Forum/SLP 112 Nelson Limited Partnership

112 Nelson Street

Stormwater Management Report

July 16, 2021

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Stormwater Management Report

Forum/SLP 112 Nelson Limited Partnership

Confidential
Issue for City Review
Project No.: 211-04788-00
Date: July 16, 2021

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Revision History

FIRST ISSUE

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Signatures

Prepared by

July 16, 2021

Kathryn Kerker
Water Resources E.I.T.

Date

APPROVED BY

July 16, 2021

Michelle Hughes, P.Eng., MSc.
Team Lead, Water Resources

Date

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1 INTRODUCTION

1.1 Scope

WSP Canada Inc. was retained by FORUM/SLP 112 Nelson Limited Partnership to conduct a stormwater management study in support of proposals to develop an 9-storey residential building on land which previously contained a two-storey multi-tenant warehouse with surface parking.

1.2 Site Location

The site is located at 112 Nelson Street, Ottawa, Ontario, between Rideau Street and York Street. The location of the proposed development is illustrated in **Figure 1**.

Figure 1: Site Location

1.3 Stormwater Management Plan Objectives

The objectives of the stormwater management (SWM) study are as follows:

— Collect and review background information.
— Confirm applicable SWM design criteria with City of Ottawa staff.
— Evaluate various SWM practices that meet the stormwater management requirements and recommend a preferred strategy—specifically related to the applicable quantity and quality control criteria.

1.4 Design Criteria

Design criteria were confirmed through pre-consultation with the city of Ottawa held on October 22, 2020 (Meeting minutes included in **Appendix A**), with follow-up email on April 14, 2021. Criteria for 112 Nelson Street are as follows:

Water Quantity Control and Discharge to Municipal Infrastructure

- Stormwater must be controlled to the peak flow for the 2-year pre-development storm event. Runoff must be detained onsite to control all storm events up to and including the 100-year event.
- Allowable Runoff coefficient (C): C = the lesser of the existing pre-development conditions to a maximum of 0.5 (OSDG 8.3.7.3)
- Time of concentration (Tc): Tc = pre-development (Calculated); maximum Tc = 10 min

Water Quality

- RVCA requires enhanced water quality protection (80% TSS removal) be provided on-site

2 PRE-DEVELOPMENT CONDITIONS

2.1 General

Currently the land proposed for the new development contains a two-storey multi-tenant warehouse with surface parking. The overall existing site has an estimated runoff coefficient of 0.90. The total study area (i.e. portion of the site affected by the proposed works) is 0.29 ha.

2.2 Rainfall Information

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

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

Where;

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

2.3 Allowable Flow Rates

As noted in **Section 1.4**, post-development stormwater runoff from the 2-year to 100-year design storms must not exceed the pre-development peak 2-year flow rate, calculated using a runoff coefficient being the lesser of 0.50 or existing conditions. In this instance existing conditions have a runoff coefficient of 0.90, therefore a value of 0.5 has been used to calculate the allowable release rate.

The area will discharge east to a 450mm concrete storm pipe on Nelson Street through a new storm connection. The calculated peak flow rates for the site in the pre-development condition are summarized below in Table 2-1.

Table 2-1: Pre-Development Peak Flow Rate Calculations (Runoff Coefficient, C = 0.50 and T_c=10 min)

Return Period (Years)	Rainfall Intensity (MM/hour)	Peak Flow Rate (l/s)	Target Release Rate (l/s)
2	76.8	**31**	**31**
5	104.2	43	
10	122.1	50	
25	144.7	65	
50	161.5	79	
100	178.6	91	

3 POST-DEVELOPMENT CONDITIONS

3.1 General

The site will be developed with a new 9-storey residential building. The developed site will have a runoff coefficient of 0.77 and study area of 0.29 ha. A cistern will be used to control the peak discharge of the newly developed site to 31 L/s. Figure 2 shows the proposed controlled and uncontrolled drainage areas for the developed site.

Note that this report should be read in conjunction with the proposed site servicing drawing package—specifically drawings C02 (Grading Plan), C03 (Servicing Plan), and C04 (Storm Drainage Area Plan).

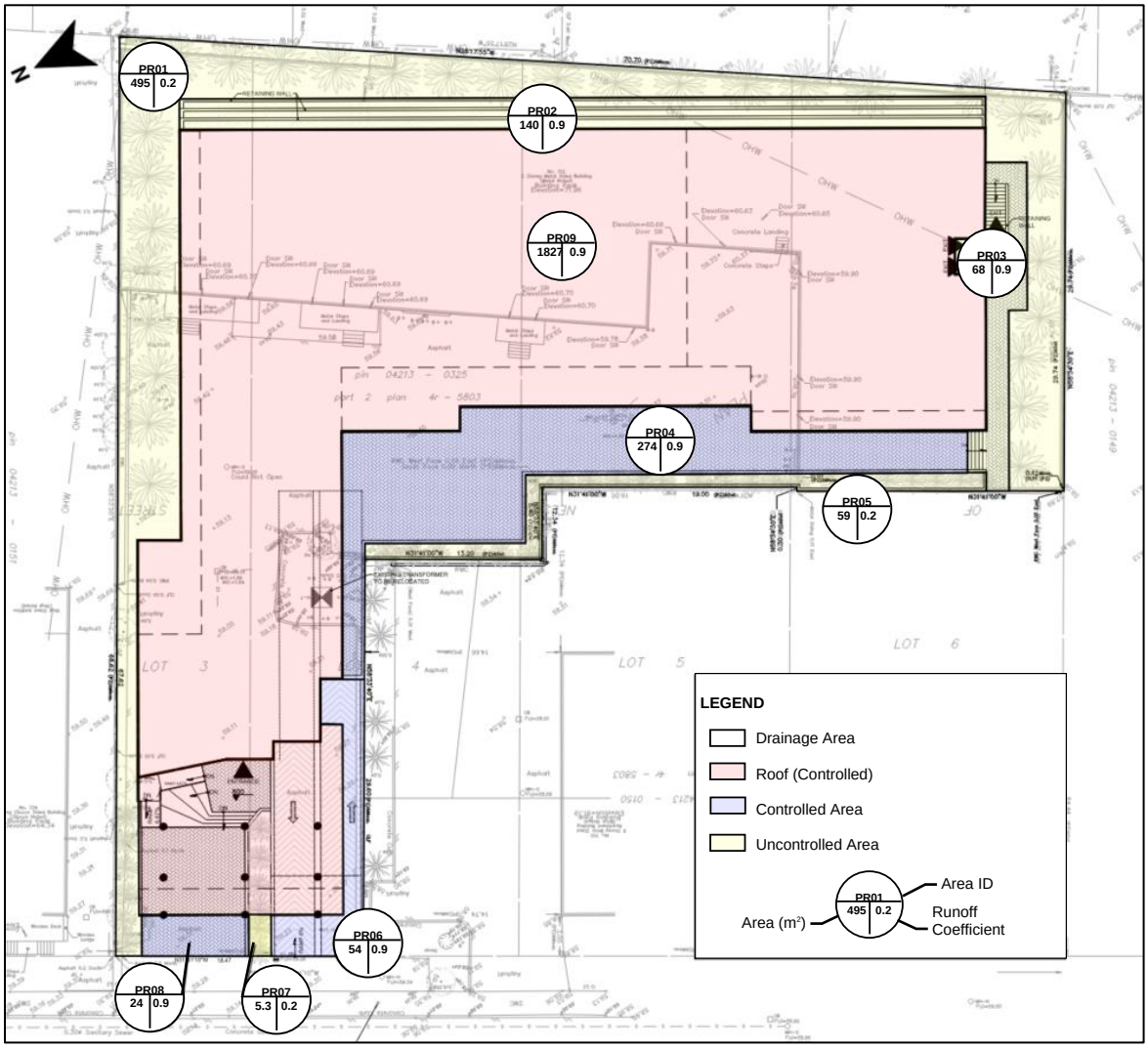

Figure 2: Proposed Drainage Areas

3.2 Water Quantity

As noted in **Section 2.3**, the target allowable discharge rate to the Nelson Street sewer is 31 L/s. This is equivalent to the peak runoff rate under pre-development conditions during a 2-year design storm event with a runoff coefficient of 0.50. Compliance with the 100-yr target offsite discharge rate will be achieved through use of a cistern with outlet control prior to discharge into the Nelson Street storm sewer.

It is noted that a small portion of the study area will not drain to the proposed cistern. Post-development runoff calculations have accounted for uncontrolled runoff from these areas, and the following analysis results report on the cumulative release rates from the study area (controlled plus uncontrolled). There are no external areas draining to the site.

A HydroCAD model of the project was created and includes:

- Cistern (minimum volume 69 m^3), with outlet controlled using flow control ICD (HYDROVEX 125-VHV-2) to detain 0.22 ha of the new development with a runoff coefficient of 0.9 (+25% for 100-year event as per OSDG 5.4.5.2.1; C = 1.0).
- Uncontrolled runoff from 0.077 ha area with C = 0.36 (+25% for 100-year event as per OSDG 5.4.5.2.1; C = 0.45).

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 cistern based on the proposed flow. The peak flow rate generated from the uncontrolled drainage area within the project site and controlled flow from the cistern is 31 L/s, which meets the total allowable 100-year release rate of 31 L/s. Modelling results are summarized below in **Table 3-1** and shown in **Appendix C**.

Note that results provided below describe performance of the proposed system at multiple storm durations, which have been solved iteratively within HydroCAD to represent critical conditions (i.e. maximum storage utilized within storage features, and peak release rate at the system discharge point). The results demonstrate that the target allowable 100-year release rate is satisfied at all durations.

Table 3-1: Summary of Modelling Results

Return Period (Years)	Time of Conc. (min)	Utilized Storage (m^3)	Peak Water Elevation in storage (m)	Peak Flow Rate at control (L/s)	Total Flow Leaving Site* (L/s)	Allowable 100-yr Flow Rate (L/s)
100 (Peak Discharge)	10	51	58.189	18	**31**	**31**
100 (Peak Storage)	36	69	58.541	21	28	

*'Total Flow Leaving Site' includes uncontrolled area and cistern discharge.

3.3 Water Quality

As noted in section 1.4, quality control is required to provide enhanced water quality treatment of the site (80% TSS removal). An OGS unit (Stormceptor EFO4 or equivalent) will be installed just upstream of the city storm sewer connection to provide the required quality treatment. OGS sizing is provided in **Appendix D**.

4 CONCLUSIONS

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

WATER QUANTITY

Runoff collected from the project site will be directed to a cistern with a minimum storage volume of 69 m^3 to control the 100-year event. The peak 100-year discharge from the site is 31 L/s, which meets the allowable release rate of 31 L/s.

WATER QUALITY

Water treatment is provided by an OGS unit placed just upstream of the city storm sewer connection.

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

Pre-consultation meeting minutes
(October 22, 2020)

Pre-Application Consultation Meeting Minutes

112 Nelson

PC2020-0262

October 22, 2020, Videoconference Call

Applicant Team (invitees)

- Paul Black, Fotenn
- Aly Damji, Forum Equity
- Hoa Nguyen, Forum Equity
- Jeremy Silburt, Smart Living Properties
- Dany Elsalibi, Smart Living Properties
- Bob Woodman, Woodman Architects
- Juan Gomez, Woodman Architects
- Christopher Gordon, CHG Transportation
- Andrew Harte, CHG Transportation

Lowertown Community Association

- Warren Waters

City of Ottawa

- Andrew McCreight, Planner, File Lead
- John Wu, Engineering
- Christopher Moise, Urban Design
- Wally Dubyk, Transportation

Subject: 112 Nelson Street

Opening & attendee introduction

- Introduction of meeting attendees
- Andrew explained NDA process with Lowertown CA.

Project Overview (applicant team)

Intro to team and partnership

- Presentation and Intro made to forum equity and smart living properties partnership and business approach.
    - **Note**: Staff request a copy of the presentation made during the meeting.
- Development focuses on millennial form housing.

- Forum has worked on various Ottawa projects, as well as student residents in Manitoba, and many rental projects.
- Proposed development is intended for Rental.
- Location is priority for our projects, and target active transit tenants
- All inclusive rental package, and tenant mix
- Fully furnished suites etc.
- Rental affordability with efficient units and location with amenity proximity etc. Tenants will be enjoying the outside of the unit with quality amenities in the building and surrounding neighbourhood

Proposal Overview

- Goal of project is to try to design the building to meet zoning as close as possible.
- The built form and envelope is intended to meet previous Schedule as much as possible.
- Parking complies with plans submitted, but there will likely be a request to further reduce parking requirement.
- Biggest difference from previous rezoning concept (and approval) is the building is now 10-storeys, but fits within previous zoning height.
- Architect description
    - Previous proposal was 150+ condo type units. We are looking at very different market (rental) and creating flexible use spaces.
    - Looking to maintain 10% as 3-bedroom units.
    - Fit within the envelope but not necessarily maximizing.
    - Meeting envelope and setbacks
    - Change of use to high-rise but within permitted form.
    - Residential building
    - Amenity – interior and roof-top. Meet calc. requirements
    - 342 keys (units)
    - This is not specifically designed for student. May include student but looking for young professionals etc.

Preliminary Comments from Related Discipline

<u>Andrew McCreight – File Lead</u>

- The Pre-con Form notes Site Plan but based on the discussion it is clear that a Zoning By-law amendment will be required as well.
- Provided a brief overview of the ownership, site history and previous rezoning application (recently approved via Omnibus Report)
- Question was raised about the design if the intent was for the design to result in every “suite” satisfying the definition of a dwelling unit?
    - Answer: Jeremy – all units will be designed to comply as dwelling units.

- Section 37 requirements will require re-negotiation based on the changes to the proposed development.
    - Applicant acknowledged.
- Any submission needs to provide a clear breakdown of the how the proposed GFA compares to the previous rezoning concept.
    - Planning Rationale to include a section of S. 37. See guidelines.
- The assessment and rationale that the built form and envelopment is consistent with the previous approval, except going to 10-storeys, is not accurate. Comparing this proposal to the approved Zoning Schedule highlights some concerning inconsistencies, such as the height (storeys), but also some of the stepbacks have not been incorporated.
- Staff fully expect that building heights (including storeys), setbacks and stepbacks previously established and approved through the Omnibus Report will be maintained.
- The design seems to intentionally maximize the number of units in this development and in a manner that is not desirable.
    - Floor heights seem to be squeezed to the minimum code requirement and paired with exceptionally small units
    - The concept incorporates dwelling units within the P1 garage level. This seems unnecessary and may contribute to a discussion around overdevelopment.
- Visitor parking – the zoning provision specific to minimum of 6 spaces was based on the previous concept. More visitor parking should be provided and relate the number of units.
- Waste Room access does not appear sufficient, at least for City collection. Consider the number of units proposed and design the waste/recycling room accordingly.
- Part of the business plan presentation spoke to tenants having excellent access to amenity outside of their unit. With the proposal development concept, which raises concern about the number and type of units proposed, it will be very important to see proper indoor Amenity Areas for ease of access by all tenants.
- Bicycle parking – the desire to achieve a 1:1 ratio is supported but further the design and location of bike parking for ease of use. Bicycle rooms within parking garage may work, but they need to be easy to access with a bike. Prefer to see a ground floor facility. Also look at option for visitor bicycle parking.
- More information will be required on affordable housing relative to the previous S. 37 items.
- Discuss this proposal with the Ward Councillor as he may have other ideas in mind for S. 37, and for the proposed development in general.
- Further pre-consultation is strongly recommended in response to comments received. The current proposal raises many concerns, and with the high-level issues addressed, staff can provide more detailed feedback.

Christopher – Urban Design

- Convincing business plan
    - Location
    - Quality design with efficient spaces, shared amenities, quality finishes etc.
    - Convenience
    - Shortage of rental housing, proforma, small units, amenities.
- However, while the strong business plan discussion is appreciated, but the missing piece is how the building itself contributes to the immediate community and the design of the City.

Specific Areas of Concern:

- The project is ten storeys and triggers the tall building guidelines and this proposal doesn't come close to meeting the max 750m^2 floorplate. Bringing this proposal down to nine storeys would avoid that.
- Would like further analysis of building relationship with surrounding context, especially planned function. Provide visualization.
- It might be helpful to see how this proposal relates to its surrounding properties within their planned context. Perhaps some modelling with ghosted blocks that illustrate what could be built around it to investigate side yard conditions.
- How the building presents a street scale and how the design relates to the context of Nelson.
- The massing and materiality of the design seems akin to a campus building on a green field site, so additional investigation would be valuable to recognize the diverse local context.
- No balconies which are a common way to visually break up a long facade and provide an architectural element that signifies a residential use.
- Concern about livability of below grade units. More elaboration of this approach needs to be provided (perhaps with a section).
- Quality of life of the building needs further description from a built form and design perspective. Not sure the business plan idea has translated into this form. This is not a convincing proposal.
- The P1 level units are very concerning.
- There is no landscaping plan provided yet and this will be a critical component of the success of the design and how it stitches itself into the context of the block as a whole.

Other

- This building will be highly visible in the middle of a downtown block, and although it does not sit within one of the City's Design Priority Areas we

recommend the proposal consider attending an Informal visit (prior to a full submission and is not a public meeting), with the City's UDRP to further discuss and evaluate various scenarios of development for the whole site;
- A Design Brief is a required submittal for all site plan applications. Please see the Design Brief Terms of Reference provided for details and consult the City's website for details regarding the UDRP schedule (if applicable).

John Wu - Engineering

- Major concern is to check sanitary capacity.
- Storm and water should not cause any concerns.
- Noise study will be required due to proximity of Rideau and King Edward.
- Jeremy – similar number of occupants from previous proposal, so capacity should not be an issue.

Wally - Transportation

- The remaining steps (Forecasting & Analysis) of the TIA report to be submitted during the Site Plan application. All other Transportation comments have been noted by the consultant and should be addressed on the site plan.
- Applicant
    - We will be further discussing additional transit demand strategies with staff such as car share, e-bike spaces etc.

Preliminary Comments from Community Association Representatives:

Warren is currently the only member from Lowertown Community Association who has signed the non-disclosure agreement.

- Welcome to the neighbourhood. There is an affordability emergency.
- We need more family housing.
- We do welcome student and young professions.
- You will receive concerns about this being a student bunkhouse.
- Beautiful neighbourhood and I recommend you get to know your neighbours and get to know the people who are affected by this development.
- City – don't hold up good housing projects.
- Investment with rental real estate with high turnover results in higher rents and increasement. Don't make this your business approach.
- Increase stress on infrastructure and more property taxes etc.

Note: there was a response discussion about Development Charges, and application process

Next Steps:

- Warren has signed non-disclosure agreement. If the applicant decides to go to the public, please email Warren to break this agreement. Andrew must be copied on such an e-mail if this occurs.
- Recommend consulting the Ward Councillor, as well as Lowertown Community Association.
- The plans and studies list will be provided for submission requirements.

McCaughey, Stephen

From: Wu, John <John.Wu@ottawa.ca>
Sent: Wednesday, April 14, 2021 11:10 AM
To: McCaughey, Stephen
Subject: RE: 112 Nelson St. - Design Criteria from Pre-consultation

Follow Up Flag: Follow up
Flag Status: Flagged

Please use C 0.5 , 2 year's storm to restrict up to 100 year's storm on site.

From: McCaughey, Stephen <Stephen.Mccaughey@wsp.com>
Sent: April 14, 2021 11:06 AM
To: Wu, John <John.Wu@ottawa.ca>
Cc: Blanchette, Erin <Erin.Blanchette@wsp.com>
Subject: 112 Nelson St. - Design Criteria from Pre-consultation

I understand you're the engineering contact for this 112 Nelson St. proposed development and possible re-zoning.

We'll be generating the proposed water and sanitary demands shortly but what isn't clear from the pre-consultation minutes is what are the stormwater management requirements for this site development?

Thanks very much,

Stephen McCaughey, P.Eng.
Project Engineer
Municipal Infrastructure

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APPENDIX

B

Pre-Development Stormwater Management Calculations

Project:	112 Nelson Street	No.:	211-04788-00	
By:	KK	Date:	2021-07-14	Page:
Checked:	MH	Checked:	2021-07-14	1

Subject: **SWM CALCULATIONS- Pre-Development Peak Flow**

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	2,948	m^2
Site Area, A	0.29	hectares
Runoff Coefficient, C	0.50	

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) 10 minutes

Return Period (Years)	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
T (mins)	10	10	10	10	10	10
I (mm/hr)	76.8	104.2	122.1	144.7	161.5	178.6
Runoff Coefficient C	0.50	0.50	0.50	0.50	0.50	0.50
C Multiplier (OSDG Table 5.7)	1.00	1.00	1.00	1.10	1.20	1.25
Revised Runoff Coefficient C	0.50	0.50	0.50	0.55	0.60	0.63
Q (litres/sec)	31	43	50	65	79	91
Q (m3/sec)	0.03	0.04	0.05	0.07	0.08	0.09

APPENDIX

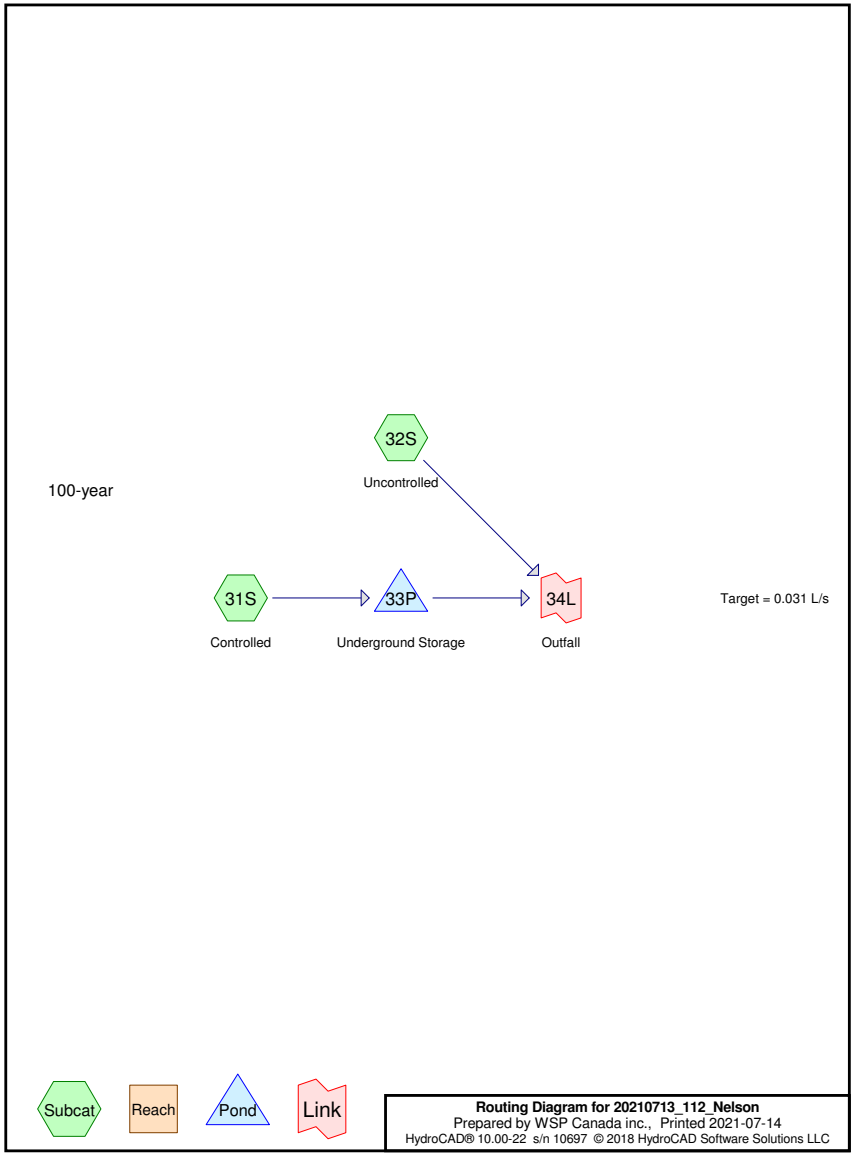
C

HydroCAD Model Output

APPENDIX

C-1 100-Year Analysis (Peak Discharge, T_C = 10 Min)

The storm system for the site is governed by the 100-year storm. Peak storage and peak discharge occur at separate times of concentration and are therefore reported separately.



Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
559.4	0.25	Landscaping (0.2) (32S)
274.4	1.00	Parking garage (0.9) (31S)
67.5	1.00	Pathway (0.9) (32S)
24.4	1.00	Plaza (0.9) (31S)
54.5	1.00	Ramp (0.9) (31S)
140.5	1.00	Retaining wall (0.9) (32S)
1,827.0	1.00	Roof (0.9) (31S)
2,947.7	**0.86**	**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 31S: Controlled Runoff Area=2,180.3 m² 100.00% Impervious Runoff Depth=30 mm
Tc=10.0 min C=1.00 Runoff=0.10625 m³/s 64.9 m³

Subcatchment 32S: Uncontrolled Runoff Area=767.4 m² 27.10% Impervious Runoff Depth=13 mm
Tc=10.0 min C=0.45 Runoff=0.01683 m³/s 10.3 m³

Pond 33P: Underground Storage Peak Elev=58.189 m Storage=51.4 m³ Inflow=0.10625 m³/s 64.9 m³
Outflow=0.01801 m³/s 64.9 m³

Link 34L: Outfall Inflow=0.03118 m³/s 75.1 m³
Primary=0.03118 m³/s 75.1 m³

Total Runoff Area = 2,947.7 m² Runoff Volume = 75.1 m³ Average Runoff Depth = 25 mm
18.98% Pervious = 559.4 m² 81.02% Impervious = 2,388.3 m²

Summary for Subcatchment 31S: Controlled

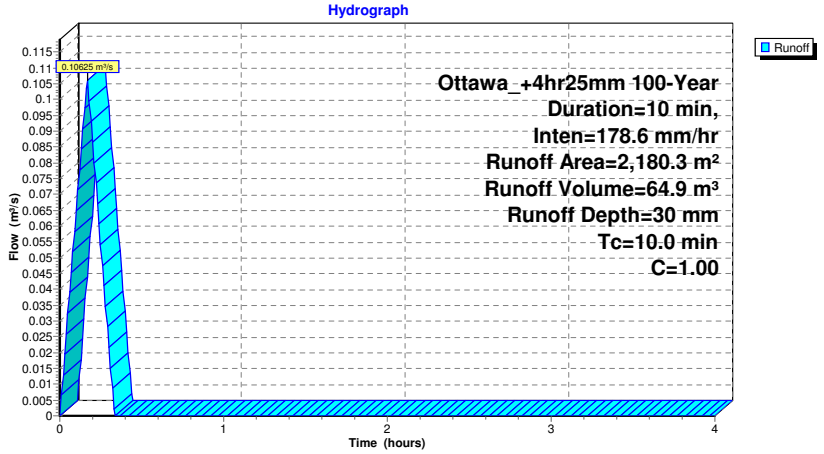
Runoff = 0.10625 m³/s @ 0.17 hrs, Volume= 64.9 m³, Depth= 30 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa_+4hr25mm 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (m²)	C	Description
1,827.0	1.00	Roof (0.9)
274.4	1.00	Parking garage (0.9)
54.5	1.00	Ramp (0.9)
24.4	1.00	Plaza (0.9)
2,180.3	1.00	Weighted Average
2,180.3		100.00% Impervious Area

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

Subcatchment 31S: Controlled



Summary for Subcatchment 32S: Uncontrolled

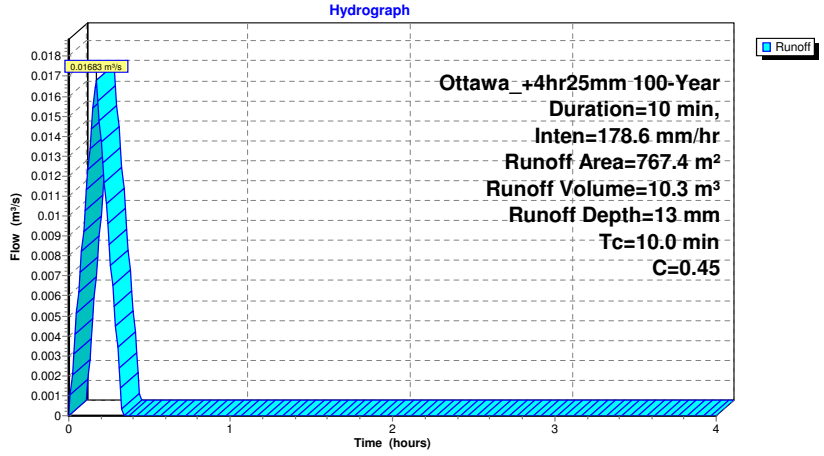
Runoff = 0.01683 m³/s @ 0.17 hrs, Volume= 10.3 m³, Depth= 13 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa_+4hr25mm 100-Year Duration=10 min, Inten=178.6 mm/hr

Area (m²)	C	Description
495.0	0.25	Landscaping (0.2)
140.5	1.00	Retaining wall (0.9)
67.5	1.00	Pathway (0.9)
59.2	0.25	Landscaping (0.2)
5.2	0.25	Landscaping (0.2)
767.4	0.45	Weighted Average
559.4		72.90% Pervious Area
208.0		27.10% Impervious Area

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

Subcatchment 32S: Uncontrolled



Summary for Pond 33P: Underground Storage

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

Inflow Area = 2,180.3 m²,100.00% Impervious, Inflow Depth = 30 mm for 100-Year event
Inflow = 0.10625 m³/s @ 0.17 hrs, Volume= 64.9 m³
Outflow = 0.01801 m³/s @ 0.31 hrs, Volume= 64.9 m³, Atten= 83%, Lag= 8.3 min
Primary = 0.01801 m³/s @ 0.31 hrs, Volume= 64.9 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 58.189 m @ 0.31 hrs Surf.Area= 0.0 m² Storage= 51.4 m³

Plug-Flow detention time= 32.0 min calculated for 64.7 m³ (100% of inflow)
Center-of-Mass det. time= 32.2 min (42.2 - 10.0)

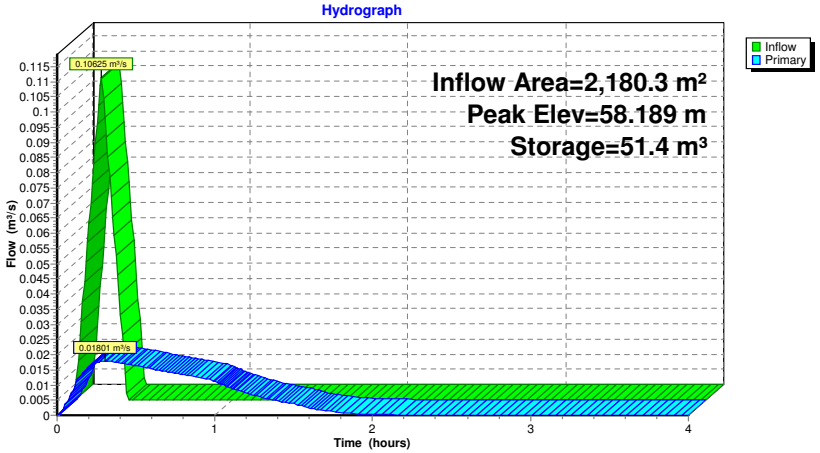
Volume	Invert	Avail.Storage	Storage Description
#1	57.160 m	75.0 m³	**Custom Stage Data** Listed below

Elevation (meters)	Cum.Store (cubic-meters)
57.160	0.0
58.660	75.0

Device	Routing	Invert	Outlet Devices
#1	Primary	56.890 m	**HYDROVEX 125-VHV-2 X 0.85** Head (meters) 0.000 0.200 0.600 1.000 1.500 2.000 2.500 3.500 4.500 6.000 Disch. (m³/s) 0.000000 0.000100 0.014000 0.018500 0.023000 0.027000 0.030000 0.035500 0.040000 0.046000

Primary OutFlow Max=0.01801 m³/s @ 0.31 hrs HW=58.188 m (Free Discharge)
↑**1=HYDROVEX 125-VHV-2** (Custom Controls 0.01801 m³/s)

Pond 33P: Underground Storage

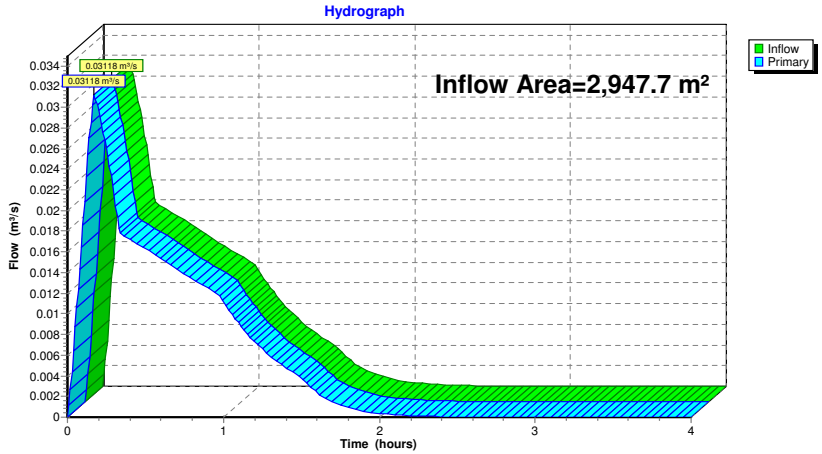


Summary for Link 34L: Outfall

Inflow Area = 2,947.7 m², 81.02% Impervious, Inflow Depth = 25 mm for 100-Year event
Inflow = 0.03118 m³/s @ 0.17 hrs, Volume= 75.1 m³
Primary = 0.03118 m³/s @ 0.17 hrs, Volume= 75.1 m³, Atten= 0%, Lag= 0.0 min

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

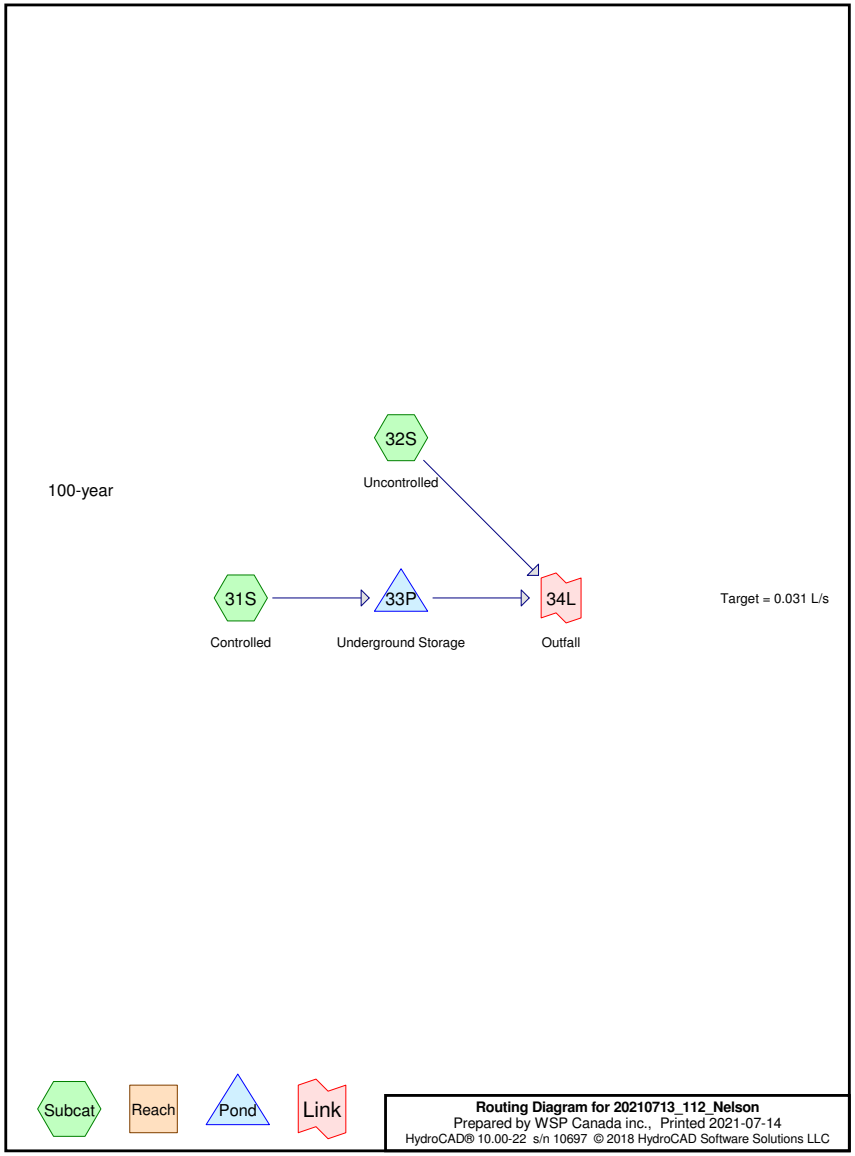
Link 34L: Outfall



APPENDIX C-2

100-Year Analysis (Peak Storage, T_C = 36 Min)

The storm system for the site is governed by the 100-year storm. Peak storage and peak discharge occur at separate times of concentration and are therefore reported separately.



Area Listing (selected nodes)

Area (sq-meters)	C	Description (subcatchment-numbers)
559.4	0.25	Landscaping (0.2) (32S)
274.4	1.00	Parking garage (0.9) (31S)
67.5	1.00	Pathway (0.9) (32S)
24.4	1.00	Plaza (0.9) (31S)
54.5	1.00	Ramp (0.9) (31S)
140.5	1.00	Retaining wall (0.9) (32S)
1,827.0	1.00	Roof (0.9) (31S)
2,947.7	**0.86**	**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 31S: Controlled Runoff Area=2,180.3 m² 100.00% Impervious Runoff Depth=49 mm
Tc=10.0 min C=1.00 Runoff=0.04903 m³/s 105.9 m³

Subcatchment 32S: Uncontrolled Runoff Area=767.4 m² 27.10% Impervious Runoff Depth=22 mm
Tc=10.0 min C=0.45 Runoff=0.00777 m³/s 16.8 m³

Pond 33P: Underground Storage Peak Elev=58.541 m Storage=69.0 m³ Inflow=0.04903 m³/s 105.9 m³
Outflow=0.02057 m³/s 105.9 m³

Link 34L: Outfall Inflow=0.02767 m³/s 122.7 m³
Primary=0.02767 m³/s 122.7 m³

Total Runoff Area = 2,947.7 m² Runoff Volume = 122.7 m³ Average Runoff Depth = 42 mm
18.98% Pervious = 559.4 m² 81.02% Impervious = 2,388.3 m²

Summary for Subcatchment 31S: Controlled

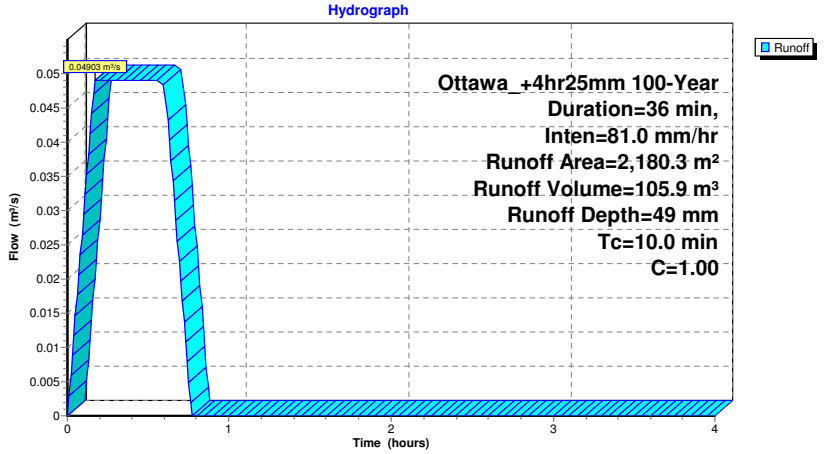
Runoff = 0.04903 m³/s @ 0.17 hrs, Volume= 105.9 m³, Depth= 49 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa_+4hr25mm 100-Year Duration=36 min, Inten=81.0 mm/hr

Area (m²)	C	Description
1,827.0	1.00	Roof (0.9)
274.4	1.00	Parking garage (0.9)
54.5	1.00	Ramp (0.9)
24.4	1.00	Plaza (0.9)
2,180.3	1.00	Weighted Average
2,180.3		100.00% Impervious Area

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

Subcatchment 31S: Controlled



Summary for Subcatchment 32S: Uncontrolled

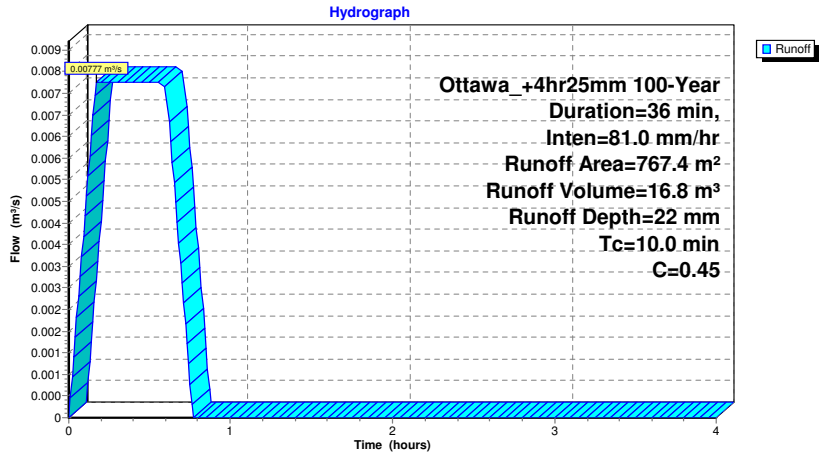
Runoff = 0.00777 m³/s @ 0.17 hrs, Volume= 16.8 m³, Depth= 22 mm

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Ottawa_+4hr25mm 100-Year Duration=36 min, Inten=81.0 mm/hr

Area (m²)	C	Description
495.0	0.25	Landscaping (0.2)
140.5	1.00	Retaining wall (0.9)
67.5	1.00	Pathway (0.9)
59.2	0.25	Landscaping (0.2)
5.2	0.25	Landscaping (0.2)
767.4	0.45	Weighted Average
559.4		72.90% Pervious Area
208.0		27.10% Impervious Area

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

Subcatchment 32S: Uncontrolled



Summary for Pond 33P: Underground Storage

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

Inflow Area = 2,180.3 m²,100.00% Impervious, Inflow Depth = 49 mm for 100-Year event
Inflow = 0.04903 m³/s @ 0.17 hrs, Volume= 105.9 m³
Outflow = 0.02057 m³/s @ 0.70 hrs, Volume= 105.9 m³, Atten= 58%, Lag= 31.6 min
Primary = 0.02057 m³/s @ 0.70 hrs, Volume= 105.9 m³

Routing by Stor-Ind method, Time Span= 0.00-4.00 hrs, dt= 0.01 hrs
Peak Elev= 58.541 m @ 0.70 hrs Surf.Area= 0.0 m² Storage= 69.0 m³

Plug-Flow detention time= 38.5 min calculated for 105.7 m³ (100% of inflow)
Center-of-Mass det. time= 38.7 min (61.7 - 23.0)

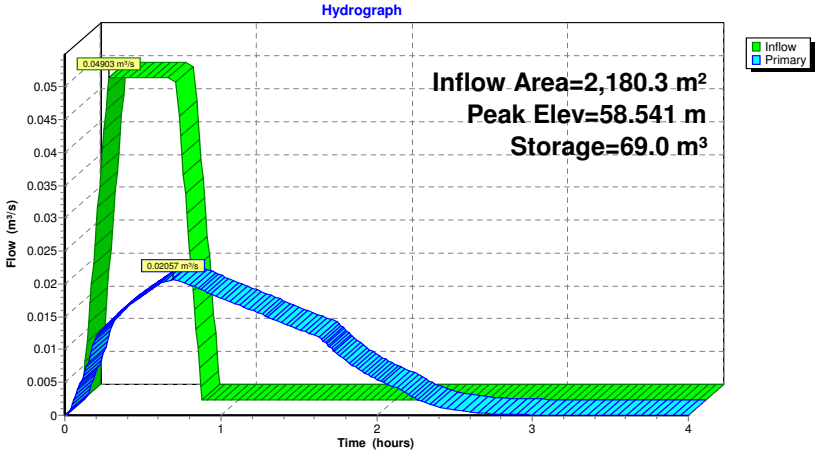
Volume	Invert	Avail.Storage	Storage Description
#1	57.160 m	75.0 m³	**Custom Stage Data** Listed below

Elevation (meters)	Cum.Store (cubic-meters)
57.160	0.0
58.660	75.0

Device	Routing	Invert	Outlet Devices
#1	Primary	56.890 m	**HYDROVEX 125-VHV-2 X 0.85** Head (meters) 0.000 0.200 0.600 1.000 1.500 2.000 2.500 3.500 4.500 6.000 Disch. (m³/s) 0.000000 0.000100 0.014000 0.018500 0.023000 0.027000 0.030000 0.035500 0.040000 0.046000

Primary OutFlow Max=0.02057 m³/s @ 0.70 hrs HW=58.540 m (Free Discharge)
↑**1=HYDROVEX 125-VHV-2** (Custom Controls 0.02057 m³/s)

Pond 33P: Underground Storage

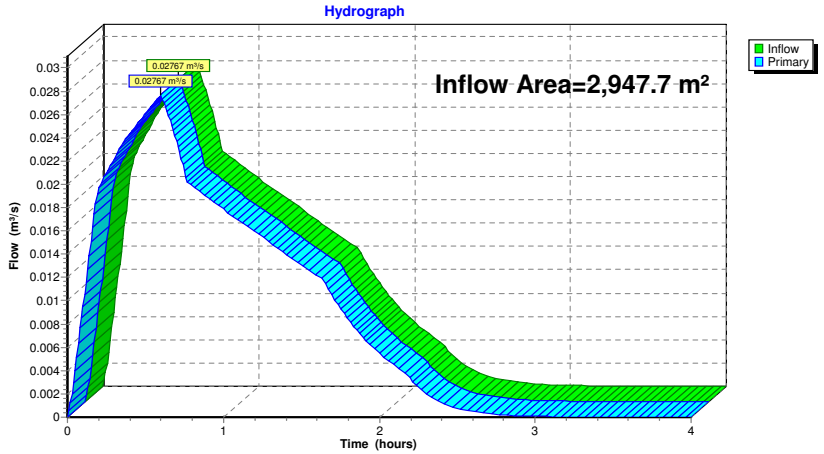


Summary for Link 34L: Outfall

Inflow Area = 2,947.7 m², 81.02% Impervious, Inflow Depth = 42 mm for 100-Year event
Inflow = 0.02767 m³/s @ 0.60 hrs, Volume= 122.7 m³
Primary = 0.02767 m³/s @ 0.60 hrs, Volume= 122.7 m³, Atten= 0%, Lag= 0.0 min

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

Link 34L: Outfall



APPENDIX

D OGS Sizing

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

07/14/2021

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA MACDONALD-CARTIER INT'L AP
NCDC Rainfall Station Id:	6000
Years of Rainfall Data:	37

Site Name:	

Drainage Area (ha):	0.22
% Imperviousness:	100.00

Runoff Coefficient 'c': 0.90

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Project Name:	112 Nelson Street
Project Number:	211-04788-00
Designer Name:	Kathryn Kerker
Designer Company:	WSP
Designer Email:	kathryn.kerker@wsp.com
Designer Phone:	613-690-1206
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	7.16
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	31.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

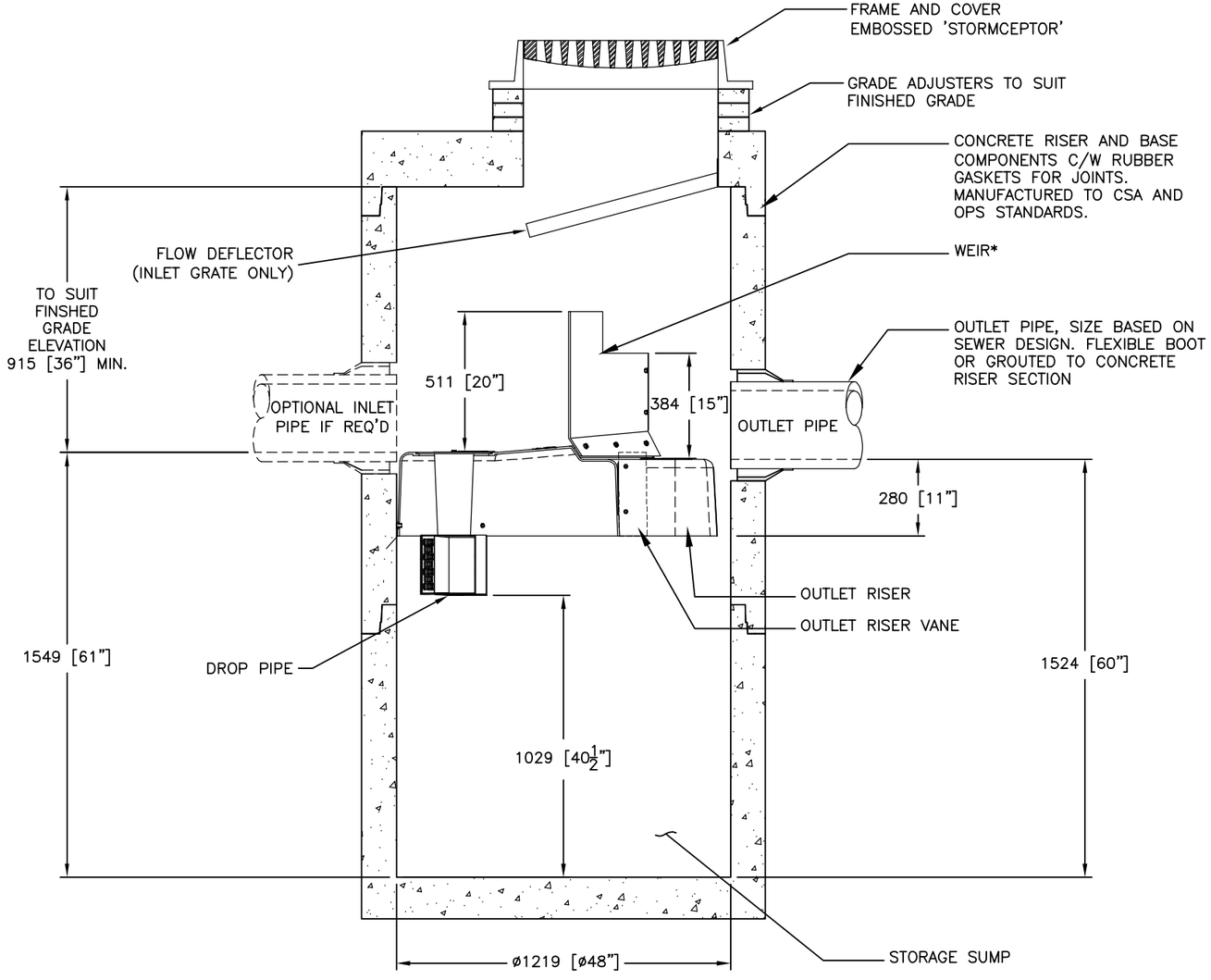
Stormceptor Model	TSS Removal Provided (%)
EFO4	85
EFO6	89
EFO8	91
EFO10	92
EFO12	93

Recommended Stormceptor EFO Model: EFO4

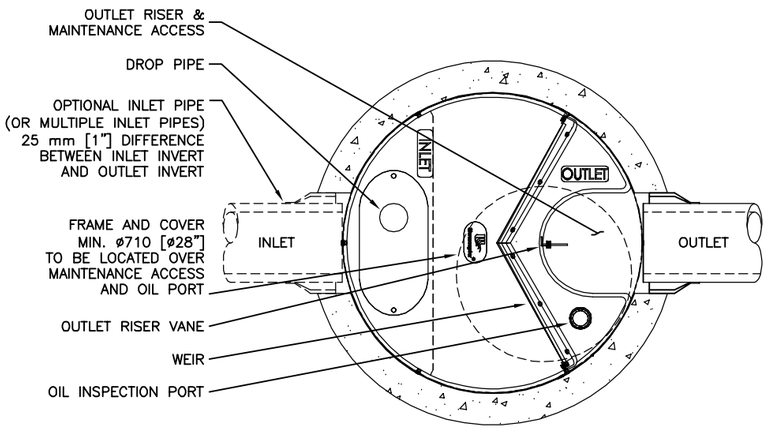
Estimated Net Annual Sediment (TSS) Load Reduction (%): 85

Water Quality Runoff Volume Capture (%): > 90

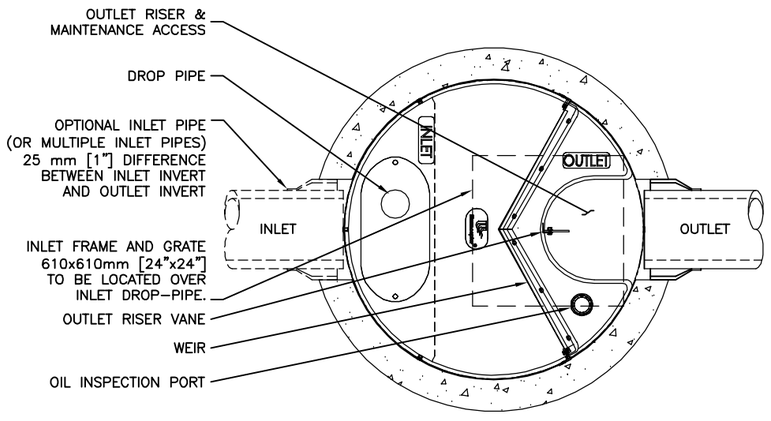
imbrium



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF4 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO4 (OIL CAPTURE CONFIGURATION). WEIR HEIGHT IS 150 mm (6 INCH) FOR EF04.

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

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 STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EF4
STRUCTURE ID	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
DRAINAGE AREA (HA)	*
DRAINAGE AREA IMPERVIOUSNESS (%)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
1	6/8/18	UPDATES	JSK
0	5/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

SCALE = NTS

imbrium®
7007 RIDGE ROAD, SUITE 350, HANOVER, MD 21076
USA 888-279-9828 CA 800-388-4601 INTL +1-416-960-9900

DATE: 5/26/2017

DESIGNED:	DRAWN:
JSK	JSK
CHECKED:	APPROVED:
BSF	SP
PROJECT No.:	SEQUENCE No.:
EF4	*

SHEET: 1 OF 1