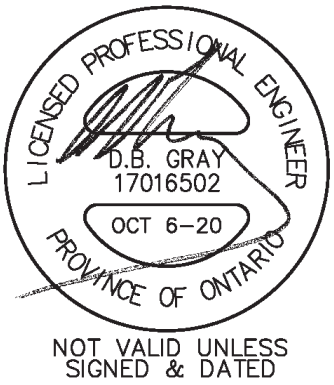
SERVICING BRIEF

176-178 Russell Avenue
Ottawa, Ontario

Report No. 20090

October 6, 2020



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SERVICING BRIEF

176-178 Russell Avenue
Ottawa, Ontario

This report describes the services of an existing apartment building located at 176-178 Russell Avenue. The building is being renovated and converted from a four to a six-unit apartment building. A small (4.5 sq.m.) addition is proposed provide access to the basement units.

WATER SUPPLY FOR FIREFIGHTING:

The subject building is wood-framed construction. As per the Fire Underwriter Survey (FUS) "Water Supply For Fire Protection": *"Wood frame structures separated by less than 3 metres shall be considered as one fire area."* Buildings at 170, 172-174, 176-178 and 180-186 Russell Avenue are all within 3m of each other, therefore, as per FUS calculation method they are considered as one fire area and based on FUS a fire flow of 266.7 L/s (16,000 L/min) is required.

The boundary conditions for the 266.7 L/s fire flow (based on the city's computer model of the municipal water distribution system) were received from the City. They include a HGL (hydraulic grade line) of 98.0 m during fire flow conditions in the municipal watermains at the subject location which calculates to be 398 kPa (58 psi). Since the pressure is above 138 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 fire flow of all contributing fire hydrants within 150 m of the building can used to supply the required fire flow. There is an existing municipal fire hydrant in the Russell Avenue right-of-way located on the near side of the street approximately 24 m unobstructed distance to the main entrances. A second municipal hydrant located near the northwest corner of the Russell Avenue / Templeton Street intersection about 88 m unobstructed distance to the proposed building. A third municipal hydrant is located near the southwest corner of the Russell Avenue / Somerset Street East intersection about 128 m unobstructed distance to the proposed building. There also two other municipal hydrants just beyond the 150 m, one at the northwest corner of Templeton Street / Chapel Street intersection (167 m) and the other in front of 118 Russel Avenue (169 m). All existing municipal hydrants in the vicinity are Class AA. The closest hydrant is within 75 m and can contribute 5,700 L/min (95 L/s); and the next two closest hydrants are between 75 and 150 m and can contribute 3,800 L/min (63.3 L/s) each (as per Table 1 of ISTB-2018-02). Therefore, the aggregate flow from all three hydrants is 13,300 L/min (221.7 L/s). While the aggregate flow is about 83% of the required fire flow, the two hydrants just beyond 150 m should be considered as being able to make up the 2700 L/min (45.0 L/s) shortfall. Consideration should be given to the fact that this is an existing condition that the proposed renovation does not aggravate the situation. Consideration should also be given to the fact that that the "Required Minimum Water Supply Flow Rate" as calculated

using the Ontario Building Code - Appendix A - Article A-3.2.5.7 "Water Supply For Fire Fighting" is only 2,700 L/min (45 L/s) for the subject building and more than twice this this flow rate is available from the one closest fire hydrant. Therefore, from a practical perspective, it should be considered that there is an adequate water supply for firefighting.

WATER SERVICE:

The apartment building is comprised of six two-bedroom units. Based on the City of Ottawa Water Distribution Design Guidelines for residential properties (two-bedroom apartment units / 2.1 persons per unit – 350 L/person/day); and Ministry of the Environment Design Guidelines for peaking factors; the daily average flow is 0.1 L/s with a maximum daily and maximum hourly demand of 0.5 and 0.7 L/s respectively.

To determine water pressure under these demands, boundary conditions, based on the City of Ottawa computer simulation of the water distribution system, at the subject location, are required. In summary, we required the boundary conditions for the subject area based on the following:

Average Daily Demand: 0.1 L/s.
Maximum Daily Demand: 0.5 L/s.
Maximum Hourly Demand: 0.7 L/s

Based on the boundary conditions received from the City, the minimum HGL (hydraulic grade line) is 106.3 m and the maximum is 114.9 m. With these HGLs the water pressure at the water meter is calculated to vary from 482 kPa to 567 kPa (70 to 82 psi). This is at the high end of an acceptable range of water pressures. Since it is calculated that the water pressure can be above 80 psi at times an on-site pressure check is recommended to determine if a pressure reducing valve (PRV) is required.

Each side of the building is serviced by an existing 19 mm water service connecting to a 200 mm municipal watermain in Russell Avenue. The municipal watermain was constructed around 1997 and it is believed that the water services were replaced from the watermain to the property line at that time. The water service to 176 Russell Avenue is copper and appears relatively new. The water service to 178 Russell appears that it may be the original lead pipe and it is proposed to be replaced with copper from the building to the property line.

Based on the Maximum Hourly Demand of 0.35 L/s (50% of the 0.7 L/s demand for all six units) the velocity in each 19 mm water service connection is an acceptable 1.2 m/s (up to 2.4 m/s is acceptable).

Based on the AWWA water flow demand curve, and a water pressure at the meter of 524 kPa (76 psi), the peak demand for the building is expected to be 1.4 L/s (87 L/min / 23 USgpm). The AWWA method calculates the instantaneous demand and is typically used to size the water service. This peak demand will produce a high velocity of 5.1 m/s in the existing 19 mm water service connections. This may produce pressure fluctuations in the domestic supply but since the water pressure at the water meter will be relatively high at up to 82 psi it should not be an issue.

SANITARY SERVICE:

The building is serviced by an existing 100 mm sanitary sewer connecting to the existing 300 mm municipal sanitary sewer in Russell Avenue. A CCTV sewer inspection was conducted on this sewer connection. The pipe appears to transition from ABS pipe inside the building to cast iron outside and then to PVC pipe. (The PVC pipe likely begins at the property line since the municipal sanitary sewer was constructed around 1997 and it is believed that, at that time, he sewer connection was replaced from the municipal sewer to the property line.) There appears to be a sump in the cast iron portion of the connection (the standing sewage has a depth of $\pm$20% the diameter of the pipe). In the PVC portion of the connection the sewage appears to be flowing well without obstruction. The existing sewer connection is proposed to be replaced with PVC pipe from the building to the property line (which is the cast iron portion and includes with the sump).

Based on the City of Ottawa Sewer Design Guidelines for a residential property (six two-bedroom apartment units / 2.1 persons per unit; and 280 l/person/day – 3.2 peaking factor); and based on a 0.33 L/s/ha infiltration flow; the post development flow is calculated to be 0.15 L/s. This flow will be adequately handled by the existing sanitary sewer service connection since, at the design flow; it will only be about 3% full (a 100mm pipe at an assumed 1% slope has a 5.4 L/s capacity).

STORM SEWER SERVICE:

There are no existing storm sewer connections and none are proposed.

CONCLUSIONS:

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

2. The aggregate flow from the three closest fire hydrants provide about 83% of the required fire flow and the two hydrants just beyond 150 m should be considered as being able to make up the shortfall. Consideration should be given to the fact that this is an existing condition that the proposed renovation does not aggravate the situation. Consideration should also be given to the fact that that the required minimum water supply calculated using the Ontario Building is only 2,700 L/min (45 L/s); and more than twice this this flow rate is available from the one closest fire hydrant. Therefore, from a practical perspective, it should be considered that there is an adequate water supply for firefighting.

3. The water pressure at the water meter is calculated be at the high end of an acceptable range of water pressures.

4. Since it is calculated that the water pressure can be above 80 psi at times an on-site pressure check is recommended to determine if a pressure reducing valve (PRV) is required.

5. Based on the Maximum Hourly Demand the velocity in each existing 19 mm water service connection is an acceptable 1.2 m/s. Based on the AWWA water flow demand curve, the peak demand for the building is expected produce a high velocity in the existing 19 mm water service connections. This may produce pressure fluctuations in the domestic supply but since the water pressure at the water meter will be relatively high it should not be an issue.

6. The building is serviced by an existing 100 mm sanitary sewer connecting to the existing 300 mm municipal sanitary sewer in Russell Avenue. The existing sewer connection is proposed to be replaced with PVC SDR 28 pipe from the building to the property line. A CCTV sewer inspection that the sewage appears to be flowing well without obstruction from the property line to the municipal sewer.

7. The expected sanitary sewage flow rate will be adequately handled by the 100 mm sanitary sewer service connection.

8. There are no existing storm sewer connections and none are proposed.

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21-Sep-20
REVISED 06-Oct-20

Existing 3-Storey Apartment Building
176-178 Russell Avenue
Ottawa, Ontario
Fire Flow Requirements

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

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

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

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

176-178 Russell Avenue	3rd Floor	87	sq.m.
	2nd Floor	140	sq.m.
	1st Floor	192	sq.m.
		419	sq.m.
180-186 Russell Avenue	2nd Floor	272	sq.m.
	1st Floor	272	sq.m.
		544	sq.m.
172-174 Russell Avenue	3rd Floor	90	sq.m.
	2nd Floor	137	sq.m.
	1st Floor	137	sq.m.
		364	sq.m.
170 Russell Avenue	2nd Floor	71	sq.m.
	1st Floor	71	sq.m.
		142	sq.m.
	TOTAL FIRE AREA:	1469	sq.m.

F = 12,648 L/min
= 13,000 L/min (rounded off to the nearest 1,000 L/min)

-15% Charge for Combustible Occupancy

= 11,050 L/min

0% Reduction for Sprinkler System

= - L/min

Increase for Separation Exposed Buildings

			Adjacent Building			
			Constuction	Length m	Storeys	L/H Factor
17%	North	3.1 to 10m	W-F	8	2	16
10%	East	20.1 to 30m	W-F	49	3	147
17%	South	3.1 to 10m	W-F	14	2	28
5%	West	30.1 to 45m				0
49%	Total Increase for Exposure (maximum 75%)					

= 5,415 L/min Increase

= 16,465 L/min
F = 16,000 L/min (rounded off to the nearest 1,000 L/min)
= 266.7 L/s

Centerline of road elevation: 57.40 m ASL
(approximate)

			Static Pressure at Fire Hydrant		
267 l/s FIRE FLOW:	98.0	m ASL	58	psi	398 kPa

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21-Sep-20

REVISED 06-Oct-20

3-Storey 6-Unit Apartment Building
176-178 Russell Avenue
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:	0	1.4	0
2 Bedroom:	6	2.1	13
3 Bedroom:	0	3.1	0
Average Aptarment:	0	1.8	0
		TOTAL:	13

DAILY AVERAGE

350 litres / person / day

3.1 l/min | 0.1 l/s | 1 USgpm

MAXIMUM DAILY DEMAND 9.5 (Peaking Factor for a population of 13 Table 3-3 MOE Design Guidelines for Drinking-Water Systems)

29.1 l/min | 0.5 l/s | 8 USgpm

MAXIMUM HOURLY DEMAND 14.3 (Peaking Factor for a population of 13 Table 3-3 MOE Design Guidelines for Drinking-Water Systems)

43.8 l/min | 0.7 l/s | 12 USgpm

Elevation of Water Meter: 57.10 m ASL (approximate)
Finish Floor Elevation: 56.20 m ASL (approximate)

			Static Pressure at Water Meter		
MINIMUM HGL:	106.3	m ASL	70	psi	482 kPa
MAXIMUM HGL:	114.9	m ASL	82	psi	567 kPa

D.B. Gray Engineering Inc.

Douglas Gray <d.gray@dbgrayengineering.com>

RE: 176-178 Russell Ave - Boundary Condition Request

1 message

Wu, John <John.Wu@ottawa.ca> Tue, Sep 29, 2020 at 11:00 AM
To: Douglas Gray <d.gray@dbgrayengineering.com>

Here is the result:

The following are boundary conditions, HGL, for hydraulic analysis at 176-178 Russell Avenue (zone 1W) assumed to be connected to the 203mm on Russel Avenue (see attached PDF for location).

Minimum HGL = 106.3m

Maximum HGL = 114.9m

MaxDay + Fire Flow (266.7 L/s) = 98.0m

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.

John

From: Douglas Gray <d.gray@dbgrayengineering.com>
Sent: September 21, 2020 7:47 AM
To: Wu, John <John.Wu@ottawa.ca>
Cc: Caoimhin Kennedy <c.kennedy@dbgrayengineering.com>; Chad Richardson <chad@zinnrichardson.com>
Subject: 176-178 Russell Ave - Boundary Condition Request

Hi John

Please provide the boundary conditions at 176-178 Russell Ave. We have calculated the following expected demands based on a 6-unit apartment building and a fire area that includes 170 to 186 Russell Ave.

Average daily demand: 0.1 L/s.

Maximum daily demand: 0.5 L/s.

Maximum hourly daily demand: 0.7 L/s

Fire Flow demand: 266.7 L/s

Fire Flow + Max Day: 267.2 L/s

Our calculations are attached.

Thanks, Doug

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

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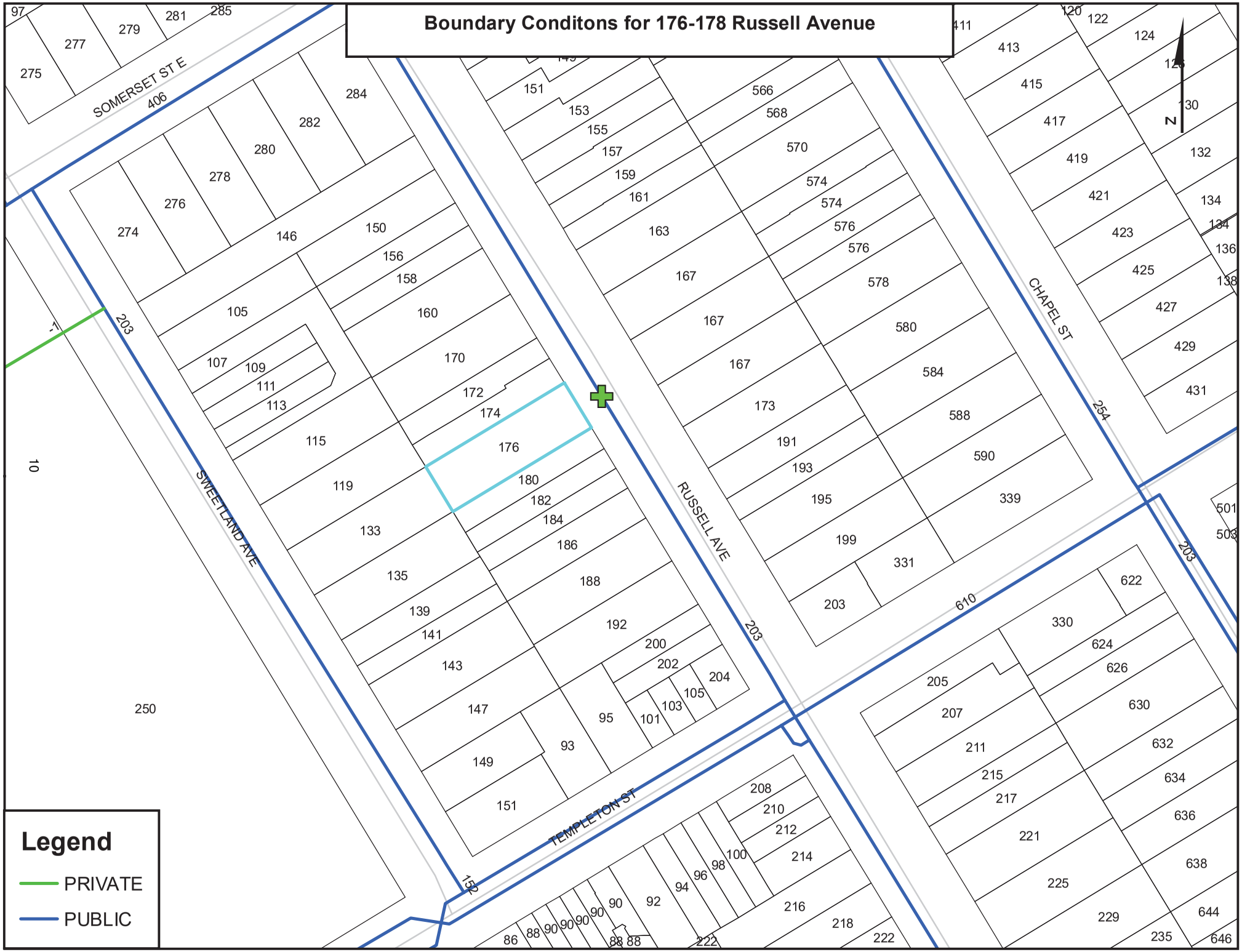
176-178 Russell Avenue September 2020.pdf
86K


Boundary Conditons for 176-178 Russell Avenue
SOMERSET ST E
SWEETLAND AVE
RUSSELL AVE
CHAPEL ST
TEMPLETON ST
203
254
610
135
406
N
Legend
PRIVATE
PUBLIC

Existing 3-Storey Apartment Building
176-178 Russell Avenue
Ottawa, Ontario

Water Supply for Fire-Fighting Calculations:

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

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

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

	Spatial Coefficient	Exposure Distance m	
S_{Side1}	0.5	1.5	(to north property line)
S_{Side2}	0	11.3	(to center line of road)
S_{Side3}	0.5	0.0	(to south property line)
S_{Side4}	0	17.0	(to south property line)
S_{Tot}	2.0	(Need not exceed 2.0)	

K (Water Supply Coefficient)

K = 23 As per A-3.2.5.7. Table 1 (Group C Occupancy / Combustible construction with no fire resistance ratings as per OBC 3.2.2.)

V (Building Volume)

	Area sq.m.	Average Height m	Volume cu.m.
3rd Floor	87	2.45	213
2nd Floor	140	2.45	343
1st Floor	192	2.45	470
		V =	1,027 cu.m.

Q = KVS_{Tot}

Q = 47,221 L

Required Minimum Water Supply Flow Rate 2,700 L/min 45 L/sec
(As per A-3.2.5.7. Table 2)

17-Sep-20

REIVSED 05-Oct-20

176 or 178 Russell Avenue

Ottawa, Ontario

Peak Water Demand

WATER FIXTURE VALUE
(AWWA Manual M22 - Sizing Water Service Lines and Meters)

	No.	F.V.	Total
Bathtub		8	0
Toilet - tank	3	6	18
Toilet - flush valve		24	0
Lavs.		1.5	0
Bidet		2	0
Urinal - wall flush valve		10	0
Shower	3	2.5	7.5
K. Sink	3	1.8	5.4
Dishwasher		1.3	0
Clothes Washer	3	3	9
Commercial Sink		4	0
J. Sink		4	0
Commercial Dishwasher		4	0
Commercial Washer		4	0
Hose 1/2 in		5	0
Hose 3/4 in		12	0
			39.9

Peak Demand (fig 4-2 or 4-3 AWWA M22)			20	USgpm		
Pressure @ Meter	524	kPa	76	psi		
Pressure Factor (table 4-1 AWWA M22)			1.14			
Peak Demand			23	USgpm		
Irrigation - hose 1/2 in	0		0	USgpm (includes pressure factor)		
TOTAL PEAK DEMAND	87	l/min	23	USgpm	1.4	l/s
		Nominal Size	0.75	in	19	mm
			16.8	ft/s	5.1	m/s

MAXIMUM HOURLY DEMAND	21	l/min	6	USgpm	0.35	l/s
		Nominal Size	0.75	in	19	mm
			4.1	ft/s	1.2	m/s

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SANITARY SEWER DESIGN FORM

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

Infiltration Allowance: 0.33 l / s / ha

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

Project: 178 Russell Road
Designed By: D.B.G.
06-Oct-20
Page: 1 of 1

Location		Section								Cumulative Residential		Section Non-Residential			Cumulative					Sewer Data n = 0.013								Comments
		Single Family	Semi/Townhouse	Duplex / Triplex	Apartment (average)	Apartment (1 Bed.)	Apartment (2 Bed.)	Apartment (3 Bed.)	Residential Area	Pop.	Peaking Factor	Area	Flow	Peaking Factor	Flow	Area	Sewage Flow	Infiltration Flow	Total Flow	Type of Pipe	Dia. Actual	Dia. Nom.	Slope	Length	Capacity	Velocity	Ratio	
		ppu = 3.4	ppu = 2.7	ppu = 2.3	ppu = 1.8	ppu = 1.4	ppu = 2.1	ppu = 3.1																			
FROM	TO	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	No. of Units	ha			ha	l/ha/day		l/s	ha	l/s	l/s	l/s		(mm)	(mm)	(%)	(m)	(l/s)	(m/s)	Q/Qfull	
	Exist																											
Bldg	300						6		0.046	12.6	3.2					0.046	0.13	0.02	0.15	PVC	101.6	100	1.0		5.39	0.66	0.03	
	SAN																											
																				EXISTING 300 SANITARY SEWER IN RUSSEL RD								
																					203.2	300	0.76		29.83	0.92		

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

Location map and plan showing municipal address, boundary, and layout of proposed development: n/a

Plan showing the site and location of all existing services: n/a

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

Identification of existing and proposed infrastructure available in the immediate area: n/a

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). n/a

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: n/a

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

- **Metric scale:** n/a
- **North arrow:** n/a
    - **(including construction North):** not included
- **Key Plan:** n/a
- **Name and contact information of applicant and property owner:** n/a
    - **Property limits**: n/a
    - **including bearings and dimensions:** n/a
- **Existing and proposed structures and parking areas:** n/a

- **Easements, road widening and rights-of-way:** n/a
- **Adjacent street names:** n/a

Development Servicing Report: Water

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

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

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

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

Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow locations throughout the development: see page 2 & 6 of Servicing Brief

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

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

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

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

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

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

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

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

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

Development Servicing Report: Wastewater

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

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

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

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

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

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

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

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

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

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

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

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

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

Development Servicing Report: Stormwater Checklist

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

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: n/a

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: n/a

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

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: n/a

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). n/a

Identification of watercourses within the proposed development and how watercourses will be protected, or , if necessary, altered by the proposed development with applicable approvals. n/a

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: n/a

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: n/a

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

Descriptions of how the conveyance and storage capacity will be achieved for the development: n/a

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: n/a

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: n/a

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

Changes to Municipal Drains. : not applicable

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

Conclusion Checklist

Clearly stated conclusions and recommendations: see page 5 of Servicing Brief

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