2458 Cleroux Crescend, Ottawa
Assessment of Adequacy of Public Services & Stormwater Management Report

Project # CW-02-21

City Application #

Prepared for:

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12 Southland Crescent
Ottawa, Ontario, K1G 5E4

By:

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September 2022

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1. Introduction

The subject property is located at 2458 Cleroux Crescent Ottawa. The proposed work comprises of a 3-storey+underground garage apartment building with total of 17 apartments and a garage for 24 vehicles at the parking level (basement). For the purpose of this report the site is considered to run north-south. Cleroux Crescent is extending east-west along the property's north edge.

Currently the property is used as a residential with a single house with backyard and two utility sheds.

Existing services locations are known and they will be disconnected before the demolition and will be recorded in the construction diary. The area is serviced by:

- Sanitary: 250mm Concrete .
- Storm: A 375 mm PVC Storm sewer (2000)
- Water: A 203 mm Ductile Iron.

The sidewalk in front of the property is at elevation between 82.41 and 82.43 m a.s.l.

2458 Cleroux Cres, Ottawa: Location

2. Public Services Capacity

This section of the report will analyze existing municipal services and the potential impact of the proposed building at 2458 Cleroux Cres. on the existing service capacity.

2.1 Water Supply

Existing building is supplied from DI 203 mm pipe and calculated current consumption is **0.20 l/sec** for the peak period.

Nearest fire hydrant is located further east on Cleorux from the property at distance of 38.4 m, which is sufficient for use by the fire department and its vehicles. The hydrant is marked as class AA (visual rectification: blue head) so it should have a capacity of 5,700 l/min (95 l/sec)for distances less than 75.0 m. The second nearest hydrant is located east from the property at 111.9 m distance and also it is marked as Class AA. Based on the Table 1: "Maximum flow to be considered from a given hydrant"[1] its maximum capacity is 3,800 l/min (63.3 l/sec).

2458 Cleroux Cres., Ottawa: Hydrant-1 location and distance

2458 Cleroux Cres., Ottawa: Hydrant-2 location and distance

[1] City of Ottawa Tech Bulletin ISTB-2018-02: Page 42, Table 1.

Total available flow from two hydrants is 9,500 l/min (158.3 l/sec).

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Residential Average Daily Demand	280 L/d/P
Residential Maximum Daily Demand	9.5 x Average Daily *
Residential Maximum Hourly	1.5 x Maximum Daily *
Commercial Demand	2.5 L / m2 /d
Commercial Maximum Daily Demand	1.5 x Average Daily
Commercial Maximum Hourly	1.8 x Maximum Daily
Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
During Peak Hourly Demand operating pressure must remain within	275kPa and 552kPa
During fire flow operating pressure must not drop below	140kPa
* Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.	

Table 1: Water Supply Design Criteria

[2]The following are boundary conditions, HGL, for hydraulic analysis at Cleroux Cres. (zone R4) assumed to connected to the 203 mm watermain on Cleroux Crescent (see attached PDF for location).

Scenario	Demand	
	L/min	L/s
Average Daily Demand	7	0.12
Maximum Daily Demand	70	1.16
Peak Hour	105	1.75
Fire Flow Demand #1	13,000	216.67

Required fire flow is available at residual pressure of 31.3 psi (22.82 Kpa) and with ground elevation of 83.3 m.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	131.0	67.7
Peak Hour	127.0	62.1
Max Day plus Fire 1	105.3	31.3

Ground Elevation = 83.3 m

[2] City of Ottawa boundary condition information is based on current operation of the city water distribution system (also see Appendix A for complete correspondence information)

Proposed building height is 12.1 m so the residual pressure at the top of the building will be 10.0 Kpa.

Fire protection from the municipal system using two nearest hydrants will not meet the FUS requirements (10,000 l/min including full sprinkler system) but the OBC requirements will be achieved (6,881 l/sec).

The consumption is expected to be **1.55 l/sec** for peak period. Total domestic consumption consists of two components: use/person (280/cap/day) and use for amenities of 2.5 l/m^2/day (gym, janitors, garage). In this case the garage is making relatively large portion of total space so use of domestic water for cleaning is not recommended. Other means of cleaning like use of commercial sweeper vehicles are more appropriate. For such a reason the garage flow requirement is shown as zero.

Using Darsy-Weisbach calculation, as shown below, it was determined that 50 mm lateral would provide required flow of 1.55 l/sec at 0.89 m/s velocity and the pressure loss at the building of 0.14 bar. For calculation stimated length of the lateral is 80 m.

Calculation output

Flow medium:	Water 20 °C / liquid
Volume flow::	1.75 l/s
Weight density:	998.206 kg/m³
Dynamic Viscosity:	1001.61 10-6 kg/ms
Element of pipe:	circular
Dimensions of element:	Diameter of pipe D: 50 mm
	Length of pipe L: 80 m
Velocity of flow:	0.89 m/s
Reynolds number:	44412
Velocity of flow 2:	-
Reynolds number 2:	-
Flow:	turbulent
Absolute roughness:	0.0015 mm
Pipe friction number:	0.02
Resistance coefficient:	34.49
Resist.coeff.branching pipe:	-
Press.drop branch.pipe:	-
Pressure drop:	136.74 mbar
	0.14 bar

Note: The pressure drop was calculated by the online calculator of www.pressure-drop.com. We can not w

Important notice: The new version of the Online-Calculator is available: www.pressure-drop.online

Do you know our software SF Pressure Drop 10.x for Excel?
Information: www.pressure-drop.com

2.2 Sanitary Sewer

Sanitary sewer outflow for the current buildings is 0.096 l/sec (wet weather peak flow).

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Average Daily Demand	280 L/cap/day
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Correction Factor (City of Ottawa Tech.Bulletin ISTB-2018-01)	0.8
Commercial Space	28,000 L/ha/day
Infiltration and Inflow Allowance	0.33L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	Q =(1/n)AR2/3S1/2
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, November 2012 & Infrastructure Technical Bulletins 2018	

Table 2: Wastewater Design Criteria

The estimated outflow for the new building is **0.4753 l/sec** (peak flow + wet weather). In addition, for covered garage flow for maintenance and cleaning was calculated as 6 l/parking space/day[3] (i.e snow and rain runoff from cars) was used to estimate the sewer outflow for this service.

Existing municipal sewer 250 mm has a capacity of 41.77 l/sec for 0.44% slope and 80% full. For increase of 0.42 l/sec the increase is considered insignificant. The sewer line starts just west from the property.

Inputs: sanitary sewer

Pipe Diameter, d_o	250.0000	mm
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_o	0.4400	% slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	80.0000	%

[3] Ottawa Sewer Design Guideline 2012, Appendix 4-A.5

Results:

Flow, Q	41.7706	l/s
Velocity, v	0.9922	m/s
Velocity head, hv	0.0502	m
Flow Area, A	0.0421	m^2
Wetted Perimeter, P	0.5536	m
Hydraulic Radius	0.0760	m
Top Width, T	0.2000	m
Froude Number, F	0.69	
Shear Stress (tractive force), τ	8.6293	N/m^2

The estimate is that just 4-5 properties are connected upstream from 2458 Cleroux and it was assumed that the pipe is full up to 10%. The velocity at this level is still at 0.35 m/sec so observation and seasonal maintenance would be required.

The Manning formula was also used to assess the sewer lateral's size. 200 mm pipe at 1.5% slope. The main criteria was to maintain the velocity at minimum 0.5 m/sec in order to provide the self-cleaning of the lateral. At level of 10% full the flow is 0.9 l/sec at 0.55 m/sec. This is sufficient capacity for the flow and self-cleaning.

Inputs: sanitary sewer

Pipe Diameter, d_o	200.0000	mm
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_o	1.5000	% slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	10.0000	%

Results:

Flow, Q	0.9085	l/s
Velocity, v	0.5557	m/s
Velocity head, hv	0.0157	m
Flow Area, A	0.0016	m^2
Wetted Perimeter, P	0.1287	m
Hydraulic Radius	0.0127	m
Top Width, T	0.1200	m
Froude Number, F	1.52	
Shear Stress (tractive force), τ	2.9418	N/m^2

Detailed calculation of water and sanitary flow is presented in Appendix A.

2.3 Site Stormwater Services

Current building and the rest of surface of the lot at 2458 Cleroux Crescent represent a typical urban site. All stormwater runoff is under uncontrolled condition for the entire site. For the purpose of protecting the municipal sewer system the City of Ottawa requires that the predevelopment 5-year runoff coefficient should be in range up to C=0.5 so the newly developed site must store certain amount of water. Real composite C factor is calculated as 0.36.

The proposed new building and area of the lot will increase the runoff from 0.36 to 0.75 combined which is more than 25% increase as recommended by City of Ottawa sewer Design Guideline and this will require the stormwater retention on site in order to match the predevelopment runoff condition.

Proposed stormwater retention will prevent increase of stormwater inflow into the system. The stormwater storage is proposed on the new building's flat roof. Total storage required for the 100 year event is 18.81 m^3.

The building terraces around the main level will have the runoff as uncontrolled, however the vegetation on terraces will provide an effect of evapotranspiration lowering even further the uncontrolled runoff. In addition current backyard runoff is toward a ravine at rear. The proposed terrace and grading will direct water toward ravine too. In comparison to the predevelopment runoff of 11.93 l/s (5 year) the postdevelopment flow will be 7.8 l/sec. This will prevent erosion around the new foundation. The roof drains will be connected through inside of the building to the lateral. The roof drains will provide maximum of 2.53 l/sec and will be a single point for controlled outflow. The storm lateral 200 mm provides this flow at 16.5% full.

Inputs: storm lateral

Pipe Diameter, d_o	200.0000	mm
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_o	1.5000	% slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	16.5000	%

Results:

Flow, Q	2.5740	l/s
Velocity, v	0.7588	m/s
Velocity head, hv	0.0294	m
Flow Area, A	0.0034	m^2
Wetted Perimeter, P	0.1673	m
Hydraulic Radius	0.0203	m
Top Width, T	0.1485	m
Froude Number, F	1.60	
Shear Stress (tractive force), τ	4.8540	N/m^2

Detailed calculation is provided in Appendix A.

3. Conclusion and Recommendation

3.1 Water Supply

The consumption is expected to be **1.55 l/sec** for peak period. Total domestic consumption consists of two components: use/person (280/cap/day) and use for amenities of 2.5 l/m^2/day (gym, janitors, garage). In this case the garage is making relatively large portion of total space so use of domestic water for cleaning is not recommended. Other means of cleaning like use of commercial sweeper vehicles are more appropriate. For such a reason the garage flow requirement is shown as zero.

Fire protection from the municipal system using two nearest hydrants will not meet the FUS requirements (10,000 l/min including full sprinkler system) but the OBC requirements will be achieved (6,881 l/sec).

3.2 Sanitary Sewer

The estimated outflow for the new building is **0.4753 l/sec** (peak flow + wet weather). In addition, for covered garage flow for maintenance and cleaning was calculated as 6 l/parking space/day[4] (i.e snow and rain runoff from cars) was used to estimate the sewer outflow for this service.

[4] Ottawa Sewer Design Guideline 2012, Appendix 4-A.5

Existing municipal sewer 250 mm has a capacity of 41.77 l/sec for 0.44% slope and 80% full. For increase of 0.42 l/sec the increase is considered insignificant. The sewer line starts just west from the property.

3.3 Stormwater

The proposed new building and area of the lot will increase the runoff from 0.36 to 0.75 combined which is more than 25% increase as recommended by City of Ottawa sewer Design Guideline and this will require the stormwater retention on site in order to match the predevelopment runoff condition.

Proposed stormwater retention will prevent increase of stormwater inflow into the system. The stormwater storage is proposed on the new building's flat roof. Total storage required for the 100 year event is 18.81 m^3.

Prepared by:

Zoran Mrdja, P.Eng.

September 2022

Professional Engineers Ontario

Authorized by Professional Engineers of Ontario to provide professional services to public

Appendix A: Calculations

Water Supply Design Criteria

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Residential Average Daily Demand	350 L/d/P
Residential Maximum Daily Demand	9.5 x Average Daily *
Residential Maximum Hourly	1.5 x Maximum Daily *
Commercial Demand	2.5 L / m2 /d
Commercial Maximum Daily Demand	1.5 x Average Daily
Commercial Maximum Hourly	1.8 x Maximum Daily
Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
must remain within	275kPa and 552kPa (40-80 psi; 28-56m)
During fire flow operating pressure must not drop below	140kPa (20 psi; 14 m)
* Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.	

2458 Cleroux Crescent, Ottawa
Current

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	1	3.4
Semi-detached	2.7		0
Townhouse	2.7		0
Apartment			0
Bachelor	1.4	0	0
1 Bedroom	1.4	0	0
2 Bedroom	2.1	0	0
3 Bedroom	3.1		0
4 Bedroom	4.2	0	0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/sec	m^3/d	L/sec	m^3/d	L/sec
Total Domestic Demand	3.4	1.19	0.01	11.31	0.13	16.96	0.20

Institutional / Commercial / Industrial Demand

				Avg. Daily		Max Day		Peak Hour	
Property Type	**Unit Rate**		**Units**	m^3/d	L/sec	m^3/d	L/sec	m^3/d	L/sec
Commercial floor space	2.5	$L/m^2/d$	0	0.00	0.00	0.00	0.00	0.00	0.00
Office	75.0	$L/9.3m^2/d$	0.0	0.00	0.000	0.00	0.0000	0.00	0.0000
Restaurant*	125.0	L/seat/d							
Industrial -Light	35,000.0	L/gross ha/d							
Industrial -Heavy	55,000.0	L/gross ha/d							
Total I/C/I Demand				0.00	0.00	0.00	0.00	0.00	0.00

Total Demand	1.19	0.01	11.31	0.13	16.96	0.20

* Estimated number of seats at 1seat per $9.3m^2$

Water Demand and Boundary Conditions

Proposed Conditions

Design Parameter	Anticipated Demand[1] (L/sec)	Boundary Condition[2] (kPa)
Average Daily Demand	0.01	
Max Day + Fire Flow	3,000.13	
Peak Hour	0.20	

[1)] Water demand calculation per Water Supply Guidelines. See Appendix B for detailed calculations.

[2)] Boundary conditions supplied by the City of Ottawa. See Appendix B for correspondence with the City.

Wastewater Design Criteria

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Average Daily Demand	350 L/cap/day
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Correction Factor (City of Ottawa Tech.Bulletin ISTB-2018-0	0.8
Commercial Space	28,000 L/ha/day
Infiltration and Inflow Allowance	0.28L/s/ha
Sanitary sewers are to be sized employing the Manning's Equation	$Q = (1/n)AR^{2/3}S^{1/2}$
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, November 2012.	

2458 Cleroux Crescent, Ottawa
Current

Sanitary Sewer Post Development Outflow

Site Area	**0.138 ha**
Extraneous Flow Allowances	
Infiltration / Inflow	**0.04558 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	**Pop**
Single Family	3.4	1	3.4
Semi-detached and duplex	2.7		0
Duplex	2.3		0
Townhouse	2.7		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4	0	0
2 Bedroom	2.1	0	0
3 Bedroom	3.1	0	0
4 Bedroom	4.2	0	0
Total Population			**3.4**
Average Domestic Flow			**0.01 L/s**
Peaking Factor			**3.8**
Peak Domestic Flow			**0.05 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**	**No. of Units**	**Avg Wastewater (L/s)**
Commercial	28,000 L/gross ha/d	0	0.0000
Office	75 L/9.3m2/d	0	0.0000
Institutional	28,000 L/gross ha/d	0	0.00
Industrial - Light	35,000 L/gross ha/d	0	0.00
Industrial - Heavy	55,000 L/gross ha/d	0	0.00
Average I/C/I Flow			**0.0000**
Peak Institutional / Commercial Flow*			**0.0000**
Peak Industrial Flow**			**0.0000**
Peak I/C/I Flow			**0.0000**

Total Estimated Average Dry Weather Flow Rate	**0.0138**
Total Estimated Peak Dry Weather Flow Rate	**0.0530**
Total Estimated Peak Wet Weather Flow Rate	**0.0986**

Ottawa TechBulletin ISTB-2018-01 Section 4.4.1 Page 4.5
**Use Apendix 4B diagram

Fire Flow Calculation Ontario Building Code 2006 (Appendix A)

Project: 2458 Cleroux Crescent,
Ottawa
Current

Date: **July 14, 2022**
Data input by: Zoran Mrdja, P.Eng.

Type of Construction	Building Clasification	Water Supply Coefficient (K)
Non-combustable construction, or a heavy timber conforming to article 3.1.4.6	A-2; B1-; B-2; B-3 C; D	16

		Total Building Volume (V)(m3)
Building Height (incl.Basement)	6.00	816.72
Building Width	16.60	
Building Length	8.20	

Side	Exposure Distance (m)	Spatial Coefficient	Total Spatial Coefficient S_{tot}*
North	34.00	0	1.4
East	27.00	0	
South	100.00	0	
West	10.00	0.4	
Total Volume of Water Required Q**		**18,294.53**	
Minimum Required Fire Flow (L/min) ***		**609.82**	

Note:

* S_{tot}= 1+(S_{side1}+S_{side2}+S_{side3}+S_{side4})

** V=KVS_{tot}

*** Flow=Q/30 (min) for min. duration of 30 min

Summary:
2. Nearest fire hydrant distance 38.4m;

2458 Cleroux Crescent, Ottawa
Current

FUS Fire Flow Calculations

Project: 2458 Cleroux Cres.

Calculations Based on 1999 Publication "Water Supply for Public

Fire Protection " by Fire Underwriters' Survey (FUS)

Fire Flow Calculation #: 1

Date: **2022-07-14**

Building Type/Description/Name: Apartment building

Data input by: Zoran Mrdja, P.Eng.

Table A: Fire Underwriters Survey Determination of Required Fire Flow - Long Method

Step	Task	Term	Options	Multiplier Associated with Option	Choose:	Value Used	Unit	Total Fire Flow (L/min)
1	Choose Frame Used for Construction of Unit	Framing Material						
		Coefficient related to type of construction (C)	Wood Frame	1.50	Ordinary Construction	1.00		
			Ordinary construction	1.00				
			Non-combustible construction	0.80				
			Fire resistive construction (< 2 hrs)	0.70				
			Fire resistive construction (> 2 hrs)	0.60				
2	Choose Type of Housing (if TH, Enter Number of Units Per TH Block)	Floor Space Area						
		Type of Housing	Single Family	1	Other (Comm, ind)	1	Units	
			Townhouse - indicate # of units	1				
			Other (Comm, Ind, etc.)	1				
2.2	# of Storeys	Number of Floors/ Storeys in the Unit (do not include basement):			1	1	Storeys	
3	Enter Ground Floor Area of One Unit	Enter Ground Floor Area (A) of One Unit Only :			366			
		Measurement Units	Square Feet (ft2)	0.093	Square Metres (m2)	130	Area in Square Meters (m2)	
			Square Metres (m2)	130				
			Hectares (ha)	10000				
4	Obtain Required Fire Flow without Reductions	Required Fire Flow(without reductions or increases per FUS) (F = 220 * C * √A) Round to nearest 1000L/min						2,508
5	Apply Factors Affecting Burning	Reductions/Increases Due to Factors Affecting Burning						
5.1	Choose Combustibility of Building Contents	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	-376
			Limited combustible	-0.15				
			Combustible	0.00				
			Free burning	0.15				
			Rapid burning	0.25				
5.2	Choose Reduction Due to Presence of Sprinklers	Sprinkler reduction	Complete Automatic Sprinkler Protection	-0.3	None	0.00	N/A	0
			None	0				
5.3	Choose Separation Distance Between Units	Exposure Distance Between Units	North Side	30.1-45 m	0.05	0.40	m	
			East Side	20.1-30 m	0.10			
			South Side	30.1-45 m	0.05			
			West Side	3.1-10 m	0.20			1,003
6	Obtain Required Fire Flow, Duration & Volume	Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:						3,000
		Total Required Fire Flow (above) in L/s:						50
		Required Duration of Fire Flow (hrs)						2.00
		Required Volume of Fire Flow (m^3)						360

Note: The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guideline

Legend	
	Drop down menu - choose option, or enter value.
	No Information, No input required.

Note:

The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guideline.

Nearest fire hydrant distance 38.4m;

Water Supply Design Criteria

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Residential Average Daily Demand	350 L/d/P
Residential Maximum Daily Demand	9.5 x Average Daily *
Residential Maximum Hourly	1.5 x Maximum Daily *
Commercial Demand	2.5 L / m2 /d
Commercial Maximum Daily Demand	1.5 x Average Daily
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Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
must remain within	275kPa and 552kPa (40-80 psi; 28-56m)
During fire flow operating pressure must not drop below	140kPa (20 psi; 14 m)
* Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.	

2458 Cleroux Cres, Ottawa
New

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	0	0
Semi-detached	2.7		0
Townhouse	2.7		0
Apartment			0
Bachelor	1.4	0	0
1 Bedroom	1.4	3	4
2 Bedroom	2.1	14	29
3 Bedroom	3.1		0
4 Bedroom	4.2	0	0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/sec	m^3/d	L/sec	m^3/d	L/sec
Total Domestic Demand	34	9.41	0.11	89.38	1.03	134.06	1.55

Institutional / Commercial / Industrial Demand

				Avg. Daily		Max Day		Peak Hour	
Property Type	**Unit Rate**		**Units**	m^3/d	L/sec	m^3/d	L/sec	m^3/d	L/sec
Garage	2.5	$L/m^2/d$	0	0.00	0.00	0.00	0.00	0.00	0.00
Office	75.0	$L/9.3m^2/d$	0.0	0.00	0.000	0.00	0.0000	0.00	0.0000
Restaurant*	125.0	L/seat/d							
Industrial -Light	35,000.0	L/gross ha/d							
Industrial -Heavy	55,000.0	L/gross ha/d							
Total I/C/I Demand				0.00	0.00	0.00	0.00	0.00	0.00

Total Demand	9.41	0.11	89.38	1.03	134.06	1.552

* Estimated number of seats at 1seat per $9.3m^2$

Water Demand and Boundary Conditions

Proposed Conditions

Design Parameter	Anticipated Demand[1] (L/sec)	Boundary Condition[2] (kPa)
Average Daily Demand	0.11	
Max Day + Fire Flow	167.70	
Peak Hour	1.55	

[1)] Water demand calculation per Water Supply Guidelines. See Appendix B for detailed calculations.

[2)] Boundary conditions supplied by the City of Ottawa. See Appendix B for correspondence with the City.

Wastewater Design Criteria

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Average Daily Demand	280 L/cap/day
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
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Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, November 2012.	

2458 Cleroux Cres, Ottawa
New

Sanitary Sewer Post Development Outflow

Site Area	**0.138 ha**
Extraneous Flow Allowances	
Infiltration / Inflow	**0.04558 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	**Pop**
Single Family	3.4	0	0
Semi-detached and duplex	2.7		0
Duplex	2.3		0
Townhouse	2.7		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4	3	4.2
2 Bedroom	2.1	14	29.4
3 Bedroom	3.1	0	0
4 Bedroom	4.2	0	0
Total Population			**33.6**
Average Domestic Flow			**0.11 L/s**
Peaking Factor			**3.9**
Peak Domestic Flow			**0.43 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	**Unit Rate**	**No. of Units**	**Avg Wastewater (L/s)**
Commercial	28,000 L/gross ha/d	0	0.0000
Office	75 L/9.3m2/d	0	0.0000
Parking (Covered)*	6 l/park.space/d	12	0.0008
Institutional	28,000 L/gross ha/d	0	0.00
Industrial - Light	35,000 L/gross ha/d	0	0.00
Industrial - Heavy	55,000 L/gross ha/d	0	0.00
Average I/C/I Flow			**0.0008**
Peak Institutional / Commercial Flow*			**0.0000**
Peak Industrial Flow**			**0.0000**
Peak I/C/I Flow			**0.0000**

Total Estimated Average Dry Weather Flow Rate	**0.1097**
Total Estimated Peak Dry Weather Flow Rate	**0.4297**
Total Estimated Peak Wet Weather Flow Rate	**0.4753**

* Ottawa Sewer Design Guidelines 2012, Appendix 4-A.5
Ottawa TechBulletin ISTB-2018-01 Section 4.4.1 Page 4.5
**Use Apendix 4B diagram

2458 Cleroux Cres, Ottawa
New

Fire Flow Calculation Ontario Building Code 2006 (Appendix A)

Project: 2458 Cleroux Cres., Ottawa

Date: **July 14, 2022**
Data input by: Zoran Mrdja, P.Eng.

Type of Construction	Building Clasification	Water Supply Coefficient (K)
Non-combustable construction, or a heavy timber conforming to article 3.1.4.6	A-2; B1-; B-2; B-3 C; D	16

		Total Building Volume (V)(m3)
Building Height (incl.Basement)	12.10	9,216.21
Building Width	11.70	
Building Length	65.10	

Side	Exposure Distance (m)	Spatial Coefficient	Total Spatial Coefficient S_{tot}*
North	34.00	0	1.4
East	27.00	0	
South	100.00	0	
West	10.00	0.4	

Total Volume of Water Required Q**	**206,443.04**
Minimum Required Fire Flow (L/min) ***	**6,881.43**
Minimum Required Fire Flow (L/min) ***	**114.69**

Note:

* S_{tot}= 1+(S_{side1}+S_{side2}+S_{side3}+S_{side4})

** V=KVS_{tot}

*** Flow=Q/30 (min) for min. duration of 30 min

Summary:

2. Nearest fire hydrant distance 38.4m;

2458 Cleroux Cres, Ottawa
New

FUS Fire Flow Calculations

Project: 2458 Cleroux Cres., Ottawa

Calculations Based on 1999 Publication "Water Supply for Public

Fire Protection " by Fire Underwriters' Survey (FUS)

Fire Flow Calculation #: 1

Date: **2022-07-14**

Building Type/Description/Name: Apartment building

Data input by: Zoran Mrdja, P.Eng.

Table A: Fire Underwriters Survey Determination of Required Fire Flow - Long Method

Step	Task	Term	Options	Multiplier Associated with Option	Choose:	Value Used	Unit	Total Fire Flow (L/min)
1	Choose Frame Used for Construction of Unit	Framing Material						
		Coefficient related to type of construction (C)	Wood Frame	1.50	Ordinary Construction	1.00		
			Ordinary construction	1.00				
			Non-combustible construction	0.80				
			Fire resistive construction (< 2 hrs)	0.70				
			Fire resistive construction (> 2 hrs)	0.60				
2	Choose Type of Housing (if TH, Enter Number of Units Per TH Block)	Floor Space Area						
		Type of Housing	Single Family	1	Other (Comm, ind)	1	Units	
			Townhouse - indicate # of units	1				
			Other (Comm, Ind, etc.)	1				
2.2	# of Storeys	Number of Floors/ Storeys in the Unit (do not include basement):			3	3	Storeys	
3	Enter Ground Floor Area of One Unit	Enter Ground Floor Area (A) of One Unit Only :			762			
		Measurement Units	Square Feet (ft^2)	0.093	Square Metres (m2)	2286	Area in Square Meters (m^2)	
			Square Metres (m^2)	762				
			Hectares (ha)	10000				
4	Obtain Required Fire Flow without Reductions	Required Fire Flow(without reductions or increases per FUS) (F = 220 * C * √A) Round to nearest 1000L/min						10,519
5	Apply Factors Affecting Burning	Reductions/Increases Due to Factors Affecting Burning						
5.1	Choose Combustibility of Building Contents	Occupancy content hazard reduction or surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	-1,578
			Limited combustible	-0.15				
			Combustible	0.00				
			Free burning	0.15				
			Rapid burning	0.25				
5.2	Choose Reduction Due to Presence of Sprinklers	Sprinkler reduction	Complete Automatic Sprinkler Protection	-0.3	None	-0.30	N/A	-3,156
			None	0				
5.3	Choose Separation Distance Between Units	Exposure Distance Between Units	North Side	30.1-45 m	0.05	0.40	m	4,207
			East Side	20.1-30 m	0.10			
			South Side	30.1-45 m	0.05			
			West Side	3.1-10 m	0.20			
6	Obtain Required Fire Flow, Duration & Volume	Total Required Fire Flow, rounded to nearest 1000 L/min, with max/min limits applied:						10,000
		Total Required Fire Flow (above) in L/s:						167
		Required Duration of Fire Flow (hrs)						2.00
		Required Volume of Fire Flow (m^3)						1200

Note: The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guideline

Legend	
	Drop down menu - choose option, or enter value.
	No Information, No input required.

Note:

The most current FUS document should be referenced before design to ensure that the above figures are consistent with the intent of the Guideline.

Nearest fire hydrant distance 38.4m;

Manning Formula Uniform Pipe Flow at Given Slope and Depth

2458 Cleroux Cres, Ottawa

Inputs: storm lateral

Pipe Diameter, d_o	200.0000	mm
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_o	1.5000	% slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	16.5000	%

Results:

Flow, Q	2.5740	l/s
Velocity, v	0.7588	m/s
Velocity head, hv	0.0294	m
Flow Area, A	0.0034	m^2
Wetted Perimeter, P	0.1673	m
Hydraulic Radius	0.0203	m
Top Width, T	0.1485	m
Froude Number, F	1.60	
Shear Stress (tractive force), τ	4.8540	N/m^2

Manning Formula Uniform Pipe Flow at Given Slope and Depth

2458 Cleroux Cres, Ottawa

Inputs:

Pipe Diameter, d_o	250.0000	mm
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_o	0.4400	% slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	10.0000	%

Results:

Flow, Q	0.8922	l/s
Velocity, v	0.3492	m/s
Velocity head, hv	0.0062	m
Flow Area, A	0.0026	m^2
Wetted Perimeter, P	0.1609	m
Hydraulic Radius	0.0159	m
Top Width, T	0.1500	m
Froude Number, F	0.85	
Shear Stress (tractive force), τ	1.0787	N/m^2

Manning Formula Uniform Pipe Flow at Given Slope and Depth

2458 Cleroux Cres, Ottawa

Inputs:

Pipe Diameter, d_o	250.0000	mm
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_o	0.4400	% slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	80.0000	%

Results:

Flow, Q	41.7706	l/s
Velocity, v	0.9922	m/s
Velocity head, hv	0.0502	m
Flow Area, A	0.0421	m^2
Wetted Perimeter, P	0.5536	m
Hydraulic Radius	0.0760	m
Top Width, T	0.2000	m
Froude Number, F	0.69	
Shear Stress (tractive force), τ	8.6293	N/m^2

Manning Formula Uniform Pipe Flow at Given Slope and Depth

2458 Cleroux Cres, Ottawa

Inputs:

Pipe Diameter, d_o	375.0000	mm
Manning Roughness, n	0.0120	
Pressure slope (possibly equal to pipe slope), S_o	0.2700	% slope
Percent of (or ratio to) full depth (100% or 1 if flowing full)	10.0000	%

Results:

Flow, Q	2.0606	l/s
Velocity, v	0.3585	m/s
Velocity head, hv	0.0066	m
Flow Area, A	0.0057	m^2
Wetted Perimeter, P	0.2413	m
Hydraulic Radius	0.0238	m
Top Width, T	0.2250	m
Froude Number, F	0.72	
Shear Stress (tractive force), τ	0.9929	N/m^2

Project Number: CW-02-21 2458 Cleroux Cres. Ottawa

PRE-DEVELOPMENT (UNCONTROLLED)

The pre-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

I_5 = 104.2 mm/hr I_{100} = **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Vegetation area	A1	0.0360	25.8%	0.25	0.009
Green space	A2	0.0640	45.9%	0.25	0.016
Shed	A3	0.0035	2.5%	0.90	0.003
Shed2	A4	0.0008	0.6%	0.90	0.001
House	A5	0.0142	10.2%	0.90	0.013
Porch	A6	0.0030	2.2%	0.75	0.002
Green space	A7	0.0010	0.7%	0.25	0.000
Green space	A8	0.0110	7.9%	0.25	0.003
Driveway	A9	0.0040	2.9%	0.80	0.003
Wood ramp	A10	0.0020	1.4%	0.40	0.001
TOTAL		0.13950	100.0%		0.051
Weighted C =					0.36

0.36 Actual C factor

$Q_{5pre} = (2.78)*(C)*(I_5)*(A)$

Q_{5pre} = 2.78 x 0.36 x 104.2 x 0.1395

Q_{5pre} = 14.55 L/s

$Q_{100pre} = (2.78)*(C)*(I_{100})*(A)$

Q_{100pre} = 2.78 x 0.36 x 178.6 x 0.1395

Q_{100pre} = 24.93 L/s

Note: Maximum C=0.5 for predevlopment (City of Ottawa)

POST-DEVELOPMENT (UNCONTROLLED RUNOFF)

The post-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

I_5 = 104.2 mm/hr I_{100} = **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Landscape 1	A2	0.067300	100.0%	0.40	0.027
Landscape 2	A3	0.000000	0.0%	0.70	0.000
TOTAL		0.0673	100.0%		0.027
Weighted C =					0.40

0.40 Actual C factor

$Q_{5post} = (2.78)*(C)*(I_5)*(A)$

Q_{5post} = 2.78 x 0.40 x 104.2 x 0.0673

Q_{5post} = 7.80 L/s

$Q_{100post} = (2.78)*(C)*(I_{100})*(A)$

$Q_{100post}$ = 2.78 x 0.40 x 178.6 x 0.0673

$Q_{100post}$ = 13.37 L/s

Project Number: CW-02-21 2458 Cleroux Cres. Ottawa

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PRE-DEVELOPMENT (CONTROLLED)

The pre-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

I_5 = 104.2 mm/hr I_{100} = **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
		0.00000	0.0%	0.95	0.000
		0.00000	0.0%	0.95	0.000
		0.00000	0.0%	0.70	0.000
TOTAL		0.0000	0.0%		0.000
Weighted C =					0.00

$Q_{5pre} = (2.78)*(C)*(I_5)*(A)$
Q_{5pre} = 2.78 x 0.00 x 104.2 x 0.0000
Q_{5pre} = 0.00 L/s

$Q_{100pre} = (2.78)*(C)*(I_{100})*(A)$
Q_{100pre} = 2.78 x 0.00 x 178.6 x 0.0000
Q_{100pre} = 0.00 L/s

POST-DEVELOPMENT (CONTROLLED RUNOFF)

The post-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

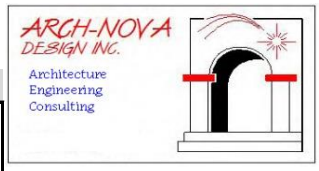
I_5 = 104.2 mm/hr I_{100} = **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Building	A1	0.04950	0.0%	0.95	0.047
TOTAL		0.04950	0.0%		0.047
Weighted C =					1.00

$Q_{5post} = (2.78)*(C)*(I_5)*(A)$
Q_{5post} = 2.78 x 1.00 x 104.2 x 0.0495
Q_{5post} = 14.34 L/s

$Q_{100post} = (2.78)*(C)*(I_{100})*(A)$
$Q_{100post}$ = 2.78 x 1.00 x 178.6 x 0.0495
$Q_{100post}$ = 24.58 L/s

ALLOWABLE RUNOFF



Predevelopment Runoff:		
Uncontrolled Runoff		
5-year	10.33	l/sec
100-year	17.70	l/sec
Controlled Runoff:		
5-year	14.34	l/sec
100-year	24.58	l/sec

Postdevelopment Runoff:		
Uncontrolled Runoff		
5-year	7.80	l/sec
100-year	13.37	l/sec
Controlled Runoff:		
5-year	14.34	l/sec
100-year	24.58	l/sec

Controlled allowable runoff		
5 year	**2.53**	**l/sec**

Storage Volumes (5-Year Storm)

Project : 2458 Cleroux Cres. Ottawa

Tc = 10 (mins)
C_{AVG} = 1.00 (dimmensionless)
Area = 0.0495 (hectares)
Storm = 5 (year)
Release Rate = 2.53 (L/sec)
Time Interval = 10 (mins)

Duration (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
1	204	2.8	2.53		
11	99	13.6	2.53	11.12	7.34
21	68	9.4	2.53	6.85	8.63
31	53	7.3	2.53	4.73	8.80
41	43	6.0	2.53	3.45	8.48
51	37	5.1	2.53	2.58	7.89
61	33	4.5	2.53	1.95	7.14
71	29	4.0	2.53	1.47	6.27
81	26	3.6	2.53	1.09	5.31
91	24	3.3	2.53	0.79	4.29
101	22	3.1	2.53	0.53	3.22
111	21	2.8	2.53	0.32	2.11
121	19	2.7	2.53	0.13	0.97
131	18	2.5	2.53	-0.03	-0.20
141	17	2.4	2.53	-0.17	-1.40
151	16	2.2	2.53	-0.29	-2.61
161	15	2.1	2.53	-0.40	-3.85
171	15	2.0	2.53	-0.50	-5.10
181	14	1.9	2.53	-0.59	-6.36
191	14	1.9	2.53	-0.67	-7.63
201	13	1.8	2.53	-0.74	-8.92
211	13	1.7	2.53	-0.81	-10.22
221	12	1.7	2.53	-0.87	-11.52
231	12	1.6	2.53	-0.93	-12.84
241	11	1.5	2.53	-0.98	-14.16
251	11	1.5	2.53	-1.03	-15.49
261	11	1.5	2.53	-1.07	-16.82
271	10	1.4	2.53	-1.12	-18.17

Notes

1) For a storm duration that is less than the time of concentration the peak flow is equal to the product of 2.78CIA and the ratio of the storm duration to the time of concentration.

2) Rainfall Intensity, I = 998.071 / (Tc + 6.053)^0.814 (5 year, City of Ottawa)
3) Peak Flow = Duration/Tc x 2.78 x C x I x A (Duration < Tc)
4) Peak Flow = 2.78 x C x I x A (Duration > Tc)
5) Storage = Duration x Storage Rate

Storage Volumes (100-Year Storm)

Tc = 10 (mins)
C_{AVG} = 1.00 (dimmensionless)
Area = 0.0495 (hectares)
Storm = 100 (year)
Release Rate = 2.53 (L/sec)
Time Interval = 10 (mins)

Duration (min)	Rainfall Intensity (mm/hr)	Peak Flow (L/sec)	Release Rate (L/sec)	Storage Rate (L/sec)	Storage (m^3)
1	351	4.8	2.53		
11	170	23.4	2.53	20.85	13.76
21	116	16.0	2.53	13.48	16.98
31	90	12.4	2.53	9.83	18.29
41	74	10.2	2.53	7.63	18.77
51	63	8.7	2.53	6.15	18.81
61	55	7.6	2.53	5.07	18.55
71	49	6.8	2.53	4.25	18.11
81	45	6.1	2.53	3.60	17.52
91	41	5.6	2.53	3.08	16.82
101	38	5.2	2.53	2.65	16.04
111	35	4.8	2.53	2.28	15.20
121	33	4.5	2.53	1.97	14.30
131	31	4.2	2.53	1.70	13.35
141	29	4.0	2.53	1.46	12.36
151	27	3.8	2.53	1.25	11.34
161	26	3.6	2.53	1.06	10.29
171	25	3.4	2.53	0.90	9.21
181	24	3.3	2.53	0.75	8.11
191	23	3.1	2.53	0.61	6.99
201	22	3.0	2.53	0.48	5.85
211	21	2.9	2.53	0.37	4.69
221	20	2.8	2.53	0.27	3.52
231	20	2.7	2.53	0.17	2.33
241	19	2.6	2.53	0.08	1.13
251	18	2.5	2.53	-0.01	-0.08
261	18	2.4	2.53	-0.08	-1.30
271	17	2.4	2.53	-0.16	-2.53

Notes

1) For a storm duration that is less than the time of concentration the peak flow is equal to the product of 2.78CIA and the ratio of the storm duration to the time of concentration.

2) Rainfall Intensity, I = 1735.688 / (Tc + 6.014)^0.820 (100 year, City of Ottawa)
3) Peak Flow = Duration/Tc x 2.78 x C x I x A (Duration < Tc)
4) Peak Flow = 2.78 x C x I x A (Duration > Tc)
5) Storage = Duration x Storage Rate

ect : 2458 Cleroux Cres. Ottawa

Storage Requirements

5-year **8.80 m^3**

100-year **18.81 m^3**

Surface Type	ID	Area (ha)	Percent of total Area	Required Storage 2 year	Required Storage 100 year	Max Allowed Drain Outflow l/s	Max Allowed Drain Outflow GPM
Roof	A1	0.02286	49.9%	4.39	9.39	1.26	20.01
Roof	A2	0.02292	50.1%	4.40	9.42	1.27	20.07
TOTAL		0.0458	100.0%	8.80	18.81	2.53	40.07

Legend:

data for 2-year event

data for 100-year event

Stage-Storage

Roof A1 (Drain 1)			**Roof A2 (Drain 2)**		
Depth m	**Area** m^2	**Volume** m^3	**Depth** m	**Area** m^2	**Volume** m^3
0.020	75.00	0.50	0.020	75.00	0.50
0.040	110.00	1.47	0.040	110.00	1.47
0.075	**175.50**	**4.39**	**0.075**	**176.00**	**4.40**
0.124	**227.40**	**9.40**	**0.124**	**228**	**9.42**

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Notes:

Roof drains with controlled flow to be specified by manufacturer using the allowable flow rates presented in this chart

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Project Number: CW-02-21 2458 Cleroux Cres. Ottawa

PRE-DEVELOPMENT Uncontrolled to rear

The pre-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

I_5 = 104.2 mm/hr I_{100} = **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Vegetation area	A1	0.0360	32.3%	0.25	0.009
Green space	A2	0.0640	57.5%	0.25	0.016
Shed	A3	0.0035	3.1%	0.90	0.003
Shed2	A4	0.0008	0.7%	0.90	0.001
House	A5	0.0071	6.4%	0.90	0.006
TOTAL		0.11140	100.0%		0.035
Weighted C =					0.32

0.32 Actual C factor

$Q_{5pre} = (2.78)*(C)*(I_5)*(A)$

Q_{5pre} = 2.78 x 0.32 x 104.2 x 0.1114

Q_{5pre} = 10.33 L/s

$Q_{100pre} = (2.78)*(C)*(I_{100})*(A)$

Q_{100pre} = 2.78 x 0.32 x 178.6 x 0.1114

Q_{100pre} = 17.70 L/s

Note: Maximum C=0.5 for predevlopment (City of Ottawa) *

house's 1/2 of the roof drains to the rear yard

PRE-DEVELOPMENT Uncontrolled to front

The post-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

I_5 = 104.2 mm/hr I_{100} = **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
House*	A5	0.0071	6.4%	0.90	0.006
Porch	A6	0.0030	2.7%	0.75	0.002
Green space	A7	0.0010	0.9%	0.25	0.000
Green space	A8	0.0110	9.9%	0.25	0.003
Driveway	A9	0.0040	3.6%	0.80	0.003
Wood ramp	A10	0.0020	1.8%	0.40	0.001
TOTAL		0.0281	25.2%		0.016
Weighted C =					0.50

0.56 Actual C factor

$Q_{5post} = (2.78)*(C)*(I_5)*(A)$

Q_{5post} = 2.78 x 0.50 x 104.2 x 0.0281

Q_{5post} = 4.07 L/s

$Q_{100post} = (2.78)*(C)*(I_{100})*(A)$

$Q_{100post}$ = 2.78 x 0.50 x 178.6 x 0.0281

$Q_{100post}$ = 6.98 L/s

Note: * house 1/2 of the roof drains toward the street

Project Number: CW-02-21 2458 Cleroux Cres. Ottawa

PRE-DEVELOPMENT (unclontrolled runoff to the front)

The pre-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

I_5 = 104.2 mm/hr I_{100} = **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Vegetation area	A1	0.0000	0.0%	0.25	0.000
Green space	A2	0.0000	0.0%	0.25	0.000
Shed	A3	0.0000	0.0%	0.90	0.000
Shed2	A4	0.0000	0.0%	0.90	0.000
House*	A5	0.0071	25.3%	0.90	0.006
Porch	A6	0.0030	10.7%	0.75	0.002
Green space	A7	0.0010	3.6%	0.25	0.000
Green space	A8	0.0110	39.1%	0.25	0.003
Driveway	A9	0.0040	14.2%	0.80	0.003
Wood ramp	A10	0.0020	7.1%	0.40	0.001
TOTAL		0.02810	100.0%		0.016
Weighted C =					0.50

$Q_{5pre} = (2.78)*(C)*(I_5)*(A)$

Q_{5pre} = 2.78 x 0.50 x 104.2 x 0.0281

Q_{5pre} = 4.07 L/s

$Q_{100pre} = (2.78)*(C)*(I_{100})*(A)$

Q_{100pre} = 2.78 x 0.50 x 178.6 x 0.0281

Q_{100pre} = 6.98 L/s

0.56 Actual C factor

Note: Maximum C=0.5 for predevlopment (City of Ottawa)

* house 1/2 of the roof drains to the rear yard

POST-DEVELOPMENT (uncontrolled runoff to the front)

The post-development time of concentration is 10 minutes

where:

$I_5 = 998.071 / (Tc + 6.053)^{0.814}$ $I_{100} = 1735.688 / (Tc + 6.014)^{0.820}$

I_5 = 104.2 mm/hr I_{100} = **178.6 mm/hr**

Surface Type	ID	Area (ha)	Percent of total Area	C	A X C (ha)
Landscape 1	A2	0.000000	0.0%	0.70	0.000
Landscape 2	A3	0.022700	100.0%	0.70	0.016
TOTAL		0.0227	100.0%		0.016
Weighted C =					0.70

$Q_{5post} = (2.78)*(C)*(I_5)*(A)$

Q_{5post} = 2.78 x 0.70 x 104.2 x 0.0227

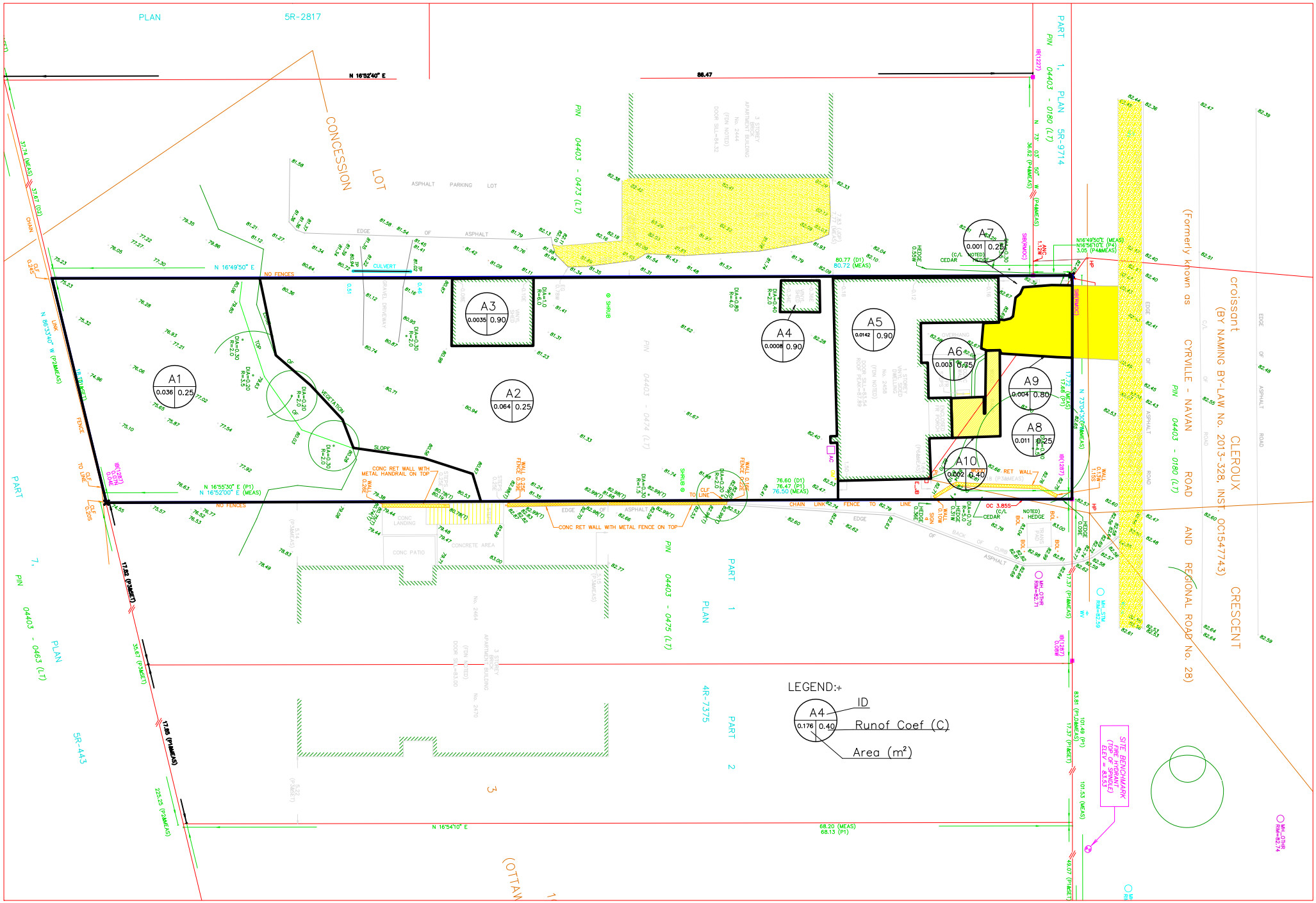
Q_{5post} = 4.60 L/s

$Q_{100post} = (2.78)*(C)*(I_{100})*(A)$

$Q_{100post}$ = 2.78 x 0.70 x 178.6 x 0.0227

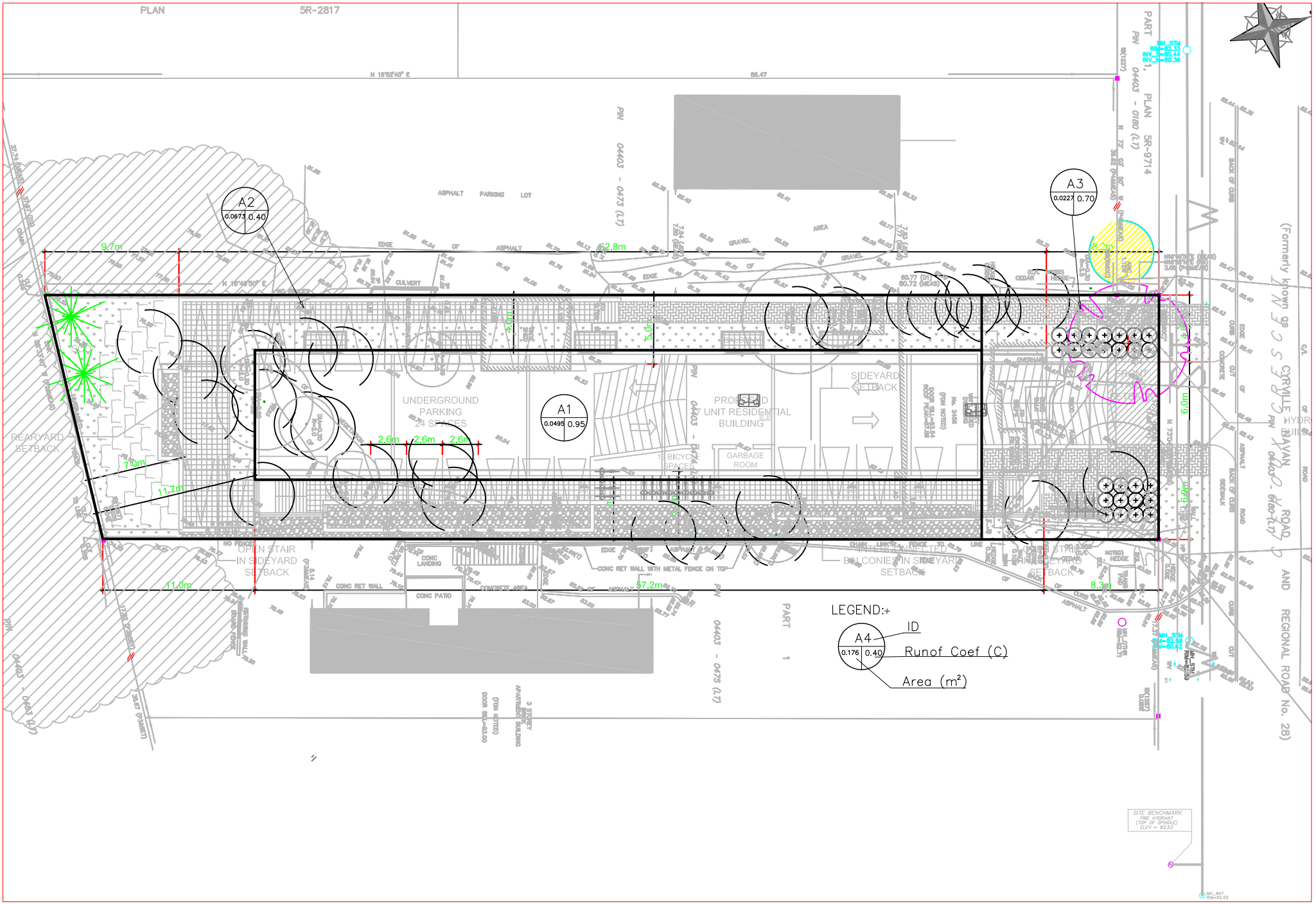
$Q_{100post}$ = 7.89 L/s

0.70 Actual C factor



2458 CLEROUX CRES
SWM PREDEVELOPMENT

ARCH-NOVA Design Inc.
45 Banner Road NEPEAN ON K2H 8X5
613-702-3403 contact@archnova.ca



2458 CLEROUX CRES
SWM POSTDEVELOPMENT

ARCH-NOVA Design Inc.
45 Banner Road NEPEAN ON K2H 8X5
613-702-3403 contact@archnova.ca

Appendix B: Correspondence

zoran@archnova.ca

From: Rasool, Rubina <Rubina.Rasool@ottawa.ca>
Sent: August 20, 2021 3:36 PM
To: zoran@archnova.ca
Subject: RE: 2458 Cleroux Cres: Boundary Codnitions
Attachments: 2458 Cleroux Cres_20August2021.docx

Good afternoon,

Please find attached the water boundary conditions for the proposed development.

Have a good weekend.

Rubina

Rubina Rasool, E.I.T.
Project Manager
Planning, Infrastructure and Economic Development Department - Services de la planification, de l'infrastructure et du développement économique
Development Review – East Branch
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West Ottawa, ON | 110, avenue Laurier Ouest. Ottawa (Ontario) K1P 1J1 rubina.rasool@ottawa.ca

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From: zoran@archnova.ca <zoran@archnova.ca>
Sent: August 03, 2021 7:41 PM
To: Rasool, Rubina <Rubina.Rasool@ottawa.ca>
Subject: 2458 Cleroux Cres: Boundary Codnitions

Could you please provide the boundary conditions for the location of 2458 Cleroux Cres., Ottawa?
Following are the initial information:

1. Type of development: 3storey+covered garage, 20 units building.
2. Fire flow required: 217 l/sec (FUS); 163.98 (OBC); nearest hydrant distance 38.4 m
3. Average Daily Demand: 0.12 l/sec
4. Maximum Hourly Demand: 1.75 l/Sec
5. Maximum Daily Demand: 1.16 l/sec

Attached are calculation sheets, image of nearest hydrant distance (from GeoOttawa) and the site plan of proposed development.
Regards,

Zoran Mrdja, P.Eng., FEC

Arch-Nova Design Inc.
613-818-3884

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'

Boundary Conditions
2458 Cleroux Crescent

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	7	0.12
Maximum Daily Demand	70	1.16
Peak Hour	105	1.75
Fire Flow Demand #1	13,000	216.67

Location

Results

Connection 1 – Cleroux Cres.

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	131.0	67.7
Peak Hour	127.0	62.1
Max Day plus Fire 1	105.3	31.3

Ground Elevation = 83.3 m

Notes

1. A second connection to the watermain is recommended to decrease vulnerability of the water system in case of breaks.

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.