

SERVICING BRIEF & STORMWATER MANAGEMENT REPORT

1291 Summerville Avenue
Ottawa, Ontario

Report No. 20102

July 27, 2021
Revised October 27, 2021
Revised March 10, 2022



NOT VALID UNLESS
SIGNED & DATED



Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

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SERVICING BRIEF & STORMWATER MANAGEMENT REPORT

1291 Summerville Avenue
Ottawa, Ontario

This report describes the services and addresses the stormwater management requirements of a property 1,009 sq.m. in area located at 1291 Summerville Avenue in Ottawa. The property currently has a three-storey apartment building on it that will be demolished. A three-storey (four-level, including basement apartments), 16-unit apartment building is proposed.

This report forms part of the stormwater management design for the proposed development. Refer to drawings C-1 to C-6 also prepared by D. B. Gray Engineering Inc.

WATER SUPPLY FOR FIREFIGHTING:

The proposed building will be installed with a sprinkler system with the fire department connection (FDC) located adjacent to the main entrance of the proposed building. There is an existing municipal fire hydrant in the Summerville Avenue municipal road right-of-way located near the southwest corner of the Summerville Avenue / Silver Street intersection that is approximately 43 m unobstructed distance to the proposed FDC. There is also a proposed municipal fire hydrant immediately in front of the subject property (that will be installed as part of the 1295 Summerville Avenue development – D07-12-19-0048) that will be approximately 22 m unobstructed distance to the proposed FDC. Since these fire hydrants are located less than the maximum 45 m permitted, an additional fire hydrant is not required.

The required fire flow was originally calculated in February 2021 prior to the publication of City of Ottawa Technical Bulletin ISTB-2021-03. As such, the original required fire flow was calculated, as per the Fire Underwriters Survey (FUS) method, to be 14,000 L/min (233.3 L/s) at a minimum required pressure of 140 kPa (20 psi). As per City of Ottawa Technical Bulletin ISTB-2021-03, when calculating the required fire flow where pipe sizing is not affected, the OBC method is to be used. Using the OBC method the required fire flow has since been calculated to be 5,400 L/min (90 L/s) at a minimum required pressure of 140 kPa (20 psi). However, as per the Ontario Building Code (OBC) the flow required for firefighting is required to be calculated using NFPA-13 since the building will have a sprinkler system. The sprinkler system is not yet designed but it is expected that the required flow will be no more than 38 L/s (600 USgpm) including the flow required for hose stream allowances.

The boundary conditions, received from the City, indicated that the maximum available fire flow at 138 kPa (20 psi) is 74 L/s in the existing 150 mm municipal watermain in Summerville Avenue. Since the available flow (74 L/s) is greater than 38 L/s, there is an adequate water supply from the existing municipal water distribution system for the sprinkler system and hose stream allowances.

WATER SERVICE:

As previously mentioned the proposed building will have a sprinkler system. To service the sprinkler system, a 150 mm water service (connecting to the 150 mm municipal watermain in Summerville Avenue) is proposed. The 150 mm service will be adequate for the domestic demand.

Based on the City of Ottawa Water Distribution Design Guidelines for residential properties (Table 4.1 & Table 4.2: two bedroom apartment units / 2.1 person per unit; and 350 L/person/day) and Ministry of the Environment Design Guidelines for peaking factors (Table 3-3) the daily average flow is 0.1 L/s with a maximum daily and maximum hourly demand of 1.3 and 1.9 L/s respectively.

To determine water pressure under these demands, boundary conditions, based on the City of Ottawa computer simulation of the water distribution system, at the subject location, are required.

Based on the boundary conditions received from the City, the minimum HGL (hydraulic grade line) is 124.4 m and the maximum is 132.9 m. With these HGLs the water pressure at the water meter is calculated to vary from 390 to 473 kPa (57 to 69 psi). This is an acceptable range of water pressures for the proposed development.

SANITARY SERVICE:

Based on the City of Ottawa Sewer Design Guidelines for a residential property (Technical Bulletin ISTB-2018-01, Figure 4.3: 16 two-bedroom apartment units / 2.1 person per unit; 280 l/person/day; and a 3.2 peaking factor); and based on a 0.33 L/s/ha infiltration flow; the post development flow is calculated to be 0.38 L/s. This flow will be adequately handled by the proposed sanitary sewer service connections (150 mm at 2% - 22.47 L/s capacity) since, at the design flow, it will only be about 2% full.

The proposed 150mm sanitary service connections will connect to the 225 mm municipal sanitary sewer in Summerville Avenue which, with a 2.91% slope, has a capacity of 76.60 L/s. The existing 12-unit apartment building is calculated to have generated 0.29 L/s. The 0.09 L/s increase in sanitary flows contributing to the existing 225 mm sanitary sewer is expected to have an acceptable impact.

STORMWATER MANAGEMENT:

Water Quality:

The Rideau Valley Conservation Authority RVCA has stated: *“The RVCA will not require on-site water quality protection based on the proposed site plan (primarily rooftop collection) and distance to outlet. Best management practices are encouraged where possible.”* No permanent quality control measures are proposed.

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-3 and notes 2.1 to 2.5 on drawing C-4). In summary: to filter out construction sediment capture filter sock inserts will be installed in all existing catch basins adjacent to the site; and any material deposited on a public road shall be removed.

Water Quantity:

The stormwater management criteria for quantity control are to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 2-year storm event using a pre-development runoff coefficient or runoff coefficient of 0.50, whichever is less; and a calculated time of concentration (not less than 10 minutes). An additional criterion is to have no surface ponding during the 2-year storm event. It is calculated that the pre-development conditions reflect a 5-year runoff coefficient of 0.68 and a time of concentration of 7 minutes. Therefore, based on a 10 minute time of concentration and the Rational Method the pre-development flow rate is 38.10 L/s for the 100-year event and 19.77 L/s for the 5-year. However, based on runoff coefficient of 0.50 and the 2-year event; the maximum allowable release rate is 10.77 L/s for all storm events. The runoff coefficients for the 100 year event are increased by 25% to maximum 1.00.

Stormwater will be stored within the development on the roof of the proposed building and on the surface in the parking area. Storage requirements are calculated using the Modified Rational Method.

Drainage Area I

(Uncontrolled Flow Off Site – 141 sq.m.):

The runoff from the perimeter the site will be allowed to flow uncontrolled off the site. The flow is calculated at 10 minutes concentration.

	100-year	5-year
Maximum flow rate:	5.03 L/s	2.60 L/s

Drainage Area II (Roof – 430 sq.m.):

The two roof drains will be a flow control type which will restrict the flow and cause the storm water to pond on the roof. The flow control type roof drain shall be installed with a parabolic shaped slotted weir (1 slot per weir drain at 0.0124 l/s per mm per slot - 5 USgpm per inch per slot); the opening at top of flow control weir shall be a minimum 50

mm in diameter: Watts roof drain with a Watts Accutrol Weir RD-100-A1 or equal. Four scuppers, each a minimum 315 mm wide and installed 150 mm above the roof drains, are required (refer to architectural for exact locations and details). The roof shall be designed to carry the load of water having a 50 mm depth at scupper and 200 mm depth at roof drain (refer to structural).

	100-year	5-year
The maximum release rate:	3.33 L/s	2.53 L/s
The maximum ponding depth:	134 mm	102 mm
The maximum stored volume:	13.77 cu.m.	6.03cu.m.

Drainage Area III (438 sq.m.):

An inlet control device (ICD) located at the outlet pipe of catch basin / manhole CB/MH-3 will control the release of stormwater from Drainage Area III. The ICD will restrict the flow and force the stormwater to back up onto the asphalt surface above catch basin CB-1 in the parking area. The ICD shall be a Hydrovex "VHV Vertical Vortex Flow Regulator" and shall be sized by the manufacturer for a discharge rate of 2.42 L/s at 2.12 m head. It is calculated that an orifice area of 1,963 sq.mm. (50 mm diameter) and a discharge coefficient of 0.191 will restrict the outflow rate to 2.42 L/s at a head of 2.12 m. Based on this orifice the maximum outflow rate for the 5-year storm event is calculated to be 2.37 L/s at 2.04 m.

	100-year	5-year
Maximum release rate:	2.42 L/s	2.37 L/s
Maximum water elevation:	84.50 m	84.42 m
Maximum stored volume:	9.13 cu.m.	3.28 cu.m.

The Entire Site:

	100-year	5-year
Pre-development Flow Rate:	38.10 L/s	19.77 L/s
Maximum allowable release rate:	10.77 L/s	10.77 L/s
Maximum release rate:	10.77 L/s	7.50 L/s
Maximum stored volume:	22.91 cu.m.	9.32 cu.m.

Therefore, the maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable and it is 72% less than the pre-development flow rate. For the 5-year event the maximum post-development release is calculated to be 30% less than the maximum allowable and 62% less than the pre-development flow rate.

Since there cannot be surface storage during the 2-year storm event, the required storage has to be underground. When underground storage is used, to calculate the required storage volume, an average release rate, assumed to be equal to 50% of the maximum release rate is used (as required by the City). By this method it is calculated that there is sufficient underground storage (in catch basins, manholes and sewer pipes) to meet the required storage.

Maximum release rate:	2-year 1.79 L/s
Top of catch basin elevation:	84.30 m
Maximum water elevation:	83.53 m (below grade)
Maximum stored volume:	3.58 cu.m.

The unrestricted flowrate resulting from the five-year storm event will produce a peak flow of 18.15 L/s which will be adequately handled by the proposed storm sewer system with last segment (250mm at 0.43% - 40.7 L/s capacity) being only at 45% of its capacity. This storm sewer segment is only 12% full at 4.9 L/s, based on the 5-year restricted flowrate due to the flow control roof drains and the ICD.

The stormwater flows contributing to the 300 mm municipal storm sewer in Summerville Avenue is expected to have a positive impact given that it is 62% reduction from the pre-development flows.

CONCLUSIONS:

1. A private on-site fire hydrant is not required.
2. Based on the NFPA-13 there is an adequate water supply for firefighting from the existing municipal water distribution system for the sprinkler system and hose stream allowances.
3. There is an acceptable range of water pressures in the municipal watermain for the proposed development.
4. The expected sanitary sewage flow rate will be adequately handled by the proposed sanitary sewer service connection.
5. The sanitary flow contributing to the existing municipal sanitary sewer is expected to have an acceptable impact.
6. The RVCA does not require onsite water quality treatment, therefore, no permanent quality control measures are proposed.
7. An erosion and sediment control plan has been developed to be implemented during construction.
8. The stormwater management criteria for quantity control are to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 2-year storm event using a runoff coefficient of 0.50 and a time of concentration of 10 minutes. The maximum allowable release rate is 10.77 L/s for all storm events.

9. The maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable and it is 64% less than the pre-development flow rate. For the 5-year event the maximum post-development release is calculated to be 30% less than the maximum allowable and 62% less than the pre-development flow rate.
10. It is calculated that there is sufficient underground storage in catch basins, manholes and sewer pipes to meet the required storage during the 2-year storm event without any surface ponding.
11. The unrestricted flowrate resulting from one in five-year storm event will be adequately handled by the proposed storm sewer system
12. The stormwater flows contributing to the 300 mm municipal storm sewer in Summerville Avenue is expected to have a positive impact given that it is a 62% to 72% reduction from the pre-development flows.



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REVISÉ 04-Feb-21
 REVISÉ 22-Feb-21
 REVISÉ 19-Jul-21

1291 Summerville Avenue
 Ottawa, Ontario

Fire Flow Requirements

Proposed Four-Level 16-Unit Apartment Building

Fire flow requirement as calculated as per Fire Underwriter Survey "Water Supply For Fire Protection".

$F = 220 C A^{0.5}$ = the required fire flow in litres per minute

C = coefficient related to the type of construction
 = 1.5 Wood Frame Construction

A = total floor area (all storeys excluding basements at least 50% below grade)

3rd Level	426 sq.m.
2nd Level	426 sq.m.
Main Level	426 sq.m.
Lower Level	426 sq.m.

TOTAL FIRE AREA: 1704 sq.m.

F = 13,623 L/min
 = 14,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Non-Combustible Occupancy

= 11,900 L/min

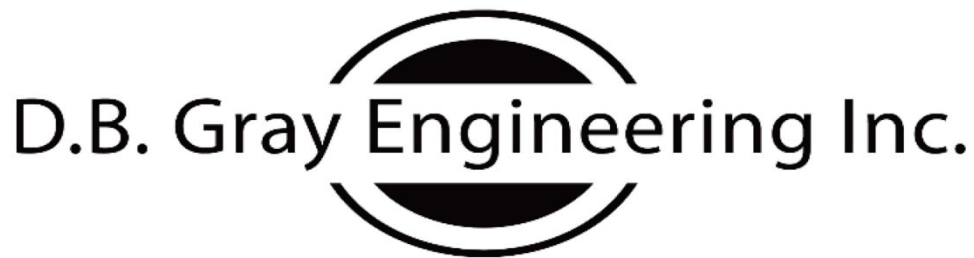
40% Reduction for Sprinkler System

= 4,760 L/min

Increase for Separation Exposed Buildings

			Adjacent Building		Length- Height Factor
		Constuction	Length m	Storeys	
8% North	20.1 to 30m	W-F	19	2	39
19% East	3.1 to 10m	W-F	22	3	66
8% South	20.1 to 30m	W-F	13	2	26
24% West	0 to 3m	W-F	21	3	62
59%	Total Increase for Exposure (maximum 75%)				
=	7,021	L/min Increase			
=	14,161	L/min			
F =	14,000	L/min (rounded off to the nearest 1,000 L/min)			
=	233.3	L/s			

Assumed Ground Elevation: 84.80 m ASL
 HGL
 74 L/s FIRE FLOW: 99.0 m ASL 20 psi 139 kPa



Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

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January 18, 2022

1291 Summerville Avenue
4-Storey Apartment Building
Ottawa, Ontario

FIRE FLOW CALCULATIONS OBC Method

Q = Required water supply in litres
= KVS_{Total}

K = Water supply coefficient, as per OBC A-3.2.5.7. Table 1
= 18 Group C Occupancy, Building is of combustible construction with
fire separations and fire resistance ratings in accordance with Subsection 3.2.2.

V = Building volume in cubic meters

Floor Area (sq.m)	Height (m)	Volume (cu.m)
430	12	5,160

S_{Total} = Total of spatial coefficients from exposure distances
= $1.0 + S_{Side\ 1} + S_{Side\ 2} + S_{Side\ 3} + S_{Side\ 4}$

	Spatial Coefficient	Exposure Distance (m)	
$S_{Side\ 1}$	0	14.5	(to north property line)
$S_{Side\ 2}$	0.5	3.5	(to east property line)
$S_{Side\ 3}$	0	13.5	(to centerline of road)
$S_{Side\ 4}$	0.5	1.5	(to west property line)
S_{Total}	2.0		

Q = 185,760 L
= 5,400 L/min as per OBC A-3.2.5.7. Table 2
= 90.0 L/s



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04-Feb-21

REVISED 19-Jul-21

1291 Summerville Avenue
 Ottawa, Ontario

Water Demand

Proposed Four-Level 16-Unit Apartment Building

	Number of Units	Persons Per Unit	Population
UNIT TYPE:			
Single Family:	0	3.4	0
Semi- detached:	0	2.7	0
Duplex:	0	2.3	0
Townhouse:	0	2.7	0
APARTMENTS:			
1 Bedroom:	0	1.4	0
2 Bedroom:	16	2.1	34
3 Bedroom:	0	3.1	0
Average Aptarment:	0	1.8	0
TOTAL:	16		34

DAILY AVERAGE

350	litres / person / day			
8.2	L/min	0.1	L/s	2 USgpm

MAXIMUM DAILY DEMAND

9.4	(Peaking Factor for a population of 34 Table 3-3 MOE Design Guidelines for Drinking-Water Systems)			
76.5	L/min	1.3	L/s	20 USgpm

MAXIMUM HOURLY DEMAND

14.1	(Peaking Factor for a population of 34 Table 3-3 MOE Design Guidelines for Drinking-Water Systems)			
115.1	L/min	1.9	L/s	30 USgpm

Elevation of Water Meter: 84.61 m ASL
 Basement Floor Elevation: 83.71 m ASL

Static Pressure at Water Meter

MINIMUM HGL: 124.4 m ASL 57 psi 390 kPa

MAXIMUM HGL: 132.9 m ASL 69 psi 473 kPa



Douglas Gray <d.gray@dbgrayengineering.com>

RE: 1291 Summerville Ave Boundary Condition Request

1 message

Baker, Adam <adam.baker@ottawa.ca>

Mon, Feb 22, 2021 at 8:58 AM

To: Douglas Gray <d.gray@dbgrayengineering.com>

Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>

Hi Doug,

Please find attached water boundary conditions for 1291 Summerville –

The following are boundary conditions, HGL, for hydraulic analysis at 1291 Summerville (zone 2W2C) assumed to be connected to the 152 mm on Summerville Avenue (see attached PDF for location).

Minimum HGL = 124.4 m

Maximum HGL = 132.9 m

Available Fire Flow @ 20 psi = 74 L/s assuming a ground elevation of 84.8m

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermain deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Thanks,
Adam**Adam Baker, EIT**

Project Manager

Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique

Development Review - South Branch

City of Ottawa | [Ville d'Ottawa](#)[110 Laurier Avenue West Ottawa, ON](#) | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1613.580.2424 ext./poste 26552, Adam.Baker@ottawa.ca

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: February 05, 2021 7:03 AM
To: Baker, Adam <adam.baker@ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: 1291 Summerville Ave Boundary Condition Request

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ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Adam

Please provide the boundary conditions at [1291 Summerville Ave](#). We have calculated the following expected demands for a Four-Level 23-Unit apartment building.

Average daily demand: 0.2 L/s.

Maximum daily demand: 1.5 L/s.

Maximum hourly daily demand: 2.3 L/s

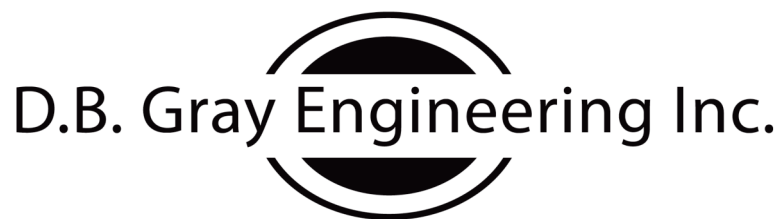
Fire Flow demand: 233.3 L/s

Fire Flow + Max Day: 234.8 L/s

Calculations are attached.

I understand that the available fire flow in the area is limited. If the required fire flow of 233.3 L/s is not available, please request a multi-hydrant analysis with three hydrants open: the hydrant located at the SW corner of the Summerville Ave / Silver St intersection; the hydrant located at the SW corner of the Dorchester Ave / Silver St intersection; and the hydrant located at the SE corner of the /Trenton Ave / Silver St intersection; .

Thanks, Doug



Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

700 Long Point Circle

Ottawa, Ontario K1T 4E9

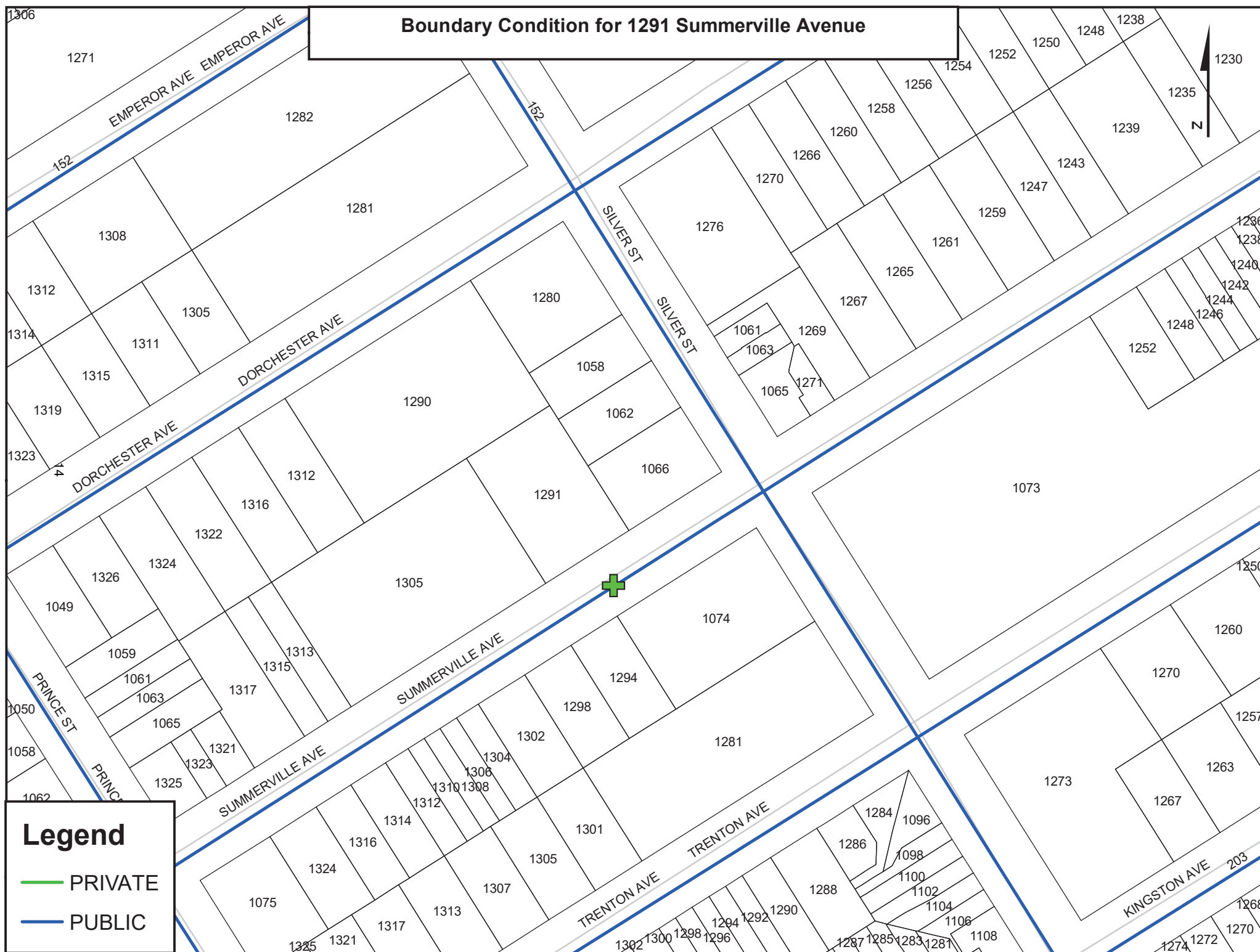
d.gray@dbgrayengineering.com

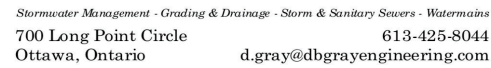
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**1291 Summerville Avenue February 2021.pdf**

84K





Average Daily Flows		
Residential:	280	L / capita / day
Commercial:	28000	L / ha / day
Institutional:	28000	L / ha / day
Light Industrial:	35000	L / ha / day
Heavy Industrial:	55000	L / ha / day

Peaking Factor:		
Residential (Harmon Equation):	$1 + \frac{14}{4 + P^{0.5}}$	
P = Population / 1000		
Harmon Correction Factor:	0.8	
Commercial & Institutional:	1.5	If contrinb
Commercial & Institutional:	1	If contrinb
Industrial:	As per Ottawa Guide	

Page: 1 of 1

Location		Section								Cumulative Residential		Section Non-Residential			Cumulative					Sewer Data							Comments		
		Single Family ppu = 3.4	Semi / Townhouse ppu = 2.7	Duplex / Triplex ppu = 2.3	Apartment (average) ppu = 1.8	Apartment (1 Bed) ppu = 1.4	Apartment (2 Bed) ppu = 2.1	Apartment (3 Bed) ppu = 3.1	Area		Peaking Factor	Area (ha)	Flow (L/ha/day)	Peaking Factor	Flow (L/s)	Area (ha)	Sewage Flow (L/s)	Infiltration Flow (L/s)	Total Flow (L/s)	Material	Actual Diameter (mm)	Nominal Diameter (mm)	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)		Ratio Q/Qfull	
From	To	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	(ha)	Pop.																			
		EXISTING DEVELOPMENT																											
Existing Building	Existing 225 SAN							12		0.1009	25	3.20						0.1009	0.26	0.03	0.29								
		PROPOSED DEVELOPMENT																											
Proposed Building	Existing 225 SAN							16		0.1009	34	3.20						0.1009	0.35	0.03	0.38	PVC	152.4	150	2.00	15.7	22.47	1.23	0.02
																				Existing 225 SAN in Summerville Avenue									
																					225.0	225	2.91		76.60	1.93			



Ryan Faith <r.faith@dbgrayengineering.com>

RE: RVCA Stormwater Management Comments - 1291 Summerville Avenue

1 message

Eric Lalande <eric.lalande@rvca.ca>
To: Ryan Faith <r.faith@dbgrayengineering.com>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>

Thu, Apr 15, 2021 at 1:51 PM

Hi Ryan,

The RVCA will not require on-site water quality protection based on the proposed site plan (primarily rooftop collection) and distance to outlet. Best management practices are encouraged where possible.

Thank you,

Eric Lalande, MCIP, RPP

Planner, RVCA

613-692-3571 x1137

From: Ryan Faith <r.faith@dbgrayengineering.com>
Sent: Thursday, April 15, 2021 12:39 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>
Subject: RVCA Stormwater Management Comments - 1291 Summerville Avenue

Hi Eric,

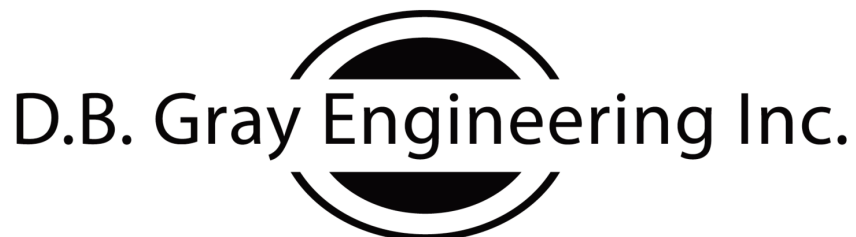
We are working on a proposed 3 storey apartment building on 1009 sq.m of land at [1291 Summerville Avenue](#) in Ottawa.

Please comment on the stormwater management for the site.

I have attached a site plan for your reference.

Thanks,

Ryan Faith



Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains

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Summary Tables

ONE HUNDRED-YEAR EVENT					
Drainage Area	Pre Development 100-Year Flow Rate (L/s)	Maximum Allowable Release Rate (L/s)	Achieved Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site)	-	-	5.03	-	-
AREA II (Roof)	-	-	3.33	13.77	13.77
AREA III	-	-	2.42	9.13	9.13
TOTAL	38.10	10.77	10.77	22.91	22.91

FIVE-YEAR EVENT					
Drainage Area	Pre Development Release Rate (L/s)	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site)	-	-	2.60	-	-
AREA II (Roof)	-	-	2.53	6.03	6.03
AREA III	-	-	2.37	3.28	3.28
TOTAL	19.77	10.77	7.50	9.32	9.32

1291 Summerville Avenue
Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS

Rational Method

PRE-DEVELOPMENT CONDITIONS

100-Year Flow Rate

			C
Roof Area:	208	sq.m	1.00
Asphalt/Concrete Area:	479	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	322	sq.m	0.25
Total Catchment Area:	1009	sq.m	0.76

Airport Formula

$$T_c = \frac{3.26 \cdot (1.1 - C) \cdot L^{1/2}}{S_w^{0.33}} \text{ min}$$

Runoff Coefficient (C):	0.76	
Sheet Flow Distance (L):	51	m
Slope of Land (Sw):	2.4	%

Time of Concentration (Sheet Flow): 6 min

Area (A):	1009	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr
Runoff Coefficient (C):	0.76	

100-Year Pre-Development Flow Rate (2.78AiC): 38.10 L/s

PRE-DEVELOPMENT CONDITIONS (Continued)

5-Year Flow Rate

			C
Roof Area:	208	sq.m	0.90
Asphalt/Concrete Area:	479	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	322	sq.m	0.20
Total Catchment Area:	1009	sq.m	0.68

Airport Formula

$$T_c = \frac{3.26 \cdot (1.1 - C) \cdot L^{1/2}}{S_w^{0.33}} \text{ min}$$

Runoff Coefficient (C):	0.68	
Sheet Flow Distance (L):	51	m
Slope of Land (Sw):	2.4	%
Time of Concentration (Sheet Flow):	7	min

Area (A):	1009	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr
Runoff Coefficient (C):	0.68	

5 Year Pre-Development Flow Rate (2.78AiC): 19.77 L/s

Maximum Allowable Release Rate

			C
Roof Area:	208	sq.m	0.90
Asphalt/Concrete Area:	479	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	322	sq.m	0.20
Total Catchment Area:	1009	sq.m	0.68

Area (A):	1009	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	77	mm/hr (2 year event)
Runoff Coefficient (C):	0.50	

100-Year Maximum Allowable Release Rate (2.78AiC): 10.77 L/s

ONE HUNDRED-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	88	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	53	sq.m	0.25
Total Catchment Area:	141	sq.m	0.72
Area (A):	141	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coefficient (C):	0.72		
Release Rate (2.78AiC):	5.03	L/s	

DRAINAGE AREA II (Roof)

(ONE HUNDRED-YEAR EVENT)

Total Catchment Area:		430	sq.m	C	1.00
No. of Roof Drains:	2				
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)			
Depth at Roof Drain:	134	mm			
Maximum Release Rate:	3.33	L/s	Pond Area:	308	sq.m
Achieved Volume:				13.77	cu.m
Maximum Volume Required:				13.77	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	243	29.01	3.33	25.68	7.70
10	179	21.34	3.33	18.01	10.81
15	143	17.08	3.33	13.75	12.38
20	120	14.34	3.33	11.01	13.21
25	104	12.41	3.33	9.08	13.63
30	92	10.98	3.33	7.65	13.77
35	83	9.87	3.33	6.54	13.74
40	75	8.98	3.33	5.65	13.57
45	69	8.25	3.33	4.92	13.30
50	64	7.65	3.33	4.32	12.95
55	60	7.13	3.33	3.80	12.53
60	56	6.68	3.33	3.35	12.07
65	53	6.29	3.33	2.96	11.56
70	50	5.95	3.33	2.62	11.01
75	47	5.65	3.33	2.32	10.44
80	45	5.38	3.33	2.05	9.83
85	43	5.13	3.33	1.80	9.20
90	41	4.91	3.33	1.58	8.56
95	39	4.71	3.33	1.38	7.89
100	38	4.53	3.33	1.20	7.21
105	36	4.36	3.33	1.03	6.51
110	35	4.21	3.33	0.88	5.80
115	34	4.06	3.33	0.73	5.07
120	33	3.93	3.33	0.60	4.34
125	32	3.81	3.33	0.48	3.59
130	31	3.69	3.33	0.36	2.84
135	30	3.59	3.33	0.26	2.07
140	29	3.48	3.33	0.15	1.30
145	28	3.39	3.33	0.06	0.52
150	28	3.30	3.30	0.00	0.00
180	24	2.86	2.86	0.00	0.00
210	21	2.53	2.53	0.00	0.00
240	19	2.27	2.27	0.00	0.00

DRAINAGE AREA III

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	245	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	193	sq.m	0.25

Total Catchment Area: 438 sq.m 0.67

Water Elevation: 84.50 m

Invert of Outlet Pipe - CB/MH-3: 82.35 m

Centroid of ICD Orifice: 82.38 m

(ICD in Outlet Pipe of CB/MH-3)

Head: 2.12 m

Orifice Diameter: 50 mm

Orifice Area: 1963 sq.mm

Coefficient of Discharge: 0.191

Maximum Release Rate: 2.42 L/s

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB-1	94	0.20	9.13	cu.m

Achieved Volume: 9.13 cu.m

Maximum Volume Required: 9.13 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	243	19.79	2.42	17.37	5.21
10	179	14.56	2.42	12.14	7.28
15	143	11.65	2.42	9.23	8.31
20	120	9.78	2.42	7.36	8.84
25	104	8.47	2.42	6.05	9.08
30	92	7.49	2.42	5.07	9.13
35	83	6.73	2.42	4.32	9.07
40	75	6.13	2.42	3.71	8.91
45	69	5.63	2.42	3.21	8.68
50	64	5.21	2.42	2.80	8.40
55	60	4.86	2.42	2.45	8.07
60	56	4.56	2.42	2.14	7.71
65	53	4.29	2.42	1.88	7.32
70	50	4.06	2.42	1.64	6.90
75	47	3.85	2.42	1.44	6.47
80	45	3.67	2.42	1.25	6.01
85	43	3.50	2.42	1.09	5.54
90	41	3.35	2.42	0.94	5.06
95	39	3.21	2.42	0.80	4.56
100	38	3.09	2.42	0.67	4.05
105	36	2.98	2.42	0.56	3.53
110	35	2.87	2.42	0.45	3.00
115	34	2.77	2.42	0.36	2.46
120	33	2.68	2.42	0.27	1.92
125	32	2.60	2.42	0.18	1.37
130	31	2.52	2.42	0.10	0.81
135	30	2.45	2.42	0.03	0.24
140	29	2.38	2.38	0.00	0.00
145	28	2.31	2.31	0.00	0.00
150	28	2.25	2.25	0.00	0.00
180	24	1.95	1.95	0.00	0.00
210	21	1.72	1.72	0.00	0.00
240	19	1.55	1.55	0.00	0.00

FIVE-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(FIVE-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	88	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	53	sq.m	0.20
Total Catchment Area:	141	sq.m	0.64
Area (A):	141	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coefficient (C):	0.64		
Release Rate (2.78AiC):	2.60	L/s	

DRAINAGE AREA II (Roof)

(FIVE-YEAR EVENT)

Total Catchment Area:		430	sq.m	C	0.90
No. of Roof Drains:	2				
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)			
Depth at Roof Drain:	102	mm			
Maximum Release Rate:	2.53	L/s	Pond Area:	178	sq.m
Achieved Volume:				6.03	cu.m
Maximum Volume Required:				6.03	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	141	15.19	2.53	12.66	3.80
10	104	11.21	2.53	8.68	5.21
15	84	8.99	2.53	6.46	5.81
20	70	7.56	2.53	5.03	6.03
25	61	6.55	2.53	4.02	6.03
30	54	5.80	2.53	3.27	5.89
35	49	5.22	2.53	2.69	5.65
40	44	4.75	2.53	2.22	5.34
45	41	4.37	2.53	1.84	4.97
50	38	4.05	2.53	1.52	4.57
55	35	3.78	2.53	1.25	4.12
60	33	3.54	2.53	1.02	3.65
65	31	3.34	2.53	0.81	3.16
70	29	3.16	2.53	0.63	2.65
75	28	3.00	2.53	0.47	2.12
80	27	2.86	2.53	0.33	1.58
85	25	2.73	2.53	0.20	1.02
90	24	2.61	2.53	0.08	0.45
95	23	2.51	2.51	0.00	0.00
100	22	2.41	2.41	0.00	0.00
105	22	2.32	2.32	0.00	0.00
110	21	2.24	2.24	0.00	0.00
115	20	2.16	2.16	0.00	0.00
120	19	2.09	2.09	0.00	0.00
125	19	2.03	2.03	0.00	0.00
130	18	1.97	1.97	0.00	0.00
135	18	1.91	1.91	0.00	0.00
140	17	1.86	1.86	0.00	0.00
145	17	1.81	1.81	0.00	0.00
150	16	1.76	1.76	0.00	0.00
180	14	1.53	1.53	0.00	0.00
210	13	1.35	1.35	0.00	0.00
240	11	1.22	1.22	0.00	0.00

(FIVE-YEAR EVENT)

			Release	Stored	Stored
Time	i	2.78AiC	Rate	Rate	Volume
(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(cu.m)
5	141	10.17	2.37	7.80	2.34
10	104	7.51	2.37	5.13	3.08
15	84	6.02	2.37	3.65	3.28
20	70	5.06	2.37	2.69	3.23
25	61	4.39	2.37	2.02	3.02
30	54	3.88	2.37	1.51	2.73
35	49	3.49	2.37	1.12	2.36
40	44	3.18	2.37	0.81	1.95
45	41	2.93	2.37	0.56	1.50
50	38	2.71	2.37	0.34	1.03
55	35	2.53	2.37	0.16	0.53
60	33	2.37	2.37	0.00	0.01
65	31	2.24	2.24	0.00	0.00
70	29	2.12	2.12	0.00	0.00
75	28	2.01	2.01	0.00	0.00
80	27	1.91	1.91	0.00	0.00
85	25	1.83	1.83	0.00	0.00
90	24	1.75	1.75	0.00	0.00
95	23	1.68	1.68	0.00	0.00
100	22	1.61	1.61	0.00	0.00
105	22	1.55	1.55	0.00	0.00
110	21	1.50	1.50	0.00	0.00
115	20	1.45	1.45	0.00	0.00
120	19	1.40	1.40	0.00	0.00
125	19	1.36	1.36	0.00	0.00
130	18	1.32	1.32	0.00	0.00
135	18	1.28	1.28	0.00	0.00
140	17	1.24	1.24	0.00	0.00
145	17	1.21	1.21	0.00	0.00
150	16	1.18	1.18	0.00	0.00
180	14	1.02	1.02	0.00	0.00
210	13	0.90	0.90	0.00	0.00
240	11	0.81	0.81	0.00	0.00

TWO-YEAR EVENT

DRAINAGE AREA III

(TWO YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	245	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	193	sq.m	0.20

Total Catchment Area: 438 sq.m 0.59

Water Elevation:	83.53	m	CB/MH Storage			
Invert of Outlet Pipe - CB/MH-3:	82.35	m	CB/MH	Invert	Size	Volume
			CB-1	82.48	0.61	0.39
			CB/MH-2	82.43	1.219	1.29
			CB/MH-3	82.35	1.219	1.38

Centroid of ICD Orifice: 82.38 m
(ICD in Outlet Pipe of CB/MH-3)

Head: 1.16 m

Orifice Diameter: 50 mm

Orifice Area: 1963 sq.mm

Coefficient of Discharge: 0.19

Maximum Release Rate: 1.79 L/s

Pipe Storage				
	Invert	Length (m)	Dia. (m)	Volume
CB-1	82.48			
to		11.9	0.254	0.60
CB/MH-2	82.43			
CB/MH-2	82.43			
to		18.0	0.254	0.91
CB/MH-3	82.35			

Achieved Volume: 3.58 cu.m

Maximum Volume Required: 3.58 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	104	7.46	0.89	6.57	1.97
10	77	5.53	0.89	4.64	2.78
15	62	4.45	0.89	3.56	3.20
20	52	3.75	0.89	2.85	3.43
25	45	3.25	0.89	2.36	3.54
30	40	2.88	0.89	1.99	3.58
35	36	2.60	0.89	1.70	3.58
40	33	2.37	0.89	1.47	3.54
45	30	2.18	0.89	1.29	3.47
50	28	2.02	0.89	1.13	3.38
55	26	1.89	0.89	0.99	3.27
60	25	1.77	0.89	0.88	3.15
65	23	1.67	0.89	0.77	3.02
70	22	1.58	0.89	0.69	2.88
75	21	1.50	0.89	0.61	2.73
80	20	1.43	0.89	0.54	2.57
85	19	1.36	0.89	0.47	2.40
90	18	1.31	0.89	0.41	2.23
95	17	1.25	0.89	0.36	2.06
100	17	1.21	0.89	0.31	1.88
105	16	1.16	0.89	0.27	1.70
110	16	1.12	0.89	0.23	1.51
115	15	1.08	0.89	0.19	1.32
120	15	1.05	0.89	0.16	1.12
125	14	1.02	0.89	0.12	0.93
130	14	0.99	0.89	0.09	0.73
135	13	0.96	0.89	0.06	0.52
140	13	0.93	0.89	0.04	0.32
145	13	0.91	0.89	0.01	0.11
150	12	0.88	0.88	0.00	0.00
180	11	0.77	0.77	0.00	0.00
210	9	0.68	0.68	0.00	0.00
240	8	0.61	0.61	0.00	0.00

1291 Summerville Avenue

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS

Rational & Modified Rational Method

PRE-DEVELOPMENT CONDITIONS

DRAINING TO THE REAR OF THE PROPERTY

STRESS TEST (100-Year +20%) Flow Rate

			C
Roof Area:	9	sq.m	1.00
Asphalt/Concrete Area:	432	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	217	sq.m	0.25
Total Catchment Area:	658	sq.m	0.75
Area (A):	658	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	214	mm/hr	
Runoff Coefficient (C):	0.75		
STRESS TEST Pre-Development Flow Rate (2.78AiC):	29.50	L/s	

DRAINAGE AREA III

(STRESS TEST (100-Year +20%))

				C			
	Roof Area:	0	sq.m	1.00			
	Asphalt/Concrete Area:	245	sq.m	1.00			
	Gravel Area:	0	sq.m	0.875			
	Landscaped Area:	193	sq.m	0.25			
	Total Catchment Area:	438	sq.m	0.67			
	Water Elevation:	84.50	m				
	Invert of Outlet Pipe - CB/MH-3:	82.35	m				
	Centroid of ICD Orifice:	82.38	m				
	(ICD in Outlet Pipe of CB/MH-3)						
	Head:	2.13	m				
	Orifice Diameter:	50	mm				
	Orifice Area:	1963	sq.mm				
	Coefficient of Discharge:	0.191					
				CB/MH	Top Area (sq.m)	Depth (m)	Volume
				CB-1	95	0.20	9.51 cu.m
	Maximum Release Rate:	2.42	L/s			Achieved Volume:	9.51 cu.m
	Overland Flow Rate: (to rear of property)	1.40	L/s			Maximum Volume Required:	9.51 cu.m
				Release Rate (L/s)	Overflow Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
	Time (min)	i (mm/hr)	2.78AiC (L/s)				
	5	291	23.74	2.42	0.00	21.33	6.40
	10	214	17.47	2.42	0.00	15.05	9.03
	15	171	13.98	2.42	0.99	10.57	9.51
	20	144	11.73	2.42	1.39	7.93	9.51
	25	125	10.16	2.42	1.40	6.34	9.51
	30	110	8.99	2.42	1.29	5.28	9.51
	35	99	8.08	2.42	1.13	4.53	9.51
	40	90	7.35	2.42	0.97	3.96	9.51
	45	83	6.76	2.42	0.81	3.52	9.51
	50	77	6.26	2.42	0.67	3.17	9.51
	55	72	5.83	2.42	0.53	2.88	9.51
	60	67	5.47	2.42	0.41	2.64	9.51
	65	63	5.15	2.42	0.29	2.44	9.51
	70	60	4.87	2.42	0.19	2.26	9.51
	75	57	4.62	2.42	0.09	2.11	9.51
	80	54	4.40	2.42	0.00	1.98	9.51
	85	52	4.20	2.42	0.00	1.78	9.10
	90	49	4.02	2.42	0.00	1.60	8.66
	95	47	3.86	2.42	0.00	1.44	8.21
	100	45	3.71	2.42	0.00	1.29	7.74
	105	44	3.57	2.42	0.00	1.15	7.26
	110	42	3.44	2.42	0.00	1.03	6.77
	115	41	3.33	2.42	0.00	0.91	6.27
	120	39	3.22	2.42	0.00	0.80	5.76
	125	38	3.12	2.42	0.00	0.70	5.24
	130	37	3.02	2.42	0.00	0.60	4.72
	135	36	2.93	2.42	0.00	0.52	4.19
	140	35	2.85	2.42	0.00	0.43	3.65
	145	34	2.77	2.42	0.00	0.36	3.10
	150	33	2.70	2.42	0.00	0.28	2.55
	180	29	2.34	2.34	0.00	0.00	0.00
	210	25	2.07	2.07	0.00	0.00	0.00
	240	23	1.86	1.86	0.00	0.00	0.00

STORM SEWER DESIGN FORM

Rational Method

FIVE YEAR EVENT
Q = 2.78 A i C

July 19, 2021

$$n = 0.013$$
[illegible]

City of Ottawa Servicing Study Checklist

General Content

Executive Summary (for large reports only): not applicable

Date and revision number of the report: see page 1 of Servicing Brief and Stormwater Management Report

Location map and plan showing municipal address, boundary, and layout of proposed development: see drawings C-1 to C-6

Plan showing the site and location of all existing services: see drawings C-1 to C-6

Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to which individual developments must adhere: not applicable

Summary of Pre-consultation Meetings with City and other approval agencies: not available

Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defensible design criteria: not applicable

Statement of objectives and servicing criteria: see page 2 of Servicing Brief and Stormwater Management Report

Identification of existing and proposed infrastructure available in the immediate area: see drawings C-1 to C-6

Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available). see drawings C-1 to C-6

Concept level master grading plan to confirm existing and proposed grades in the development and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths: not applicable

Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts: not applicable

Proposed phasing of the development, if applicable: not applicable

Reference to geotechnical studies and recommendations concerning servicing: see note 1.5 on drawing C-4

All preliminary and formal site plan submissions should have the following information:

- **Metric scale:** included
- **North arrow:** included
 - **(including construction North):** not included
- **Key Plan:** included

- **Name and contact information of applicant and property owner:** not available
- **Property limits:** included
 - **including bearings and dimensions:** not included
- **Existing and proposed structures and parking areas:** included
- **Easements, road widening and rights-of-way:** included
- **Adjacent street names:** included

Development Servicing Report: Water

Confirm consistency with Master Servicing Study, if available: not applicable

Availability of public infrastructure to service proposed development: see page 2 of Servicing Brief

Identification of system constraints: see page 2 of Servicing Brief

Confirmation of adequate domestic supply and pressure: see page 2 of Servicing Brief

Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow locations throughout the development: see page 2 & 7 of Servicing Brief

Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves: see page 2 of Servicing Brief

Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design: not applicable

Address reliability requirements such as appropriate location of shut-off valves: not applicable

Check on the necessity of a pressure zone boundary modification:. not applicable

Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range: not applicable

Description of the proposed water distribution network, including locations of proposed connections to the existing systems, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions: not applicable

Description of off-site required feeder mains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation: not applicable

Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines: see page 2 of Servicing Brief

Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference: not applicable

Development Servicing Report: Wastewater

Summary of proposed design criteria: see page 3 of Servicing Brief

(Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure): not applicable

Confirm consistency with Master Servicing Study and /or justification for deviations: not applicable

Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and conditions of sewers: not applicable

Descriptions of existing sanitary sewer available for discharge of wastewater from proposed development: see page 3 of Servicing Brief

Verify available capacity in downstream sanitary sewer and / or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable): not applicable

Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix C) format. see page 9 of Servicing Brief

Description of proposed sewer network including sewers, pumping stations, and forcemains: see page 3 of Servicing Brief

Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality): not applicable

Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development: not applicable

Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity: not applicable

Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding: not applicable

Special considerations such as contamination, corrosive environment etc: not applicable

Development Servicing Report: Stormwater Checklist

Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property): see page 4 of Servicing Brief and Stormwater Management Report

Analysis of available capacity in existing public infrastructure. not applicable

A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern: see drawing C-1, C-4 & C-6

Water quality control objective (e/g/ controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking

into account long-term cumulative effects: see Stormwater Management Report Servicing Brief and Stormwater Management Report

Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements: Servicing Brief and Stormwater Management Report

Descriptions of the references and supporting information.
Set-back from private sewage disposal systems. not applicable

Watercourse and hazard lands setbacks: not applicable

Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed: the pre-application consultation record is not yet been issued

Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists: not applicable

Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period). see drawings C-1 to C-6 and Servicing Brief and Stormwater Management Report

Identification of watercourses within the proposed development and how watercourses will be protected, or , if necessary, altered by the proposed development with applicable approvals. see drawings C-1 to C-6 and Servicing Brief and Stormwater Management Report

Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions: see Servicing Brief and Stormwater Management Report

Any proposed diversion of drainage catchment areas from one outlet to another. : not applicable

Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities. : not applicable

If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event: not applicable

Identification of potential impacts to receiving watercourses: Servicing Brief and Stormwater Management Report

Identification of municipal drains and related approval requirements. : not applicable

Descriptions of how the conveyance and storage capacity will be achieved for the development: see page 3 of Servicing Brief and Stormwater Management Report

100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading:

Inclusion of hydraulic analysis including hydraulic grade line elevations. : not applicable

Description of approach to erosion and sediment control during construction for the protection of receiving watercourses of drainage corridors: see notes 2.1 to 2.5 on drawing C-4

Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplains elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current: not applicable

Identification of fill constraints related to floodplain and geotechnical investigation. : not applicable

Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act: not applicable

Application for Certificate of Approval (CofA) under the Ontario Water Resources Act:

Changes to Municipal Drains. : not applicable

Other permits (National Capital commission, Parks Canada, public Works and Government Services Canada, Ministry of transportation etc.) : not applicable

Conclusion Checklist

Clearly stated conclusions and recommendations: see page 6 of Servicing Brief

Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.

All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario: included