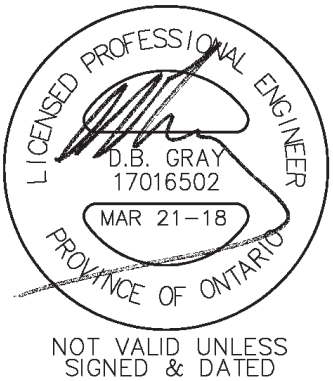
# SERVICING BRIEF &
# STORMWATER MANAGEMENT REPORT

## 83 Hinton Avenue North
## Ottawa, Ontario

Report No. 17067

March 21, 2018

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SIGNED & DATED

D. B. GRAY ENGINEERING INC.

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

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# SERVICING BRIEF &
# STORMWATER MANAGEMENT REPORT

## 83 Hinton Avenue North
## Ottawa, Ontario

This report describes the services for a proposed seven-storey 30-unit apartment building (with ground floor commercial) and addresses the stormwater management requirements of the 482 sq.m. property it is to be located on at 83 Hinton Avenue North. A building, to be demolished, is currently located on the property.

This report forms part of the stormwater management design for the proposed development. Refer to drawing C-1 to C-3 also prepared by D. B. Gray Engineering Inc.

### WATER SUPPLY FOR FIREFIGHTING:

There is an existing fire hydrant in the Hinton Avenue North right-of-way, located approximately 17 m unobstructed distance from the proposed fire department connection. Since it less than the required 45m, an on-site fire hydrant is not required.

A fire flow of 100.0 l/s (6,000 L/min) is required, as calculated as per the Fire Underwriter Survey "Water Supply For Fire Protection".

The boundary conditions received from the city (based on the city's computer model of the municipal water distribution system) includes the HGL of 104.8m during the 100.0 l/s fire flow conditions at the subject location which calculates to be 407 kPa (59 psi) at the existing fire hydrant . Since the pressure is above 138 kPa (20 psi) there is an adequate water supply for firefighting.

### WATER SERVICE:

The proposed building will have a sprinkler system. To service the sprinkler system a 150mm water service is proposed. The proposed water service will connect to an existing 150 mm municipal watermain in Hinton Avenue North.

Based on the City of Ottawa Water Distribution Design Guidelines for residential properties (30 one-bedroom apartment units / 1.4 persons per unit – 350 l/person/day); and adding a 92 sq.m. commercial component (at 75 l / person / 8 hour day – one person per 9 sq.m.) and the Ministry of the Environment Design Guidelines for peaking factors the daily average flow is 0.2 l/s with a maximum daily and maximum hourly demand of 1.7 and 2.5 l/s respectively. Based on these flowrates the 150mm service will be adequate for the domestic demand.

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, we required the boundary conditions for the subject area based on the following:

Average Daily Demand: 0.2 l/s.
Maximum Daily Demand: 1.7 l/s.
Maximum Hourly Demand: 2.5 l/s
Fire Flow Demand: 100.0 l/s
Maximum Daily + Fire Flow Demand: 101.7 l/s

Based on the boundary conditions received from the city, the minimum HGL (hydraulic grade line) is 108.1 m and the maximum is 115.6 m. With these HGLs the water pressure at the water meter is calculated to vary from 459 kPa to 533 kPa (67 to 77 psi). This is an acceptable range of pressures for the proposed development.

SANITARY SERVICE:

A 150mm sanitary sewer service is proposed to connect to an existing 1050 mm municipal combined sewer in Hinton Avenue North.

Based on the City of Ottawa Sewer Design Guidelines for a residential property (30 one-bedroom apartment units / 1.4 persons per unit – 350 l/person/day – 4.0 peaking factor); and a 92 sq.m. commercial component (at 75 l / person / 8 hour day – one person per 15 sq.m. – 4.5 peaking factor (1.5 peaking factor x 24 / 8 hours); and a 0.28 l/s/ha infiltration flow) the post development flow is calculated to be 0.72 l/s.

This flow will be adequately handled by the proposed sanitary sewer service connection (150mm at 1% - 15.9 l/s capacity). The 0.72 l/s in sanitary flows contributing to the existing 1050 mm municipal sanitary sewer is expected to have an acceptable impact given its capacity of 2516.0 l/s (1050 mm at 0.78%).

STORMWATER MANAGEMENT:

Water Quality:

The building will occupy most of the site and the proposed development does not have vehicle parking. Roof drainage is typically considered “clean”, therefore it is expected that the Rideau Valley Conservation Authority (RVCA) will not require permanent on-site quality control measures and none are proposed.

An erosion and sediment control plan has been developed to be implemented during construction, (see notes 2.1 to 2.4 on drawing C-3). In summary: to filter out construction sediment; sediment capture filter sock inserts will be installed in all existing catch basins adjacent to the site.

Water Quantity:

The stormwater management criteria for quantity control are to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 5-year storm event using a runoff coefficient of 0.50 and 10 minute time of concentration. Using the Rational Method; the maximum allowable release rate is calculated to be 6.98 l/s for all storm events. The runoff coefficients for the 100 year event are increased by 25% to maximum of 1.00.

Stormwater will be stored within the development on the roofs of the proposed building and in an underground cistern.

Drainage Area I (Uncontrolled Flow Off Site – 51 sq.m.):
The runoff from part of the perimeter of the site will be allowed to flow uncontrolled off the site. The flow from is calculated at 10 minutes concentration.

| | 100-year | 5-year |
|---|---|---|
| The maximum flow rate: | 2.05 l/s | 1.07 l/s |

Drainage Area II (Roof – 253 sq.m.):
Two roof drains on the 7th Level Roof will be flow control types which will restrict the flow and cause the storm water to pond on the roof. All roof drains will drain to the cistern. All flow control type roof drains 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 drains shall be installed at the low points of the roof which shall be 145mm lower than the perimeter of the roof. Scuppers shall be installed 145 mm above the roof drains so that the maximum depth of water on the roof cannot exceed 150 mm as per the Ontario Building Code.

| | 100-year | 5-year |
|---|---|---|
| The maximum release rate: | 3.23 l/s | 2.41 l/s |
| The maximum ponding depth: | 130 mm | 97 mm |
| The maximum stored volume: | 6.25 cu.m. | 2.59 cu.m. |

Drainage Area III (178 sq.m.):
An inlet control device (ICD) located at the outlet pipe of the cistern will control the release of stormwater from the site. The ICD will restrict the flow and force the stormwater to back up into the cistern having a capacity of 2.76 cu.m. Stormwater released through the ICD will be conveyed off the site via a 250mm storm sewer into a 600mm municipal storm sewer in Hinton Avenue North. The ICD shall be a Hydrovex "VHV Vertical Vortex Flow Regulator" and shall be sized by the manufacturer for a discharge rate of 4.93 l/s at 0.56 m head. It is calculated that an orifice area of 7,854 sq.mm. (100 mm in diameter) and a discharge coefficient of 0.190 will restrict the outflow rate to 4.93 l/s at 0.56 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 3.41 l/s at 0.27 m.

| | 100-year | 5-year |
|---|---|---|
| The maximum release rate: | 4.93 l/s | 3.14 l/s |
| The maximum stored volume: | 2.76 cu.m. | 1.32 cu.m. |

The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 9.7 l/s. However the inlet control device (ICD) located at the outlet pipe of the cistern will restrict the flow. The restricted flow calculates to a maximum flow of 3.4 l/s during the one in five storm event which will be adequately handled by a proposed storm sewer (250mm at 1.00% - 15.9 l/s capacity).

The 3.4 l/s in stormwater flows contributing to the existing 600mm municipal storm sewer (at 0.30% - 350.8 l/s capacity) is expected to have a negligible impact

CONCLUSIONS:

1. There is an adequate water supply for firefighting.
2. The existing water pressure is adequate for the proposed development.
3. The proposed water service connection is adequately sized to serve the development.
4. The sanitary sewage flow rate will be adequately handled by the proposed sanitary sewer service connection.
5. The sanitary flow contributing to the existing municipal sanitary sewer is expected to have an acceptable impact.
6. Permanent on-site quality control measures are not expected to be required.
7. An erosion and sediment control plan has been developed to be implemented during construction.
8. The stormwater management criteria for quantity control are to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 5-year storm event using a runoff coefficient of 0.50; and a10 minute time of concentration. To achieve the quantity control stormwater will be stored within the development on the roof of the proposed building and in a cistern.
9. The restricted flowrate produced by a one in five year storm event will be adequately handled by the proposed storm sewer connection.
10. The restricted stormwater flow contributing to the existing municipal storm sewer is expected to have a negligible impact.

13-Oct-17
REVISED 25-Oct-17

# 83 Hinton Avenue North
# 30-Unit Seven Storey Apartment Building
# Ottawa, Ontario

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

Fire Protection Water Supply

$F = 220\ C\ A^{0.5}$

F = the required fire flow in litres per minute

C = coefficient related to the type of construction
- = 1.5 for Wood Frame Construction
- = 1.0 for Ordinary Construction (masonary wall, combustible floor and interior)
- = 0.8 for Non-combustible Construction (unprotected structural components)
- = 0.6 for Fire-Resistive Construction (3 hour protected structural components, floor and roof)

= 0.8

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

| | | | | |
|---|---|---|---|---|
| 1st Floor Area: | 289 | sq.m. | 3110 | sq.ft. |
| 2nd Floor Area: | 290 | sq.m. | 3120 | sq.ft. |
| 3rd Floor Area: | 320 | sq.m. | 3443 | sq.ft. |
| 4th Floor Area: | 306 | sq.m. | 3296 | sq.ft. |
| 5th Floor Area: | 308 | sq.m. | 3314 | sq.ft. |
| 6th Floor Area: | 253 | sq.m. | 2721 | sq.ft. |
| 7th Floor Area: | 253 | sq.m. | 2721 | sq.ft. |
| | 2018 | sq.m. | 21725 | sq.ft. |

F = 7,907 L/min
= 8,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Change for Limited-combustible Occupancy

= 6,800 L/min

-50% Reduction to above for Supervised Sprinkler Protection with Alarm

= 3,400 L/min

Added to above Contents Fire Hazard for Separation Exposed Buildings

| | | |
|---|---|---|
| 25% | North Side | < 3m |
| 15% | East Side | 10.1 to 20m |
| 25% | South Side | < 3m |
| 15% | West Side | 10.1 to 20m |

75% Total Increase for Exposure (maximum 75%)

= 5,950 L/min

F = 6,000 L/min (rounded off to the nearest 1,000 L/min)

= 100.0 l/s

Elevation at Fire Hydrant: 63.33 m ASL

| | | | Static Pressure at Fire Hydrant | | |
|---|---|---|---|---|---|
| 100 l/s FIRE FLOW: | 104.8 | m ASL | 59 | psi | 407 kPa |

13-Oct-17

REVISED 14-Mar-18

# 83 Hinton Avenue North
# 30-Unit Seven Storey Apartment Building
# Ottawa, Ontario

## Water Demand

| | Number of Units | Persons Per Unit | Population |
|---|---|---|---|
| UNIT TYPE: | | | |
| Single Family: | 0 | 3.4 | 0 |
| Semi- detached: | 0 | 2.7 | 0 |
| Duplex: | 0 | 2.3 | 0 |
| Townhouse: | 0 | 2.7 | 0 |
| APARTMENTS: | | | |
| 1 Bedroom: | 30 | 1.4 | 42 |
| 2 Bedroom: | 0 | 2.1 | 0 |
| 3 Bedroom: | 0 | 3.1 | 0 |
| Average Aptarment: | 0 | 1.8 | 0 |
| | | TOTAL: | 42 |

DAILY AVERAGE

| | | | | | | |
|---|---|---|---|---|---|---|
| APARTMENTS: | 350 | litres / person / day | | | | |
| | 10.2 | l/min | 0.2 | l/s | 2.7 | USgpm |
| COMMERCIAL SPACES: | 92 | sq.m. | | | | |
| | 75 | litres / person / 8 hour day | | | | |
| | 6 | persons (based one person per 15 sq.m.) | | | | |
| | 1.0 | l / min | 0.0 | l/s | 0.3 | USgpm |
| TOTAL DAILY AVERAGE: | 11.2 | l / min | 0.2 | l/s | 3.0 | USgpm |
| | 16,080 | l /day | | | | |
| | 46 | equivalent persons (350 l / day) | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| MAXIMUM DAILY DEMAND | 8.9 | (Peaking Factor for a population of 46: Table 3-3 MOE Design Guidelines for Drinking-Water Systems) | | | | |
| | 99.3 | l/min | 1.7 | l/s | 26 | USgpm |
| MAXIMUM HOURLY DEMAND | 13.4 | (Peaking Factor for a population of 46: Table 3-3 MOE Design Guidelines for Drinking-Water Systems) | | | | |
| | 149.4 | l/min | 2.5 | l/s | 39 | USgpm |

| | | | Static Pressure at Water Meter | | | |
|---|---|---|---|---|---|---|
| Elevation of Water Meter: | 61.27 | m ASL | | | | |
| Finish Floor Elevation: | 60.37 | m ASL | | | | |
| MINIMUM HGL: | 108.1 | m ASL | 67 | psi | 459 | kPa |
| MAXIMUM HGL: | 115.6 | m ASL | 77 | psi | 533 | kPa |

Douglas Gray <d.gray@dbgrayengineering.com>

# FW: 83 Hinton Avenue North

1 message

**Buchanan, Richard** <Richard.Buchanan@ottawa.ca> Wed, Oct 25, 2017 at 8:23 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>

Hi Doug

The following are boundary conditions, HGL, for hydraulic analysis at 83 Hinton Ave N (zone 1W) assumed to be connected to the 152 mm on Hinton Ave N (see attached PDF for location).

Minimum HGL = 108.1 m

Maximum HGL = 115.6 m

Max Day + Fire Flow = 104.8 m

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.*

**Richard Buchanan, CET**

Project Manager, Development Approvals

Planning, Infrastructure and Economic Development Department

Planning & Growth Management Branch

City of Ottawa | Ville d'Ottawa

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ottawa.ca/planning / ottawa.ca/urbanisme

**From:** Douglas Gray [mailto:d.gray@dbgrayengineering.com]
**Sent:** Friday, October 13, 2017 9:34 AM
**To:** Buchanan, Richard <Richard.Buchanan@ottawa.ca>
**Cc:** Lucio Renna <l.renna@dbgrayengineering.com>
**Subject:** 83 Hinton Avenue North

Hi Richard

We are working on a proposed 30-Unit 7-Storey apartment building at 83 Hinton Ave North.

Please provide the boundary conditions at this location based on the following: (Calculations are attached.)

Average daily demand: 0.2 l/s.
Maximum daily demand: 1.6 l/s.
Maximum hourly daily demand: 2.3 l/s
Fire Flow demand: 100.0 l/s
Fire Flow + Max Day: 101.6 l/s

Thanks, Doug

D. B. G R A Y E N G I N E E R I N G I N C.

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

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

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**83 Hinton Ave N Oct 2017.pdf**
103K

# Boundary Condition for 83 Hinton Ave N

# D. B. GRAY ENGINEERING INC.

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

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## SANITARY SEWER DESIGN FORM

Average Daily Flows:
- Residential: 350 l / capita / day
- Commercial: 50,000 l / ha / day
- Instituational: 50,000 l / ha / day
- Light Industrial: 35,000 l / ha / day
- Heavy Industrial: 55,000 l / ha / day

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

Infiltration Allowance: 0.28 l / s / ha

PROJECT: 83 HINTON AVE N

Designed By: DBG

14-Mar-18



| LOCATION | | | Section | | | | | | | | Cumulative Residential | | Section Non-Residential | | | Cumulative | | | | SEWER DATA n = 0.013 | | | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Single Family | Semi / Townhouse | Duplex / Triplex | Apartments (average) | Apartments (1 Bed.) | Apartments (2 Bed.) | Apartments (3 Bed.) | Resid-ential Area | | | | | | Area | Sewage Flow | Infil-tration Flow | Total Flow | | | | | | | | |
| 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 | | | | | 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 | | ha | l/s | l/s | l/s | | (mm) | (mm) | (%) | (m) | (l/s) | (m/s) | Q/Qfull | |
| | BLDG | HINTON AVE N | | | | | 30 | | | 0.000 | 42 | 4.0 | 0.048 | 9544 | 4.5 | 0.048 | 0.70 | 0.01 | 0.72 | PVC SDR 35 | 152.4 | 150 | 1.00 | 13.3 | 15.9 | 0.87 | 0.05 | Non-residential (commercial) - 92 sq.m. - 75 l / person / 8 hour day - one person per 15 sq.m. - 1.5 peaking factor x 24 / 8 hours |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | MUNICIPAL COMBINED SEWER IN HINTON AVE N | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | 1066.8 | 1050 | 0.78 | | 2516.0 | 2.81 | | |

# 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 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 | Maximum Release Rate | Maximum Volume Stored |
| | l/s | l/s | cu.m. |
| AREA I (Uncontrolled flow off site) | - | 2.05 | - |
| AREA II (Roof - Drains to AREA III) | - | 3.23 | 6.25 |
| AREA III | - | 4.93 | 2.76 |
| TOTAL (AREA I + III) | 6.98 | 6.98 | 9.01 |

| FIVE YEAR EVENT | | | |
|---|---|---|---|
| Drainage Area | Maximum Allowable Release Rate | Maximum Release Rate | Maximum Volume Stored |
| | l/s | l/s | cu.m. |
| AREA I (Uncontrolled flow off site) | - | 1.07 | - |
| AREA II (Roof - Drains to AREA III) | - | 2.41 | 2.59 |
| AREA III | - | 3.41 | 1.32 |
| TOTAL (AREA I + III) | 6.98 | 4.47 | 3.91 |

# 83 Hinton Avenue North
# Ottawa, Ontario

# STORM WATER MANAGEMENT CALCULATIONS
## Rational Method

# ONE HUNDRED YEAR EVENT
## Maximum Allowable Release Rate

| | | | |
|---|---|---|---|
| Roof Area: | 115 | sq.m. | 0.90 |
| Asphalt/Concrete Area: | 337 | sq.m. | 0.90 |
| Landscaped Areas: | 30 | sq.m. | 0.20 |
| Gravel Areas: | 0 | sq.m. | 0.70 |
| Total Catchment Area | 482 | sq.m. | 0.86 |

| | | |
|---|---|---|
| Area (A): | 482 | sq.m. |
| Time of Concentration: | 10.0 | min. (see below - use not less than 10 min.) |
| Rainfall Intensity (i): | 104 | mm/hr (5 year event) |
| Runoff Coeficient (C): | 0.50 | |
| Maximum Allowable Release Rate (2.78AiC): | 6.98 | l/s |

Time of Concentration: Sheet Flow

Airport Formula

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

| | | |
|---|---|---|
| Runoff Coefficient (C): | 0.86 | see above |
| Sheet Flow Distance (L): | 18 | m |
| Slope of Land (Sw): | 1.8 | % |
| Time of Concentration (Sheet Flow): | 2.8 | min |

# DRAINAGE AREA I (Uncontrolled Flow Off Site):

(ONE HUNDRED YEAR EVENT)

| | | | C |
|---|---|---|---|
| Roof Area: | 2 | sq.m. | 1.00 |
| Asphalt/Concrete Area: | 36 | sq.m. | 1.00 |
| Landscaped Areas: | 13 | sq.m. | 0.25 |
| Total Catchment Area | 51 | sq.m. | 0.81 |

| | | |
|---|---|---|
| Area (A): | 51 | sq.m. |
| Time of Concentration: | 10 | min. |
| Rainfall Intensity (i): | 179 | mm/hr (100 year event) |
| Runoff Coeficient (C): | 0.81 | |
| Flow Rate (2.78AiC): | 2.05 | l/s |

# DRAINAGE AREA II (7th Floor Roof):

(ONE HUNDRED YEAR EVENT)

| | | | C |
|---|---|---|---|
| Roof Area: | 253 | sq.m. | 1.00 |
| Paved Area: | 0 | sq.m. | 1.00 |
| Landscaped Areas: | 0 | sq.m. | 0.25 |
| Total Catchment Area | 253 | Ave. C | 1.00 |

No. of Roof Drains: 2
Slots per Wier: 1 0.0124 l/s/mm/slot (5 USgpm/in/slot)

Depth at Roof Drain: 130 mm Pond Area: 144 sq.m.

Maximum Release Rate 3.23 l/s Achieved Vol: 6.25 cu.m.

Max. Vol. Required: 6.25 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 | 17.07 | 3.23 | 13.84 | 4.15 |
| 10 | 179 | 12.56 | 3.23 | 9.33 | 5.60 |
| 15 | 143 | 10.05 | 3.23 | 6.82 | 6.14 |
| 20 | 120 | 8.44 | 3.23 | 5.21 | 6.25 |
| 25 | 104 | 7.30 | 3.23 | 4.08 | 6.12 |
| 30 | 92 | 6.46 | 3.23 | 3.23 | 5.82 |
| 35 | 83 | 5.81 | 3.23 | 2.58 | 5.42 |
| 40 | 75 | 5.29 | 3.23 | 2.06 | 4.94 |
| 45 | 69 | 4.86 | 3.23 | 1.63 | 4.40 |
| 50 | 64 | 4.50 | 3.23 | 1.27 | 3.82 |
| 55 | 60 | 4.19 | 3.23 | 0.97 | 3.19 |
| 60 | 56 | 3.93 | 3.23 | 0.70 | 2.54 |
| 65 | 53 | 3.70 | 3.23 | 0.48 | 1.86 |
| 70 | 50 | 3.50 | 3.23 | 0.28 | 1.16 |
| 75 | 47 | 3.32 | 3.23 | 0.10 | 0.44 |
| 80 | 45 | 3.16 | 3.16 | 0.00 | 0.00 |
| 85 | 43 | 3.02 | 3.02 | 0.00 | 0.00 |
| 90 | 41 | 2.89 | 2.89 | 0.00 | 0.00 |
| 95 | 39 | 2.77 | 2.77 | 0.00 | 0.00 |
| 100 | 38 | 2.67 | 2.67 | 0.00 | 0.00 |
| 105 | 36 | 2.57 | 2.57 | 0.00 | 0.00 |
| 110 | 35 | 2.48 | 2.48 | 0.00 | 0.00 |
| 115 | 34 | 2.39 | 2.39 | 0.00 | 0.00 |
| 120 | 33 | 2.31 | 2.31 | 0.00 | 0.00 |
| 125 | 32 | 2.24 | 2.24 | 0.00 | 0.00 |
| 130 | 31 | 2.17 | 2.17 | 0.00 | 0.00 |
| 135 | 30 | 2.11 | 2.11 | 0.00 | 0.00 |
| 140 | 29 | 2.05 | 2.05 | 0.00 | 0.00 |
| 145 | 28 | 1.99 | 1.99 | 0.00 | 0.00 |
| 150 | 28 | 1.94 | 1.94 | 0.00 | 0.00 |
| 180 | 24 | 1.68 | 1.68 | 0.00 | 0.00 |
| 210 | 21 | 1.49 | 1.49 | 0.00 | 0.00 |
| 240 | 19 | 1.34 | 1.34 | 0.00 | 0.00 |
| 270 | 17 | 1.22 | 1.22 | 0.00 | 0.00 |
| 300 | 16 | 1.12 | 1.12 | 0.00 | 0.00 |

# DRAINAGE AREA III

(ONE HUNDRED YEAR EVENT)

| | | | C |
|---|---|---|---|
| Roof Area: | 68 | sq.m. | 1.00 |
| Asphalt/Concrete Area: | 33 | sq.m. | 1.00 |
| Landscaped Areas: | 77 | sq.m. | 0.25 |
| Total Catchment Area | 178 | sq.m. | 0.68 |

| | | |
|---|---|---|
| Water Elevation: | 61.77 | m |
| ICD Invert: | 61.21 | m |
| (Outlet Pipe of Cistern): Head: | 0.56 | m |
| Orifice Diameter | 100 | mm |
| Orifice Area: | 7854 | sq.mm. |
| Coefficient of Discharge: | 0.190 | |
| Maximum Release Rate: | 4.93 | l/s |

| Area sq.m. | Depth m | | |
|---|---|---|---|
| 4.95 | 0.56 | 2.76 | cu.m. |
| | Achieved Vol: | 2.76 | cu.m. |
| | Max. Vol. Required: | 2.76 | cu.m. |

| Time min. | i mm/hr | 2.78AiC l/s | Flow From Roof l/s | Total Inflow l/s | Release Rate l/s | Stored Rate l/s | Stored Volume cu.m. |
|---|---|---|---|---|---|---|---|
| 5 | 243 | 8.11 | 3.23 | 11.34 | 4.93 | 6.41 | 1.92 |
| 10 | 179 | 5.97 | 3.23 | 9.20 | 4.93 | 4.26 | 2.56 |
| 15 | 143 | 4.78 | 3.23 | 8.00 | 4.93 | 3.07 | 2.76 |
| 20 | 120 | 4.01 | 3.23 | 7.24 | 4.93 | 2.30 | 2.76 |
| 25 | 104 | 3.47 | 3.23 | 6.70 | 4.93 | 1.76 | 2.65 |
| 30 | 92 | 3.07 | 3.23 | 6.30 | 4.93 | 1.36 | 2.46 |
| 35 | 83 | 2.76 | 3.23 | 5.99 | 4.93 | 1.05 | 2.21 |
| 40 | 75 | 2.51 | 3.23 | 5.74 | 4.93 | 0.81 | 1.93 |
| 45 | 69 | 2.31 | 3.23 | 5.53 | 4.93 | 0.60 | 1.62 |
| 50 | 64 | 2.14 | 3.23 | 5.36 | 4.93 | 0.43 | 1.29 |
| 55 | 60 | 1.99 | 3.23 | 5.22 | 4.93 | 0.29 | 0.95 |
| 60 | 56 | 1.87 | 3.23 | 5.10 | 4.93 | 0.16 | 0.58 |
| 65 | 53 | 1.76 | 3.23 | 4.99 | 4.93 | 0.05 | 0.21 |
| 70 | 50 | 1.66 | 3.23 | 4.89 | 4.89 | 0.00 | 0.00 |
| 75 | 47 | 1.58 | 3.23 | 4.81 | 4.81 | 0.00 | 0.00 |
| 80 | 45 | 1.50 | 3.16 | 4.67 | 4.67 | 0.00 | 0.00 |
| 85 | 43 | 1.44 | 3.02 | 4.46 | 4.46 | 0.00 | 0.00 |
| 90 | 41 | 1.37 | 2.89 | 4.27 | 4.27 | 0.00 | 0.00 |
| 95 | 39 | 1.32 | 2.77 | 4.09 | 4.09 | 0.00 | 0.00 |
| 100 | 38 | 1.27 | 2.67 | 3.93 | 3.93 | 0.00 | 0.00 |
| 105 | 36 | 1.22 | 2.57 | 3.79 | 3.79 | 0.00 | 0.00 |
| 110 | 35 | 1.18 | 2.48 | 3.65 | 3.65 | 0.00 | 0.00 |
| 115 | 34 | 1.14 | 2.39 | 3.53 | 3.53 | 0.00 | 0.00 |
| 120 | 33 | 1.10 | 2.31 | 3.41 | 3.41 | 0.00 | 0.00 |
| 125 | 32 | 1.07 | 2.24 | 3.31 | 3.31 | 0.00 | 0.00 |
| 130 | 31 | 1.03 | 2.17 | 3.21 | 3.21 | 0.00 | 0.00 |
| 135 | 30 | 1.00 | 2.11 | 3.11 | 3.11 | 0.00 | 0.00 |
| 140 | 29 | 0.97 | 2.05 | 3.02 | 3.02 | 0.00 | 0.00 |
| 145 | 28 | 0.95 | 1.99 | 2.94 | 2.94 | 0.00 | 0.00 |
| 150 | 28 | 0.92 | 1.94 | 2.86 | 2.86 | 0.00 | 0.00 |
| 180 | 24 | 0.80 | 1.68 | 2.48 | 2.48 | 0.00 | 0.00 |
| 210 | 21 | 0.71 | 1.49 | 2.19 | 2.19 | 0.00 | 0.00 |
| 240 | 19 | 0.64 | 1.34 | 1.97 | 1.97 | 0.00 | 0.00 |
| 270 | 17 | 0.58 | 1.22 | 1.79 | 1.79 | 0.00 | 0.00 |
| 300 | 16 | 0.53 | 1.12 | 1.65 | 1.65 | 0.00 | 0.00 |

# FIVE YEAR EVENT

## Maximum Allowable Release Rate

| | | | |
|---|---|---|---|
| Roof Area: | 115 | sq.m. | 0.90 |
| Asphalt/Concrete Area: | 337 | sq.m. | 0.90 |
| Landscaped Areas: | 30 | sq.m. | 0.20 |
| Gravel Areas: | 0 | sq.m. | 0.70 |
| Total Catchment Area | 482 | sq.m. | 0.86 |

| | | |
|---|---|---|
| Area (A): | 482 | sq.m. |
| Time of Concentration: | 10.0 | min. (see below - use not less than 10 min.) |
| Rainfall Intensity (i): | 104 | mm/hr (5 year event) |
| Runoff Coeficient (C): | 0.50 | |
| Maximum Allowable Release Rate (2.78AiC): | 6.98 | l/s |

Time of Concentration: Sheet Flow

Airport Formula

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

| | | |
|---|---|---|
| Runoff Coefficient (C): | 0.86 | see above |
| Sheet Flow Distance (L): | 18 | m |
| Slope of Land (Sw): | 1.8 | % |
| Time of Concentration (Sheet Flow): | 2.8 | min |

# DRAINAGE AREA I (Uncontrolled Flow Off Site):

(FIVE YEAR EVENT)

| | | | C |
|---|---|---|---|
| Roof Area: | 2 | sq.m. | 0.90 |
| Asphalt/Concrete Area: | 36 | sq.m. | 0.90 |
| Landscaped Areas: | 13 | sq.m. | 0.20 |
| Total Catchment Area | 51 | sq.m. | 0.72 |

| | | |
|---|---|---|
| Area (A): | 51 | sq.m. |
| Time of Concentration: | 10 | min. |
| Rainfall Intensity (i): | 104 | mm/hr (100 year event) |
| Runoff Coeficient (C): | 0.72 | |
| Flow Rate (2.78AiC): | 1.07 | l/s |

# DRAINAGE AREA II (7th Floor Roof):

(FIVE YEAR EVENT)

| | | | C |
|---|---|---|---|
| Roof Area: | 253 | sq.m. | 0.90 |
| Paved Area: | 0 | sq.m. | 0.90 |
| Landscaped Areas: | 0 | sq.m. | 0.20 |
| Total Catchment Area | 253 | Ave. C | 0.90 |

No. of Roof Drains: 2
Slots per Wier: 1 0.0124 l/s/mm/slot (5 USgpm/in/slot)

Depth at Roof Drain: 97 mm Pond Area: 80 sq.m.

Maximum Release Rate 2.41 l/s Achieved Vol: 2.59 cu.m.

Max. Vol. Required: 2.59 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 | 8.94 | 2.41 | 6.53 | 1.96 |
| 10 | 104 | 6.60 | 2.41 | 4.19 | 2.51 |
| 15 | 84 | 5.29 | 2.41 | 2.88 | 2.59 |
| 20 | 70 | 4.45 | 2.41 | 2.04 | 2.45 |
| 25 | 61 | 3.85 | 2.41 | 1.45 | 2.17 |
| 30 | 54 | 3.41 | 2.41 | 1.01 | 1.81 |
| 35 | 49 | 3.07 | 2.41 | 0.66 | 1.40 |
| 40 | 44 | 2.80 | 2.41 | 0.39 | 0.94 |
| 45 | 41 | 2.57 | 2.41 | 0.16 | 0.45 |
| 50 | 38 | 2.38 | 2.38 | 0.00 | 0.00 |
| 55 | 35 | 2.22 | 2.22 | 0.00 | 0.00 |
| 60 | 33 | 2.09 | 2.09 | 0.00 | 0.00 |
| 65 | 31 | 1.97 | 1.97 | 0.00 | 0.00 |
| 70 | 29 | 1.86 | 1.86 | 0.00 | 0.00 |
| 75 | 28 | 1.77 | 1.77 | 0.00 | 0.00 |
| 80 | 27 | 1.68 | 1.68 | 0.00 | 0.00 |
| 85 | 25 | 1.61 | 1.61 | 0.00 | 0.00 |
| 90 | 24 | 1.54 | 1.54 | 0.00 | 0.00 |
| 95 | 23 | 1.48 | 1.48 | 0.00 | 0.00 |
| 100 | 22 | 1.42 | 1.42 | 0.00 | 0.00 |
| 105 | 22 | 1.37 | 1.37 | 0.00 | 0.00 |
| 110 | 21 | 1.32 | 1.32 | 0.00 | 0.00 |
| 115 | 20 | 1.27 | 1.27 | 0.00 | 0.00 |
| 120 | 19 | 1.23 | 1.23 | 0.00 | 0.00 |
| 125 | 19 | 1.19 | 1.19 | 0.00 | 0.00 |
| 130 | 18 | 1.16 | 1.16 | 0.00 | 0.00 |
| 135 | 18 | 1.12 | 1.12 | 0.00 | 0.00 |
| 140 | 17 | 1.09 | 1.09 | 0.00 | 0.00 |
| 145 | 17 | 1.06 | 1.06 | 0.00 | 0.00 |
| 150 | 16 | 1.04 | 1.04 | 0.00 | 0.00 |
| 180 | 14 | 0.90 | 0.90 | 0.00 | 0.00 |
| 210 | 13 | 0.79 | 0.79 | 0.00 | 0.00 |
| 240 | 11 | 0.71 | 0.71 | 0.00 | 0.00 |
| 270 | 10 | 0.65 | 0.65 | 0.00 | 0.00 |
| 300 | 9 | 0.60 | 0.60 | 0.00 | 0.00 |

# DRAINAGE AREA III

(FIVE YEAR EVENT)

| | | | C |
|---|---|---|---|
| Roof Area: | 68 | sq.m. | 0.90 |
| Asphalt/Concrete Area: | 33 | sq.m. | 0.90 |
| Landscaped Areas: | 77 | sq.m. | 0.20 |
| Total Catchment Area | 178 | sq.m. | 0.60 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Water Elevation: | 61.48 | m | | | | |
| ICD Invert: | 61.21 | m | | | | |
| (Outlet Pipe of Cistern): | | | | | | |
| Head: | 0.27 | m | | | | |
| Orifice Diameter | 100 | mm | | | | |
| | | | Area | Depth | | |
| Orifice Area: | 7854 | sq.mm. | sq.m. | m | | |
| | | | 4.95 | 0.27 | 1.32 | cu.m. |
| Coefficient of Discharge: | 0.190 | | | | | |
| Maximum Release Rate: | 3.41 | l/s | | Achieved Vol: | 1.32 | cu.m. |
| | | | | Max. Vol. Required: | 1.32 | cu.m. |

| Time | i | 2.78AiC | Flow From Roof | Total Inflow | Release Rate | Stored Rate | Stored Volume |
|---|---|---|---|---|---|---|---|
| min. | mm/hr | l/s | l/s | l/s | l/s | l/s | cu.m. |
| 5 | 141 | 4.17 | 2.41 | 6.58 | 3.41 | 3.17 | 0.95 |
| 10 | 104 | 3.08 | 2.41 | 5.49 | 3.41 | 2.08 | 1.25 |
| 15 | 84 | 2.47 | 2.41 | 4.88 | 3.41 | 1.47 | 1.32 |
| 20 | 70 | 2.08 | 2.41 | 4.48 | 3.41 | 1.07 | 1.29 |
| 25 | 61 | 1.80 | 2.41 | 4.21 | 3.41 | 0.80 | 1.20 |
| 30 | 54 | 1.59 | 2.41 | 4.00 | 3.41 | 0.59 | 1.06 |
| 35 | 49 | 1.43 | 2.41 | 3.84 | 3.41 | 0.43 | 0.91 |
| 40 | 44 | 1.31 | 2.41 | 3.71 | 3.41 | 0.30 | 0.73 |
| 45 | 41 | 1.20 | 2.41 | 3.61 | 3.41 | 0.20 | 0.54 |
| 50 | 38 | 1.11 | 2.38 | 3.50 | 3.41 | 0.09 | 0.26 |
| 55 | 35 | 1.04 | 2.22 | 3.26 | 3.26 | 0.00 | 0.00 |
| 60 | 33 | 0.97 | 2.09 | 3.06 | 3.06 | 0.00 | 0.00 |
| 65 | 31 | 0.92 | 1.97 | 2.88 | 2.88 | 0.00 | 0.00 |
| 70 | 29 | 0.87 | 1.86 | 2.73 | 2.73 | 0.00 | 0.00 |
| 75 | 28 | 0.82 | 1.77 | 2.59 | 2.59 | 0.00 | 0.00 |
| 80 | 27 | 0.78 | 1.68 | 2.47 | 2.47 | 0.00 | 0.00 |
| 85 | 25 | 0.75 | 1.61 | 2.36 | 2.36 | 0.00 | 0.00 |
| 90 | 24 | 0.72 | 1.54 | 2.26 | 2.26 | 0.00 | 0.00 |
| 95 | 23 | 0.69 | 1.48 | 2.16 | 2.16 | 0.00 | 0.00 |
| 100 | 22 | 0.66 | 1.42 | 2.08 | 2.08 | 0.00 | 0.00 |
| 105 | 22 | 0.64 | 1.37 | 2.00 | 2.00 | 0.00 | 0.00 |
| 110 | 21 | 0.62 | 1.32 | 1.93 | 1.93 | 0.00 | 0.00 |
| 115 | 20 | 0.59 | 1.27 | 1.87 | 1.87 | 0.00 | 0.00 |
| 120 | 19 | 0.58 | 1.23 | 1.81 | 1.81 | 0.00 | 0.00 |
| 125 | 19 | 0.56 | 1.19 | 1.75 | 1.75 | 0.00 | 0.00 |
| 130 | 18 | 0.54 | 1.16 | 1.70 | 1.70 | 0.00 | 0.00 |
| 135 | 18 | 0.52 | 1.12 | 1.65 | 1.65 | 0.00 | 0.00 |
| 140 | 17 | 0.51 | 1.09 | 1.60 | 1.60 | 0.00 | 0.00 |
| 145 | 17 | 0.50 | 1.06 | 1.56 | 1.56 | 0.00 | 0.00 |
| 150 | 16 | 0.48 | 1.04 | 1.52 | 1.52 | 0.00 | 0.00 |
| 180 | 14 | 0.42 | 0.90 | 1.32 | 1.32 | 0.00 | 0.00 |
| 210 | 13 | 0.37 | 0.79 | 1.17 | 1.17 | 0.00 | 0.00 |
| 240 | 11 | 0.33 | 0.71 | 1.05 | 1.05 | 0.00 | 0.00 |
| 270 | 10 | 0.30 | 0.65 | 0.95 | 0.95 | 0.00 | 0.00 |
| 300 | 9 | 0.28 | 0.60 | 0.88 | 0.88 | 0.00 | 0.00 |

# D.B. GRAY ENGINEERING INC.

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

700 Long Point Circle
Ottawa, Ontario K1T 4E9

613-425-8044
dbgray@rogers.com

STORM SEWER COMPUTATION FORM

RATIONAL METHOD Q = 2.78 A I R FIVE YEAR EVENT

n = 0.013

PROJECT: 83 Hinton Ave N

Designed By: DBG

Date: 20-Mar-18



| LOCATION | | | AREA (ha) Hard Surface | Gravel | Grass / Landscape | Roof | Individual 2.78 A R | Accum. 2.78 A R | Time of Conc. (min) | Rainfall Intensity I (mm/hr) | Peak Flow Q (l/s) | SEWER DATA | | | | | | | | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| STREET | FROM | TO | R = 0.90 | R = 0.70 | R = 0.20 | R = 0.90 | | | | | | Type of Pipe | Dia. Actual (mm) | Dia. Nom. (mm) | Slope (%) | Length (m) | Capacity (l/s) | Velocity (m/s) | Time of Flow (min) | Ratio Q/Qfull | |
| | CB-2 | CISTERN | 0.0033 | | 0.0077 | 0.0068 | 0.030 | 0.030 | 10 | 104 | 3.1 | PVC SDR 35 | 254 | 250 | 2 | 0.9 | 88 | 1.73 | 0.01 | 0.04 | |
| | ROOF | CISTERN | | | | 0.0253 | 0.063 | 0.063 | 10.00 | 104.2 | 6.6 | PVC SDR 28 | 152.4 | 150 | 1.00 | 0.7 | 15.9 | 0.87 | 0.01 | 0.42 | |
| | CISTERN | BUILDING | | | | | 0.000 | 0.093 | 10.01 | 104.1 | 9.7 | PVC SDR 35 | 254.0 | 250 | 0.57 | 1.7 | 46.8 | 0.92 | 0.03 | 0.21 | |
| | BUILDING | EXISTING 600 ST | | | | | 0.000 | 0.093 | 10.04 | 104.0 | 9.7 | PVC SDR 35 | 254.0 | 250 | 1.00 | 15.8 | 62.0 | 1.22 | 0.22 | 0.16 | |
| | | | | | | | | | | | 3.4 | PVC SDR 35 | 254.0 | 250 | 1.00 | 15.8 | 62.0 | 1.22 | 0.22 | 0.05 | RESTRICTED FLOW THROUGH ICD |
| | CB-1 | EXISTING 600 ST | 0.0010 | | 0.0014 | 0.0033 | 0.012 | 0.012 | 10.00 | 104 | 1.2 | PVC SDR 35 | 203.2 | 200 | 0.58 | 29.6 | 26.1 | 0.80 | 0.61 | 0.05 | |
| | | | | | | | | | | | | 600mm MUNICIPAL STORM SEWER IN HINTON AVENUE NORTH | | | | | | | | | |
| | | | | | | | | | | | | | 609.6 | 600 | 0.30 | | 350.8 | 1.20 | | | |

**City of Ottawa Servicing Study Checklist**

**General Content**

**Executive Summary (for large reports only):** not applicable

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

**Location map and plan showing municipal address, boundary, and layout of proposed development:** see drawings C-1 to C-3

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

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

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

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

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

**Identification of existing and proposed infrastructure available in the immediate area:** see drawings C-1 to C-3

**Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development ( Reference can be made to the Natural Heritage Studies, if available).** see drawings C-1 to C-3

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

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

**Proposed phasing of the development, if applicable:** not applicable

**Reference to geotechnical studies and recommendations concerning servicing: s**ee note 1.5 on drawing C-1

**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 & 5 to 8 of Servicing Brief

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

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

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

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

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

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

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

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

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

**Development Servicing Report: Wastewater**

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

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

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

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

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

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

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

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

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

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

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

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

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

**Development Servicing Report: Stormwater Checklist**

**Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property):** see page 3 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

**Water quality control objective (e/g/ controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects:** see Stormwater Management Report Servicing Brief and Stormwater Management Report

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

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

**Watercourse and hazard lands setbacks:** not applicable

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

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

**Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).** see drawings C-1 to C-3 and Servicing Brief and Stormwater Management Report

**Identification of watercourses within the proposed development and how watercourses will be protected, or , if necessary, altered by the proposed development with applicable approvals.** see drawings C-1 to C-3 and Servicing Brief and Stormwater Management Report

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

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

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

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

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

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

**Descriptions of how the conveyance and storage capacity will be achieved for the development:** see page 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: s**ee notes 2.1 to 2.4 on drawing C-3

**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 5 of Servicing Brief and Stormwater Management Report

**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