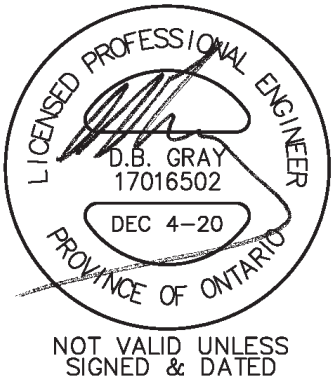
SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

243-245 Hinchey Avenue
Ottawa, Ontario

Report No. 20020

May 5, 2020
Revised August 13, 2020
Revised December 4, 2020



NOT VALID UNLESS
SIGNED & DATED

D.B. Gray Engineering Inc.

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

700 Long Point Circle
Ottawa, ON K1T 4E9

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SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

243-245 Hinchey Avenue
Ottawa, Ontario

This report describes the services and addresses the stormwater management requirements of a property 589 sq.m. in area located 243-245 Hinchey Avenue in Ottawa. The property currently has two single-dwelling building that will be demolished. A three-storey 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-3 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 Hinchey Avenue municipal road right-of-way located on the far side of the street approximately 22 m unobstructed distance to the FDC. Since the municipal fire hydrant is located less than the maximum 45 m permitted, a private on-site fire hydrant is not required. There are two other existing municipal fire hydrant in the vicinity. One is located in municipal road right-of-way at the southwest corner of the Hinchey Avenue / Scott Street intersection about 68 m unobstructed distance to the FDC. Another hydrant is located in Hinchey Avenue about 85 m south of the subject property.

A fire flow of 250.0 L/s (15,000 L/min) is required, as calculated as per the Fire Underwriter Survey (FUS) "Water Supply For Fire Protection".

The boundary conditions for the 250.0 L/s fire flow (based on the city's computer model of the municipal water distribution system) were received from the City. They include a HGL (hydraulic grade line) of 98.0 m for the above flow rate in the 200mm municipal watermain in Hinchey Avenue at the subject location. This HGL calculates to be 340 kPa (49 psi). Since the pressure is above 138 kPa (20 psi) there is an adequate water supply for firefighting from the existing municipal water distribution system.

As per City of Ottawa Technical Bulletin ISTB-2018-02, the aggregate flow of all contributing fire hydrants within 150 m of the building can used to supply the required fire flow. All existing municipal hydrants in the vicinity are Class AA. The two closest hydrants are within 75 m and can contribute 5,700 L/min (95 L/s) each; and the other hydrant being between 75 and 150 m can contribute 3,800 L/min (63.3 L/s) (as per Table 1 of ISTB-2018-02). Therefore, the aggregate flow from all three hydrants is 15,200 L/min (253.3 L/s), which is greater than the required fire flow of 250.0 L/s.

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 200 mm municipal watermain in Hinchey 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 (10 one-bedroom apartment units / 1.4 person per unit; 8 two-bedroom apartment units / 2.1 persons per unit; and 350 L/person/day) and Ministry of the Environment Design Guidelines for peaking factors the daily average flow is 0.1 L/s with a maximum daily and maximum hourly demand of 1.1 and 1.6 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 107.5 m and the maximum is 115.7 m. With these HGLs the water pressure at the water meter is calculated to vary from 449 kPa to 529 kPa (65 to 77 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 (8 one-bedroom apartment units / 1.4 person per unit; 8 two-bedroom apartment units / 2.1 persons 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 0.31 L/s. This flow will be adequately handled by the proposed sanitary sewer service connections (150 mm at 1% - 15.89 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 250mm municipal sanitary sewer in Hinchey avenue which, with a 1.35% slope, has a capacity of 72.08 L/s. The existing single family dwelling is calculated to have generated 0.09 L/s. The 0.25 L/s increase in sanitary flows contributing to the existing 250 mm sanitary sewer is expected to have an acceptable impact.

STORMWATER MANAGEMENT:

Water Quality:

The RVCA has stated: *“Based on the plans provided, the majority of rainwater will be from rooftop and landscaped areas. Rainwater from rooftop and landscaped areas is*

considered clean for the purpose of protecting aquatic habitat and water quality. Therefore, the RVCA accepts that no additional onsite water quality controls will be required save and except best management practices."

No permanent quality control measures are proposed. An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-2 and notes 2.1 to 2.5 on drawing C-3). 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 5-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). It is calculated that the pre-development conditions reflect a 5-year runoff coefficient of 0.67 and a time of concentration of 6.2 minutes. Therefore, based on runoff coefficient of 0.50, a 10 minute time of concentration; and using the Rational Method; the maximum allowable release rate is 8.53 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.

Drainage Area I
(Uncontrolled Flow Off Site – 305 sq.m.):
The runoff from front of the site will be allowed to flow uncontrolled off the site. The flow from is calculated at 10 minutes concentration.

	100-year	5-year
Maximum flow rate:	6.66L/s	3.30 L/s

Drainage Area II (Roof – 317 sq.m.):
The roof drain 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. The roof drain will be installed at the low point of the roof which will be 145mm lower than the perimeter of the roof. Four scuppers, each 210 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:	1.69 L/s	1.29 L/s
The maximum ponding depth:	136 mm	104 mm
The maximum stored volume:	10.18 cu.m.	4.57 cu.m.

The Entire Site:

	100-year	5-year
Maximum permitted release rate:	8.53 L/s	8.53 L/s
Maximum release rate:	8.35 L/s	4.59 L/s

Therefore, the maximum post-development release rate for the 100-year storm event is calculated to be less than the maximum allowable and to achieve this release rate the maximum required storage capacity is 10.18 cu.m. For the 5-year event the maximum post-development release is calculated to be 46% less than the maximum allowable at and to achieve this release rate the maximum required storage capacity is 4.57 cu.m.

The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 7.4 L/s which will be adequately by the proposed storm sewer system with the storm service connection (150mm at 2% - 22.5 L/s capacity) being only at 33% of its capacity.

The restricted flowrate (due to the flow control roof drain) during a five-year storm event will produce a peak flow off the site of 4.65 L/s during the 5-year event. The 4.65 L/s in stormwater flows contributing to the 450 mm municipal storm sewer is expected to have a positive impact given that it is 59% reduction from the pre--development flows of 11.43 L/s.

CONCLUSIONS:

1. A private on-site fire hydrant is not required.

2. There is an adequate water supply for firefighting from the existing municipal water distribution system.

3. The aggregate flow of all contributing fire hydrants within 150 m of the building. The aggregate flow from the three municipal hydrants is 15,200 L/min (253.3 L/s), which is greater than the required fire flow of 250.0 L/s.

4. A 150 mm water service is proposed to service a sprinkler system. The 150mm service will be adequate for the domestic demand.

5. There is an acceptable range of water pressures in the municipal watermain for the proposed development.

6. The expected sanitary sewage flow rate will be adequately handled by the proposed sanitary sewer service connection.

7. The sanitary flow contributing to the existing municipal combined sewer is expected to have an acceptable impact.

8. The proposed development has no surface parking so RVCA does not require onsite water quality treatment. Therefore, no permanent quality control measures are proposed.

9. An erosion and sediment control plan has been developed to be implemented during construction.

10. 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 5-year storm event using a runoff coefficient of 0.50, whichever is less; and a 10 minute time of concentration. The maximum allowable release rate is 8.53 L/s for all storm events. To achieve quantity control stormwater will be stored within the development on the roof.

11. The maximum post-development release rate for the 100-year storm event is calculated to be less than the maximum allowable and to achieve this release rate the maximum required storage capacity is 10.18 cu.m. For the 5-year event the maximum post-development release is calculated to be 46% less than the maximum allowable at and to achieve this release rate the maximum required storage capacity is 4.57 cu.m.

12. The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 7.4L/s which will be adequately by the proposed storm sewer system with the storm service connection being only at 33% of its capacity.

13. The restricted stormwater flows during a five-year storm event will produce a peak flow off the site that it is a 59% less than the pre--development flows, therefore, the stormwater flows contributing to the 450 mm municipal storm sewer is expected to have a positive impact.

D. B. GRAY ENGINEERING INC.

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16-Mar-20
REVISED 19-Mar-20

243-245 Hinchey Avenue
Ottawa, Ontario

Fire Flow Requirements

Proposed 3 Storey - Apartment Building

Fire flow requirement as calculated as per Fire Undewriter 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)

Proposed Building	3rd Floor	317	sq.m.
	2nd Floor	317	sq.m.
	1st Floor	317	sq.m.
	Lower Level	317	sq.m.
		1268	
249 Hinchey	2nd Floor	84	
	1st Floor	84	
251-253 Hinchey	2nd Floor	133	
	1st Floor	133	
249 Hinchey	2nd Floor	94	
	1st Floor	94	
	TOTAL FIRE AREA:	1890	sq.m.

F = 14,346 L/min
= 14,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Combustible Occupancy

= 11,900 L/min

Average 33% Reduction for a Sprinkler System (= 40% x (1268 sq.m. / 1890 sq.m.)$^{0.5}$)

= 3,899 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
10%	North	10.1 to 20m	Ordinary	18	1	18
14%	East	10.1 to 20m	W-F	36	2	72
22%	South	0 to 3m	W-F	15	2	30
9%	West	20.1 to 30m	W-F	34	2	68
55%	Total Increase for Exposure (maximum 75%)					

= 6,545 L/min Increase

= 14,546 L/min
F = 15,000 L/min (rounded off to the nearest 1,000 L/min)
= 250.0 L/s

Approximate Elevation at Fire Hydrant 63.34 m ASL

			Static Pressure at Fire Hydrant		
250 L/s FIRE FLOW:	98.0	m ASL	49	psi	340 kPa

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16-Mar-20
REVISED 19-Mar-20

243-245 Hinchey Avenue
Ottawa, Ontario

Fire Flow Requirements

Proposed 3 Storey - Apartment Building

Fire flow requirement as calculated as per Fire Undewriter 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-Framed Contruction with Masonry South Wall

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

Proposed Building	3rd Floor	317	sq.m.
	2nd Floor	317	sq.m.
	1st Floor	317	sq.m.
	Lower Level	317	sq.m.
	TOTAL FIRE AREA:	1268	sq.m.

F = 11,751 L/min
= 12,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Combustible Occupancy

= 10,200 L/min

Average 40% Reduction for a Sprinkler System

= 4,080 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
10%	North	10.1 to 20m	Ordinary	18	1	18
12%	East	10.1 to 20m	W-F	15	2	30
22%	South	0 to 3m	W-F	14	2	28
8%	West	20.1 to 30m	W-F	14	2	28
52%	Total Increase for Exposure (maximum 75%)					

= 5,304 L/min Increase

= 11,424 L/min
F = 11,000 L/min (rounded off to the nearest 1,000 L/min)
= 183.3 L/s

Approximate Elevation at Fire Hydrant 63.34 m ASL

			Static Pressure at Fire Hydrant			
183 L/s FIRE FLOW:	104.0	m ASL	58	psi	399	kPa

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16-Mar-20
REVISED 19-Mar-20
REVISED Aug10-20

243-245 Hinchey Ave
16-Unit Three-Storey Apartment Building
Ottawa, Ontario

Water Demand

	Number of Units	Persons Per Unit	Population
APARTMENTS:			
1 Bedroom:	8	1.4	11
2 Bedroom:	8	2.1	17
3 Bedroom:	0	3.1	0
Average Aptarment:	0	1.8	0
		TOTAL:	28

DAILY AVERAGE

350 litres / person / day

6.8 L/min | 0.1 L/s | 2 USgpm

MAXIMUM DAILY DEMAND 9.6 (Peaking Factor for a population of 31: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)

65.2 L/min | 1.1 L/s | 17 USgpm

MAXIMUM HOURLY DEMAND 14.4 (Peaking Factor for a population of 31: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)

98.1 L/min | 1.6 L/s | 26 USgpm

Elevation of Water Meter: 61.71 m ASL
Finish Floor Elevation: 60.81 m ASL

			Static Pressure at Water Meter		
MINIMUM HGL:	107.5	m ASL	65	psi	449 kPa
MAXIMUM HGL:	115.7	m ASL	77	psi	529 kPa

D.B. Gray Engineering Inc.

Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>

RE: Boundary Condition Request - 243-245 Hinchey Ave

Fawzi, Mohammed <mohammed.fawzi@ottawa.ca> Thu, Mar 19, 2020 at 11:04 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>

Good Morning Doug,

The following are boundary conditions, HGL, for hydraulic analysis at 243-245 Hinchey (zone 1W) assumed to be connected to the 203mm on Hinchey (see attached PDF for location).

Minimum HGL = 107.5m

Maximum HGL = 115.7m

MaxDay + FireFlow (183L/s) = 104.0m

MaxDay + FireFlow (250L/s) = 98.0m

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 watermains 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.

Best Regards,

Mohammed Fawzi, E.I.T.

Engineering Intern

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

Development Review - Central Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 20120, Mohammed.Fawzi@ottawa.ca

From: Fawzi, Mohammed
Sent: March 16, 2020 12:32 PM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: RE: Boundary Condition Request - 243-245 Hinchey Ave

Good Afternoon Doug,

I have forwarded your request. I'll get back to you as soon as I hear back. Please note, wait times may be longer than usual given the circumstances with Covid-19.

Thanks Doug.

Best Regards,

Mohammed Fawzi, E.I.T.

Engineering Intern

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

Development Review - Central Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 20120, Mohammed.Fawzi@ottawa.ca

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: March 16, 2020 8:06 AM
To: Fawzi, Mohammed <mohammed.fawzi@ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: Boundary Condition Request - 243-245 Hinchey Ave

Hi Mohammed

We are working on a proposed developed of a three-storey 18-unit apartment building.

Please provide the boundary conditions at 243-245 Hinchey Ave. We have calculated the following expected demands.

Average daily demand: 0.1 L/s.

Maximum daily demand: 1.2 L/s.

Maximum hourly daily demand: 1.8 L/s

Fire Flow demand: 250.0 L/s

Fire Flow + Max Day: 251.2 L/s

We are looking at alternative designs so please also provide the boundary conditions for a fire flow demand of 183.3 l/s.

Average daily demand: 0.1 L/s.

Maximum daily demand: 1.2 L/s.

Maximum hourly daily demand: 1.8 L/s

Fire Flow demand: 183.3 L/s

Fire Flow + Max Day: 184.5 L/s

Calculations are attached.

Thanks, Doug

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

700 Long Point Circle Tel: 613-425-8044

Ottawa, Ontario K1T 4E9 d.gray@dbgrayengineering.com

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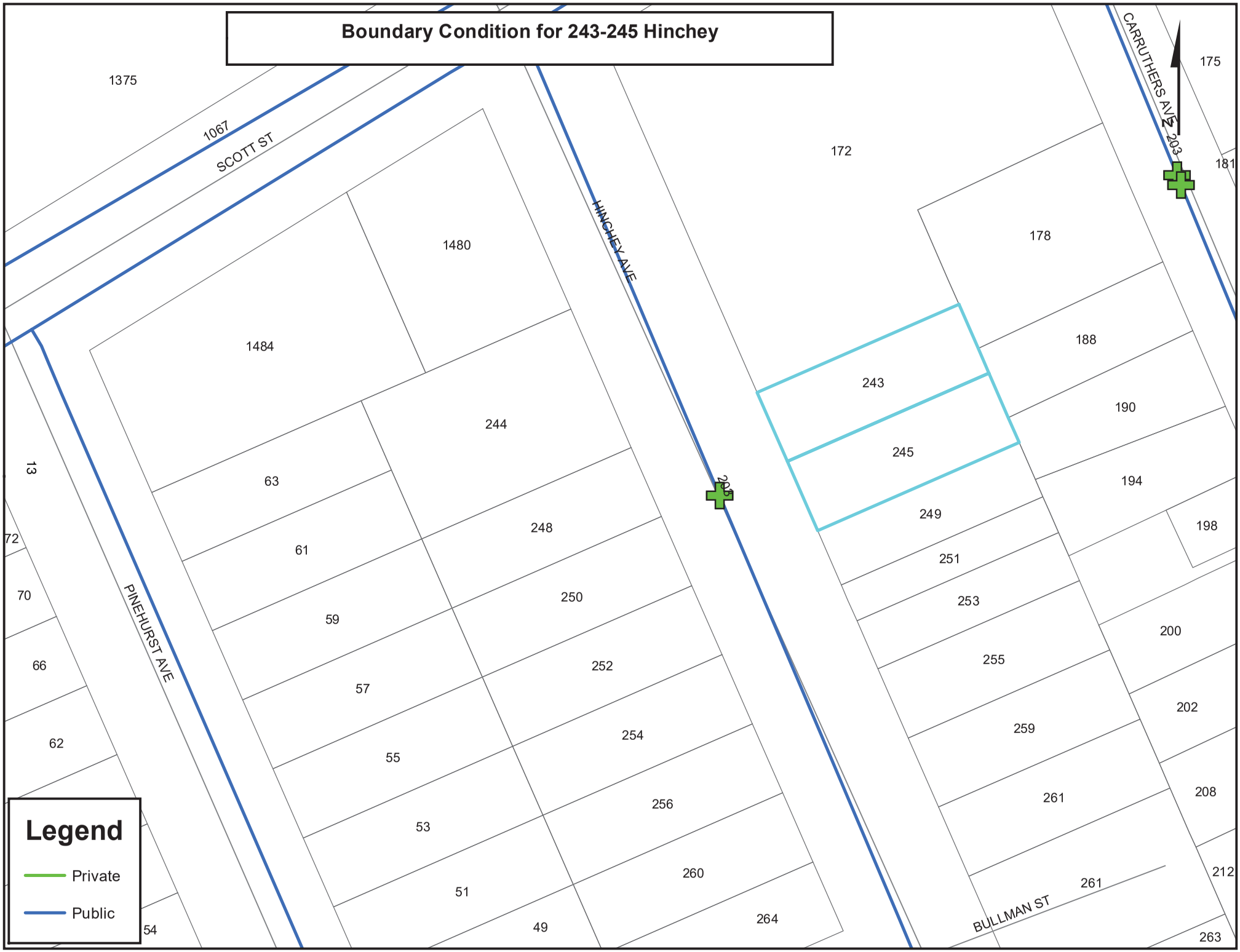
243-245 Hinchey March 2020.pdf
80K


Boundary Condition for 243-245 Hinchey
1375
1067
SCOTT ST
1480
1484
244
63
61
248
59
250
57
252
55
254
53
256
51
260
49
264
HINCHEY AVE
172
CARRUTHERS AVE
175
181
178
188
190
194
198
200
202
208
212
243
245
249
251
253
255
259
261
261
263
203
205
13
72
70
66
62
54
PINEHURST AVE
BULLMAN ST
Legend
Private
Public

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SANITARY SEWER DESIGN FORM

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

Infiltration Allowance: 0.33 l / s / ha

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 contrinbution > 20%
Commercial & Institutional: 1 If contrinbution < 20%
Industrial: As per Ottawa Guidelines Appendix 4-B

243-245 Hinchey Avenue
Designed By: D.B.G.
13-Apr-20
REVISED 11-Aug-20
Page: 1 of 1

Location		Section								Cumulative Residential		Section Non-Residential			Cumulative					Sewer Data n = 0.013								Comments
		Single Family	Semi/Townhouse	Duplex / Triplex	Apartment (average)	Apartment (1 Bed.)	Apartment (2 Bed.)	Apartment (3 Bed.)	Residential Area	Pop.	Peaking Factor	Area	Flow	Peaking Factor	Flow	Area	Sewage Flow	Infiltration Flow	Total Flow	Type of Pipe	Dia. Actual	Dia. Nom.	Slope	Length	Capacity	Velocity	Ratio	
		ppu = 3.4	ppu = 2.7	ppu = 2.3	ppu = 1.8	ppu = 1.4	ppu = 2.1	ppu = 3.1																				
FROM	TO	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	ha			ha	l/ha/day		l/s	ha	l/s	l/s	l/s		(mm)	(mm)	(%)	(m)	(l/s)	(m/s)	Q/Qfull	
		TWO EXISTING SINGLE FAMILY DWELLINGS																										
		2							0.059	6.8	3.20					0.059	0.07	0.02	0.09									
		PROPOSED 16-UNIT APPARTMENT BUILDING																										
Building	Existing 250 SAN					8	8		0.059	28.0	3.20					0.059	0.29	0.02	0.31	PVC	152.4	150	1.00	12.1	15.89	0.87	0.02	
		EXISTING 250 SANITARY SEWER IN HINCHEY AVENUE																										
																				PVC	254	250	1.35		72.08	1.42		

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

RE: RVCA Stormwater Management Comments - 243-245 Hinchey Ave

1 message

Jamie Batchelor <jamie.batchelor@rvca.ca> Wed, Apr 15, 2020 at 8:53 AM
To: Ryan Faith <r.faith@dbgrayengineering.com>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>

Good Morning Ryan,

Based on the plans provided, the majority of rainwater will be from rooftop and landscaped areas. Rainwater from rooftop and landscaped areas is considered clean for the purpose of protecting aquatic habitat and water quality. Therefore, the RVCA accepts that no additional onsite water quality controls will be required save and except best management practices.

Jamie Batchelor, MCIP, RPP

Planner, ext. 1191

Jamie.batchelor@rvca.ca

Rideau Valley Conservation Authority

3889 Rideau Valley Drive
PO Box 599, Manotick ON K4M 1A5
T 613-692-3571 | 1-800-267-3504 F 613-692-0831 | www.rvca.ca

From: Ryan Faith <r.faith@dbgrayengineering.com>
Sent: Wednesday, April 15, 2020 8:30 AM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>
Subject: Re: RVCA Stormwater Management Comments - 243-245 Hinchey Ave

Hi Jamie,

Just following up on my last email. Please comment on the stormwater management for the site.

I have attached an updated site plan for your reference.

Thanks,

Ryan Faith

D.B. Gray Engineering Inc.

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

700 Long Point Circle 613-425-8044
Ottawa, Ontario r.faith@dbgrayengineering.com

On Fri, Feb 28, 2020 at 9:47 AM Ryan Faith <r.faith@dbgrayengineering.com> wrote:

> Hi Jamie,
>
> We are working on a proposed 3 storey apartment building on 589 sq.m of land at 243-245 Hinchey Ave in Ottawa.
>
> Please comment on the stormwater management for the site.
>
> I have attached a site plan for your reference.
>
> Thanks,
>
> Ryan Faith
>
> D.B. Gray Engineering Inc.
>
> *Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains*
>
> 700 Long Point Circle 613-425-8044
> Ottawa, Ontario r.faith@dbgrayengineering.com

STORMWATER MANAGEMENT CALCULATIONS

The orifice calculations are based on the following formula:

$$Q = C_d \times A_o \sqrt{2gh} \times 1000$$

where:

Q = flowrate in litres per second
C_d = coefficient of discharge
A_o = orifice area in sq.m.
g = 9.81 m/s2
h = head above orifice in meters

Flow control roof drain calculations are based on the following formula:

$$Q = N \times S \times d \times F$$

where:

Q = flowrate in litres per second
N = number of roof drains
S = slots per weir
d = pond depth at roof drain in mm
F = flowrate through each slot
0.0124 litres per second per mm pond depth (5 USgpm per inch)

Storage calculations on the roof is based on the following formula for volume of a cone:

$$V = (A \times d)/3$$

where:

V = volume in cu.m.
A = ponding area in sq.m.
d = ponding depth in meters

Summary Tables

ONE HUNDRED YEAR EVENT				
Drainage Area	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)	-	6.66	-	-
AREA II (Roof)	-	1.69	10.18	10.18
TOTAL	8.53	8.35	10.18	10.18

FIVE YEAR EVENT				
Drainage Area	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)	-	3.30	-	-
AREA II (Roof)	-	1.29	4.57	4.57
TOTAL	8.53	4.59	4.57	4.57

April 11, 2020
REVISED August 10, 2020
REVISED December 4, 2020

243-245 Hinchey Ave

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS
Rational Method

ONE HUNDRED YEAR EVENT

100-Year Pre-Development Flow Rate

			C
Roof Area:	96	sq.m	1.00
Asphalt/Concrete Area:	105	sq.m	1.00
Gravel Area:	272	sq.m	0.875
Landscaped Area:	116	sq.m	0.25
Total Catchment Area:	589	sq.m	0.79

Airport Formula

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

Runoff Coefficient (C):	0.79	
Sheet Flow Distance (L):	35	m
Slope of Land (Sw):	2.4	%
Time of Concentration (Sheet Flow):	4.4	min
Area (A):	589	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr (100-year event)
Runoff Coeficient (C):	0.79	
100 Year Pre-Development Flow Rate (2.78AiC):	23.23	L/s

Maximum Allowable Release Rate

			C
Roof Area:	96	sq.m	0.90
Asphalt/Concrete Area:	105	sq.m	0.90
Gravel Area:	272	sq.m	0.70
Landscaped Area:	116	sq.m	0.20
Total Catchment Area:	589	sq.m	0.67

Area (A):	589	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr (5-year event)
Runoff Coeficient (C):	0.50	
Maximum Allowable Release Rate (2.78AiC):	8.53	L/s

ONE HUNDRED YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	25	sq.m	1.00
Asphalt/Concrete Area:	40	sq.m	1.00
Permeable Pavers Area:	73	sq.m	0.375
Landscaped Area:	167	sq.m	0.25
Total Catchment Area:	305	sq.m	0.44

Area (A):	305	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr
Runoff Coeficient (C):	0.44	
Release Rate (2.78AiC):	6.66	L/s

DRAINAGE AREA II (Roof)

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	284	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Permeable Pavers Area:	0	sq.m	0.375
Landscaped Area:	0	sq.m	0.25
Total Catchment Area:	284	sq.m	1.00

No. of Roof Drains:	1	
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)
Depth at Roof Drain:	136	mm
Maximum Release Rate:	1.69	L/s

Pond Area:	224	sq.m
Achieved Volume:	10.18	cu.m
Maximum Volume Required:	10.18	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	19.16	1.69	17.47	5.24
10	179	14.10	1.69	12.41	7.44
15	143	11.28	1.69	9.59	8.63
20	120	9.47	1.69	7.78	9.34
25	104	8.20	1.69	6.51	9.76
30	92	7.25	1.69	5.56	10.01
35	83	6.52	1.69	4.83	10.14
40	75	5.93	1.69	4.24	10.18
45	69	5.45	1.69	3.76	10.15
50	64	5.05	1.69	3.36	10.07
55	60	4.71	1.69	3.02	9.95
60	56	4.41	1.69	2.72	9.80
65	53	4.16	1.69	2.47	9.62
70	50	3.93	1.69	2.24	9.41
75	47	3.73	1.69	2.04	9.18
80	45	3.55	1.69	1.86	8.93
85	43	3.39	1.69	1.70	8.67
90	41	3.25	1.69	1.55	8.40
95	39	3.11	1.69	1.42	8.11
100	38	2.99	1.69	1.30	7.81
105	36	2.88	1.69	1.19	7.50
110	35	2.78	1.69	1.09	7.18
115	34	2.68	1.69	0.99	6.86
120	33	2.60	1.69	0.91	6.52
125	32	2.52	1.69	0.82	6.18
130	31	2.44	1.69	0.75	5.84
135	30	2.37	1.69	0.68	5.49
140	29	2.30	1.69	0.61	5.13
145	28	2.24	1.69	0.55	4.77
150	28	2.18	1.69	0.49	4.40
180	24	1.89	1.69	0.20	2.12
210	21	1.67	1.67	0.00	0.00
240	19	1.50	1.50	0.00	0.00
270	17	1.37	1.37	0.00	0.00
300	16	1.25	1.25	0.00	0.00

FIVE YEAR EVENT

5-Year Pre-Development Flow Rate

			C
Roof Area:	96	sq.m	0.90
Asphalt/Concrete Area:	105	sq.m	0.90
Gravel Area:	272	sq.m	0.70
Landscaped Area:	116	sq.m	0.20
Total Catchment Area:	589	sq.m	0.67

Airport Formula

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

Runoff Coefficient (C):	0.67	
Sheet Flow Distance (L):	35	m
Slope of Land (Sw):	2.4	%
Time of Concentration (Sheet Flow):	6.2	min
Area (A):	589	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr (5-year event)
Runoff Coeficient (C):	0.67	
5 Year Pre-Development Flow Rate (2.78AiC):	11.43	L/s

Maximum Allowable Release Rate

			C
Roof Area:	96	sq.m	0.90
Asphalt/Concrete Area:	105	sq.m	0.90
Gravel Area:	272	sq.m	0.70
Landscaped Area:	116	sq.m	0.20
Total Catchment Area:	589	sq.m	0.67

Area (A):	589	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr (5-year event)
Runoff Coeficient (C):	0.50	
Maximum Allowable Release Rate (2.78AiC):	8.53	L/s

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(FIVE YEAR EVENT)

			C
Roof Area:	25	sq.m	0.90
Asphalt/Concrete Area:	40	sq.m	0.90
Permeable Pavers Area:	73	sq.m	0.30
Landscaped Area:	167	sq.m	0.20
Total Catchment Area:	305	sq.m	0.37

Area (A):	305	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr
Runoff Coeficient (C):	0.37	
Release Rate (2.78AiC):	3.30	L/s

DRAINAGE AREA II (Roof)

(FIVE YEAR EVENT)

			C
Roof Area:	284	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Permeable Pavers Area:	0	sq.m	0.30
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	284	sq.m	0.90

No. of Roof Drains:	1	
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)
Depth at Roof Drain:	104	mm
Maximum Release Rate:	1.29	L/s

Pond Area:	131	sq.m
Achieved Volume:	4.57	cu.m
Maximum Volume Required:	4.57	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	10.03	1.29	8.74	2.62
10	104	7.40	1.29	6.11	3.67
15	84	5.94	1.29	4.64	4.18
20	70	4.99	1.29	3.70	4.44
25	61	4.33	1.29	3.03	4.55
30	54	3.83	1.29	2.54	4.57
35	49	3.45	1.29	2.15	4.52
40	44	3.14	1.29	1.85	4.43
45	41	2.89	1.29	1.59	4.30
50	38	2.68	1.29	1.38	4.14
55	35	2.50	1.29	1.20	3.96
60	33	2.34	1.29	1.05	3.77
65	31	2.21	1.29	0.91	3.55
70	29	2.09	1.29	0.79	3.33
75	28	1.98	1.29	0.69	3.09
80	27	1.89	1.29	0.59	2.85
85	25	1.80	1.29	0.51	2.59
90	24	1.73	1.29	0.43	2.33
95	23	1.66	1.29	0.36	2.06
100	22	1.59	1.29	0.30	1.79
105	22	1.53	1.29	0.24	1.51
110	21	1.48	1.29	0.19	1.22
115	20	1.43	1.29	0.14	0.93
120	19	1.38	1.29	0.09	0.64
125	19	1.34	1.29	0.05	0.34
130	18	1.30	1.29	0.01	0.04
135	18	1.26	1.26	0.00	0.00
140	17	1.23	1.23	0.00	0.00
145	17	1.19	1.19	0.00	0.00
150	16	1.16	1.16	0.00	0.00
180	14	1.01	1.01	0.00	0.00
210	13	0.89	0.89	0.00	0.00
240	11	0.80	0.80	0.00	0.00
270	10	0.73	0.73	0.00	0.00
300	9	0.67	0.67	0.00	0.00

243-245 Hinchey Avenue

Ottawa, Ontario

STORM SEWER COMPUTATION FORM

Rational Method

FIVE YEAR EVENT

Q = 2.78 • A • i • R

March 13, 2020

REVISED Aug11-20

n = 0.013

Location			Areas (ha)									Pipe Data									Notes
			Hard	Gravel	Landscape	Roof	Individual	Accum.	Time of Conc.	Rainfall Intensity i	Peak Flow Q		Actual Diameter	Nominal Diameter	Slope	Length	Capacity	Velocity	Time of Flow	Ratio	
Street	From	To	R = 0.90	R = 0.70	R = 0.20	R = 0.90	2.78 • A • R	2.78 • A • R	(min)	(mm/hr)	(L/s)	Material	(mm)	(mm)	(%)	(m)	(L/s)	(m/s)	(min)	Q/Qfull	
	Roof	Existing				0.0284	0.071	0.071	10.00	104.2	7.4	PVC	152.4	150	2.00	11.1	22.5	1.23	0.15	0.33	
	Drains	450 ST									1.29	PVC	152.4	150	2.00	11.1	22.5	1.23	0.15	0.06	Through flow control roof drains
													Existing 450 ST in Hinchey Avenue								
													457.2	450	1.75		393.5	2.40			

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-3

Plan showing the site and location of all existing services: see drawings C-1 to C-3

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 defendable 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-3

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-3

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-3

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 feedermains, 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-2

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-waterched 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-3 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-3 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-2

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