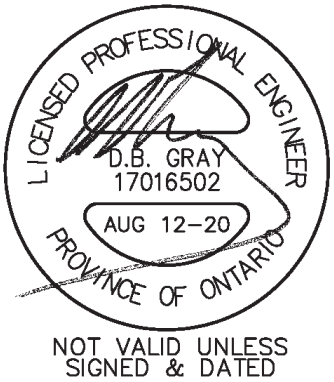
SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

2168 Tenth Line Road
Ottawa, Ontario

Report No. 20019

August 12, 2020



D.B. Gray Engineering Inc.

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

700 Long Point Circle
Ottawa, ON K1T 4E9

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

SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

2168 Tenth Line Road
Ottawa, Ontario

This report describes the services and addresses the stormwater management requirements of a property, 1.61 hectares in area, located at 2168 Tenth Line Road (at the corner of Gerry Lalonde Drive) in Orleans, Ottawa. Four apartment buildings with a total of 251 residential units are proposed. (In this report the proposed apartment buildings are identified with respect to where they are located on the property: e.g. the SE Building is located at the southeast corner of the property, NE Building in the northeast corner, etc.) The SE Building is proposed to be six storeys with 61 residential apartment units and ground floor commercial. The SW Building is proposed to be five storeys with 55 residential apartment units. The NE Building is proposed to be five storeys and 76 apartment units; and the NW Building six storeys and 59 units. Surface and two underground parking areas are proposed. The SE and SW Buildings have a common underground parking area; as do the NE and NW Buildings. There are two proposed vehicle entrances (private approaches) to the property; one from Tenth Line Road and the other from Gerry Lalonde Drive. The property is currently a vacant flat grassy field.

This report forms part of the stormwater management design for the proposed development. Refer to drawing C-1 to C-9 also prepared by D. B. Gray Engineering Inc.

WATER SUPPLY FOR FIREFIGHTING:

There are 400 mm diameter municipal watermains adjacent to the subject property in both Tenth Line Road and Gerry Lalonde Drive.

There are two existing fire hydrants in the municipal road right-of-way in the vicinity of the subject property. One hydrant is located on the west side of Tenth Line Road adjacent to the SE Building, about 51 m unobstructed distance from the nearest SE Building entrance; and 105 m from the nearest NE Building entrance. The other hydrant is located on the south side of Gerry Lalonde Drive opposite the SW Building, about 48 m unobstructed distance to the nearest SW Building entrance. Two private fire hydrants are proposed. One private hydrant (FH-1) will be located adjacent to the Gerry Lalonde entrance about 22 m from the fire department connection (FDC) which serves the SE and SW Buildings; and it will be located about 20 m to 40 m unobstructed distances from the SE and SW Building entrances at the south end of the buildings. The other private hydrant (FH-2) will be located approximately at the center of the property about 27 m from the FDC which serves the NE and NW Buildings; and it will be located about 27 m to 65 m unobstructed distances to the entrances to the NE and NW Buildings; and 27 to 39 m from the SE and SW Building entrances at the north end of the buildings.

The flows required for firefighting were calculated as per the Fire Underwriter Survey "Water Supply For Fire Protection". The fire flows submitted to City to obtain the boundary conditions

included the requirement for 24,000 L/min (400.0 L/s) for the NE Building and 22,000 L/min (366.7 L/s) for the NW Building. However, while the boundary conditions revealed that these flows are available in the municipal watermains the City commented that *"we should not support a required fire flow of 400 l/s"* and it was implied that the required fire flow should not exceed 20,000 L/min (333.3 L/s). With the introduction of 2-hour firewalls the required fire flow for the NE Building is now 19,000 L/min (316.7 L/s) and 15,000 (250.0 L/s) for the NW Building. The fire flows for the SE and SW Buildings are 20,000 L/min (333.3 L/s) and 19,000 L/min (316.7 L/s), respectively. Therefore, the proposed development requires a maximum fire flow of 20,000 L/min (333.3 L/s).

The boundary conditions for the 333.3 L/s fire flow (based on the city's computer model of the municipal water distribution system) were received from the City. They include a fire flow HGL (hydraulic grade line) of 125.1 m in the 400 mm Tenth Line Road watermain and 125.2 m in 400 mm Gerry Lalonde Drive watermain which calculates to be 51.2 psi and 52.0 psi, respectively. Since the pressures are above 138 kPa (20 psi) there is an adequate water supply for firefighting from the existing municipal water distribution system.

A 150 mm / 200 mm private watermain is proposed to serve the two proposed private on-site fire hydrants; connecting to both the Tenth Line Road and Gerry Lalonde Drive watermains. (The Gerry Lalonde Drive connection will be via an existing 200mm water service stub that terminates at a valve and valve box the property line.) A model was created using EPANET software to analyze the hydraulics of the private watermain. Using the provided HGL boundary conditions and a 95 L/s demand at each of the two on-site fire hydrants, the pressure at fire hydrant FH-1 was calculated to be 247 kPa (35.8 psi) and 232 kPa (33.7 psi) at FH-2. Since the pressure is above 138 kPa (20 psi), the private watermain is adequately sized.

As per City of Ottawa Technical Bulletin ISTB-2018-02, the aggregate fire flow of all contributing fire hydrants within 150 m of a building can used to supply the required fire flow. The private on-site hydrants will be a Class AA each contributing 5,700 L/min (95 L/s) (as per Table 1 of ISTB-2018-02). The two existing municipal hydrants in the vicinity are Class AA and can also contribute 5,700 L/min (95 L/s) each. Therefore, the aggregate flow from all four hydrants is 22,800 L/min (380.0 L/s); greater than the required fire flow of 20,000 L/min (333.3 L/s).

WATER SERVICE:

The South Building (SE and SW Buildings with a common underground garage) is proposed to have a sprinkler system. The North Building (NE and NW Buildings with a common underground garage) is also proposed to have a sprinkler system. To service the sprinkler systems, 150 mm water services, connecting to the private watermain, are proposed for each building. The 150mm services will be adequate for the domestic demand. With two water services, two water meters are proposed, one for the South and one for the North Building.

The proposed development will have a total of 251 apartment units (72 one-bedroom, 113 two-bedroom and 66 three-bedroom units. Based on the City of Ottawa Water Distribution Design Guidelines for residential properties (1.4 person per one-bedroom / 2.1 persons per two-bedroom / 3.1 per three-bedroom unit; and 350 L/person/day) and City of Ottawa peaking

factors; the daily average flow is calculated to be 2.2 L/s; with a maximum daily and maximum hourly demands calculated to be 5.5 and 12.1 L/s respectively. Ground floor commercial is proposed for the SE Building. Assuming the commercial component represents 15% of the total land area, and based on the City of Ottawa Design Guidelines, the daily average consumption rate for a commercial development is 28,000 litres per day per hectare. Using a maximum daily peaking factors of 1.5 of the daily average demand; a maximum hourly peaking factor of 1.8 of the maximum daily demand; and assuming an eight hour day, the maximum daily demand is calculated to be 0.2 L/s; the maximum daily demand is 0.3 L/s and maximum hourly demand is 0.6 L/s. Therefore, the total daily average demand for the proposed development is 2.4 L/s, and the total maximum daily and maximum hourly demands are 5.8 and 12.7 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, were required. Based on the boundary conditions received from the City, the minimum HGL (hydraulic grade line) is 126.0 m and the maximum is 130.2 m. With these HGLs the water pressure at the water meters is calculated to vary from 382 kPa to 425 kPa (55 to 62 psi). This is an acceptable range of water pressures for the proposed development.

SANITARY SERVICE:

The South and North Buildings are proposed to each have a 200 mm sanitary sewer service connecting to a proposed private sanitary sewer system.

Based on the City of Ottawa Sewer Design Guidelines for residential properties 1.4 person per one-bedroom / 2.1 persons per two-bedroom / 3.1 per three-bedroom unit – 280 L/person/day; and using Harmon Equation to (a maximum 3.2) peaking factor; and assuming the commercial component represents 15% of the total land area, using City guidelines of 28,000 litres per day per hectare for a commercial development; and based on a 0.33 l/s/ha infiltration flow; the post development flow is calculated to be 2.84 L/s from the North Buildings, 3.44 L/s from the South Building; and total of 6.21 L/s from the development. These flow will be adequately handled by the proposed sanitary sewer service connections (200 mm at 1% slope – 34.22 L/s capacity) since, at the design flow, it will only be about 8% and 10% full in the North and South Buildings, respectively.

The proposed private sanitary sewer system will connect to an existing 200 mm sanitary sewer stub terminating at the property line which connects to a manhole at the far upstream end of a 250 mm municipal sanitary sewer in Gerry Lalonde Drive. The 6.21 L/s flow from the entire development will be adequately handled by the proposed private sanitary sewer with the last segment (200 mm at 0.32% – 19.36 L/s capacity) being 32% full. The 6.21 L/s in sanitary flows contributing to the existing 250 mm municipal sanitary sewer is expected to have an acceptable impact as it represents only 20% of its capacity (250 mm at 0.26% – 31.63 L/s).

STORMWATER MANAGEMENT:

Water Quality:

There has been an exchange of correspondence with the Rideau Valley Conservation Authority (RVCA) with respect to water quality and stormwater management for the site. They have not yet provided their comments but is expected that an enhanced level of protection will be required (80% TSS removal). An oil/grit separator (OGS) manhole is proposed to be located in the lasted segment of the proposed private storm sewer system. Specifically an AquaShield Aqua-Swirl Concentrator model AS-4 was selected to achieve a minimum 80% TSS removal. Based on software supplied by the manufacturer, the Aqua-Swirl AS-4 will remove approximately 81% of TSS from the runoff produced by the development property. Output from the manufacturer's software is attached to the report. The Aqua-Swirl model AS-4 has a sediment capacity of 0.9 cubic metres and an oil/debris capacity of 720 litres.

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-5 and notes 2.1 to 2.7 on drawing C-6). In summary: to filter out construction sediment a silt fence barrier will be installed adjacent around the perimeter of property; sediment capture filter sock inserts will be installed in all existing catch basins adjacent to the site and all new catch basins as they are installed; geotextile fabric mud mats will be install at the point of egress onto public roads; and any material deposited on a public road will be removed.

Water Quantity:

The stormwater management criteria for quantity control are to control the post development peak flows to 85 L/s/ha (as per Mer Bleue Community Design Plan Infrastructure Servicing Study, dated April 2006, prepared by IBI Group). Based on this criterion the maximum allowable release rate is 134.88 L/s for all storm events. Almost the entire site is captured and controlled, with exception of the area where a City walkway is located on about 200 sq.m. of the subject lands. This area, which drains toward the Tenth Line Road, cannot be controlled, and is, therefore, excluded from the calculations. The runoff coefficients for the 100 year event are increased by 25% to maximum 1.00.

Stormwater will be stored within the development in underground, primarily in chambers surrounded by clear stone and wrapped in a waterproof membrane (Soleno Hydrostor Chambers or approved equal).

Drainage Area I (15,868 sq.m.):
An inlet control device (ICD) located at the outlet pipe of manhole MH-22 will control the release of stormwater from the property. The ICD will restrict the flow and force the stormwater to back up into upstream pipes, manholes and catch basins and the underground chambers. To calculate the required storage volume an average release rate is assumed to be equal to 50% of the maximum release rate. Specifically 80 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 plug style with a round orifice design (with the orifice located at the bottom of the plug) manufactured by Pedro Plastics (or approved equal) and shall be sized by the manufacturer for a discharge rate of 134.88 L/s at 2.19 m head. It is

calculated that an orifice area of 33,702 sq.mm. (±207 mm in diameter) and a discharge coefficient of 0.61 will restrict the outflow rate to 134.88 L/s at 2.19 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 98.37 L/s at 1.17 m.

	100-year	5-year
Maximum release rate:	134.88 L/s	98.37 L/s
Maximum allowable release rate:	134.88 L/s	134.88 L/s
Maximum water elevation:	87.95 m	86.92 m
Maximum stored volume:	485.59 cu.m.	222.29 cu.m.

Therefore, the maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable and to achieve this release rate the total maximum required capacity is 485.59 cu.m. For the 5-year event the maximum post-development release is calculated to be 27% less than the maximum allowable.

A private storm sewer system is proposed to connect to an existing 525 mm storm sewer stub terminating at the property line. The stubs connects a 600 mm municipal sanitary sewer in Gerry Lalonde Drive.

The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 258.03 L/s. However, the restricted flow through the ICD is 98.37 L/s which will be adequately by the proposed storm sewer system with the last pipe segment (525 mm at 0.20% - 133.0 L/s capacity) being at 74% of its capacity. The flows contributing to the 600 mm municipal storm sewer is expected to have an acceptable impact given the proposed quantity controls.

CONCLUSIONS:

1. There are two existing fire hydrants in the municipal road right-of-way in the vicinity of the subject property and two private fire hydrants are proposed.

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

3. A 150 mm / 200 mm private watermain is proposed to serve the two proposed private on-site fire hydrants. The pressure at fire hydrant FH-1 is calculated be 247 kPa (35.8 psi) and 232 kPa (33.7 psi) at FH-2. Since the pressure is above 138 kPa (20 psi), the private watermain is adequately sized.

4. The aggregate flow from the four existing and proposed fire hydrants within 75 m of the buildings is 22,800 L/min (380.0 L/s); greater than the required fire flow of 20,000 L/min (333.3 L/s).

5. The water pressure in the municipal watermain is adequate for the proposed development.

6. The design sanitary flows from each building (North and South Buildings) will be adequately handled by the proposed sanitary sewer service connections.

7. The design sanitary flow from the entire development will be adequately handled by the proposed private sanitary sewer.

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

9. The Rideau Valley Conservation Authority (RVCA) have not yet provided their comments with respect to water quality and stormwater management for the site, but is expected that an enhanced level of protection will be required (80% TSS removal). An oil/grit separator (OGS) manhole is proposed; removing 81% of TSS from the runoff produced by the development property.

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

11. The stormwater management criteria for quantity control are to control the post development peak flows to 85 L/s/ha. Based on these criteria the maximum allowable release rate is 134.88 L/s for all storm events.

12. The maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable. For the 5-year event the maximum post-development release is calculated to be 27% less than the maximum allowable.

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

14. The flows contributing to the 600 mm municipal storm sewer is expected to have an acceptable impact given the proposed quantity controls.

D.B. GRAY ENGINEERING INC.

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700 Long Point Circle
Ottawa, Ontario K1T 4E9

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

02-Aug-20

2168 Tenth Line Rd
Proposed 5-Storey Apartment Building (Northeast)

Ottawa, Ontario

Fire Flow Requirements

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	5th Floor	1432	sq.m.
	4th Floor	1432	sq.m.
	3rd Floor	1432	sq.m.
	2nd Floor	1432	sq.m.
	Ground Floor	1453	sq.m.
	TOTAL FIRE AREA:	7181	sq.m.

F = 27,964 L/min
= 28,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Limited-combustible Occupancy

= 23,800 L/min

Average 40% Reduction for Sprinkler System

= 9,520 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
0%	North	>45m				0
0%	East	>45m				0
10%	South	20.1 to 30m	W-F	20	6	120
10%	West	2 hr FIRE WALL				0
20%	Total Increase for Exposure (maximum 75%)					

= 4,760 L/min Increase

= 19,040 L/min
F = 19,000 L/min (rounded off to the nearest 1,000 L/min)
= 316.7 L/s

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02-Aug-20

2168 Tenth Line Rd
Proposed 6-Storey Apartment Building (Northwest - South End)

Ottawa, Ontario

Fire Flow Requirements

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	6th Floor	505	sq.m.
	5th Floor	505	sq.m.
	4th Floor	505	sq.m.
	3rd Floor	505	sq.m.
	2nd Floor	505	sq.m.
	Ground Floor	619	sq.m.
	TOTAL FIRE AREA:	3144	sq.m.

F = 18,504 L/min
= 19,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Limited-combustible Occupancy

= 16,150 L/min

Average 40% Reduction for Sprinkler System

= 6,460 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
10%	North	2 hr FIRE WALL				0
5%	East	30.1 to 45m				0
15%	South	10.1 to 20m	W-F	20	5	100
0%	West	>45m				0
30%	Total Increase for Exposure (maximum 75%)					

= 4,845 L/min Increase

= 14,535 L/min
F = 15,000 L/min (rounded off to the nearest 1,000 L/min)
= 250.0 L/s

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02-Aug-20

2168 Tenth Line Rd
Proposed 6-Storey Apartment Building (Northwest - North End)

Ottawa, Ontario

Fire Flow Requirements

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

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

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

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

Proposed Building	6th Floor	619	sq.m.
	5th Floor	619	sq.m.
	4th Floor	619	sq.m.
	3rd Floor	619	sq.m.
	2nd Floor	619	sq.m.
	Ground Floor	619	sq.m.
	TOTAL FIRE AREA:	3714	sq.m.

F = 20,111 L/min
= 20,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Limited-combustible Occupancy

= 17,000 L/min

Average 40% Reduction for Sprinkler System

= 6,800 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
0%	North	>45m				0
17%	East	3.1 to 10m	W-F	5	5	25
10%	South	2 hr FIRE WALL				0
0%	West	>45m				0
27%	Total Increase for Exposure (maximum 75%)					

= 4,590 L/min Increase

= 14,790 L/min
F = 15,000 L/min (rounded off to the nearest 1,000 L/min)
= 250.0 L/s

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Ottawa, Ontario K1T 4E9

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

10-Jun-20

2168 Tenth Line Rd
Proposed 6-Storey Mixed-Use Apartment Building (Southeast)

Ottawa, Ontario

Fire Flow Requirements

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	6th Floor	1011	sq.m.
	5th Floor	1217	sq.m.
	4th Floor	1217	sq.m.
	3rd Floor	1217	sq.m.
	2nd Floor	1263	sq.m.
	Ground Floor	1364	sq.m.
	TOTAL FIRE AREA:	7289	sq.m.

F = 28,174 L/min
= 28,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Limited-combustible Occupancy

= 23,800 L/min

Average 40% Reduction for Sprinkler System

= 9,520 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
10%	North	20.1 to 30m	W-F	20	5	100
0%	East	>45				0
5%	South	30.1 to 45m	W-F	18	4	72
10%	West	20.1 to 30m	W-F	62	5	310
25%	Total Increase for Exposure (maximum 75%)					

= 5,950 L/min Increase

= 20,230 L/min
F = 20,000 L/min (rounded off to the nearest 1,000 L/min)
= 333.3 L/s

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10-Jun-20

2168 Tenth Line Rd
Proposed 5-Storey Apartment Building (Southwest)

Ottawa, Ontario

Fire Flow Requirements

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	5th Floor	1163	sq.m.
	4th Floor	1163	sq.m.
	3rd Floor	1163	sq.m.
	2nd Floor	1163	sq.m.
	Ground Floor	1280	sq.m.
	TOTAL FIRE AREA:	5932	sq.m.

F = 25,416 L/min
= 25,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Limited-combustible Occupancy

= 21,250 L/min

Average 40% Reduction for Sprinkler System

= 8,500 L/min

Increase for Separation Exposed Buildings

			Adjacent Building			Length-Height
			Constuction	Length m	Storeys	Factor
15%	North	10.1 to 20m	W-F	20	6	120
10%	East	20.1 to 30m	W-F	62	6	372
5%	South	30.1 to 45m	W-F	18	4	72
0%	West	>45m				0
30%	Total Increase for Exposure (maximum 75%)					

= 6,375 L/min Increase

= 19,125 L/min
F = 19,000 L/min (rounded off to the nearest 1,000 L/min)
= 316.7 L/s

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10-Jun-20
REVISED 10-Aug-20

2168 Tenth Line Rd
Four 5/6-Storey Buildings
247 Apartment Units / Ground Floor Commercial
Ottawa, Ontario

Water Demand

	Number of Units	Persons Per Unit	Population
APARTMENTS:			
Bachelor	0	1.4	0
1 Bedroom:	72	1.4	101
2 Bedroom:	113	2.1	237
3 Bedroom:	66	3.1	205
Average Apartment:	0	1.8	0
TOTAL:	251		543

RESIDENTIAL

DAILY AVERAGE:	350	litres / person / day				
	131.9	L/min	2.2	L/s	34.8	USgpm
MAXIMUM DAILY DEMAND:	2.5	(Peaking Factor as per Ottawa Design Guidelines)				
	329.8	L/min	5.5	L/s	87	USgpm
MAXIMUM HOURLY DEMAND:	2.2	(Peaking Factor as per Ottawa Design Guidelines)				
	725.5	L/min	12.1	L/s	192	USgpm

GROUND FLOOR COMMERCIAL

DAILY AVERAGE:	28,000	L /gross ha / day (as per Ottawa Design Guidelines)				
	0.24	ha (15% OF TOTAL land area)				
	6611	L / day				
	8	hour day				
	13.8	L/min	0.2	L/s	3.6	USgpm
MAXIMUM DAILY DEMAND:	1.5	(Peaking Factor as per Ottawa Design Guidelines)				
	20.7	L/min	0.3	L/s	5.5	USgpm
MAXIMUM HOURLY DEMAND:	1.8	(Peaking Factor as per Ottawa Design Guidelines)				
	37.2	L/min	0.6	L/s	9.8	USgpm

TOTAL DAILY AVERAGE:	145.7	L/min	2.4	L/s	38.5	USgpm
TOTAL MAXIMUM DAILY DEMAND:	350.4	L/min	5.8	L/s	92.6	USgpm
TOTAL MAXIMUM HOURLY DEMAND:	762.7	L/min	12.7	L/s	201.5	USgpm

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South Buildings Elevation of Water Meter:	87.00	m ASL				
Finish Floor Elevation:	86.10	m ASL				
			Static Pressure at Water Meter			
MINIMUM HGL:	126.0	m ASL	55	psi	382	kPa
MAXIMUM HGL:	130.2	m ASL	61	psi	424	kPa
North Buildings Elevation of Water Meter:	86.81	m ASL				
Finish Floor Elevation:	85.91	m ASL				
			Static Pressure at Water Meter			
MINIMUM HGL:	126.0	m ASL	56	psi	384	kPa
MAXIMUM HGL:	130.2	m ASL	62	psi	425	kPa

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

Fw: 2168 Tenth Line Rd - Boundary Condition Request response

1 message

Curry, William <William.Curry@ottawa.ca> Wed, Jun 24, 2020 at 11:36 AM
To: Douglas Gray <doug@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>

From
Subject: FW: 2168 Tenth Line Rd - Boundary Condition Request

Hi Will,

See attached, we should not support a required fire flow of 400 l/s. A total of 4 hydrants within 75 m of the subject site will be required to accommodate such a high fire demand. The two 406 mm watermains fronting the site are clearly not limiting the flow.

We have provided a BC for a much lower fire flow. The consultant can interpolate HGL for flows ranging between 10,000 l/min and 24,000 l/min.

From: S
Subject: RE: 2168 Tenth Line Rd - Boundary Condition Request

I can confirm that the results from the 400 l/s fire flow were applied. I also provided the extra flow for 10,000 l/min. Let me know if you have any questions.

From
Subject: RE: 2168 Tenth Line Rd - Boundary Condition Request

Can you confirm that a fire flow of 400 l/s was applied in your model? I would expect to see a higher drop in HGL.
Could you also provide a fire flow of 10,000 l/min? I am going to recommend the use of a lower fire flow.

From: Curry, William <William.Curry@ottawa.ca>
Sent: June 11, 2020 07:21

To:
Subject: Fw: 2168 Tenth Line Rd - Boundary Condition Request

please and thanks

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: Wednesday, June 10, 2020 5:20 PM
To: Curry, William <William.Curry@ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: 2168 Tenth Line Rd - Boundary Condition Request

Hi Will

We are working on a residential project that proposes four 5/6-storey apartment buildings with some ground floor commercial.

Please provide the boundary conditions at Gerry Lalonde Dr (at Tenth Line). A private watermain is proposed; a looped system connecting to both the Gerry Lalonde and Tenth Line Rd watermains.

We have calculated the following expected demands.

Average daily demand: 2.4 L/s.
Maximum daily demand: 5.8 L/s.
Maximum hourly daily demand: 12.6 L/s
Fire Flow demand: 400.0 L/s
Fire Flow + Max Day: 405.8 L/s

We are looking at alternative designs so please also provide the boundary conditions for a fire flow demand of 333.3 l/s.

Average daily demand: 2.4 L/s.
Maximum daily demand: 5.8 L/s.
Maximum hourly daily demand: 12.6 L/s
Fire Flow demand: 333.3 L/s
Fire Flow + Max Day: 339.1 L/s

Calculations are attached.

Thanks, 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

'

'

2168 Tenth Line Rd_Boundary Conditions_24June2020.docx
1250K

Boundary Conditions
2168 Tenth Line Rd

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	144	2.40
Maximum Daily Demand	348	5.80
Peak Hour	756	12.60
Fire Flow Demand #1	10,000	167.00
Fire Flow Demand #2	20,000	333.33
Fire Flow Demand #3	24,000	400.00

Location

Results

Connection 1 – Tenth Line Rd.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.2	58.4
Peak Hour	126.0	52.4
Max Day plus Fire 1	127.2	54.1
Max Day plus Fire 2	125.2	51.2
Max Day plus Fire 3	124.2	49.8

[1] Ground Elevation = 89.1 m

Connection 2 – Gerry Lalonde Dr.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.2	59.3
Peak Hour	126.0	53.4
Max Day plus Fire 1	127.2	55.1
Max Day plus Fire 2	125.1	52.0
Max Day plus Fire 3	124.0	50.5

[1] Ground Elevation = 88.5 m

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. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

2168 Tenth Line Road
Ottawa, Ontario

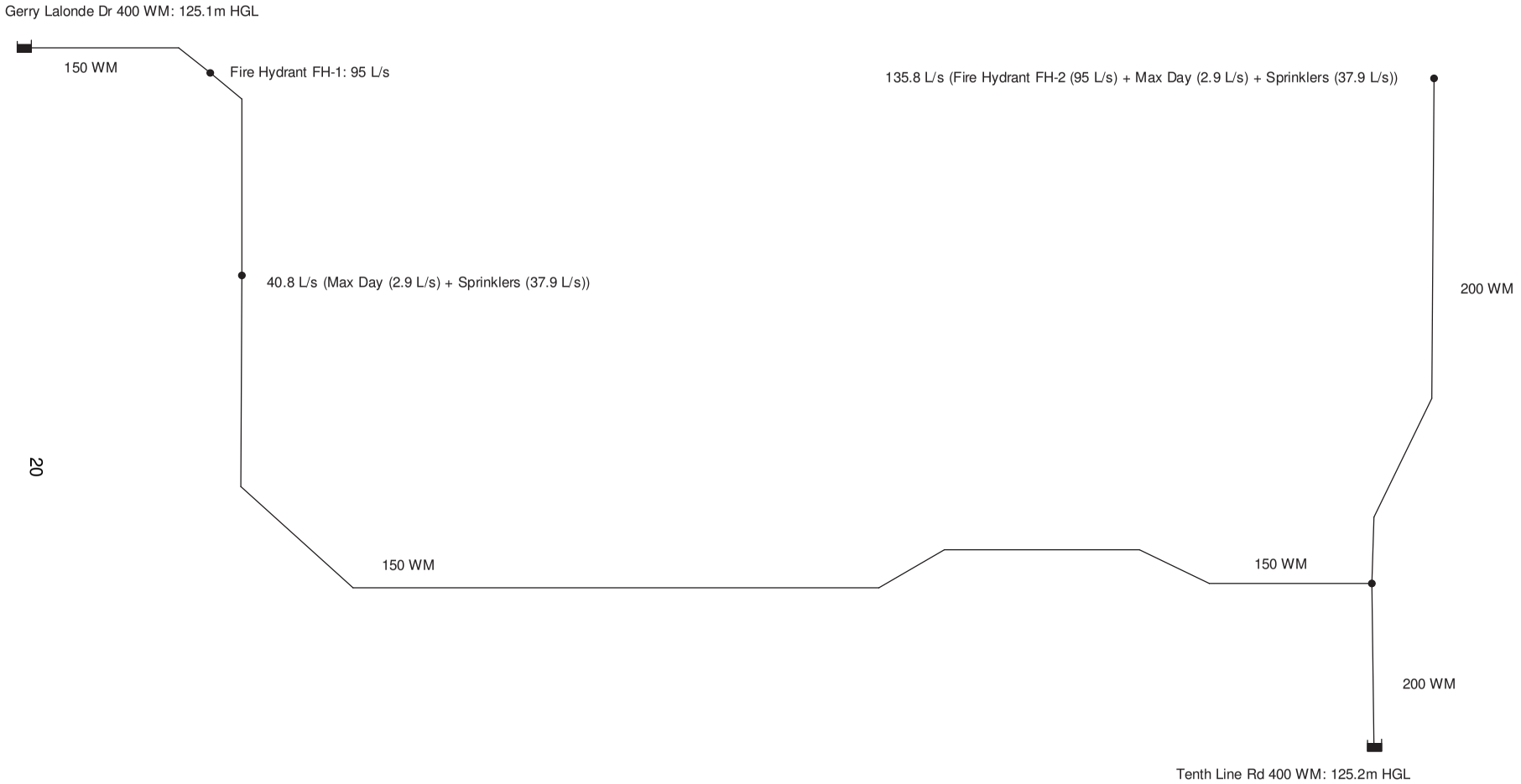
EPANET HYDRAULIC MODELLING RESULTS

* 40.8 L/s: Sprinkler Flow (600 USgpm - 37.9 L/s) + 50% of Max Daily Demand (2.9 L/s)

** 135.8 L/s: Hydrant Flow (95 L/s) + Sprinkler Flow (600 USgpm - 37.9 L/s) + Max Daily Demand (2.9 L/s)

Node ID	Demand	Head	Elevation	Pressure		
	l/s	m	m	m	psi	kPa
1 - Reservoir 1 (400 WM Gerry Lalonde Dr)	-98.8	125.10	88.65	36.45	51.8	357
2 - Fire Hydrant 1	95.0	114.19	89.01	25.18	35.8	247
3 - Domestic Demand*	40.8	114.08	89.12	24.96	35.5	245
4	0.0	118.02	89.00	29.02	41.3	285
5 Fire Hydrant 2 (inc. Sprinklers + Max. Day) **	135.8	112.30	88.59	23.71	33.7	232
6 - Reservoir 1 (400 WM Tenth Line Rd)	-97.0	125.20	88.94	36.26	51.6	355

Link ID	Diameter	Length	Roughness	Loss Coeff.	Flow	Velocity
	mm	m			l/s	m/s
Pipe 1	150	15.5	100	3.00	106.68	4.39
Pipe 2	150	14.7	100	1.30	11.68	0.98
Pipe 3	150	104.6	100	5.00	29.12	1.15
Pipe 4	200	44.6	110	0.80	135.80	3.12
Pipe 5	200	19.5	110	2.90	164.92	3.76


Gerry Lalonde Dr 400 WM: 125.1m HGL
150 WM
Fire Hydrant FH-1: 95 L/s
40.8 L/s (Max Day (2.9 L/s) + Sprinklers (37.9 L/s))
150 WM
135.8 L/s (Fire Hydrant FH-2 (95 L/s) + Max Day (2.9 L/s) + Sprinklers (37.9 L/s))
200 WM
150 WM
200 WM
Tenth Line Rd 400 WM: 125.2m HGL

Network Table - Nodes

Node ID	Elevation m	Base Demand LPS	Demand LPS	Head m	Pressure m
Junc 2	89.01	95.0	95.00	114.19	25.18
Junc 3	89.12	40.8	40.80	114.08	24.96
Junc 4	89.00	0	0.00	118.02	29.02
Junc 5	88.59	135.8	135.80	112.30	23.71
Resvr 1	125.1	#N/A	-106.68	125.10	0.00
Resvr 6	125.2	#N/A	-164.92	125.20	0.00

Network Table - Links

Link ID	Length m	Diameter mm	Roughness	Flow LPS	Velocity m/s
Pipe 1	15.5	150	100	106.68	6.04
Pipe 2	14.7	150	100	11.68	0.66
Pipe 3	104.6	150	100	-29.12	1.65
Pipe 4	44.6	200	110	-135.80	4.32
Pipe 5	19.5	200	110	-164.92	5.25

D. B. GRAY ENGINEERING INC.

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

700 Long Point Circle
Ottawa, Ontario K1T 4E9

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

SANITARY SEWER DESIGN FORM

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

Infiltration Allowance: 0.33 l / s / ha

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

Project: 2168 Tenth Line Rd.
Designed By: D.B.G.
10-Aug-20
Page: 1 of 1

Location		Section								Cumulative Residential		Section Non-Residential			Cumulative					Sewer Data n = 0.013								Comments
		Single Family	Semi/Town house	Duplex / Triplex	Apartment (average)	Apartment (1 Bed.)	Apartment (2 Bed.)	Apartment (3 Bed.)	Residential Area	Pop.	Peaking Factor	Area	Flow	Peaking Factor	Flow	Area	Sewage Flow	Infiltration Flow	Total Flow	Type of Pipe	Dia. Actual	Dia. Nom.	Slope	Length	Capacity	Velocity	Ratio	
		ppu = 3.4	ppu = 2.7	ppu = 2.3	ppu = 1.8	ppu = 1.4	ppu = 2.1	ppu = 3.1																				
FROM	TO	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	ha			ha	l/ha/day		l/s	ha	l/s	l/s	l/s		(mm)	(mm)	(%)	(m)	(l/s)	(m/s)	Q/Qfull	
		EXISTING SINGLE FAMILY DWELLING																										
North BLDG	MH-SA.1					35	52	29	0.803	248.1	3.20					0.803	2.57	0.27	2.84	PVC	203.2	200	1.00	16.5	34.22	1.055	0.08	
MH-SA.1	MH-SA.2								0.000	248.1	3.20					0.803	2.57	0.27	2.84	PVC	203.2	200	0.32	65.5	19.36	0.597	0.15	
MH-SA.2	MH-SA.3								0.000	248.1	3.20					0.803	2.57	0.27	2.84	PVC	203.2	200	0.32	45.8	19.36	0.597	0.15	
South BLDG	MH-SA.3					37	61	37	0.562	294.6	3.20	0.241	28000	1.5	0.12	0.803	3.17	0.27	3.44	PVC	203.2	200	1.00	16.5	34.22	1.055	0.10	
MH-SA.3	EXIST 200 SAN STUB									542.7	3.16				0.12	1.607	5.68	0.53	6.21	PVC	203.2	200	0.32	6.3	19.36	0.597	0.32	
		EXISTING 300 SANITARY SEWER IN GERRY LALONDE DRIVE																										
																			6.21		254.0	250	0.26		31.63	0.62	0.20	

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

Re: RVCA Stormwater Management Comments - 2168 Tenth Line Road

1 message

Ryan Faith <r.faith@dbgrayengineering.com> Wed, Aug 12, 2020 at 8:23 AM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>

Hi Jamie,

If you are referring to the pond south of Hepatica Way, I believe you are correct.

Regards,

Ryan Faith

D.B. Gray Engineering Inc.

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

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

On Tue, Aug 11, 2020 at 5:46 PM Jamie Batchelor <jamie.batchelor@rvca.ca> wrote:

> Hi Ryan,
>
> Thanks for the clarification. I tried to trace the downstream outlet, and it appeared that the outlet is to an existing stormwater management pond, presumable for the plan of subdivision. Can you confirm my assumption is correct?
>
> Jamie Batchelor, MCIP, RPP
>
> Planner, ext. 1191
>
> Jamie.batchelor@rvca.ca
>
> Rideau Valley Conservation Authority
> 3889 Rideau Valley Drive
> PO Box 599, Manotick ON K4M 1A5
> T 613-692-3571 | 1-800-267-3504 F 613-692-0831 | www.rvca.ca
>
>
>
> **From:** Ryan Faith <r.faith@dbgrayengineering.com>
> **Sent:** Tuesday, August 11, 2020 4:01 PM
> **To:** Jamie Batchelor <jamie.batchelor@rvca.ca>
> **Cc:** Douglas Gray <d.gray@dbgrayengineering.com>
> **Subject:** Re: RVCA Stormwater Management Comments - 2168 Tenth Line Road
>
> Hi Jamie,
>
> The storm sewers will be connecting to an existing stub the City provided to the property line off Gerry Lalonde. There is a combination of surface and underground parking proposed. I have attached a site plan for your reference.

Regards,

Ryan Faith

D.B. Gray Engineering Inc.

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

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

On Tue, Aug 11, 2020 at 3:50 PM Jamie Batchelor <jamie.batchelor@rvca.ca> wrote:

> Good Afternoon Ryan,
>
> Would you be connecting to the storm sewers on Tenth Line or Gerry Lalonde Drive? Also, is there any surface parking provided, or would it be below ground?
>
> Jamie Batchelor, MCIP, RPP
>
> Planner, ext. 1191
>
> Jamie.batchelor@rvca.ca
>
> Rideau Valley Conservation Authority
>
> 3889 Rideau Valley Drive
> PO Box 599, Manotick ON K4M 1A5
> T 613-692-3571 | 1-800-267-3504 F 613-692-0831 | www.rvca.ca
>
>
>
> **From:** Ryan Faith <r.faith@dbgrayengineering.com>
> **Sent:** Monday, August 10, 2020 8:26 AM
> **To:** Jamie Batchelor <jamie.batchelor@rvca.ca>
> **Cc:** Douglas Gray <d.gray@dbgrayengineering.com>
> **Subject:** Re: RVCA Stormwater Management Comments - 2168 Tenth Line Road
>
> Hi Jamie,
>
> This is a reminder that we are still waiting on your comments for this one.
>
> Regards,

Ryan Faith

D.B. Gray Engineering Inc.

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

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

On Thu, Jul 9, 2020 at 11:53 AM Ryan Faith <r.faith@dbgrayengineering.com> wrote:

> Hi Jamie,
>
> geoOttawa seems to have trouble with the address. I've attached a snippet of geoOttawa with the subject property.
>
> Regards,

Ryan Faith

D.B. Gray Engineering Inc.

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

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

On Thu, Jul 9, 2020 at 11:46 AM Jamie Batchelor <jamie.batchelor@rvca.ca> wrote:

> Good Morning Ryan,
>
> Would you happen to have a property ma showing the location? When I do a search for the address in our mapping system it directs me to Mer Bleue.

Jamie Batchelor, MCIP, RPP

Planner, ext. 1191

Jamie.batchelor@rvca.ca

Rideau Valley Conservation Authority

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

From: Ryan Faith <r.faith@dbgrayengineering.com>
Sent: Wednesday, July 8, 2020 1:02 PM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>
Subject: RVCA Stormwater Management Comments - 2168 Tenth Line Road

Hi Jamie,

We are working on a proposed development consisting of 4 multi-storey mixed-use buildings on approximately 16 ha of land at 2168 Tenth Line Road in Ottawa.

Please comment on the stormwater management for the site.

I have attached a site plan for your reference.

Thanks,

Ryan Faith

D.B. Gray Engineering Inc.

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

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

AquaShield™ STORMWATER TREATMENT SOLUTIONS

Sizing Report

2733 Kanasita Drive • Suite 111 • Chattanooga, TN 37343 • Phone: (423) 870-8888 • Fax: (423) 826-2112 • www.aquashieldinc.com

Site Information

Project Name: **2168 Tenth Line Rd.**

Site Area (hectacres): **1.5936**

Unit Label: **MH 23 / OGS**

Runoff Coeff. : **.72**

Unit Location: **Ottawa, ON**

Target Removal Efficiency(%): **80% based on NJDEP**

Product Recommendation

Aqua-Swirl™ Model	Net Annual TSS Removal Efficiency	Chamber Diameter	Maximum Inside Diameter (mm)		Oil/Debris Storage Capacity	Sediment Storage Capacity
			Offline	BYP[5]		
AS-4	**80.57 %**	1296 mm.	303 mm.	603 mm.	720 L	0.9 m^3

Rainfall Information

NCDC Station[1]: **OTTAWA MACDONALD-CARTIER INT'L A** Data Range[4]: **261,759 readings taken hourly between 1967 to 2007 (~40 years)**

Rainfall Event Range (mm/hre)	Rainfall Interval Point (mm/hre)	Operating Rate (Lps/m^2)	Total Rainfall (%)	Removal Efficiency (%)[2]	Relative Efficiency(%)
02.00 - 03.00	02.50	05.39	44.18	91.45	40.40
03.00 - 04.00	03.50	07.55	21.52	87.38	18.80
04.00 - 05.00	04.50	09.71	11.68	82.53	09.64
05.00 - 06.00	05.50	11.86	06.68	76.88	05.14
06.00 - 07.00	06.50	14.02	04.03	70.45	02.84
07.00 - 08.00	07.50	16.18	01.99	63.23	01.26
08.00 - 09.00	08.50	18.33	01.84	55.23	01.02
09.00 - 10.00	09.50	20.49	01.81	46.43	00.84
10.00 - 15.00	12.50	26.96	04.12	15.32	00.63
		Total Cumulative Rainfall %:	**97.85[3]**	**Net Annual %:**	**80.57**

Sales Agent Information

Agent Name: **Dave Kanters**

Phone: **416-347-2799**

Company Name: **Soleno**

Fax:

Address: **347, 15-75 Bayly St. W.**

E-mail: **dkanters@soleno.com**

City, State Zip: **Ajax, ON L1S7K7**

Footnotes

1. Recorded as hourly precipitation rainfall data (inches), National Climatic Data Center (NCDC)
2. Based on Tennessee Tech University laboratory testing of the AquaSwirl™ Model AS-3 for OK-110 silica particles 50-125 microns(Neary, 2002)
3. 90% Rainfall Event, calculated as a cumulative percentile of individual events, www.stormwatercenter.net, sizing criteria (Center for Watershed Protection)
4. NCDC data may not be consecutive, skipping days, months and/or years in the range of dates.
5. The Aqua-Swirl™ Internal Bypass (BYP) provides full treatment of the "first flush," while the peak design storm is diverted and channeled through the main conveyance pipe. Please refer to your local representative for more information.
6. When applicable, the performance curve was adjusted via Peclet Scaling to provide estimated sizing per NJDEP PSD (d50 = 67 microns).

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

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 II	-	134.88	485.59	485.59
TOTAL	134.88	134.88	485.59	485.59

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 II	-	98.37	222.29	222.29
TOTAL	134.88	98.37	222.29	222.29

2168 Tenth Line Road

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS

Rational Method

Maximum Allowable Release Rate

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	0	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Pasture Area:	15868	sq.m	0.30
Total Catchment Area:	15868	sq.m	0.30
Area (A):	15868	sq.m	
Criteria:	85	L/s/ha	
100 Year Maximum Allowable Release Rate:	134.88	L/s	

ONE HUNDRED YEAR EVENT

DRAINAGE AREA I

(ONE HUNDRED YEAR EVENT)

			C
Roof Area:	5785	sq.m	1.00
Asphalt/Concrete Area:	6102	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	3981	sq.m	0.25
Total Catchment Area:	15868	sq.m	0.81

Water Elevation:	87.95	m
Invert of Outlet Pipe - MH-22:	85.65	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of MH-22)	85.75	m
Head:	2.19	m
Orifice Diameter:	207	mm
Orifice Area:	33702	sq.mm
Coefficient of Discharge:	0.61	
Maximum Release Rate:	134.88	L/s

REFER TO DETAILED CALCULATIONS ON THE NEXT PAGE

	Volume	
CB/MH Storage	34.49	cu.m
Pipe Storage	53.39	cu.m
Chamber Storage	261.90	cu.m
Clear Stone Storage	135.81	cu.m
Achieved Volume:	485.59	cu.m
Maximum Volume Required:	485.59	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	50% Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	243	869.19	67.44	801.75	240.52
10	179	639.47	67.44	572.03	343.22
15	143	511.74	67.44	444.30	399.87
20	120	429.57	67.44	362.13	434.56
25	104	371.90	67.44	304.46	456.69
30	92	329.00	67.44	261.56	470.81
35	83	295.74	67.44	228.29	479.42
40	75	269.12	67.44	201.67	484.02
45	69	247.29	67.44	179.85	485.59
50	64	229.04	67.44	161.60	484.79
55	60	213.53	67.44	146.09	482.09
60	56	200.17	67.44	132.73	477.84
65	53	188.54	67.44	121.10	472.29
70	50	178.31	67.44	110.87	465.65
75	47	169.23	67.44	101.79	458.07
80	45	161.12	67.44	93.68	449.68
85	43	153.83	67.44	86.39	440.58
90	41	147.23	67.44	79.79	430.86
95	39	141.23	67.44	73.79	420.58
100	38	135.74	67.44	68.30	409.80
105	36	130.71	67.44	63.27	398.57
110	35	126.07	67.44	58.63	386.95
115	34	121.78	67.44	54.34	374.95
120	33	117.81	67.44	50.36	362.62
125	32	114.11	67.44	46.66	349.99
130	31	110.65	67.44	43.21	337.07
135	30	107.43	67.44	39.99	323.89
140	29	104.40	67.44	36.96	310.46
145	28	101.56	67.44	34.12	296.82
150	28	98.88	67.44	31.44	282.96
180	24	85.60	67.44	18.16	196.13
210	21	75.72	67.44	8.28	104.36
240	19	68.06	67.44	0.62	8.98
270	17	61.94	61.94	0.00	0.00
300	16	56.91	56.91	0.00	0.00

DRAINAGE AREA I
(ONE HUNDRED YEAR EVENT)
(CONTINUED)

DETAILED VOLUME CALCULATIONS

CB/MH Storage				Pipe Storage				
CB/MH	Invert	Size	Volume	From	To	Length	Dia.	Volume
CB/MH-1	86.45	1200	1.75	CB/MH-1	CB/MH-2	87.4	300	6.38
CB/MH-2	86.15	1200	2.10	CB/MH-2	CB/MH-3	70.0	300	5.11
CB/MH-3	85.91	1200	2.38	CB/MH-3	CB/MH-14	11.7	375	1.33
CB-4	86.22	600	0.64	CB-4	CB/MH-5	10.8	375	1.23
CB/MH-5	86.01	1200	2.26	CB/MH-5	CB/MH-7	12.5	375	1.43
CB-6	86.24	600	0.64	CB-6	CB/MH-7	15.0	375	1.71
CB/MH-7	85.98	1200	2.30	CB/MH-7	CB/MH-8	6.8	450	1.12
CB/MH-8	85.97	1200	2.31	CB/MH-8	CB/MH-9	30.6	450	5.02
CB/MH-9	85.91	1200	2.38	CB/MH-9	CB/MH-10	7.7	450	1.26
CB/MH-10	85.89	1200	2.40	CB/MH-10	CB/MH-14	2.3	450	0.38
CB-11	86.60	600	0.50	CB-11	CB/MH-14	4.1	250	0.21
CB-12	87.29	600	0.24	CB-12	CB/MH-14	3.9	250	0.20
CB-13	87.25	600	0.26	CB-13	CB/MH-14	3.9	250	0.20
CB/MH-14	85.88	1200	2.41	CB/MH-14	MH-19	80.5	450	13.22
CB-15	87.21	600	0.27	CB-15	MH-19	3.9	250	0.20
CB-16	86.85	600	0.41	CB-16	MH-19	0.9	250	0.05
CB-17	86.76	600	0.44	CB-17	MH-19	1.5	250	0.08
CB-18	87.16	600	0.29	CB-18	MH-19	4.3	250	0.22
MH-19	85.72	1200	2.60	MH-19	MH-22	36.1	450	5.93
CB/MH-20	85.75	1200	2.56	CB/MH-20	CB/MH-21	38.2	450	6.27
CB/MH-21	85.67	1200	2.66	CB/MH-21	MH-22	11.4	450	1.87
MH-22	85.65	1200	2.68					

FIVE YEAR EVENT

DRAINAGE AREA I

(FIVE YEAR EVENT)

			C
Roof Area:	5785	sq.m	0.90
Asphalt/Concrete Area:	6102	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	3981	sq.m	0.20
Total Catchment Area:	15868	sq.m	0.72

Water Elevation:	86.92	m
Invert of Outlet Pipe - MH-22:	85.65	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of MH-22)	85.75	m
Head:	1.17	m
Orifice Diameter:	207	mm
Orifice Area:	33702	sq.mm
Coefficient of Discharge:	0.61	
Maximum Release Rate:	98.37	L/s

REFER TO DETAILED CALCULATIONS ON THE NEXT PAGE

	Volume	
CB/MH Storage	15.92	cu.m
Pipe Storage	52.52	cu.m
Chamber Storage	139.97	cu.m
Clear Stone Storage	13.88	cu.m
Achieved Volume:	222.29	cu.m
Maximum Volume Required:	222.29	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	50% Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
5	141	451.13	49.18	401.95	120.58
10	104	332.95	49.18	283.76	170.26
15	84	267.00	49.18	217.82	196.04
20	70	224.49	49.18	175.30	210.36
25	61	194.59	49.18	145.41	218.11
30	54	172.32	49.18	123.14	221.65
35	49	155.04	49.18	105.85	222.29
40	44	141.19	49.18	92.01	220.82
45	41	129.83	49.18	80.64	217.74
50	38	120.32	49.18	71.14	213.41
55	35	112.24	49.18	63.05	208.07
60	33	105.27	49.18	56.09	201.91
65	31	99.20	49.18	50.02	195.06
70	29	93.86	49.18	44.67	187.63
75	28	89.12	49.18	39.93	179.70
80	27	84.88	49.18	35.70	171.34
85	25	81.06	49.18	31.88	162.60
90	24	77.61	49.18	28.43	153.52
95	23	74.47	49.18	25.29	144.15
100	22	71.60	49.18	22.42	134.51
105	22	68.97	49.18	19.78	124.63
110	21	66.54	49.18	17.35	114.54
115	20	64.29	49.18	15.11	104.25
120	19	62.21	49.18	13.03	93.78
125	19	60.27	49.18	11.09	83.15
130	18	58.46	49.18	9.28	72.36
135	18	56.77	49.18	7.58	61.44
140	17	55.18	49.18	6.00	50.38
145	17	53.69	49.18	4.51	39.20
150	16	52.28	49.18	3.10	27.92
180	14	45.31	45.31	0.00	0.00
210	13	40.12	40.12	0.00	0.00
240	11	36.09	36.09	0.00	0.00
270	10	32.86	32.86	0.00	0.00
300	9	30.22	30.22	0.00	0.00

DRAINAGE AREA I
(FIVE YEAR EVENT)
(CONTINUED)

DETAILED VOLUME CALCULATIONS

CB/MH Storage				Pipe Storage				
CB/MH	Invert	Size	Volume	From	To	Length	Dia.	Volume
CB/MH-1	86.45	1200	0.55	CB/MH-1	CB/MH-2	87.4	300	6.38
CB/MH-2	86.15	1200	0.90	CB/MH-2	CB/MH-3	70.0	300	5.11
CB/MH-3	85.91	1200	1.18	CB/MH-3	CB/MH-14	11.7	375	1.33
CB-4	86.22	600	0.26	CB-4	CB/MH-5	10.8	375	1.23
CB/MH-5	86.01	1200	1.06	CB/MH-5	CB/MH-7	12.5	375	1.43
CB-6	86.24	600	0.25	CB-6	CB/MH-7	15.0	375	1.71
CB/MH-7	85.98	1200	1.10	CB/MH-7	CB/MH-8	6.8	450	1.12
CB/MH-8	85.97	1200	1.11	CB/MH-8	CB/MH-9	30.6	450	5.02
CB/MH-9	85.91	1200	1.18	CB/MH-9	CB/MH-10	7.7	450	1.26
CB/MH-10	85.89	1200	1.20	CB/MH-10	CB/MH-14	2.3	450	0.38
CB-11	86.60	600	0.12	CB-11	CB/MH-14	4.1	250	0.21
CB-12	87.29	600	0.00	CB-12	CB/MH-14	3.9	250	0.00
CB-13	87.25	600	0.00	CB-13	CB/MH-14	3.9	250	0.00
CB/MH-14	85.88	1200	1.21	CB/MH-14	MH-19	80.5	450	13.22
CB-15	87.21	600	0.00	CB-15	MH-19	3.9	250	0.00
CB-16	86.85	600	0.03	CB-16	MH-19	0.9	250	0.02
CB-17	86.76	600	0.06	CB-17	MH-19	1.5	250	0.04
CB-18	87.16	600	0.00	CB-18	MH-19	4.3	250	0.00
MH-19	85.72	1200	1.40	MH-19	MH-22	36.1	450	5.93
CB/MH-20	85.75	1200	1.37	CB/MH-20	CB/MH-21	38.2	450	6.27
CB/MH-21	85.67	1200	1.46	CB/MH-21	MH-22	11.4	450	1.87
MH-22	85.65	1200	1.48					

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-9

Plan showing the site and location of all existing services: see drawings C-1 to C-9

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

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

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

Statement of objectives and servicing criteria: see page 1 of Servicing Brief and Stormwater Management Report

Identification of existing and proposed infrastructure available in the immediate area: see drawings C-1 to C-9

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-9

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 & 3 of Servicing Brief

Confirmation of adequate domestic supply and pressure: see page 2 & 3 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 & 8 to13 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 4 of Servicing Brief

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

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

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

Descriptions of existing sanitary sewer available for discharge of wastewater from proposed development: see page 4 of Servicing Brief

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

Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix C) format. see page 15 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-9 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-9 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 drawing C-5 & notes 2.1 to 2.7 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 16 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 6 of Servicing Brief

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

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