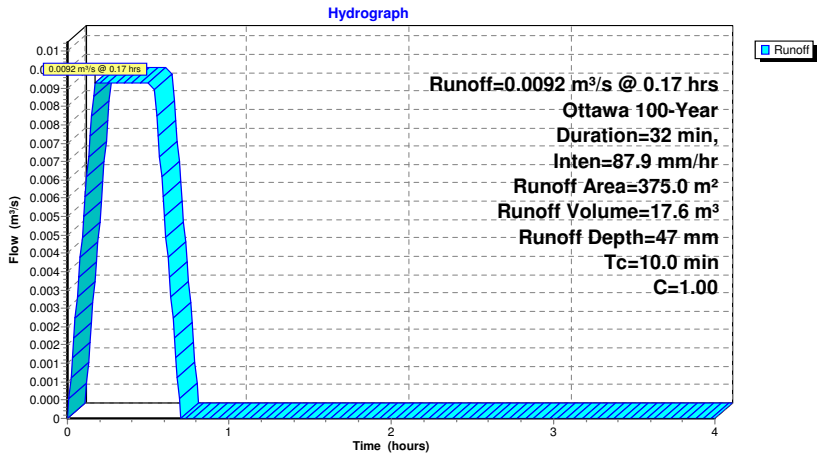
Runoff = 0.0092 m³/s @ 0.17 hrs, Volume= 17.6 m³, Depth= 47 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=32 min, Inten=87.9 mm/hr

Area (m²)	C	Description
375.0	1.00	Tower A

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

Subcatchment 11S: Tower A to Rooftop



Summary for Subcatchment 12S: Tower B1 to Rooftop

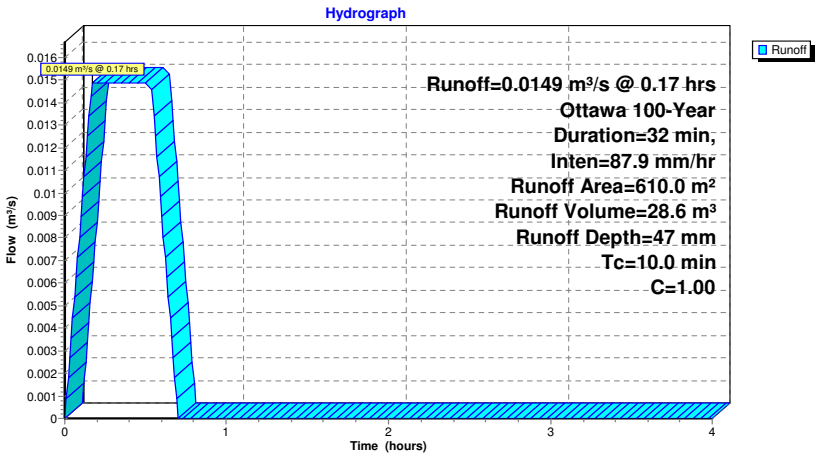
Runoff = 0.0149 m³/s @ 0.17 hrs, Volume= 28.6 m³, Depth= 47 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=32 min, Inten=87.9 mm/hr

Area (m²)	C	Description
610.0	1.00	Tower B1

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

Subcatchment 12S: Tower B1 to Rooftop



Summary for Subcatchment 14S: Uncontrolled

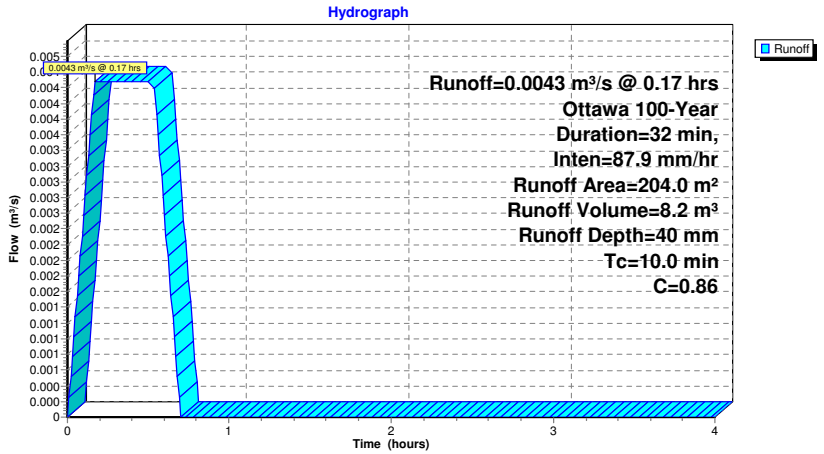
Runoff = 0.0043 m³/s @ 0.17 hrs, Volume= 8.2 m³, Depth= 40 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=32 min, Inten=87.9 mm/hr

Area (m²)	C	Description
99.0	0.72	S09
105.0	1.00	S08
204.0	0.86	Weighted Average

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

Subcatchment 14S: Uncontrolled



Summary for Pond 16P: Tower A Rooftop Storage

Inflow Area = 375.0 m², Inflow Depth = 47 mm for 100-Year event
Inflow = 0.0092 m³/s @ 0.17 hrs, Volume= 17.6 m³
Outflow = 0.0012 m³/s @ 0.11 hrs, Volume= 17.4 m³, Atten= 86%, Lag= 0.0 min
Primary = 0.0012 m³/s @ 0.11 hrs, Volume= 17.4 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 100.109 m @ 0.68 hrs Surf.Area= 271.3 m² Storage= 14.7 m³

Plug-Flow detention time= 99.0 min calculated for 17.4 m³ (99% of inflow)
Center-of-Mass det. time= 99.1 min (120.1 - 21.0)

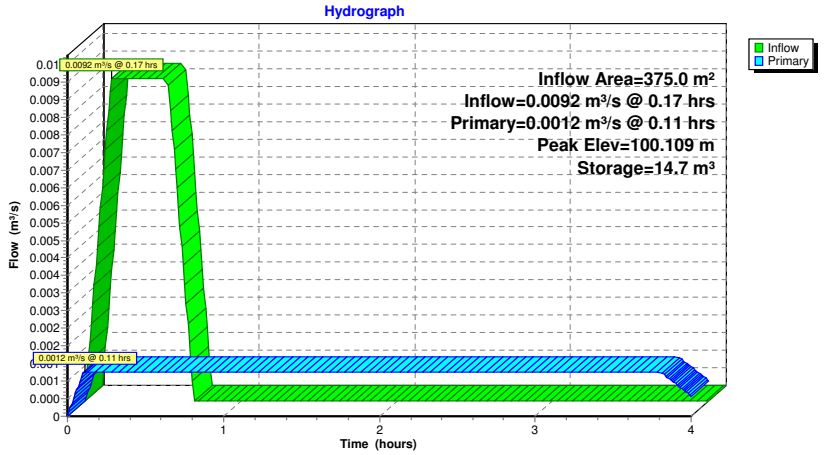
Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	28.1 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 4

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
100.000	0.0	0.0	0.0
100.150	93.7	7.0	7.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.000 m	**WATTS Accutrol_5-Closed X 4.00** Head (meters) 0.000 0.025 0.051 0.076 0.102 0.127 0.152 Disch. (m³/s) 0.00000 0.00031 0.00031 0.00031 0.00031 0.00031 0.00031

Primary OutFlow Max=0.0012 m³/s @ 0.11 hrs HW=100.027 m (Free Discharge)
↑—**1=WATTS Accutrol_5-Closed** (Custom Controls 0.0012 m³/s)

Pond 16P: Tower A Rooftop Storage



Summary for Pond 17P: Tower B1 Rooftop Storage

Inflow Area = 610.0 m², Inflow Depth = 47 mm for 100-Year event
Inflow = 0.0149 m³/s @ 0.17 hrs, Volume= 28.6 m³
Outflow = 0.0019 m³/s @ 0.05 hrs, Volume= 26.7 m³, Atten= 88%, Lag= 0.0 min
Primary = 0.0019 m³/s @ 0.05 hrs, Volume= 26.7 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 100.139 m @ 0.68 hrs Surf.Area= 521.2 m² Storage= 24.1 m³

Plug-Flow detention time= 100.9 min calculated for 26.7 m³ (93% of inflow)
Center-of-Mass det. time= 99.7 min (120.7 - 21.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	30.5 m³	**Custom Stage Data (Pyramidal)** Listed below (Recalc) x 6

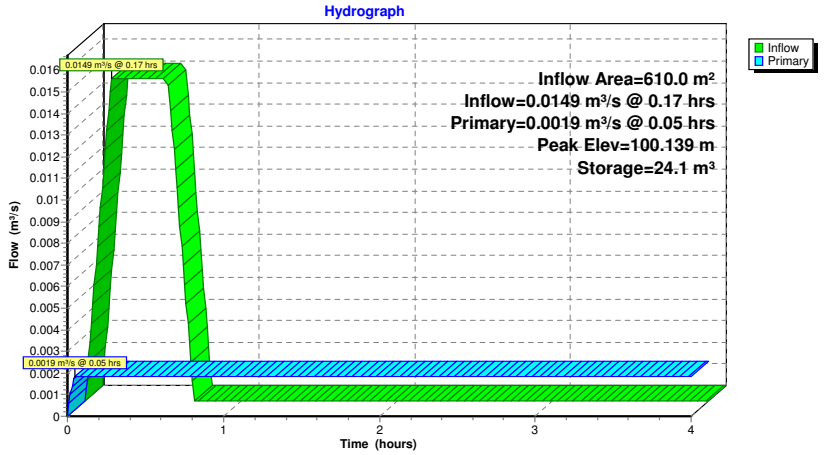
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
100.000	0.0	0.0	0.0	0.0
100.150	101.6	5.1	5.1	101.6

Device	Routing	Invert	Outlet Devices
#1	Primary	100.000 m	**WATTS Accutrol_5-Closed X 6.00**

Head (meters) 0.000 0.025 0.051 0.076 0.102 0.127 0.152
Disch. (m³/s) 0.00000 0.00031 0.00031 0.00031 0.00031 0.00031 0.00031

Primary OutFlow Max=0.0019 m³/s @ 0.05 hrs HW=100.028 m (Free Discharge)
↳**1=WATTS Accutrol_5-Closed** (Custom Controls 0.0019 m³/s)

Pond 17P: Tower B1 Rooftop Storage



Summary for Pond 25P: Cistern

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 11,960.0 m², Inflow Depth > 45 mm for 100-Year event
Inflow = 0.2580 m³/s @ 0.17 hrs, Volume= 533.4 m³
Outflow = 0.0976 m³/s @ 1.16 hrs, Volume= 533.4 m³, Atten= 62%, Lag= 59.4 min
Primary = 0.0976 m³/s @ 1.16 hrs, Volume= 533.4 m³
Secondary = 0.0000 m³/s @ 0.00 hrs, Volume= 0.0 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 56.075 m @ 0.64 hrs Surf.Area= 250.0 m² Storage= 308.6 m³

Plug-Flow detention time= 29.2 min calculated for 533.4 m³ (100% of inflow)
Center-of-Mass det. time= 29.2 min (58.4 - 29.2)

Volume	Invert	Avail.Storage	Storage Description
#1	54.840 m	325.0 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

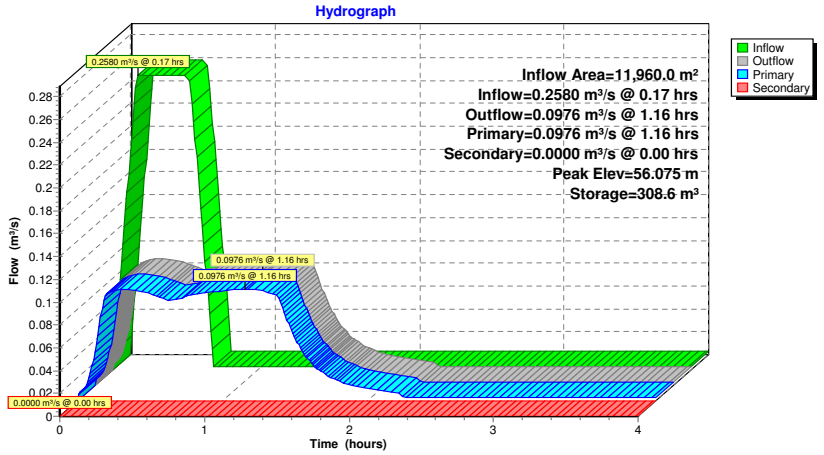
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
54.840	250.0	0.0	0.0
56.140	250.0	325.0	325.0

Device	Routing	Invert	Outlet Devices
#1	Primary	54.760 m	**Hydrovex Hydro-Break Optimum SHE-0379-9800-2000-9800**
#2	Secondary	56.790 m	***Overflow Check**
			Head (meters) 0.000 0.010
			Disch. (m³/s) 0.00000 10.00000

Primary OutFlow Max=0.0976 m³/s @ 1.16 hrs HW=55.431 m (Free Discharge)
└**1=Hydrovex Hydro-Break Optimum SHE-0379-9800-2000-9800** (Custom Controls 0.0976 m³/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=54.840 m (Free Discharge)
└**2=***Overflow Check** (Controls 0.0000 m³/s)

Pond 25P: Cistern

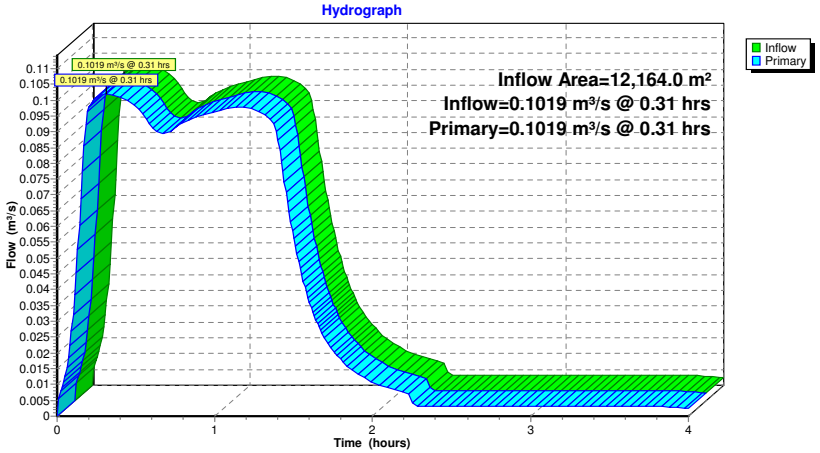


Summary for Link 19L: Site Release

Inflow Area = 12,164.0 m², Inflow Depth > 45 mm for 100-Year event
Inflow = 0.1019 m³/s @ 0.31 hrs, Volume= 541.6 m³
Primary = 0.1019 m³/s @ 0.31 hrs, Volume= 541.6 m³, Atten= 0%, Lag= 0.0 min

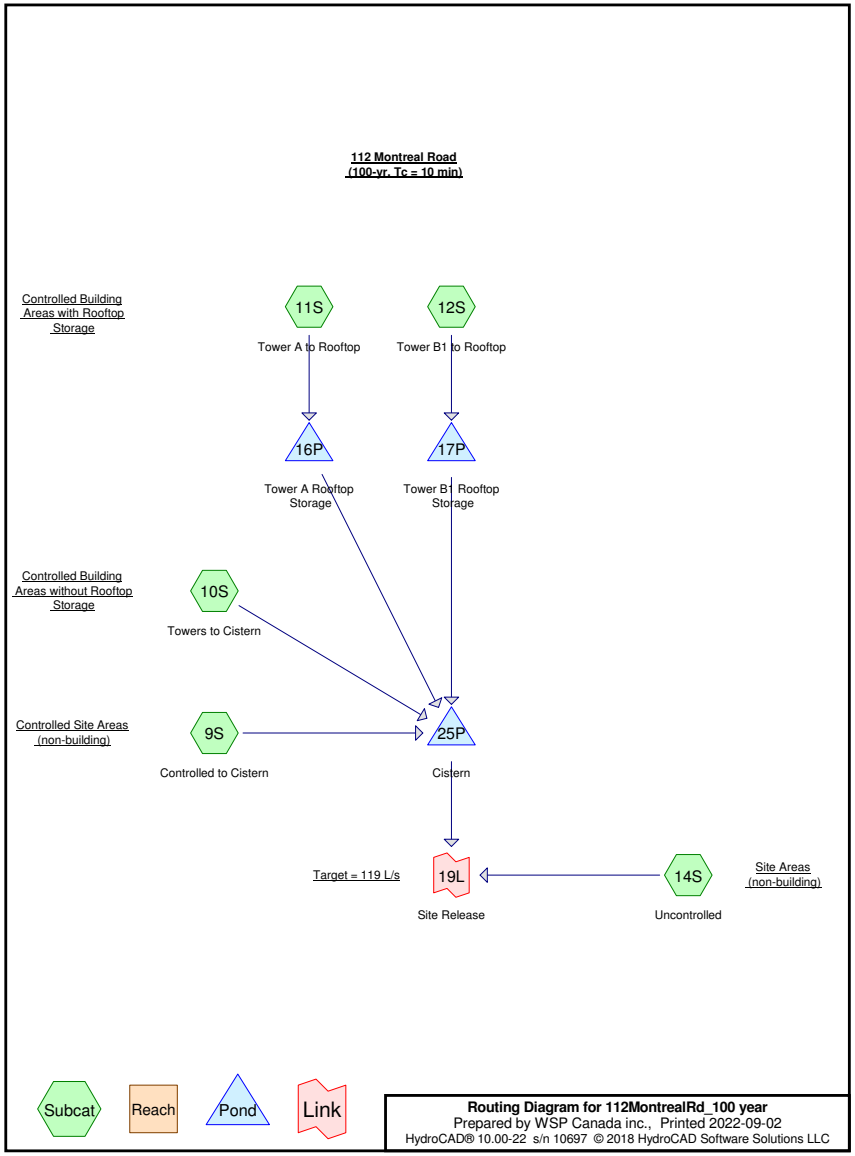
Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

Link 19L: Site Release



APPENDIX

G-4 *100-YEAR ANALYSIS (PEAK ROOF STORAGE)*



Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
3,790.0	0.89	S03 (9S)
720.0	0.93	S04 (9S)
250.0	0.76	S05 (9S)
5,200.0	1.00	S06 (9S)
690.0	1.00	S07 (9S)
105.0	1.00	S08 (14S)
99.0	0.72	S09 (14S)
500.0	1.00	Tower A (10S, 11S)
810.0	1.00	Tower B1 (10S, 12S)
12,164.0	**0.95**	**TOTAL AREA**

Time span=0.00-4.00 hrs, dt=0.01 hrs, 401 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 9S: Controlled to Cistern Runoff Area=10,650.0 m² Runoff Depth=57 mm
Tc=10.0 min C=0.95 Runoff=0.1253 m³/s 608.7 m³

Subcatchment 10S: Towers to Cistern Runoff Area=325.0 m² Runoff Depth=60 mm
Tc=10.0 min C=1.00 Runoff=0.0040 m³/s 19.6 m³

Subcatchment 11S: Tower A to Rooftop Runoff Area=375.0 m² Runoff Depth=60 mm
Tc=10.0 min C=1.00 Runoff=0.0046 m³/s 22.6 m³

Subcatchment 12S: Tower B1 to Rooftop Runoff Area=610.0 m² Runoff Depth=60 mm
Tc=10.0 min C=1.00 Runoff=0.0076 m³/s 36.7 m³

Subcatchment 14S: Uncontrolled Runoff Area=204.0 m² Runoff Depth=52 mm
Tc=10.0 min C=0.86 Runoff=0.0022 m³/s 10.6 m³

Pond 16P: Tower A Rooftop Storage Peak Elev=100.114 m Storage=16.2 m³ Inflow=0.0046 m³/s 22.6 m³
Outflow=0.0012 m³/s 17.5 m³

Pond 17P: Tower B1 Rooftop Storage Peak Elev=100.144 m Storage=26.9 m³ Inflow=0.0076 m³/s 36.7 m³
Outflow=0.0019 m³/s 26.6 m³

Pond 25P: Cistern Peak Elev=55.656 m Storage=204.0 m³ Inflow=0.1324 m³/s 672.4 m³
Primary=0.0976 m³/s 672.3 m³ Secondary=0.0000 m³/s 0.0 m³ Outflow=0.0976 m³/s 672.3 m³

Link 19L: Site Release Inflow=0.0998 m³/s 682.9 m³
Primary=0.0998 m³/s 682.9 m³

Total Runoff Area = 12,164.0 m² Runoff Volume = 698.1 m³ Average Runoff Depth = 57 mm

Summary for Subcatchment 9S: Controlled to Cistern

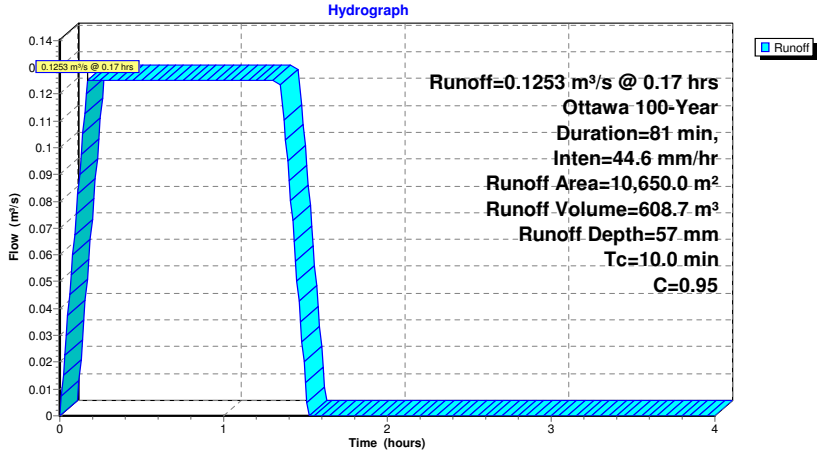
Runoff = 0.1253 m³/s @ 0.17 hrs, Volume= 608.7 m³, Depth= 57 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=81 min, Inten=44.6 mm/hr

Area (m²)	C	Description
3,790.0	0.89	S03
5,200.0	1.00	S06
720.0	0.93	S04
250.0	0.76	S05
690.0	1.00	S07
10,650.0	0.95	Weighted Average

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

Subcatchment 9S: Controlled to Cistern



Summary for Subcatchment 10S: Towers to Cistern

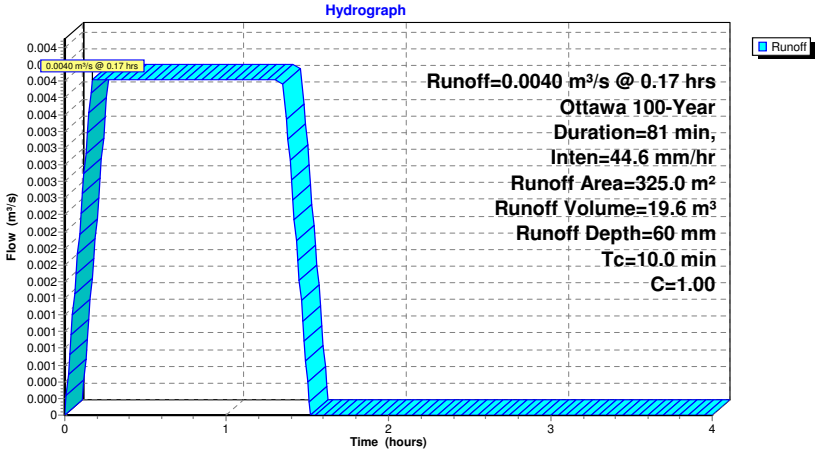
Runoff = 0.0040 m³/s @ 0.17 hrs, Volume= 19.6 m³, Depth= 60 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=81 min, Inten=44.6 mm/hr

Area (m²)	C	Description
125.0	1.00	Tower A
200.0	1.00	Tower B1
325.0	1.00	Weighted Average

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

Subcatchment 10S: Towers to Cistern



Summary for Subcatchment 11S: Tower A to Rooftop

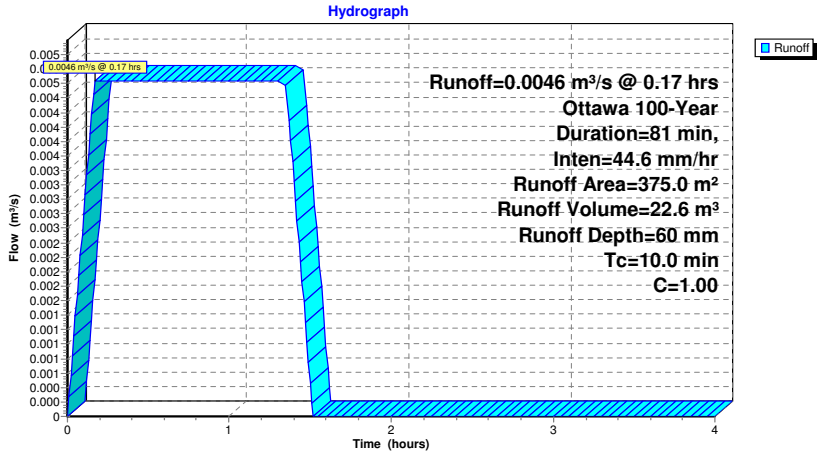
Runoff = 0.0046 m³/s @ 0.17 hrs, Volume= 22.6 m³, Depth= 60 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=81 min, Inten=44.6 mm/hr

Area (m²)	C	Description
375.0	1.00	Tower A

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

Subcatchment 11S: Tower A to Rooftop



Summary for Subcatchment 12S: Tower B1 to Rooftop

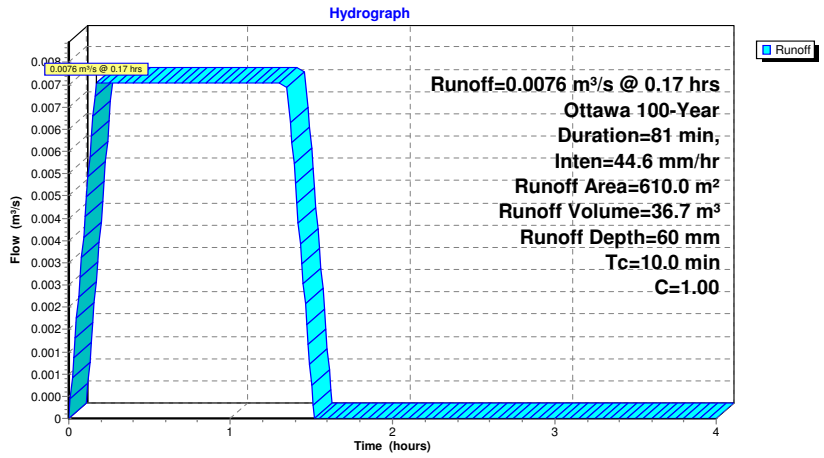
Runoff = 0.0076 m³/s @ 0.17 hrs, Volume= 36.7 m³, Depth= 60 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=81 min, Inten=44.6 mm/hr

Area (m²)	C	Description
610.0	1.00	Tower B1

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

Subcatchment 12S: Tower B1 to Rooftop



Summary for Subcatchment 14S: Uncontrolled

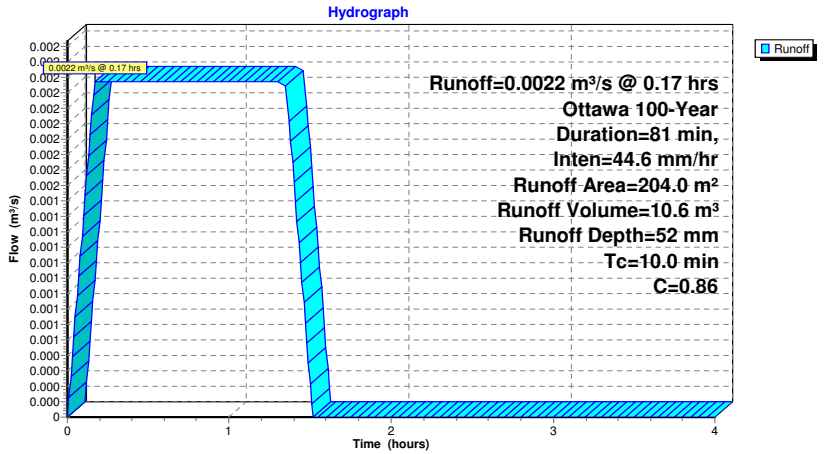
Runoff = 0.0022 m³/s @ 0.17 hrs, Volume= 10.6 m³, Depth= 52 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa 100-Year Duration=81 min, Inten=44.6 mm/hr

Area (m²)	C	Description
99.0	0.72	S09
105.0	1.00	S08
204.0	0.86	Weighted Average

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

Subcatchment 14S: Uncontrolled



Summary for Pond 16P: Tower A Rooftop Storage

Inflow Area = 375.0 m², Inflow Depth = 60 mm for 100-Year event
Inflow = 0.0046 m³/s @ 0.17 hrs, Volume= 22.6 m³
Outflow = 0.0012 m³/s @ 0.15 hrs, Volume= 17.5 m³, Atten= 73%, Lag= 0.0 min
Primary = 0.0012 m³/s @ 0.15 hrs, Volume= 17.5 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 100.114 m @ 1.47 hrs Surf.Area= 284.7 m² Storage= 16.2 m³

Plug-Flow detention time= 85.7 min calculated for 17.5 m³ (78% of inflow)
Center-of-Mass det. time= 76.9 min (122.4 - 45.5)

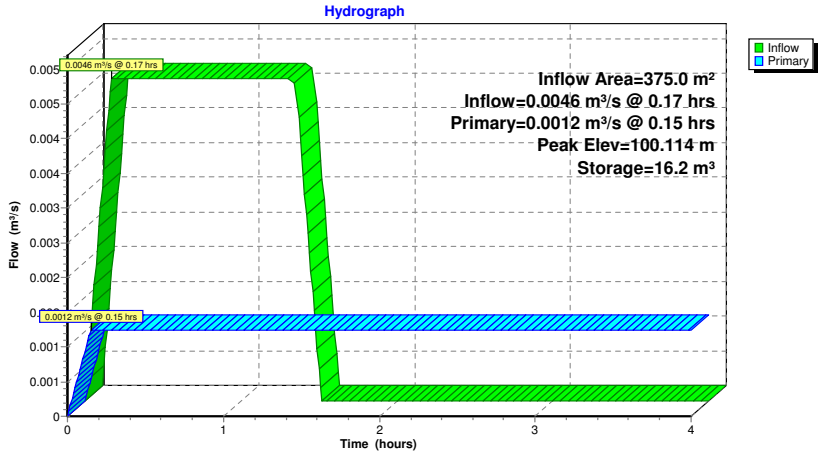
Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	28.1 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 4

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
100.000	0.0	0.0	0.0
100.150	93.7	7.0	7.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.000 m	**WATTS Accutrol_5-Closed X 4.00** Head (meters) 0.000 0.025 0.051 0.076 0.102 0.127 0.152 Disch. (m³/s) 0.00000 0.00031 0.00031 0.00031 0.00031 0.00031 0.00031

Primary OutFlow Max=0.0012 m³/s @ 0.15 hrs HW=100.025 m (Free Discharge)
↑—**1=WATTS Accutrol_5-Closed** (Custom Controls 0.0012 m³/s)

Pond 16P: Tower A Rooftop Storage



Summary for Pond 17P: Tower B1 Rooftop Storage

Inflow Area = 610.0 m², Inflow Depth = 60 mm for 100-Year event
Inflow = 0.0076 m³/s @ 0.17 hrs, Volume= 36.7 m³
Outflow = 0.0019 m³/s @ 0.08 hrs, Volume= 26.6 m³, Atten= 75%, Lag= 0.0 min
Primary = 0.0019 m³/s @ 0.08 hrs, Volume= 26.6 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 100.144 m @ 1.48 hrs Surf.Area= 560.7 m² Storage= 26.9 m³

Plug-Flow detention time= 86.8 min calculated for 26.6 m³ (72% of inflow)
Center-of-Mass det. time= 75.6 min (121.1 - 45.5)

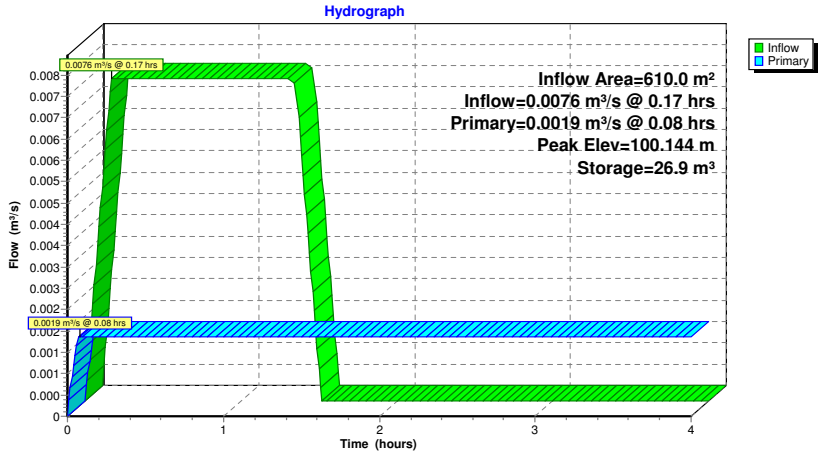
Volume	Invert	Avail.Storage	Storage Description
#1	100.000 m	30.5 m³	**Custom Stage Data (Pyramidal)** Listed below (Recalc) x 6

Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)	Wet.Area (sq-meters)
100.000	0.0	0.0	0.0	0.0
100.150	101.6	5.1	5.1	101.6

Device	Routing	Invert	Outlet Devices
#1	Primary	100.000 m	**WATTS Accutrol_5-Closed X 6.00** Head (meters) 0.000 0.025 0.051 0.076 0.102 0.127 0.152 Disch. (m³/s) 0.00000 0.00031 0.00031 0.00031 0.00031 0.00031 0.00031

Primary OutFlow Max=0.0019 m³/s @ 0.08 hrs HW=100.028 m (Free Discharge)
↑—**1=WATTS Accutrol_5-Closed** (Custom Controls 0.0019 m³/s)

Pond 17P: Tower B1 Rooftop Storage



Summary for Pond 25P: Cistern

[44] Hint: Outlet device #1 is below defined storage

Inflow Area = 11,960.0 m², Inflow Depth > 56 mm for 100-Year event
Inflow = 0.1324 m³/s @ 0.17 hrs, Volume= 672.4 m³
Outflow = 0.0976 m³/s @ 0.92 hrs, Volume= 672.3 m³, Atten= 26%, Lag= 45.1 min
Primary = 0.0976 m³/s @ 0.92 hrs, Volume= 672.3 m³
Secondary = 0.0000 m³/s @ 0.00 hrs, Volume= 0.0 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 55.656 m @ 1.40 hrs Surf.Area= 250.0 m² Storage= 204.0 m³

Plug-Flow detention time= 21.5 min calculated for 672.3 m³ (100% of inflow)
Center-of-Mass det. time= 21.5 min (72.0 - 50.5)

Volume	Invert	Avail.Storage	Storage Description
#1	54.840 m	325.0 m³	**Custom Stage Data (Prismatic)** Listed below (Recalc)

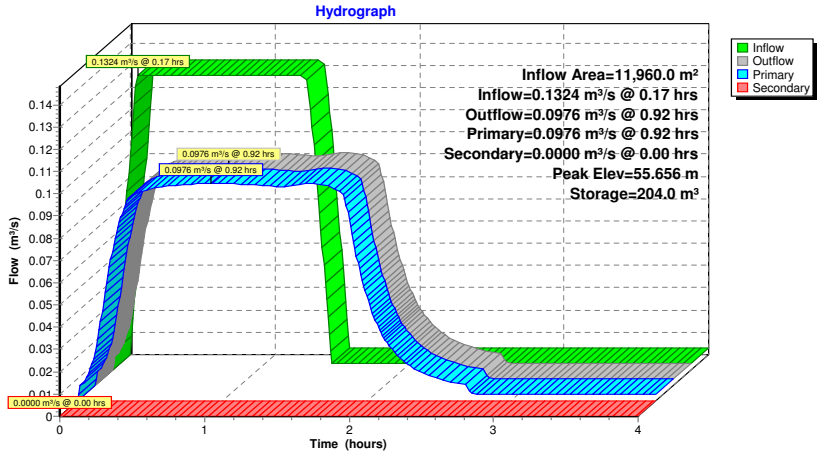
Elevation (meters)	Surf.Area (sq-meters)	Inc.Store (cubic-meters)	Cum.Store (cubic-meters)
54.840	250.0	0.0	0.0
56.140	250.0	325.0	325.0

Device	Routing	Invert	Outlet Devices
#1	Primary	54.760 m	**Hydrovex Hydro-Break Optimum SHE-0379-9800-2000-9800**
#2	Secondary	56.790 m	***Overflow Check**
			Head (meters) 0.000 0.010
			Disch. (m³/s) 0.00000 10.00000

Primary OutFlow Max=0.0976 m³/s @ 0.92 hrs HW=55.428 m (Free Discharge)
└**1=Hydrovex Hydro-Break Optimum SHE-0379-9800-2000-9800** (Custom Controls 0.0976 m³/s)

Secondary OutFlow Max=0.0000 m³/s @ 0.00 hrs HW=54.840 m (Free Discharge)
└**2=***Overflow Check** (Controls 0.0000 m³/s)

Pond 25P: Cistern

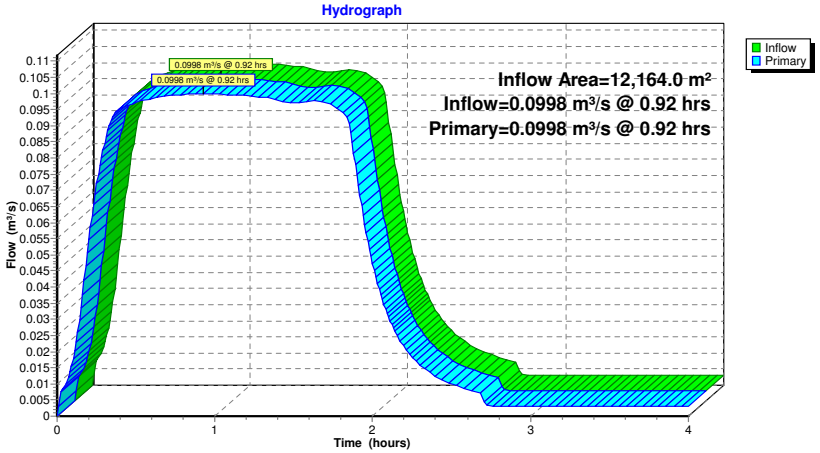


Summary for Link 19L: Site Release

Inflow Area = 12,164.0 m², Inflow Depth > 56 mm for 100-Year event
Inflow = 0.0998 m³/s @ 0.92 hrs, Volume= 682.9 m³
Primary = 0.0998 m³/s @ 0.92 hrs, Volume= 682.9 m³, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs

Link 19L: Site Release



APPENDIX

H FLOOD PLAIN MAPPING AND ELEVATIONS

Rideau River at Cumming Island

RIDEAU VALLEY CONSERVATION AUTHORITY

Legend

- OHN Watercourse
- RVCA Sub-Watersheds
- RVCA Catchments
- Floodplain Cross-sections
- Regulation Limit
- 100yr Floodline

Reg Limit Dominant Hazard

- Floodplain
- Geo-technical Hazard Limit
- Meander Belt
- Stable Slope
- Top of Slope
- Unstable Slope
- Wetland

- Township Municipal
- Geographic Township
- Conservation Authorities (Easte

Roads

- Freeway
- Expressway / Highway
- Arterial
- Local
- Ramp
- Rapid Transit
- Service

- Waterbody

Wetlands

- Evaluated-Provincial
- Evaluated-Other
- Not evaluated per OWES

DRAPE 2014

1: 15,084.78

Map Projection: WGS_1984_Web_Mercator_Auxiliary_Sphere

766.3 0 383.15 766.3

Meters

Map created: 9/18/2015

Notes

Parcel data is owned by Teranet Enterprises Inc and its suppliers.

Data Received from RVCA September 2015

FPM_UNIQUE	PROFILE	Q_TOTAL__C	WS_ELEV__M	EG_ELEV__M
Rideau - Reach 1 - 2474	50 Year	626	56.44	56.52
Rideau - Reach 1 - 2474	5 Year	513	56.1	56.17
Rideau - Reach 1 - 2474	25 Year	598	56.36	56.44
Rideau - Reach 1 - 2474	100 Year	654	56.52	56.6
Rideau - Reach 1 - 2474	10 Year	552	56.22	56.29
Rideau - Reach 1 - 2490	50 Year	626	56.46	56.54
Rideau - Reach 1 - 2490	5 Year	513	56.12	56.18
Rideau - Reach 1 - 2490	25 Year	598	56.38	56.46
Rideau - Reach 1 - 2490	100 Year	654	56.54	56.63
Rideau - Reach 1 - 2490	10 Year	552	56.24	56.31
Rideau - Reach 1 - 2512	50 Year	626	56.47	56.55
Rideau - Reach 1 - 2512	5 Year	513	56.13	56.19
Rideau - Reach 1 - 2512	25 Year	598	56.39	56.47
Rideau - Reach 1 - 2512	100 Year	654	56.56	56.64
Rideau - Reach 1 - 2512	10 Year	552	56.25	56.32