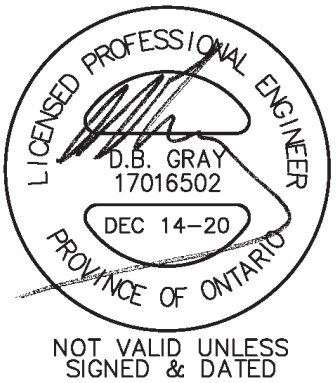
SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

3455 Hawthorne Road
Ottawa, Ontario

Report No. 19107

December 14, 2020



D.B. Gray Engineering Inc.

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

700 Long Point Circle
Ottawa, ON K1T 4E9

613-425-8044
d.gray@dbgrayengineering.com

SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

3455 Hawthorne Road
Ottawa, Ontario

This report describes the services and addresses the stormwater management requirements of a 0.81 hectare property at 3455 Hawthorne Road in Ottawa. Currently there is a 139 sq.m. single-storey building on the property that will be demolished. Most of the property currently has a granular surface and used for outdoor storage. A four-storey Dymon Storage building, having 4,205 sq.m. footprint, is proposed.

This report forms part of the stormwater management design for the proposed development. Refer to drawing C-1 to C-8 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 near the southwest corner of the proposed building. An existing municipal fire hydrant located adjacent to southwest corner of the property in the Hawthorne Road ROW will be relocated approximately 9 m north. The relocated hydrant will be located about 43 m unobstructed distance to the FDC. Since the municipal fire hydrant is located less than the maximum 45 m permitted, an additional private on-site fire hydrant is not required.

The relocated hydrant will still protect the existing buildings in the area. The unobstructed distance to the gas station building at 3467 Hawthorne Road at the northeast corner of Hawthorne Road / Hunt Club Road intersection will increase from about 41m to about 50m unobstructed distance. (There is also a fire hydrant in the Hunt Club Road ROW in front of this property that is about 54m from this building.) The unobstructed distance to the gas station building at 3500 Hawthorne Road at the northwest corner of Hawthorne Road / Hunt Club Road intersection will only increase from about 66m to about 67m unobstructed distance. (There is also a private fire hydrant on this property that is about 38m from the building.)

There is a second existing municipal fire hydrant immediately in front of the proposed building about 22 m unobstructed distance to the building. There are also existing municipal fire hydrants about 79 unobstructed meters north on Hawthorne Road. The fire hydrant in the Hunt Club Road ROW in front of the gas station mentioned above is 143 unobstructed meters from the proposed building.

The proposed building will be built of non-combustible construction and with a sprinkler system and requires a fire flow of 250.0 L/s (15,000 L/min), as calculated as per the Fire Underwriter Survey "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) was received from the City. The HGL (hydraulic grade line) for this flow rate is 121.00 m in the 400mm municipal watermain in Hawthorne Road at the subject location. This HGL calculates to be 354 kPa (51 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 fire 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 two hydrants, being between 75 and 150 m, can contribute 3,800 L/min (63.3 L/s) each (as per Table 1 of ISTB-2018-02). Therefore, the aggregate flow from all four hydrants is 19,000 L/min (316.7 L/s), which is greater than the required fire flow.

WATER SERVICE:

As previously mentioned the proposed Dymon building will have a sprinkler system. To service the sprinkler system, a 150 mm water service, connecting to the 400 mm municipal watermain, is proposed. The 150mm service will be adequate for the domestic demand in the Dymon Building.

As per the City of Ottawa Design Guidelines the daily average consumption rate for a commercial development is 28,000 litres per day per hectare. Based on an 8-hour day the maximum daily demand for the subject property is calculated to be 0.8 L/s. Based on a maximum daily peaking factor of 1.5 times the daily average demand and a maximum hourly peaking factor of 1.8 times the maximum daily demand, the maximum daily demand is 1.2 L/s and maximum hourly demand is 2.1 L/s.

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 123.7 m and the maximum is 130.2 m. With these HGLs the water pressure at the water meter is calculated to vary from 375 kPa to 439 kPa (54 to 64 psi). This is an acceptable range of water pressures for the proposed development.

SANITARY SERVICE:

A 150mm private sanitary sewer system is proposed to connect to an existing 250 mm municipal sanitary sewer in Hawthorne Road.

Based on the City of Ottawa Sewer Design Guidelines for a commercial property (28,000 L/ha/day; 1.5 peaking factor (and an 8-hour day); and a 0.33 L/s/ha infiltration flow) the post development peak flow is calculated to be 1.45 L/s. This flow will be adequately handled by the proposed sanitary sewer system with the first segment being only 6% full (150mm at 2.00% - 22.47 L/s capacity) and the last segment being only 13% full (150mm at 0.47% - 10.89 L/s capacity).

The 1.45 L/s in sanitary flows contributing to the existing 250mm municipal sanitary sewer is expected to have an acceptable impact given its capacity of 56.52 L/s (at 0.83%).

STORMWATER MANAGEMENT:

Water Quality Control:

In the pre-consultation notes the City has advised that with respect to quality control: *"None required for water being discharged into Hawthorne storm sewer (provided by McEwen Creek stormwater management facility)."* No permanent quality control measures are proposed.

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-4 and notes 2.1 to 2.7 on drawing C-5). In summary: to filter out construction sediment; a silt fence barrier will be installed at the perimeter of the site; sediment capture filter sock inserts will be installed in all new catch basins as they are installed; geotextile fabric mud mats will be install at the point of egress onto public roads; and any material deposited on a public road will be removed at the end of each day.

Water Quantity Control:

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 (but not less than 10 minutes). It is calculated that the pre-development conditions reflect a 5-year runoff coefficient of 0.70 and a time of concentration of 4.7 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 117.76 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 on the roof of the proposed building and on the asphalted surface above catch basins.

Drainage Area I
(Uncontrolled Flow – 1,006 sq.m.):
The runoff from front of the site will be allowed to flow uncontrolled. The flow from this area is calculated at 10 minutes concentration.

	100-year	5-year
Maximum flow rate:	24.47 L/s	12.36 L/s

Drainage Area II (First Floor Roof – 240 sq.m.):
The one roof drain will be a flow control type which will restrict the flow and cause the stormwater 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 150mm lower than the perimeter of the roof. Two scuppers, each a minimum 350 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:	1.65 L/s	1.26 L/s
The maximum ponding depth:	133 mm	102 mm
The maximum stored volume:	8.10 cu.m.	3.59 cu.m.

Drainage Area III (Third Floor Roof – 1,005 sq.m.):
The five roof drains will be a flow control type which will restrict the flow and cause the stormwater 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 150mm lower than the perimeter of the roof. Six scuppers, each a minimum 490 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:	8.06 L/s	6.12 L/s
The maximum ponding depth:	130 mm	99 mm
The maximum stored volume:	31.69 cu.m.	13.86 cu.m.

Drainage Area IV (Fourth Floor Roof – 2,960 sq.m.):
The five 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. The roof drain will be installed at the low point of the roof which will be 150mm lower than the perimeter of the roof. Two scuppers, each a minimum 350 mm wide and nine scuppers, each a minimum 880 mm wide; and all 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:	9.31 L/s	7.22 L/s
The maximum ponding depth:	150 mm	116 mm
The maximum stored volume:	133.10 cu.m.	62.03 cu.m.

Drainage Area V (2,920 sq.m.):
An inlet control device (ICD) located at the outlet pipe of catch basin / manhole CB/MH-6 will control the release of stormwater from this drainage area. The ICD will restrict the flow and force the stormwater to back up onto the asphalt surface above five catch basins. The ICD shall be a plug style with a round orifice design (with the orifice located at the bottom of the plug) manufactured by Pedro Plastics (or approved equal) and shall be sized by the manufacturer for a discharge rate of 74.27 L/s at 3.04 m head. It is calculated that an orifice area of 15,752 sq.mm. ($\pm$142 mm in diameter) and a discharge coefficient of 0.61 will restrict the outflow rate to 74.27 L/s at 3.04 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 73.43 L/s at 2.98 m.

	100-year	5-year
Maximum release rate:	74.27 L/s	73.43 L/s
Maximum water elevation:	84.12 m	84.05 m
Maximum stored volume:	39.01 cu.m.	7.66 cu.m.

The Entire Site:

	100-year	5-year
Pre-development flow rate:	354.08 L/s	165.72 L/s
Maximum permitted release rate:	117.76 L/s	117.76 L/s
Maximum release rate:	117.76 L/s	100.38 L/s
Maximum stored volume:	211.90 cu.m.	87.14 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 67% less than the pre-development flow rate. The maximum post-development release rate for the 5-year storm event is calculated to be 15% less than the maximum allowable and 39% less than the re-development flow rate.

A private storm sewer system is proposed. Stormwater will be conveyed off the site via a private 450 mm storm sewer connecting to an 825 mm municipal storm sewer located in Hawthorne Road at a proposed manhole. The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 152.79 L/s that will be

adequately by the proposed site storm sewer system with the proposed pipe segments varying from 1% to 100% full. However, the restricted flow through the flow control roof drains will reduce this to 1% to 92% full.

The flows contributing to the municipal storm sewer is expected to have a positive impact given the post-development flows from the site are being reduced by 39% during the 5-year event and 67% during the 100-year.

MINISTRY OF ENVIRONMENT, CONSERVATION AND PARKS (MECP) ENVIRONMENTAL COMPLIANCE APPROVAL (ECA):

Other Dymon Storage facilities are not considered an industrial use, therefore, it is expected that the MECP will not consider the property “industrial lands” and an ECA will not be required.

CONCLUSIONS:

1. An existing municipal fire hydrant located adjacent to southwest corner of the property in the Hawthorne Road ROW will be relocated approximately 9m north. The relocated hydrant will still protect the existing buildings in the area.

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

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

4. The aggregate flow from four municipal fire hydrants in the vicinity is greater than the required fire flow.

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 City has advised that no quality control measures are required and none 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. The maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable and 67% less than the pre-development flow rate. The maximum post-development release rate for the 5-year storm event is calculated to be 15% less than the maximum allowable and 39% less than the re-development flow rate.

11. The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow that will be adequately handled by the proposed site storm sewer system.

12. The flows contributing to the municipal storm sewer is expected to have a positive impact given the post-development flows from the site are being reduced by 39% during the 5-year event and 67% during the 100-year.

13. It is expected that the MECP will not consider the property “industrial lands” and an ECA will not be required.

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d.gray@dbgrayengineering.com

25-Nov-20

REVISED 26-Nov-20

3455 Hawthorne Road
Ottawa, Ontario

Fire Flow Requirements

Proposed Dymon Storage 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
= 0.8
Non-combustible Construction (unprotected structural components)

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

4th Floor	2,940	sq.m.
3rd Floor	3,945	sq.m.
2nd Floor	3,945	sq.m.
Ground Floor	3,860	sq.m.
TOTAL FIRE AREA:	11,750	sq.m.

F = 19,078 L/min
= 19,000 L/min (rounded off to the nearest 1,000 L/min)

15% Charge for Frage Facility

= 21,850 L/min

40% Reduction for Sprinkler System

= 8,740 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
0%	North	>45m				0
0%	East	>45m				0
7%	South	20.1 to 30m	Ordinary	24	1	24
0%	West	>45m				0
7%	Total Increase for Exposure (maximum 75%)					

= 1,530 L/min Increase

= 14,640 L/min
F = 15,000 L/min (rounded off to the nearest 1,000 L/min)
= 250.0 l/s

Elevation at Fire Hydrant	84.89	m ASL				
			Static Pressure at Fire Hydrant			
250 L/s FIRE FLOW:	121.0	m ASL	51	psi	354	kPa

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25-Nov-20
REVISED 14-Dec-20

3455 Hawthorne Rd - Four-Storey Storage Building
Ottawa, Ontario

Water Demand

DAILY AVERAGE

COMMERCIAL:	28,000	l /gross ha / day (as per Ottawa Design Guidelines)				
	0.81	ha (land area)				
	22,767	l / day				
	8	hour day				
	47.4	l/min	0.8	l/s	12.5	USgpm
MAXIMUM DAILY DEMAND	1.5	(Peaking Factor as per Ottawa Design Guidelines)				
	71.1	l/min	1.2	l/s	18.8	USgpm
MAXIMUM HOURLY DEMAND	1.8	(Peaking Factor as per Ottawa Design Guidelines)				
	128.1	l/min	2.1	l/s	33.8	USgpm

Elevation of Water Meter:	85.41	m ASL				
Finish Floor Elevation:	84.51	m ASL				
			Static Pressure at Water Meter			
MINIMUM HGL:	123.7	m ASL	54	psi	375	kPa
MAXIMUM HGL:	130.2	m ASL	64	psi	439	kPa

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

RE: Boundary Condition Request - 3455 Hawthorne Rd

1 message

Oram, Cody <Cody.Oram@ottawa.ca> Tue, Dec 8, 2020 at 4:05 PM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>, "Sevigny, John" <John.Sevigny@ottawa.ca>

Hi Doug,

I've passed the request along to DR South Sr. Eng's to process and assign a new PM as I've moved to the Central group. The boundary conditions have been requested and they will be sent to you as soon as they've been received.

Take care,

Cody

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: December 08, 2020 1:40 PM
To: Oram, Cody <Cody.Oram@ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: Re: Boundary Condition Request - 3455 Hawthorne Rd

Hi Cody

This is a reminder that we require boundary conditions (see email below).

Regards, Doug

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700 Long Point Circle Tel: 613-425-8044

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

On Wed, Nov 25, 2020 at 6:30 PM Douglas Gray <d.gray@dbgrayengineering.com> wrote:

> Hi Cody
>
> Please provide the boundary conditions at 3455 Hawthorne Rd. We have calculated the following expected demands based on a 4-storey Dymon Storage building.
>
> Average daily demand: 0.8 L/s.
>
> Maximum daily demand: 1.2 L/s.
>
> Maximum hourly daily demand: 2.1 L/s
>
> Fire Flow demand: 250.0 L/s
>
> Fire Flow + Max Day: 251.2 L/s
>
> Calculations are attached.
>
> Thanks, Doug

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'

'

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Douglas Gray <d.gray@dbgrayengineering.com>

RE: Boundary Condition Request - 3455 Hawthorne Rd

1 message

Sevigny, John <John.Sevigny@ottawa.ca> Mon, Dec 14, 2020 at 11:15 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>, "Oram, Cody" <Cody.Oram@ottawa.ca>

Hi Doug,

Below are the boundary conditions:

The following are boundary conditions, HGL, for hydraulic analysis at 3455 Hawthorne (zone 2W2C) assumed to be connected to the 406mm on Hawthorne Road (see attached PDF for location).

Minimum HGL = 123.7m

Maximum HGL = 130.2m

MaxDay + Fire Flow (250 L/s) = 121.0m

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.

*****Absence alert*****

Please note that I will be away from the office on the following dates:

December 24th, 2020 to January 4th, 2021 Inclusive (returning January 5th, 2021)

John Sevigny, C.E.T.

Senior Project Manager

Development Review, Suburban Services | *Examen des projets d'aménagement, Services suburbains*

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

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 **14388**, fax/téléc:613-580-2576, john.sevigny@ottawa.ca

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From: Oram, Cody <Cody.Oram@ottawa.ca>
Sent: December 08, 2020 4:06 PM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>; Sevigny, John <John.Sevigny@ottawa.ca>
Subject: RE: Boundary Condition Request - 3455 Hawthorne Rd

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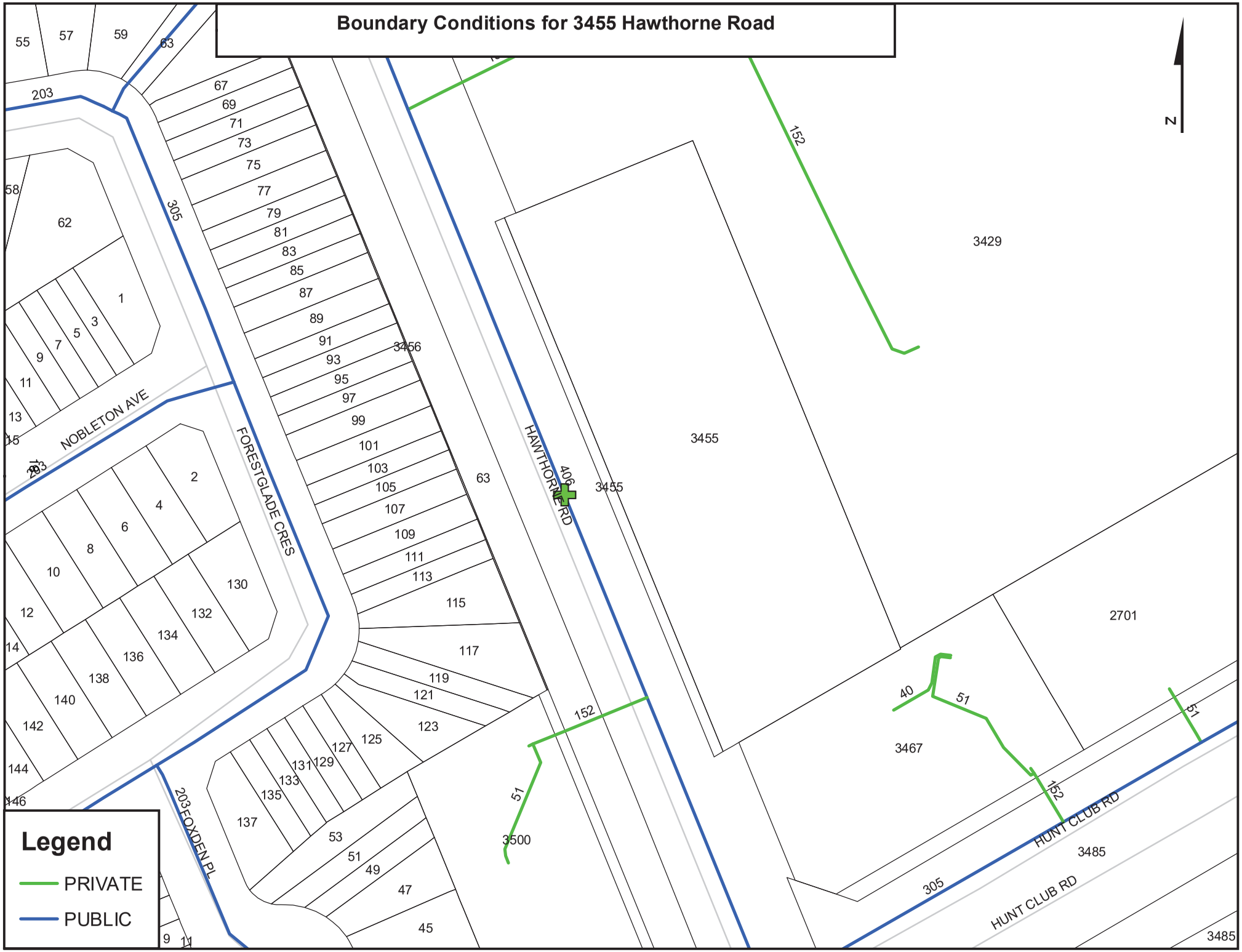
3455 Hawthorne Road December 2020.pdf
83K


Boundary Conditions for 3455 Hawthorne Road
N
Legend
PRIVATE
PUBLIC
NOBLETON AVE
FORESTGLADE CRES
HAWTHORNE RD
203 FOXDEN PL
HUNT CLUB RD
HUNT CLUB RD
3455
3429
3456
3455
3467
2701
3485
3485
3500
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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

n = 0.013

Project: 3455 Hawthorne Road
Designed By: D.B.G
December 10, 2020
Page: 1 of 1

Location		Section									Cumulative		Section			Cumulative					Sewer Data								Comments
											Residential		Non-Residential																
From	To	Single Family ppu = 3.4 No. of Units	Semi / Townhouse ppu = 2.7 No. of Units	Duplex / Triplex ppu = 2.3 No. of Units	Apartment (average) ppu = 1.8 No. of Units	Apartment (1 Bed) ppu = 1.4 No. of Units	Apartment (2 Bed) ppu = 2.1 No. of Units	Apartment (3 Bed) ppu = 3.1 No. of Units	Area (ha)	Pop.	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	
																													P.F.=
Proposed	MH-SA.1											0.8131	28000	4.5	1.19	0.8131	1.19	0.27	1.45	PVC	152.4	150	2.00	19.8	22.47	1.23	0.06	1.5x24hrs/ 8hrs
Building																													
MH-SA.1	Existing														1.19	0.8131	1.19	0.27	1.45	PVC	152.4	150	0.47	23.5	10.89	0.60	0.13	
	250 SAN																												
																					Existing 250 SAN in Hawthorne Road								
																					254.0	250	0.83		56.52	1.12		

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 and asphalted areas are 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	Pre-development Flow 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)	-	-	24.47	-	-
AREA II (1st Floor Roof)	-	-	1.65	8.10	8.10
AREA III (3rd Floor Roof)	-	-	8.06	31.69	31.69
AREA IV (4th Floor Roof)	-	-	9.31	133.10	133.10
AREA V	-	-	74.27	39.01	39.01
TOTAL	354.08	117.76	117.76	211.90	211.90

FIVE-YEAR EVENT

Drainage Area	Pre-development Flow 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)	-	-	12.36	-	-
AREA II (1st Floor Roof)	-	-	1.26	3.59	3.59
AREA III (3rd Floor Roof)	-	-	6.12	13.86	13.86
AREA IV (4th Floor Roof)	-	-	7.22	62.03	62.03
AREA V	-	-	73.43	7.66	7.66
TOTAL	165.72	117.76	100.38	87.14	87.14

3455 Hawthorne Road

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS
Rational Method

PRE-DEVELOPMENT CONDITIONS

100-Year Flow Rate

			C
Roof Area:	147	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	7984	sq.m	0.875
Landscaped Area:	0	sq.m	0.25
Total Catchment Area:	8131	sq.m	0.88

Bransby William Formula (Used when C > 0.40)

$$Tc = \frac{0.057 \bullet L}{Sw^{0.2} \bullet A^{0.1}} min$$

Sheet Flow Distance (L):	92	m
Slope of Land (Sw):	2	%
Area (A):	0.8131	ha
Time of Concentration (Sheet Flow):	4.7	min
Area (A):	8131	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr
Runoff Coeficient (C):	0.88	
100-Year Pre-Development Release Rate (2.78AiC):	354.08	L/s

5-Year Flow Rate

			C
Roof Area:	147	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	7984	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	8131	sq.m	0.70
Area (A):	8131	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coeficient (C):	0.70		
5-Year Pre-Development Release Rate (2.78AiC):	165.72	L/s	

MAXIMUM ALLOWABLE RELEASE RATE

			C
Roof Area:	147	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	7984	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	8131	sq.m	0.70

Area (A):	8131	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):	117.76	L/s	

ONE HUNDRED-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	322	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	684	sq.m	0.25
Total Catchment Area:	1006	sq.m	0.49
Area (A):	1006	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.49		
Release Rate (2.78AiC):	24.47	L/s	

DRAINAGE AREA II (1st Floor Roof)

(ONE HUNDRED-YEAR EVENT)

			C
Total Catchment Area:	240	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:	133	mm
Maximum Release Rate:	1.65	L/s

Pond Area:	182	sq.m
Achieved Volume:	8.10	cu.m
Maximum Volume Required:	8.10	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	16.19	1.65	14.54	4.36
10	179	11.91	1.65	10.26	6.16
15	143	9.53	1.65	7.88	7.09
20	120	8.00	1.65	6.35	7.62
25	104	6.93	1.65	5.28	7.91
30	92	6.13	1.65	4.48	8.06
35	83	5.51	1.65	3.86	8.10
40	75	5.01	1.65	3.36	8.07
45	69	4.61	1.65	2.95	7.98
50	64	4.27	1.65	2.61	7.84
55	60	3.98	1.65	2.33	7.67
60	56	3.73	1.65	2.08	7.48
65	53	3.51	1.65	1.86	7.25
70	50	3.32	1.65	1.67	7.01
75	47	3.15	1.65	1.50	6.75
80	45	3.00	1.65	1.35	6.48
85	43	2.87	1.65	1.21	6.19
90	41	2.74	1.65	1.09	5.89
95	39	2.63	1.65	0.98	5.58
100	38	2.53	1.65	0.88	5.26
105	36	2.44	1.65	0.78	4.93
110	35	2.35	1.65	0.70	4.59
115	34	2.27	1.65	0.62	4.25
120	33	2.19	1.65	0.54	3.90
125	32	2.13	1.65	0.47	3.55
130	31	2.06	1.65	0.41	3.19
135	30	2.00	1.65	0.35	2.83
140	29	1.95	1.65	0.29	2.46
145	28	1.89	1.65	0.24	2.08
150	28	1.84	1.65	0.19	1.71
180	24	1.59	1.59	0.00	0.00
210	21	1.41	1.41	0.00	0.00
240	19	1.27	1.27	0.00	0.00
270	17	1.15	1.15	0.00	0.00
300	16	1.06	1.06	0.00	0.00

DRAINAGE AREA III (3rd Floor Roof)

(ONE HUNDRED-YEAR EVENT)

			C
Total Catchment Area:	1005	sq.m	1.00

No. of Roof Drains:	5	
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)
Depth at Roof Drain:	130	mm
Maximum Release Rate:	8.06	L/s

Pond Area:	731	sq.m
Achieved Volume:	31.69	cu.m
Maximum Volume Required:	31.69	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	67.81	8.06	59.75	17.92
10	179	49.89	8.06	41.83	25.10
15	143	39.92	8.06	31.86	28.68
20	120	33.51	8.06	25.45	30.54
25	104	29.01	8.06	20.95	31.43
30	92	25.67	8.06	17.61	31.69
35	83	23.07	8.06	15.01	31.52
40	75	20.99	8.06	12.93	31.04
45	69	19.29	8.06	11.23	30.32
50	64	17.87	8.06	9.81	29.42
55	60	16.66	8.06	8.60	28.37
60	56	15.62	8.06	7.55	27.20
65	53	14.71	8.06	6.65	25.92
70	50	13.91	8.06	5.85	24.57
75	47	13.20	8.06	5.14	23.13
80	45	12.57	8.06	4.51	21.64
85	43	12.00	8.06	3.94	20.09
90	41	11.49	8.06	3.42	18.49
95	39	11.02	8.06	2.96	16.85
100	38	10.59	8.06	2.53	15.17
105	36	10.20	8.06	2.14	13.45
110	35	9.84	8.06	1.77	11.71
115	34	9.50	8.06	1.44	9.93
120	33	9.19	8.06	1.13	8.13
125	32	8.90	8.06	0.84	6.30
130	31	8.63	8.06	0.57	4.45
135	30	8.38	8.06	0.32	2.59
140	29	8.14	8.06	0.08	0.70
145	28	7.92	7.92	0.00	0.00
150	28	7.71	7.71	0.00	0.00
180	24	6.68	6.68	0.00	0.00
210	21	5.91	5.91	0.00	0.00
240	19	5.31	5.31	0.00	0.00
270	17	4.83	4.83	0.00	0.00
300	16	4.44	4.44	0.00	0.00

DRAINAGE AREA IV (4th Floor Roof)

(ONE HUNDRED-YEAR EVENT)

			C
Total Catchment Area:	2960	sq.m	1.00

No. of Roof Drains:	5	
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)
Depth at Roof Drain:	150	mm
Maximum Release Rate:	9.31	L/s

Pond Area:	2660	sq.m
Achieved Volume:	133.10	cu.m
Maximum Volume Required:	133.10	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	199.72	9.31	190.41	57.12
10	179	146.93	9.31	137.62	82.57
15	143	117.58	9.31	108.28	97.45
20	120	98.70	9.31	89.40	107.28
25	104	85.45	9.31	76.15	114.22
30	92	75.60	9.31	66.29	119.32
35	83	67.95	9.31	58.64	123.15
40	75	61.84	9.31	52.53	126.07
45	69	56.82	9.31	47.51	128.28
50	64	52.63	9.31	43.32	129.96
55	60	49.06	9.31	39.76	131.19
60	56	45.99	9.31	36.69	132.07
65	53	43.32	9.31	34.01	132.65
70	50	40.97	9.31	31.66	132.98
75	47	38.89	9.31	29.58	133.10
80	45	37.02	9.31	27.71	133.03
85	43	35.35	9.31	26.04	132.79
90	41	33.83	9.31	24.52	132.41
95	39	32.45	9.31	23.14	131.91
100	38	31.19	9.31	21.88	131.29
105	36	30.03	9.31	20.72	130.57
110	35	28.97	9.31	19.66	129.75
115	34	27.98	9.31	18.67	128.85
120	33	27.07	9.31	17.76	127.87
125	32	26.22	9.31	16.91	126.83
130	31	25.43	9.31	16.12	125.72
135	30	24.68	9.31	15.38	124.54
140	29	23.99	9.31	14.68	123.32
145	28	23.34	9.31	14.03	122.04
150	28	22.72	9.31	13.41	120.71
180	24	19.67	9.31	10.36	111.90
210	21	17.40	9.31	8.09	101.95
240	19	15.64	9.31	6.33	91.17
270	17	14.23	9.31	4.92	79.75
300	16	13.08	9.31	3.77	67.83

DRAINAGE AREA V

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	2768	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	152	sq.m	0.25
Total Catchment Area:	2920	sq.m	0.96

Water Elevation: 84.12 m 84.116083

Invert of Outlet Pipe - CB/MH-6: 81.00 m

Centroid of ICD Orifice: 81.07 m
(ICD in Outlet Pipe of MH-6)

Head: 3.04 m

Orifice Diameter: 142 mm

Orifice Area: 15752 sq.mm

Coefficient of Discharge: 0.61

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB-1	83	0.16	4.32	cu.m
CB/MH-3	284	0.16	14.74	cu.m
CB/MH-4	122	0.16	6.34	cu.m
CB/MH-5	139	0.16	7.22	cu.m
CB/MH-6	123	0.16	6.39	cu.m

Maximum Release Rate: 74.27 L/s

Achieved Volume: 39.01 cu.m

Maximum Volume Required: 39.01 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	189.33	74.27	115.06	34.52
10	179	139.29	74.27	65.02	39.01
15	143	111.47	74.27	37.20	33.48
20	120	93.57	74.27	19.30	23.16
25	104	81.01	74.27	6.74	10.11
30	92	71.66	71.66	0.00	0.00
35	83	64.42	64.42	0.00	0.00
40	75	58.62	58.62	0.00	0.00
45	69	53.86	53.86	0.00	0.00
50	64	49.89	49.89	0.00	0.00
55	60	46.51	46.51	0.00	0.00
60	56	43.60	43.60	0.00	0.00
65	53	41.07	41.07	0.00	0.00
70	50	38.84	38.84	0.00	0.00
75	47	36.86	36.86	0.00	0.00
80	45	35.10	35.10	0.00	0.00
85	43	33.51	33.51	0.00	0.00
90	41	32.07	32.07	0.00	0.00
95	39	30.76	30.76	0.00	0.00
100	38	29.57	29.57	0.00	0.00
105	36	28.47	28.47	0.00	0.00
110	35	27.46	27.46	0.00	0.00
115	34	26.53	26.53	0.00	0.00
120	33	25.66	25.66	0.00	0.00
125	32	24.85	24.85	0.00	0.00
130	31	24.10	24.10	0.00	0.00
135	30	23.40	23.40	0.00	0.00
140	29	22.74	22.74	0.00	0.00
145	28	22.12	22.12	0.00	0.00
150	28	21.54	21.54	0.00	0.00
180	24	18.65	18.65	0.00	0.00
210	21	16.49	16.49	0.00	0.00
240	19	14.83	14.83	0.00	0.00
270	17	13.49	13.49	0.00	0.00
300	16	12.40	12.40	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:	322	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	684	sq.m	0.20
Total Catchment Area:	1006	sq.m	0.42

Area (A):	1006	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	104	mm/hr
Runoff Coeficient (C):	0.42	
Release Rate (2.78AiC):	12.36	L/s

DRAINAGE AREA II (1st Floor Roof)

(FIVE-YEAR EVENT)

			C
Total Catchment Area:	240	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:	102	mm
Maximum Release Rate:	1.26	L/s

Pond Area:	106	sq.m
Achieved Volume:	3.59	cu.m
Maximum Volume Required:	3.59	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	8.48	1.26	7.22	2.17
10	104	6.26	1.26	5.00	3.00
15	84	5.02	1.26	3.76	3.38
20	70	4.22	1.26	2.96	3.55
25	61	3.66	1.26	2.40	3.59
30	54	3.24	1.26	1.98	3.56
35	49	2.91	1.26	1.65	3.47
40	44	2.65	1.26	1.39	3.34
45	41	2.44	1.26	1.18	3.18
50	38	2.26	1.26	1.00	3.00
55	35	2.11	1.26	0.85	2.80
60	33	1.98	1.26	0.72	2.58
65	31	1.86	1.26	0.60	2.35
70	29	1.76	1.26	0.50	2.11
75	28	1.67	1.26	0.41	1.86
80	27	1.59	1.26	0.33	1.61
85	25	1.52	1.26	0.26	1.34
90	24	1.46	1.26	0.20	1.07
95	23	1.40	1.26	0.14	0.79
100	22	1.35	1.26	0.09	0.51
105	22	1.30	1.26	0.04	0.22
110	21	1.25	1.25	0.00	0.00
115	20	1.21	1.21	0.00	0.00
120	19	1.17	1.17	0.00	0.00
125	19	1.13	1.13	0.00	0.00
130	18	1.10	1.10	0.00	0.00
135	18	1.07	1.07	0.00	0.00
140	17	1.04	1.04	0.00	0.00
145	17	1.01	1.01	0.00	0.00
150	16	0.98	0.98	0.00	0.00
180	14	0.85	0.85	0.00	0.00
210	13	0.75	0.75	0.00	0.00
240	11	0.68	0.68	0.00	0.00
270	10	0.62	0.62	0.00	0.00
300	9	0.57	0.57	0.00	0.00

DRAINAGE AREA III (3rd Floor Roof)

(FIVE-YEAR EVENT)

			C
Total Catchment Area:	1005	sq.m	0.90

No. of Roof Drains:	5	
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)
Depth at Roof Drain:	99	mm
Maximum Release Rate:	6.12	L/s

Pond Area:	421	sq.m
Achieved Volume:	13.86	cu.m
Maximum Volume Required:	13.86	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	35.50	6.12	29.38	8.81
10	104	26.20	6.12	20.08	12.05
15	84	21.01	6.12	14.89	13.40
20	70	17.66	6.12	11.55	13.86
25	61	15.31	6.12	9.19	13.79
30	54	13.56	6.12	7.44	13.39
35	49	12.20	6.12	6.08	12.77
40	44	11.11	6.12	4.99	11.98
45	41	10.22	6.12	4.10	11.06
50	38	9.47	6.12	3.35	10.05
55	35	8.83	6.12	2.71	8.95
60	33	8.28	6.12	2.17	7.79
65	31	7.81	6.12	1.69	6.58
70	29	7.39	6.12	1.27	5.32
75	28	7.01	6.12	0.89	4.02
80	27	6.68	6.12	0.56	2.69
85	25	6.38	6.12	0.26	1.33
90	24	6.11	6.11	0.00	0.00
95	23	5.86	5.86	0.00	0.00
100	22	5.63	5.63	0.00	0.00
105	22	5.43	5.43	0.00	0.00
110	21	5.24	5.24	0.00	0.00
115	20	5.06	5.06	0.00	0.00
120	19	4.90	4.90	0.00	0.00
125	19	4.74	4.74	0.00	0.00
130	18	4.60	4.60	0.00	0.00
135	18	4.47	4.47	0.00	0.00
140	17	4.34	4.34	0.00	0.00
145	17	4.22	4.22	0.00	0.00
150	16	4.11	4.11	0.00	0.00
180	14	3.57	3.57	0.00	0.00
210	13	3.16	3.16	0.00	0.00
240	11	2.84	2.84	0.00	0.00
270	10	2.59	2.59	0.00	0.00
300	9	2.38	2.38	0.00	0.00

DRAINAGE AREA IV (4th Floor Roof)

(FIVE-YEAR EVENT)

			C
Total Catchment Area:	2960	sq.m	0.90

No. of Roof Drains:	5	
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)
Depth at Roof Drain:	116	mm
Maximum Release Rate:	7.22	L/s

Pond Area:	1599	sq.m
Achieved Volume:	62.03	cu.m
Maximum Volume Required:	62.03	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	104.56	7.22	97.34	29.20
10	104	77.16	7.22	69.95	41.97
15	84	61.88	7.22	54.67	49.20
20	70	52.03	7.22	44.81	53.77
25	61	45.10	7.22	37.88	56.82
30	54	39.94	7.22	32.72	58.90
35	49	35.93	7.22	28.72	60.30
40	44	32.72	7.22	25.51	61.21
45	41	30.09	7.22	22.87	61.76
50	38	27.89	7.22	20.67	62.01
55	35	26.01	7.22	18.80	62.03
60	33	24.40	7.22	17.18	61.85
65	31	22.99	7.22	15.77	61.52
70	29	21.75	7.22	14.54	61.05
75	28	20.65	7.22	13.44	60.47
80	27	19.67	7.22	12.46	59.78
85	25	18.79	7.22	11.57	59.01
90	24	17.99	7.22	10.77	58.16
95	23	17.26	7.22	10.04	57.25
100	22	16.59	7.22	9.38	56.27
105	22	15.98	7.22	8.77	55.23
110	21	15.42	7.22	8.20	54.15
115	20	14.90	7.22	7.68	53.02
120	19	14.42	7.22	7.20	51.85
125	19	13.97	7.22	6.75	50.64
130	18	13.55	7.22	6.33	49.39
135	18	13.16	7.22	5.94	48.11
140	17	12.79	7.22	5.57	46.81
145	17	12.44	7.22	5.23	45.47
150	16	12.12	7.22	4.90	44.11
180	14	10.50	7.22	3.29	35.48
210	13	9.30	7.22	2.08	26.23
240	11	8.36	7.22	1.15	16.53
270	10	7.62	7.22	0.40	6.48
300	9	7.00	7.00	0.00	0.00

DRAINAGE AREA V

(FIVE-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	2768	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	152	sq.m	0.20
Total Catchment Area:	2920	sq.m	0.86

Water Elevation:	84.05	m
Invert of Outlet Pipe - CB/MH-6:	81.00	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of MH-6)	81.07	m
Head:	2.98	m
Orifice Diameter:	142	mm
Orifice Area:	15752	sq.mm
Coefficient of Discharge:	0.61	
Maximum Release Rate:	73.43	L/s

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB-1	26	0.09	0.77	cu.m
CB/MH-3	109	0.09	3.17	cu.m
CB/MH-4	43	0.09	1.26	cu.m
CB/MH-5	46	0.09	1.34	cu.m
CB/MH-6	39	0.09	1.12	cu.m
		Achieved Volume:	7.66	cu.m
		Maximum Volume Required:	7.66	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	98.97	73.43	25.54	7.66
10	104	73.04	73.04	0.00	0.00
15	84	58.57	58.57	0.00	0.00
20	70	49.25	49.25	0.00	0.00
25	61	42.69	42.69	0.00	0.00
30	54	37.80	37.80	0.00	0.00
35	49	34.01	34.01	0.00	0.00
40	44	30.97	30.97	0.00	0.00
45	41	28.48	28.48	0.00	0.00
50	38	26.40	26.40	0.00	0.00
55	35	24.62	24.62	0.00	0.00
60	33	23.09	23.09	0.00	0.00
65	31	21.76	21.76	0.00	0.00
70	29	20.59	20.59	0.00	0.00
75	28	19.55	19.55	0.00	0.00
80	27	18.62	18.62	0.00	0.00
85	25	17.78	17.78	0.00	0.00
90	24	17.03	17.03	0.00	0.00
95	23	16.34	16.34	0.00	0.00
100	22	15.71	15.71	0.00	0.00
105	22	15.13	15.13	0.00	0.00
110	21	14.60	14.60	0.00	0.00
115	20	14.10	14.10	0.00	0.00
120	19	13.65	13.65	0.00	0.00
125	19	13.22	13.22	0.00	0.00
130	18	12.82	12.82	0.00	0.00
135	18	12.45	12.45	0.00	0.00
140	17	12.11	12.11	0.00	0.00
145	17	11.78	11.78	0.00	0.00
150	16	11.47	11.47	0.00	0.00
180	14	9.94	9.94	0.00	0.00
210	13	8.80	8.80	0.00	0.00
240	11	7.92	7.92	0.00	0.00
270	10	7.21	7.21	0.00	0.00
300	9	6.63	6.63	0.00	0.00

3455 Hawthorne Road
Ottawa, Ontario

STORM SEWER DESIGN FORM
Rational Method

# FIVE YEAR EVENT
Q = 2.78 A i C

December 10, 2020

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	
From	To	C = 0.9	C = 0.7	C = 0.2	C = 0.9	2.78AC	2.78AC	(min)	(mm/hr)	(L/s)	Material	(mm)	(mm)	(%)	(m)	(L/s)	(m/s)	(min)	Q/Qfull	
CB-1	MH-2	0.0522		0.0069		0.1344	0.1344	10.00	104	14.01	PVC	254.0	250	0.43	21.4	40.7	0.80	0.44	0.34	
MH-2	CB/MH-3					0.0000	0.1344	10.44	102	13.70	PVC	254.0	250	0.43	24.9	40.7	0.80	0.52	0.34	
CB/MH-3	CB/MH-4	0.1161		0.0080		0.2949	0.4294	10.96	99	42.67	PVC	304.8	300	0.34	101.5	58.8	0.81	2.10	0.73	
CB/MH-4	CB/MH-5	0.0478				0.1196	0.5490	13.06	90	49.63	PVC	304.8	300	0.34	23.8	58.8	0.81	0.49	0.84	
CB/MH-5	CB/MH-6	0.0251				0.0628	0.6118	13.55	89	54.17	PVC	304.8	300	0.34	21.6	58.8	0.81	0.45	0.92	
CB/MH-6	MH-9	0.0356		0.0003		0.0892	0.7010	14.00	87	60.95	CONC	457.2	450	0.48	6.9	206.1	1.26	0.09	0.30	
CB-7	CB/MH-8					0.0000	0.0000	10.00	104	0.00	PVC	254.0	250	0.43	5.6	40.7	0.80	0.12	0.00	
Roof	CB/MH-8				0.4205	1.0521	1.0521	10.00	104	109.62	PVC	381.0	375	2.00	1.7	258.7	2.27	0.01	0.42	
Drains										14.60	PVC	381.0	375	2.00	1.7	258.7	2.27	0.01	0.06	Through flow control RDs
CB/MH-8	MH-9					0.0000	1.0521	10.12	104	108.98	PVC	381.0	375	0.36	29.4	109.7	0.96	0.51	0.99	
										14.60	PVC	381.0	375	2.00	1.7	258.7	2.27	0.01	0.06	Through flow control RDs
MH-9	MH-10					0.0000	1.7531	14.09	87	151.85	CONC	457.2	450	2.05	45.2	425.9	2.59	0.29	0.36	
												Existing 825 ST in Hawthorne Road								
												838.2	825	0.68		1234.9	2.24			

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-8

Plan showing the site and location of all existing services: see drawings C-1 to C-8

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 1 of Servicing Brief and Stormwater Management Report

Identification of existing and proposed infrastructure available in the immediate area: see drawings C-1 to C-8

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-8

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-5

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 & 3 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 & 9 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 & 3 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 4 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 4 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 4 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-2, C-3 & C-8

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-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-8 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 4 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 2.8 on drawing C-5

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: see page 19 of Servicing Brief and Stormwater Management Report

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 7 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