50-STOREY HOTEL & 5-STOREY PARKING GARAGE
4873 & 4898 KITCHENER STREET, NIAGARA FALLS

FUNCTIONAL SERVICING DESIGN BRIEF
NEW STORM, SANITARY AND WATER SERVICES

REV 1 – March 11, 2026

PREPARED BY:

HALLEX PROJECT #250702

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 Kitchener Street 50-storey hotel and 5-storey parking garage development consists of the redevelopment of two existing properties located at 4873 & 4898 Kitchener Street, which are west of the Kitchener Street and Victoria Avenue intersection in the City of Niagara Falls, ON. The development at 4898 Kitchener Street consists of the demolition of the existing 2-storey single-family dwelling and part of the existing church complete with concrete sidewalk, asphalt driveway and grass areas and the construction of a 50-storey hotel building complete with concrete sidewalks, permeable pavers surfaces and grass areas. The development at 4873 Kitchener Street consists of the demolition of part of the existing municipal asphalt parking lot & grass areas and the construction of a 5-storey parking garage and asphalt parking on-grade complete with asphalt driveways, concrete sidewalk, permeable pavers surfaces and grass areas.

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 church property at 4898 Kitchener Street currently drains, via overland flow, to the existing municipal storm sewers at Kitchener Street and Hunter Street. The existing municipal parking lot property at 4873 Kitchener Street currently drains, via overland flow and sewers, to the existing municipal storm sewers at Kitchener Street and Victoria Avenue. These flow paths are according to the Storm Drainage Plan completed by the City of Niagara Falls under reference number 84-CA-67, dated February 14, 1996.

2.2 STORM SEWER

The existing church property at 4898 Kitchener Street is not known to be serviced with an existing storm lateral however the site is included in the drainage areas for the Kitchener Street and Hunter Street municipal storm sewers. The existing drainage infrastructure at Kitchener Street consists of a 375mm municipal concrete storm sewer and drains to the 525mm municipal concrete storm sewer at the former Union Avenue which has been converted to a parking lot east of the subject site. The existing drainage infrastructure at Hunter Street consists of a 525mm municipal concrete storm sewer, connects to the 525mm municipal concrete storm sewer at the former Union Avenue intersection, continues as a 600mm municipal concrete storm sewer along Hunter Street and drains to the 1050mm municipal concrete storm sewer at Victoria Avenue.

The existing municipal parking lot property at 4873 Kitchener Street is currently serviced as existing catchbasins are located onsite, however the size and location of the existing storm lateral is unknown. The site is included in the drainage areas for the aforementioned Kitchener Street municipal storm sewer and the Victoria Avenue

municipal storm sewer. The existing drainage infrastructure at Victoria Avenue consists of a 375mm municipal concrete storm sewer, connects to the 1050mm municipal concrete storm sewer at the Victoria Avenue / Palmer Avenue intersection and continues as a 1200mm municipal concrete storm sewer along Palmer Avenue and Bender Street.

2.3 SANITARY SEWER

The existing church property at 4898 Kitchener Street is currently serviced as it consists of the existing church and single-family dwelling however the size and location of the existing sanitary lateral(s) is unknown. The existing sanitary infrastructure at Kitchener Street consists of a 250mm municipal PVC sanitary sewer and drains to the relined 250mm municipal PE sanitary sewer at Victoria Avenue. The existing sanitary infrastructure at Hunter Street consists of a 250mm municipal PVC sanitary sewer and drains to the relined 300mm municipal PE sanitary sewer at Victoria Avenue. Both relined sewers at Victoria Avenue connect together at the Victoria Avenue / Palmer Avenue intersection and continues as a 375mm municipal combined sewer along Palmer Avenue and Bender Street.

The existing municipal parking lot property at 4873 Kitchener Street is not known to be serviced with an existing sanitary lateral however the site was previously serviced as it formerly consisted of single-family dwellings. The site is included in the drainage areas for the aforementioned Kitchener Street and Victoria Avenue municipal sanitary sewers.

2.4 WATERMAIN

The existing church property at 4898 Kitchener Street is currently serviced as it consists of the existing church and single-family dwelling however the size and location of the existing water service(s) is unknown. The existing watermain infrastructure at Kitchener Street consists of a 200mm municipal PVC watermain and Hunter Street consists of a 150mm municipal ductile iron watermain.

The existing municipal parking lot property at 4873 Kitchener Street is not known to be serviced with an existing water service however the site was previously serviced as it formerly consisted of single-family dwellings. The existing watermain infrastructure at Kitchener Street consists of a 200mm municipal PVC watermain and Victoria Avenue consists of a 300mm municipal PVC watermain.

3. STORM SEWER SYSTEM

3.1 PRE-DEVELOPMENT SITE FLOW

The total drainage area for the subject developments are 0.147 hectares for the existing church property and 0.651 hectares for the existing municipal parking lot property. The existing runoff coefficients are calculated to be 0.68 for the church property and 0.73 for the municipal parking lot property 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 for the church property and Hallex Sketch CSK2 for the municipal parking lot property, 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 sites are as follows:

Storm Event	Ex. Church Pre-Development Storm Flow	Ex. Parking Lot Pre-Development Storm Flow
5-year Storm	23.3 L/s	110.4 L/s
100-year Storm	37.1 L/s	175.7 L/s

These flows are calculated using the City of Niagara Falls intensity-duration-frequency curves. The pre-development flows for the subject properties 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 50-storey hotel building at 4898 Kitchener Street, the 5-storey parking garage building at 4873 Kitchener Street, asphalt driveways, concrete sidewalks, permeable pavers surfaces & grass areas. The grading for the site will ensure drainage through the proposed storm sewer systems for each site for storm water quantity controls. The total drainage area for the subject developments are 0.147 hectares for the hotel property and 0.651 hectares for the parking garage property. The proposed runoff coefficients are calculated to be 0.80 for the hotel property and 0.73 for the parking garage property based on the proposed roof, asphalt, permeable pavers surfaces and grass surfaces.

The proposed storm sewer system for the hotel property will discharge to the existing 525mm municipal concrete storm sewer at Hunter Street. The proposed storm sewer system for the parking garage property will discharge to the existing 525mm municipal concrete storm sewer at the Kitchener Street and former Union Avenue intersection. The catchment area plan for the post-development site condition is provided on Hallex Sketch CSK3 for the hotel property and Hallex Sketch CSK4 for the parking garage property, 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 sites are as follows:

Storm Event	Prop. Hotel Post-Development Storm Flow	Prop. Parking Garage Post-Development Storm Flow
5-year Storm	27.4 L/s	111.2 L/s
100-year Storm	43.7 L/s	177.1 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 for the hotel property will increase by 4.1 L/s for the five-year storm, and 6.6 L/s for the one-hundred-year storm from the pre-development flow rate. The post-development storm water runoff for the parking garage property will increase by 0.8 L/s for the five-year storm, and 1.4 L/s for the one-hundred-year storm from the pre-development flow rate. As such, storm water detention will be required for both developments.

Stormwater quantity controls for the site can be achieved by utilizing an orifice plate within each property. The resulting 11.0 m^3 volume generated from the hotel property and the 7.0 m^3 volume generated from the parking garage property for the one-hundred-year storm events can be stored within a proposed underground storage chamber system, catchbasins / maintenance holes and/or temporary surface ponding or a cast-in-place stormwater management tank prior to discharging to the existing 525mm municipal concrete storm sewer at Hunter Street for the hotel property and prior to discharging to the existing 525mm municipal concrete storm sewer at the Kitchener Street and former Union Avenue intersection for the parking garage property.

3.4 STORMWATER QUALITY CONTROL

The existing paved areas combined across both sites and consisting of the asphalt parking lot, asphalt driveways, and pedestrian walkways will be reduced by the proposed developments. As such, the water quality from the sites is therefore improved and no further storm quality control measures have been proposed for the developments.

4. SANITARY SEWER SYSTEM

Given both properties are to be redeveloped for the proposed developments, all existing sanitary laterals are to be located, capped and abandoned as required at the municipal sanitary sewer. New sanitary laterals shall be proposed from the 50-storey hotel building and the 5-storey parking garage to the existing 250mm municipal PVC sanitary sewer at Kitchener 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 average daily 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 proposed 50-storey hotel consists of 389 rooms where the 294 standard rooms are assumed to have 1 bed space, the 63 junior suite rooms assumed to have 1 bed space, and the 32 king suite rooms assumed to have 2 bed spaces.

The peak design flows for the proposed developments are calculated as follows:

Site	Post-Development Peak Dry Weather Sanitary Flow	Post-Development Peak Wet Weather Sanitary Flow
Area.1	4.541 L/s	4.582 L/s
Area.2	0.633 L/s	0.815 L/s

These calculations are based on the Hallex Sketch CSK5 for the hotel property, Hallex Sketch CSK6 for the parking garage property and the Post-Development Sanitary Sewer Design sheet provided in Exhibit #5, attached.

Based on the above, Hallex recommends a minimum 200mm sanitary sewer @ 1.0% to be installed to convey sanitary flows from each proposed building to the existing 250mm municipal PVC sanitary sewer at Kitchener Street.

5. WATER DISTRIBUTION SYSTEM

Given both properties are to be redeveloped for the proposed developments, all existing water services are to be located, capped and abandoned as required at the municipal watermain. New water services shall be proposed from the 50-storey hotel building and the 5-storey parking garage to the existing 200mm municipal PVC watermain at Kitchener 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 average daily water demands and commercial peaking factors are based on Section 3.4.3. Commercial and Institutional 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 proposed 50-storey hotel consists of 389 rooms where the 294 standard rooms are assumed to have 1 bed space, the 63 junior suite rooms assumed to have 1 bed space, and the 32 king suite rooms assumed to have 2 bed spaces.
- The proposed 50-storey hotel and the 5-storey parking garage 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 each building as per applicable standards.

The domestic water demand for the proposed development is calculated in Exhibit #6, attached and are summarized as follows:

Site	Average Day Water Demand	Maximum Day Water Demand	Peak Hour Water Demand
Area.1	98.8 m^3/day	301.4 m^3/day	5.34 L/s
Area.2	18.2 m^3/day	27.3 m^3/day	0.95 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 flow for the hotel building and 3,000 L/min flow for the parking garage building based on the above assumptions as shown in Exhibits #7-8, attached. There are four existing municipal fire hydrants located near these sites. Two hydrants are located immediately adjacent to the north property line of the hotel property on the north side of Kitchener Street. A third hydrant is located approximately 22.5m south of the hotel property on the southwest side of Hunter Street. A fourth hydrant is located immediately adjacent to the east property line on the east side of Victoria Avenue.

The resulting domestic flow head losses for the developments are determined to be 0.05 kPa (0.008 psi) for the hotel building and 0.01 kPa (0.002 psi) for the parking garage building. The resulting combined domestic flow and fire flow head losses for the developments are determined to be 9.8 kPa (1.42 psi) for the hotel building and 16.97 kPa (2.46 psi) for the parking garage building. As such, the minimum working pressure within the existing municipal watermain at Kitchener Street is required to be 42.46 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 #6, attached.

Hydrant pressure testing was performed by Troy Life & Fire Safety Ltd for the aforementioned hydrants as provided in Appendix 'A' of this report and the results of the testing are as follows:

Hydrant ID	Address	Date of Hydrant Testing	Static Pressure (psi)	Residual Pressure (psi)	Test Flow (gpm)
01092	4873 Kitchener Street	18/07/2025	70	60	1,609
01232	4882 Hunter Street	18/07/2025	78	69	1,521
01064	5485 Victoria Avenue	18/07/2025	75	64	1,797

The hydrants provide a test flow of 1,609 gpm (6,090.7 L/min) at the Kitchener Street hydrant, 1,521 gpm (5,757.6 L/min) at the Hunter Street hydrant and 1,797 gpm (6,802.4 L/min) at the Victoria Avenue hydrant. Given the fire flows during the hydrant tests exceed the required 5,000 L/min flow for the hotel building and 3,000 L/min flow for the parking garage building, the existing municipal watermain can adequately service this building under fire flow conditions.

Based on the above, Hallex recommends a minimum 150mm domestic water service and 2-200mm fire water services as per OBC 3.2.9.7.(4). to be installed to provide water supply to the proposed 50-storey hotel building and a minimum a 150mm water service to be installed to provide water supply to the proposed 5-storey parking garage from the existing 200mm municipal PVC watermain at Kitchener Street. The domestic and fire protection water services for the hotel shall extend to the mechanical room of the proposed building complete with a water meter and backflow preventers as per applicable standards. The water service for the parking garage is to be separated at the property line with a 100mm domestic water service and a 150mm fire protection service and shall extend to the mechanical room of the proposed building complete with a water meter and backflow preventers as per applicable standards.

6. CONCLUSION

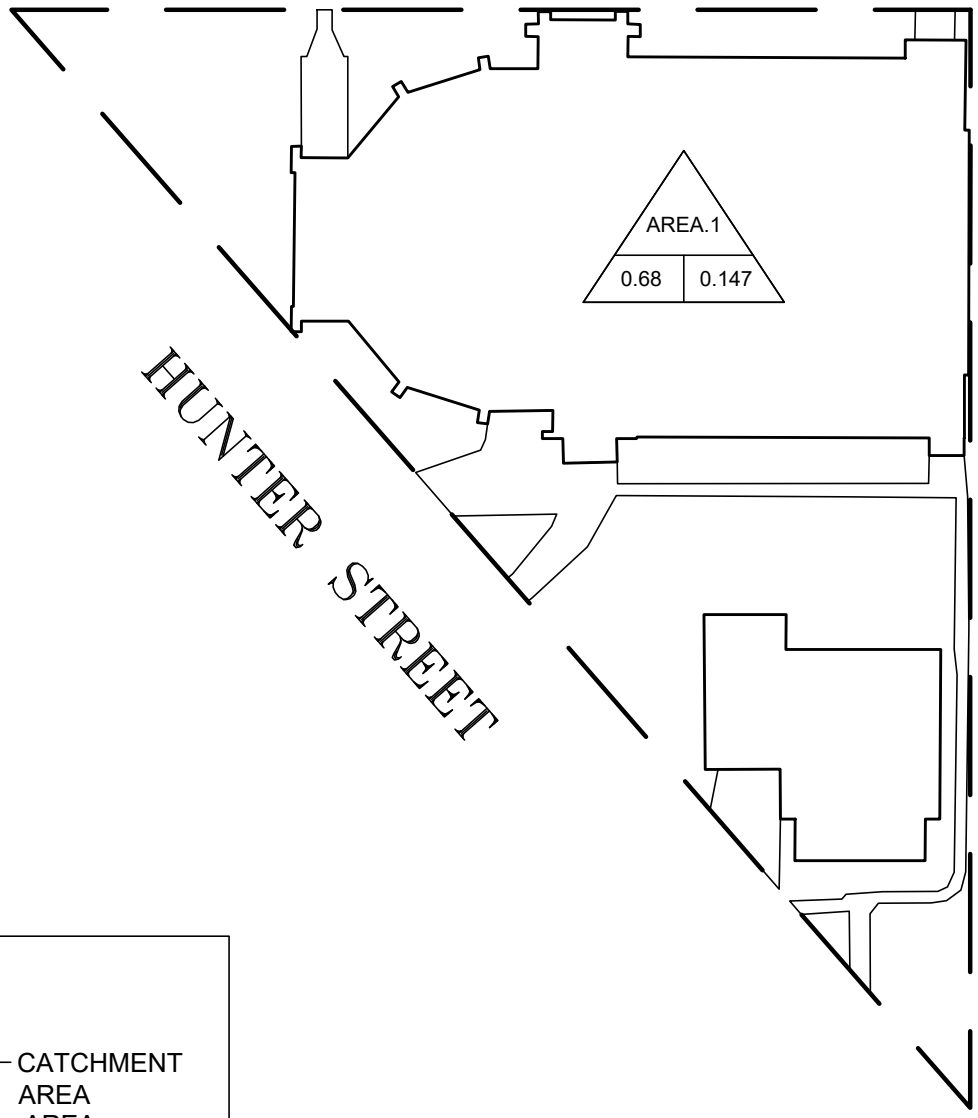
The aforementioned calculations and recommendations for the storm, sanitary and water services are based on the current design for the site as of writing this report. A final sealed report, complete with updates to the recommendations made in this report, may be required based on the final site design.

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

Yours truly,
HALLEX CIVIL ENGINEERING LTD

Jim Halucha P.Eng
Civil/Structural Engineer

Anthony Infurna, C.E.T., rcsi
Partner, Project Manager



LEGEND

CATCHMENT AREA
AREA (HECTARES)
AVERAGE RUNOFF COEFFICIENT

HALLEX CIVIL ENGINEERING LTD.
4999 Victoria Avenue
Niagara Falls, ON L2E 4C9
Tel: 905-357-4015 Fax: 905-353-1105

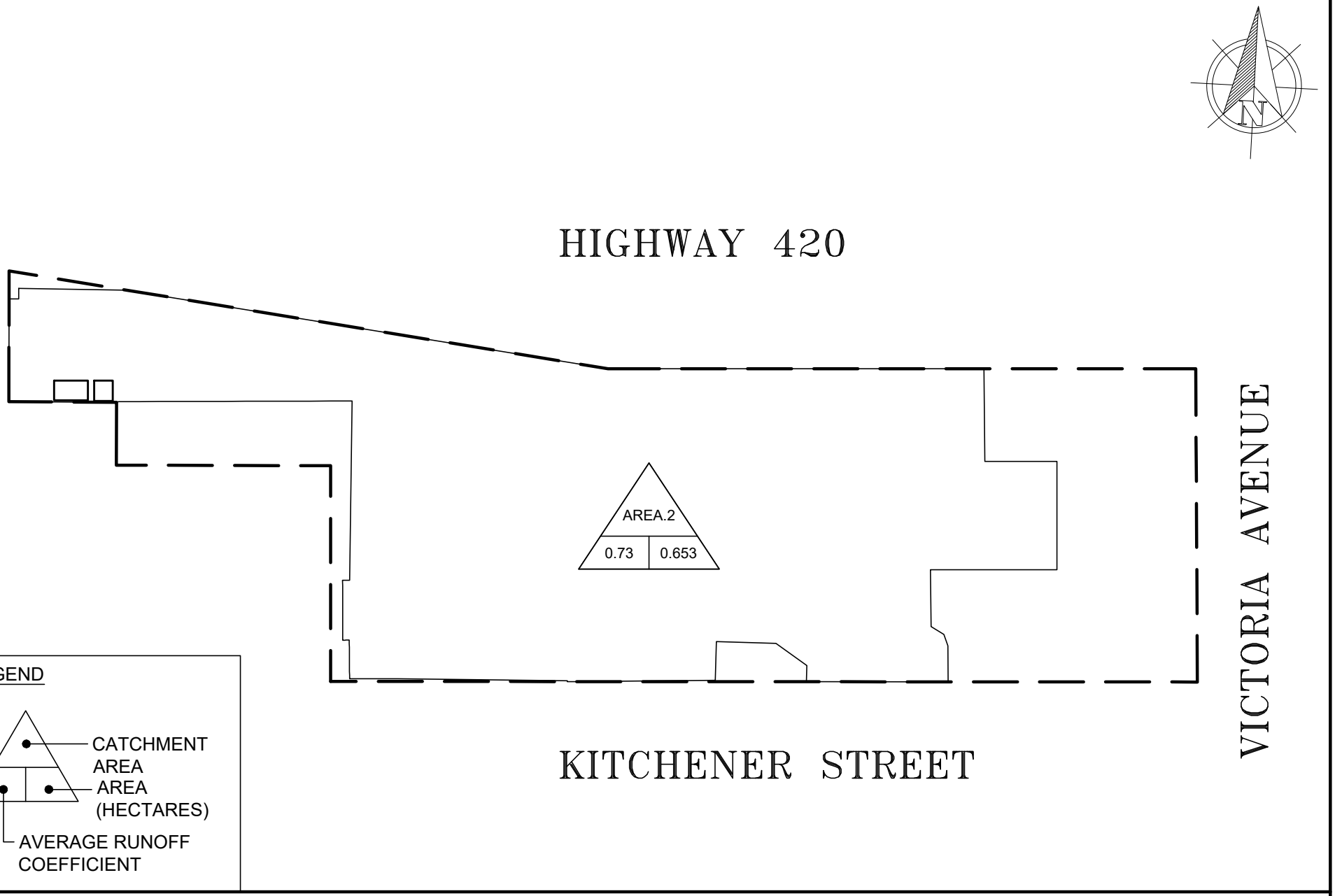
PROJECT:
50-STOREY HOTEL
4898 KITCHENER ST, NIAGARA FALLS

SHEET TITLE:
PRE-DEVELOPMENT
CATCHMENT AREA PLAN

SCALE: 1:400
DATE: 2025/07/30
DRAWN BY: JL
DESIGNED BY: JS
CHECKED BY: JH

JOB NUMBER: 250702
ISSUED FOR: OPA / ZBA

DWG: CSK1
REV.: 0

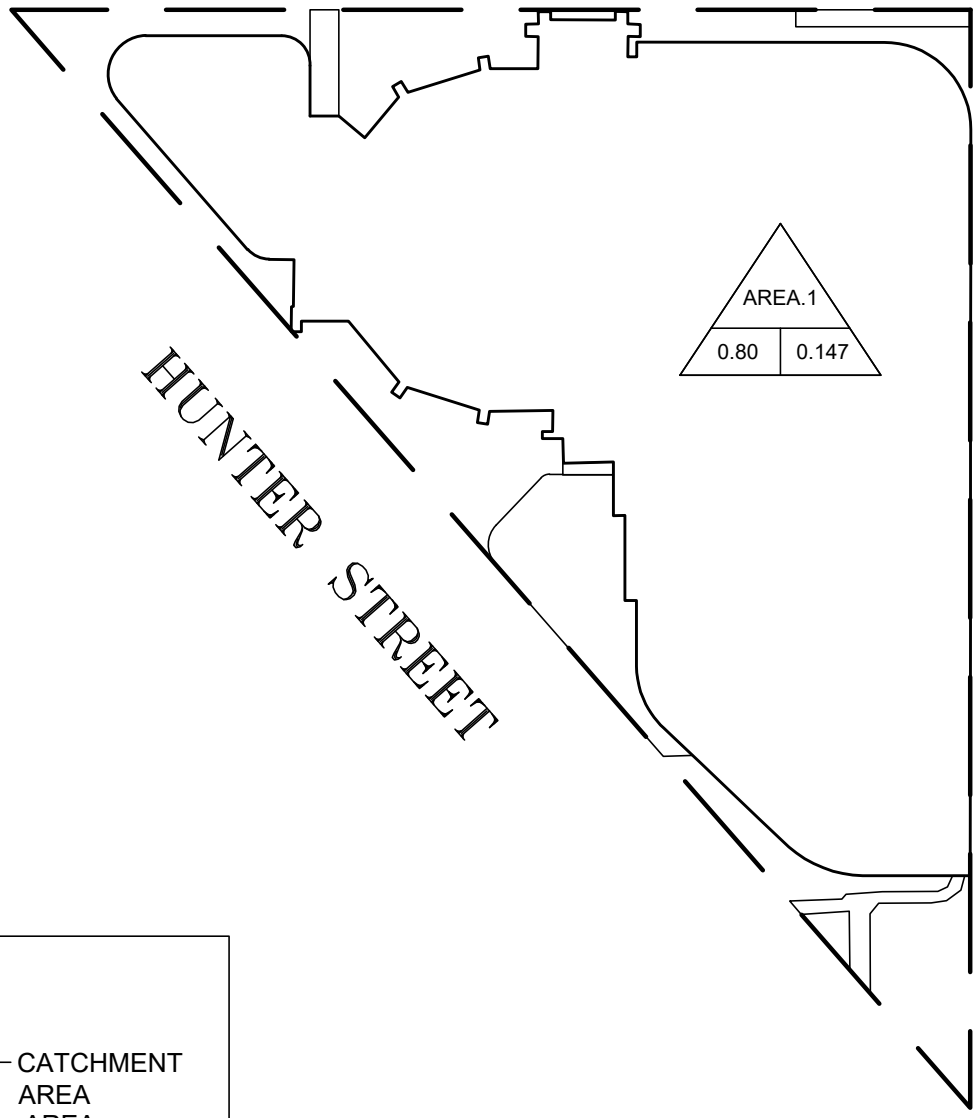


HALLEX CIVIL ENGINEERING LTD.
4999 Victoria Avenue
Niagara Falls, ON L2E 4C9
Tel: 905-357-4015 Fax: 905-353-1105

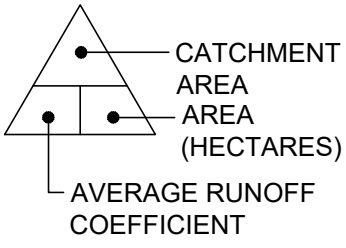
PROJECT:
5-STOREY PARKING GARAGE
4873 KITCHENER ST, NIAGARA FALLS

SHEET TITLE:
PRE-DEVELOPMENT
CATCHMENT AREA PLAN

SCALE: 1:750	JOB NUMBER: 250702
DATE: 2025/07/30	ISSUED FOR: OPA / ZBA
DRAWN BY: JP	DWG CSK2 REV. 0
DESIGNED BY: JS	
CHECKED BY: JH	

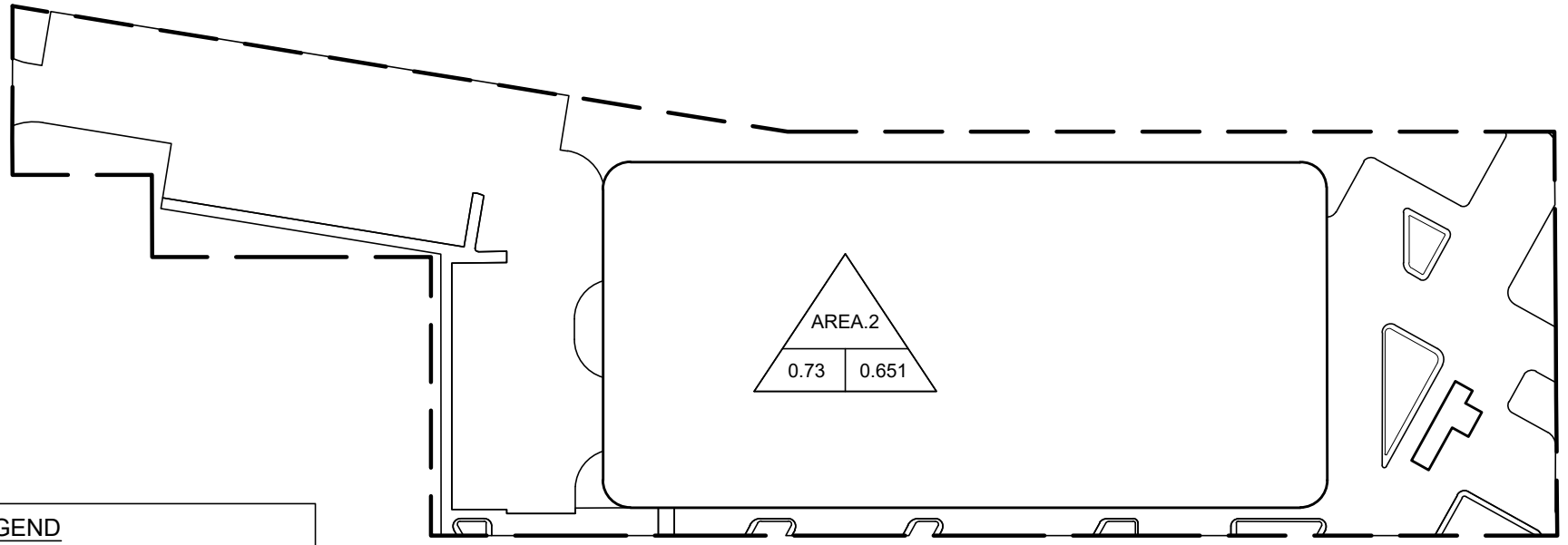


LEGEND



HALLEX CIVIL ENGINEERING LTD.
4999 Victoria Avenue
Niagara Falls, ON L2E 4C9
Tel: 905-357-4015 Fax: 905-353-1105

PROJECT: 50-STOREY HOTEL 4898 KITCHENER ST, NIAGARA FALLS	SCALE: 1:400	JOB NUMBER: 250702	
	DATE: 2026/03/11	ISSUED FOR: OPA / ZBA	
	DRAWN BY: CA	DWG CSK3	REV. 1
SHEET TITLE: POST-DEVELOPMENT CATCHMENT AREA PLAN	DESIGNED BY: CA		
	CHECKED BY: AI/JH		



LEGEND

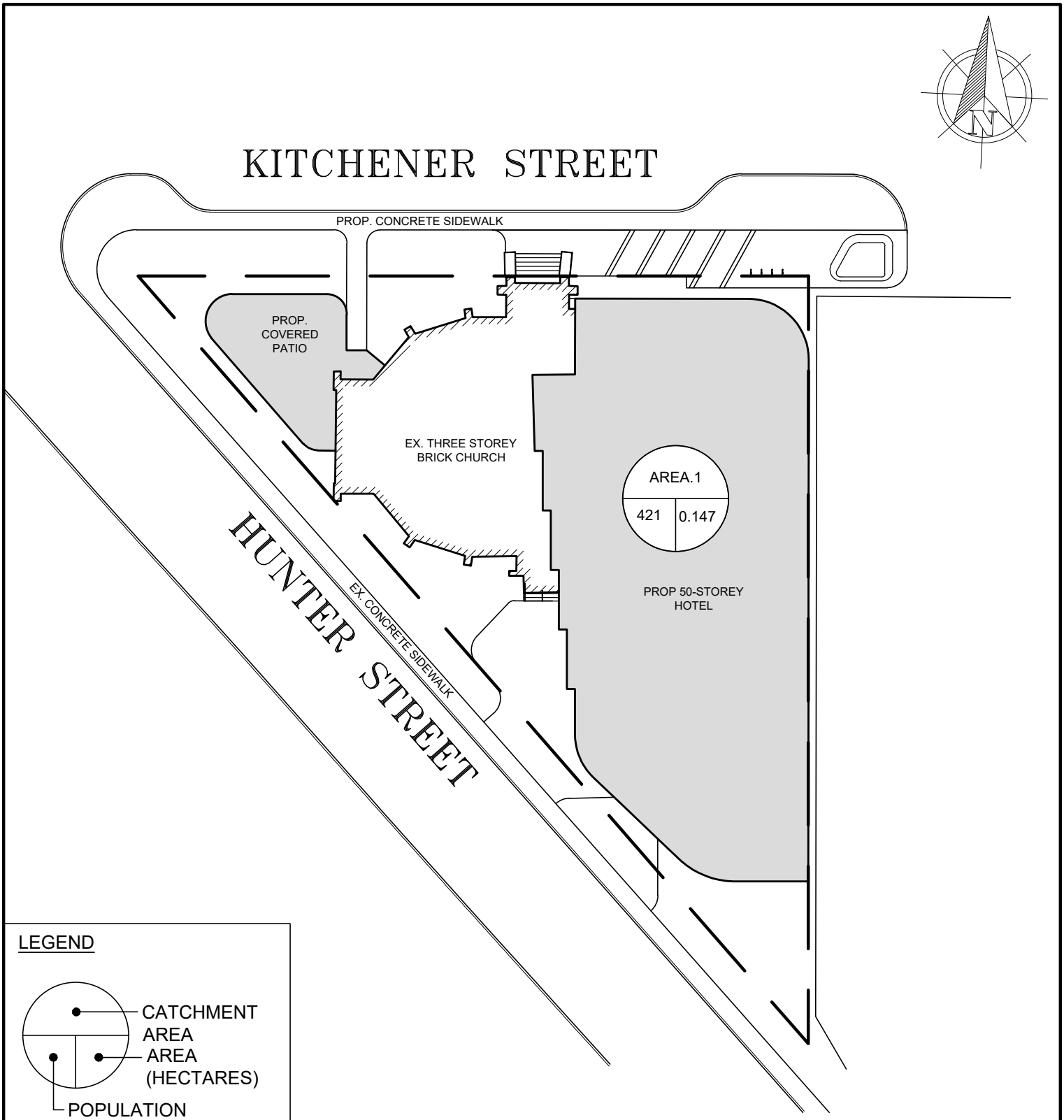
CATCHMENT AREA
AREA (HECTARES)
AVERAGE RUNOFF COEFFICIENT

HALLEX CIVIL ENGINEERING LTD.
4999 Victoria Avenue
Niagara Falls, ON L2E 4C9
Tel: 905-357-4015 Fax: 905-353-1105

PROJECT:
5-STOREY PARKING GARAGE
4873 KITCHENER ST, NIAGARA FALLS

SHEET TITLE:
POST-DEVELOPMENT
CATCHMENT AREA PLAN

SCALE: 1:750	JOB NUMBER: 250702
DATE: 2026/03/11	ISSUED FOR: OPA / ZBA
DRAWN BY: JP	DWG CSK4 REV. 1
DESIGNED BY: JS	
CHECKED BY: JH	



LEGEND

CATCHMENT AREA
AREA (HECTARES)
POPULATION

HALLEX CIVIL ENGINEERING LTD.
4999 Victoria Avenue
Niagara Falls, ON L2E 4C9
Tel: 905-357-4015 Fax: 905-353-1105

PROJECT:
50-STOREY HOTEL
4898 KITCHENER ST, NIAGARA FALLS

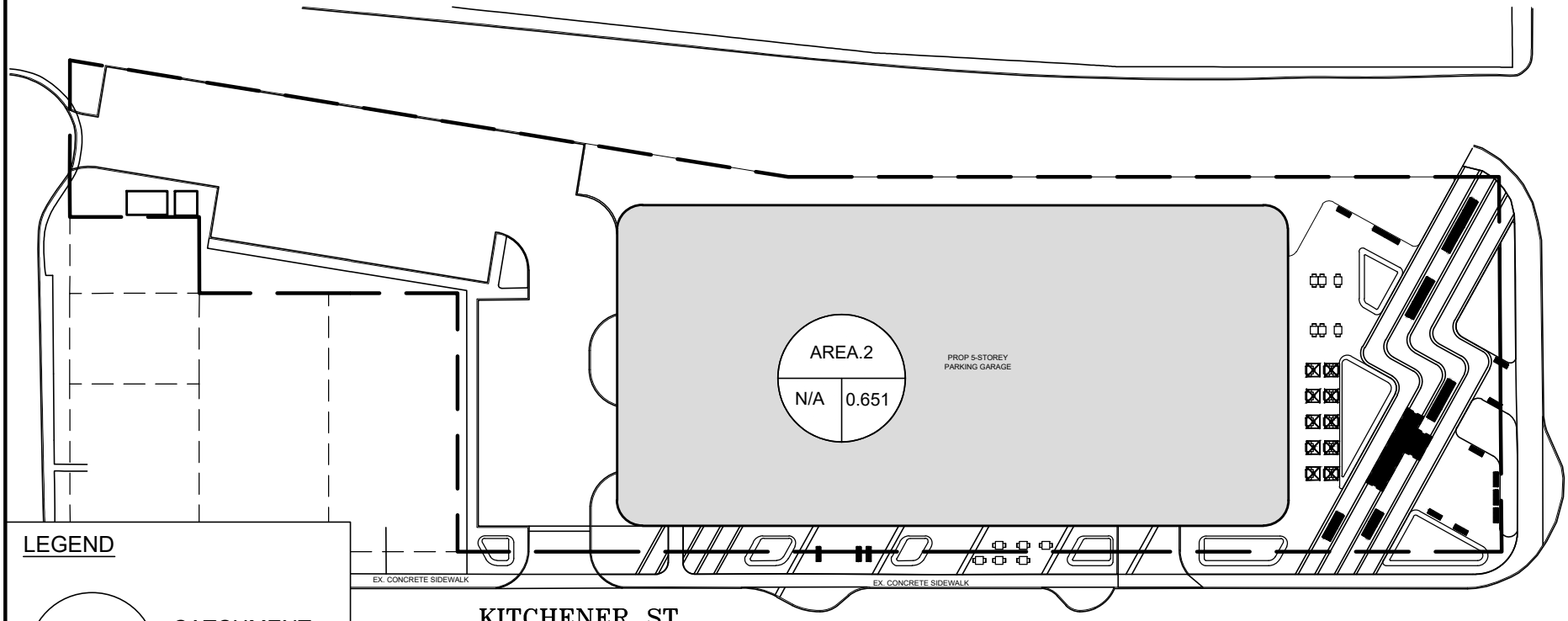
SHEET TITLE:
POST-DEVELOPMENT
SANITARY CATCHMENT AREA PLAN

SCALE: 1:400
DATE: 2026/03/11
DRAWN BY: CA
DESIGNED BY: CA
CHECKED BY: AI/JH

JOB NUMBER: 250702
ISSUED FOR: OPA / ZBA

DWG CSK5

REV. 1



LEGEND

CATCHMENT AREA
AREA (HECTARES)
POPULATION

HALLEX CIVIL ENGINEERING LTD.
4999 Victoria Avenue
Niagara Falls, ON L2E 4C9
Tel: 905-357-4015 Fax: 905-353-1105

PROJECT:
5-STOREY PARKING GARAGE
4873 KITCHENER ST, NIAGARA FALLS

SHEET TITLE:
POST-DEVELOPMENT
SANITARY CATCHMENT AREA PLAN

SCALE: 1:750	JOB NUMBER: 250702
DATE: 2026/03/11	ISSUED FOR: OPA / ZBA
DRAWN BY: CA	DWG CSK6 REV. 1
DESIGNED BY: CA	
CHECKED BY: AI/JH	

Kitchener Street 50-Storey Hotel 5-Storey Parking Garage
Exhibit #1 - 5 Year Pre - Development Calculations

2026-03-11
Job: 250702

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 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.1**	**N/A**	**0.147**	**0.147**	**10.00**	**N/A**	**84**	**60497**	**2013.6**	**0.0233**
Roof	-	-	-	0.079	-	-	-	-	19157.5	1513.4	-
Paved	-	-	-	0.012	-	-	-	-	18149.2	217.8	-
Grass	-	-	-	0.056	-	-	-	-	5041.4	282.3	-
2	**Area.2**	**Street.2**	**N/A**	**0.651**	**0.651**	**10.00**	**N/A**	**84**	**60497**	**9536.4**	**0.1104**
Roof	-	-	-	0.002	-	-	-	-	19157.5	38.3	-
Paved	-	-	-	0.475	-	-	-	-	18149.2	8620.9	-
Grass	-	-	-	0.174	-	-	-	-	5041.4	877.2	-

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

Kitchener Street 50-Storey Hotel 5-Storey Parking Garage
Exhibit #2 - 100 Year Pre - Development Calculations

2026-03-11
Job: 250702

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.1**	**N/A**	**0.147**	**0.147**	**10.00**	**N/A**	**134**	**96322**	**3205.9**	**0.0371**
Roof	-	-	-	0.079	-	-	-	-	30502.0	2409.7	-
Paved	-	-	-	0.012	-	-	-	-	28896.6	346.8	-
Grass	-	-	-	0.056	-	-	-	-	8026.8	449.5	-
2	**Area.2**	**Street.2**	**N/A**	**0.651**	**0.651**	**10.00**	**N/A**	**134**	**96322**	**15183.6**	**0.1757**
Roof	-	-	-	0.002	-	-	-	-	30502.0	61.0	-
Paved	-	-	-	0.475	-	-	-	-	28896.6	13725.9	-
Grass	-	-	-	0.174	-	-	-	-	8026.8	1396.7	-

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 = 10 min

4999 Victoria Avenue
Niagara Falls, ON L2E 4C9

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

Kitchener Street 50-Storey Hotel 5-Storey Parking Garage
Exhibit #3 - 5 Year Post - Development Calculations

2026-03-11
Job: 250702

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 1**	**N/A**	**0.147**	**0.147**	**10.00**	**N/A**	**84**	**48398**	**2369.5**	**0.0274**
Roof	-	-	-	0.113	-	-	-	-	19157.5	2164.8	-
Paved	-	-	-	0.002	-	-	-	-	18149.2	36.3	-
Paver	-	-	-	0.007	-	-	-	-	6049.7	42.3	-
Grass	-	-	-	0.025	-	-	-	-	5041.4	126.0	-
2	**Area 2**	**Street 2**	**N/A**	**0.651**	**0.651**	**10.00**	**N/A**	**84**	**48398**	**9609.0**	**0.1112**
Roof	-	-	-	0.301	-	-	-	-	19157.5	5766.4	-
Paved	-	-	-	0.150	-	-	-	-	18149.2	2722.4	-
Paver	-	-	-	0.111	-	-	-	-	6049.7	671.5	-
Grass	-	-	-	0.089	-	-	-	-	5041.4	448.7	-

Run-off Coefficients Used:

Roof Structure	C =	0.95
Paved Surface	C =	0.90
Perm. Paver	C =	0.30
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

HALLEX CIVIL ENGINEERING LTD.

Kitchener Street 50-Storey Hotel 5-Storey Parking Garage
Exhibit #4 - 100 Year Post - Development Calculations

2026-03-11
Job: 250702

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 1**	**N/A**	**0.147**	**0.147**	**10.00**	**N/A**	**134**	**77058**	**3772.6**	**0.0437**
Roof	-	-	-	0.113	-	-	-	-	30502.0	3446.7	-
Paved	-	-	-	0.002	-	-	-	-	28896.6	57.8	-
Paver	-	-	-	0.007	-	-	-	-	9632.2	67.4	-
Grass	-	-	-	0.025	-	-	-	-	8026.8	200.7	-
2	**Area 2**	**Street 2**	**N/A**	**0.651**	**0.651**	**10.00**	**N/A**	**134**	**77058**	**15299.2**	**0.1771**
Roof	-	-	-	0.301	-	-	-	-	30502.0	9181.1	-
Paved	-	-	-	0.150	-	-	-	-	28896.6	4334.5	-
Paver	-	-	-	0.111	-	-	-	-	9632.2	1069.2	-
Grass	-	-	-	0.089	-	-	-	-	8026.8	714.4	-

Run-off Coefficients Used:

Roof Structure	C =	0.95
Paved Surface	C =	0.90
Perm. Paver	C =	0.30
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

HALLEX CIVIL ENGINEERING LTD.

Kitchener Street 50-Storey Hotel 5-Storey Parking Garage
Exhibit #5 - Post-Development Sanitary Sewer Design

2026-03-11
Job: 250702

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		Hotel Bed Spaces	Comrc'l Area	Hotel Bed Spaces	Comrc'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	421	0.147	421	0.147	4.01	4.541	0.041	4.582	0.0100	32.798	1.044	0.200
2	Area. 2	Street. 1	N/A	0	0.651	0	0.651	4.50	0.633	0.182	0.815	0.0100	32.798	1.044	0.200

Calculations:

M = domestic peaking factor — $M = 1 + \frac{14}{4 + \sqrt{P_h}}$ where P=population in 1000's

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

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

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

q_h = hotel daily flow 225 L/bed space.d — P_h = number of hotel bed spaces

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

I = infiltration allowance 0.280 L/ha.s

Velocity Range:

Minimum Velocity = 0.60 m/s
Maximum Velocity = 3.00 m/s

HALLEX CIVIL ENGINEERING LTD.

Kitchener Street 50-Storey Hotel 5-Storey Parking Garage
Exhibit #6 - Water Demand Design

2026-03-11
Job: 250702

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

Location			Length	Hotel Bed Spaces	Area	Water Demand by Population			Water Demand by Area			Total Peak Hour	Fire Flow	Watermain Design						
Pipe	From Node	To Node				Average Day	Maximum Day	Peak Hour	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	m^3/day	m^3/day	L/s	L/s	(L/s)	(m)	(m)	(kPa)	(psi)	(m)	(kPa)	(psi)
1	Area 1	Street. 1	20.0	421	0.147	94.7	295.2	5.12	4.1	6.2	0.21	5.34	83.33	0.200	0.005	0.05	0.008	1.000	9.80	1.42
2	Area 2	Street. 1	20.0	0	0.651	0.0	0.0	0.00	18.2	27.3	0.95	0.95	50.00	0.150	0.001	0.01	0.002	1.732	16.97	2.46

Calculations:

		Population =	300	450
Avg Daily Water Demand (Hotel)	0.225 m^3/Bed.Space/day	Hotel Max Day Factor =	3.6	3.0
Avg Daily Water Demand (Commercial)	28.0 m^3/ha/day	Hotel Max Hourly Peaking Factor =	5.4	4.5
Fluid Specific Weight	9.8 kN/m^3	Commercial Max Day Factor =	1.5	

HALLEX CIVIL ENGINEERING LTD.

Kitchener Street 50-Storey Hotel
Exhibit #7 - Fire Water Demand

2026-03-11
Job: 250702

FIRE WATER SUPPLY

Building Type: Fire Protected (Vertically)

Floor Area		Reduct.	
Level 1	891.7 m^2	1.00	891.7 m^2
Level 2	580.5 m^2	0.25	145.1 m^2
Level 3	647.4 m^2	0.25	161.9 m^2
Level 4	647.4 m^2	0.00	0 m^2
Level 5-49	502.7 m^2	0.00	0 m^2
Level 50-52	393.6 m^2	0.00	0 m^2
			1198.7 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	24.4 m	0.10
South	21.3 m	0.10
West	24.8 m	0.10
East	45+ m	0.00
		0.30

Net Increase = 1530 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

HALLEX CIVIL ENGINEERING LTD.

Kitchener Street 5-Storey Parking Garage
Exhibit #8 - Fire Water Demand

2026-03-11
Job: 250702

FIRE WATER SUPPLY

Building Type: Fire Protected (Vertically)

Floor Area		Reduct.	
Level 1	295.3 m^2	1.00	295.3 m^2
Level 2	295.3 m^2	0.25	73.8 m^2
Level 3	295.3 m^2	0.25	73.8 m^2
Level 4-5	295.3 m^2	0.00	0 m^2
			442.951 m^2

Construction Type: Non-Combustible Const.

Construction Coefficient: 0.8

1st Preliminary Fire Flow = 4000 L/min

Fire Hazard: Limited Combustible

Fire Hazard Factor: -0.15

Net Decrease = -600 L/min

2nd Preliminary Fire Flow = 3400 L/min

Sprinkler System: Sprinkler & Hose Lines

Sprinkler System Factor: -0.4

Net Decrease = -1360 L/min

Separation Factor

North	45+ m	0.00
South	24.4 m	0.10
West	19.4 m	0.15
East	45+ m	0.00
		0.25

Net Increase = 850 L/min

FINAL FIRE FLOW = 3000.0 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

APPENDIX ‘A’

Troy Life & Fire Safety Ltd.

Hydrant Flow Test Reports

Troy
Life & Fire Safety Ltd.

FLOW TEST REPORT

LOCATION: 4873 Kitchener St, Niagara Falls, ON

DATE OF FLOW TEST: July 18th, 2025 TIME OF FLOW TEST: 8:00 AM

TEST BY: TROY LIFE & FIRE SAFETY LTD TEST CONDUCTED BY: Dennis Brady & Rob Konkle

WITNESSED BY: City of Niagara Falls

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

WATER MAIN SIZE (IF AVAILABLE): 8" PVC

HYDRANT ELEVATION COMPARED TO BUILDING: No Elevation Change

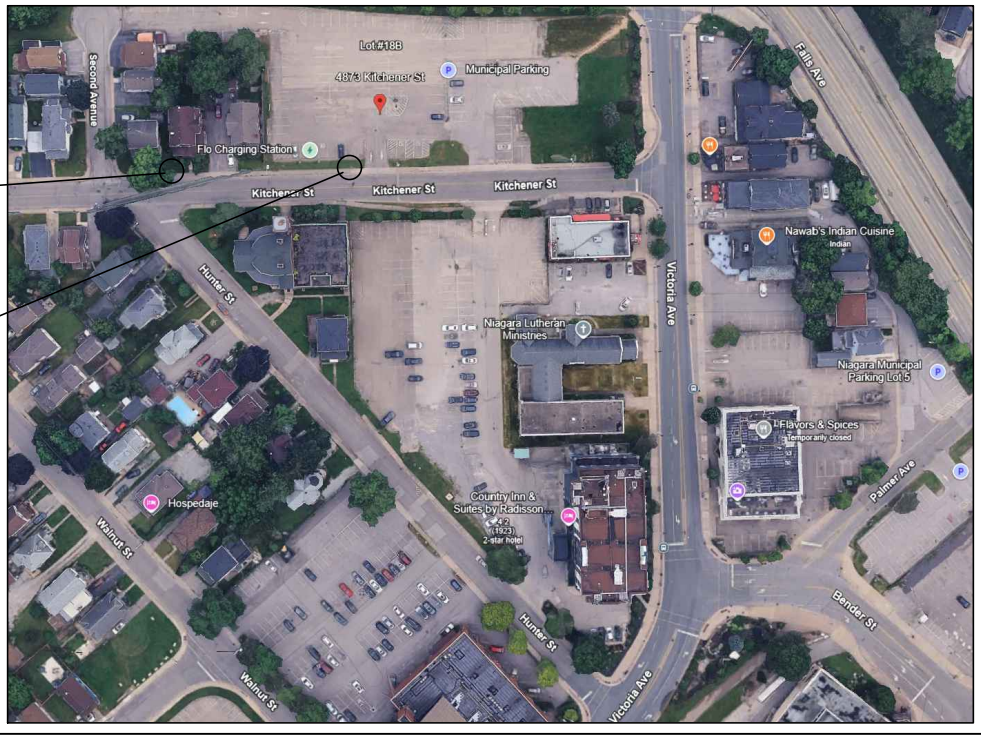
HYDRANT FLOW DATA:

STATIC PRESSURE:	70 PSI		
SIZE OF OPENING:	1x1¾"	1x2½"	2x2½"
DISCHARGE COEFFICIENT:	N/A	N/A	N/A
PITO READING:	59 PSI	32 PSI	18+28 PSI
FLOW USGPM:	684	1360	1609
RESIDUAL PRESSURE:	68 PSI	65 PSI	60 PSI

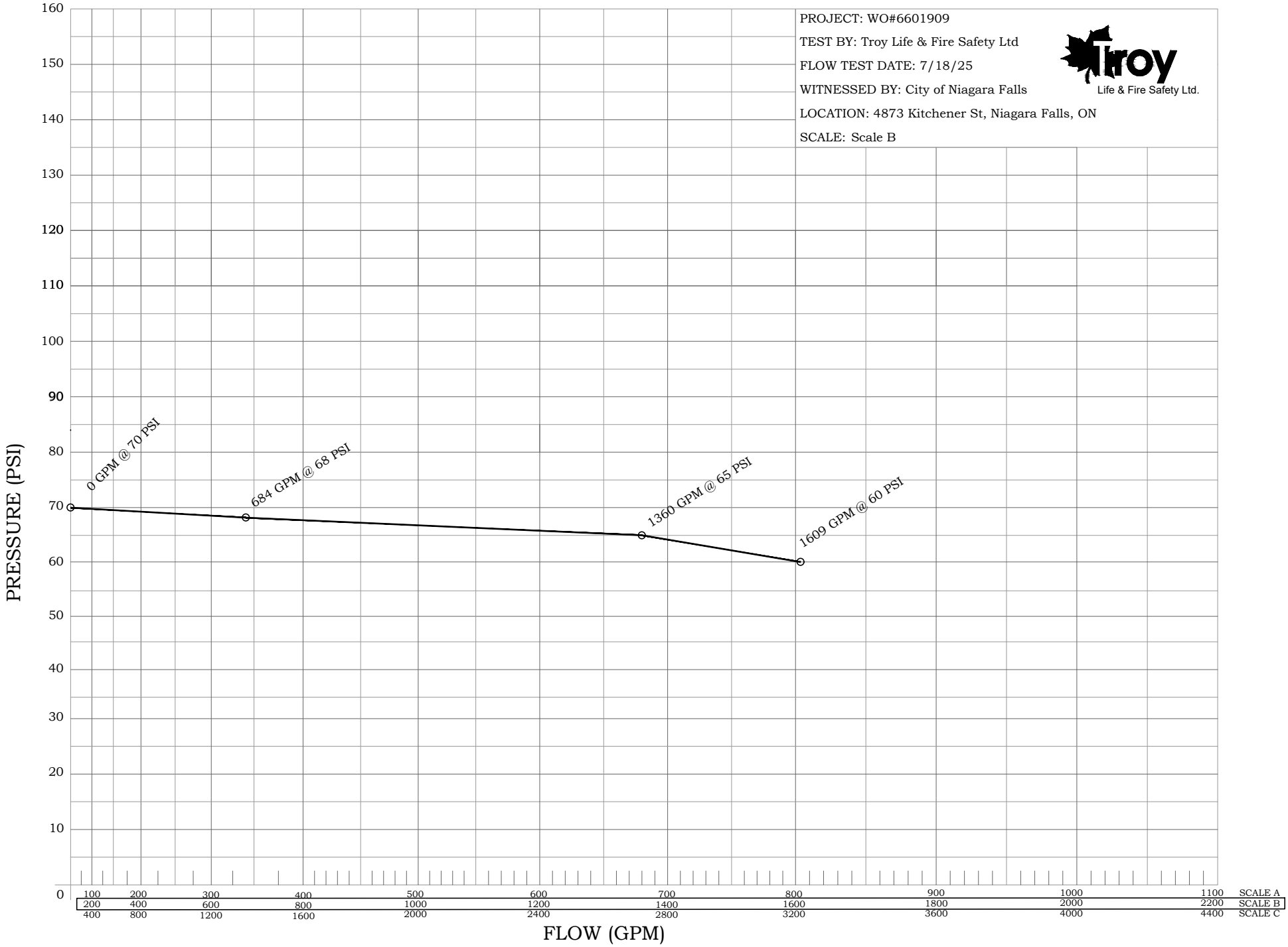
DRAWING OF SITE

STATIC HYD. 01092

FLOW HYD. 01094



WATER SUPPLY GRAPH



Troy
Life & Fire Safety Ltd.

FLOW TEST REPORT

LOCATION: 4882 Hunter St, Niagara Falls, ON

DATE OF FLOW TEST: July 18th, 2025 TIME OF FLOW TEST: 8:30 AM

TEST BY: TROY LIFE & FIRE SAFETY LTD TEST CONDUCTED BY: Dennis Brady & Rob Konkle

WITNESSED BY: City of Niagara Falls

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

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

HYDRANT ELEVATION COMPARED TO BUILDING: No Elevation Change

HYDRANT FLOW DATA:

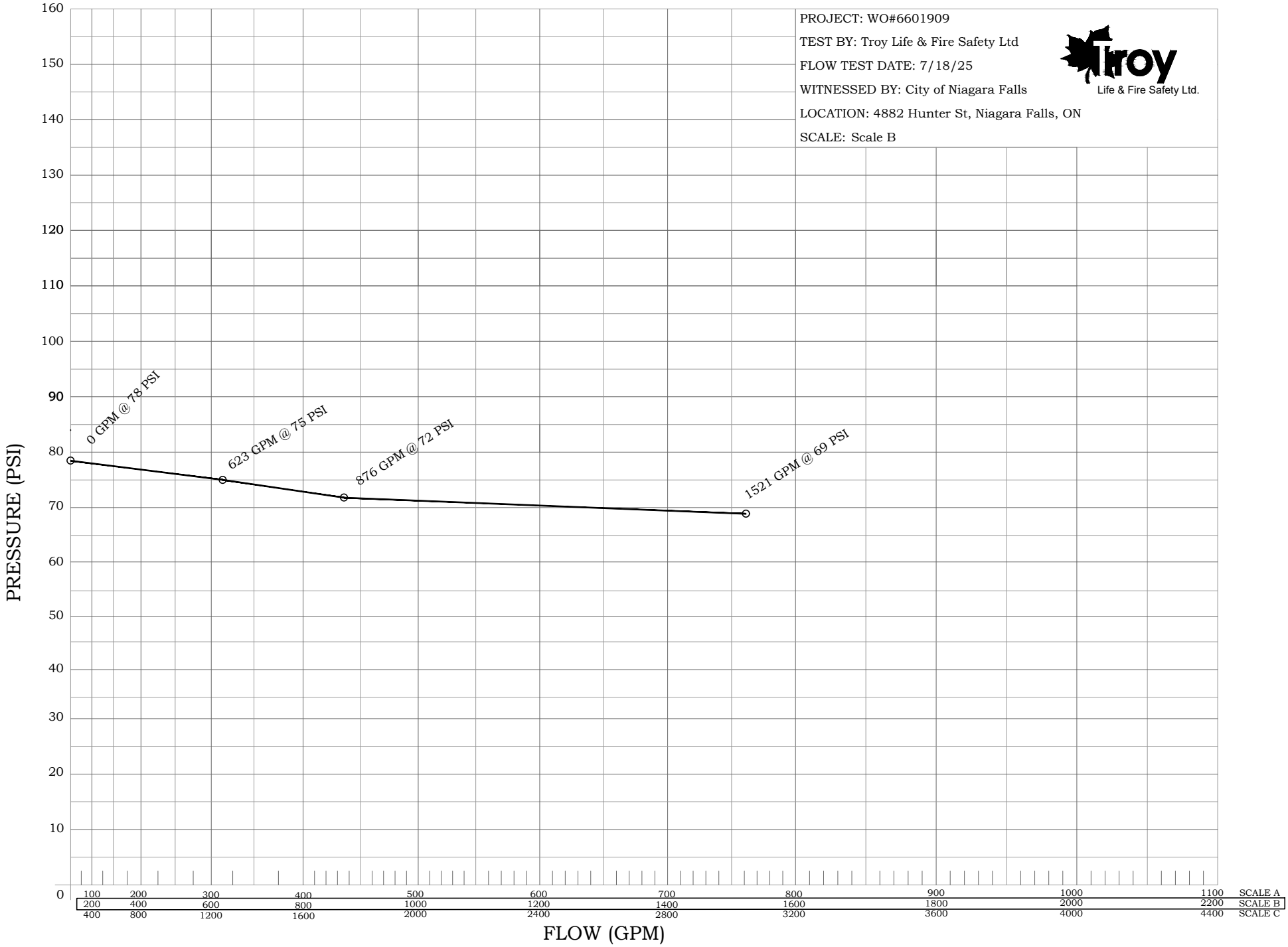
STATIC PRESSURE:	78 PSI		
SIZE OF OPENING:	1x1¾"	1x2½"	2x2½"
DISCHARGE COEFFICIENT:	N/A	N/A	N/A
PITO READING:	49 PSI	27 PSI	24+17PSI
FLOW USGPM:	623	876	1521
RESIDUAL PRESSURE:	75 PSI	72 PSI	69 PSI

DRAWING OF SITE

FLOW HYD. 0166

STATIC HYD. 01232

WATER SUPPLY GRAPH



Troy
Life & Fire Safety Ltd.

FLOW TEST REPORT

LOCATION: 5485 Victoria Ave, Niagara Falls, ON

DATE OF FLOW TEST: July 18th, 2025 TIME OF FLOW TEST: 9:00 AM

TEST BY: TROY LIFE & FIRE SAFETY LTD TEST CONDUCTED BY: Dennis Brady & Rob Konkle

WITNESSED BY: City of Niagara Falls

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

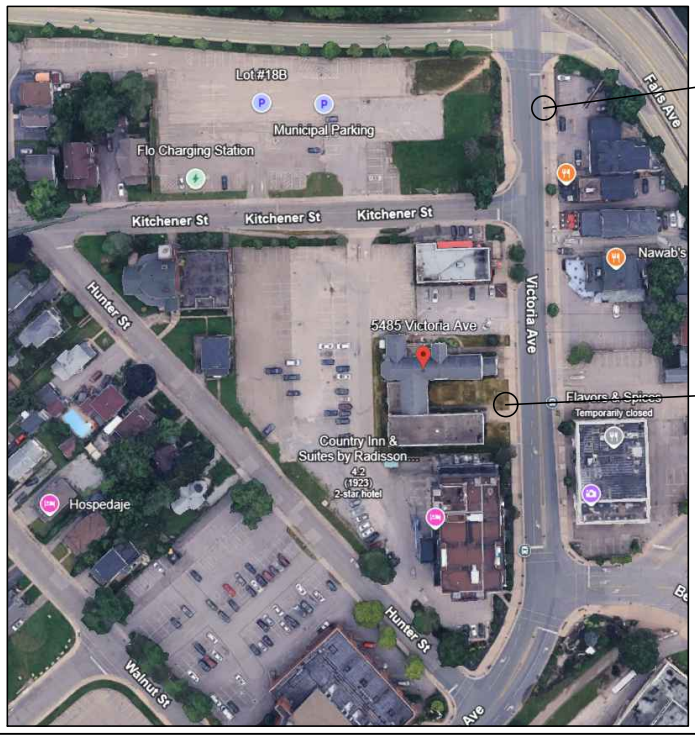
WATER MAIN SIZE (IF AVAILABLE): 12" PVC

HYDRANT ELEVATION COMPARED TO BUILDING: No Elevation Change

HYDRANT FLOW DATA:

STATIC PRESSURE:	75 PSI		
SIZE OF OPENING:	1x1¾"	1x2½"	2x2½"
DISCHARGE COEFFICIENT:	N/A	N/A	N/A
PITO READING:	54 PSI	27 PSI	32+25 PSI
FLOW USGPM:	654	876	1797
RESIDUAL PRESSURE:	70 PSI	68 PSI	64 PSI

DRAWING OF SITE



WATER SUPPLY GRAPH