TEN-STOREY SENIOR'S APARTMENT BUILDING
8055 McLEOD ROAD, NIAGARA FALLS

FUNCTIONAL SERVICING DESIGN BRIEF
NEW STORM, SANITARY AND WATER SERVICES

REV 2 – October 01, 2024

PREPARED BY:

HALLEX PROJECT #240516

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

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

TABLE OF CONTENTS

1. INTRODUCTION

The proposed senior's apartment building development consists of the construction of a ten-storey senior's apartment building, asphalt laneway and parking areas and grass areas. This development is located at 8055 McLeod Road, which is east of Kalar Road and McLeod Road 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 current drainage path for the site consists partly of overland sheet flow to the existing storm sewer at McLeod Road and partly of overland sheet flow to the Provincially Significant Wetland at the north end of the site as per the Topographic Survey completed by J.D. Barnes Limited under reference number 23-16-062-00, dated May 30, 2023.

2.2 STORM SEWER

The existing site is currently not serviced as it is a vacant area of the existing site and will be severed into a separate parcel. The existing drainage infrastructure at McLeod Road consists of a 1200mm concrete municipal storm sewer which drains westerly towards Kalar Road.

2.3 SANITARY SEWER

The existing site is currently not serviced as it is a vacant area of the existing site and will be severed into a separate parcel. The existing sanitary infrastructure at McLeod Road consists of a 600mm concrete municipal sanitary sewer which drains easterly towards Pin Oak Drive.

2.4 WATERMAIN

The existing site is currently not serviced as it is a vacant area of the existing site and will be severed into a separate parcel. The existing watermain infrastructure at McLeod Road consists of a 300mm PVC municipal watermain and a 500mm PVC regional watermain.

3. STORM SEWER SYSTEM

3.1 PRE-DEVELOPMENT SITE FLOW

The total drainage area for the subject development is 2.348 hectares with an existing runoff coefficient of 0.26 based on the existing asphalt and grass surfaces. and an allowable runoff coefficient of 0.5 based on the City of Niagara Falls Kalar Road and McLeod Road Storm Drainage Area Plan Reference No. CC-STM, Revision 0, dated June 06, 2006. The catchment area plan for the pre-development site condition is provided on Hallex Sketch CSK1 and the allowable 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 peak flow rates for the pre-development condition of the site is as follows:

Storm Event	McLeod Rd Pre-Development Storm Flow	PSW Pre-Development Storm Flow
5-year Storm	74.3 L/s	66.8 L/s

Using the Rational Method, the maximum allowable peak flow rates are as follows:

Storm Event	McLeod Rd Allowable Storm Flow
5-year Storm	274.0 L/s

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

3.2 POST-DEVELOPMENT SITE FLOW

The proposed development includes the ten-storey seniors apartment building, asphalt laneway and parking areas and grass areas. The grading for the site will ensure drainage from the developed area of the site will drain through the proposed storm sewer system for storm water quantity and quality controls while the Provincially Significant Wetland is intended to be relatively unaltered and unaffected by the development.

The total drainage for the site consists of 2.348 hectares with a calculated runoff coefficient of 0.47 based on the proposed roof, asphalt, and grass surfaces. The proposed storm sewer system for the developed area of the site will then discharge to the existing 1200mm concrete municipal storm sewer at McLeod Road. The catchment area plan for the post-development site condition is provided on Hallex Sketch CSK3, 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	McLeod Rd Post-Development Storm Flow	PSW Post-Development Storm Flow
5-year Storm	191.9 L/s	68.8 L/s

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

3.3 STORMWATER QUANTITY CONTROL

The post-development storm water runoff for the subject site will be 15.3 L/s lower than the maximum allowable peak flow rates for the five-year storm. Furthermore, the post-development storm water runoff for Area.2 to the Provincially Significant Wetland will remain unchanged as a result of the development. As such, stormwater quantity controls are not proposed for this development.

3.4 STORMWATER QUALITY CONTROL

Stormwater quality controls for the site can be achieved by utilizing a HydroDome HD8 prior to draining to the existing 1200mm concrete municipal storm sewer at McLeod Road. This will achieve a total suspended solids removal of at least 82% based on the above post-development site conditions. This value is greater than the required 'Enhanced' treatment of 80% 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 developed for the proposed ten-storey seniors apartment building development, a new sanitary lateral shall be proposed from the apartment building to the existing 600mm concrete municipal sanitary sewer at McLeod Road.

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.

- The senior's apartment building development is assumed to have 10 floors consisting of 74 one-bedroom apartment units and 38 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 development is determined to be 6.373 L/s and the peak wet weather design flow is determined to be 7.030 L/s. These calculations are based on the Sanitary Catchment Area Plan CSK4 and the Post-Development Sanitary Sewer Design sheet provided in Exhibit #4, attached.

Based on the above, Hallex recommends a minimum 200mm sanitary sewer @ 1.0% to be installed to convey sanitary flows from the proposed apartment building to the existing 600mm concrete municipal sanitary sewer at McLeod Road. The installation of the new sanitary sewer will require crossing the existing 500mm PVC regional watermain at McLeod Road. As such, protection of the 500mm regional watermain during the installation of the new sanitary service shall be completed in accordance with the Region of Niagara requirements.

5. WATER DISTRIBUTION SYSTEM

Given the site is to be completely developed for the proposed ten-storey seniors apartment building development, a new water service shall be proposed from the apartment building to the existing 300mm PVC municipal watermain at McLeod Road.

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 3-1: Peaking Factors of the Ministry of the Environment Design Guidelines for Drinking-Water Systems 2008.
- The senior's apartment building development is assumed to have 10 floors consisting of 74 one-bedroom apartment units and 38 two-bedroom apartment units. Each apartment is assumed to have a maximum of 2 persons per bedroom.
- 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 subject development is calculated as follows:

Site	Average Day Water Demand	Maximum Day Water Demand	Peak Hour Water Demand
Area.1	135.0 m^3/day	371.3 m^3/day	17.7 L/s

The resulting domestic flow head losses for the development are determined to be 25.20 kPa (3.66 psi) for the site. As such, the minimum working pressure within the existing municipal watermain is required to be 43.66 psi to ensure a minimum normal operating pressure of 40 psi within the municipal watermain. These calculations are based on the Water Demand Design Sheet provided in Exhibit #5, 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 15,000 L/min for the building based on the above assumptions as shown in Exhibit #6, attached. There are 3 existing municipal fire hydrants located near the site. The first is located adjacent to the site approximately 25.7m from the south property line on the south side of McLeod Road. The second is approximately 62.3m east of the property on the south side of McLeod Road. The third is approximately 90.8m west of the property on the south side of McLeod Road.

Using the maximum fire flow rate required for the proposed ten-storey seniors apartment building, the head loss at the proposed hydrant located on-site is determined to be 246.08 kPa (35.69 psi). As such, the minimum working pressure within the existing municipal watermain is required to be 55.69 psi to ensure a minimum normal operating pressure of 20 psi within the watermain under fire flow conditions. The above calculations are based on the Water Demand design sheet provided in Exhibit #5, attached.

Based on the above, Hallex recommends a minimum 200mm diameter water service to be installed to provide water supply to the proposed ten-storey senior's apartment building from the existing 300mm PVC municipal watermain at McLeod Road. The apartment building water service is to be separated at the property line with a 100mm diameter domestic water service and a 200mm fire protection service and shall extend to the mechanical room of the proposed building. Additionally, a fire hydrant is proposed for the development in accordance with Ontario Building Code requirements. The installation of the new water service will require crossing the existing 500mm PVC regional watermain at McLeod Road. As such, protection of the 500mm regional watermain during the installation of the new water service shall be completed in accordance with the Region of Niagara requirements.

6. CONCLUSION

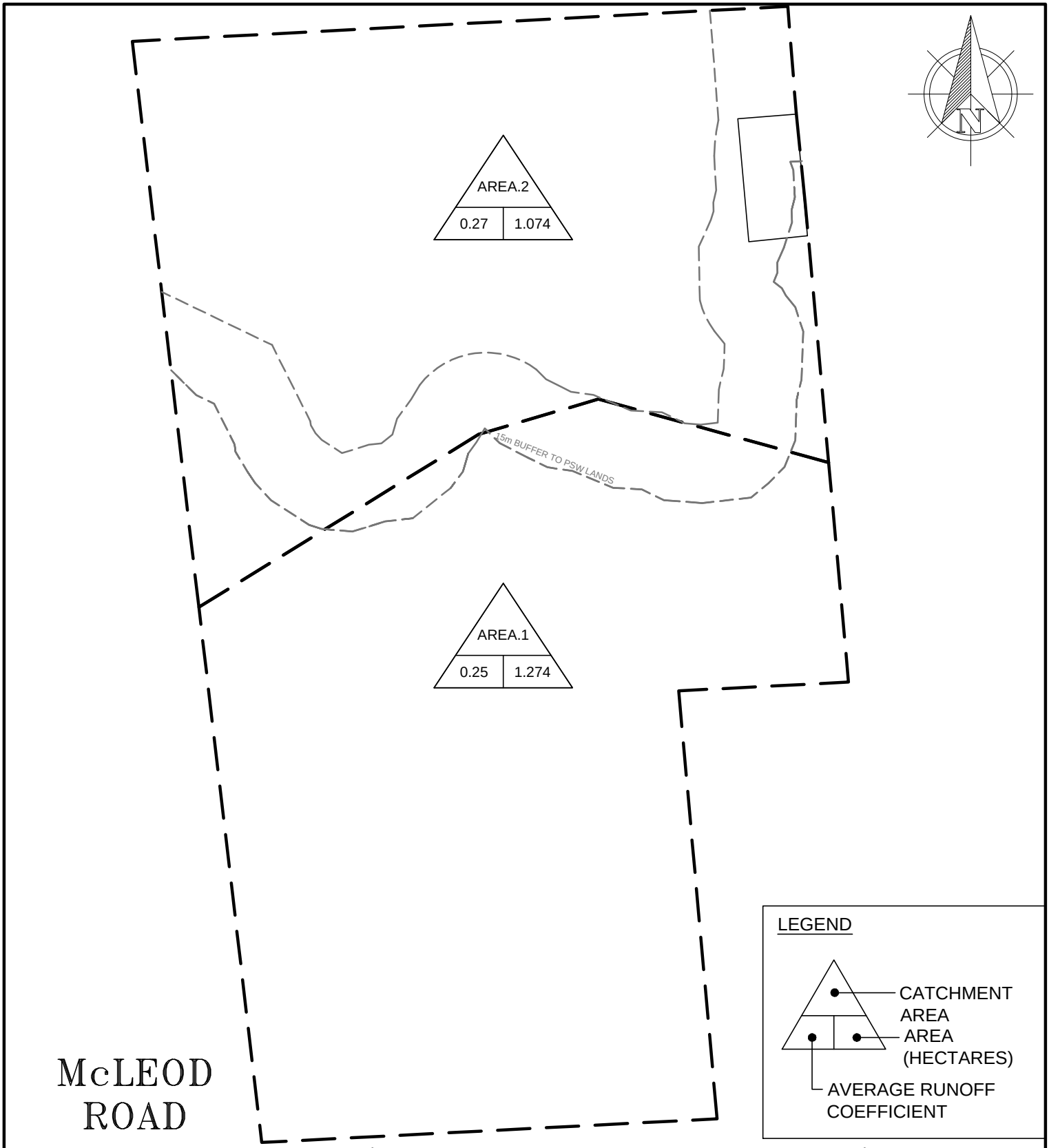
The aforementioned calculations and recommendations for the storm, sanitary and water services are based on the current design for the site as of writing this report. A final sealed report, complete with updates to the recommendations made in this report, may be required based on the final site design.

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

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



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PROJECT: TEN-STOREY SENIORS APARTMENT BUILDING	SCALE: 1:1000	JOB NUMBER: 240516	
	DATE: 2024/10/01	ISSUED FOR: ZONING BYLAW AMENDMENT	
	DRAWN BY: JF	DWG: CSK1	REV.: 2
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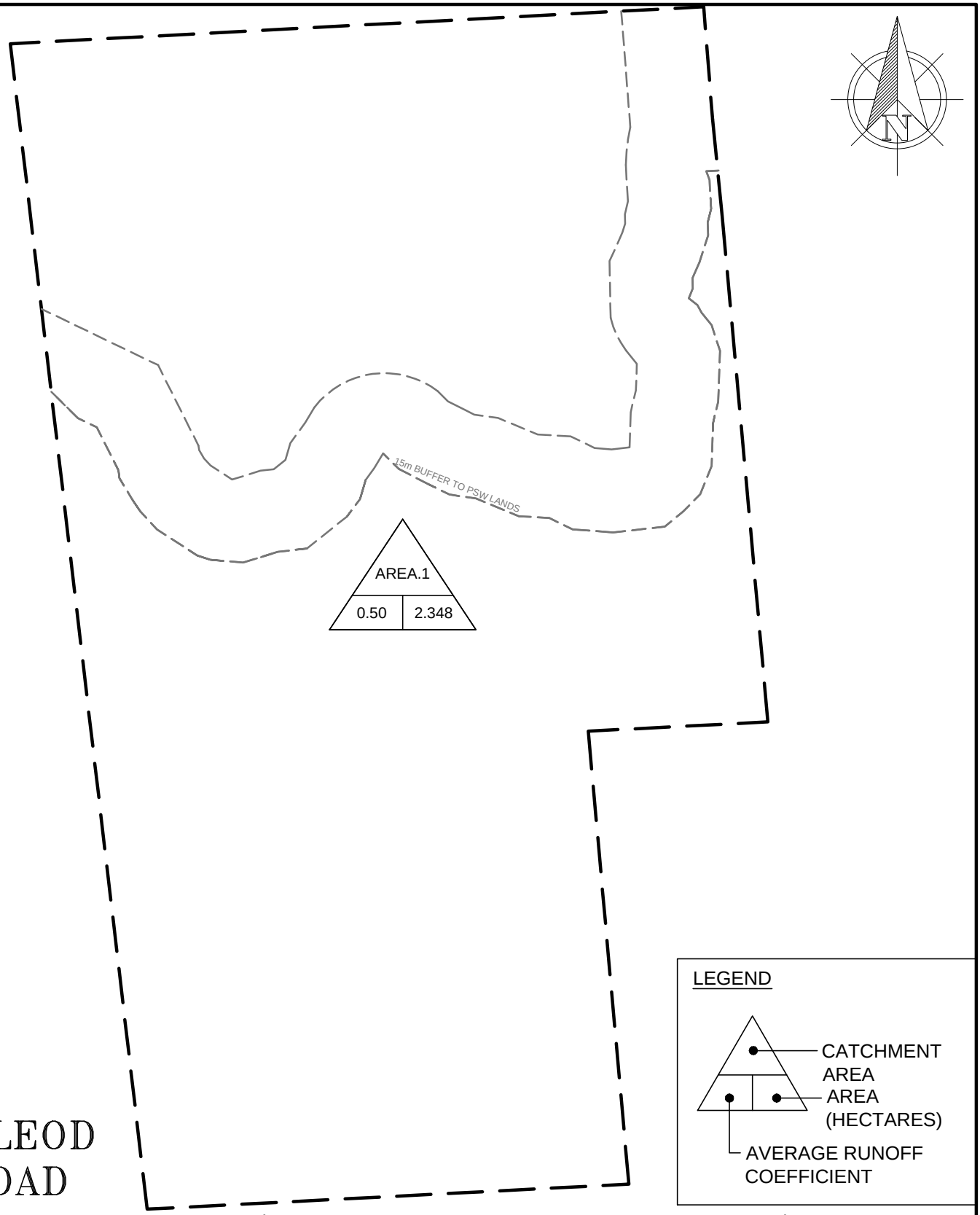
	CHECKED BY: JH		



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	DATE: 2024/10/01	ISSUED FOR: ZONING BYLAW AMENDMENT	
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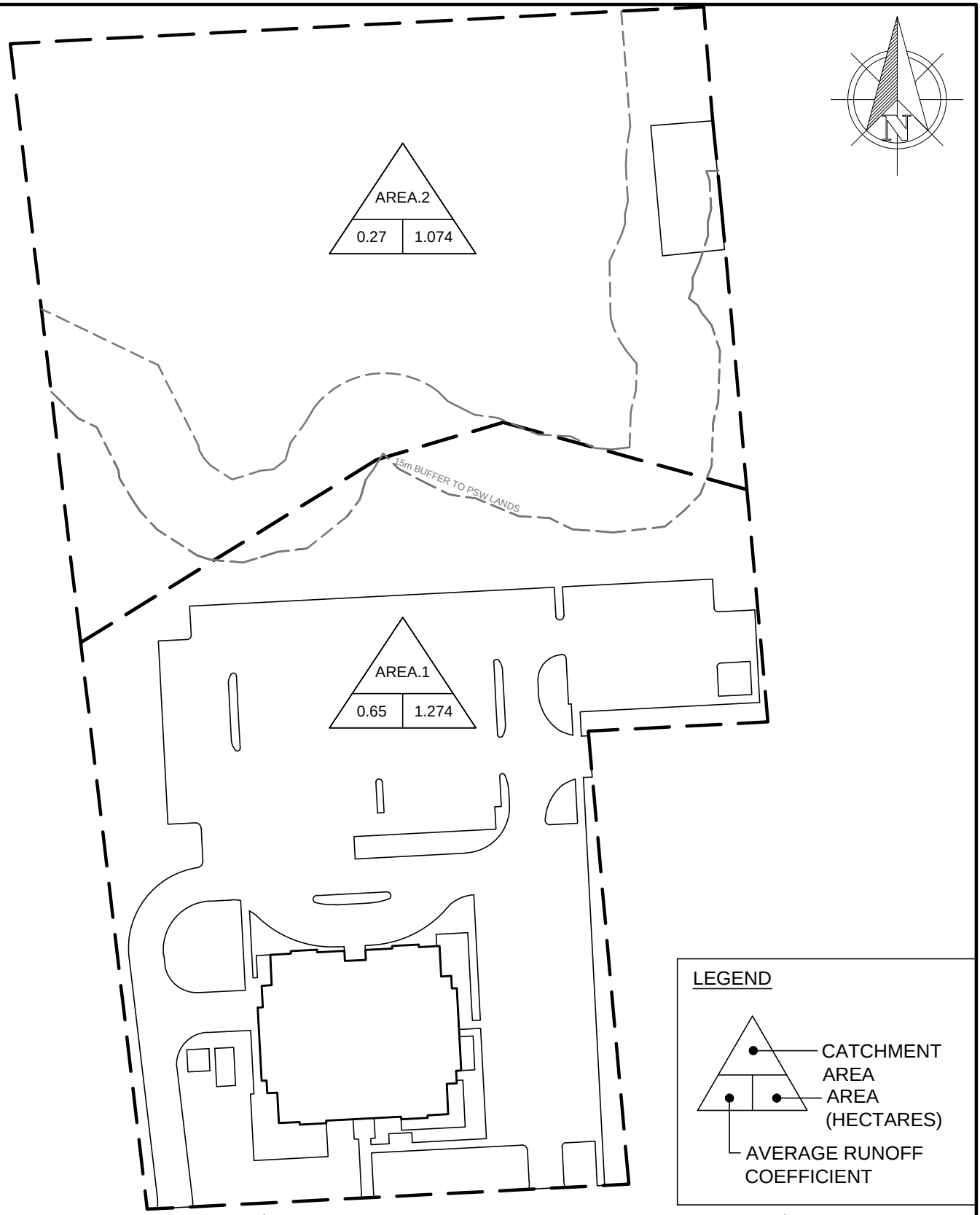
	CHECKED BY: JH		



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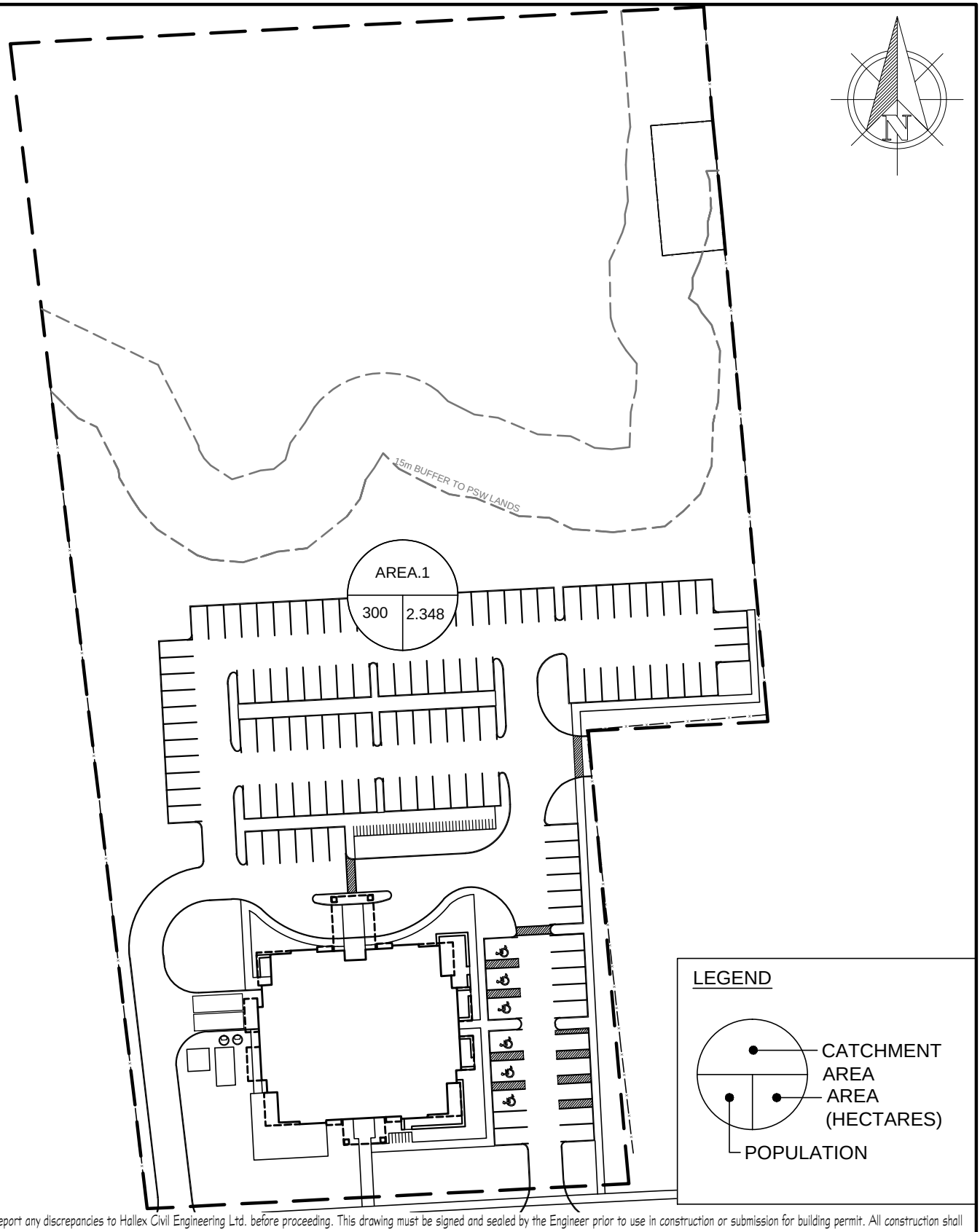
PROJECT: TEN-STOREY SENIORS APARTMENT BUILDING	SCALE: 1:1000	JOB NUMBER: 240516	
	DATE: 2024/10/01	ISSUED FOR: ZONING BYLAW AMENDMENT	
	DRAWN BY: JF	DWG	REV.
SHEET TITLE: POST-DEVELOPMENT CATCHMENT AREA PLAN	DESIGNED BY: JS	CSK3	2
	CHECKED BY: JH		



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PROJECT:
TEN-STOREY SENIORS APARTMENT BUILDING

SHEET TITLE:
POST-DEVELOPMENT SANITARY CATCHMENT AREA PLAN

SCALE: 1:1000
DATE: 2024/10/01
DRAWN BY: JF
DESIGNED BY: JS
CHECKED BY: JH

JOB NUMBER: 240516
ISSUED FOR: ZONING BYLAW AMENDMENT

DWG
CSK4

REV.
2

Ten-Storey Seniors Apartment Building
Exhibit #1 - 5 Year Pre - Development Calculations

10/1/2024
Job: 240516

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**	**N/A**	**1.274**	**1.274**	**10.00**	**N/A**	**84**	**60497**	**6422.8**	**0.0743**
Grass	-	-	-	1.274	-	-	-	-	5041.4	6422.8	-
2	**Area.2**	**PSW**	**N/A**	**1.074**	**1.074**	**10.00**	**N/A**	**84**	**60497**	**5768.4**	**0.0668**
Paved	-	-	-	0.027	-	-	-	-	18149.2	490.0	-
Grass	-	-	-	1.047	-	-	-	-	5041.4	5278.4	-

Run-off Coefficients Used:

Roof Structure	C =	0.95
Paved Surface	C =	0.90
Gravel Surface	C =	0.60
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 = 10 min

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Ten-Storey Seniors Apartment Building
Exhibit #2 - 5 Year Allowable Flow Calculations

10/1/2024
Job: 240516

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**	**N/A**	**2.348**	**2.348**	**10.00**	**N/A**	**84**	**64531**	**23674.6**	**0.2740**
Site Avg	-	-	-	2.348	-	-	-	-	10082.9	23674.6	-

Run-off Coefficients Used:

Site Average C = 0.50

Velocity Range:

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

Time of Concentration = 10 min

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Ten-Storey Seniors Apartment Building
Exhibit #3 - 5 Year Post - Development Calculations

10/1/2024
Job: 240516

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**	**1.274**	**1.274**	**10.00**	**N/A**	**84**	**42348**	**16581.3**	**0.1919**
Roof	-	-	-	0.104	-	-	-	-	19157.5	1992.4	-
Paved	-	-	-	0.663	-	-	-	-	18149.2	12032.9	-
Grass	-	-	-	0.507	-	-	-	-	5041.4	2556.0	-
2	**Area 2**	**PSW**	**N/A**	**1.074**	**1.074**	**10.00**	**N/A**	**84**	**23191**	**5768.4**	**0.0668**
Paved	-	-	-	0.027	-	-	-	-	18149.2	490.0	-
Grass	-	-	-	1.047	-	-	-	-	5041.4	5278.4	-

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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Ten-Storey Seniors Apartment Building
Exhibit #4 - Post-Development Sanitary Sewer Design

10/1/2024
Job: 240516

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.	10.0	300	2.348	300	2.348	4.08	6.373	0.657	7.030	0.0100	32.798	1.044	0.200

Calculations:

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

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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Ten-Storey Seniors Apartment Building
Exhibit #5 - Water Demand

10/1/2024
Job: 240516

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

Location			Length	Pop.	Area	Area Type	Water Demand by Pop'n & Area			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	34.4	300	2.348	Apartments	135.0	371.3	17.70	0.00	0.100	2.572	25.20	3.66	0.000	0.00	0.00
2	FH 1	Street	72.9	0	0.000	Apartments	0.0	0.0	0.00	250.00	0.200	0.000	0.00	0.00	25.110	246.08	35.69

Calculations:

Avg Daily Water Demand (Domestic)	0.450 m^3/cap./day	Max Day Factor	2.75
Fluid Specific Weight	9.8 kN/m^3	Max Hourly Peaking Factor	4.13

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Ten-Storey Seniors Apartment Building
Exhibit #6 - Fire Water Demand

10/1/2024
Job: 240516

FIRE WATER SUPPLY

Building Type: Fire Protected (Vertically)

Floor Area			Reduct.		
First Floor	11180	m^2	1.00	11180	m^2
Second Floor	11110	m^2	0.25	2777.5	m^2
Third Floor	11110	m^2	0.25	2777.5	m^2
Fourth Floor	11110	m^2	0.00	0	m^2
Fifth Floor	11110	m^2	0.00	0	m^2
Sixth Floor	11110	m^2	0.00	0	m^2
Seventh Floor	11110	m^2	0.00	0	m^2
Eighth Floor	11110	m^2	0.00	0	m^2
Ninth Floor	11110	m^2	0.00	0	m^2
Tenth Floor	11110	m^2	0.00	0	m^2
				16735	m^2

Construction Type: Non-Combustible Const.

Construction Coefficient: 0.8

1st Preliminary Fire Flow = 23000 L/min

Fire Hazard: Limited Combustible

Fire Hazard Factor: -0.15

Net Decrease = -3450 L/min

2nd Preliminary Fire Flow = 19550 L/min

Sprinkler System: Sprinkler & Hose Lines

Sprinkler System Factor: -0.4

Net Decrease = -7820 L/min

Separation Factor

North	45+	m	0.00
South	45+	m	0.00
West	28.2	m	0.10
East	39.3	m	0.05
			0.15

Net Increase = 2932.5 L/min

FINAL FIRE FLOW = 15000.0 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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