STANLEY / MORDEN MIXED-USE DEVELOPMENT
4965-4981 STANLEY AVE - 5516 MORDEN DR, NIAGARA FALLS

FUNCTIONAL SERVICING DESIGN BRIEF
NEW STORM, SANITARY AND WATER SERVICES

REV 0 – September 16, 2024

PREPARED BY:

HALLEX PROJECT #240712

HALLEX NIAGARA
4999 VICTORIA AVENUE
NIAGARA FALLS, ON L2E 4C9

HALLEX HAMILTON
745 SOUTH SERVICE ROAD, UNIT 205
STONEY CREEK, ON L8E 5Z2

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1. INTRODUCTION

The proposed Stanley / Morden mixed-use building development consists of the demolition of the two single-family dwellings, the three-unit townhouse block, the four-unit townhouse block and the parking lots and the construction of a six-storey mixed-use commercial and residential building, asphalt laneway and parking areas, parking structure below grade and grass areas. This development is located at 4965-4981 Stanley Avenue & 5516 Morden Drive, which is at the southwest corner of the Stanley Avenue and Morden Drive intersection and the northwest corner of the Stanley Avenue and Arthur Street intersection in the City of Niagara Falls, ON.

The purpose of the service assessment is to determine the functional sizing of the proposed storm, sanitary, and water services in addition to the post-development flows from the site to determine the impact on the existing municipal infrastructure.

2. EXISTING MUNICIPAL INFRASTRUCTURE

2.1 EXISTING SITE DRAINAGE

The existing site currently drains from the northwest to the southeast side of the property via overland flow as shown in Figure 1 – 4965-4981 Stanley Avenue & 5516 Morden Drive Watershed Map – Existing Site Contours.

Figure 1 – 4965-4981 Stanley Avenue & 5516 Morden Drive Watershed Map – Existing Site Contours

This overland flow ultimately drains to the existing municipal storm sewer at Stanley Avenue.

2.2 STORM SEWER

The existing site is not currently serviced with a storm lateral connection as the existing residential properties currently drains from the site via overland flow. The existing drainage infrastructure at Morden Drive consists of a 450mm PVC municipal storm sewer which drains easterly towards Stanley Avenue. The existing drainage infrastructure at Arthur Street consists of a 450mm PVC municipal storm sewer which drains easterly towards Stanley Avenue. The existing drainage infrastructure at Stanley Avenue consists of a 1050mm reinforced concrete municipal storm sewer which drains southerly to Valley Way.

2.3 SANITARY SEWER

The existing site is currently serviced with a 100mm and a 150mm sanitary lateral connection to Stanley Avenue as it consists of the existing residential properties. However the size and location of other existing sanitary laterals are unknown. The existing sanitary infrastructure at Morden Drive consists of a 300mm concrete municipal sanitary sewer which drains easterly towards Stanley Avenue. The existing sanitary infrastructure at Arthur Street consists of a 250mm asbestos cement municipal sanitary sewer which also drains easterly towards Stanley Avenue. The existing drainage infrastructure at Stanley Avenue consists of a 675mm reinforced concrete municipal storm sewer which drains southerly to Valley Way.

2.4 WATERMAIN

The existing site is currently serviced with a 16mm copper water service connection to Stanley Avenue, a 25mm water service connection to Morden Drive and a water service connection to Arthur Street as it consists of the existing residential properties. However, the size and location of other existing water service connections are unknown. The existing watermain infrastructure at Morden Drive consists of a 200mm cast iron municipal watermain. The existing watermain infrastructure at Arthur Street consists of a 150mm cast iron municipal watermain. The existing watermain infrastructure at Stanley Avenue consists of a 150mm PVC municipal watermain and a 450mm hyprescon regional watermain.

3. STORM SEWER SYSTEM

3.1 PRE-DEVELOPMENT SITE FLOW

The total drainage area for the subject development is 0.460 hectares with an existing runoff coefficient of 0.49 based on the existing roof, asphalt, and grass surfaces. The catchment area plan for the pre-development site condition is provided on Hallex Sketch CSK1, attached.

Utilizing the rationale method (Q = CiA/360) and the minimum recommended time of concentration of 10 minutes, the allowable peak flow for the pre-development site is as follows:

Storm Event	Pre-Development Storm Flow
5-year Storm	53.0 L/s
100-year Storm	84.3 L/s

These flows are calculated using the City of Niagara Falls intensity-duration-frequency curves. The pre-development flows for the proposed development are provided in Exhibit #1 for the five-year storm and Exhibit #2 for the one-hundred-year storm at the end of the design brief.

3.2 POST-DEVELOPMENT SITE FLOW

The proposed development includes the six-storey mixed-use building, asphalt laneway and parking areas, parking structure below grade, and grass areas. The grading for the site will ensure drainage through the proposed storm sewer for storm water quantity and quality controls. The total drainage for the site consists of 0.460 hectares with a calculated runoff coefficient of 0.78 based on the proposed roof, asphalt, and grass surfaces. The proposed storm sewer for the site will then discharge to the existing 1050mm reinforced concrete municipal storm sewer at Stanley Street. The catchment area plan for the post-development site condition is provided on Hallex Sketch CSK2, attached.

Utilizing the rationale method (Q = CiA/360) and the minimum recommended time of concentration of 10 minutes, the calculated peak flow for the post-development site is as follows:

Storm Event	Post-Development Storm Flow
5-year Storm	83.6 L/s
100-year Storm	133.1 L/s

These flows are calculated using the City of Niagara Falls' intensity-duration-frequency curves. The post-development flows for the proposed development are provided in Exhibit #3 for the five-year storm and Exhibit #4 for the one-hundred-year storm at the end of the design brief.

3.3 STORMWATER QUANTITY CONTROL

The post-development storm water runoff to Stanley Avenue will increase by 30.6 L/s for the five-year storm and 48.8 L/s for the one-hundred-year storm from the maximum allowable flow from the site. As such, storm water detention will be required for the proposed development.

Stormwater quantity controls for the site can be achieved by utilizing an orifice plate in a cast-in-place stormwater management tank within the envelope of the building prior to discharging to the existing 1050mm reinforced concrete municipal storm sewer at Stanley Avenue. The cast-in-place stormwater management tank

will be sized to ensure the resulting 42.0m^3 volume generated for the five-year storm event and 65.0m^3 volume generated for the one-hundred-year storm event can be stored within the tank.

3.4 STORMWATER QUALITY CONTROL

Stormwater quality controls for the site can be achieved by utilizing a Hydroguard HG4 prior to draining to the existing 1050mm reinforced concrete municipal storm sewer at Stanley Avenue. This will achieve a total suspended solids removal of at least 78% based on the above post-development site conditions. This value is greater than the required 'Normal' treatment of 70% as indicated in the MOE Stormwater Management Planning and Design Manual, dated March 2003 (refer to Chapter 3: Environmental Design Criteria, Section 3.3.1.1. Level of Protection).

4. SANITARY SEWER SYSTEM

Given the site is to be completely redeveloped for the proposed six-storey mixed-use building development, all existing sanitary laterals are to be located, capped and abandoned as required at the municipal sanitary sewers. A new sanitary lateral shall be proposed from the building to the existing 300mm concrete municipal sanitary sewer at Morden Drive.

The building development is currently in the concept phase; therefore, the following assumptions based on the architectural drawings are made in carrying out the calculations:

- The domestic sewage design flow is based on the recommendation in Section 5.5.2.1 - Domestic Sewage Flows of the Ministry of the Environment Design Guidelines for Sewage Works 2008 and Section 3 - Sanitary Drainage Systems of the City of Niagara Falls Engineering Design Guidelines Manual
- The average commercial daily design flow is based on the recommendation in Section 5.5.2.2 Commercial and Institutional Sewage Flows of the Ministry of the Environment Design Guidelines for Sewage Works 2008 assuming the flow is distributed over 8 hours.
- The six-storey mixed-use building is assumed to have five floors consisting of 73 two-bedroom apartment units. Each apartment is assumed to have a maximum of 2 persons per bedroom

The peak dry weather design flow for the proposed mixed-use development is determined to be 7.291 L/s, and the peak wet weather design flow is determined to be 7.420 L/s. These calculations are based on the Post-Development Sanitary Catchment Area Plan CSK3 and the Post-Development Sanitary Sewer Design sheet provided in Exhibit #5, attached.

Based on the above, Hallex recommends a minimum 200mm diameter sanitary sewer @ 1.0% to be installed to convey sanitary flows from the proposed building to the existing 300mm concrete municipal sanitary sewer at Morden Drive.

5. WATER DISTRIBUTION SYSTEM

Given the site is to be completely redeveloped for the proposed mixed-use development, all existing water services are to be located, capped and abandoned as required at the municipal watermains. A new water service shall be proposed from the building to the existing 200mm cast iron municipal watermain at Morden Drive.

The building development is currently in the concept phase; therefore, the following assumptions based on the architectural drawings are made in carrying out the calculations:

- The domestic average daily water demand is based on Section 3.4.2. Domestic Water Demands of the Ministry of the Environment Design Guidelines for Drinking-Water Systems 2008.
- The peaking factors are based on the recommendation in Table 3-3: Peaking Factors for Drinking-Water Systems Serving Fewer than 500 People of the Ministry of the Environment Design Guidelines for Drinking-Water Systems 2008.
- The building is assumed to be fire protected vertically between floors (including the protection of vertical openings between floors), of non-combustible construction and will have sprinklers and hose cabinets installed throughout the building as per applicable standards.

The domestic water demand for the proposed development is calculated as follows:

Site	Average Day Water Demand	Maximum Day Water Demand	Peak Hour Water Demand
Area.1	144.3 m^3/day	519.4 m^3/day	38.3 L/s

The resulting domestic flow head losses for the development are determined to be 5.32 kPa (0.77 psi). The resulting fire flow head losses for the development are determined to be 31.46 kPa (4.56 psi). As such, the minimum working pressure within the existing municipal watermain is required to be 40.77 psi to ensure a minimum normal operating pressure of 40 psi (domestic) and 20 psi (fire) within the municipal watermain. These calculations are based on the Water Demand Design sheet provided in Exhibit #6, attached.

Using the calculations provided in the Fire Underwriters Survey – 2020 Water Supply for Public Fire Protection, the minimum water supply flow rate for fire protection is determined to be 6,000 L/min for the building based on the above assumptions as shown in Exhibit #5, attached. There are five existing municipal fire hydrants located near the site. The first is located immediately adjacent to the southeast corner of the site on the east side of Stanley Avenue. The second is located immediately adjacent to the southeast corner of the site on the north side of Arthur Street. The third is located immediately adjacent to the northeast corner of the site on the south side of Morden Drive. The fourth is approximately 36.5m north of the property on the east side of Stanley Avenue. The fifth is approximately 68.5m west of the property on the south side of Morden Drive.

Based on the above, Hallex recommends a minimum 150mm diameter water service to be installed to provide water supply to the proposed six-storey apartment building from the existing 200mm cast iron municipal watermain at Morden Drive. The water service is to be separated at the property line with a 100mm diameter domestic water service and a 150mm fire protection service and shall extend to the mechanical room of the proposed building

6. CONCLUSION

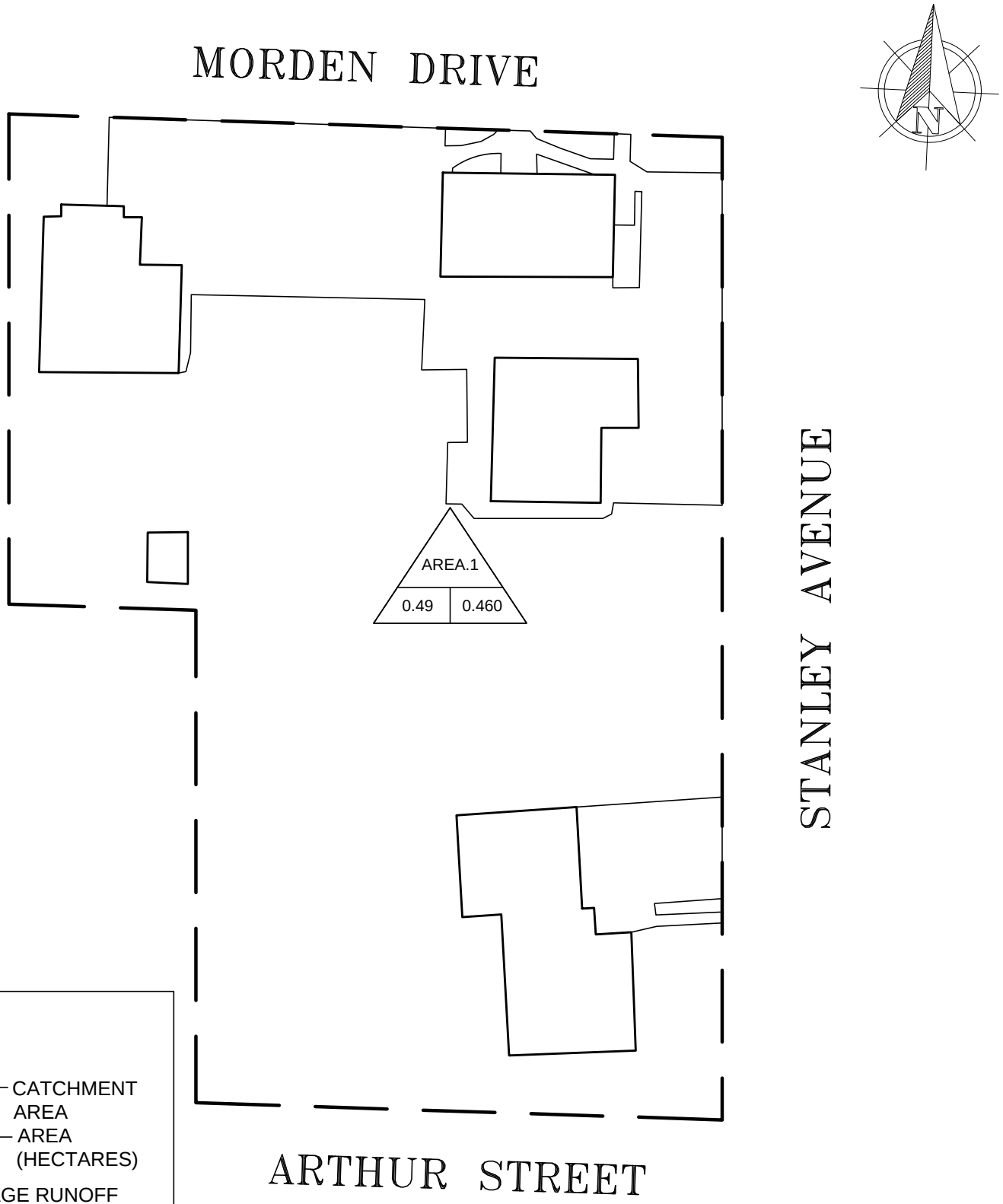
The aforementioned calculations and recommendations for the storm, sanitary and water services are based on the current design for the site as of writing this report. A final sealed report, complete with updates to the recommendations made in this report, may be required based on the final site design.

We trust this report meets your approval. Please contact the undersigned should you have any questions or comments.

Yours truly,
HALLEX ENGINEERING LTD

Jim Halucha P.Eng
Civil/Structural Engineer

Jonathan Skinner, C.E.T., B.Tech
Civil Technologist



LEGEND

CATCHMENT AREA
AREA (HECTARES)
AVERAGE RUNOFF COEFFICIENT

HALLEX CIVIL ENGINEERING LTD.
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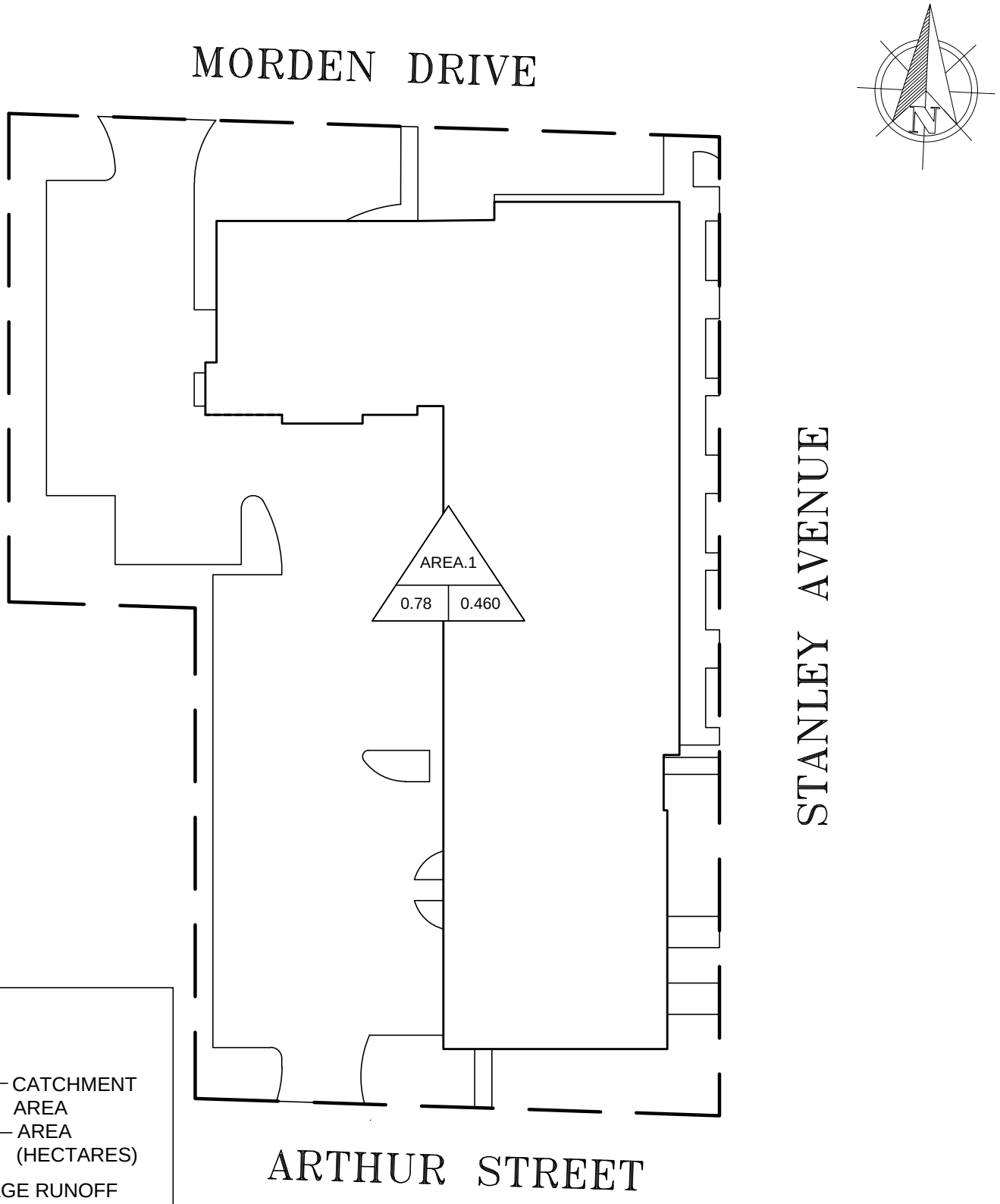
PROJECT: STANLEY / MORDEN DEVELOPMENT STANLEY AVE. & MORDEN DR., NF	SCALE: 1:500	JOB NUMBER: 240712	
	DATE: 2024/09/17	ISSUED FOR: ZONING BYLAW AMENDMENT	
	DRAWN BY: JSa	DWG: CSK1	REV.: 0
SHEET TITLE: PRE-DEVELOPMENT CATCHMENT AREA PLAN	DESIGNED BY: JS		
	CHECKED BY: JH		



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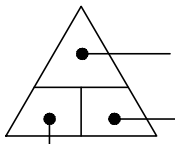

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PROJECT:
STANLEY / MORDEN DEVELOPMENT
STANLEY AVE. & MORDEN DR., NF

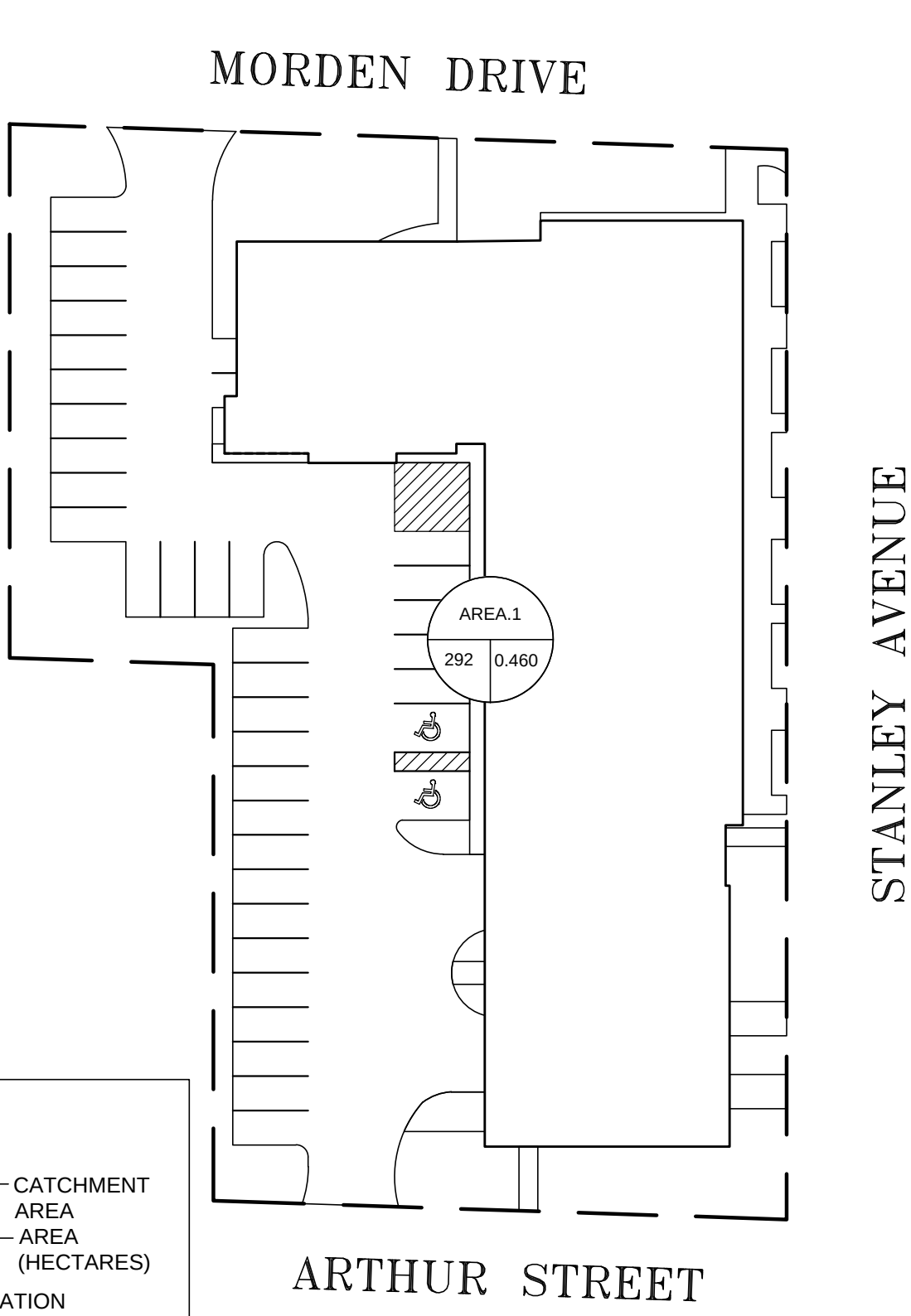
SHEET TITLE:
POST-DEVELOPMENT
CATCHMENT AREA PLAN

SCALE: 1:500
DATE: 2024/09/17
DRAWN BY: JSa
DESIGNED BY: JS
CHECKED BY: JH

JOB NUMBER: 240712
ISSUED FOR: ZONING BYLAW AMENDMENT

DWG CSK2

REV. 0



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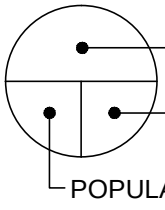

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PROJECT: STANLEY / MORDEN DEVELOPMENT STANLEY AVE. & MORDEN DR., NF	SCALE: 1:500	JOB NUMBER: 240712	
	DATE: 2024/09/17	ISSUED FOR: ZONING BYLAW AMENDMENT	
	DRAWN BY: JSa	DWG	REV.
SHEET TITLE: POST-DEVELOPMENT SANITARY CATCHMENT AREA PLAN	DESIGNED BY: JS	CSK3	0
	CHECKED BY: JH		

Stanley / Morden Mixed-Use Development
Exhibit #1 - 5 Year Pre - Development Calculations

9/17/2024
Job: 240712

MUNICIPALITY: **Niagara Falls**

manning's n = 0.013 Conc Pipe
0.013 PVC Pipe
0.024 Corr. Stl Pipe

Rainfall Intensity Values = A= 719.500
B= 6.340
C= 0.769

Location			Length of Pipe	Area		Flow Time		Rainfall Intensity	Unit rate of Runoff	Design Flows	
Pipe	From Node	To Node		Increment	Cum Total	To Upper	In Sectio			Cum Flow	Cum Flow
			(m)	(ha)	(ha)	(min)	(min)	mm/hr	m^3/ha*day	(m^3/d)	(m^3/s)
1	**Area.1**	**Street**	**N/A**	**0.460**	**0.460**	**10.00**	**N/A**	**84**	**60497**	**4575.6**	**0.0530**
Roof	-	-	-	0.067	-	-	-	-	19157.5	1283.6	-
Paved	-	-	-	0.100	-	-	-	-	18149.2	1814.9	-
Grass	-	-	-	0.293	-	-	-	-	5041.4	1477.1	-

Run-off Coefficients Used:

Roof Structure C = 0.95
Paved Surface C = 0.90
Grass Surface C = 0.25

Velocity Range:

Minimum Velocity = 0.80 m/s
Maximum Velocity = 6.00 m/s

Time of Concentration = 10 min

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Niagara Falls, ON L2E 4C9

745 South Service Road, Unit 205
Stoney Creek, ON L8E 5Z2

Stanley / Morden Mixed-Use Development
Exhibit #2 - 100 Year Pre - Development Calculations

9/17/2024
Job: 240712

MUNICIPALITY: **Niagara Falls**

manning's n = 0.013 Conc Pipe
0.013 PVC Pipe
0.024 Corr. Stl Pipe

Rainfall Intensity Values = A= 1264.570
B= 7.720
C= 0.781

Location			Length of Pipe	Area		Flow Time		Rainfall Intensity	Unit rate of Runoff	Design Flows	
Pipe	From Node	To Node		Incre-ment	Cum Total	To Upper	In Sectio			Cum Flow	Cum Flow
			(m)	(ha)	(ha)	(min)	(min)	mm/hr	m^3/ha*day	(m^3/d)	(m^3/s)
1	**Area.1**	**Street**	**N/A**	**0.460**	**0.460**	**10.00**	**N/A**	**134**	**96322**	**7285.2**	**0.0843**
Roof	-	-	-	0.067	-	-	-	-	30502.0	2043.6	-
Paved	-	-	-	0.100	-	-	-	-	28896.6	2889.7	-
Grass	-	-	-	0.293	-	-	-	-	8026.8	2351.9	-

Run-off Coefficients Used:

Roof Structure C = 0.95
Paved Surface C = 0.90
Grass Surface C = 0.25

Velocity Range:

Minimum Velocity = 0.80 m/s
Maximum Velocity = 6.00 m/s

Time of Concentration = 10 min

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Stoney Creek, ON L8E 5Z2

HALLEX CIVIL ENGINEERING LTD.

Stanley / Morden Mixed-Use Development
Exhibit #3 - 5 Year Post - Development Calculations

9/17/2024
Job: 240712

MUNICIPALITY: **Niagara Falls**

Rainfall Intensity Values =

A=	719.500
B=	6.340
C=	0.769

Location			Length of Pipe	Area		Flow Time		Rainfall Intensity	Unit rate of Runoff	Design Flows	
Pipe	From Node	To Node		Incre-ment	Cum Total	To Upper	In Section			Cum Flow	Cum Flow
			(m)	(ha)	(ha)	(min)	(min)	mm/hr	m^3/ha*day	(m^3/d)	(m^3/s)
1	**Area 1**	**Street**	**N/A**	**0.460**	**0.460**	**10.00**	**N/A**	**84**	**42348**	**7222.4**	**0.0836**
Roof	-	-	-	0.183	-	-	-	-	19157.5	3505.8	-
Paved	-	-	-	0.177	-	-	-	-	18149.2	3212.4	-
Grass	-	-	-	0.100	-	-	-	-	5041.4	504.1	-

Run-off Coefficients Used:

Roof Structure	C =	0.95
Paved Surface	C =	0.90
Grass Surface	C =	0.25

Velocity Range:

Minimum Velocity =	0.80	m/s
Maximum Velocity =	6.00	m/s

Time of Concentration:

Time of Concentration = 10 min

4999 Victoria Avenue
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Stoney Creek, ON L8E 5Z2

Stanley / Morden Mixed-Use Development
Exhibit #4 - 100 Year Post - Development Calculations

MUNICIPALITY: **Niagara Falls**

Rainfall Intensity Values =

A= 1264.570
B= 7.720
C= 0.781

Location			Length of Pipe	Area		Flow Time		Rainfall Intensity	Unit rate of Runoff	Design Flows	
Pipe	From Node	To Node		Incre-ment	Cum Total	To Upper	In Section			Cum Flow	Cum Flow
			(m)	(ha)	(ha)	(min)	(min)	mm/hr	m^3/ha*day	(m^3/d)	(m^3/s)
1	**Area 1**	**Street**	**N/A**	**0.460**	**0.460**	**10.00**	**N/A**	**134**	**67425**	**11499.3**	**0.1331**
Roof	-	-	-	0.183	-	-	-	-	30502.0	5581.9	-
Paved	-	-	-	0.177	-	-	-	-	28896.6	5114.7	-
Grass	-	-	-	0.100	-	-	-	-	8026.8	802.7	-

Run-off Coefficients Used:

Roof Structure C = 0.95
Paved Surface C = 0.90
Grass Surface C = 0.25

Velocity Range:

Minimum Velocity = 0.80 m/s
Maximum Velocity = 6.00 m/s

Time of Concentration:

Time of Concentration = 10 min

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745 South Service Road, Unit 205
Stoney Creek, ON L8E 5Z2

Stanley / Morden Mixed-Use Development
Exhibit #5 - Post-Development Sanitary Sewer Design

9/17/2024
Job: 240712

Niagara Falls

manning's n = 0.013 PVC Pipe
0.013 Conc Pipe
0.024 Corr. Stl Pipe

Location			Length	INDIVIDUAL			CUMULATIVE		M	Q (p)	Q (i)	Q	Sewer Design			
Pipe	From Node	To Node		Resid'l Populat'n	Comrc'l Area	Resid'l Area	Resid'l Populat'n	Comrc'l Area					Slope	Capacity Full	Velocity Full	Dia-meter
			(m)		(ha)	(ha)		(ha)		(L/s)	(L/s)	(L/s)	(m/m)	(L/s)	(m/s)	(m)
1	Area. 1	Street.	N/A	292	0.460	0.000	292	0.460	4.50	7.291	0.129	7.420	0.0100	32.798	1.044	0.200

Calculations:

M = domestic peaking factor — $M = \frac{5}{P_r^{0.2}}$ where P=population in 1000's; Min M=2.0 and Max M=4.5

Q (p) = peak population flow (L/s) — $Q(p) = \frac{P_r * q_r * M}{86.4} + \frac{A_c * q_c}{28.8}$ where P=population and A=area in 1000's

Q (i) = peak extraneous flow (L/s) — $Q(i) = I * (A_r + A_c)$ (L/s) where A = area in hectares

Q = peak design flow (L/s) — $Q = Q(p)+Q(i)$ (L/s)

q_d = domestic sewage flow 450 L/cap.d — P_r = residential population

q_c = commercial daily flow 28000 L/ha.d — A_c = commercial area (hectares)

I = infiltration allowance 0.280 L/ha.s — A_r = residential area (hectares)

Velocity Range:

Minimum Velocity = 0.60 m/s

Maximum Velocity = 3.00 m/s

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Stanley / Morden Mixed-Use Development
Exhibit #6 - Water Demand Design

9/17/2024
Job: 240712

Roughness Coefficient = 100 for 150mm pipe
110 for 200-250mm pipe

Location			Length	Pop.	Area	Area Type	Water Demand by Pop'n &			Fire Flow	Watermain Design						
Pipe	From Node	To Node					Average Day	Maximum Day	Peak Hour		Dia-meter	Dom. Head Loss	Domestic Pressure Loss		Fire Head Loss	Fire Pressure Loss	
			(m)		(ha)		m^3/day	m^3/day	L/s	(L/s)	(m)	(m)	(kPa)	(psi)	(m)	(kPa)	(psi)
1	Area. 1	Street	10.5	292	0.460	Mixed-Use	144.3	519.4	38.30	100.00	0.150	0.543	5.32	0.77	3.210	31.46	4.56

Calculations:

Avg Daily Water Demand (Domestic)	0.450 m^3/cap./day	Max Day Factor	3.6
Fluid Specific Weight	9.8 kN/m^3	Max Hourly Peaking Factor	5.40
Avg Daily Water Demand (Commercial)	28.0 m^3/ha/day		

Stanley / Morden Mixed-Use Development
Exhibit #7 - Fire Water Demand

9/17/2024
Job: 240712

FIRE WATER SUPPLY

Building Type: Fire Protected (Vertically)

Floor Area			Reduct.		
First Floor	1227	m^2	0.00	0	m^2
Second Floor	1415.0001	m^2	1.00	1415.0001	m^2
Third Floor	1415	m^2	0.25	353.75	m^2
Fourth Floor	1151	m^2	0.25	287.75	m^2
Fifth Floor	1151	m^2	0.00	0	m^2
Sixth Floor	1151	m^2	0.00	0	m^2
				2056.5001	m^2

Construction Type: Non-Combustible Const.

Construction Coefficient: 0.8

1st Preliminary Fire Flow = 8000 L/min

Fire Hazard: Limited Combustible

Fire Hazard Factor: -0.15

Net Decrease = -1200 L/min

2nd Preliminary Fire Flow = 6800 L/min

Sprinkler System: Sprinkler & Hose Lines

Sprinkler System Factor: -0.4

Net Decrease = -2720 L/min

Separation Factor

North	45+	m	0.00
South	31.5	m	0.05
West	19.1	m	0.15
East	25.8	m	0.10
			0.30

Net Increase = 2040 L/min

FINAL FIRE FLOW = 6000.0 L/min

Minimum Water Supply Flow Rate for Fire Protection as determined by the Water Supply For Public Fire Protection, dated 2020, by the Fire Underwriter's Survey

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Stoney Creek, ON L8E 5Z2