SERVICING BRIEF & STORMWATER MANAGEMENT REPORT

Sequoia Church 35 Highbury Park Drive Ottawa, Ontario

Report No. 18060

May 29, 2019



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

SERVICING BRIEF & STORMWATER MANAGEMENT REPORT

Sequoia Church 35 Highbury Park Drive Ottawa, Ontario

This report describes the services and addresses the stormwater management requirements of an 11,574 sq.m. property at 35 Highbury Park Drive. The property is currently vacant. A church building, with a partial walkout basement and having a 1,923 sq.m. footprint, is proposed. The building will also function as a community centre and will include a café.

This report forms part of the stormwater management design for the proposed development. Refer to drawing C-1 to C-5 also prepared by D. B. Gray Engineering Inc.

WATER SUPPLY FOR FIREFIGHTING:

The proposed building will be installed with a sprinkler system with the fire department connection (FDC) located near the southeast corner of the proposed building. There is an existing fire hydrant in the municipal road right-of-way located on the opposite side of the road roughly 37m unobstructed distance from the FDC. Therefore a private on-site fire hydrant is not required.

A fire flow of 100 l/s (6,000 L/min) is required, as calculated as per the Fire Underwriter Survey "Water Supply For Fire Protection".

Two sets of boundary conditions (based on the city's computer model of the municipal water distribution system) were received from the city. The "*Pre-configuration conditions refer to HGL and pressure for the current water pump operations existing in the BARR pressure zone. The post-Config results refer to HGL and pressures when the pressure zone BARR is split in to BARR and 3SW (which is predicted to happen by end of this year – but not guaranteed).*"

The current (pre-configuration) boundary conditions include the HGL of 121.1m during the 100 l/s fire flow at the subject location which calculates to be 179 kPa (26 psi). Since the pressure is above 138 kPa (20 psi) there is an adequate water supply for firefighting.

With the future (post-configuration) boundary conditions the HGL during the 100 l/s fire flow increases to 139.6m which calculates to an increased pressure to 361 kPa (52 psi).

WATER SERVICE:

As previously mentioned the proposed building will have a sprinkler system. To service the sprinkler system, a 150 mm water service, connecting to an existing 200mm municipal watermain in Highbury Park Drive, is proposed. The 150mm service will be adequate for the domestic demand.

Based on Appendix 4-A of the City of Ottawa Sewer Design Guidelines for churches with kitchen facilities, the daily average consumption rate is 30 L/seat/day. Based on this rate and 500 seats and an 8-hour day the daily average demand is calculated to be 1.0 L/s. Based on the City guidelines the maximum daily peaking factor is 1.5 of the daily average demand and maximum hourly peaking factor is 1.8 of the maximum daily demand. Based on these peaking factors the maximum daily demand for the church is 1.6 L/s and maximum hourly demand is 2.8 L/s.

Based on Appendix 4-A of the City of Ottawa Sewer Design Guidelines for an "ordinary restaurant (not 24 hours)", the daily average flow rate is 125 L/seat/day. Based on this rate and 50 seats and a 12-hour day the daily average demand is calculated to be 0.1 L/s. Based on the City guidelines the maximum daily peaking factor is 1.5 of the daily average demand and maximum hourly peaking factor is 1.8 of the maximum daily demand. Based on these peaking factors the maximum daily demand for the church is 0.2 L/s and maximum hourly demand is 0.4 L/s.

Therefore the total daily average flow (church + café) is 1.2 L/s, with a maximum daily and maximum hourly demand of 1.8 and 3.2 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. In summary, we required the boundary conditions for the subject area based on the following:

Average Daily Demand: 1.2 L/s. Maximum Daily Demand: 1.8 L/s. Maximum Hourly Demand: 3.2 L/s Fire Flow Demand: 100.0 L/s Maximum Daily + Fire Flow Demand: 101.8 L/s

The current (pre-configuration) boundary conditions, received from the City, included a peak hour HGL (hydraulic grade line) of 125.9m and a maximum of 132.90m. With these HGLs, the water pressure is calculated vary in pressures at the water meter from 266 to 334 kPa (39 to 49 psi). These pressures are low given that, as per City Guidelines, the minimum required under the maximum hourly demand conditions is 40 psi. However, the future (post-configuration) boundary conditions include a peak hour HGL of 146.6m and a maximum of 147.8m. With these HGLs, the water pressure is calculated to vary in pressures from 469 to 481 kPa (68 to 70 psi). Post-configuration is anticipated to occur this year (i.e. before construction of the proposed development is complete) and at that time an acceptable range of pressures will be available.

SANITARY SERVICE:

The subject property includes "Block 122" which has frontage on Highbury Park Drive and "Part of Lot 18" which are lands immediately north of "Block 122". The local municipal sanitary sewer is sized based on populations or flow rates assigned to all properties served by the sewer. "Block 122" was assigned a residential population of 66 and "Part of Lot 18" lands have no population or flow rate assigned to it. Based on the design standard (when the municipal sewer was constructed) of 350 L/capita/day, a residential population of 66 calculates to a peak sanitary sewage flow rate of 1.31 L/s which means this is the maximum permitted flow rate for all of the subject lands.

Based on Appendix 4-A of the City of Ottawa Sewer Design Guidelines for churches with kitchen facilities, the daily average consumption rate is 30 L/seat/day and for a "ordinary restaurant (not 24 hours)", the daily average flow rate is 125 L/seat/day. Therefore based on these rates; 500 church seats and 50 restaurant seats; a 3.6 peaking factor (a 1.5 peaking factor adjusted for a 12-hour day); and a 0.33 l/s/ha infiltration flow; the total flow is calculated to be 1.12 L/s. Since this flow is less than the maximum permitted of 1.31 L/s, the proposed sanitary flows contributing to the existing 250 mm municipal sanitary sewer in Highbury Drive is expected to have an acceptable impact.

A 200mm at 1.0% sanitary service is proposed to connect to an existing 200mm diameter stub located near the south property line. The 1.12 L/s flow will be adequately handled by the proposed sanitary sewer service connection having a capacity of 33.0 L/s.

STORMWATER MANAGEMENT:

Water Quality:

The Rideau Valley Conservation Authority (RVCA) has commented: "The RVCA will have no quality control requirements, the site is serviced by SWM facility prior to outetting to the Rideau River."

No permanent quality control measures are proposed.

An erosion and sediment control plan has been developed to be implemented during construction, (see drawing C-4 and notes 2.1 to 2.7 on drawing C-5). In summary: to filter out construction sediment a silt fence barrier will be installed around the perimeter of the 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 all points of egress to public roads; and any material deposited on a public road will be removed at the end of each day.

Water Quantity:

The stormwater management criteria for quantity control are to control the post development peak flows for the 5-year and 100-year storm events to peak flows during the 5-year storm event using a pre-development runoff coefficient or runoff coefficient of 0.50, whichever is less; and a calculated time of concentration (but not less than 10 minutes). It is calculated that the pre-development conditions reflect a 5-year runoff coefficient of 0.39 and a time of concentration of 22 minutes. Therefore, using the Rational Method, the maximum allowable release rate is 83.90 L/s for all storm events. The runoff coefficients for the 100 year event are increased by 25% to maximum 1.00.

To the west of the subject property 3,216 sq.m. of lands drain onto the property. This off-site drainage area is not required to be controlled but is included in the stormwater management calculations and the storm sewer design form.

Stormwater will be stored within the development on the asphalt surface above the catch basins.

Drainage Area I

(Uncontrolled Flow Off Site - 2,244 sq.m.):

The runoff from the north, east and west perimeter of the site will be allowed to flow uncontrolled off the site. The flow from is calculated at 10 minutes concentration.

	100-year	5-year
Maximum flow rate:	32.58 L/s	15.57 L/s

Drainage Area II (9,063 sq.m.):

An inlet control device (ICD) located at the outlet pipe of catch basin/manhole CB/MH-4 will control the release of stormwater from this drainage area. The ICD will restrict the flow and force the stormwater to back up onto the surface of the parking area. The required storage was sized by excluding the off-site drainage. The off-site drainage area was then included and any excess flows were assumed to flow out an overflow pipe at manhole CB/MH-4 bypassing the ICD. The ICD shall be a plug style with a round orifice design manufactured by Pedro Plastics (or approved equal manufactured by IPEX) and shall be sized by the manufacturer for a discharge rate of 49.12 L/s at 1.81 m head. It is calculated that an orifice area of 13,520 sq.mm. (\pm 131 mm diameter) and a discharge coefficient of 0.61 will restrict the outflow rate to 49.12 L/s at a head of 1.81 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 48.47 L/s at 1.76 m.

	100-year	5-year
Maximum ICD release rate:	49.12 L/s	48.47 L/s
Maximum overflow release rate:	<u>29.01 L/s</u>	<u>0.00 L/s</u>
Maximum total release rate:	78.13 L/s	48.47 L/s
Maximum water elevation:	97.70 m	97.66 m
Maximum stored volume:	275.66 cu.m.	129.47 cu.m.

Drainage Area III (447 sq.m.):

The

An inlet control device (ICD) located at the outlet pipe of catch basin/manhole CB/MH-2 will control the release of stormwater from this drainage area. The ICD will restrict the flow and force the stormwater to back up onto the surface above catch basin/manhole CB/MH-2 and catch basin CB-3. The ICD shall be a Hydrovex "VHV Vertical Vortex Flow Regulator" and shall be sized by the manufacturer for a discharge rate of 2.20 L/s at 2.49 m head. It is calculated that an orifice area of 1,963 sq.mm. (50 mm in diameter) and a discharge coefficient of 0.161 will restrict the outflow rate to 2.20 l/s at 2.49 m. Based on this orifice the maximum outflow rate for the 1:5 year storm event is calculated to be 2.19 l/s at 2.45 m.

	100-year	5-year
Maximum release rate:	2.20 L/s	2.19 L/s
Maximum water elevation:	101.63 m	101.59 m
Maximum stored volume:	14.84 cu.m.	5.85 cu.m.
Entire Site:		
	100-year	5-year
Maximum allowable release rate:	83.90 L/s	83.90 L/s
Maximum release rate:	83.90 L/s	66.23 L/s
Maximum overflow release rate:	29.01 L/s	0.00 L/s
Maximum stored volume:	290.50 cu.m.	135.33 cu.m.

Therefore maximum post-development release rate for the 100-year storm event is calculated to be equal to the maximum allowable at 83.90 L/s and to achieve this release rate the total maximum required stored volume is 290.50 cu.m. And the maximum post-development release rate for the 5-year storm event is calculated to be less than the maximum allowable and to achieve this release rate the total maximum required stored volume is 135.33 cu.m.

Stormwater released through the ICDs and flowing out the overflow pipe will be conveyed off the site via a 450mm storm sewer connecting existing 450mm diameter stub located near the south property line. The stub connects to an existing 525mm municipal storm sewer.

The unrestricted flowrate resulting from one in five-year storm event will produce a peak flow of 155.5 L/s which will be adequately by the proposed storm sewer system with the last pipe segment (450mm at 0.33% - 170.9 L/s capacity) being at 91% of its capacity. However the inlet control devices (ICDs) will restrict the flow to 50.6 L/s during the one in five storm event so that flow in the last segment will be only at 30% its capacity.

The 50.6 L/s in stormwater flows contributing to the existing 525mm municipal storm sewer (at 1.06% - 461.9 l/s capacity) is expected to have an acceptable impact.

CONCLUSIONS:

- 1. There will be an adequate water supply for firefighting.
- 2. The proposed water service connection is adequately sized to serve the development.
- 3. The existing water pressure in the municipal watermain is currently low but after the City reconfigures their water distribution system (which will probably occur prior to the completion of construction of the proposed development) it will be adequate for the proposed development.
- 4. The expected sanitary sewage flow rate will be adequately handled by the proposed sanitary sewer service connection.
- 5. The sanitary flow contributing to the existing municipal sanitary sewer is expected to have an acceptable impact.
- 6. The RVCA does not require any additional quality control measures. No permanent quality control measures are proposed.
- 7. An erosion and sediment control plan has been developed to be implemented during construction.
- 8. The stormwater management criteria for quantity control require that the maximum post-development release rate both the 5 and 100-year storm events to be 83.90 L/s. The maximum release rate for the 100-year event is equal to the maximum allowable and it is less than the maximum allowable for the 5-year event. To achieve the release rates the maximum required stored volume is 290.50 cu.m. for the 100-year event and 135.33 cu.m. for the 5-year.
- 9. The flowrate produced by a one in five-year storm event will be adequately handled by the proposed storm sewer system.
- 10. The restricted stormwater flow contributing to the existing municipal storm sewer is expected to have an acceptable impact.

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

700 Long Point Circle Ottawa, Ontario K1T 4E9 613-425-8044 d.gray@dbgrayengieering.com

> 11-Jan-19 Revision 1 15-Apr-19

Sequoia Community Church 35 Highbury Park Drive Ottawa, Ontario

Fire Flow Requirements (Pre-Configuration)

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

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

C = coefficient related to the type of construction

= 0.8 Non-Combustible Construction (Unprotected structural components)

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

Proposed Church:	Basement Floor	1140 sq.m.
	Ground Floor	1924 sq.m.
	2nd Floor	984 sq.m.
	TOTAL FIRE AREA:	4048 sq.m.

F = 11,198 L/min

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

-15% Change for Combustible Occupancy

= 9,350 L/min

40% Reduction for Sprinkler System

= 3,740 L/min

		Increase fo	ncrease for Separation Exposed BuildingsAdjacent Building				
				Constuction	Length m	Storeys	Factor
	0%	North	>45				0
	0%	East	>45				0
	0%	South	>45				0
	0%	West	>45				0
	0%	Total Increa	ase for Expos	ure (maximum	75%)		
=	-	L/min Increa	ase	-			
=	5,610	L/min					
F =	6,000	L/min (roun	ded off to the	nearest 1,000	L/min)		
=	100.0	l/s			,		
Elevation at Fire Hydrant	102.80	m ASL					
5			Static P	Pressure at Fire	Hydrant		
100 I/s FIRE FLOW:	121.1	m ASL	26	psi	179	kPa	
				1			

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> 11-Jan-19 REVISED 15-Apr-19

Sequoia Community Church 35 Highbury Park Drive Ottawa, Ontario

Fire Flow Requirements (Post-Configuration)

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

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

C = coefficient related to the type of construction

= 0.8 Non-Combustible Construction (Unprotected structural components)

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

Proposed Church:	Basement Floor	1140 sq.m.
	Ground Floor	1924 sq.m.
	2nd Floor	984 sq.m.
	TOTAL FIRE AREA:	4048 sq.m.

F = 11,198 L/min

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

-15% Change for Combustible Occupancy

= 9,350 L/min

40% Reduction for Sprinkler System

= 3,740 L/min

		Increase	for Separation E	Exposed Buildir	ngs Adjacent	Building	Length- Height
	09/	North	> 4 E	Constuction	Length m	Storeys	Factor
	0%	Fact	>45				0
	0%	Casi	>45				0
	0%	Weet	>45				0
	0%	Total Inc	rease for Exposi	ire (maximum	75%)		0
=	070	I /min Inc			1370)		
_	_	L/11111 1110					
=	5 610	I /min					
F =	6,000	L/min (ro	ounded off to the	nearest 1,000	l /min)		
. =	100.0	l/s					
	100.0						
Elevation at Fire Hydrant	102.8	m ASL					
2			Static P	ressure at Fire	Hydrant		
100 I/s FIRE FLOW:	139.6	m ASL	52	psi	361	kPa	

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

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REVISED

16-Jan-19 15-Apr-19

Sequoia Community Church 35 Highbury Park Drive Ottawa, Ontario

Water Demand (Pre-Configuration)

Churches						
- with kitchen facilities	30 500	L per seat seats	- as per A	opendix 4-A,	City Sewer	Design Guidelines
Daily Average	15000	L / day				
	8	hours per d	ay			
	62.5	L/min	1.0	l/s	16.5	USgpm
Maximum Daily Demand	1.5	(Peaking Fa	actor as per	Ottawa Des	ign Guidelii	nes)
	93.8	L/min	1.6	l/s	24.8	USgpm
Maximum Hourly Demand	1.8	(Peaking Fa	actor as per	Ottawa Des	ign Guidelii	nes)
	168.8	L/min	2.8	l/s	44.6	USgpm
Café **						
- "ordinary retaurant" (not 24 hours)	125	L per seat	- as per A	opendix 4-A,	City Sewer	Design Guidelines
	50	seats				
Dally Average	6250	L /day	21/			
	87	I /min	ay 0 1	l/s	23	USanm
	0.1	2/1111	0.1		2.0	oogpiii
Maximum Daily Demand	15	(Peaking Fa	actor as per	Ottawa Des	ian Guidelii	nes)
······································		(
	13.0	L/min	0.2	l/s	3.4	USgpm
Maximum Hourly Demand	1.8	(Peaking Fa	actor as per	Ottawa Des	ign Guidelii	nes)
	23.4	I /min	0.4	l/s	62	USapm
	2011		0		0.2	0035
TOTAL DAILY AVERAGE	71.2	L/min	1.2	l/s	18.8	USapm
	100.0		4.0			
TOTAL MAXIMUM DAILY DEMAND	106.8	L/min	1.8	l/s	28.2	USgpm
TOTAL MAXIMUM HOURLY DEMAND	192.2	L/min	3.2	l/s	50.8	USgpm
Elevation of Mater Mater	00.70					
Finish Floor Flevation	96.79	m ASL				
	000		Static Pre	essure at Wa	ater Meter	
PEAL HOUR:	125.9	m ASL	39	psi	266	kPa
MAXIMUM HGL:	132.9	m ASL	49	psi	334	kPa

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

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> 16-Jan-19 REVISED 15-Apr-19

Sequoia Community Church 35 Highbury Park Drive Ottawa, Ontario

Water Demand (Post-Configuration)

Churches						
- with kitchen facilities	30 500	L per seat seats	- as per A	opendix 4-A,	City Sewer	Design Guidelines
Daily Average	15000	L / day				
	8	hours per d	ау	_		
	62.5	L/min	1.0	l/s	16.5	USgpm
		_				
Maximum Daily Demand	1.5	(Peaking Fa	actor as per	Ottawa Des	sign Guidelir	nes)
	93.8	L/min	1.6	l/s	24.8	USgpm
Maximum Hourly Demand	1.8	(Peaking Fa	actor as per	^r Ottawa Des	sign Guidelir	nes)
1	168.8	L/min	2.8	l/s	44.6	USgpm
Café **						
- "ordinary retaurant" (not 24 hours)	125	L per seat	- as per Ai	opendix 4-A.	Citv Sewer	Desian Guidelines
	50	seats		- p,		
Daily Average	6250	L /day				
	12	hours per d	ay	_		
	8.7	L/min	0.1	l/s	2.3	USgpm
Maximum Daily Demand	1.5	(Peaking Fa	actor as pei	Ottawa Des	sign Guidelir	nes)
1	13.0	L/min	0.2	l/s	3.4	USgpm
Maximum Hourly Demand	1.8	(Peaking Fa	actor as pei	Ottawa Des	sign Guidelir	nes)
	23.4	L/min	0.4	l/s	6.2	USgpm
TOTAL DAILY AVERAGE	71.2	L/min	1.2	l/s	18.8	USgpm
TOTAL MAXIMUM DAILY DEMAND	106.8	L/min	1.8	l/s	28.2	USgpm
TOTAL MAXIMUM HOURLY DEMAND	192.2	L/min	3.2	l/s	50.8	USgpm
Elevation of Water Meter:	98.79	m ASL				
FILISN FLOOR ELEVATION:	97.89	III ASL	Static Dr	assura at M/	ator Motor	
PEAK HOUR HGI	146 6	m ASI	68	nsi	469	kPa
	110.0			201	100	
MAXIMUM HGL:	147.8	m ASL	70	psi	481	kPa



Douglas Gray <d.gray@dbgrayengineering.com>

RE: Request for Boundary Conditions - Sequoia Church, 35 Highbury Park Dr

1 message

Baker, Adam <adam.baker@ottawa.ca>

Thu, Apr 11, 2019 at 8:16 AM

To: Douglas Gray <d.gray@dbgrayengineering.com> Cc: "Lodoen Unseth, Kelby" <Kelby.LodoenUnseth@ottawa.ca>, "Oram, Cody" <Cody.Oram@ottawa.ca>, Ryan Faith <r.faith@dbgrayengineering.com>

Hi Doug,

Please see attached your water boundary conditions for 35 Highbury.

Thanks,

Adam Baker, EIT

Engineering Intern

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

Development Review - South Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 26552, Adam.Baker@ottawa.ca

From: Douglas Gray <d.gray@dbgrayengineering.com> Sent: April 11, 2019 7:11 AM To: Baker, Adam <adam.baker@ottawa.ca> Cc: Lodoen Unseth, Kelby <Kelby.LodoenUnseth@ottawa.ca>; Oram, Cody <Cody.Oram@ottawa.ca>; Ryan Faith <r.faith@dbgrayengineering.com> Subject: Re: Request for Boundary Conditions - Sequoia Church, 35 Highbury Park Dr

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D.B. Gray Engineering Inc. Mail - RE: Request for Boundary Conditions - Sequoia Church, 35 Highbury Park Dr

This is a reminder that we have not received the boundary conditions for 35 Highbury Park Dr. (The request was submitted on January 16th - see below.)

Regards, Doug



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

700 Long Point Circle

Tel: 613-425-8044

Ottawa, Ontario K1T 4E9

d.gray@dbgrayengineering.com

On Wed, Jan 16, 2019 at 11:34 AM Baker, Adam <adam.baker@ottawa.ca> wrote:

Hi Doug,

Your request has been submitted to our water modelling group. I'll forward your boundary conditions as soon as I receive them.

Thanks,

Adam Baker, EIT

Engineering Intern

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

Development Review - South Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 26552, Adam.Baker@ottawa.ca

From: Douglas Gray <d.gray@dbgrayengineering.com> Sent: January 16, 2019 11:17 AM To: Lodoen Unseth, Kelby <Kelby.LodoenUnseth@ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: Request for Boundary Conditions - Sequoia Church, 35 Highbury Park Dr

Hi Kelby

We are working on a project that proposes a new church 35 Highbury Park Dr.

We require boundary conditions. Please forward this email and the attachments to the person at Infrastructure Approvals that will be reviewing our work.

Please provide the boundary conditions at 35 Highbury Park Dr. We have calculated the following expected demands for the based on a church with a Cafe tenant.

Average daily demand: 1.2 l/s. Maximum daily demand: 1.8 l/s. Maximum hourly daily demand: 3.2 l/s Fire Flow demand: 100.0 l/s Fire Flow + Max Day: 101.8 l/s

Calculations are attached.

Thanks, Doug

D.B. GRAY ENGINEERING INC.

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

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Tel: 613-425-8044

Ottawa, Ontario K1T 4E9

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Bighbury Park Dr.docx 235K



Douglas Gray <d.gray@dbgrayengineering.com>

35 Highbury Park - Boundary Conditions

1 message

Baker, Adam <adam.baker@ottawa.ca> To: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com> Thu, May 9, 2019 at 11:40 AM

Hi Coaimhin,

Thanks for your patience, please see attached a revised set of boundary conditions and the following clarification from our water network group:

"Pre-configuration conditions refer to HGL and pressure for the current water pump operations existing in the BARR pressure zone. The post-Config results refer to HGL and pressures when the pressure zone BARR is split in to BARR and 3SW (which is predicted to happen by end of this year – but not guaranteed)."

Please let me know if you have any questions.

Thank you,

Adam Baker, EIT

Engineering Intern

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

Development Review - South Branch

City of Ottawa | Ville d'Ottawa

110 Laurier Avenue West Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1

613.580.2424 ext./poste 26552, Adam.Baker@ottawa.ca

35 Highbury Park Dr.docx 236K

BOUNDARY CONDITIONS



Boundary Conditions For: 35 Highbury Park Dr.

Date of Boundary Conditions: 2019-Jan-28

Provided Information:

Scenario	Demand		
	L/min	L/s	
Average Daily Demand	72	1.2	
Maximum Daily Demand	105	1.8	
Peak Hour	192	3.2	
Fire Flow #1 Demand	6,000	100.0	

Number Of Connections: 1

Location:





BOUNDARY CONDITIONS

Results:

Pre-Configuration

Connection #: 1

Demand Scenario	Head (m)	Pressure ¹ (psi)
Maximum HGL	132.9	48.6
Peak Hour	125.9	38.5
Max Day Plus Fire (6,000) L/min	121.1	31.8

¹Elevation: **98.780 m**

Post-Configuration

Connection #: 1

Demand Scenario	Head (m)	Pressure ¹ (psi)
Maximum HGL	147.8	70.8
Peak Hour	146.6	69.1
Max Day Plus Fire (6,000) L/min	139.6	59.2

¹Elevation: **98.780 m**

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:

- a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
- b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

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

BOUNDARY CONDITIONS



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.

INC.	
NEERING	
ENGIN	
GRAY	
D. B.	

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

700 Long Point Circle Ottawa, Ontario K1T 4E9

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

Avenage Daily Flows: Residential: 280 // capita/day Commercial: 28000 // ha/day Institutional: 28000 // ha/day Light holustrial: 55,000 // ha/day Heavy Industrial: 55,000 // ha/day

SANITARY SEWER DESIGN FORM

Cumulative

Infiltration Allowance: 0.33 I / s / ha

PROJECT: SEQUOIA CHURCH Designed By: DBG

1 of 1

Page:

29-May-19

	COMMENTS																															
			Ratio	a/afull																			0.03					/E				
			Velocity	(m/s)																			1.06					MAN DRI		0.67		
			Capacity	(Vs)																			34.2					R IN BATE		34.0		
ATA		0.013	Length	(m)																			33.0					Y SEWER				
SEWER D		= u	Slope	(%)																			1.000					SANITAR		0.3		
			Dia. Nom	(mm)																			200					NICIPAL		250		
			Dia. Actual	(mm)																			203.2					MU		254.0		
			Type of	Pipe					1	e)																						
	Total	Flow		s/I				122	1.1	llowanc		1.31								seats)			1.12									
ve	Infil-	tration	Flow	l/S				NOCK		ation a		0.24							C .				0.38									
Cumulat		Flow		s/I				TOB		ia Intiit		1.07								per sea			7 0.74									
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	Apartmen	(2 Bed.)	ppu = 2.	s No. of Un																												
u	Apartments	(1 Bed.)	ppu = 1.4	No. of Units																												
Deci	vpartments	(average)	pu = 1.8	Vo. of Units																												
) uplex / /	Triplex	u = 2.3 p	of Units 1																												
ŀ	Town	se	2.7 pp	Units No	 	_	_																	+			 		_	_	-	
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Douglas Gray <d.gray@dbgrayengineering.com>

RE: 35 Highbury Park Dr

1 message

Eric Lalande <eric.lalande@rvca.ca> To: "d.gray@dbgrayengineering.com" <d.gray@dbgrayengineering.com> Wed, Feb 20, 2019 at 1:36 PM

Hi Doug,

The RVCA will have no quality control requirements, the site is serviced by SWM facility prior to outetting to the Rideau River.

Please let me know if you require anything else.

Thanks,

Eric Lalande, MCIP, RPP

Planner, Rideau Valley Conservation Authority

613-692-3571 x1137

From: Jamie Batchelor Sent: Friday, February 08, 2019 10:18 AM To: Eric Lalande <eric.lalande@rvca.ca> Subject: FW: 35 Highbury Park Dr

Hi Eric,

It looks like this would be in your area.

Jamie Batchelor, MCIP, RPP

Planner, ext. 1191

jamie.batchelor@rvca.ca



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

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From: Douglas Gray <d.gray@dbgrayengineering.com> Sent: Monday, February 04, 2019 7:20 AM To: Jamie Batchelor <jamie.batchelor@rvca.ca> Cc: Ryan Faith <r.faith@dbgrayengineering.com> Subject: 35 Highbury Park Dr

Hi Jamie

We are working on a proposed church located on 11,754 sq.m. of land at 35 Highbury Park Dr in Ottawa.

Attached is a preliminary site plan.

Please comment concerning the stormwater management for this site.

Regards, Doug

D.B. GRAY ENGINEERING INC.

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

700 Long Point Circle

Tel: 613-425-8044

Ottawa, Ontario K1T 4E9

d.gray@dbgrayengineering.com

STORMWATER MANAGEMENT CALCULATIONS

The orifice calculations are based on the following formula:

 $Q = C_d \times A_o \sqrt{2gh} \times 1000$

where:

Q = flowrate in litres per second C_d = coefficient of discharge

 A_o = orifice area in sq.m.

g = 9.81 m/s2

 \hat{h} = head above orifice in meters

Storage calculations in the parking area are based on the following formula for volume of a cone:

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

where:

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

Summary Tables

ONE HUNDRED YEAR EVENT										
Drainage Area	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)						
AREA I (Uncontrolled Flow Off Site)	-	32.58	-	-						
AREA II	-	49.12	275.66	275.66						
AREA III	-	2.20	14.84	14.84						
TOTAL	83.90	83.90	290.50	290.50						

FIVE YEAR EVENT									
Drainage Area	Maximum Allowable Release Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)					
AREA I (Uncontrolled Flow Off Site)	-	15.57	-	-					
AREA II	-	48.47	129.47	129.47					
AREA III	-	2.19	5.85	5.85					
TOTAL	83.90	66.23	135.33	135.33					

Sequoia Church Ottawa, Ontario

STORM WATER MANAGEMENT CALCULATIONS Rational Method

ONE HUNDRED YEAR EVENT

(Calculations Assuming No Off Site Drainage)

Pre-Development Conditions

5 Year Event

Roof Area:	0	sq.m	0.90	
Asphalt/Concrete Area:	0	sq.m	0.90	
Gravel Area:	2572	sq.m	0.70	(Table 5.7 from Ottawa Sewer Design
	9182	sq.m	0.30	Guidelines - Flat Woodland on Clay
				and Silt Loam)
Total Catchment Area:	11754	sq.m	0.39	
Airport Formula	3			
Tc = <u>3.26 (1.1</u> -	C) (L) ^{1/2}	min		
Sw	0.33			
Runoff Coefficient (C):	0.39	see above		
Sheet Flow Distance (L):	141	m		
Slope of Land (Sw):	2	%		
Time of Concentration (Sheet Flow):	22	min		
	11754	ea m		
Time of Concentration:	00	sy.m		
	22			
Rainfall Intensity (i):	66	mm/hr (5 ye	ear event)	
Runoff Coeficient (C):	0.39			
Maximum Allowable Balaase Bate (2.78AiC):	82 00	1/0		
waximum Anowable Release Rale (2.70AIC).	03.90	L/5		

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(ONE HUNDRED YEAR EVENT - ASSUMING NO OFF SITE DRAINAGE)

Roof Area:	0	sq.m	1.00
Asphalt/Concrete Area:	127	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	2117	sq.m	0.25
Total Catchment Area:	2244	sq.m	0.29
Area (A):	2244	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr (100	year event)
Runoff Coeficient (C):	0.29		
Flow Rate (2.78AiC):	32.58	L/s	

DRAINAGE AREA II

(ONE HUNDRED YEAR EVENT - ASSUMING NO OFF SITE DRAINAGE)

	Roof Area:	1923	sq.m	1.00			
Asphalt/Co	ncrete Area:	5252	sq.m	1.00			
(Gravel Area:	324	sq.m	0.875			
Lands	caped Area:	1564	sq.m	0.25			
Total Catc	hment Area:	9063	sq.m	0.87			
Water Elevation:	97.70	m					
Invert of Outlet Pipe - CB/MH-4:	95.83	m					
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	95.90	m		Surface Sto	rage Above Ca	atch Basins	i
			CB/MH	Top Area	Depth	Ve	lume
Head:	1.81	m	OB/WIT	(sq.m)	(m)	ve	June
			CB/MH-7	335.82	0.21	23.94	cu.m
Orifice Diameter:	131	mm	CB/MH-8	441.00	0.21	31.44	cu.m
			CB-9	599.41	0.21	42.74	cu.m
Orifice Area:	13520	sq.mm	CB/MH-10	726.13	0.21	51.77	cu.m
			CB/MH-11	780.62	0.21	55.66	cu.m
Coefficient of Discharge:	0.61		CB-12	983.38	0.21	70.11	cu.m
Maximum Release Rate:	49.12	L/s		Achie	ved Volume:	275.66	cu.m
			М	aximum Volur	ne Required:	275.66	cu.m
				Release	Stored	Stored	
	Time	i	2.78AiC	Rate	Rate	Volume	
	(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(cu.m)	
	5	243	529.62	49.12	480.50	144.15	
	10	179	389.64	49.12	340.52	204.31	
	15	143	311.82	49.12	262.70	236.43	
	20	120	261 75	49 12	212 63	255 15	
	25	104	226.61	49.12	177 49	266.23	
	30	92	200.47	49.12	151 35	272 43	
	35	83	180.20	49.12	131.08	275.26	
	40	75	163.98	49.12	114.86	275.66	
	45	69	150.68	49.12	101 56	274 20	
	50	64	139.56	49.12	90.44	271.31	
	55	60	130 11	49.12	80.99	267 25	
	60	56	121.97	49.12	72 85	262.25	
	65	53	114 88	49.12	65.76	256 47	
	70	50	108 65	49.12	59.53	250.01	
	75	47	103.12	49.12	54.00	242.98	
	80	45	98.18	49.12	49.05	235.46	
	85	43	93.73	49.12	44.61	227.51	
	90	41	89.71	49.12	40.59	219.17	
	95	39	86.05	49.12	36.93	210.50	
	100	38	82.71	49.12	33.59	201.53	
	105	36	79.64	49.12	30.52	192.28	
	110	35	76.82	49.12	27.69	182.78	
	115	34	74.21	49.12	25.08	173.07	
	120	33	71.78	49.12	22.66	163.15	
	125	32	69.53	49.12	20.40	153.04	
	130	31	67.42	49.12	18.30	142.76	
	135	30	65.46	49.12	16.34	132.32	
	140	29	63.61	49.12	14.49	121.73	
	145	28	61.88	49.12	12.76	111.00	
	150	28	60.25	49.12	11.13	100.15	
	180	24	52.16	49.12	3.04	32.79	
	210	21	46.14	46.14	0.00	0.00	
	240	19	41.47	41.47	0.00	0.00	
	270	17	37.74	37.74	0.00	0.00	
	300	16	34.68	34.68	0.00	0.00	

DRAINAGE AREA III

(ONE HUNDRED YEAR EVENT)

Asphalt/Co	Roof Area: oncrete Area:	0 386	sq.m sq.m	1.00 1.00			
Lands	Gravel Area: scaped Area:	0 61	sq.m sq.m	0.875 0.25			
Total Cate	chment Area:	447	sq.m	0.90			
Water Elevation:	101.63	m					
Invert of Outlet Pipe - CB/MH-2:	99.11	m					
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-2)	99.14	m					
Head:	2.49	m					
Orifice Diameter:	50	mm		Surface Stor	age Above Ca	atch Basins	
Orifice Area:	1963	sq.mm	CB/MH	(sq.m)	(m)	Vc	olume
Coefficient of Discharge:	0.161		CB/MH-2 CB-3	50.10	0.15 0.19	3.15	cu.n cu.n
Maximum Release Rate:	2.20	L/s		Achiev	ved Volume:	14.84	cu.n
			Μ	laximum Volum	ne Required:	14.84	cu.n
				Release	Stored	Stored	
	Time	i	2.78AiC	Rate	Rate	Volume	
	(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(cu.m)	
	5	243	27.07	2.20	24.87	7.46	
	10	179	19.92	2.20	17.71	10.63	
	15	143	15.94	2.20	13.73	12.36	
	20	120	13.38	2.20	11.18	13.41	
	25	104	11.58	2.20	9.38	14.07	
	30	92	10.25	2.20	8.04	14.48	
	35	83	9.21	2.20	7.01	14.71	
	40	75	8.38	2.20	6.18	14.83	
	45	69	7.70	2.20	5.50	14.84	
	50	64	7.13	2.20	4.93	14.79	
	55	60	6.65	2.20	4.45	14.67	
	60	56	6.23	2.20	4.03	14.51	
	65	53	5.87	2.20	3.67	14.30	
	70	50	5.55	2.20	3.35	14.07	
	75	47	5.27	2.20	3.07	13.80	
	80	45	5.02	2.20	2.81	13.51	
	85	43	4.79	2.20	2.59	13.19	
	90	41	4.59	2.20	2.38	12.86	
	95	39	4.40	2.20	2.19	12.51	
	100	38	4.23	2.20	2.02	12.14	
	105	36	4.07	2.20	1.87	11.76	
	110	35	3.93	2.20	1.72	11.36	
	115	34	3.79	2.20	1.59	10.96	
	120	33	3.67	2.20	1.46	10.54	
	125	32	3.55	2.20	1.35	10.12	
	130	31	3.45	2.20	1.24	9.69	
	135	30	3.35	2.20	1.14	9.24	
	140	29	3.25	2.20	1.05	8.79	
	145	28	3.16	2.20	0.96	8.34	
	150	28	3.08	2.20	0.88	7.88	
	180	24	2.67	2.20	0.46	4.98	
	210	21	2.36	2.20	0.15	1.94	
	240	19	2.12	2.12	0.00	0.00	
	270	17	1.93	1.93	0.00	0.00	
	300	16	1.77	1.77	0.00	0.00	

cu.m

cu.m

cu.m cu.m

ONE HUNDRED YEAR EVENT

(Calculations Including Off Site Drainage)

DRAINAGE AREA II

(ONE HUNDRED YEAR EVENT - INCLUDING OFF SITE DRAINAGE)

	Roof Area	: 1923	sq.m	1.00			
Asphalt/Con	crete Area	5252	sq.m	1.00			
G	ravel Area	: 324	sq.m	0.875			
Landsc	aped Area	: 1564	sq.m	0.25	(Table 5.7 fro	m Ottawa S	Sewer Desian
Of	f Site Area	: 3216	sq.m	0.375	Guidelines -	Flat Wood	land on Clay
					and S	ilt Loam x '	125%)
Total Catch	ment Area	: 12279	sq.m	0.74			
Water Floyetien:	07 70	~					
Water Elevation.	97.70	111					
Invert of Outlet Pipe - CB/MH-4:	95.83	m					
·							
Centroid of ICD Orifice:	95.90	m					
(ICD in Outlet Pipe of CB/MH-4)				Surface Sto	rage Above Ca	atch Basins	
				Top Area	Depth	Ve	lumo
Head:	1.81	m	CB/IMIT	(sq.m)	(m)	VC	nume
			CB/MH-7	335.82	0.21	23.94	cu.m
Orifice Diameter:	131	mm	CB/MH-8	441.00	0.21	31.44	cu.m
			CB-9	599.41	0.21	42.74	cu.m
Orifice Area:	13520	sq.mm	CB/MH-10	726.13	0.21	51.77	cu.m
			CB/MH-11	780.62	0.21	55.66	cu.m
Coefficient of Discharge:	0.61		CB-12	983.38	0.21	70.11	cu.m
Maximum ICD Release Rate	49 12	1 /s		Achie	wed Volume.	275 66	cu m
Maximum Overflow Pipe Release Rate:	29.01	1/s		Achie		210.00	00.111
	20.01		М	aximum Volur	ne Required:	275.66	cu.m
	78.13	L/s					

				Pipe		
			Release	Release	Stored	Stored
Time	i	2.78AiC	Rate	Rate	Rate	Volume
(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(L/s)	(cu.m)
5	243	610.99	49.12	0.00	561.87	168.56
10	179	449.51	49.12	0.00	400.39	240.23
15	143	359.73	49.12	4.32	306.28	275.66
20	120	301.97	49.12	23.13	229.71	275.66
25	104	261.43	49.12	28.53	183.77	275.66
30	92	231.27	49.12	29.01	153.14	275.66
35	83	207.89	49.12	27.50	131.26	275.66
40	75	189.17	49.12	25.19	114.86	275.66
45	69	173.83	49.12	22.61	102.09	275.66
50	64	161.00	49.12	19.99	91.89	275.66
55	60	150.10	49.12	17.44	83.53	275.66
60	56	140.71	49.12	15.02	76.57	275.66
65	53	132.53	49.12	12.73	70.68	275.66
70	50	125.34	49.12	10.59	65.63	275.66
75	47	118.96	49.12	8.58	61.26	275.66
80	45	113.26	49.12	6.71	57.43	275.66
85	43	108.13	49.12	4.96	54.05	275.66
90	41	103.49	49.12	3.32	51.05	275.66
95	39	99.27	49.12	1.79	48.36	275.66
100	38	95.42	49.12	0.35	45.94	275.66
105	36	91.88	49.12	0.00	42.76	269.37
110	35	88.62	49.12	0.00	39.50	260.68
115	34	85.61	49.12	0.00	36.48	251.73
120	33	82.81	49.12	0.00	33.69	242.55
125	32	80.21	49.12	0.00	31.09	233.15
130	31	77.78	49.12	0.00	28.66	223.56
135	30	75.52	49.12	0.00	26.39	213.78
140	29	73.39	49.12	0.00	24.27	203.83
145	28	71.39	49.12	0.00	22.27	193.72
150	28	69.51	49.12	0.00	20.39	183.47
180	24	60.17	49.12	0.00	11.05	119.34
210	21	53.23	49.12	0.00	4.11	51.75
240	19	47.85	47.85	0.00	0.00	0.00
270	17	43.54	43.54	0.00	0.00	0.00
300	16	40.01	40.01	0.00	0.00	0.00

Overflow

FIVE YEAR EVENT

Maximum Allowable Release Rate

Pre-development Conditions

Roof Area:	0	sq.m	0.90	
Asphalt/Concrete Area:	0	sq.m	0.90	
Gravel Area:	2572	sq.m	0.70	(Table 5.7 from Ottawa Sewer Design
	9182	sq.m	0.30	Guidelines - Flat Woodland on Clay
-		_		and Silt Loam)
Total Catchment Area:	11754	sq.m	0.39	
Airport Formula				
Tc = 3.26 (1.1 -	C) (L) ^{1/2}	min		
Sw ⁰	33			
Runoff Coefficient (C):	0.39	see above		
Sheet Flow Distance (L):	141	m		
Slope of Land (Sw):	2.0	%		
Time of Concentration (Sheet Flow):	22	min		
Area (A):	11754	sq.m		
Time of Concentration:	21.9	min (see be	elow - use not le	ess than 10 min)
Rainfall Intensity (i):	66	mm/hr (5 y	ear event)	
Runoff Coeficient (C):	0.39		,	
Flow Rate (2.78AiC):	83.90	L/s		

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(FIVE YEAR EVENT - ASSUMING NO OFF SITE DRAINAGE)

Roof Area:	0	sq.m	0.90
Asphalt/Concrete Area:	127	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	2117	sq.m	0.20
Total Catchment Area:	2244	sq.m	0.24
Area (A):	2244	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr (5 ye	ar event)
Runoff Coeficient (C):	0.24		
Flow Rate (2.78AiC):	15.57	L/s	

DRAINAGE AREA II

(FIVE YEAR EVENT - ASSUMING NO OFF SITE DRAINAGE)

	Roof Area:	1923	sq.m	0.90			
Asphalt/Co	ncrete Area:	5252	sq.m	0.90			
(Gravel Area:	324	sa.m	0.70			
Lands	caped Area:	1564	sq.m	0.20			
Total Catc	hment Area:	9063	sq.m	0.77			
Water Elevation:	97.65	m					
Invert of Outlet Pipe - CB/MH-4:	95.83	m					
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	95.90	m		Surface Sto	rage Above C	atch Basins	
			CB/MH	Top Area	Depth	Ve	Jumo
Head:	1.75	m	OB/MIT	(sq.m)	(m)	ve	June
			CB/MH-7	177.58	0.16	9.21	cu.m
Orifice Diameter:	131	mm	CB/MH-8	233.19	0.16	12.09	cu.m
			CB-9	316.96	0.16	16.43	cu.m
Orifice Area:	13520	sq.mm	CB/MH-10	383.97	0.16	19.91	cu.m
			CB/MH-11	412.78	0.16	21.40	cu.m
Coefficient of Discharge:	0.61		CB-12	520.00	0.16	26.96	cu.m
Maximum Release Rate:	48.32	L/s		Achie	eved Volume:	105.99	cu.m
			М	aximum Volur	ne Required:	105.99	cu.m
				Release	Stored	Stored	
	Time	i	2 78AiC	Rate	Rate	Volume	
	min	mm/hr	1/s	L/s	L/s	cum	
	5	141	274 62	48.32	226.30	67.89	
	10	104	202.68	48.32	154 35	92.61	
	15	84	162.53	48.32	114.21	102.79	
	20	70	136.65	48.32	88.33	105.99	
	25	61	118.45	48.32	70.13	105.20	
	30	54	104.90	48.32	56.58	101.84	
	35	49	94.38	48.32	46.05	96.71	
	40	44	85.95	48.32	37.62	90.30	
	45	41	79.03	48.32	30.71	82.91	
	50	38	73.24	48.32	24.92	74.76	
	55	35	68.32	48.32	20.00	65.99	
	60	33	64.08	48.32	15.76	56.73	
	65	31	60.39	48.32	12.06	47.04	
	70	29	57.13	48.32	8.81	37.00	
	75	28	54.25	48.32	5.92	26.66	
	80	27	51.67	48.32	3.34	16.05	
	85	25	49.35	48.32	1.02	5.22	
	90	24	47.25	47.25	0.00	0.00	
	95	23	45.33	45.33	0.00	0.00	
	100	22	43.59	43.59	0.00	0.00	
	105	22	41.98	41.98	0.00	0.00	
	110	21	40.50	40.50	0.00	0.00	
	115	20	39.14	39.14	0.00	0.00	
	120	19	37.87	37.87	0.00	0.00	
	125	19	36.69	36.69	0.00	0.00	
	130	18	35.59	35.59	0.00	0.00	
	135	18	34.56	34.56	0.00	0.00	
	140	17	33.59	33.59	0.00	0.00	
	145	17	32.68	32.68	0.00	0.00	
	150	16	31.83	31.83	0.00	0.00	
	180	14	27.58	27.58	0.00	0.00	
	210	13	24.42	24.42	0.00	0.00	
	240	11	21.97	21.97	0.00	0.00	
	270	10	20.01	20.01	0.00	0.00	
	300	9	18.39	18.39	0.00	0.00	

DRAINAGE AREA III

(FIVE YEAR EVENT)

	Roof Area:	0	sq.m	0.90				
Asphalt/Co	oncrete Area:	386	sq.m	0.90				
	Gravel Area:	0	sq.m	0.70				
Lands	scaped Area:	61	sq.m	0.20				
Total Cato	chment Area:	447	sq.m	0.80				
Water Elevation:	101.59	m						
Invert of Outlet Pipe - CB/MH-2:	99.11	m						
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-2)	99.14	m						
Head:	2.45	m						
Orifice Diameter:	50	mm		Surface Stor	age Above Ca	atch Basins		
Orifice Area:	1963	sq.mm	CB/MH	Top Area (m)	Depth (m)	Vo	lume	
Coefficient of Discharge:	0.161		CB/MH-2 CB-3	132.04 22.46	0.11 0.15	4.74 1.11	cu.n cu.n	
Maximum Release Rate:	2.19	L/s		Achie	ved Volume:	5.85	cu.n	
			М	aximum Volum	ne Required:	5.85	cu.n	
				Poloasa	Stored	Storod		
	Timo	;	2 79 410	Pata	Bata	Volumo		
	min	ı mm/hr	2.78AIC			cum		
	5	1/1	14 11	2 10	11 03	3.58		
	10	104	10.42	2.19	8.23	4 94		
	15	84	8 35	2.10	6.17	5 55		
	20	70	7.02	2.10	4.84	5.80		
	20	61	6.09	2.19	3.90	5.85		
	30	54	5 39	2.19	3.20	5.00		
	35	4Q	4 85	2.10	2.66	5 59		
	40	43	4.00	2.19	2.00	5 35		
	45	41	4.06	2.19	1.87	5.06		
	50	38	3.76	2.19	1.57	4 73		
	55	35	3 51	2.10	1.32	4.37		
	60	33	3 29	2.10	1.02	3.98		
	65	31	3.10	2.19	0.92	3.57		
	70	29	2.94	2.19	0.75	3.15		
	75	28	2.79	2.19	0.60	2.70		
	80	27	2.66	2.19	0.47	2.25		
	85	25	2.54	2.19	0.35	1.78		
	90	24	2.43	2.19	0.24	1.30		
	95	23	2.33	2.19	0.14	0.81		
	100	22	2.24	2.19	0.05	0.32		
	105	22	2.16	2.16	0.00	0.00		
	110	21	2.08	2.08	0.00	0.00		
	115	20	2.01	2.01	0.00	0.00		
	120	19	1.95	1.95	0.00	0.00		
	125	19	1.89	1.89	0.00	0.00		
	130	18	1.83	1.83	0.00	0.00		
	135	18	1.78	1.78	0.00	0.00		
	140	17	1.73	1.73	0.00	0.00		
	145	17	1.68	1.68	0.00	0.00		
	150	16	1.64	1.64	0.00	0.00		
	180	14	1.42	1.42	0.00	0.00		
	210	13	1.26	1.26	0.00	0.00		
	240	11	1.13	1.13	0.00	0.00		
	270	10	1.03	1.03	0.00	0.00		
	300	9	0.95	0.95	0.00	0.00		

cu.m

cu.m

cu.m cu.m

FIVE YEAR EVENT

(Calculations Including Off Site Drainage)

DRAINAGE AREA II

(FIVE YEAR EVENT - INCLUDING OFF SITE DRAINAGE)

Asphalt/Con G Landsc Of	Roof Area crete Area aravel Area aped Area f Site Area	: 1923 5252 324 1564 3216	sq.m sq.m sq.m sq.m _sq.m	0.90 0.90 0.70 0.20 0.30	(Table 5.7 from Ottawa Sewer Desi Guidelines - Flat Woodland on Cla and Silt Loam)					
	ment Area	12279	sq.m	0.65						
Water Elevation:	97.66	m								
Invert of Outlet Pipe - CB/MH-4:	95.83	m								
Centroid of ICD Orifice: (ICD in Outlet Pipe of CB/MH-4)	95.90	m		Surface Sto	rage Above Ca	atch Basins				
Head:	1.76	m	CB/MH	Top Area (sq.m)	Depth (m)	Vo	olume			
			CB/MH-7	202.92	0.17	11.25	cu.m			
Orifice Diameter:	131	mm	CB/MH-8	266.47	0.17	14.77	cu.m			
			CB-9	362.19	0.17	20.07	cu.m			
Orifice Area:	13520	sq.mm	CB/MH-10	438.76	0.17	24.32	cu.m			
			CB/MH-11	471.69	0.17	26.14	cu.m			
Coefficient of Discharge:	0.61		CB-12	594.20	0.17	32.93	cu.m			
Maximum ICD Release Rate:	48.47	L/s		Achie	eved Volume:	129.47	cu.m			
Maximum Overnow Pipe Release Rate:	0.00	L/S	М	laximum Volur	me Required:	129.47	cu.m			
	48.47	L/s								

				Pipe		
			Release	Release	Stored	Stored
Time	i	2.78AiC	Rate	Rate	Rate	Volume
(min)	(mm/hr)	(L/s)	(L/s)	(L/s)	(L/s)	(cu.m)
5	141	312.49	48.47	0.00	264.01	79.20
10	104	230.62	48.47	0.00	182.15	109.29
15	84	184.95	48.47	0.00	136.47	122.83
20	70	155.49	48.47	0.00	107.02	128.43
25	61	134.79	48.47	0.00	86.32	129.47
30	54	119.36	48.47	0.00	70.89	127.61
35	49	107.39	48.47	0.00	58.92	123.73
40	44	97.80	48.47	0.00	49.33	118.38
45	41	89.93	48.47	0.00	41.46	111.93
50	38	83.34	48.47	0.00	34.87	104.61
55	35	77.74	48.47	0.00	29.27	96.59
60	33	72.92	48.47	0.00	24.45	88.00
65	31	68.71	48.47	0.00	20.24	78.94
70	29	65.01	48.47	0.00	16.54	69.47
75	28	61.73	48.47	0.00	13.26	59.66
80	27	58.79	48.47	0.00	10.32	49.54
85	25	56.15	48.47	0.00	7.68	39.16
90	24	53.76	48.47	0.00	5.29	28.56
95	23	51.58	48.47	0.00	3.11	17.74
100	22	49.60	48.47	0.00	1.12	6.75
105	22	47.77	47.77	0.00	0.00	0.00
110	21	46.09	46.09	0.00	0.00	0.00
115	20	44.53	44.53	0.00	0.00	0.00
120	19	43.09	43.09	0.00	0.00	0.00
125	19	41.75	41.75	0.00	0.00	0.00
130	18	40.49	40.49	0.00	0.00	0.00
135	18	39.32	39.32	0.00	0.00	0.00
140	17	38.22	38.22	0.00	0.00	0.00
145	17	37.19	37.19	0.00	0.00	0.00
150	16	36.22	36.22	0.00	0.00	0.00
180	14	31.39	31.39	0.00	0.00	0.00
210	13	27.79	27.79	0.00	0.00	0.00
240	11	25.00	25.00	0.00	0.00	0.00
270	10	22.76	22.76	0.00	0.00	0.00
300	9	20.93	20.93	0.00	0.00	0.00

Overflow

	COMMENTS												INCLUDES 3216 sq.m OFF SITE				FLOW THROUGH ICD			FLOW THROUGH ICD		FLOW THROUGH ICD		FLOW THROUGH ICD			
1 of 1		Ratio	(Marian	1	0.42	0.33		0.38	0.48		0.27	0.23	0.37	0.98	0.98	0.98	0.31	0.01	0.05	0.01	0.91	0.30	0.91	0.30			
Page:	Time of	Flow	(min)		0.35	0.35		0.37	0.66		0.35	0.35	0.46	0.65	0.56	0.74	0.74	0.18	0.16	0.16	0.06	0.06	0.18	0.18			
		Velocity	(e/III)	1	0.81	0.81		0.81	0.81		0.81	0.81	0.81	0.83	0.85	0.94	0.94	0.81	3.00	3.00	1.04	1.04	1.04	1.04		щ	2.07
		Capacity	(L/S)	-	58.8	133.0		133.0	133.0		58.8	133.0	58.8	136.3	139.5	154.6	154.6	58.8	218.7	218.7	170.9	170.9	170.9	170.9		ARK DRIV	461.9
	ER DATA	Length	(111)	1	16.8	17.1		18.2	31.9		16.8	17.1	22.1	32.2	28.6	42.0	42.0	8.8	29.3	29.3	3.5	3.5	11.3	11.3		3HBURY P	
	SEW	Slope	(0/)	1	0.34	0.20		0.20	0.20		0.34	0.20	0.34	0.21	0.22	0.27	0.27	0.34	4.70	4.70	0.33	0.33	0.33	0.33		5 ST IN HIG	1.06
	ġ	Nominal	(mm)		300	450		450	450		300	450	300	450	450	450	450	300	300	300	450	450	450	450		ISTING 52	525
	ġ	Dia. Actual	(mm)		304.8	457.2		457.2	457.2		304.8	457.2	304.8	457.2	457.2	457.2	457.2	304.8	304.8	304.8	457.2	457.2	457.2	457.2		EX	533.4
	_	Type of	- he		PVC SDR-35	CONCRETE		CONCRETE	CONCRETE		PVC SDR-35	CONCRETE	PVC SDR-35	CONCRETE	CONCRETE	CONCRETE	CONCRETE	PVC SDR-35	PVC SDR-35	CONCRETE	CONCRETE	CONCRETE	CONCRETE	CONCRETE			
	Peak	ð	(L/S)	1	24.7	43.7		50.1	64.2		15.7	30.2	21.9	134.2	137.4	151.7	48.5	0.4	10.3	2.2	155.9	50.6	155.5	50.6			
	Rainfall	i	(mm/hr)	-	104.2	102.4		104.2	100.6		104.2	102.4	104.2	97.5	94.7	92.4		104.2	103.2		89.5		89.3				
	Time of	Conc.	()	-	10.00	10.35		10.00	10.70		10.00	10.35	10.00	11.36	12.00	12.56		10.00	10.18		13.31		13.36				
	A coum	2.78 A R			0.237	0.427		0.481	0.638		0.151	0.295	0.210	1.376	1.451	1.643		0.003	0.100		1.743		1.743				
	Individual	2.78 A R			0.237	0.190		0.481	0.211		0.151	0.144	0.210	0.233	0.075	0.192		0.003	0.097								
		Roof	R = 0.90					0.1923																			
	(ha)	Landscape	R = 0.20		0.0397	0.0008			0.0104		0.0258	0.0066	0.3777	0.0134	0.0016	0.0020		0.0061									
	AREA	Gravel	۶= 0.70		0.0195						0.0129																
		Hard	= 0.90 F	0000	0.0708	0.0756			0.0822		0.0446	0.0561		0.0901	0.0296	0.0762			0.0386								
			TO R		MH-11 (MH-10 (_	MH-10	/MH-7 (/MH-8	/MH-7	/MH-7	/MH-5 (/MH-4 (IH-1 (/MH-2	1H-1 (stub		STING	3/MH			
	z	2	M		12 CB/	H-11 CB/		13 CB/	H-10 CB	_	89 69	H-8 CB	6 CB	H-7 CB	H-5 CB	H-4 N		-3 CB	H-2 N				b EXI	ö			
			FRC		CB-	CB/MI		CB-	CB/MI		Ó	CB/M	-10	CB/M	CB/M	CB/M		CB	CB/M		MH		Stu				
			STREET																								

D. B. GRAY ENGINEERING INC. Stormwater Management - Grading & Drainage - Storm & Sanitary Servers - Watermains

RATIONAL METHOD Q = 2.78 A I R FIVE YEAR EVENT STORM SEWER COMPUTATION FORM

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

700 Long Point Circle Ottawa, Ontario K1T 4E9

n = 0.013

Date: May 28, 2019

Designed By: DBG

Project: Sequoia Church

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-5

Plan showing the site and location of all existing services: see drawings C-1 to C-5

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-5

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-5

<u>Concept level master grading plan</u> 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-4

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 and Stormwater Management Report

Identification of system constraints: see page 2 & 3 of Servicing Brief and Stormwater Management Report

Confirmation of adequate domestic supply and pressure: see page 2 &3 of Servicing Brief and Stormwater Management Report

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 to 14 of Servicing Brief and Stormwater Management Report

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 & 3 of Servicing Brief and Stormwater Management Report

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

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

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

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

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

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

Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines: see page 2 & 3 of Servicing Brief and Stormwater Management Report

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 and Stormwater Management Report

(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 and Stormwater Management Report

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 page159 of Servicing Brief and Stormwater Management Report

Description of proposed sewer network including sewers, pumping stations, and forcemains: see page 4 of Servicing Brief and Stormwater Management Report

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 to 6 of Servicing Brief and Stormwater Management Report

Analysis of available capacity in existing public infrastructure. not applicable

A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern: see drawing C-2

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

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

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

Watercourse and hazard lands setbacks: not applicable

Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed: not applicable

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-5 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-5 and Servicing Brief and Stormwater Management Report

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

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

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

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

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

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

Descriptions of how the conveyance and storage capacity will be achieved for the development: see page 4 to 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 2.7 on drawing C-4

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 4 of Servicing Brief and Stormwater Management Report

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

Changes to Municipal Drains. : not applicable

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

Conclusion Checklist

Clearly stated conclusions and recommendations: see page 7 of Servicing Brief and Stormwater Management Report

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

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