

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

700 Long Point Circle
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SITE SERVICING STUDY & STORMWATER MANAGEMENT REPORT

262 ARMSTRONG STREET
OTTAWA, ONTARIO

REPORT NO. 21037

FEBRUARY 24, 2022

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1.0 INTRODUCTION

This report describes the servicing and stormwater management requirements for a proposed 3-storey, 4-unit apartment building located at 262 Armstrong Street in Ottawa, Ontario. The property is currently occupied by an existing single family dwelling to be demolished.

This report forms part of the servicing and stormwater management design for the proposed development. Also refer to drawings C-1 to C-3, prepared by D.B. Gray Engineering Inc.

2.0 WATER SERVICING

2.1 WATER SUPPLY FOR FIREFIGHTING

There is an existing municipal Class AA fire hydrant located at the intersection of Armstrong Street and Hamilton Avenue. It is 60 m unobstructed distance to the far side of the front façade of the proposed building, which is less than the maximum 90 m required by the Ontario Building Code (OBC); therefore, a private fire hydrant is not required.

The required fire flow was originally calculated in April 2021 prior to the publication of City of Ottawa Technical Bulletin ISTB-2021-03. As such, the original required fire flow was calculated, as per the Fire Underwriters Survey (FUS) method, to be 10,000 L/min (166.7 L/s) at a minimum required pressure of 140 kPa (20 psi). As per City of Ottawa Technical Bulletin ISTB-2021-03, when calculating the required fire flow where pipe sizing is not affected, the OBC method is to be used. Using the OBC method the required fire flow has since been calculated to be 2,700 L/min (45 L/s) at a minimum required pressure of 140 kPa (20 psi). Refer to calculations in Appendix A.

The boundary conditions in the 200 mm municipal watermain in Armstrong Street provided by the City of Ottawa for the original 166.7 L/s fire flow at the subject property indicate a hydraulic grade line (HGL) of 106.9 m. Refer to Appendix A. This HGL calculates to 437 kPa (63 psi). Since the pressure is above the required minimum pressure of 140 kPa (20 psi), there is an adequate water supply for firefighting from the existing municipal water distribution system.

As per City of Ottawa Technical Bulletin ISTB-2018-02, the aggregate flow of all contributing fire hydrants within 150 m of the building shall not be less than the required fire flow. The closest existing municipal fire hydrant (at the intersection of Armstrong Street and Hamilton Avenue) can contribute 5,700 L/min (95 L/s), which (as per Table 1 of ISTB-2018-02), which is greater than the required fire flow of 2,700 L/min (45 L/s).

2.2 DOMESTIC WATER SUPPLY

The water demand was originally calculated in April 2021 prior to the publication of City of Ottawa Technical Bulletin ISTB-2021-03. As such, as per

- i. the City of Ottawa Water Design Guidelines for populations and the original 350 L/person/day consumption rate;
- ii. the Ministry of the Environment Water Design Guidelines for peaking factors; and
- iii. based on the 2 1-bedroom apartment units and 2 2-bedroom apartment units;

the average daily demand was calculated to be 0.03 L/s, the maximum daily demand was calculated to be 0.3 L/s and the maximum hourly demand was calculated to be 0.4 L/s. Refer to calculations in Appendix A.

As per

- i. the City of Ottawa Water Design Guidelines for populations,
 - ii. City of Ottawa Technical Bulletin ISTB-2021-03 for the new 280 L/person/day consumption rate;
 - iii. the Ministry of the Environment Water Design Guidelines for peaking factors; and
 - iv. based on the 2 1-bedroom apartment units and 2 2-bedroom apartment units;
- the average daily demand was calculated to be 0.02 L/s, the maximum daily demand was calculated to be 0.2 L/s and the maximum hourly demand was calculated to be 0.3 L/s. Refer to calculations in Appendix A.

The boundary conditions in the 200 mm municipal watermain in Armstrong Street provided by the City of Ottawa at the subject property indicate a minimum HGL of 108.1 m and a maximum HGL of 114.6 m. Refer to Appendix A. Based on these boundary conditions the pressure at the water meter is calculated to vary between 467 kPa (68 psi) and 530 kPa (77 psi). This is an acceptable range for the proposed development.

Using the American Water Works Association (AWWA) Manual of Water Supply Practices M22 for fixture values, and based on an average water pressure at the water meter of 500 kPa (72.5 psi), the peak demand was calculated to be 1.8 L/s. A 38 mm water service connecting to the 200 mm Armstrong Street watermain is proposed to service the development. The peak demand will produce an acceptable velocity of 1.5 m/s (5.1 ft/s) in the proposed 38 mm water service. Refer to calculations in Appendix A.

3.0 SANITARY SERVICING

As per

- i. the City of Ottawa Sewer Design Guidelines for populations,
- ii. City of Ottawa Technical Bulletin ISTB-2018-01 for consumption rate, Harmon Formula correction factor, and infiltration allowance, and
- iii. the Harmon Formula for the peaking factor, and
- iv. based on the 2 1-bedroom apartment units and 2 2-bedroom apartment units;

the post development sanitary flow rate was calculated to be 0.07 L/s.

A 150 mm sanitary service at 1% slope (15.89 L/s capacity) is proposed to service the development. At the design flow rate the sanitary service will only be at 0.5% of its capacity. The proposed 150 mm sanitary service will connect to the existing 300 mm municipal sanitary sewer in Armstrong Street, which at 0.60% slope has a capacity of 78.14 L/s. The pre-development sanitary flow rate was calculated to be 0.04 L/s. Refer to calculations in Appendix B. The 0.03 L/s post development increase in flow is expected to have an acceptable impact on the 300 mm Armstrong Street sanitary sewer.

The sub-basement plumbing fixtures will drain to a sanitary sump and be pumped to the sanitary drain.

4.0 STORMWATER MANAGEMENT & STORM SERVICING

4.1 QUALITY CONTROL

The Rideau Valley Conservation Authority has stated: “The RVCA shall not require any additional quality controls on site. The RVCA encourages best management practices to be integrated into the design where possible.” Refer to Appendix C. As such, no permanent stormwater quality control measures are proposed.

An Erosion & Sediment Control Plan has been developed to be implemented during construction. Refer to drawing C-2 and notes 2.1 to 2.5 on drawing C-3. In summary: Sediment capture filter sock inserts are to be installed in all existing catch-basins adjacent to the site; and any material deposited on the public road is to be removed.

4.2 QUANTITY CONTROL

The stormwater quantity control criterion was to control the post development peak flows with the use of flow control roof drains. The runoff coefficients were each increased by 25% to a maximum of 1.00 during the 100-year event. Using the Bransby Williams Formula the pre development time of concentration was calculated to be 1 minute. Using the Rational Method with a time of concentration of 10 minutes, the pre-development flow rates were calculated to be 7.10 L/s during the 100-year event and 3.73 L/s during the 5-year event. The Modified Rational Method was used to calculate the post development flow rates and corresponding storage volumes. Refer to calculations in Appendix C.

Drainage Area I (Uncontrolled Flow Off Site – 27 sq.m)

Other than roof storage, stormwater from the property will drain uncontrolled off the site. The flow rates are calculated at a time of concentration of 10 minutes.

	100-Year Event	5-Year Event
Maximum Flow Rate	1.12 L/s	0.58 L/s

Drainage Area II (Roofs & Canopies – 116 sq.m)

The roof drain on the north roof is to be a flow control type roof drain which will restrict the flow of stormwater and cause it to pond on the roof. The roof drain is to be installed with 1 parabolic slotted weir and is to release 0.0124 L/s/mm (5 USgpm/in). The opening at the top of the flow control weir is to be a minimum 50 mm in diameter. The roof drain is to be a Watts with an Accutrol Weir RD-100-A1 or approved equal. A minimum of 2 scuppers each a minimum 200 mm wide are to be installed 150 mm above the roof drain. Refer to architectural for exact locations and details. The roof is to be designed to carry the load of water having a 50 mm depth at the scuppers or 200 mm depth at the roof drain. Refer to structural.

	100-Year Event	5-Year Event
Maximum Release Rate	1.94 L/s	1.38 L/s
Maximum Depth at Roof Drain	150 mm	111 mm
Maximum Volume Stored	2.40 cu.m	0.99 cu.m

Entire Site:

	100-Year Event	5-Year Event
Pre-Development Flow Rate	7.10 L/s	3.73 L/s
Maximum Release Rate	3.06 L/s	1.96 L/s
Maximum Volume Stored	2.40 cu.m	0.99 cu.m

The maximum post development release rates were calculated to be 6.35 L/s during the 100-year event and 3.98 L/s during the 5-year event. Therefore, the maximum post development release rate is calculated to be 57% less than the pre-development flow rate during the 100-year event and 47% less during the 5-year event.

4.3 STORM SERVICING

The unrestricted roof flow rate during the 5-year event was calculated to be 3.44 L/s. A 150 mm storm service at 1% slope (15.89 L/s capacity) is proposed to service the development. At the design flow rate the storm service will only be at 22% of its capacity. The proposed 150 mm storm service will connect to the existing 900 mm municipal storm sewer in Armstrong Street, which at 0.63% slope has a capacity of 1,499 L/s. Refer to calculations in Appendix C.

The post development reduction in flow is expected to have a positive impact on the 900 mm Armstrong Street storm sewer.

The foundation drains will drain to a storm sump and be pumped to the storm drain.

5.0 CONCLUSIONS

1. A private fire hydrant is not required.
2. There is an adequate water supply for firefighting from the existing municipal water distribution system.
3. The aggregate flow of all contributing fire hydrants is greater than the required fire flow.
4. There is an acceptable range of water pressures in the existing water distribution system.
5. The post development sanitary flow rate will be adequately handled by the proposed sanitary service.
6. The post development increase in sanitary flow is expected to have an acceptable impact on the existing municipal sanitary sewer.
7. The Rideau Valley Conservation Authority does not require permanent stormwater quality control measures. As such, no permanent measures are proposed.
8. An Erosion & Sediment Control Plan has been developed to be implemented during construction.
9. The maximum post development release rate is calculated to be 57% less than the pre-development flow rate during the 100-year event and 47% less during the 5-year event.

10. The post development reduction in stormwater flow is expected to have a positive impact on the existing municipal storm sewer.
11. The unrestricted flow rate during the 5-year event will be adequately handled by the proposed storm service.

Prepared by D.B. Gray Engineering Inc.



NOT VALID UNLESS
SIGNED & DATED

APPENDIX A

WATER SERVICING



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 d.gray@dbgrayengineering.com

05-Apr-21

REVISED 14-Apr-21

262 Armstrong Street
 Ottawa, Ontario

Fire Flow Requirements

Proposed 3-Storey 4-Unit Apartment Building (Not Sprinklered)

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

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

C = coefficient related to the type of construction
 = 1.50 Wood Frame Construction

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

Proposed Building (262 Armstrong)	Mezzanine	49	sq.m.
	3rd Floor	124	sq.m.
	2nd Floor	124	sq.m.
	Ground Floor	102	sq.m.
	TOTAL FIRE AREA:	399	sq.m.

260 Armstrong	2nd Floor	59	sq.m.
	Ground Floor	64	sq.m.
	TOTAL FIRE AREA:	123	sq.m.

$$F = 7,540 \text{ L/min}$$

$$= 8,000 \text{ L/min (rounded off to the nearest 1,000 L/min)}$$

-15% Charge for Limited-combustible Occupancy

$$= 6,800 \text{ L/min}$$

0% Reduction: No Sprinkler System

$$= - \text{ L/min}$$

Increase for Separation Exposed Buildings

		Adjacent Building			Length-Height Factor	
		Constuction	Length m	Storeys		
10%	North	10.1 to 20m	Ordinary	13	2	26
0%	East	>45m	W-F			0
14%	South	10.1 to 20m	NC	8	8	64
17%	West	3.1 to 10m	W-F	10	2	20
41%	Total Increase for Exposure (maximum 75%)					
=	2,788	L/min Increase				

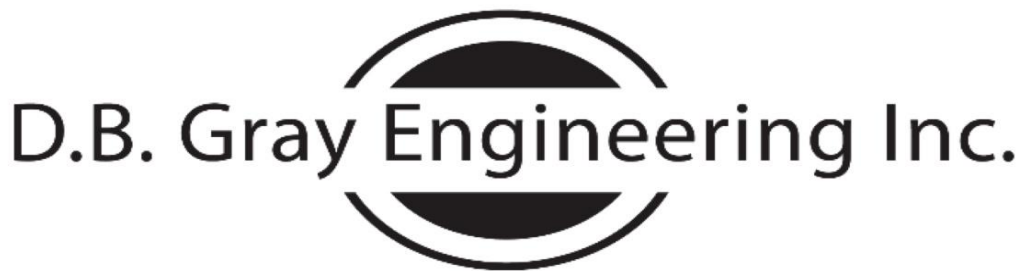
$$= 9,588 \text{ L/min}$$

$$F = 10,000 \text{ L/min (rounded off to the nearest 1,000 L/min)}$$

$$= 166.7 \text{ l/s}$$

Centerline of Road
 Grade Elevation: 62.34 m ASL

167 l/s FIRE FLOW: 106.9 m ASL Static Pressure at Fire Hydrant
 63 psi 437 kPa



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January 31, 2022

262 Armstrong Street
3 Storey Apartment Building
Ottawa, Ontario

FIRE FLOW CALCULATIONS OBC Method

Q = Required water supply in litres
= KVS_{Total}

K = Water supply coefficient, as per OBC A-3.2.5.7. Table 1
= 23 Group C Occupancy, Building is of combustible construction with fire separations without fire resistance ratings.

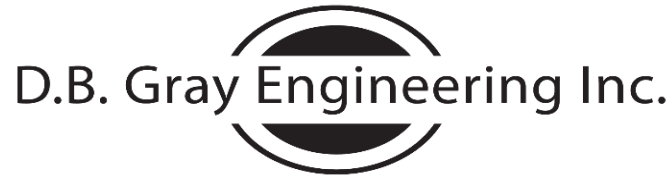
V = Building volume in cubic meters

	Floor Area (sq.m)	Height (m)	Volume (cu.m)
Mezzanine	45	3.2	144
3rd Floor	135	3.2	432
2nd Floor	135	3.2	432
1st Floor	90	3.2	288
			1,296

S_{Total} = Total of spatial coefficients from exposure distances
= $1.0 + S_{Side 1} + S_{Side 2} + S_{Side 3} + S_{Side 4}$

	Spatial Coefficient	Exposure Distance (m)	
$S_{Side 1}$	0.4	6.0	(to centerline of road)
$S_{Side 2}$	0.5	0.0	(to east property line)
$S_{Side 3}$	0.5	0.0	(to south property line)
$S_{Side 4}$	0.5	0.0	(to west property line)
S_{Total}	2.9		Need not exceed 2.0

Q = 59,616 L
= 2,700 L/min as per OBC A-3.2.5.7. Table 2
= 45 L/s



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05-Apr-21
 REIVISED 14-Apr-21

262 Armstrong Street
 Proposed 3-Storey 4-Unit Apartment Building
 Ottawa, Ontario

Water Demand

	Number of Units	Persons Per Unit	Population
UNIT TYPE:			
Single Family:	0	3.4	0
Semi- detached:	0	2.7	0
Duplex:	0	2.3	0
Townhouse:	0	2.7	0
APARTMENTS:			
1 Bedroom:	2	1.4	3
2 Bedroom:	2	2.1	4
3 Bedroom:	0	3.1	0
Average Aptarment:	0	1.8	0
TOTAL:			7

DAILY AVERAGE

350	litres / person / day
1.7	l/min
0.03	l/s
0.4	USgpm

MAXIMUM DAILY DEMAND

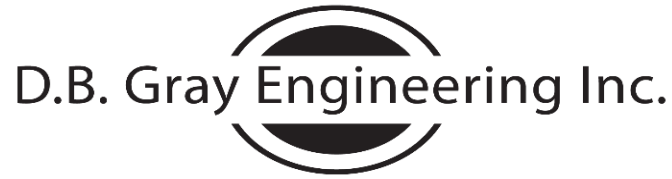
9.5	(Peaking Factor for a population of 30: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)
16.2	l/min
0.3	l/s
4	USgpm

MAXIMUM HOURLY DEMAND

14.3	(Peaking Factor for a population of 30: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)
24.3	l/min
0.4	l/s
6	USgpm

Elevation of Water Meter: 60.5 m ASL
 Basement Floor Elevation: 59.6 m ASL

		Static Pressure at Water Meter	
MINIMUM HGL:	108.1 m ASL	68 psi	467 kPa
MAXIMUM HGL:	114.6 m ASL	77 psi	530 kPa



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05-Apr-21
 REIVISED 14-Apr-21
 REIVISED 31-Jan-22

262 Armstrong Street
 Proposed 3-Storey 4-Unit Apartment Building
 Ottawa, Ontario

Water Demand

	Number of Units	Persons Per Unit	Population
UNIT TYPE:			
Single Family:	0	3.4	0
Semi- detached:	0	2.7	0
Duplex:	0	2.3	0
Townhouse:	0	2.7	0
APARTMENTS:			
1 Bedroom:	2	1.4	3
2 Bedroom:	2	2.1	4
3 Bedroom:	0	3.1	0
Average Aptarment:	0	1.8	0
TOTAL:			7

DAILY AVERAGE

280	litres / person / day		
1.4	l/min	0.02	l/s
0.4	USgpm		

MAXIMUM DAILY DEMAND

9.5	(Peaking Factor for a population of 30: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)		
12.9	l/min	0.2	l/s
3	USgpm		

MAXIMUM HOURLY DEMAND

14.3	(Peaking Factor for a population of 30: Table 3-3 MOE Design Guidelines for Drinking-Water Systems)		
19.5	l/min	0.3	l/s
5	USgpm		

Elevation of Water Meter: 60.5 m ASL
 Basement Floor Elevation: 59.6 m ASL

		Static Pressure at Water Meter	
MINIMUM HGL:	108.1 m ASL	68	psi
		467	kPa
MAXIMUM HGL:	114.6 m ASL	77	psi
		530	kPa

262 Armstrong Street Ottawa, Ontario

PEAK WATER DEMAND

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

	No.	F.V.	Total
Bathtub	4	8	32
Toilet - Tank	5	6	30
Toilet - Flush Valve	0	24	0
Lavatory	6	1.5	9.0
Bidet	0	2	0
Urinal - Wall Flush Valve	0	10	0
Shower	1	2.5	2.5
Kitchen Sink	4	1.8	7.2
Dishwasher	4	1.3	5.2
Clothes Washer	4	6	24
Commercial Sink	0	4	0
Janitor Sink	1	4	4
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

113.9

Peak Demand (Figure 4-2 or 4-3 AWWA M22) 25 USgpm

Pressure @ Meter 500 kPa 72.5 psi

Pressure Factor (Table 4-1 AWWA M22) 1.11

TOTAL PEAK DEMAND 105 L/min 28 USgpm 1.8 L/s

Nominal Size 1.5 in 38 mm
 5.1 ft/s 1.5 m/s



Douglas Gray <d.gray@dbgrayengineering.com>

RE: 262 Armstrong St - Boundary Condition Request

1 message

Fawzi, Mohammed <mohammed.fawzi@ottawa.ca>
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>

Tue, Apr 13, 2021 at 11:11 AM

Good Morning Doug,

The following are boundary conditions, HGL, for hydraulic analysis at 262 Armstrong St (zone 1W) assumed to be connected to the 203 mm on Armstrong St (see attached PDF for location).

Minimum HGL = 108.1 m

Maximum HGL = 114.6 m

Max Day + Fire Flow 1 (166.7 L/s) = 106.9 m

Max Day + Fire Flow 2 (116.7 L/s) = 108.4 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.

Thank you.

Best Regards,

Mohammed Fawzi, E.I.T.

Project Manager

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

Development Review - Central Branch

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

613.580.2424 ext./poste 20120, Mohammed.Fawzi@ottawa.ca

****Please note that due to the current situation, I am working remotely. Email is currently the best way to contact me****

From: Fawzi, Mohammed
Sent: April 07, 2021 8:16 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: RE: 262 Armstrong St - Boundary Condition Request

Good Morning Doug,

This is to confirm that I have forwarded the request.

Thank you.

Best Regards,

Mohammed Fawzi, E.I.T.

Project Manager

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

Development Review - Central Branch

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613.580.2424 ext./poste 20120, Mohammed.Fawzi@ottawa.ca

****Please note that due to the current situation, I am working remotely. Email is currently the best way to contact me****

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: April 06, 2021 8:09 AM
To: Fawzi, Mohammed <mohammed.fawzi@ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>
Subject: 262 Armstrong St - Boundary Condition Request

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ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Mohammed

Please provide the boundary conditions at 262 Armstrong St. We have calculated the following expected demands based on a 4-unit apartment building.

Average daily demand: 0.03 L/s.

Maximum daily demand: 0.3 L/s.

Maximum hourly daily demand: 0.4 L/s

Fire Flow demand: 166.7 L/s

Fire Flow + Max Day: 167.0 L/s

We are looking at alternative designs so please also provide the boundary conditions for a fire flow demand of 116.7 l/s.

Average daily demand: 0.03 L/s.

Maximum daily demand: 0.3 L/s.

Maximum hourly daily demand: 0.4 L/s

Fire Flow demand: 116.7 L/s

Fire Flow + Max Day: 117.0 L/s

Our calculations are attached.

Regards, Doug



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

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Tel: 613-425-8044

Ottawa, Ontario K1T 4E9

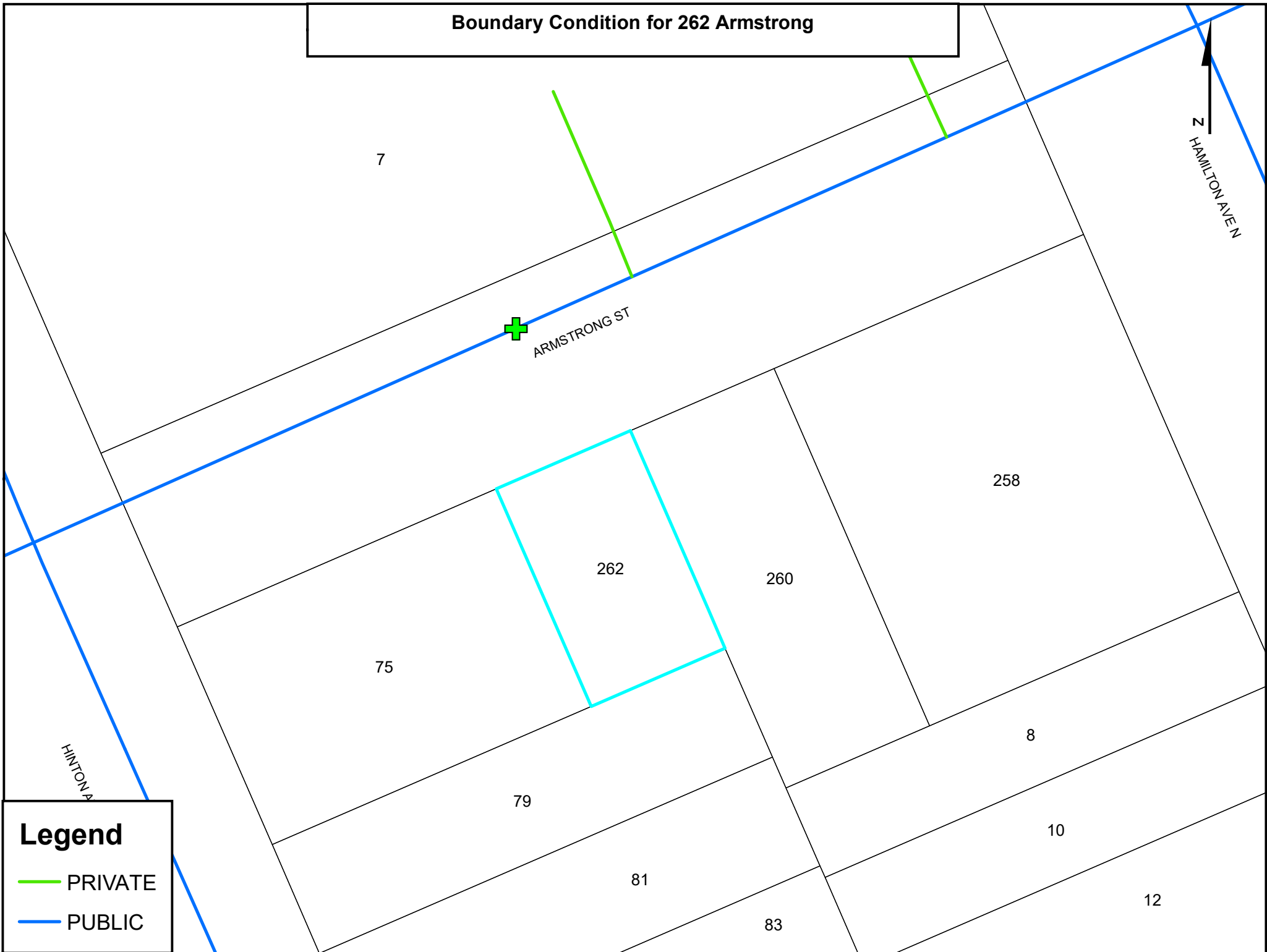
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 **262 Armstrong April 2021.pdf**
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Boundary Condition for 262 Armstrong



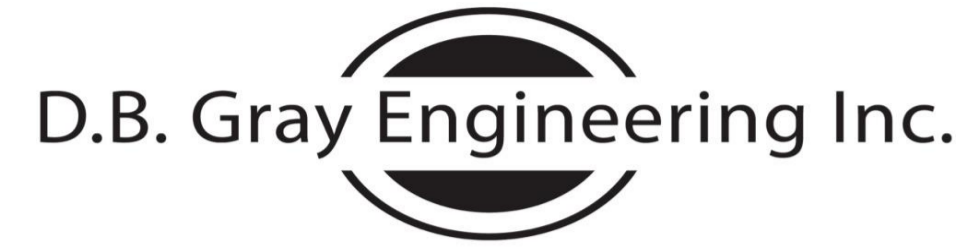
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— PRIVATE

— PUBLIC

APPENDIX B

SANITARY SERVICING



Stormwater Management - Grading & Drainage - Storm & Sanitary Sewers - Watermains
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SANITARY SEWER DESIGN FORM

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

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 contribution > 20%
 Commercial & Institutional: 1 If contribution < 20%
 Industrial: As per Ottawa Guidelines Appendix 4-B

Project: 262 Armstrong Street

Designed By: D.B.G

January 31, 2022

Page: 1 of 1

Infiltration Allowance: 0.33 l / s / ha

n = 0.013

Location		Section								Cumulative Residential		Section Non-Residential			Cumulative					Sewer Data									
		Single Family ppu = 3.4 No. of Units	Semi / Townhouse ppu = 2.7 No. of Units	Duplex / Triplex ppu = 2.3 No. of Units	Apartment (average) ppu = 1.8 No. of Units	Apartment (1 Bed) ppu = 1.4 No. of Units	Apartment (2 Bed) ppu = 2.1 No. of Units	Apartment (3 Bed) ppu = 3.1 No. of Units	Area (ha)	Pop.	Peaking Factor	Area (ha)	Flow (L/ha/day)	Peaking Factor	Flow (L/s)	Area (ha)	Sewage Flow (L/s)	Infiltration Flow (L/s)	Total Flow (L/s)	Material	Actual Diameter (mm)	Nominal Diameter (mm)	Slope (%)	Length (m)	Capacity (L/s)	Velocity (m/s)	Ratio Q/Qfull		
Existing Single Family Dwelling																													
Existing Dwelling	Existing 300 SAN	1							0.0143	3.4	3.20				0.0143	0.04	0.00	0.04											
Proposed Apartment Building																													
Proposed Building	Existing 300 SAN				2	2			0.0143	7	3.20				0.0143	0.07	0.00	0.08	PVC	152.4	150	1.00	8.6	15.89	0.87	0.005			
Existing 300 SAN in Armstrong Street																													
																				304.8	300	0.60	78.14	1.07					

APPENDIX C

STORMWATER MANAGEMENT & STORM SERVING



Ryan Faith <r.faith@dbgrayengineering.com>

RE: RVCA Stormwater Management Comments - 262 Armstrong Street

1 message

Eric Lalande <eric.lalande@rvca.ca>
To: Ryan Faith <r.faith@dbgrayengineering.com>

Tue, Jun 1, 2021 at 10:21 AM

Hi Ryan,

The RVCA shall no require any additional quality controls on site. The RVCA encourages best management practices to be integrated into the design where possible.

Thank you,

Eric Lalande, MCIP, RPP

Planner, RVCA

613-692-3571 x1137

From: Ryan Faith <r.faith@dbgrayengineering.com>
Sent: Monday, May 31, 2021 10:07 AM
To: Eric Lalande <eric.lalande@rvca.ca>
Cc: Douglas Gray <d.gray@dbgrayengineering.com>
Subject: RVCA Stormwater Management Comments - 262 Armstrong Street

Hi Eric,

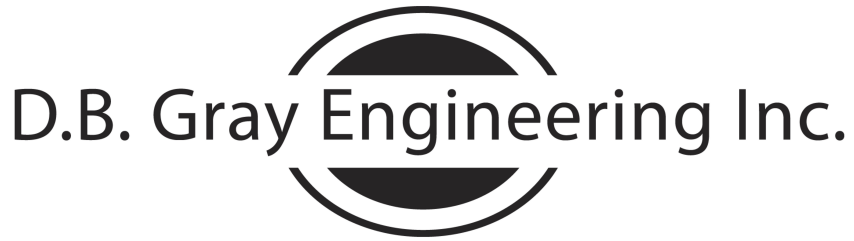
We are working on a proposed 3 storey apartment building on 143 sq.m of land at 262 Armstrong Street in Ottawa.

Please comment on the stormwater management for the site.

I have attached a site plan for your reference.

Thanks,

Ryan Faith



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

700 Long Point Circle
Ottawa, Ontario

613-425-8044
r.faith@dbgrayengineering.com

Summary Tables

ONE HUNDRED-YEAR EVENT				
Drainage Area	Pre-Development Flow Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site)	-	1.12	-	-
AREA II (Roof)	-	1.94	2.40	2.40
TOTAL	7.10	3.06	2.40	2.40

FIVE-YEAR EVENT				
Drainage Area	Pre-Development Flow Rate (L/s)	Maximum Release Rate (L/s)	Maximum Volume Required (cu.m)	Maximum Volume Stored (cu.m)
AREA I (Uncontrolled Flow Off Site)	-	0.58	-	-
AREA II (Roof)	-	1.38	0.99	0.99
TOTAL	3.73	1.96	0.99	0.99

262 Armstrong Street

Ottawa, Ontario

STORMWATER MANAGEMENT CALCULATIONS

Rational Method

PRE-DEVELOPMENT CONDITIONS

100-Year Flow Rate

			C
Roof Area:	66	sq.m	1.00
Asphalt/Concrete Area:	77	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	<u>0</u>	<u>sq.m</u>	<u>0.25</u>
Total Catchment Area:	143	sq.m	1.00

Bransby William Formula

$$T_c = \frac{0.057 \cdot L}{S_w^{0.2} \cdot A^{0.1}} \text{ min}$$

Sheet Flow Distance (L):	15	m
Slope of Land (Sw):	1	%
Area (A):	0.0143	ha

Time of Concentration (Sheet Flow): 1 min

Area (A):	143	sq.m
Time of Concentration:	10	min
Rainfall Intensity (i):	179	mm/hr
Runoff Coefficient (C):	1.00	

100-Year Pre-Development Flow Rate (2.78AiC): 7.10 L/s

5-Year Flow Rate

			C
Roof Area:	66	sq.m	0.90
Asphalt/Concrete Area:	77	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	143	sq.m	0.90
Area (A):	143	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coeficient (C):	0.90		
5-Year Pre-Development Flow Rate (2.78AiC):	3.73	L/s	

Maximum Allowable Release Rate

			C
Roof Area:	66	sq.m	0.90
Asphalt/Concrete Area:	77	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	0	sq.m	0.20
Total Catchment Area:	143	sq.m	0.90
Area (A):	143	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr (5 year event)	
Runoff Coeficient (C):	0.50		
Maximum Allowable Flow Rate (2.78AiC):	2.07	L/s	

ONE HUNDRED-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(ONE HUNDRED-YEAR EVENT)

			C
Roof Area:	16	sq.m	1.00
Asphalt/Concrete Area:	5	sq.m	1.00
Gravel Area:	0	sq.m	0.875
Landscaped Area:	6	sq.m	0.25
			<hr/>
Total Catchment Area:	27	sq.m	0.83
Area (A):	27	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	179	mm/hr	
Runoff Coefficient (C):	0.83		
Flow Rate (2.78AiC):	1.12	L/s	

DRAINAGE AREA II (North Roof)

(ONE HUNDRED-YEAR EVENT)

			C
Total Catchment Area:	116	sq.m	1.00
No. of Roof Drains:	1		
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)	
Depth at Roof Drain:	150	mm	
Maximum Slot Release Rate:	1.86	L/s	Pond Area: 48 sq.m
Maximum Scupper Release Rate:	0.08	L/s	
			Achieved Volume: 2.40 cu.m
Total Maximum Release Rate:	1.94	L/s	Maximum Volume Required: 2.40 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Slot Release Rate (L/s)	Weir Release Rate (L/s)	Total Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	179	5.76	1.86	0.00	1.86	3.90	2.34
15	143	4.61	1.86	0.08	1.94	2.67	2.40
20	120	3.87	1.86	0.01	1.87	2.00	2.40
25	104	3.35	1.86	0.00	1.86	1.49	2.23
30	92	2.96	1.86	0.00	1.86	1.10	1.98
35	83	2.66	1.86	0.00	1.86	0.80	1.69
40	75	2.42	1.86	0.00	1.86	0.56	1.35
45	69	2.23	1.86	0.00	1.86	0.37	0.99
50	64	2.06	1.86	0.00	1.86	0.20	0.61
55	60	1.92	1.86	0.00	1.86	0.06	0.21
60	56	1.80	1.80	0.00	1.80	0.00	0.00

FIVE-YEAR EVENT

DRAINAGE AREA I (Uncontrolled Flow Off Site)

(FIVE-YEAR EVENT)

			C
Roof Area:	16	sq.m	0.90
Asphalt/Concrete Area:	5	sq.m	0.90
Gravel Area:	0	sq.m	0.70
Landscaped Area:	6	sq.m	0.20
			<hr/>
Total Catchment Area:	27	sq.m	0.74
Area (A):	27	sq.m	
Time of Concentration:	10	min	
Rainfall Intensity (i):	104	mm/hr	
Runoff Coeficient (C):	0.74		
Flow Rate (2.78AiC):	0.58	L/s	

DRAINAGE AREA II (North Roof)

(FIVE-YEAR EVENT)

			C
Total Catchment Area:	116	sq.m	0.90
No. of Roof Drains:	1		
Slots per Wier:	1	0.0124 L/s/mm/slot (5 USGPM/in/slot)	
Depth at Roof Drain:	111	mm	
Maximum Release Rate:	1.38	L/s	
			Pond Area: 27 sq.m
			Achieved Volume: 0.99 cu.m
			Maximum Volume Required: 0.99 cu.m

Time (min)	i (mm/hr)	2.78AiC (L/s)	Release Rate (L/s)	Stored Rate (L/s)	Stored Volume (cu.m)
10	104	3.02	1.38	1.64	0.99
15	84	2.43	1.38	1.04	0.94
20	70	2.04	1.38	0.66	0.79
25	61	1.77	1.38	0.39	0.58
30	54	1.57	1.38	0.18	0.33
35	49	1.41	1.38	0.03	0.05
40	44	1.28	1.28	0.00	0.00
45	41	1.18	1.18	0.00	0.00
50	38	1.09	1.09	0.00	0.00
55	35	1.02	1.02	0.00	0.00
60	33	0.96	0.96	0.00	0.00

APPENDIX D

PRE-CONSULTATION MEETING NOTES & CITY OF OTTAWA SERVICING STUDY CHECKLIST

Site Plan Control Pre-consultation
262 Armstrong Street

Applicant: Paul Cooper

Owner: Lane Lunetta

Meeting Date: February 22nd 2021

Attendees: Applicant Team

Paul Cooper, Applicant and Architect

Lance Lunetta, Owner

Mark MacDonald, General Contractor

City of Ottawa

Seana Turkington – Planner

Randolph Wang – Urban Designer

Mohammed Fawzi – Engineering

Mark Richardson – Forester

Shukufa Sultonmamad – Student Planner

Meeting Notes & Comments

Proposal:

- Proposed to demolish existing duplex and construct a 4-unit low-rise apartment building with a rooftop patio.
- Would build out to lot lines.

Planning Comments – Seana Turkington

- Site designated Mixed-use Centre on Schedule B of the current Official Plan (OP).
- The site is also within the boundary of both the Wellington Street West Secondary Plan and the Wellington Street Community Design Plan (CDP).
- Zoned MC16 H(20).
- Bike parking needs to conform with Section 111 and garbage with Section 143.
- Amenity area is required for 4-unit proposals. Please incorporate amenity area into the proposal. Consider using the proposed rooftop amenity area as communal area for all tenants, as opposed to having the rooftop be for the exclusive use and benefit of unit 4 (which would result in unit 4 having amenity area and the remaining 3 units having none).
- It is noted that minor variances may be required. It is recommended that any variance application be submitted following the first review of the site plan application. Further discussion with staff concerning proposed variances is required.

Urban Design Comments- Randolph Wang

- A Design Brief is required as part of the site plan control applications. The Terms of Reference for the Design Brief is attached for convenience.
- The site is within a Design Priority Area but the proposed low-rise development is exempted from the review by the City's Urban Design Review Panel (UDRP). Anything taller than 4 storeys, however, will be subject to the review by the UDRP.
- The proposed building looks quite handsome architecturally. Moving forward:
 - Please study and show the development potential on the abutting properties in accordance with the zoning. This study will help to understand and evaluate the appropriateness of the proposed design in planned context to make sure access to natural light and free air will not be denied when abutting properties are developed in the future.
 - Please make sure a 2m building setback from Armstrong at ground level as required by the zoning is provided. Armstrong is a narrow street. The area is undergoing significant changes as directed by planning policies. It is crucially important to make sure the pedestrian realm is of sufficient width to support the on-going intensification.
 - The provision of parking and its conflict with bike parking and waste management is concerning.
 - Installing a canopy above the main entrance is normally a good practice. However, extending the canopy above the very narrow sidewalk is concerning.

Engineering Comments – Mohammed Fawzi

Available Infrastructure:

Sanitary: 300mm PVC (Install 1992)

Storm: 900mm Conc (Install 1992)

Water: 200mm PVC (Install 1992)

Water Boundary Conditions:

Will be provided at request of consultant. Requests must include the location of the service and the expected loads required by the proposed development. Please provide the following and submit Fire Flow Calculation Sheet per FUS method with the request:

- Location of service
- Type of development and amount of required fire flow (per FUS method – include FUS calculation sheet with request)
- Average Daily Demand (l/s)
- Maximum Hourly Demand (l/s)
- Maximum Daily Demand (l/s)
- Water Supply Redundancy – Fire Flow:
Applicant to ensure that a second service with an inline valve chamber be provided where the average daily demand exceeds 50 m³ / day (0.5787 l/s per day)

Water services larger than 19 mm require a Water Data Card. Please complete card and submit.

Stormwater Management:

- Coefficient (C) of runoff determined **as per existing conditions** but in no case more than 0.5
- TC = To be calculated, minimum 10 minutes
- Any storm events greater than 5 year, up to 100 year, and including 100-year storm event must be detained on site.
- Foundation drains are to be independently connected to sewer main unless being pumped with appropriate back up power, sufficient sized pump and back flow prevention.
- Roof drains are to be connected downstream of any incorporated ICD within the SWM system.

Stormwater management criteria (Quality Control)

Include a section in the SWM report concerning quality control requirements. It is the consultant's responsibility to check with the relevant Conservation Authority for quality control issues and include this information in the SWM report.

Phase I and Phase II ESA:

- Phase I ESA is required; Phase II ESA may be required depending on the results of the Phase I ESA. Phase I ESA must include an EcoLog ERIS Report.
- Phase I ESA and Phase II ESAs must conform to clause 4.8.4 of the Official Plan that requires that development applications conform to Ontario Regulation 153/04.

Required Studies

- Servicing and Stormwater Management Report
- Geotechnical Study
- Phase I ESA
- Phase II ESA (depends on outcome of Phase I)

Required Plans

- Site Servicing Plan
- Grade Control and Drainage Plan
- Erosion and Sediment Control Plan (Can be combined with grading plan)

Relevant information

1. The Servicing Study Guidelines for Development Applications are available at the following address: <https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans#servicing-study-guidelines-development-applications>
2. Servicing and site works shall be in accordance with the following documents:
 - Ottawa Sewer Design Guidelines (October 2012)
 - Ottawa Design Guidelines – Water Distribution (2010)
 - Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
 - City of Ottawa Slope Stability Guidelines for Development Applications (revised 2012)
 - City of Ottawa Environmental Noise Control Guidelines (January, 2016)
 - City of Ottawa Park and Pathway Development Manual (2012)
 - City of Ottawa Accessibility Design Standards (2012)
 - Ottawa Standard Tender Documents (latest version)
 - Ontario Provincial Standards for Roads & Public Works (2013)
3. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).
4. Any proposed work in utility easements requires written consent of easement owner.

Forester Comments – Mark Richardson

TCR requirements:

- Tree Conservation Report (TCR) must be supplied for review along with the suite of other plans/reports required by the City
 - an approved TCR is a requirement of Site Plan approval.
- As of January 1 2021, any removal of privately or publicly (City) owned trees 10cm or larger in diameter requires a tree permit issued under the Tree Protection Bylaw (Bylaw 2020 – 340); the permit will be based on an approved TCR and made available at or near plan approval.

- The Planning Forester from Planning and Growth Management as well as foresters from Forestry Services will review the submitted TCR
 - If tree removal is required, both municipal and privately-owned trees will be addressed in a single permit issued through the Planning Forester
 - Compensation may be required for city owned trees – if so, it will need to be paid prior to the release of the tree permit
- the TCR must list all trees on site by species, diameter and health condition
- the TCR must list all trees on adjacent sites if they have a critical root zone that extends onto the development site
- If trees are to be removed, the TCR must clearly show where they are, and document the reason they cannot be retained
- All retained trees must be shown and all retained trees within the area impacted by the development process must be protected as per City guidelines available at Tree Protection Specification or by searching Ottawa.ca
 - securities may be required for retained trees
 - the location of tree protection fencing must be shown on a plan
 - show the critical root zone of the retained trees
 - if excavation will occur within the critical root zone, please show the limits of excavation
- the City encourages the retention of healthy trees; if possible, please seek opportunities for retention of trees that will contribute to the design/function of the site.

LP tree planting requirements:

For additional information on the following please contact Tracy.Smith@Ottawa.ca

Minimum Setbacks

- Maintain 1.5m from sidewalk or MUP/cycle track.
- Maintain 2.5m from curb
- Coniferous species require a minimum 4.5m setback from curb, sidewalk or MUP/cycle track/pathway.
- Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing.
- Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.

Tree specifications

- Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.
- Maximize the use of large deciduous species wherever possible to maximize future canopy coverage
- Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; and include watering and warranty as described in the specification (can be provided by Forestry Services).
- Plant native trees whenever possible
- No root barriers, dead-man anchor systems, or planters are permitted.
- No tree stakes unless necessary (and only 1 on the prevailing winds side of the tree)

Hard surface planting

- Curb style planter is highly recommended
- No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.
- Trees are to be planted at grade

Soil Volume

Please ensure adequate soil volumes are met:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

Please note that these soil volumes are not applicable in cases with Sensitive Marine Clay.

Sensitive Marine Clay

- Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines

Additional Comments and Considerations

Planning

Official Plan Designation: Mixed Use Centre

Secondary Plan and/or Community Design Plan: Wellington Street West Secondary Plan and Wellington Street CDP

Zoning By-law: MC16 H(20)

Other:

- Note that in November 2020, a draft of the New Official Plan was released for review and comment. The policy framework may be subject to change prior to application submission. Depending on timing of application submission, any application submitted prior to the New OP coming into effect shall have regard to the policy direction. For further information, please visit: <https://engage.ottawa.ca/the-new-official-plan>
- Prior to submission of a formal development application, it is recommended that the applicant revise the proposal and have further discussions with City staff on the revisions made and provide further information (i.e. elevations)
- The required Planning Rationale should discuss the existing policies in place (OP, Secondary Plan, CDP and Zoning By-law) in relation to the proposal and how the proposal complies.
- If a formal Site Plan Control application is submitted, please ensure that the required zoning table shows the existing, the proposed, the requirements under the Zoning By-law, and how the proposal meets (or does not meet) the existing requirements.
- Prior to formal application submission, it is recommended that the proposal be discussed with the Community Association and Ward Councillor.
- Please note that this proposal will be subject to Cash-in-Lieu of Parkland, as per the City's Parkland Dedication By-law (<https://ottawa.ca/en/living-ottawa/laws-licences-and-permits/laws/law-z/parkland-dedication-law-no-2009-95>). Additionally, the proposal will also be subject to Development Charges (DCs). For more information on DCs, please consult the City's Development Charges By-law and/or contact Building Code Services (BCS).

Application Submission Information

Application Type: **Site Plan Control, Standard, Staff Approval (based on plans discussed at the meeting of February 22nd, 2021)**

For information on Site Plan Control Thresholds under the Site Plan Control By-law, please visit: https://documents.ottawa.ca/sites/documents/files/siteplan_thresholds_en.pdf

For information on Applications, including fees, please visit: <https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/fees-and-funding-programs/development-application-fees>

The application processing timeline generally depends on the quality of the submission. For more information on standard processing timelines, please visit: <https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/development-application-forms#site-plan-control>

Prior to submitting a formal application, it is recommended that you pre-consult with the Ward Councillor.

Application Submission Requirements

For information on the preparation of Studies and Plans and the City's Planning and Engineering requirements, please visit: <https://ottawa.ca/en/city-hall/planning-and-development/information-developers/development-application-review-process/development-application-submission/guide-preparing-studies-and-plans>

Please provide electronic copy (PDF) of all plans and studies required.

All plans and drawings must be produced on A1-sized paper and folded to 21.6 cm x 27.9 cm (8½" x 11").

Note that many of the plans and studies collected with this application must be signed, sealed and dated by a qualified engineer, architect, surveyor, planner or designated specialist.

General Content

Executive Summary (for large reports only): not applicable

Date and revision number of the report: included

Location map and plan showing municipal address, boundary, and layout of proposed development: included

Plan showing the site and location of all existing services: included

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: included

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 defensible design criteria: not applicable

Statement of objectives and servicing criteria: included

Identification of existing and proposed infrastructure available in the immediate area: included

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). not applicable

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: included

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

- **Metric scale:** included
- **North arrow:** included
- **Key Plan:** included
- **Name and contact information of applicant and property owner:** not available
- **Property limits:** 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: included

Identification of system constraints: included

Confirmation of adequate domestic supply and pressure: included

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: included

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: included

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 feeder mains, 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: included

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: included

(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: included

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. included

Description of proposed sewer network including sewers, pumping stations, and forcemains: included

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): included

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: included

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: included

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

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-watershed 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). included

Identification of watercourses within the proposed development and how watercourses will be protected, or , if necessary, altered by the proposed development with applicable approvals. not applicable

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: included

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: included

Identification of municipal drains and related approval requirements: not applicable

Descriptions of how the conveyance and storage capacity will be achieved for the development: included

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: included

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: not applicable

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: included

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