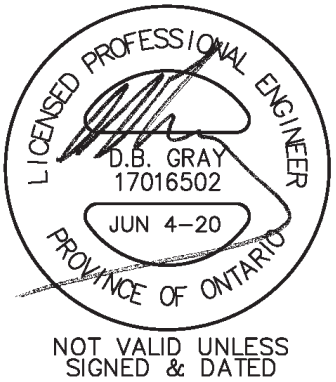
SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

1010 Byron Avenue
Ottawa, Ontario

Report No. 20015

June 4, 2020



D.B. Gray Engineering Inc.

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

700 Long Point Circle
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SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

1010 Byron Avenue
Ottawa, Ontario

This report describes the services and addresses the stormwater management requirements of a 1,744 sq.m. property in area located at 1010 Byron Avenue in Ottawa. The property has frontage on, and access to, Byron Avenue and Honeywell Avenue. The property is currently used as a parking area with two garages for five existing apartment buildings (1012 Byron Avenue, 117 & 121 Lockhart Avenue, and 2123 & 2129 Honeywell Avenue). The garages will be demolished. A three-storey 13-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-7, also prepared by D. B. Gray Engineering Inc.

WATER SUPPLY FOR FIREFIGHTING:

There are two existing municipal fire hydrants located in the municipal road right-of-way in the vicinity of the proposed building. One is located at the south-east corner of the Byron / Lockhart intersection and the other at the north-east corner of the Lockhart / Honeywell intersection. The Byron / Lockhart fire hydrant is about 78 m unobstructed distance to the main entrance of the proposed building and the Lockhart / Honeywell hydrant is 143 m. An on-site private fire hydrant is proposed adjacent to the Byron Avenue entrance, approximately 31 m unobstructed distance to the main entrance. The on-site hydrant will connect to a proposed private 150mm watermain which will connect to an existing 300 mm municipal watermain in Byron Avenue.

The building is proposed to be wood-framed construction; a sprinkler system is not proposed. Based on this construction, a fire flow of 216.7 L/s (13,000 L/min) is required, as calculated as per the Fire Underwriter Survey "Water Supply For Fire Protection". The calculations were submitted to the City and boundary conditions were requested. The boundary conditions received from the City (based on the City's computer model of the municipal water distribution system) includes the HGL (hydraulic grade line) of 104.0m during a flow rate of 217.7 L/s (Max day (1.0 L/s) + Fire Flow (216.7 L/s)) at the subject location. This calculates to be 258 kPa (52 psi) at the Byron / Lockhart fire hydrant and 350 kPa (51 psi) at the Lockhart / Honeywell hydrant. Since the pressures are above 138 kPa (20 psi) there is an adequate water supply for firefighting.

(In the event the 216.7 L/s fire flow was not available a second set of calculations were submitted to the City based on “ordinary” construction instead of wood-framed. Based on this construction a fire flow of 133.3 L/s (8,000 L/min) would be required. However, since there is an adequate water supply for firefighting with the above scenario (i.e. with wood-framed construction) these calculations are redundant.)

A model was created using EPANET software to analyze the hydraulics of the proposed 150mm private watermain serving the proposed on-site fire hydrant. Using the 104.0 m HGL boundary condition and using a 95 L/s flowrate to the new on-site fire hydrant, the pressure at the hydrant was determined to be 284 kPa (41.2 psi). Since the pressure is above 138 kPa (20 psi), the private watermain is adequately sized.

As per City of Ottawa Tech 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. The private on-site hydrant will be a Class AA contributing 5,700 L/min (95 L/s) (as per Table 1 of ISTB-2018-02). That leaves 7,300 L/min to be supplied by the two existing municipal fire hydrants. They are Class AA hydrants, and since they are greater than 75 m and less than 150 m of the building, they can contribute up to 3800 L/min (63.3 L/s) (each as per Table 1). Therefore, the aggregate flow from all three hydrants is 13,300 L/min (221.7 L/s), which is greater than the required fire flow.

WATER SERVICE:

The 13 apartment units are comprised of 7 one-bedroom, 4 two-bedroom and 2 three-bedroom units. Based on the City of Ottawa Water Distribution Design Guidelines for residential properties (1.4 person per bachelor/one-bedroom unit; 2.1 persons per two-bedroom unit and 3.1 persons per three-bedroom 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 1.0 and 1.4 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. In summary, the requested the boundary conditions for the subject area were based on the following:

Average Daily Demand: 0.3 L/s.
Maximum Daily Demand: 1.0 L/s.
Maximum Hourly Demand: 1.4 L/s
Fire Flow Demand: 216.7 L/s
Maximum Daily + Fire Flow Demand: 217.7 L/s

Based on the boundary conditions received from the City, the minimum HGL (hydraulic grade line) is 108.0 m and the maximum is 116.3 m. With these HGLs the water pressure at the water meter is calculated to vary from 380 kPa to 461 kPa (55 to 67 psi).

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

Based on the AWWA water flow demand curve, and a water pressure at the meter of 414 kPa (60 psi), the peak demand for the building is expected to be 2.1 L/s (129 L/min / 34 USgpm). The AWWA method calculates the instantaneous demand and is used to size the water service. This peak demand will produce an acceptable velocity of 1.1 m/s in the proposed 50mm water service connection (up to 2.4 m/s is acceptable). The water service will connect to the proposed 150 mm private watermain.

SANITARY SERVICE:

Based on the City of Ottawa Sewer Design Guidelines for a residential property (7 one-bedroom apartment units / 1.4 person per unit; and 4 two-bedroom apartment units / 2.1 persons per unit; and 2 three-bedroom apartment units / 3.1 persons per unit – 280 L/person/day – 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 (150mm at 1.0% - 15.9 L/s capacity) since, at the design flow, it will only be about 2% full.

The proposed 150mm sanitary service will connect to a proposed 200mm private sanitary sewer. The design flow 0.31 L/s will be adequately handled by this private sanitary sewer with each pipe segment being only at about 1% of its capacity.

The proposed private sanitary sewer will connect to an existing 225 mm municipal sanitary sewer in Byron Avenue which, with a 0.60% slope, has a capacity of 36.3 L/s. The 0.31 L/s in sanitary flows contributing to the existing 225mm sanitary sewer is expected to have an acceptable impact.

STORMWATER MANAGEMENT:

Water Quality:

The Rideau Valley Conservation Authority (RVCA) has reviewed the proposed development and has stated: *“RVCA will not require any quality protection, however encourage best management practice such as maximizing landscape area and promoting infiltration on site.”*

As per the borehole records in geotechnical report, bedrock is only 0.53 to 0.66 m below grade, so there is no opportunity for promoting infiltration on the site; therefore, 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 2.5 on drawing C-6). In summary: to

filter out construction sediment; a sediment capture filter sock inserts will be installed in all new catch basins as they are installed; and any material deposited on a public road will be removed.

Water Quantity:

The stormwater management criteria for quantity control are to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 2-year storm event using a pre-development runoff coefficient or runoff coefficient of 0.50, whichever is less; and a calculated time of concentration (not less than 10 minutes). It is calculated that the pre-development conditions reflect a runoff coefficient of 0.86 and a time of concentration of 3.8 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 18.62 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 and in underground chambers surrounded by clear stone and wrapped in a waterproof membrane (Soleno Hydrostor Chambers or approved equal).

Drainage Area I
(Uncontrolled Flow Off Site – 227 sq.m.):
The runoff from the entrances to the property 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:	10.30 L/s	5.39 L/s

Drainage Area II (Small Part of Roof – 111 sq.m.):
The one 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): 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 150 mm lower than the perimeter of the roof. Two scuppers, each 320 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 50mm depth at scupper and 200mm depth at roof drain (refer to structural).

	100-year	5-year
The maximum release rate:	1.49 L/s	1.11 L/s
The maximum ponding depth:	120 mm	89 mm
The maximum stored volume:	2.65 cu.m.	1.09 cu.m.

Drainage Area III (Large Part of Roof – 328 sq.m.):
The one 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): 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 150 mm lower than the perimeter of the roof. Two scuppers, each 320 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 50mm depth at scupper and 200mm depth at roof drain (refer to structural).

	100-year	5-year
The maximum release rate:	1.80 L/s	1.38 L/s
The maximum ponding depth:	145 mm	111 mm
The maximum stored volume:	12.14 cu.m.	5.48 cu.m.

Drainage Area IV (1,078 sq.m.):
An inlet control device (ICD) located at the outlet pipe of catch basin / manhole CB/MH-4 will control the release of stormwater from the property. The ICD will restrict the flow and force the stormwater to back up into an underground chamber. To calculate the required storage volume in the underground chambers an average release rate is assumed to be equal to 50% of the maximum release rate. Specifically nine Soleno Hydrostor HS180 Chambers (or approved equal) surrounded by clear stone and wrapped in a waterproof membrane will be used. The ICD shall be a Hydrovex "VHV Vertical Vortex Flow Regulator" (or approved equal) and shall be sized by the manufacturer for a discharge rate of 8.32 L/s at 1.57 m head. It is calculated that an orifice area of 7,854 sq.mm. (100 mm in diameter) and a discharge coefficient of 0.191 will restrict the outflow rate to 8.32 L/s at 1.57 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 6.14 L/s at 0.85 m.

	100-year	5-year
Maximum release rate:	14.35 L/s	6.14 L/s
Maximum water elevation:	67.04 m	66.32 m
Maximum stored volume:	51.44 cu.m.	24.80 cu.m.

The Entire Site:

	100-year	5-year
Maximum allowable release rate:	18.62 L/s	18.62 L/s
Maximum release rate:	18.62 L/s	11.53 L/s
Maximum stored volume:	66.23 cu.m.	31.38 cu.m.

Therefore, the maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable of 18.62 L/s and to achieve this release rate the maximum required storage capacity is 62.23 cu.m. For the 5-year event the maximum post-development release is calculated to be less than the maximum allowable at 11.53 L/s and to achieve this release rate the maximum required storage capacity is 31.38 cu.m.

The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 11.44 L/s from the roof which will be adequately handled by the proposed storm sewer connection (150mm at 1.0% - 15.9 L/s capacity) which would be at 72% of its

capacity. However, the restricted flow through the flow control roof drains during the 5-year storm is 2.49 L/s and so the storm sewer connection will only be 16% full.

A private storm sewer system is proposed. Stormwater will be conveyed off the site via a private 300 mm storm sewer connecting to a 600 mm municipal storm sewer located in Byron Avenue. The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 48.48 L/s resulting in the last pipe segment being 82% full. However, the inlet control device (ICD) will restrict the flow to a maximum flow of 6.14 L/s during the 5-year event so that the last pipe segment will actually be only 10% full.

Since the subject site is currently almost all hard surfaces, and there are currently no stormwater quantity control measures, the current flow off the site would be approximately the same as the 48.48 L/s unrestricted flow rate. Therefore the proposed restricted flow of 6.14 L/s contributing to the existing 300 m municipal storm sewer is expected to have a positive impact given that it is 87% reduction from the pre--development flows.

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

Since the drainage to the proposed stormwater management facility crosses more than one property sewer it is expected that a MECP ECA will be required.

CONCLUSIONS:

1. There is an adequate water supply for firefighting from the municipal watermain.

2. The private watermain connecting to a proposed on-site fire hydrant is adequately sized during fire flow conditions.

3. The aggregate flow from the private on-site fire hydrant plus two municipal hydrants within 150 m of the building is greater than the required fire flow.

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

5. The proposed water service connection is adequately sized to serve the development.

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

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

8. The RVCA will not require any quality protection and no permanent quality control measures are proposed.

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

10. The maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable and to achieve this release rate the maximum required storage capacity of 62.23 cu.m is provided. For the 5-year event the maximum post-development release is calculated to be less than the maximum allowable.

11. The unrestricted flowrate from the roof will be adequately handled by the proposed storm sewer connection and storm sewer system.

12. The proposed restricted flow from the property contributing to the existing 300 m municipal storm sewer is expected to have a positive impact given that it is an 87% reduction from the pre--development flows.

13. Since the drainage to the proposed stormwater management facility crosses more than one property sewer it is expected that a MECP ECA will be required.

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27-Mar-20
REVISED 07-Apr-20

1010 Byron Avenue
Ottawa, Ontario

Fire Flow Requirements

Proposed 3-Storey Apartment Building
Wood-framed Construction

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	444	sq.m.
	2nd Floor	444	sq.m.
	Ground Floor	202	sq.m.
	TOTAL FIRE AREA:	1090	sq.m.

F = 10,895 L/min
= 11,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Combustible Occupancy

= 9,350 L/min

Average 0% Reduction - No Sprinkler System

= - L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
7%	North	20.1 to 30m	W-F	23	2	46
11%	East	10.1 to 20m	Ordinary	14	3	42
13%	South	10.1 to 20m	Ordinary	27	3	81
10%	West	10.1 to 20m	Ordinary	10	3	30
41%	Total Increase for Exposure (maximum 75%)					

= 3,834 L/min Increase

= 13,184 L/min
F = 13,000 L/min (rounded off to the nearest 1,000 L/min)
= 216.7 L/s

Byron/Lockhart Fire Hydrant						
Grade Elevation	67.52	m ASL				
			Static Pressure at Fire Hydrant			
217 L/s FIRE FLOW:	104.0	m ASL	52	psi	358	kPa
Lockhart/Honeywell Fire Hydrant						
Grade Elevation	68.30	m ASL				
			Static Pressure at Fire Hydrant			
217 L/s FIRE FLOW:	104.0	m ASL	51	psi	350	kPa

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27-Mar-20
REVISED 07-Apr-20

1010 Byron Avenue
Ottawa, Ontario

Fire Flow Requirements

Proposed 3-Storey Apartment Building
Ordinary Construction

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
= 1.0 Wood Frame Construction

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

Proposed Building	3rd Floor	444	sq.m.
	2nd Floor	444	sq.m.
	Ground Floor	202	sq.m.
	TOTAL FIRE AREA:	1090	sq.m.

F = 7,263 L/min
= 7,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Combustible Occupancy

= 5,950 L/min

Average 0% Reduction - No Sprinkler System

= - L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
7%	North	20.1 to 30m	W-F	23	2	46
11%	East	10.1 to 20m	Ordinary	14	3	42
13%	South	10.1 to 20m	Ordinary	27	3	81
10%	West	10.1 to 20m	Ordinary	10	3	30
41%	Total Increase for Exposure (maximum 75%)					

= 2,440 L/min Increase

= 8,390 L/min
F = 8,000 L/min (rounded off to the nearest 1,000 L/min)
= 133.3 L/s

Byron/Lockhart Fire Hydrant						
Grade Elevation	67.52	m ASL				
			Static Pressure at Fire Hydrant			
133 L/s FIRE FLOW:	107.5	m ASL	57	psi	392	kPa
Lockhart/Honeywell Fire Hydrant						
Grade Elevation	68.30	m ASL				
			Static Pressure at Fire Hydrant			
133 L/s FIRE FLOW:	107.5	m ASL	56	psi	384	kPa

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27-Mar-20

REVISED 07-Apr-20

1010 Byron Avenue
Three-Storey 13-Unit Apartment Building
Ottawa, Ontario

Water Demand

	Number of Units	Persons Per Unit	Population
APARTMENTS:			
1 Bedroom:	7	1.4	10
2 Bedroom:	4	2.1	8
3 Bedroom:	2	3.1	6
Average Aptarment:	0	1.8	0
TOTAL:	13		24

DAILY AVERAGE

350 litres / person / day

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

MAXIMUM DAILY DEMAND 9.7 (Peaking Factor for a population of 24: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)

57.6 L/min | 1.0 L/s | 15 USgpm

MAXIMUM HOURLY DEMAND 14.6 (Peaking Factor for a population of 24: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)

86.7 L/min | 1.4 L/s | 23 USgpm

Elevation of Water Meter: 69.26 m ASL

Finish Floor Elevation: 68.36 m ASL

			Static Pressure at Water Meter		
MINIMUM HGL:	108.0	m ASL	55	psi	380 kPa
MAXIMUM HGL:	116.3	m ASL	67	psi	461 kPa

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

RE: 1010 Byron Ave

1 message

Kuruvilla, Santhosh <Santhosh.Kuruvilla@ottawa.ca> Tue, Apr 7, 2020 at 10:29 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>

Hi Doug,

Hope you're doing well.

Please find attached the connection location for the water.

The following are boundary conditions, HGL, for hydraulic analysis at 1010 Byron (zone 1W) assumed to be connected to the 305mm on Byron (see attached PDF for location).

Minimum HGL = 108.0m

Maximum HGL = 116.3m

Max Day + Fire Flow (133L/s) = 107.5m

Max Day + Fire Flow (217L/s) = 104.0m

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.

Santhosh

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: March 30, 2020 8:53 AM
To: Kuruvilla, Santhosh <Santhosh.Kuruvilla@ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: 1010 Byron Ave

Hi Santosh

We are working on a three-storey 13-unit apartment building at 1010 Byron Ave (see attached property location). The water service will connect to the watermain in Byron Ave.

Please provide the boundary conditions at 1010 Byron Ave. We have calculated the following expected demands:

Average daily demand: 0.1 L/s.

Maximum daily demand: 1.0 L/s.

Maximum hourly daily demand:1.4 L/s

Fire Flow demand: 216.7 L/s

Fire Flow + Max Day: 217.7 L/s

We are looking at alternative designs so please also provide the boundary conditions for a fire flow demand of 133.3 l/s:

Average daily demand: 0.1 L/s.

Maximum daily demand: 1.0 L/s.

Maximum hourly daily demand: 1.4 L/s

Fire Flow demand: 133.3 L/s

Fire Flow + Max Day: 134.3 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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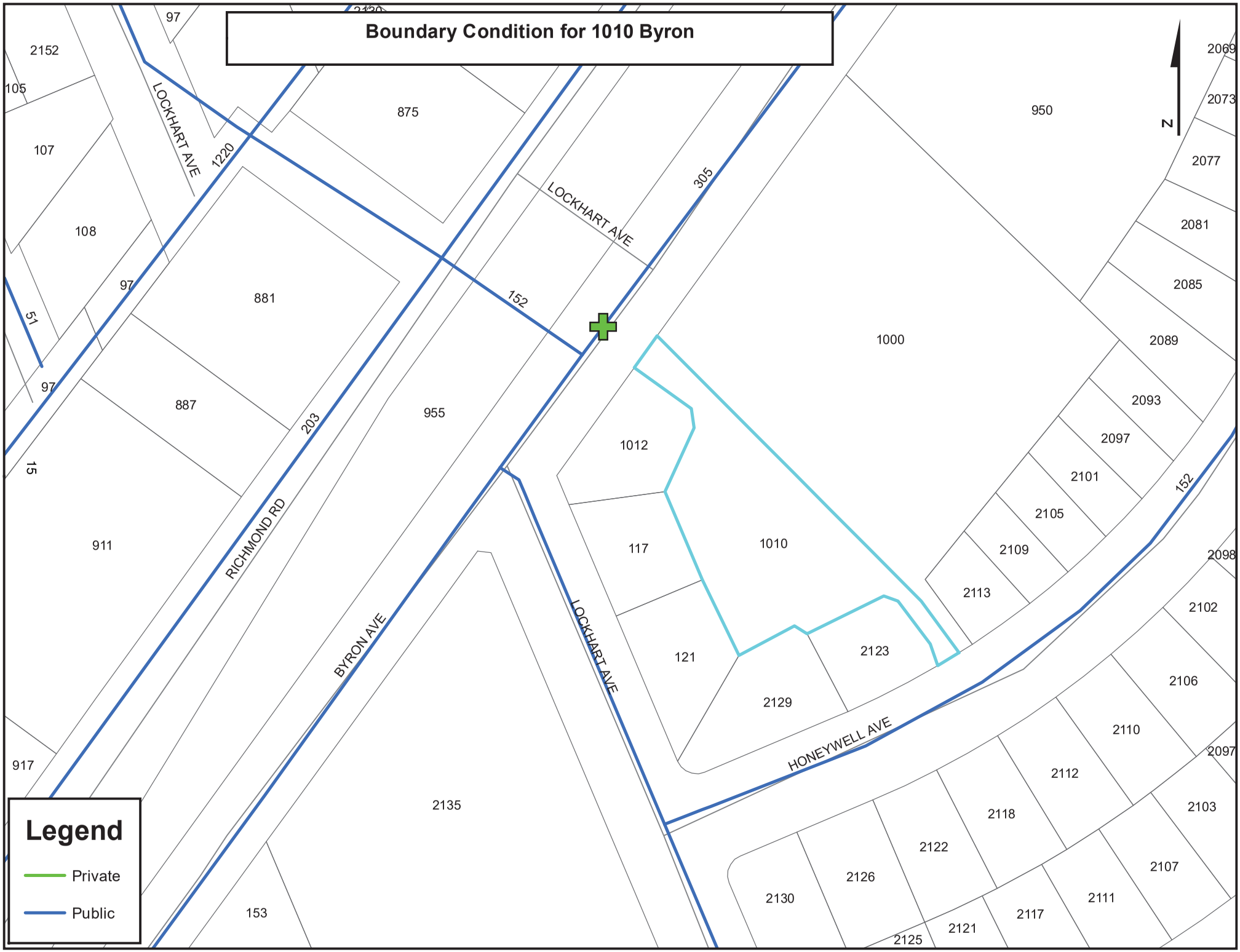
Boundary Condition for 1010 Byron
N
Legend
Private
Public
LOCKHART AVE
1220
305
152
203
51
15
97
RICHMOND RD
BYRON AVE
HONEYWELL AVE
2152
105
107
108
875
881
887
911
917
955
1000
950
1012
1010
117
121
2123
2129
2135
153
2130
2126
2122
2118
2112
2110
2106
2102
2098
2097
2103
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2121
2125
2113
2109
2105
2101
2093
2089
2085
2081
2077
2073
2069

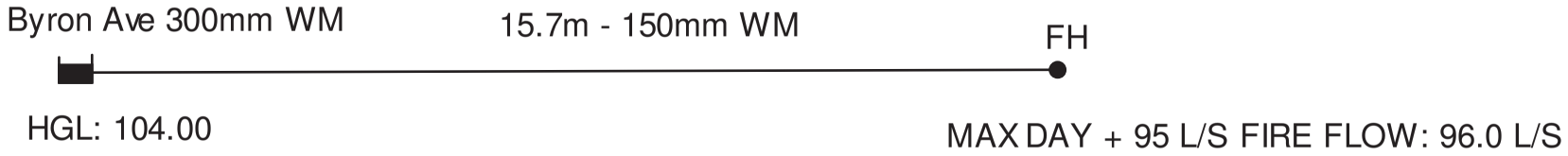
2-Jun-20

1010 Byron Avenue
Three-Storey 13-Unit Apartment Building
Ottawa, Ontario

EPANET HYDRAULIC MODELLING RESULTS

Node ID	Demand	Head	Elevation	Pressure		
	L/s	m	m	m	psi	kPa
1 Reservoir 1 (300 WM - Byron Ave)	-96.0	104.00	67.01	36.99	52.6	363
2 Proposed FH	96.0	96.32	67.34	28.98	41.2	284

Link ID	Diameter	Length	Roughness	Loss Coeff.	Flow	Velocity
	mm	m			L/s	m/s
Pipe 1	150	15.7	100	2.15	96.0	5.43


Byron Ave 300mm WM
15.7m - 150mm WM
FH
HGL: 104.00
MAX DAY + 95 L/S FIRE FLOW: 96.0 L/S

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s
Pipe 1	15.7	150	100	96.00	5.43

Network Table - Nodes

Node ID	Elevation m	Demand LPS	Head m	Pressure m
Junc 2	67.34	96.00	96.32	28.98
Resvr 1	104.00	-96.00	104.00	0.00

02-Jun-20

1010 Byron Avenue
Three-Storey 13-Unit Apartment Building
Ottawa, Ontario

Peak Water Demand

WATER FIXTURE VALUE
(AWWA Manual M22 - Sizing Water Service Lines and Meters)

	No.	F.V.	Total			
Bathtub	13	8	104		13	Units
Tiolet - tank	15	6	90			
Tiolet - flush valve	0	24	0			
Lavs.	15	1.5	22.5			
Bidet	0	2	0			
Urinal - wall flush valve	0	10	0			
Shower	0	2.5	0			
K. Sink	13	1.8	23.4			
Dishwasher	0	1.3	0			
Clothes Washer	1	6	6	3 to 6		
Commercial Sink	1	4	4			
J. Sink	1	4	4			
Commercial Dishwasher	0	4	0			
Commercial Washer	3	4	12			
Hose 1/2 in	0	5	0			
Hose 3/4 in	0	12	0			
			265.9			

Peak Demand (fig 4-2 or 4-3 AWWA M22)			34	USgpm		
Pressure @ Meter	414	kPa	60	psi		
Pressure Factor (table 4-1 AWWA M22)			1.00			
Peak Demand			34	USgpm		
Irrigation - hose 1/2 in	0		0	USgpm (includes pressure factor)		
TOTAL PEAK DEMAND	129	l/min	34	USgpm	2.1	l/s
		Nominal Size	2.0	in	50	mm
			3.6	ft/s	1.1	m/s

D.B. GRAY ENGINEERING INC.

Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains
700 Long Point Circle 613-425-8044
Ottawa, Ontario K1T 4E9 d.gray@dbgrayengineering.com

SANITARY SEWER DESIGN FORM

Average Daily Flows:
- Residential: 280 l / capita / day
- Commercial: 28,000 l / ha / day
- Instituational: 28,000 l / ha / day
- Light Industrial: 35,000 l / ha / day
- Heavy Industrial: 55,000 l / ha / day

Infiltration Allowance: 0.33 l / s / ha

Peaking Factor:
- Residential (Harmon Equation): $P.F. = 1 + \frac{14}{4 + P^{0.5}}$
- P = Population / 1000
- Harmon Correction Factor 0.8
- Commercial & Institutional: 1.5 If contrinbution > 20%
- Commercial & Institutional: 1.0 If contrinbution < 20%
- Industrial: As per Ottawa Guidelines Appendix 4-B

PROJECT: 1010 Byron Ave

Designed By: DBG

2-Jun-20

LOCATION			Section								Cumulative Residential		Section Non-Residential			Cumulative					SEWER DATA								COMMENTS
			Single Family	Semi/Town house	Duplex / Triplex	Apartment (average)	Apartment (1 Bed.)	Apartment (2 Bed.)	Apartment (3 Bed.)	Resid-ential Area															n = 0.013					
STREET	FROM	TO	ppu = 3.4	ppu = 2.7	ppu = 2.3	ppu = 1.8	ppu = 1.4	ppu = 2.1	ppu = 3.1		Pop.	Peaking Factor	Area	Flow	Peaking Factor	Flow	Area	Sewage Flow	Infil-tration Flow	Total Flow	Type of Pipe	Dia. Actual	Dia. Nom.	Slope	Length	Capacity	Velocity	Ratio	
			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	
	BLDG	MH-SA.1					7	4	2	0.174	24	3.2				0.0	0.174	0.25	0.06	0.31	PVC	152.4	150	1.00	6.8	15.9	0.87	0.02	
	MH-SA.1	MH-SA.2								0	24	3.2				0.0	0.174	0.25	0.06	0.31	PVC	203.2	200	0.50	14.7	24.2	0.75	0.01	
	MH-SA.2	MH.-SA.3								0	24	3.2				0.0	0.174	0.25	0.06	0.31	PVC	203.2	200	2.55	27.8	54.6	1.68	0.01	
																					MUNICIPAL SANITARY SEWER IN BYRON AVENUE								
																						228.6	225	0.60		36.3	0.88		

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

Re: 1010 Byron Ave

1 message

Eric Lalande <eric.lalande@rvca.ca> Thu, May 21, 2020 at 9:16 AM
To: Ryan Faith <r.faith@dbgrayengineering.com>

Hi Ryan,

The RVCA will not require any quality protection, however encourage best management practice such as maximizing landscape area and promoting infiltration on site.

Thank you,

Eric Lalande, MCIP, RPP
Planner, RVCA
613-692-3571 x1137

From: Jamie Batchelor <jamie.batchelor@rvca.ca>
Sent: May 20, 2020 4:27 PM
To: Eric Lalande <eric.lalande@rvca.ca>
Subject: FW: 1010 Byron Ave

Hi Eric,

Looks like this would be yours.

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: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: Tuesday, May 19, 2020 7:04 AM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Cc: Ryan Faith <r.faith@dbgrayengineering.com>
Subject: 1010 Byron Ave

Hi Jamie

We are working on a proposed three-storey 13-unit apartment building infill development at 1010 Byron Avenue in Ottawa. The proposed building will be constructed in what is currently a parking lot, with two garage buildings being demolished.

Attached are Existing and Proposed Site Plans.

Please comment concerning the stormwater management for this site.

Regards, Doug

D.B. Gray Engineering Inc.

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

700 Long Point Circle Tel: 613-425-8044
Ottawa, Ontario K1T 4E9 d.gray@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 area 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	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)	-	10.30	-	-
AREA II (Small Roof)	-	1.49	2.65	2.65
AREA III (Large Roof)	-	1.80	12.14	12.14
AREA IV	-	8.32	51.44	51.44
TOTAL (AREA I + AREA IV)	18.62	18.62	66.23	66.23

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)	-	5.39	-	-
AREA II (Small Roof)	-	1.11	1.09	1.09
AREA III (Large Roof)	-	1.38	5.48	5.48
AREA IV	-	6.14	24.80	24.80
TOTAL (AREA I + AREA IV)	18.62	11.53	31.38	31.38

1010 Byron Avenue

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS
Rational Method

2 Year Pre-Development Conditions

			C
Roof Area:	299	sq.m	0.90
Asphalt/Concrete Area:	1354	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	91	sq.m	0.20
Total Catchment Area:	1744	sq.m	0.86

Bransby William Formula (Used when C > 0.40)

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

Sheet Flow Distance (L):	66	m
Slope of Land (Sw):	2.3	%
Area (A):	0.1744	ha
Calculated Time of Concentration (Sheet Flow):	3.8	min
Area (A):	1744	sq.m
Time of Concentration:	10	min (calculated but not less than 10)
Rainfall Intensity (i):	77	mm/hr
Runoff Coeficient (C):	0.50	(calculated but not greater than 0.50)
Maximum Allowable Release Rate (2.78AiC):	18.62	L/s

ONE HUNDRED YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	201	sq.m	1.00
Gravel Area:	0	sq.m	0.88
Landscaped Area:	26	sq.m	0.25
Total Catchment Area:	227	sq.m	0.91
Area (A):	227	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coeficient (C):	0.91		
Release Rate (2.78AiC):	10.30	L/s	

DRAINAGE AREA II (Small Part of Roof)

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	111	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.88
Landscaped Area:	0	sq.m	0.25
Total Catchment Area:	111	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: 120 mm

Maximum Release Rate: 1.49 L/s Pond Area: 66 sq.m

Achieved Volume: 2.65 cu.m

Maximum Volume Required: 2.65 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	7.49	1.49	6.00	1.80
10	179	5.51	1.49	4.02	2.41
15	143	4.41	1.49	2.92	2.63
20	120	3.70	1.49	2.21	2.65
25	104	3.20	1.49	1.71	2.57
30	92	2.83	1.49	1.34	2.42
35	83	2.55	1.49	1.06	2.22
40	75	2.32	1.49	0.83	1.99
45	69	2.13	1.49	0.64	1.73
50	64	1.97	1.49	0.48	1.45
55	60	1.84	1.49	0.35	1.15
60	56	1.72	1.49	0.23	0.84
65	53	1.62	1.49	0.13	0.52
70	50	1.54	1.49	0.05	0.19
75	47	1.46	1.46	0.00	0.00
80	45	1.39	1.39	0.00	0.00
85	43	1.33	1.33	0.00	0.00
90	41	1.27	1.27	0.00	0.00
95	39	1.22	1.22	0.00	0.00
100	38	1.17	1.17	0.00	0.00
105	36	1.13	1.13	0.00	0.00
110	35	1.09	1.09	0.00	0.00
115	34	1.05	1.05	0.00	0.00
120	33	1.02	1.02	0.00	0.00
125	32	0.98	0.98	0.00	0.00
130	31	0.95	0.95	0.00	0.00
135	30	0.93	0.93	0.00	0.00
140	29	0.90	0.90	0.00	0.00
145	28	0.88	0.88	0.00	0.00
150	28	0.85	0.85	0.00	0.00
180	24	0.74	0.74	0.00	0.00
210	21	0.65	0.65	0.00	0.00
240	19	0.59	0.59	0.00	0.00
270	17	0.53	0.53	0.00	0.00
300	16	0.49	0.49	0.00	0.00

DRAINAGE AREA III (Large Part of Roof)

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	328	sq.m	1.00
Asphalt/Concrete Area:	0	sq.m	1.00
Gravel Area:	0	sq.m	0.88
Landscaped Area:	0	sq.m	0.25
Total Catchment Area:	328	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: 145 mm

Maximum Release Rate: 1.80 L/s Pond Area: 251 sq.m

Achieved Volume: 12.14 cu.m

Maximum Volume Required: 12.14 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	22.13	1.80	20.33	6.10
10	179	16.28	1.80	14.48	8.69
15	143	13.03	1.80	11.23	10.11
20	120	10.94	1.80	9.14	10.97
25	104	9.47	1.80	7.67	11.50
30	92	8.38	1.80	6.58	11.84
35	83	7.53	1.80	5.73	12.03
40	75	6.85	1.80	5.05	12.13
45	69	6.30	1.80	4.50	12.14
50	64	5.83	1.80	4.03	12.10
55	60	5.44	1.80	3.64	12.00
60	56	5.10	1.80	3.30	11.87
65	53	4.80	1.80	3.00	11.70
70	50	4.54	1.80	2.74	11.51
75	47	4.31	1.80	2.51	11.29
80	45	4.10	1.80	2.30	11.05
85	43	3.92	1.80	2.12	10.80
90	41	3.75	1.80	1.95	10.52
95	39	3.60	1.80	1.80	10.24
100	38	3.46	1.80	1.66	9.94
105	36	3.33	1.80	1.53	9.63
110	35	3.21	1.80	1.41	9.31
115	34	3.10	1.80	1.30	8.98
120	33	3.00	1.80	1.20	8.64
125	32	2.91	1.80	1.11	8.29
130	31	2.82	1.80	1.02	7.94
135	30	2.74	1.80	0.94	7.58
140	29	2.66	1.80	0.86	7.21
145	28	2.59	1.80	0.79	6.84
150	28	2.52	1.80	0.72	6.46
180	24	2.18	1.80	0.38	4.10
210	21	1.93	1.80	0.13	1.62
240	19	1.73	1.73	0.00	0.00
270	17	1.58	1.58	0.00	0.00
300	16	1.45	1.45	0.00	0.00

DRAINAGE AREA IV

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	876	sq.m	1.00
Gravel Area:	0	sq.m	0.88
Landscaped Area:	202	sq.m	0.25
Total Catchment Area:	1078	sq.m	0.86

Water Elevation:	67.04	m
Invert of Outlet Pipe - CB/MH-4:	65.42	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	65.47	m
Head:	1.57	m
Orifice Diameter:	100	mm
Orifice Area:	7854	sq.mm
Coefficient of Discharge:	0.191	
Maximum Release Rate:	8.32	L/s

Chamber Storage (cu.m)	Clear Stone Storage (cu.m)	Volume	
29.84	21.60	51.44	cu.m
	Achieved Volume:	51.44	cu.m
	Maximum Volume Required:	51.44	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	From Small Roof (L/s)	From large Roof (L/s)	Total Inflow (L/s)	50% of Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	243	62.51	1.49	1.80	65.80	4.16	61.64	18.49
10	179	45.99	1.49	1.80	49.28	4.16	45.12	27.07
15	143	36.80	1.49	1.80	40.10	4.16	35.93	32.34
20	120	30.90	1.49	1.80	34.19	4.16	30.02	36.03
25	104	26.75	1.49	1.80	30.04	4.16	25.88	38.81
30	92	23.66	1.49	1.80	26.95	4.16	22.79	41.02
35	83	21.27	1.49	1.80	24.56	4.16	20.40	42.84
40	75	19.35	1.49	1.80	22.65	4.16	18.48	44.36
45	69	17.79	1.49	1.80	21.08	4.16	16.91	45.67
50	64	16.47	1.49	1.80	19.76	4.16	15.60	46.80
55	60	15.36	1.49	1.80	18.65	4.16	14.49	47.80
60	56	14.40	1.49	1.80	17.69	4.16	13.53	48.69
65	53	13.56	1.49	1.80	16.85	4.16	12.69	49.49
70	50	12.82	1.49	1.80	16.11	4.16	11.95	50.20
75	47	12.17	1.46	1.80	15.43	4.16	11.27	50.70
80	45	11.59	1.39	1.80	14.78	4.16	10.61	50.95
85	43	11.06	1.33	1.80	14.19	4.16	10.03	51.14
90	41	10.59	1.27	1.80	13.66	4.16	9.50	51.27
95	39	10.16	1.22	1.80	13.17	4.16	9.01	51.37
100	38	9.76	1.17	1.80	12.73	4.16	8.57	51.42
105	36	9.40	1.13	1.80	12.33	4.16	8.16	51.44
110	35	9.07	1.09	1.80	11.95	4.16	7.79	51.42
115	34	8.76	1.05	1.80	11.61	4.16	7.45	51.38
120	33	8.47	1.02	1.80	11.29	4.16	7.13	51.30
125	32	8.21	0.98	1.80	10.99	4.16	6.83	51.21
130	31	7.96	0.95	1.80	10.71	4.16	6.55	51.09
135	30	7.73	0.93	1.80	10.45	4.16	6.29	50.95
140	29	7.51	0.90	1.80	10.21	4.16	6.05	50.79
145	28	7.30	0.88	1.80	9.98	4.16	5.82	50.61
150	28	7.11	0.85	1.80	9.76	4.16	5.60	50.41
180	24	6.16	0.74	1.80	8.69	4.16	4.53	48.95
210	21	5.45	0.65	1.80	7.90	4.16	3.74	47.08
240	19	4.90	0.59	1.73	7.21	4.16	3.05	43.96
270	17	4.45	0.53	1.58	6.57	4.16	2.40	38.93
300	16	4.09	0.49	1.45	6.03	4.16	1.87	33.67

FIVE YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(FIVE YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	201	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	26	sq.m	0.20
Total Catchment Area:	227	sq.m	0.82
Area (A):	227	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coeficient (C):	0.82		
Release Rate (2.78AiC):	5.39	L/s	

DRAINAGE AREA II (Small Part of Roof)

(FIVE YEAR EVENT)

			C
Roof Area:	111	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	111	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: 89 mm

Maximum Release Rate: 1.11 L/s

Pond Area: 37 sq.m

Achieved Volume: 1.09 cu.m

Maximum Volume Required: 1.09 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	3.92	1.11	2.81	0.84
10	104	2.89	1.11	1.78	1.07
15	84	2.32	1.11	1.21	1.09
20	70	1.95	1.11	0.84	1.01
25	61	1.69	1.11	0.58	0.87
30	54	1.50	1.11	0.39	0.70
35	49	1.35	1.11	0.24	0.50
40	44	1.23	1.11	0.12	0.28
45	41	1.13	1.11	0.02	0.05
50	38	1.05	1.05	0.00	0.00
55	35	0.98	0.98	0.00	0.00
60	33	0.91	0.91	0.00	0.00
65	31	0.86	0.86	0.00	0.00
70	29	0.82	0.82	0.00	0.00
75	28	0.77	0.77	0.00	0.00
80	27	0.74	0.74	0.00	0.00
85	25	0.70	0.70	0.00	0.00
90	24	0.67	0.67	0.00	0.00
95	23	0.65	0.65	0.00	0.00
100	22	0.62	0.62	0.00	0.00
105	22	0.60	0.60	0.00	0.00
110	21	0.58	0.58	0.00	0.00
115	20	0.56	0.56	0.00	0.00
120	19	0.54	0.54	0.00	0.00
125	19	0.52	0.52	0.00	0.00
130	18	0.51	0.51	0.00	0.00
135	18	0.49	0.49	0.00	0.00
140	17	0.48	0.48	0.00	0.00
145	17	0.47	0.47	0.00	0.00
150	16	0.45	0.45	0.00	0.00
180	14	0.39	0.39	0.00	0.00
210	13	0.35	0.35	0.00	0.00
240	11	0.31	0.31	0.00	0.00
270	10	0.29	0.29	0.00	0.00
300	9	0.26	0.26	0.00	0.00

DRAINAGE AREA III (Large Part of Roof)

(FIVE YEAR EVENT)

			C
Roof Area:	328	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	328	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: 111 mm

Maximum Release Rate: 1.38 L/s

Pond Area: 148 sq.m

Achieved Volume: 5.48 cu.m

Maximum Volume Required: 5.48 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	11.59	1.38	10.21	3.06
10	104	8.55	1.38	7.17	4.30
15	84	6.86	1.38	5.48	4.93
20	70	5.77	1.38	4.38	5.26
25	61	5.00	1.38	3.62	5.43
30	54	4.43	1.38	3.04	5.48
35	49	3.98	1.38	2.60	5.46
40	44	3.63	1.38	2.25	5.39
45	41	3.33	1.38	1.95	5.27
50	38	3.09	1.38	1.71	5.13
55	35	2.88	1.38	1.50	4.96
60	33	2.70	1.38	1.32	4.76
65	31	2.55	1.38	1.17	4.55
70	29	2.41	1.38	1.03	4.33
75	28	2.29	1.38	0.91	4.09
80	27	2.18	1.38	0.80	3.84
85	25	2.08	1.38	0.70	3.58
90	24	1.99	1.38	0.61	3.31
95	23	1.91	1.38	0.53	3.03
100	22	1.84	1.38	0.46	2.75
105	22	1.77	1.38	0.39	2.46
110	21	1.71	1.38	0.33	2.17
115	20	1.65	1.38	0.27	1.87
120	19	1.60	1.38	0.22	1.56
125	19	1.55	1.38	0.17	1.25
130	18	1.50	1.38	0.12	0.94
135	18	1.46	1.38	0.08	0.63
140	17	1.42	1.38	0.04	0.31
145	17	1.38	1.38	0.00	0.00
150	16	1.34	1.34	0.00	0.00
180	14	1.16	1.16	0.00	0.00
210	13	1.03	1.03	0.00	0.00
240	11	0.93	0.93	0.00	0.00
270	10	0.84	0.84	0.00	0.00
300	9	0.78	0.78	0.00	0.00

DRAINAGE AREA IV

(FIVE YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	876	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	202	sq.m	0.20
Total Catchment Area:	1078	sq.m	0.77

Water Elevation:	66.32	m
Invert of Outlet Pipe - CB/MH-4:	65.42	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	65.47	m
Head:	0.85	m
Orifice Diameter:	100	mm
Orifice Area:	7854	sq.mm
Coefficient of Discharge:	0.191	
Maximum Release Rate:	6.14	L/s

Chamber Storage (cu.m)	Clear Stone Storage (cu.m)	Volume	
14.50	10.30	24.80	cu.m
	Achieved Volume:	24.80	cu.m
	Maximum Volume Required:	24.80	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	From Small Roof (L/s)	From large Roof (L/s)	Total Inflow (L/s)	50% of Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	141	32.53	1.11	1.38	35.02	3.07	31.95	9.58
10	104	24.01	1.11	1.38	26.50	3.07	23.43	14.06
15	84	19.25	1.11	1.38	21.74	3.07	18.67	16.80
20	70	16.19	1.11	1.38	18.68	3.07	15.60	18.73
25	61	14.03	1.11	1.38	16.52	3.07	13.45	20.17
30	54	12.43	1.11	1.38	14.91	3.07	11.84	21.32
35	49	11.18	1.11	1.38	13.67	3.07	10.60	22.25
40	44	10.18	1.11	1.38	12.67	3.07	9.60	23.04
45	41	9.36	1.11	1.38	11.85	3.07	8.78	23.70
50	38	8.68	1.05	1.38	11.10	3.07	8.03	24.09
55	35	8.09	0.98	1.38	10.45	3.07	7.38	24.35
60	33	7.59	0.91	1.38	9.89	3.07	6.82	24.53
65	31	7.15	0.86	1.38	9.40	3.07	6.32	24.67
70	29	6.77	0.82	1.38	8.96	3.07	5.89	24.75
75	28	6.43	0.77	1.38	8.58	3.07	5.51	24.79
80	27	6.12	0.74	1.38	8.24	3.07	5.17	24.80
85	25	5.85	0.70	1.38	7.93	3.07	4.86	24.78
90	24	5.60	0.67	1.38	7.65	3.07	4.58	24.73
95	23	5.37	0.65	1.38	7.40	3.07	4.33	24.66
100	22	5.16	0.62	1.38	7.17	3.07	4.09	24.57
105	22	4.97	0.60	1.38	6.95	3.07	3.88	24.46
110	21	4.80	0.58	1.38	6.76	3.07	3.69	24.33
115	20	4.64	0.56	1.38	6.58	3.07	3.50	24.18
120	19	4.49	0.54	1.38	6.41	3.07	3.34	24.02
125	19	4.35	0.52	1.38	6.25	3.07	3.18	23.84
130	18	4.22	0.51	1.38	6.10	3.07	3.03	23.66
135	18	4.09	0.49	1.38	5.97	3.07	2.90	23.46
140	17	3.98	0.48	1.38	5.84	3.07	2.77	23.25
145	17	3.87	0.47	1.38	5.72	3.07	2.65	23.02
150	16	3.77	0.45	1.34	5.57	3.07	2.50	22.47
180	14	3.27	0.39	1.16	4.82	3.07	1.75	18.94
210	13	2.89	0.35	1.03	4.27	3.07	1.20	15.13
240	11	2.60	0.31	0.93	3.84	3.07	0.77	11.12
270	10	2.37	0.29	0.84	3.50	3.07	0.43	6.94
300	9	2.18	0.26	0.78	3.22	3.07	0.15	2.64

1010 Byron Ave

Ottawa, Ontario

STORM SEWER COMPUTATION FORM

Rational Method

FIVE YEAR EVENT

Q = 2.78 A i C

May 21, 2020

n = 0.013

Location			Areas (ha)				Individual	Accum.	Time of Conc.	Rainfall Intensity i	Peak Flow Q	Pipe Data									Notes
			Hard	Gravel	Landscape	Roof							Actual Diam.	Nominal Diam.	Slope	Length	Capacity	Velocity	Time of Flow	Ratio	
Street	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	
	Roof Drains	CB-1				0.0439	0.1098	0.1098	10.00	104	11.44	PVC	152.4	150	1.00	2.1	15.9	0.87	0.04	0.72	
											2.49	PVC	152.4	150	1.00	2.1	15.9	0.87	0.04	0.16	Flow through flow control RD
	CB-1	CB/MH-2			0.0115		0.0064	0.1162	10.04	104	12.09	PVC	254.0	250	0.43	10.0	40.7	0.80	0.21	0.30	
	CB/MH-2	CB/MH-3	0.0885		0.0025		0.2228	0.3390	10.25	103	34.89	PVC	254.0	250	0.43	12.0	40.7	0.80	0.25	0.86	
	CB/MH-3	CB/MH-4	0.0575		0.005		0.1466	0.4857	10.50	102	49.37	PVC	304.8	300	0.34	18.1	58.8	0.81	0.37	0.84	
	CB/MH-4	Exist. 600 ST						0.4857	10.87	100	48.48	PVC	304.8	300	0.34	18.1	58.8	0.81	0.37	0.82	
											6.14	PVC	304.8	300	0.34	18.1	58.8	0.81	0.37	0.10	Flow through ICD
													Existing 600 ST in Byron Avenue								
													609.6	600	0.76		558.4	1.91			

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-7

Plan showing the site and location of all existing services: see drawings C-1 to C-7

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-7

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-7

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-6

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 & 9 to 14 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 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 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 16 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-4

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-7 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-7 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-6

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