VISCA RESIDENTIAL DEVELOPMENT – PARCEL A
5523-5555 FRASER ST. & 5578 GEORGE ST., NIAGARA FALLS

FUNCTIONAL SERVICING DESIGN BRIEF
NEW STORM, SANITARY AND WATER SERVICES

REV 1 – April 14, 2025

PREPARED BY:

HALLEX PROJECT #240816

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

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

TABLE OF CONTENTS

1. INTRODUCTION

The proposed Visca residential development at Parcel A consists of the demolition of three existing single-family dwellings with gravel / asphalt driveways and a commercial building with a gravel parking lot and the construction of a four-storey residential apartment building, asphalt laneway and parking areas, and grass areas. This development is located at 5523-5555 Fraser Street and 5578 George Street, which is west of the Stanley Avenue and Fraser Street intersection and west of the Stanley Avenue and George 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 south to the north side of the property via overland flow as per the Topographic Survey completed by J.D. Barnes Limited under reference number 24-16-178-00, dated October 17, 2024. This overland flow ultimately drains to George Street.

2.2 COMBINED SEWER

The existing sites are currently serviced with sanitary lateral connections to Fraser Street and George Street as they consist of the existing residential and commercial properties. However, the size and locations of the existing sanitary laterals are unknown. The existing sewer infrastructure at Fraser Street consists of a 250mm concrete municipal combined sewer which drains westerly towards the Hydro Canal. The existing sewer infrastructure at George Street consists of a 300mm concrete municipal combined sewer which also drains westerly towards the Hydro Canal.

2.3 WATERMAIN

The existing sites are currently serviced with water service connections to Fraser Street and George Street as they consist of the existing residential and commercial properties. However, the size and locations of the existing water services are unknown. The existing watermain infrastructure at Fraser Street consists of a 150mm PVC municipal watermain. The existing watermain infrastructure at George Street consists of a 150mm cast iron municipal watermain.

3. STORM SEWER SYSTEM

3.1 PRE-DEVELOPMENT SITE FLOW

The total drainage area for the subject development is 0.334 hectares with an existing runoff coefficient of 0.57 based on the existing roof, asphalt, gravel, 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	Pre-Development Sanitary Flow
5-year Storm	44.7 L/s	0.109 L/s

As such, the combined pre-development flow to George Street is calculated to be 44.809 L/s. The storm flows are calculated using the City of Niagara Falls' intensity-duration-frequency curves and the sanitary flows are calculated as per Section 4. Sanitary Sewer System of this report. The pre-development flows for the existing site are provided in Exhibit #1 for the five-year storm and Exhibit #3 for the sanitary flow at the end of the design brief.

3.2 POST-DEVELOPMENT SITE FLOW

The proposed development includes the four-storey residential apartment building, the asphalt laneway and parking areas, and the 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 0.334 hectares with a calculated runoff coefficient of 0.79 based on the proposed roof, asphalt, and grass surfaces. The proposed storm sewer for the site will then discharge to the existing 300mm concrete municipal combined sewer at George 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	Post-Development Sanitary Flow
5-year Storm	61.3 L/s	2.156 L/s

As such, the combined post-development flow to George Street is calculated to be 63.456 L/s. The storm flows are calculated using the City of Niagara Falls' intensity-duration-frequency curves and the sanitary flows are calculated as per Section 4. Sanitary Sewer System of this report. The post-development flows for the existing site are provided in Exhibit #2 for the five-year storm and Exhibit #4 for the sanitary flow at the end of the design brief.

3.3 STORMWATER QUANTITY CONTROL

The combined post-development five-year storm water flows and sanitary flows for the subject site draining to George Street will increase by 18.647 L/s. 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 within a manhole prior to discharging to the existing 300mm concrete municipal combined sewer at George Street. The orifice plate will ensure the combined post development flows for both the storm sewer and the sanitary sewer is controlled to the combined pre-development flow rates for the five-year storm event. The resulting 30m^3 volume generated for the five-year storm event can be stored within a proposed underground storage chamber system, a storm sewer system consisting of oversized storm sewers, catchbasins / manholes and/or temporary surface ponding prior to discharging to the existing 300mm concrete municipal combined sewer at George Street.

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 300mm concrete municipal combined sewer at George Street. This will achieve a total suspended solids removal of at least 81% 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 four-storey residential apartment building, all existing sanitary laterals are to be located, capped and abandoned as required at the municipal combined sewers. A new sanitary lateral shall be proposed from the building to the existing 300mm concrete municipal combined sewer at George Street.

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 three existing single-family dwellings are each assumed to have two bedrooms with a maximum of 2 persons per bedroom.
- The proposed four-storey residential apartment building is assumed to have 4 floors consisting of 13 two-bedroom units and 18 one-bedroom units. Each apartment is assumed to have a maximum of 2 persons per bedroom.

The peak dry weather design flow for the existing properties is determined to be 0.094 L/s to George Street and 0.350 L/s to Fraser Street. The peak wet weather design flow for the existing properties is determined to be 0.109 L/s to George Street and 0.428 L/s to Fraser Street. These calculations are based on the Sanitary Catchment Area Plan CSK3 and the Sanitary Sewer Design Sheet provided in Exhibit #3, attached.

The peak dry weather design flow for the proposed four-storey residential apartment building is determined to be 2.063 L/s to George Street and the peak wet weather design flow is determined to be 2.156 L/s to George Street. These calculations are based on the Sanitary Catchment Area Plan CSK4 and the Sanitary Sewer Design Sheet provided in Exhibit #4, 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 combined sewer at George Street.

5. WATER DISTRIBUTION SYSTEM

Given the site is to be completely redeveloped for the proposed four-storey residential apartment building, all existing water services are to be located, capped and abandoned as required at the municipal watermain. A new water service shall be proposed from the building to the existing 150mm PVC municipal watermain at Fraser Street.

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	39.6 m^3/day	288.2 m^3/day	5.03 L/s

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 5,000 L/min for the building based on the above assumptions as shown in Exhibit #6, attached. There are three existing municipal fire hydrants located near the site. The first is located immediately adjacent to the south property line on the north side of Fraser Street. The second is approximately 76.4m east of the property on the west side of Stanley Avenue. The third is approximately 81.4m west of the property on the north side of Fraser Street.

The resulting domestic flow head losses for the development are determined to be 0.24 kPa (0.04 psi). The resulting combined domestic flow and fire flow head losses for the development are determined to be 49.40 kPa (7.17 psi). As such, the minimum working pressure within the existing municipal watermain is required to be 40.04 psi to ensure a minimum normal operating pressure of 40 psi (domestic) and 20 psi (domestic & fire) within the municipal watermain. These calculations are based on the Water Demand Design sheet provided in Exhibit #5, attached.

Hydrant pressure testing was performed by Troy Life & Fire Safety Ltd. using the first and second aforementioned hydrants and the results of the testing is as follows:

Hydrant ID	Address	Date of Hydrant Testing	Static Pressure (psi)	Residual Pressure (psi)	Test Flow (USgpm)
N/A	5523 Fraser St	04/11/2025	81	75	1,261

This hydrant provides a test flow of 1,261 USgpm (4,773 L/min). FAR20 calculations were performed to determine the flows from the hydrant at 20 psi residual pressure which is calculated to be 4,411.6 USgpm (16,699 L/min) as shown in Exhibit #6, attached. Given the fire flow at 20 psi residual pressure within the

watermain exceeds the combined domestic and fire flows for the proposed development, the existing municipal watermain can adequately service the site.

Based on the above, Hallex recommends a minimum 150mm diameter water service to be installed to provide water supply to the proposed four-storey apartment building from the existing 150mm PVC municipal watermain on Fraser Street. 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.

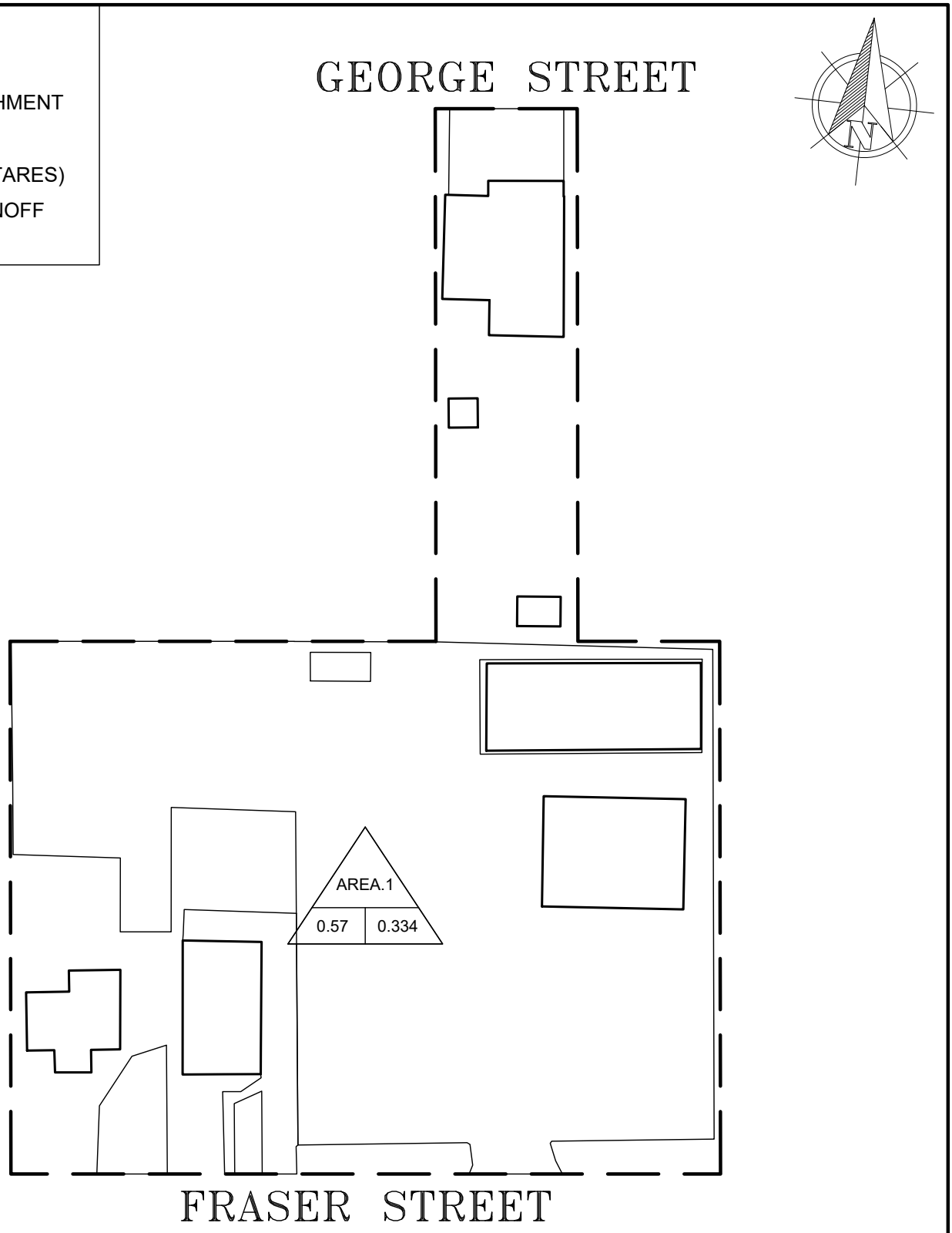
Yours truly,
HALLEX ENGINEERING LTD

Jim Halucha P.Eng
Civil/Structural Engineer

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

LEGEND

CATCHMENT AREA
AREA (HECTARES)
AVERAGE RUNOFF COEFFICIENT



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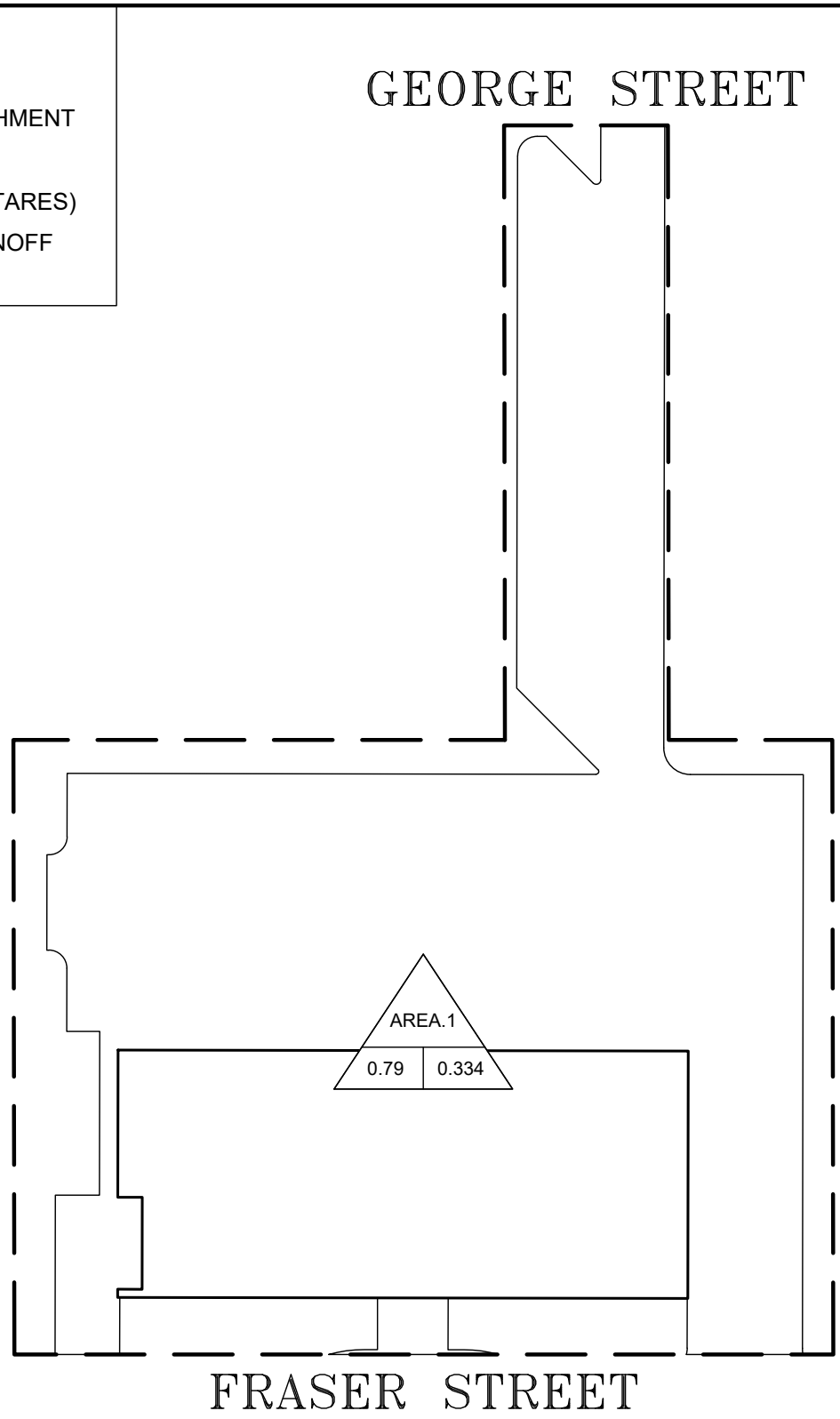
PROJECT: VISCA RESIDENTIAL - PARCEL A FRASER ST. & GEORGE ST., NF	SCALE: 1:500	JOB NUMBER: 240816	
	DATE: 2025/04/14	ISSUED FOR: ZONING BYLAW AMENDMENT	
	DRAWN BY: JSa	DWG: CSK1	REV.: 1
SHEET TITLE: PRE-DEVELOPMENT CATCHMENT AREA PLAN	DESIGNED BY: JSa		
	CHECKED BY: JS/JH		

LEGEND

CATCHMENT AREA
AREA (HECTARES)
AVERAGE RUNOFF COEFFICIENT



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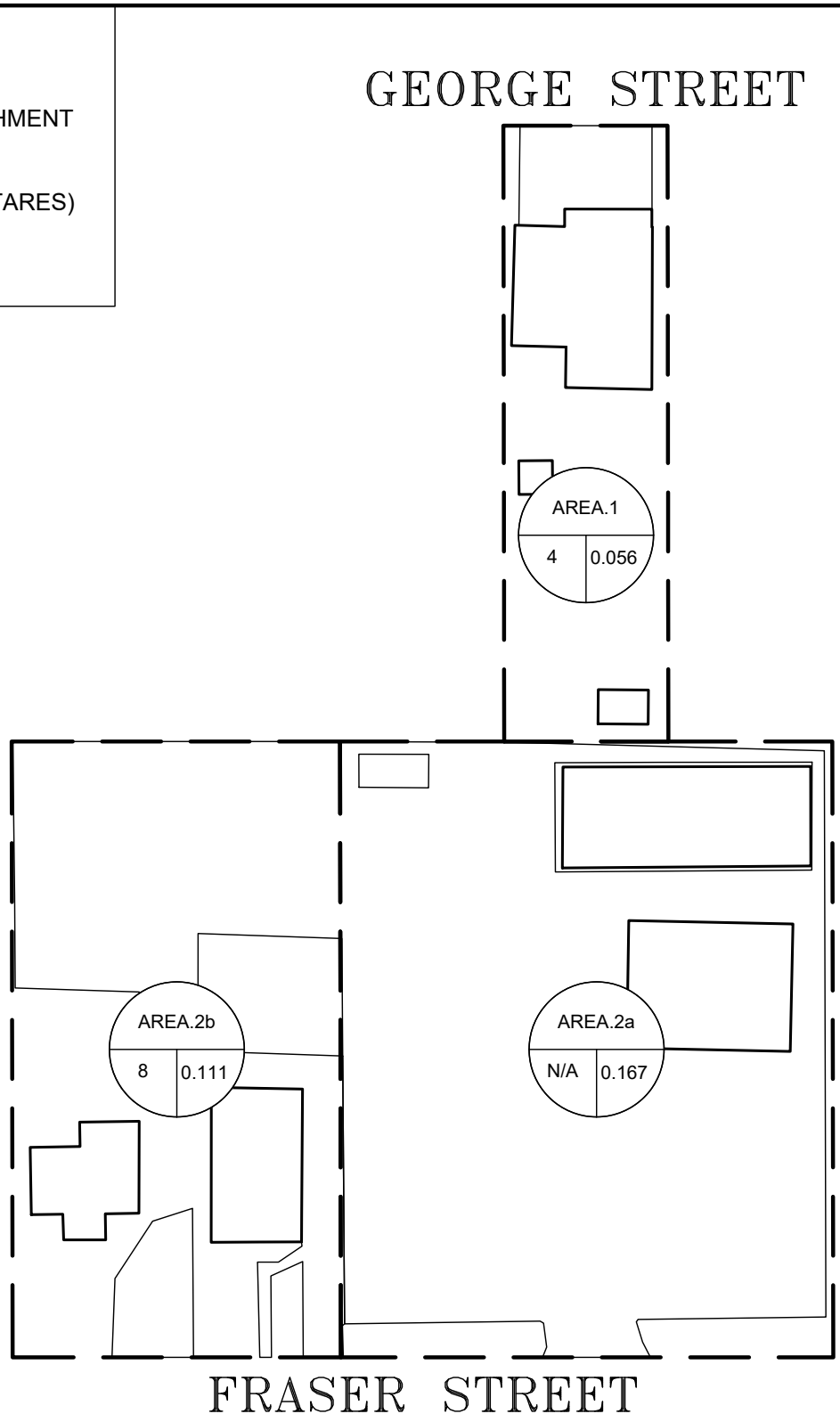
	DRAWN BY: JSa	DWG	REV.
SHEET TITLE: POST-DEVELOPMENT CATCHMENT AREA PLAN	DESIGNED BY: JSa	CSK2	1
	CHECKED BY: JS/JH		

LEGEND

CATCHMENT AREA
AREA (HECTARES)
POPULATION



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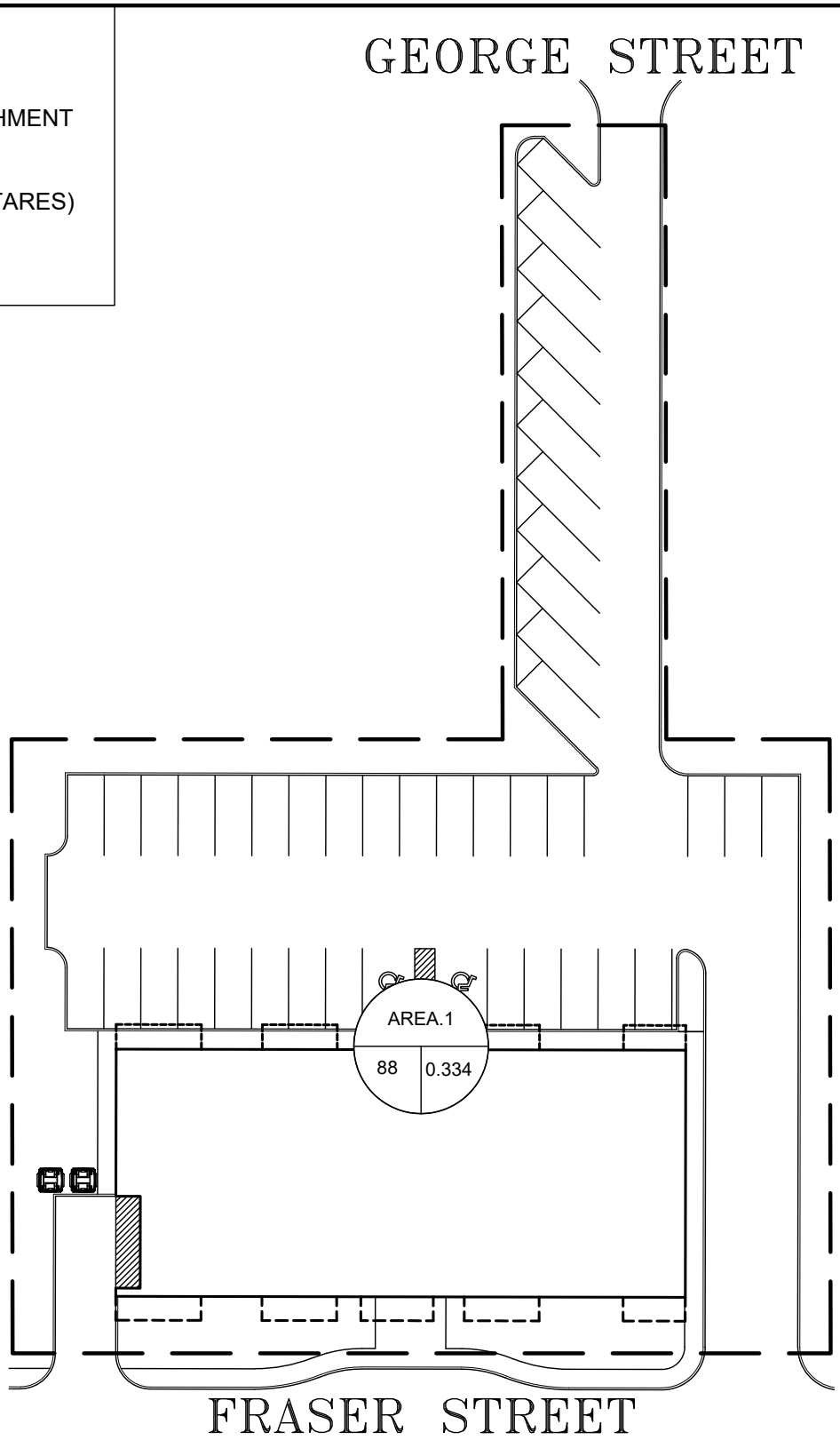
	DATE: 2025/04/14	ISSUED FOR: ZONING BYLAW AMENDMENT	
SHEET TITLE: PRE-DEVELOPMENT SANITARY CATCHMENT AREA PLAN	DRAWN BY: JSa	DWG CSK3	REV. 1
	DESIGNED BY: JSa		
	CHECKED BY: JS/JH		

LEGEND

CATCHMENT AREA
AREA (HECTARES)
POPULATION



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SHEET TITLE: POST-DEVELOPMENT SANITARY CATCHMENT AREA PLAN	DRAWN BY: JSa	DWG CSK4	REV. 1
	DESIGNED BY: JSa		
	CHECKED BY: JS/JH		

Visca Residential Development - Parcel A
Exhibit #1 - 5 Year Pre - Development Calculations

2025-04-14
Job: 240816

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		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**	**0.334**	**0.334**	**10.00**	**N/A**	**84**	**60497**	**3859.7**	**0.0447**
Roof	-	-	-	0.052	-	-	-	-	19157.5	996.2	-
Paved	-	-	-	0.012	-	-	-	-	18149.2	217.8	-
Paver	-	-	-	0.000	-	-	-	-	6049.7	0.0	-
Grass	-	-	-	0.088	-	-	-	-	5041.4	443.6	-

Run-off Coefficients Used:

Roof Structure	C =	0.95
Paved Surface	C =	0.90
Gravel Surface	C =	0.60
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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745 South Service Road, Unit 205
Stoney Creek, ON L8E 5Z2

Visca Residential Development - Parcel A
Exhibit #2 - 5 Year Post - Development Calculations

2025-04-14
Job: 248016

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**	**0.334**	**0.334**	**10.00**	**N/A**	**84**	**42348**	**5300.6**	**0.0613**
Roof	-	-	-	0.077	-	-	-	-	19157.5	1475.1	-
Paved	-	-	-	0.193	-	-	-	-	18149.2	3502.8	-
Grass	-	-	-	0.064	-	-	-	-	5041.4	322.7	-

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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Visca Residential Development - Parcel A
Exhibit #3 - Pre-Development Sanitary Sewer Flows

2025-04-14
Job: 248016

Location			Length	INDIVIDUAL			CUMULATIVE			M	Q (p)	Q (i)	Q
Pipe	From Node	To Node		Resid'l Populat'n	Comrc'l Area	Resid'l Area	Resid'l Populat'n	Comrc'l Area	Resid'l Area				
			(m)		(ha)	(ha)		(ha)	(ha)		(L/s)	(L/s)	(L/s)
1	Area. 1	Street. 1	N/A	4	0.000	0.056	4	0.000	0.056	4.50	0.094	0.016	0.109
2	Area. 2	Street. 2	N/A	8	0.167	0.111	8	0.167	0.111	4.50	0.350	0.078	0.428

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

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

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Visca Residential Development - Parcel A
Exhibit #4 - Post-Development Sanitary Sewer Design

2025-04-14
Job: 248016

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	Resid'l Area	Resid'l Populat'n	Resid'l Area					Slope	Capacity Full	Velocity Full	Dia-meter
			(m)		(ha)		(ha)		(L/s)	(L/s)	(L/s)	(m/m)	(L/s)	(m/s)	(m)
1	Area. 1	Street. 1	N/A	88	0.334	88	0.334	4.50	2.063	0.094	2.156	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) — $Q(p) = \frac{P_r * q_d * M}{86.4}$ 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

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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Visca Residential Development - Parcel A
Exhibit #5 - Water Demand Design

2025-04-14
Job: 240816

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

Location			Length	Pop.	Area	Area Type	Water Demand by Population			Fire Flow	Watermain Design						
Pipe	From Node	To Node					Average Day	Maximum Day	Peak Hour		Dia-meter	Dom. Head Loss	Domestic Pressure Loss		Fire & Dom. HL	Fire & Domestic 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 1	21.0	88	0.334	Residential	39.6	288.2	5.03	83.33	0.150	0.025	0.24	0.04	5.041	49.40	7.17

Calculations:

Avg Daily Water Demand (Domestic)	0.450 m^3/cap./day	Max Day Factor	7.28
Fluid Specific Weight	9.8 kN/m^3	Max Hourly Peaking Factor	10.97

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Visca Residential Development - Parcel A
Exhibit #6 - Fire Water Demand

2025-04-14
Job: 240816

FIRE WATER SUPPLY

Building Type: Fire Protected (Vertically)

Floor Area		Reduct.	
First Floor	768.14 m^2	0.00	0 m^2
Second Floor	780.59 m^2	1.00	780.59 m^2
Third Floor	780.59 m^2	0.25	195.15 m^2
Fourth Floor	780.59 m^2	0.25	195.15 m^2
			1170.88 m^2

Construction Type: Non-Combustible Const.

Construction Coefficient: 0.8

1st Preliminary Fire Flow = 6000 L/min

Fire Hazard: Limited Combustible

Fire Hazard Factor: -0.15

Net Decrease = -900 L/min

2nd Preliminary Fire Flow = 5100 L/min

Sprinkler System: Sprinkler & Hose Lines

Sprinkler System Factor: -0.4

Net Decrease = -2040 L/min

Separation Factor

North	23.3 m	0.10
South	24.3 m	0.10
West	9.9 m	0.20
East	43.6 m	0.05
		0.45

Net Increase = 2295 L/min

FINAL FIRE FLOW = 5000.0 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

FAR20 CALCULATIONS - QR=QF*(HR^0.54/HF^0.54)

Static Pressure during Test=	81 psi
Residual Pressure during Test=	75 psi
Flow during Test QF=	1261 GPM
Pressure Drop to 20psi Residual Pressure HR=	61 psi
Pressure Drop Measured During Test HF=	6 psi
Calculated Flow at 20psi Residual Pressure QR=	4411.6 GPM
	16699.5 LPM

Troy
Life & Fire Safety Ltd.

FLOW TEST REPORT

LOCATION: 5523 Fraser St, Niagara Falls

DATE OF FLOW TEST: April 11, 2025 TIME OF FLOW TEST: 8:00 AM

TEST BY: TROY LIFE & FIRE SAFETY TEST CONDUCTED BY: Dennis Brady

WITNESSED BY: City of Niagara Falls

FLOW NOZZLE TYPE (IE HOSE MONSTER/PLAY PIPE): Hose Monster

WATER MAIN SIZE (IF AVAILABLE): 6" Cast Iron

HYDRANT ELEVATION COMPARED TO BUILDING: No Elevation Change

HYDRANT FLOW DATA:

STATIC PRESSURE:	81 PSI		
SIZE OF OPENING:	1x1¾"	1x2½"	2x2½"
DISCHARGE COEFFICIENT:	N/A	N/A	N/A
PITO READING:	60 PSI	35 PSI	15+13 PSI
FLOW USGPM:	690	998	1261
RESIDUAL PRESSURE:	79 PSI	76 PSI	75 PSI

DRAWING OF SITE

WATER SUPPLY GRAPH