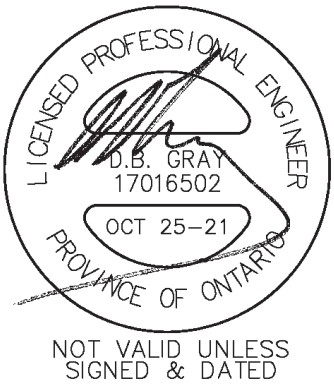
SERVICING BRIEF &
STORMWATER MANAGEMENT REPORT

Ellwood House Extension
2262 Braeside Avenue
& Site Improvements
2262-2270 Braeside Avenue & 2345 Alta Vista Drive
Ottawa, Ontario

Report No. 21028

October 25, 2021



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SIGNED & DATED

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

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Ellwood House Extension
2262 Braeside Avenue
& Site Improvements
2262-2270 Braeside Avenue & 2345 Alta Vista Drive
Ottawa, Ontario

The subject site, located in the Alta Vista area of Ottawa, is 1.27 hectares in area and is comprised of three properties: 2345 Alta Vista Drive and 2262 and 2270 Braeside Avenue. 2345 Alta Vista Drive is 8,496 sq.m. in area and is occupied by St. Thomas the Apostle Anglican Church and Braeside House (a residence for adults with developmental disabilities). Ellwood House (a seniors apartment building) is located on a 3,000 sq.m. property at 2270 Braeside Avenue; and 2262 Braeside Avenue (1,233 sq.m.) currently has a single detached dwelling (a rectory) that will be demolished.

An extension of an Ellwood House is proposed. The extension will be a 38-unit, three-storey (four-level including basement apartments) building. This report describes the services of 2262 Braeside Avenue. This report also describes the modifications to existing services (that are required to accommodate the proposed building) and addresses the stormwater management requirements of the entire site.

This report forms part of the stormwater management design for the proposed development. Refer to drawings C-1 to C-7 also prepared by D. B. Gray Engineering Inc.

WATER SUPPLY FOR FIREFIGHTING:

There is an existing municipal fire hydrant in the Braeside Avenue municipal road right-of-way located across the street from the proposed building approximately 28 m unobstructed distance from the east entrance to the proposed building and about 60 m unobstructed distance from the north entrance. There is also an existing private on-site fire hydrant located adjacent to the northwest corner of the proposed building approximately 23 m unobstructed distance to the north entrance and about 68 m unobstructed distance to the north entrance. Since the existing fire hydrants are less than the maximum 90 m permitted, an additional on-site fire hydrant is not required. There is one other existing municipal fire hydrant in the vicinity. It is located in the Randall Avenue road right-of-way, just west of the intersection with Braeside Avenue, about 146 m unobstructed distance to the proposed building. The Braeside Avenue municipal hydrant is a Class A hydrant (colour coded green). The Randall Avenue municipal hydrant is a Class AA (colour coded blue).

As per Technical Bulletin ISTB-2021-03, on private property, where pipe size is not affected, the flow required for firefighting is to be calculated as per the Ontario Building Code (OBC). A fire demand of 3,600 L/min (60 L/s) at 138 kPa is required as per "Required Minimum Water

Supply Flow Rate" as calculated using the Ontario Building Code - Appendix A - Article A-3.2.5.7 "Water Supply For Fire Fighting".

The boundary conditions (based on the city's computer model of the municipal water distribution system) for a 60 L/s fire flow were requested from the City. However, the boundary conditions revealed that available flow at 20 psi (138 kPa) is only 50 L/s. The Class A Braeside Avenue fire hydrant connects to a 150 mm watermain but the Class AA Randall Avenue hydrant connects to a 610 mm watermain so it is expected that if the City performed a Multi-Hydrant analysis assuming the two municipal hydrants running simultaneously; it is expected that at least 60 L/s would be available at 20 psi and, therefore, there would be an adequate water supply for firefighting.

As per City of Ottawa Technical Bulletin ISTB-2018-02, the aggregate fire flow of all contributing fire hydrants within 150 m of the building can used to supply the required fire flow. The Class A Braeside Avenue fire hydrant is within 75 m and can contribute 3,800 L/min (63 L/s) as per Table 1 of ISTB-2018-02 but as per the boundary conditions only 3,000 L/s (50 L/s) is available. The Class AA Randall Avenue hydrant, being between 75 and 150 m, can contribute 3,800 L/min (63 L/s) (as per Table 1 of ISTB-2018-02). Therefore, the aggregate flow from both hydrants is 6,800 L/min (113 L/s), which is greater than the required fire flow of 60 L/s.

The proposed building conflicts with the private watermain serving the on-site hydrant and will be decommissioned. A new watermain is proposed. The existing fire hydrant will remain approximately at its current location and will connect to the new watermain. The existing 150 mm watermain and fire hydrant lead is about 47 m in length from the City watermain to the fire hydrant. The proposed watermain will be about 50 m. Since the City water pressure is low, and to compensate for the longer length, about 40 m of the new watermian will be 200 mm in diameter.

WATER SERVICE:

Thirty-eight one-bedroom apartment units are proposed. Based on Technical Bulletin ISTB-2018-02 and the City of Ottawa Water Distribution Design Guidelines (Table 4.1 & Table 4.2: one-bedroom apartment units / 1.4 person per unit; two-bedroom apartment units / 2.1 persons per unit; and 280 L/person/day) and Ministry of the Environment Design Guidelines for peaking factors (Table 3-3) the daily average flow is 0.2 L/s with a maximum daily and maximum hourly demand of 1.5 and 2.2 L/s respectively.

To determine water pressure under these demands, boundary conditions, based on the City of Ottawa computer simulation of the water distribution system, at the subject location, are required. Based on the boundary conditions received from the City, the minimum HGL (hydraulic grade line) is 123.8 m and the maximum is 132.3 m. With these HGLs the water pressure at the water meter is calculated to vary from 235 kPa to 318 kPa (34 to 46 psi). As per City of Ottawa Design Guidelines: *"In accordance with MOE Guidelines, the distribution system shall be sized so that under maximum hourly demand conditions the pressures are not less than 276 kPa (40 psi)."* Since the water pressure under the maximum hourly demand

is 235 kPa (34 psi), the existing City water distribution adjacent to the subject location does not meet this guideline; a booster pump will likely be required for the domestic water supply.

Based on the AWWA water flow demand curve, and a water pressure at the meter of 276 kPa (40 psi), the peak demand for the building is expected to be 2.7 L/s (164 L/min / 43 USgpm). The AWWA method calculates the instantaneous demand and is used to size the water service. This peak demand will produce an acceptable velocity of 1.4 m/s in the proposed 50 mm water service connection (up to 2.4 m/s is acceptable). The water service will connect to the 150 mm municipal watermain in Braeside Avenue.

The existing 150 mm water service for Braeside House currently connects to the existing private 150 mm watermain that will be decommissioned. This existing service will connect to the new private watermain. This will have a positive impact on water pressure and flow at Braeside House since much of the new private watermain has increased in size from 150mm to 200 mm in diameter.

The proposed building conflicts with the water service for the church (which connects directly to the 150 mm City watermain in Braeside Avenue). The size of the existing service is 25 mm where it enters the building but part of the service may be up to 50 mm in diameter. About 52 m of the existing water service will be decommissioned. A new 50 mm water service is proposed. It will be 30.5 m in length and will connect to the new private water main. This will have a positive impact on water pressure and flow at the church since the new water service is about 21 m shorter and may be larger.

SANITARY SERVICE:

Based on the City of Ottawa Sewer Design Guidelines for a residential property (Technical Bulletin ISTB-2018-01, Figure 4.3: 38 one-bedroom apartment units / 1.4 person per unit; 280 l/person/day; and a 3.2 peaking factor); and based on a 0.33 L/s/ha infiltration flow; the post development flow is calculated to be 0.59 L/s. (The existing dwelling has a design flow of 0.08 L/s.) This flow will be adequately handled by the proposed sanitary sewer service connections (150 mm at 1% - 15.89 L/s capacity) since, at the design flow, it will only be about 3% full.

The proposed 150 mm sanitary service connections will connect to the 225 mm municipal combined sewer in Braeside Avenue which, with about a 1.30% slope, has a capacity of 51.20 L/s. The 0.51 L/s increase in sanitary flows contributing to the existing 225 mm combined sewer is expected to have an acceptable impact.

The proposed building conflicts with the existing 150 mm sanitary sewer service for Braeside House (which connects directly to the 225 mm City sanitary sewer in Braeside Avenue). A new 200 mm private sanitary sewer is proposed. This existing service will connect to the new private sanitary sewer (and part of the service will be decommissioned).

The proposed building also conflicts with the sanitary sewer service for the church (which also connects directly to the 225 mm City sanitary sewer in Braeside Avenue). This existing

service will connect to the new private sanitary sewer (and part of the service will be decommissioned).

STORMWATER MANAGEMENT:

Water Quality:

The Rideau Valley Conservation Authority (RVCA) has advised that; *"Based on the downstream stormwater outlet to a watercourse being just around 2 km, water quality treatment of 'enhanced' (80% TSS removal) would be the appropriate water quality target."*

To meet the water quality target of 80% TSS removal an oil/grit separator (OGS) manhole (manhole MH-5) is proposed to be located downstream of the inlet control device (ICD). Specifically, a Contech Engineered Solutions CDS Model 2015-4 has been selected to achieve a minimum 80% TSS removal. Based on software supplied by the manufacturer, the CDS Model 2015-4 will remove approximately 87% of TSS from the runoff produced by the drainage area. Output from the manufacturer's software is attached to this report. The CDS Model 2015-4 has a sediment capacity of 0.7 cubic metres and an oil/debris capacity of 232 litres.

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-3 and notes 2.1 to 2.6 on drawing C-4). In summary: to filter out construction sediment; a silt fence barrier will be installed; sediment capture filter sock inserts will be installed in all new catch basins as they are installed; and any material deposited on a public road will be removed at the end of each day.

Water Quantity:

In addition to the proposed building there are many small changes to the site that result in a total of 1,671 sq.m. of soft surfaces changing to hard; and a total of 637 sq.m. of hard surface changing to soft. The net result is a 1,034 sq.m (= 1,671 - 637 sq.m.) increase in hard surfaces. The stormwater management criteria for quantity control are to control the peak flows from the 1,034 sq.m increase in hard surfaces for the 5-year and 100-year storm events to peak flows during the 2-year storm event using a runoff coefficient of 0.5; and a 10 minute time of concentration. Therefore, based on the Rational Method, the maximum allowable release rate is 11.04 L/s. The Modified Rational Method is used to calculate the required storage volume. The runoff coefficients for the 100 year event are increased by 25% to maximum 1.00. Stormwater will be stored on the paved surfaced above catch basins.

Drainage Area I (1,815 sq.m.):
Assuming that 354 sq.m. (of 1,034 sq.m.) increase in hard surface is controlled in Drainage Area I, 7.25 cu.m. of storage is required; 14.05 cu.m. is provided. An inlet control device (ICD) located at the outlet pipe of catch basin / manhole CB/MH-4 will control the release of stormwater from this drainage area. The ICD will restrict the flow and force the stormwater to back up into upstream pipes and onto the paved surfaces above CB/MH-4. The ICD shall be a Hydrovex "VHV Vertical Vortex Flow Regulator" (or approved equal) and shall be sized by the manufacturer for a discharge rate of 6.00 L/s at 1.84 m head (6.00 L/s is the minimum

flow rate permitted by the City for a vortex style ICD). It is calculated that an orifice area of 4,418 sq.mm. (75 mm in diameter) and a discharge coefficient of 0.226 will restrict the outflow rate to 6.00 L/s at 1.84 m. The maximum available storage is exceeded for both the 5-year and 100-year events and the excess water will flow overland towards the Braeside Avenue (as it currently does).

	100-year	5-year
Maximum release rate:	6.00 L/s	6.00 L/s
Maximum overland flow:	58.44 L/s	16.67 L/s
Maximum water elevation:	102.27 m	102.27 m
Maximum stored volume:	14.05 cu.m.	14.05 cu.m.

Drainage Area II (1,815 sq.m.):
Assuming that 680 sq.m. (the balance of 1,034 sq.m.) increase in hard surface is controlled in Drainage Area II, 20.46 cu.m. of storage is required; 21.02 cu.m. is provided. An inlet control device (ICD) located at the outlet pipe of catch basin / manhole CB/MH-3 will control the release of stormwater from this drainage area. The ICD will restrict the flow and force the stormwater to back up into upstream pipes and onto the paved surfaces above catch basin CB-1, CB/MH-2 and CB/MH-3. The ICD shall be a Hydrovex "VHV Vertical Vortex Flow Regulator" (or approved equal) and shall be sized by the manufacturer for a discharge rate of 6.00 L/s at 2.30 m head (6.00 L/s is the minimum flow rate permitted by the City for a vortex style ICD). It is calculated that an orifice area of 4,418 sq.mm. (75 mm in diameter) and a discharge coefficient of 0.202 will restrict the outflow rate to 6.00 L/s at 2.30 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 5.97 L/s at 2.98 m. The maximum available storage is exceeded for the 100-year events and the excess water will flow overland towards the Alta Vista Drive and Braeside Avenue.

	100-year	5-year
Maximum release rate:	6.00 L/s	5.97 L/s
Maximum overland flow:	6.37 L/s	0.00 L/s
Maximum water elevation:	102.55 m	102.53 m
Maximum stored volume:	21.02 cu.m.	11.70 cu.m.

The Net Increase in Hard Surfaces:

	100-year	5-year
Maximum allowable release rate:	11.04 L/s	11.04 L/s
Maximum release rate:	12.00 L/s	11.98 L/s

Therefore, given the minimum allowable release rate of 6.00 L/s, it is not possible meet the 11.04 L/s maximum allowable release rate; however, the release rate is less than 10% greater.

A proposed storm sewer system will connect to existing 375 mm storm sewer in Alta Vista Drive. The unrestricted flowrate resulting from two-year storm event will produce a peak flow of 48.80 L/s which will be adequately handled by the proposed storm sewer systems with the last segment being at 83% of its capacity.

The proposed building conflicts with an existing storm sewer system which serves Braeside House, the church and east part of the site. It connects directly to the 375 mm City storm sewer in Braeside Avenue. A new 300 mm private storm sewer system is proposed. The

unrestricted flowrate resulting from two-year storm event will produce a peak flow of 67.80 L/s. The system will be slightly undersized with the last segment being at 102% of its capacity.

The stormwater flows contributing to the 375 mm municipal storm sewer in Braeside Avenue is expected to have a positive impact given that ICD in CB/MH-4 will reduce the flows.

Ministry of Environment, Conservation and Parks (MECP) Environmental Compliance Approval (ECA):

The proposed storm and sanitary sewers cross multiple properties; therefore, an ECA is expected to be required for the proposed sewers and stormwater management facility.

CONCLUSIONS:

1. There is an existing private on-site fire hydrant; an additional on-site fire hydrant is not required.

2. The flow required for firefighting is 60 L/s but the available flow from the 150 mm Braeside Avenue watermain is only 50 L/s. The Braeside Avenue fire hydrant is a Class A but a Randall Avenue hydrant is a Class AA and connects to a 610 mm watermain. It is expected that if the City performed a Multi-Hydrant analysis assuming the two municipal hydrants running simultaneously; it is expected that at least 60 L/s would be available; and, therefore, there would be an adequate water supply for firefighting

3. The aggregate flow from two contributing fire hydrants within 150 m of the proposed building is greater than the required fire flow.

4. The water pressure is calculated to vary from 235 kPa to 318 kPa (34 to 46 psi); and since the water pressure under the maximum hourly demand is less than 40 psi, the existing City water distribution adjacent to the subject location does not meet this guideline; a booster pump will likely be required for the domestic water supply.

5. The peak water demand will produce an acceptable velocity of 1.4 m/s in the proposed 50 mm water service connection (up to 2.4 m/s is acceptable).

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

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

8. To meet the water quality target of 80% TSS removal an oil/grit separator (OGS) manhole (manhole MH-5) is proposed.

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

10. In addition to the proposed building there are many small changes to the site that result in a net 1,034 sq.m increase in hard surfaces. The stormwater management criteria for quantity control are to control the peak flows from the 1,034 sq.m increase in hard surfaces for the 5-year and 100-year storm events to peak flows during the 2-year storm event resulting in a maximum allowable release rate is 11.04 L/s. Two ICDs are used to control the release rate, therefore, given the minimum release rate of 6.00 L/s (for a totoal of 12.00 L/s), it is not possible meet the 11.04 L/s maximum allowable release rate; however, it is less than 10% greater.

11. The unrestricted flowrate resulting from two-year storm event will be adequately by the proposed storm sewer system connecting to the Alta Vista Drive storm sewer.

12. The proposed storm sewer system connecting to the Braeside Avenue City storm sewer will be slightly undersized with the last segment being at 102% of its capacity.

13. The stormwater flows contributing to the 375 mm municipal storm sewer in Braeside Avenue is expected to have a positive impact given that the flow is bring restricted.

14. A MECP ECA is expected to be required

D.B. Gray Engineering Inc.

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Ottawa, Ontario K1T 4E9

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

14-Oct-21

Ellwood House Extension
38-Unit 3-Storey Apartment Building
2262 Braeside Avenue
Ottawa, Ontario

Water Supply for Fire-Fighting Calculations:

As per "Required Minimum Water Supply Flow Rate" as calculated using the Ontario Building Code - Appendix A - Article A-3.2.5.7 "Water Supply For Fire Fighting".

Fire Protection Water Supply $Q = KVS_{Tot}$

$S_{Tot} = 1.0 + S_{Side1} + S_{Side2} + S_{Side3} + S_{Side1} + S_{Side4}$

Spatial Coefficient		Exposure Distance m	
S_{Side1}	0.33	6.8	(to north property line)
S_{Side2}	0.00	17.5	(to east to center line of road)
S_{Side3}	0.00	10.0	(south - 2 hour firewall)
S_{Side4}	0.00	14.5	(to south property line)
S_{Tot}	1.33	Need not exceed 2	

K (Water Supply Coefficient)

18 As per A-3.2.5.7. Table 1 (Group C Occupancy / Combustible construction with fire separations and fire resistance ratings as per OBC 3.2.2.)

V (Building Volume)

	Area sq.m.	Average Height m	Volume cu.m.
Third Floor	630.5	2.64	1665
Second Floor	630.5	2.64	1665
Ground Floor	630.5	2.64	1665
			4994 cu.m.

$Q = KVS_{Tot}$

$Q =$ 119,096 L

Required Minimum Water Supply Flow Rate 3,600 L/min 60 L/sec
(As per A-3.2.5.7. Table 2)

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14-Oct-21

Ellwood House Extension
38-Unit 3-Storey Apartment Building
2262 Braeside Avenue
Ottawa, Ontario

Water Demand

	Number of Units	Persons Per Unit	Population
APARTMENTS:			
Bachelor	0	1.4	0
1 Bedroom:	38	1.4	53
2 Bedroom:	0	2.1	0
3 Bedroom:	0	3.1	0
Average Apartment:	0	1.8	0
TOTAL:	38		53

APARTMENTS:

DAILY AVERAGE: 280 litres / person / day

10.3 L/min | 0.2 L/s | 2.7 USgpm

MAXIMUM DAILY DEMAND: 8.6 (Peaking Factor for a equivalent population of 53: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)

89.1 L/min | 1.5 L/s | 24 USgpm

MAXIMUM HOURLY DEMAND: 13.0 (Peaking Factor for a equivalent population of 53: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)

134.1 L/min | 2.2 L/s | 35 USgpm

Elevation of Water Meter: 99.86 m ASL

Finish Floor Elevation: 98.96 m ASL

			Static Pressure at Water Meter			
MINIMUM HGL:	123.8	m ASL	34	psi	235	kPa
MAXIMUM HGL:	132.3	m ASL	46	psi	318	kPa

D.B. Gray Engineering Inc.

Ryan Faith <r.faith@dbgrayengineering.com>

RE: Boundary Condition Request - 2262 Braeside Ave

1 message

Sharif, Golam <sharif.sharif@ottawa.ca> Wed, Oct 20, 2021 at 11:51 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Ryan Faith <r.faith@dbgrayengineering.com>

Hi Doug,

Here is the requested boundary condition:

The following are boundary conditions, HGL, for hydraulic analysis at 2262 Braeside Avenue (zone 2W2C) assumed to be connected to the 152 mm on Braeside Avenue (see attached PDF for location).

Minimum HGL: 123.8 m

Maximum HGL: 132.3 m

Available flow at 20 psi: 50 L/s, assuming a ground elevation of 99.8 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.

Regards,

Sharif

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: October 14, 2021 5:35 PM
To: Sharif, Golam <sharif.sharif@ottawa.ca>
Cc: Ryan Faith <r.faith@dbgrayengineering.com>
Subject: Boundary Condition Request - 2262 Braeside Ave

Hi Sharif

Please provide the boundary conditions at 2262 Braeside Ave. We have calculated the following expected demands for a 3-Storey 38-unit apartment building.

Average daily demand: 0.2 L/s.

Maximum daily demand: 1.5 L/s.

Maximum hourly daily demand: 2.2 L/s

Fire Flow demand: 250.0 L/s (based on FUS method)

Fire Flow + Max Day: 2501.5 L/s

Fire Flow demand: 60 L/s (based on OBC method)

Fire Flow + Max Day: 61.5 L/s

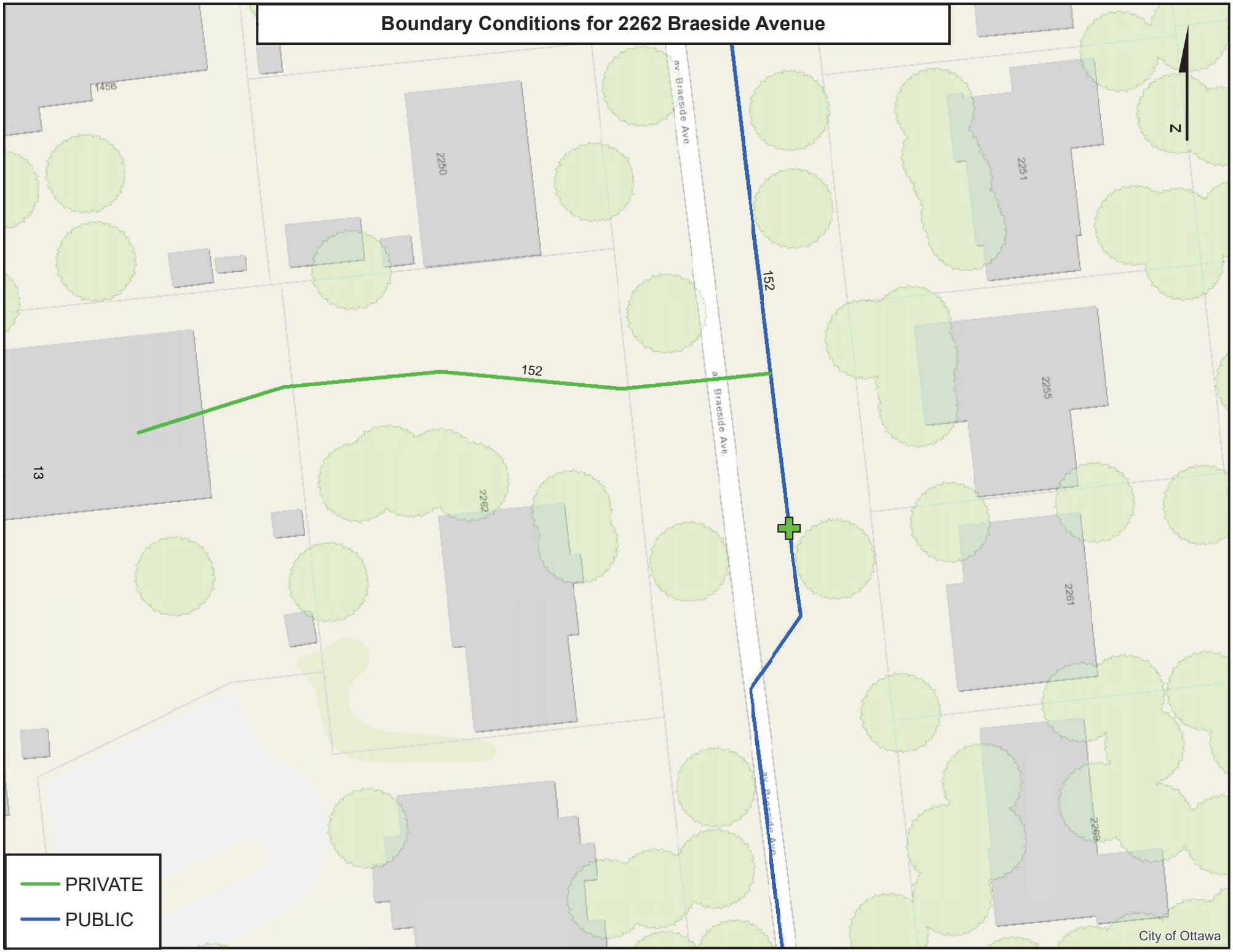
Calculations are attached.

Thanks, Doug

'

'

2262 Braeside Avenue October 2021.pdf
991K


Boundary Conditions for 2262 Braeside Avenue
1458
2250
av. Braeside Ave.
152
2251
N
152
2255
13
2262
a Braeside Ave.
2261
av. Braeside Ave.
2269
PRIVATE
PUBLIC
City of Ottawa

October 19, 2021
REVISED October 20, 2021

Ellwood House Extension
38-Unit 3-Storey Apartment Building
2262 Braeside Avenue
Ottawa, Ontario

PEAK WATER DEMAND

WATER FIXTURE VALUE
(Table 4-2 AWWA Manual M22)

	No.	F.V.	Total
Bathtub	0	8	0
Toilet - Tank	38	6	228
Toilet - Flush Valve	0	24	0
Lavatory	38	1.5	57.0
Bidet	0	2	0
Urinal - Wall Flush Valve	0	10	0
Shower	38	2.5	95.0
Kitchen Sink	38	1.8	68.4
Dishwasher	38	1.3	49.4
Clothes Washer	4	3	12
Commercial Sink	0	4	0
Janitor Sink	2	4	8
Commercial Dishwasher	0	4	0
Commercial Clothes Washer	0	4	0
Hose 1/2 in	0	5	0
Hose 3/4 in	0	12	0
			517.8

Peak Demand (Figure 4-2 or 4-3 AWWA M22)			48	USgpm		
Pressure @ Meter	276	kPa	40	psi		
Pressure Factor (Table 4-1 AWWA M22)			0.80			
Peak Demand			38	USgpm		
Irrigation - Hose 1/2 in	1		5	USgpm (includes pressure factor)		
TOTAL PEAK DEMAND	164	L/min	43	USgpm	2.7	L/s
	Nominal Size		2.0	in	50	mm
			4.6	ft/s	1.4	m/s

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SANITARY SEWER DESIGN FORM

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

Infiltration Allowance: 0.33 l / s / ha

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

n = 0.013

Project: 2262 Braeside Avenue
Designed By: D.B.G
October 19, 2021
Page: 1 of 1

Location		Section								Cumulative Residential		Section Non-Residential			Cumulative					Sewer Data								Comments
		Single Family ppu = 3.4	Semi / Townhouse ppu = 2.7	Duplex / Triplex ppu = 2.3	Apartment (average) ppu = 1.8	Apartment (1 Bed) ppu = 1.4	Apartment (2 Bed) ppu = 2.1	Apartment (3 Bed) ppu = 3.1	Area			Area	Flow	Peaking	Flow	Area	Sewage Flow	Infiltration Flow	Total Flow		Actual Diameter	Nominal Diameter	Slope	Length	Capacity	Velocity	Ratio	
From	To	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	(ha)	Pop.	Peaking Factor	(ha)	(L/ha/day)	Factor	(L/s)	(ha)	(L/s)	(L/s)	(L/s)	Material	(mm)	(mm)	(%)	(m)	(L/s)	(m/s)	Q/Qfull	
		Existing Dwelling																										
Existing	Existing	1							0.1233	3.4	3.20					0.1233	0.04	0.04	0.08									
Dwelling	225 SAN																											
		Proposed Apartment Building																										
Proposed	Existing					38			0.1233	53.2	3.20					0.1233	0.55	0.04	0.59	PVC	152.4	150	2.00	18.0	22.47	1.23	0.03	
Building	225 SAN																											
																					Existing 225 SAN in Braeside Avenue							
																					225.0	225	1.30		51.20	1.29		

D.B. Gray Engineering Inc.

Ryan Faith <r.faith@dbgrayengineering.com>

RE: RVCA Stormwater Management Comments - 2270 Braeside Avenue

1 message

Jamie Batchelor <jamie.batchelor@rvca.ca> Mon, Oct 18, 2021 at 2:56 PM
To: Ryan Faith <r.faith@dbgrayengineering.com>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>

Good Afternoon Ryan,

Based on the downstream stormwater outlet to a watercourse being just around 2 km, water quality treatment of 'enhanced' (80% TSS removal) would be the appropriate water quality target.

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: Thursday, October 14, 2021 10:30 AM
To: Jamie Batchelor <jamie.batchelor@rvca.ca>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>
Subject: RVCA Stormwater Management Comments - 2270 Braeside Avenue

Hi Jamie,

We are working on a proposed 3 storey addition to the existing Ellwood House at 2270 Braeside Avenue in Ottawa. Some of the existing parking lots are being reconfigured and new parking is proposed.

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

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD BASED ON A FINE PARTICLE SIZE DISTRIBUTION

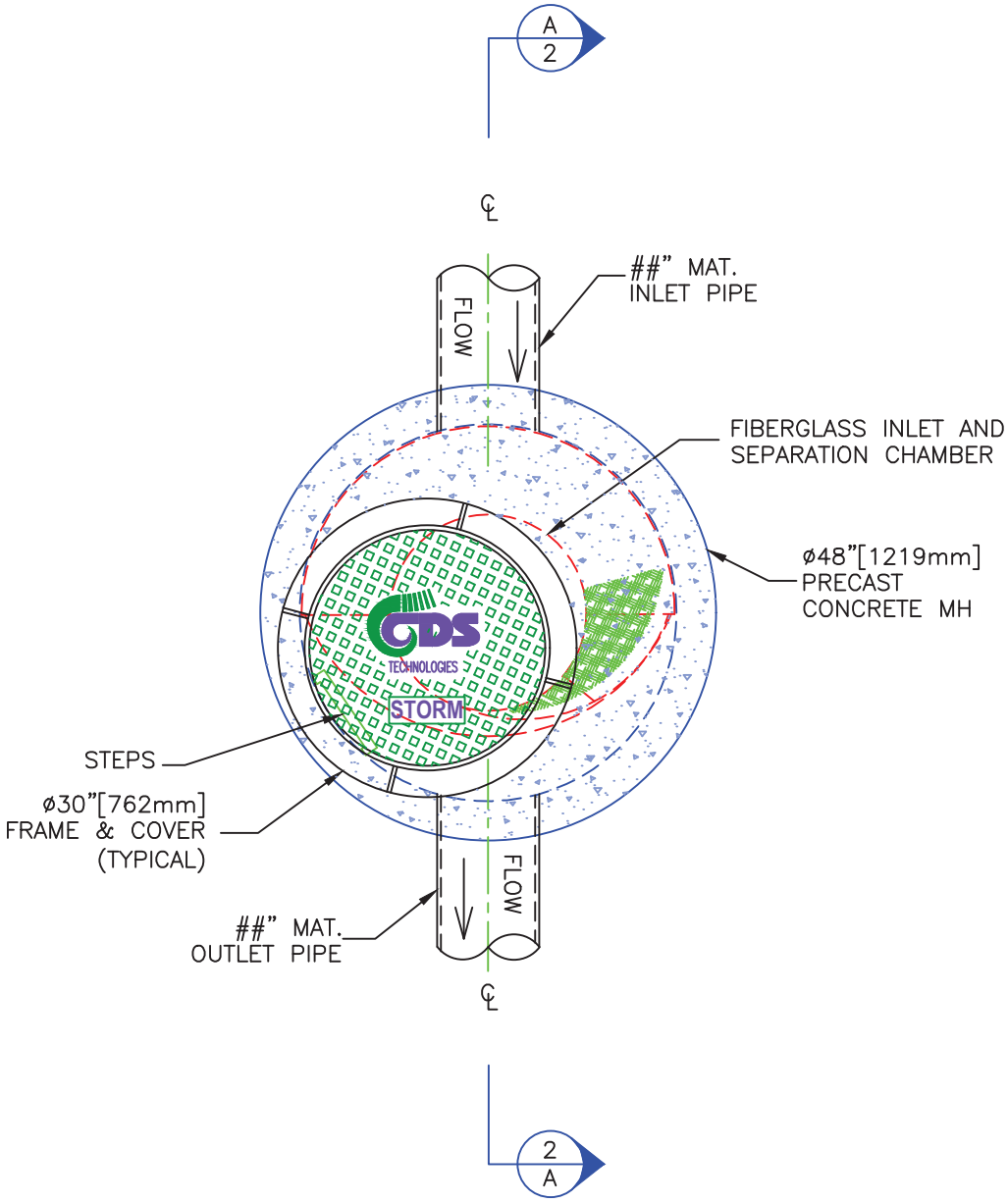
Project Name:	2270 Braeside Avenue	**Engineer:**	**D.B. Gray Engineering**
Location:	Ottawa, ON	**Contact:**	R. Faith
OGS #:	1	**Report Date:**	20-Oct-21

Area	0.276	ha	**Rainfall Station #**	215	
Weighted C	0.87		**Particle Size Distribution**	FINE	
CDS Model	2015-4		**CDS Treatment Capacity**	20	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.2%	9.2%	0.3	0.3	1.7	98.4	9.0
1.0	10.6%	19.8%	0.7	0.7	3.4	97.9	10.4
1.5	9.9%	29.7%	1.0	1.0	5.1	97.4	9.6
2.0	8.4%	38.1%	1.3	1.3	6.7	96.9	8.1
2.5	7.7%	45.8%	1.7	1.7	8.4	96.4	7.4
3.0	5.9%	51.7%	2.0	2.0	10.1	96.0	5.7
3.5	4.4%	56.1%	2.3	2.3	11.8	95.5	4.2
4.0	4.7%	60.7%	2.7	2.7	13.5	95.0	4.4
4.5	3.3%	64.0%	3.0	3.0	15.2	94.5	3.1
5.0	3.0%	67.1%	3.3	3.3	16.8	94.0	2.8
6.0	5.4%	72.4%	4.0	4.0	20.2	93.1	5.0
7.0	4.4%	76.8%	4.7	4.7	23.6	92.1	4.0
8.0	3.5%	80.3%	5.3	5.3	26.9	91.1	3.2
9.0	2.8%	83.2%	6.0	6.0	30.3	90.2	2.5
10.0	2.2%	85.3%	6.7	6.7	33.7	89.2	1.9
15.0	7.0%	92.3%	10.0	10.0	50.5	84.4	5.9
20.0	4.5%	96.9%	13.4	13.4	67.3	79.6	3.6
25.0	1.4%	98.3%	16.7	16.7	84.2	74.7	1.1
30.0	0.7%	99.0%	20.0	19.8	100.0	69.5	0.5
35.0	0.5%	99.5%	23.4	19.8	100.0	59.6	0.3
40.0	0.5%	100.0%	26.7	19.8	100.0	52.1	0.3
							93.2
						Removal Efficiency Adjustment[2] =	6.5%
						Predicted Net Annual Load Removal Efficiency =	**86.7%**
						Predicted % Annual Rainfall Treated =	**99.8%**

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.
3 - CDS Efficiency based on testing conducted at the University of Central Florida
4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

PLAN VIEW

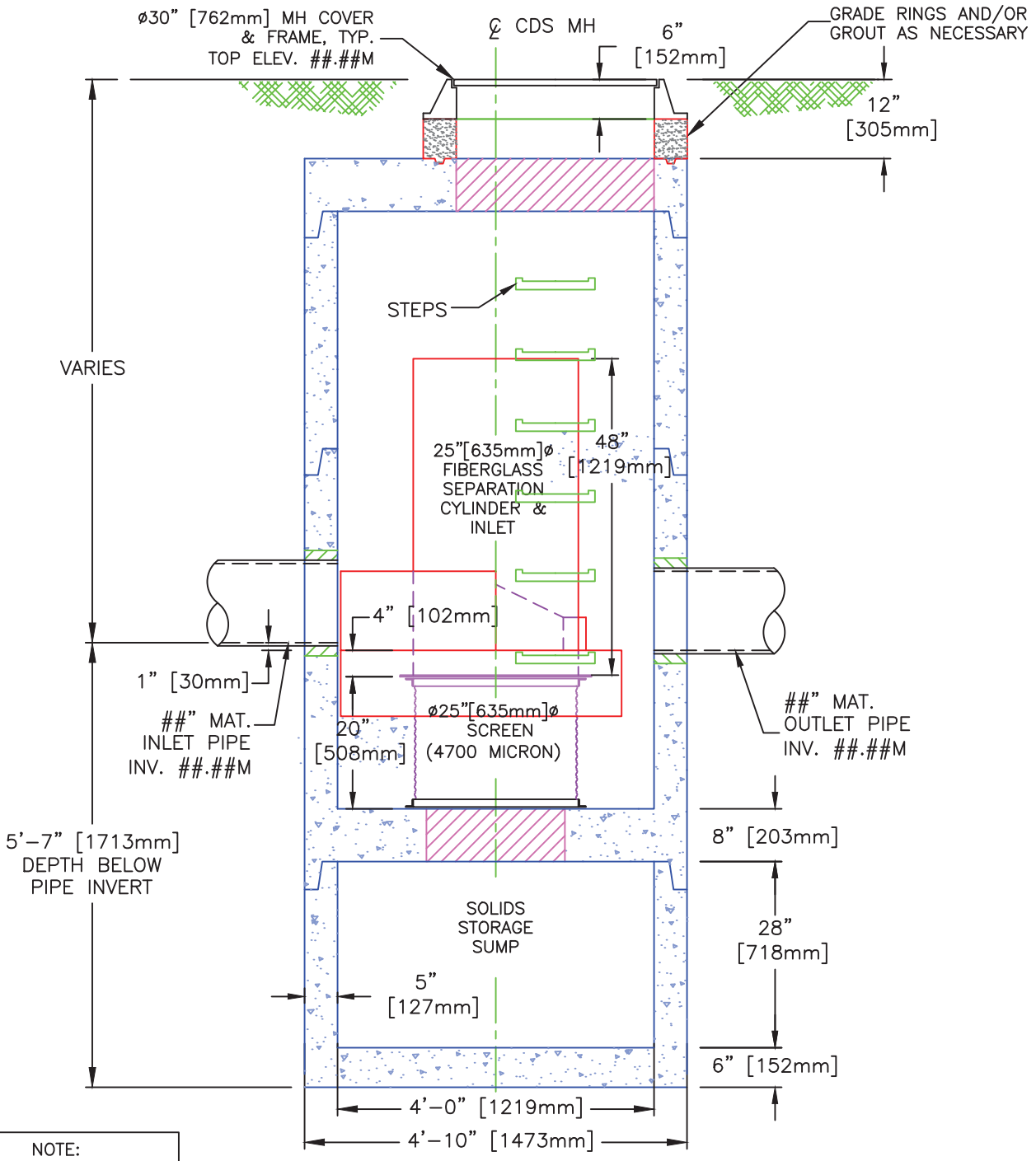


CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, PROVINCE	JOB# XX-##-###	SCALE 1" = 2'
		DATE ##/##/##	SHEET 1
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

SECTION A–A
ELEVATION VIEW



NOTE:
CONTRACTOR TO FIELD VERIFY DIMENSIONS OF OR CONCRETE SECTIONS

CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS

PROJECT NAME
CITY, PROVINCE

JOB#	XX–##–###	SCALE 1" = 2'
DATE	##/##/##	SHEET 2
DRAWN	INITIALS	
APPROV.		

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

Storage calculations in the paved areas above catch basins are based on the following formula for volume of a cone (or pyramid):

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

where:

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

Summary Tables

ONE HUNDRED-YEAR EVENT				
Drainage Area	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I	-	6.00	7.25	14.05
AREA II	-	6.00	20.46	21.02
TOTAL	11.04	12.00	27.72	35.08

FIVE-YEAR EVENT				
	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I	-	6.00	14.05	14.05
AREA II	-	5.97	11.70	21.02
TOTAL	11.04	11.98	25.75	35.08

Ellwood House II

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS
Rational Method

MAXIMUM ALLOWABLE RELEASE RATE

			C
Increase in Hard Area:	1034	sq.m	0.90
Area (A):	1034	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	77	mm/hr	(2-year event)
Runoff Coeficient (C):	0.50		
Maximum Allowable Release Rate (2.78AiC):	11.04	L/s	

ONE HUNDRED-YEAR EVENT

(Maximum Volume Required Calculation)

DRAINAGE AREA I

(ONE HUNDRED-YEAR EVENT - Maximum Volume Required Calculation)

			C
Increase in Hard Area:	354	sq.m	1.00

Water Elevation:	102.27	m
Invert of Outlet Pipe - CB/MH-4:	100.39	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	100.43	m
Head:	1.84	m
Orifice Diameter:	75	mm
Orifice Area:	4418	sq.mm
Coefficient of Discharge:	0.226	
Maximum ICD Release Rate:	6.00	L/s

	Top Area	Depth	Volume	
CB/MH	(sq.m)	(m)		
CB/MH-4	248	0.17	14.05	cu.m

Achieved Volume: 14.05 cu.m

Maximum Volume Required: 7.25 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	179	17.57	6.00	11.57	6.94
15	143	14.06	6.00	8.06	7.25
20	120	11.80	6.00	5.80	6.96
25	104	10.22	6.00	4.22	6.33
30	92	9.04	6.00	3.04	5.47
35	83	8.13	6.00	2.12	4.46
40	75	7.40	6.00	1.39	3.34
45	69	6.80	6.00	0.79	2.14
50	64	6.29	6.00	0.29	0.87
55	60	5.87	5.87	0.00	0.00
60	56	5.50	5.50	0.00	0.00

DRAINAGE AREA II

(ONE HUNDRED-YEAR EVENT - Maximum Volume Required Calculation)

			C
Increase in Hard Area:	680	sq.m	1.00

Water Elevation:	102.55	m
Invert of Outlet Pipe - CB/MH-3:	100.21	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-3)	100.25	m
Head:	2.30	m
Orifice Diameter:	75	mm
Orifice Area:	4418	sq.mm
Coefficient of Discharge:	0.202	
Maximum ICD Release Rate:	6.00	L/s

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB-1	189	0.10	6.30	cu.m
CB/MH-2	160	0.12	6.40	cu.m
CB/MH-3	227	0.11	8.32	cu.m
		Achieved Volume:	21.02	cu.m
		Maximum Volume Required:	20.46	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	179	33.75	6.00	27.76	16.65
15	143	27.01	6.00	21.01	18.91
20	120	22.68	6.00	16.68	20.01
25	104	19.63	6.00	13.63	20.45
30	92	17.37	6.00	11.37	20.46
35	83	15.61	6.00	9.61	20.19
40	75	14.21	6.00	8.21	19.70
45	69	13.05	6.00	7.06	19.05
50	64	12.09	6.00	6.09	18.28
55	60	11.27	6.00	5.27	17.40
60	56	10.57	6.00	4.57	16.45

ONE HUNDRED-YEAR EVENT

DRAINAGE AREA I

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	1755	sq.m	1.00
Landscaped Area:	60	sq.m	0.25
Total Catchment Area:	1815	sq.m	0.98

Water Elevation:	102.27	m
Invert of Outlet Pipe - CB/MH-4:	100.39	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	100.43	m
Head:	1.84	m
Orifice Diameter:	75	mm
Orifice Area:	4418	sq.mm
Coefficient of Discharge:	0.226	
Maximum ICD Release Rate:	6.00	L/s
Maximum Overland Flow:	58.44	L/s

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB/MH-4	248	0.17	14.05	cu.m

Achieved Volume:	14.05	cu.m
Maximum Volume Required:	14.05	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Overland Flow (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	179	87.86	6.00	58.44	23.42	14.05
15	143	70.31	6.00	48.69	15.61	14.05
20	120	59.02	6.00	41.31	11.71	14.05
25	104	51.10	6.00	35.73	9.37	14.05
30	92	45.20	6.00	31.39	7.81	14.05
35	83	40.63	6.00	27.94	6.69	14.05
40	75	36.98	6.00	25.12	5.86	14.05
45	69	33.98	6.00	22.77	5.20	14.05
50	64	31.47	6.00	20.78	4.68	14.05
55	60	29.34	6.00	19.08	4.26	14.05
60	56	27.50	6.00	17.60	3.90	14.05
65	53	25.91	6.00	16.30	3.60	14.05
70	50	24.50	6.00	15.15	3.35	14.05
75	47	23.25	6.00	14.13	3.12	14.05
80	45	22.14	6.00	13.21	2.93	14.05
85	43	21.14	6.00	12.38	2.76	14.05
90	41	20.23	6.00	11.62	2.60	14.05
95	39	19.40	6.00	10.94	2.47	14.05
100	38	18.65	6.00	10.31	2.34	14.05
105	36	17.96	6.00	9.73	2.23	14.05
110	35	17.32	6.00	9.19	2.13	14.05
115	34	16.73	6.00	8.69	2.04	14.05
120	33	16.19	6.00	8.23	1.95	14.05
125	32	15.68	6.00	7.80	1.87	14.05
130	31	15.20	6.00	7.40	1.80	14.05
135	30	14.76	6.00	7.02	1.73	14.05
140	29	14.34	6.00	6.67	1.67	14.05
145	28	13.95	6.00	6.34	1.62	14.05
150	28	13.59	6.00	6.02	1.56	14.05
180	24	11.76	6.00	4.46	1.30	14.05
210	21	10.40	6.00	3.29	1.12	14.05
240	19	9.35	6.00	2.37	0.98	14.05
270	17	8.51	6.00	1.64	0.87	14.05
300	16	7.82	6.00	1.04	0.78	14.05
330	15	7.24	6.00	0.53	0.71	14.05
360	14	6.75	6.00	0.10	0.65	14.05
390	13	6.33	6.00	0.00	0.33	7.64
420	12	5.96	5.96	0.00	0.00	0.00
450	11	5.64	5.64	0.00	0.00	0.00
480	11	5.35	5.35	0.00	0.00	0.00

DRAINAGE AREA II

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	200	sq.m	1.00
Asphalt/Concrete Area:	680	sq.m	1.00
Landscaped Area:	65	sq.m	0.25
Total Catchment Area:	945	sq.m	0.95

Water Elevation:	102.55	m
Invert of Outlet Pipe - CB/MH-3:	100.21	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-3)	100.25	m
Head:	2.30	m
Orifice Diameter:	75	mm
Orifice Area:	4418	sq.mm
Coefficient of Discharge:	0.202	
Maximum Release Rate:	6.00	L/s
Maximum Overland Flow:	6.37	L/s

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB-1	189	0.10	6.30	cu.m
CB/MH-2	160	0.12	6.40	cu.m
CB/MH-3	227	0.11	8.32	cu.m

Achieved Volume: 21.02 cu.m

Maximum Volume Required: 21.02 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Overland Flow (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	179	44.49	6.00	3.45	35.04	21.02
15	143	35.60	6.00	6.25	23.36	21.02
20	120	29.89	6.00	6.37	17.52	21.02
25	104	25.87	6.00	5.86	14.02	21.02
30	92	22.89	6.00	5.21	11.68	21.02
35	83	20.58	6.00	4.57	10.01	21.02
40	75	18.72	6.00	3.97	8.76	21.02
45	69	17.20	6.00	3.42	7.79	21.02
50	64	15.93	6.00	2.93	7.01	21.02
55	60	14.86	6.00	2.49	6.37	21.02
60	56	13.93	6.00	2.09	5.84	21.02
65	53	13.12	6.00	1.73	5.39	21.02
70	50	12.41	6.00	1.40	5.01	21.02
75	47	11.77	6.00	1.10	4.67	21.02
80	45	11.21	6.00	0.83	4.38	21.02
85	43	10.70	6.00	0.58	4.12	21.02
90	41	10.24	6.00	0.35	3.89	21.02
95	39	9.83	6.00	0.14	3.69	21.02
100	38	9.44	6.00	0.00	3.45	20.67
105	36	9.09	6.00	0.00	3.10	19.50
110	35	8.77	6.00	0.00	2.77	18.30
115	34	8.47	6.00	0.00	2.47	17.07
120	33	8.20	6.00	0.00	2.20	15.82
125	32	7.94	6.00	0.00	1.94	14.55
130	31	7.70	6.00	0.00	1.70	13.26
135	30	7.47	6.00	0.00	1.48	11.95
140	29	7.26	6.00	0.00	1.27	10.63
145	28	7.07	6.00	0.00	1.07	9.29
150	28	6.88	6.00	0.00	0.88	7.93
180	24	5.96	5.96	0.00	0.00	0.00
210	21	5.27	5.27	0.00	0.00	0.00
240	19	4.74	4.74	0.00	0.00	0.00
270	17	4.31	4.31	0.00	0.00	0.00
300	16	3.96	3.96	0.00	0.00	0.00
330	15	3.67	3.67	0.00	0.00	0.00
360	14	3.42	3.42	0.00	0.00	0.00
390	13	3.20	3.20	0.00	0.00	0.00
420	12	3.02	3.02	0.00	0.00	0.00
450	11	2.85	2.85	0.00	0.00	0.00
480	11	2.71	2.71	0.00	0.00	0.00

FIVE YEAR-EVENT

DRAINAGE AREA I

(FIVE-YEAR EVENT)

			C
Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	1755	sq.m	0.90
Landscaped Area:	60	sq.m	0.20
Total Catchment Area:	1815	sq.m	0.88

Water Elevation:	102.27	m
Invert of Outlet Pipe - CB/MH-4:	100.39	m
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	100.43	m
Head:	1.84	m
Orifice Diameter:	75	mm
Orifice Area:	4418	sq.mm
Coefficient of Discharge:	0.226	
Maximum ICD Release Rate:	6.00	L/s
Maximum Overland Flow:	16.67	L/s

CB/MH	Top Area (sq.m)	Depth (m)	Volume	
CB/MH-4	248	0.17	14.05	cu.m
		Achieved Volume:	14.05	cu.m
		Maximum Volume Required:	14.05	cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Overland Flow (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	104	46.10	6.00	16.67	23.42	14.05
15	84	36.97	6.00	15.35	15.61	14.05
20	70	31.08	6.00	13.37	11.71	14.05
25	61	26.94	6.00	11.57	9.37	14.05
30	54	23.86	6.00	10.05	7.81	14.05
35	49	21.47	6.00	8.77	6.69	14.05
40	44	19.55	6.00	7.69	5.86	14.05
45	41	17.98	6.00	6.77	5.20	14.05
50	38	16.66	6.00	5.97	4.68	14.05
55	35	15.54	6.00	5.28	4.26	14.05
60	33	14.58	6.00	4.67	3.90	14.05
65	31	13.73	6.00	4.13	3.60	14.05
70	29	13.00	6.00	3.65	3.35	14.05
75	28	12.34	6.00	3.21	3.12	14.05
80	27	11.75	6.00	2.82	2.93	14.05
85	25	11.22	6.00	2.47	2.76	14.05
90	24	10.75	6.00	2.14	2.60	14.05
95	23	10.31	6.00	1.84	2.47	14.05
100	22	9.91	6.00	1.57	2.34	14.05
105	22	9.55	6.00	1.32	2.23	14.05
110	21	9.21	6.00	1.08	2.13	14.05
115	20	8.90	6.00	0.86	2.04	14.05
120	19	8.61	6.00	0.66	1.95	14.05
125	19	8.34	6.00	0.47	1.87	14.05
130	18	8.09	6.00	0.29	1.80	14.05
135	18	7.86	6.00	0.12	1.73	14.05
140	17	7.64	6.00	0.00	1.64	13.75
145	17	7.43	6.00	0.00	1.43	12.45
150	16	7.24	6.00	0.00	1.24	11.12
180	14	6.27	6.00	0.00	0.27	2.92
210	13	5.55	5.55	0.00	0.00	0.00
240	11	5.00	5.00	0.00	0.00	0.00
270	10	4.55	4.55	0.00	0.00	0.00
300	9	4.18	4.18	0.00	0.00	0.00
330	9	3.88	3.88	0.00	0.00	0.00
360	8	3.62	3.62	0.00	0.00	0.00
390	8	3.39	3.39	0.00	0.00	0.00
420	7	3.20	3.20	0.00	0.00	0.00
450	7	3.02	3.02	0.00	0.00	0.00
480	6	2.87	2.87	0.00	0.00	0.00

DRAINAGE AREA II

(FIVE-YEAR EVENT)

			C
Roof Area:	200	sq.m	0.90
Asphalt/Concrete Area:	680	sq.m	0.90
Landscaped Area:	65	sq.m	0.20
Total Catchment Area:	945	sq.m	0.85

Water Elevation: 102.53 m

Invert of Outlet Pipe - CB/MH-3: 100.21 m

Centroid of ICD Orifice: 100.25 m
(ICD in Outlet Pipe of CB/MH-3)

Head: 2.28 m

Orifice Diameter: 75 mm

Orifice Area: 4418 sq.mm

Coefficient of Discharge: 0.202

CB/MH	Top Area (sq.m)	Depth (m)		
CB-1	123	0.08	3.29	cu.m
CB/MH-2	112	0.10	3.76	cu.m
CB/MH-3	154	0.09	4.64	cu.m

Maximum Release Rate: 5.97 L/s

Achieved Volume: 11.70 cu.m

Maximum Overland Flow: 0.00 L/s

Maximum Volume Required: 11.70 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Overland Flow (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	104	23.32	5.97	0.00	17.34	10.41
15	84	18.70	5.97	0.00	12.73	11.45
20	70	15.72	5.97	0.00	9.75	11.70
25	61	13.63	5.97	0.00	7.66	11.48
30	54	12.07	5.97	0.00	6.10	10.97
35	49	10.86	5.97	0.00	4.89	10.26
40	44	9.89	5.97	0.00	3.92	9.40
45	41	9.09	5.97	0.00	3.12	8.42
50	38	8.43	5.97	0.00	2.45	7.36
55	35	7.86	5.97	0.00	1.89	6.23
60	33	7.37	5.97	0.00	1.40	5.04
65	31	6.95	5.97	0.00	0.97	3.80
70	29	6.57	5.97	0.00	0.60	2.52
75	28	6.24	5.97	0.00	0.27	1.21
80	27	5.94	5.94	0.00	0.00	0.00
85	25	5.68	5.68	0.00	0.00	0.00
90	24	5.44	5.44	0.00	0.00	0.00
95	23	5.22	5.22	0.00	0.00	0.00
100	22	5.01	5.01	0.00	0.00	0.00
105	22	4.83	4.83	0.00	0.00	0.00
110	21	4.66	4.66	0.00	0.00	0.00
115	20	4.50	4.50	0.00	0.00	0.00
120	19	4.36	4.36	0.00	0.00	0.00
125	19	4.22	4.22	0.00	0.00	0.00
130	18	4.09	4.09	0.00	0.00	0.00
135	18	3.98	3.98	0.00	0.00	0.00
140	17	3.86	3.86	0.00	0.00	0.00
145	17	3.76	3.76	0.00	0.00	0.00
150	16	3.66	3.66	0.00	0.00	0.00
180	14	3.17	3.17	0.00	0.00	0.00
210	13	2.81	2.81	0.00	0.00	0.00
240	11	2.53	2.53	0.00	0.00	0.00
270	10	2.30	2.30	0.00	0.00	0.00
300	9	2.12	2.12	0.00	0.00	0.00
330	9	1.96	1.96	0.00	0.00	0.00
360	8	1.83	1.83	0.00	0.00	0.00
390	8	1.72	1.72	0.00	0.00	0.00
420	7	1.62	1.62	0.00	0.00	0.00
450	7	1.53	1.53	0.00	0.00	0.00
480	6	1.45	1.45	0.00	0.00	0.00

STORM SEWER DESIGN FORM — TWO YEAR EVENT

Rational Method — Q = 2.78 A i C

October 22, 2021

n = 0.013

Location		Areas (ha)									Pipe Data									Notes
		Roof	Hard	Gravel	Landscape	Individual	Accum.	Time of	Rainfall Intensity	Peak Flow		Actual	Nominal					Time of		
From	To	C = 0.9	C = 0.9	C = 0.7	C = 0.2	2.78AC	2.78AC	Conc. (min)	i (mm/hr)	Q (L/s)	Material	Diameter (mm)	Diameter (mm)	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Flow (min)	Ratio Q/Qfull	
CB-1	CB/MH-2		0.0215			0.0538	0.0538	10.00	77	4.13	PVC	254.0	250	0.43	16.2	40.7	0.80	0.34	0.10	
CB/MH-2	CB/MH-3	0.0010	0.0180		0.0045	0.0500	0.1038	10.34	76	7.84	PVC	254.0	250	0.43	16.8	40.7	0.80	0.35	0.19	
CB/MH-3	MH-5	0.0190	0.0285		0.0020	0.1200	0.2238	10.69	74	16.62	PVC	254.0	250	0.43	2.0	40.7	0.80	0.04	0.41	
CB/MH-4	MH-5		0.1755		0.0060	0.4424	0.4424	10.00	77	33.98	PVC	304.8	300	0.34	47.3	58.8	0.81	0.98	0.58	
MH-5	MH-6						0.6662	10.98	73	48.80	PVC	304.8	300	0.34	37.5	58.8	0.81	0.78	0.83	
												Existing 300 ST in Alta Vista Drive								
												304.8	300	0.99		100.4	1.38			
CB-A	CB-B	0.0230	0.0490		0.0115	0.1865	0.1865	10.00	77	14.33	PVC	203.2	200	1.00	2.0	34.2	1.06	0.03	0.42	
CB-B	CB/MH-D	0.0050	0.0955		0.0045	0.2540	0.4405	10.03	77	33.78	PVC	304.8	300	1.00	36.9	100.9	1.38	0.44	0.33	
CB-C	CB/MH-D	0.0510	0.0090		0.0945	0.2027	0.2027	10.00	77	15.57	PVC	203.2	200	1.00	21.3	34.2	1.06	0.34	0.45	
Church	CB/MH-D	0.0300				0.0751	0.0751	10.00	77	5.76	PVC	152.4	150	1.00	11.6	15.9	0.87	0.22	0.36	
Roof Drains																				
Church Hal	CB/MH-D	0.0315				0.0788	0.0788	10.00	77	6.05	PVC	152.4	150	1.00	18.6	15.9	0.87	0.36	0.38	
Roof Drains																				
CB/MH-D	CB/MH-10		0.0165		0.0005	0.0416	0.8386	10.48	75	62.91	PVC	304.8	300	1.00	13.5	100.9	1.38	0.16	0.62	
CB-7	CB/MH-10		0.0150		0.0010	0.0381	0.0381	10.00	77	2.93	PVC	254.0	250	0.43	22.5	40.7	0.80	0.47	0.07	
CB-8	CB/MH-10	0.0125			0.0042	0.0336	0.0336	10.00	77	2.58	PVC	254.0	250	0.43	7.6	40.7	0.80	0.16	0.06	
CB-9	CB/MH-10	0.0101			0.0030	0.0269	0.0269	10.00	77	2.07	PVC	254.0	250	0.43	7.0	40.7	0.80	0.15	0.05	
CB/MH-10	CB/MH-11	0.0160	0.0090		0.0090	0.0676	0.9442	10.64	74	70.28	PVC	304.8	300	0.43	41.6	66.2	0.91	0.76	1.06	
CB/MH-11	MH-12						0.9442	11.40	72	67.80	PVC	304.8	300	0.43	40.5	66.2	0.91	0.74	1.02	
												Existing 375 ST in Braeside Avenue								
												381.0	375	1.31		209.4	1.84			

City of Ottawa Servicing Study Checklist

General Content

Executive Summary (for large reports only): not applicable

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

Location map and plan showing municipal address, boundary, and layout of proposed development: see drawings C-1 to C-7

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

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

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

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

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

Identification of existing and proposed infrastructure available in the immediate area: see drawings C-1 to C-7

Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available). see drawings C-1 to C-7

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

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

Proposed phasing of the development, if applicable: not applicable

Reference to geotechnical studies and recommendations concerning servicing: see note 1.5 on drawing C-5

All preliminary and formal site plan submissions should have the following information:

- **Metric scale:** included
- **North arrow:** included
    - **(including construction North):** not included

- **Key Plan:** included
- **Name and contact information of applicant and property owner:** not available
- **Property limits**: included
    - **including bearings and dimensions:** not included
- **Existing and proposed structures and parking areas:** included
- **Easements, road widening and rights-of-way:** included
- **Adjacent street names:** included

Development Servicing Report: Water

Confirm consistency with Master Servicing Study, if available: not applicable

Availability of public infrastructure to service proposed development: see page 2 & 3 of Servicing Brief

Identification of system constraints: see page 2 & 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 2,3 & 5 of Servicing Brief

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

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

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

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

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

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

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

Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines: see page 3 of Servicing Brief

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

Development Servicing Report: Wastewater

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

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

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

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

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

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

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

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

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

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

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

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

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

Development Servicing Report: Stormwater Checklist

Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property): see page 4 of Servicing Brief and Stormwater Management Report

Analysis of available capacity in existing public infrastructure. not applicable

A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern: see drawing C-3 & C-7

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

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

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

Watercourse and hazard lands setbacks: not applicable

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

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

Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period). see drawings C-1 to C-7 and Servicing Brief and Stormwater Management Report

Identification of watercourses within the proposed development and how watercourses will be protected, or , if necessary, altered by the proposed development with applicable approvals. see drawings C-1 to C-7 and Servicing Brief and Stormwater Management Report

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

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

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

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

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

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

Descriptions of how the conveyance and storage capacity will be achieved for the development: see page 5 & 6 of Servicing Brief and Stormwater Management Report

100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading:

Inclusion of hydraulic analysis including hydraulic grade line elevations. : not applicable

Description of approach to erosion and sediment control during construction for the protection of receiving watercourses of drainage corridors: see notes 2.1 to 2.5 on drawing C-5

Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplains elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current: not applicable

Identification of fill constraints related to floodplain and geotechnical investigation. : not applicable

Approval and Permit Requirements: Checklist

The Servicing Study shall provide a list of applicable permits and regulatory approvals necessary for the proposed development as well as the relevant issues affecting each approval. The approval and permitting shall include but not be limited to the following:

Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not approval authority for the Lakes and Rivers Improvement Act. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act: see page 19 of Servicing Brief and Stormwater Management Report

Application for Certificate of Approval (CofA) under the Ontario Water Resources Act:

Changes to Municipal Drains. : not applicable

Other permits (National Capital commission, Parks Canada, public Works and Government Services Canada, Ministry of transportation etc.) : not applicable

Conclusion Checklist

Clearly stated conclusions and recommendations: see page 6 & 7 of Servicing Brief

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

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