FUNCTIONAL SERVICING & STORMWATER MANAGEMENT REPORT 13290 NUNNVILLE ROAD

TOWN OF CALEDON

PREPARED FOR:

BOLTON SUMMIT DEVELOPMENTS INC.

PREPARED BY:

C.F. CROZIER & ASSOCIATES INC. 2800 HIGH POINT DRIVE, SUITE 100 MILTON, ON L9T 6P4

APRIL 2022

CFCA FILE NO. 649-6278

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Revision Number	Date	Comments
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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Bolton Summit Developments Inc. (BSDI) to prepare a Functional Servicing and Stormwater Management Report in support of the Zoning By-Law Amendment and Official Plan Amendment for the proposed development located at 13290 Nunnville Road in the Town of Caledon.

This report demonstrates how the proposed development's functional servicing and stormwater management will integrate with the area's existing water, sanitary and stormwater infrastructure.

2.0 Site Description

The proposed development is part of an established residential area in Bolton. The property is located at 13290 Nunnville Road. The site currently consists of one existing residential building surrounded by a forested area. The proposed development covers an area of approximately 0.85 ha. The developable area is proposed to include 15 multi-unit townhouses comprised of 3 (three)separate blocks, a private road, and associated landscaped areas. The remainder of the site is environmentally sensitive and is regulated by the Toronto and Region Conservation Authority (TRCA).

The subject property is bounded by:

- A TRCA Regulated Environmental Protection Area (EPA) to the north and west.
- Nunnville Road to the east and south.
- An Existing residential property to the south.

3.0 Water Servicing

The Region of Peel is responsible for the operation and maintenance of the public water supply and treatment system in the Town of Caledon. Any local water supply system will connect to the existing or proposed Region's municipal water network.

3.1 Existing Water Servicing

According to Berkshire Homes Development as-constructed drawing 36209-D (A.M. Candaras Associates, May 2006), there is an existing 150 mm diameter PVC watermain along Nunnville Road with a plug and blowoff valve located at the northwest corner of Bateman Lane and Nunnville Road. An existing fire hydrant is also located at the northwest corner of Bateman Lane and Nunnville Road.

3.2 Design Water Demand

The population density, provided by the Region of Peel, was used to determine an equivalent population estimate for the proposed residential development. The results are provided in Table 1 and detailed calculations along with email correspondences regarding the population density are provided in Appendix A.

Table 1: Equivalent Population Estimate						
Number of Units Persons/Unit Total Persons						
15	3.4	51				

The Region of Peel Watermain Design Criteria (June 2010) was used to determine the maximum domestic water demand generated by the proposed development based on the equivalent population estimate for the site. Table 2 summarizes the estimated design water demand. Appendix A contains detailed calculations for the required water demand.

Table 2: Estimated Design Water Demand

Standard	Average Daily	Maximum Daily	Peak Hourly
	Demand	Demand	Demand
	(L/s)	(L/s)	(L/s)
Region of Peel Watermain Design Criteria (June 2010)	0.17	0.33	0.50

The domestic water service will be designed to convey a peak domestic design water demand of 0.50 L/s.

3.3 Fire Flow Demand

The Fire Underwriters Survey method (1999) was used to estimate the fire flow demand for the proposed development. Based on dwelling gross floor area and exposure distance (WSP, March 2022), the preliminary fire demand using this method is 150 L/s for a minimum duration of 2 hours. Detailed calculations are provided in Appendix A. The calculation is based on the assumptions that the proposed building will be made from ordinary construction material, potential to contain rapid burning fire hazards, and will not have an automatic sprinkler system.

Hydrant flow testing was carried out on April 18, 2019, by Aquazition on the existing 150 mm diameter municipal watermain on Nunnville Road. Based on the hydrant test results, at 276 kPa (40 psi) residual pressure, a minimum of 171 L/s (2,708 US GPM) projected flow is available within the 150 mm diameter municipal watermain on Nunnville Road. Detailed results of the hydrant flow test and projected fire flows are provided in Appendix A.

3.4 Proposed Water Servicing

The proposed development will be serviced by the existing 150 mm diameter PVC watermain located on Nunnville Road. The existing watermain will be extended from the plug located at the northwest corner of Nunnville Road and Bateman Lane to the proposed development. The proposed development will be serviced with a 150 mm diameter PVC watermain within the private site. The units will be serviced by a 25 mm diameter domestic water services which will connect to the proposed watermain within the private road. Two (2) fire hydrants are also proposed to provide the required fire suppression coverage for the proposed development.

4.0 Sanitary Servicing

The Region of Peel is responsible for the operation and maintenance of the public sewage collection and treatment system in the Town of Caledon. Any local sewage system will connect to the Region's municipal sanitary sewage network.

4.1 Existing Sanitary Servicing

According to Southridge Estates Phase 7 as-constructed drawing 25231-D (Falby Burnside & Associates, May 1997) there is an existing 250 mm diameter sanitary sewer flowing south on Nunnville Road. Additionally, according Nunnville Road issued for construction drawings 69958-D (Region of Peel, July 2018) there is a proposed 900 mm diameter trunk sanitary sewer flowing south on Nunnville Road which will connect to the existing trunk sanitary sewer on Albion-Vaughan Road. According to the issued for construction drawings, a 250 mm diameter sanitary sewer is proposed to provide sanitary service from the site to the trunk sewer.

4.2 Design Sanitary Flow

The Region of Peel Sanitary Design Criteria (March 2017) and the equivalent population estimate from Section 3.2, were used to determine the estimated design sanitary flow for the proposed development. Estimated design sanitary calculations are provided in Table 3, and detailed calculations are provided in Appendix B.

Table 5. Estimated Design Samary Demana							
Standard	Average Day	Peaking	Infiltration Flow	Total Flow			
Sidildald	(L/s)	Factor	(L/s)	(L/s)			
Region of Peel Sanitary Design Criteria (March 2017)	0.18	4.00	0.08	0.80			

Table 3: Estimated Design Sanitary Demand

The proposed sanitary service must convey a total design sanitary demand of 0.80 L/s determined according to the Region of Peel Sanitary Design Criteria (March 2017).

4.3 Proposed Sanitary Servicing

The proposed development will be serviced by a 200 mm diameter sanitary sewer at a minimum slope of 1% which will connect to the future 250 mm diameter sanitary sewer (completed by others) within Nunnville Road.

5.0 Drainage Conditions

5.1 Existing Drainage Conditions

According to the topographic survey (R-PE Surveying Ltd., February 2022) the site slopes from south to north and existing stormwater flows are conveyed overland to the TRCA Environmental Protection Area (EPA) Regulated Lands and towards adjacent properties on Old King Road and Deer Hollow Court, ultimately to the Humber River.

• Catchment 101 (A = 0.77 ha; RC = 0.30) demonstrates drainage from the south of the site discharging uncontrolled to the TRCA EPA regulated land that surrounds the site.

• Catchment 102 (A = 0.08 ha; RC = 0.25) demonstrates drainage form the southeast corner of the site discharging uncontrolled minor flows towards a catch basin located on the southeast portion of the property. Flows are discharges to a headwall adjacent to the Nunnville Road pedestrian walkway towards Old King Road within the TRCA EPA regulated land. Major flows also drain to the TRCA EPA regulated land that surrounds the site.

Figure 1 illustrates the delineation of the drainage areas and existing drainage conditions. The existing residential building is connected to the municipal stormwater infrastructure.

5.2 Proposed Drainage Conditions

The developable area is proposed to include 15 multi-unit townhouses comprised of 3 (three) separate blocks, a private road, and associated landscaped areas. Stormwater flows within the total property area will be considered for this analysis. Lands outside the development limit will maintain their existing drainage patterns.

The proposed development has been divided into three post-development stormwater catchment areas as shown on Figure 2 Post-Development Drainage Plan. The grading of the proposed development results in the following post-development drainage catchments:

- Catchment UC1 (A = 0.51 ha; RC = 0.25) discharges uncontrolled to the TRCA EPA regulated lands and adjacent properties on Old King Road and Deer Hollow Court, ultimately to the Humber River following existing drainage patterns. Post-development uncontrolled peak flows will be equal to or less than pre-development peak flows.
- Catchment 201 (A = 0.32 ha; RC = 0.77) minor flows will be controlled using an orifice tube and a superpipe for stormwater storage. Minor flows will be conveyed to the existing storm sewer system on Nunnville Road which discharge via a headwall to the existing concrete channel adjacent to the Nunnville Road walkway within the TRCA EPA regulated land, ultimately draining to Old King Road and then the Humber River. Emergency flows will be conveyed to the ditch on Nunnville Road within the TRCA EPA regulated land, ultimately draining to Old King Road and then the Humber River.
- Catchment 202 (A = 0.02 ha; RC = 0.53) minor flows will be conveyed to the relocated catch basin located in the southeast corner of the site (previously conveyed Catchment 102 minor flows) and major flows will be directed to a ditch on Nunnville Road within the TRCA EPA regulated land, ultimately draining to Old King Road and then the Humber River.

In accordance with Town of Caledon standards, stormwater flows will be attenuated so the postdevelopment peak flows for all storm events match or are less than the pre-development peak flows for all storm events. The controlled catchment 201 will be controlled by a 150 mm diameter orifice tube downstream of a proposed 1200 mm diameter storm sewer superpipe which will be used to attenuate excess flows.

Emergency flows will be directed to the TRCA EPA regulated lands that surround the site. The overland flow route for an emergency flow scenario is outlined in Figure 2.

6.0 Stormwater Management

The proposed stormwater management design must comply with the Town of Caledon Development Standards Manual (V5, 2019). Table 4 provides a summary of the stormwater management criteria based on the stormwater management design guidelines.

Table 4: Summary of Sformwater Management Criteria				
Control Parameter	Catchment 202			
Quantity Control	Post-development peak stormwater flows must be equal to or less than pre-development peak stormwater flows.			
Quality Control	Achieve Ontario Ministry of the Environment, Conservation and Parks (MECP.) Enhanced Level of protection (80% total suspended solids (TSS) removal).			
Water Balance	Retain 5 mm rainfall event on-site.			
Erosion and Sediment Controls	Provided during construction and until the site is stabilized.			

Table 4: Summary of Stormwater Management Criteria

6.1 Stormwater Quantity Control

The Modified Rational Method was used to determine the pre-development and post-development flow rates for the site using the Town's IDF rainfall data according to Town Standard Drawing No. 103. The peak flow rates were then used to determine if any stormwater guantity control was required for the proposed development. Detailed Modified Rational Method calculations are included in Appendix C.

The following section will consider one outlet, which is the TRCA EPA regulated lands. The outlet to the regulated lands includes pre-development Catchment 101 and 102, and post-development Catchments UC1, 201, and 202. Table 5 summarizes the pre-and post-development peak flows to the TRCA EPA regulated lands.

	Flow Rates (L/s)							
Storm Event	Pre-Development			Post-Development				
(yr)	Uncontrolled			Uncon	trolled	Controlled		
	Q 101	Q102	Qtotal	QUC1	Q202	Q201 – 150 mm orifice	Qtotal	
2-yr	55	5	60	31	3	27	60	
5-yr	71	6	77	39	3	34	77	
10-yr	87	8	94	48	4	41	93	
25-yr	101	9	110	56	5	47	107	
50-yr	114	10	124	63	5	51	120	
100-yr	127	11	138	70	6	56	132	

Table 5: Summary of Peak Flow Rates

As presented in Table 5, the post-development peak flows to the regulated lands are equal to or less than the pre-development peak flows. Therefore, the stormwater quantity control criterion to this outlet is satisfied.

Controlled stormwater from Catchment 201 will be conveyed to the existing 375 mm diameter storm sewer located on Nunnville Road. A 150 mm diameter orifice tube downstream of a 97 m long 1200 mm diameter storm sewer superpipe network which will restrict peak flow to achieve the quantity control criterion. The superpipe will retain the attenuated peak flows from the 2-year to 100-year storm events.

A summary of the target peak flows and subsequent required storage volumes is presented in Table 6.

	Catchment 201 (150mm Orifice Tube)					
Storm Event (yr)	Target Flow Rate (L/s)	Flowrate	Required Storage	Provided Storage		
	$Q_{201} = Q_{101} + Q_{102} - Q_{UC1} - Q_{202}$	(L/s)	(m³)	(m³)		
2-yr	27	27	24			
5-yr	35	34	35			
10-yr	42	41	44	110		
25-yr	49	47	56	110		
50-yr	56	51	66			
100-yr	62	56	77			

Table 6: Summary of Target Peak Flow Rates and Storage Volumes

As shown in Table 6, a 150 mm diameter orifice tube is required for Catchment 201 to control post-development peak flows to pre-development peak flows and meet the quantity control criteria. A 97 m long 1200 mm diameter storm sewer superpipe network, upstream of the 150 mm diameter orifice tube, will provide storage for the attenuated flows up to the 100-year storm event. The 100-year high-water level will be contained within the pipe. The system will be designed to detain 110h m³ therefore satisfying the storage requirement outlined in Table 6.

6.2 Stormwater Quality Control

Stormwater quality controls for the site must incorporate measures to provide an Enhanced Level of Protection (Level 1) according to the MECP (March 2003) guidelines. Enhanced water quality protection involves the removal of at least 80% of total suspended solids (TSS) from 90% of the annual runoff volume. An area breakdown and associated TSS removal rate is provided in Table 7.

Catchment		Area (ha)	% of Total Development Area	TSS Removal Efficiency	Total TSS Removal
Catchment UC1	Landscape	0.51	60%	80%	48%
Catchment 201	Jellyfish Filter	0.32	38%	89%	34%
Catchment 202	Partial Landscape	0.02	2%	40%	1%
	Total Site	0.85	100.0%	-	83%

Table 7: Area Breakdown	and Associated TSS Removal

Catchment UC1, which discharges uncontrolled to the TRCA EPA regulated lands, are landscaped areas that naturally achieve 80% TSS removal efficiency. Catchment 202, discharges to the existing storm sewer network on Nunnville Road partially treated as the portion of landscaped area will naturally achieve 80% TSS removal efficiency and the remaining road area will discharge untreated. A Jellyfish Filter will be used to treat the controlled discharge from Catchment 201 and will apply 89% TSS Removal Efficiency. The resulting combined TSS removal efficiency for the site is 83%, therefore the quality control criterion is achieved.

6.3 Water Balance

The minimum volume requirement to promote water balance is the retention of a 5 mm rainfall event. The water balance retention volume was calculated considering initial abstraction of runoff based on various surface types.

Water balance for the proposed development will be achieved through attenuation of stormwater runoff over the natural landscaped area with a 150 mm enhanced topsoil layer. Water balance for the impervious areas of the site (Catchment 201) will be achieved by providing a total topsoil depth of 300 mm over the landscaped areas per the Town of Caledon Development Standards Manual (V5, 2019). A storage volume of approximately 12.5 m³ is required to achieve the water balance criteria (5mm x 0.25 ha of impervious area in Catchment 201).

The total water balance volume will be stored in the topsoil of the landscaped area in Catchment 201 (0.06 ha). Using typical topsoil parameters (soil porosity = 0.47; soil field capacity = 0.32), the first 150 mm of topsoil is available for initial abstraction and has approximately 13.50 m³ of capacity for rainfall storage. Since the capacity of storage in the topsoil and the physical volume of rainfall exceed the required storage volume, we conclude that a total topsoil depth of 300 mm will successfully retain 12.5 m³ of rainfall volume. Detailed calculations for the topsoil retention are included in Appendix C.

7.0 Erosion and Sediment Controls During Construction

Erosion and sediment controls (ESC) will be installed prior to the start of any construction activities and will be maintained until the site is stabilized or as directed by the Site Engineer or the Town of Caledon. The contractor will inspect the ESC after each significant rainfall event to ensure they are maintained in proper working condition.

Sediment Control Fencing

Sediment control fencing in accordance with Town standard drawing 304 will be installed on the perimeter of the site to intercept sheet flow. Adjacent to the sensitive EPA lands, double silt fence with straw bales will be installed for additional protection. Based on field decisions, the Site Engineer and the Owner may add additional sediment control fencing prior to, during, and following construction.

Rock Mud Mat

A rock mud mat will be installed at the entrance to the construction zone to prevent mud tracking from the site onto the surrounding lands and perimeter roadway network. All construction traffic will be restricted to this access only.

Sediment Control for Catchbasins

Sediment control device will be installed in the existing nearby storm sewer catch basins. The sediment control device will provide sediment control to prevent silt and sediment from entering the stormwater system.

8.0 Conclusions & Recommendations

The proposed development can be serviced for water, sanitary, and stormwater in accordance with the Town of Caledon requirements and standards. Our conclusions and recommendations include:

- 1. Water demand for the proposed development will be provided using individual 25 mm domestic water services connected to the proposed 150 mm diameter PVC watermain within the private road. The proposed watermain will connect to an extension of the existing 150 mm diameter watermain on Nunnville Road.
- 2. Two (2) fire hydrants are proposed to provide fire suppression coverage for the development.
- 3. Sanitary servicing for the proposed development will be provided using a 200 mm diameter sanitary sewer, which connects to the future 250mm diameter sanitary sewer located on Nunnville Road.
- 4. Stormwater runoff from Catchment UC1 and 202 will flow uncontrolled to the TRCA EPA regulated lands outlet. Stormwater runoff from Catchment 201 will flow controlled to the existing storm sewer system located on Nunnville Road.
- 5. Stormwater quantity control has been provided using a 200 mm diameter orifice tube and a 97 m long 1200 mm diameter storm sewer superpipe which is sized to contain the attenuated post-development peak flows up to the 100-year storm event.
- 6. A combination of landscaped areas and a Jellyfish filter will provide an enhanced level of protection (83% TSS removal for total site) for stormwater quality control for Catchment 201.

- 7. Water balance for the proposed development will be achieved using enhanced topsoil over the landscaped area in Catchment 201, providing 13.5 m³ of storage.
- 8. Erosion and Sediment Controls will be implemented on-site during construction and will be maintained until the site is stabilized.

Based on the above conclusions we support the proposed development application from the perspective of water supply, sanitary servicing, and stormwater management.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

Jayesh Boily, E.I.T. Land Development

OS/cj

C.F. CROZIER & ASSOCIATES INC.

Peter Smuczak, P.Eng. Project Engineer

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APPENDIX A

Water Demand Calculations

Connection Demand Table

WATER CONNECTION

Connection point ³⁾					
Existing 150mm diameter watermain on Nunnville Road ID: WND6569890-WND6569891					
Pressure zone of connection poir	nt	6			
Total equivalent population to be	e serviced ¹⁾	51 persons			
Total lands to be serviced0.41 ha					
Hydrant flow test					
Hydrant flow test location		Nunnville Road			
	Flow (in I/s)	Time			
Minimum water pressure	379	92			
Maximum water pressure	448	55			

No.	Water Demand							
NO.	Demand type	Demand	Units					
1	Average day flow	0.17	l/s					
2	Maximum day flow	0.33	l/s					
3	Peak hour flow	0.50	l/s					
4	Fire flow ²⁾	150.00	l/s					
Anal	ysis							
5	Maximum day plus fire	150.50	l/s					
	flow							



WASTEWATER CONNECTION

Phase	1					
Conr	nection point ⁴⁾					
Future 250mm diameter PVC sanitary sewer on Nunnville Road						
Wastewater Line ID: SMH6579831-SMH6579832						
Total	equivalent population to be serviced	51 persons				
Total	lands to be serviced	0.41 ha				
6	Wastewater sewer effluent (I/s)	0.80				

¹⁾ Please refer to design criteria for population equivalencies

²⁾ Please reference the Fire Underwriters Survey Document

³⁾ Please specify the connection point ID

⁴⁾ Please specify the connection point (wastewater line or manhole ID) Also, the "total equivalent population to be serviced" and the "total lands to be serviced" should reference the connection point. (the FSR should contain one copy of Site Servicing Plan)

Please include the graphs associated with the hydrant flow test information table Please provide Professional Engineer's signature and stamp on the demand table All required calculations must be submitted with the demand table submission.



 Project:
 13290 Nunnville Rd

 Project No.:
 649-6278

 Prepared By:
 OS

 Checked By:
 JB/PS

 Date:
 2022.03.30

 Undated:
 2022.04.22

	ed: 2022.04.22	
WAT	ER DEMAND CALCULATION	NS
13290 Nu	unnville Road, Town of Ca	ledon
Note: Based on Concept Plan provided by 2 2022.	WSP Global Inc. dated April 5,	References
Population Density Number of Units	3.4 persons/unit 15	Population density as per email corespondence with Iwona Frandsen from the Region of Peel.
Total Population	51 persons	
Average Daily Demand	280 L/cap/day 14,280.00 L/day 0.17 L/s	Region of Peel Public Works Design, Specifications & Procedures Manual, Linear Infrastructure, Watermain Design Criteria, Table 1, Section 2.3 (Revised June 2010)
Maximum Daily Demand Peaking Factor Maximum Hourly Demand Peaking Factor	2.0 3.0	Region of Peel Public Works Design, Specifications & Procedures Manual, Linear Infrastructure, Watermain Design Criteria, Table 1, Section 2.3 (Revised June 2010)
Maximum Daily Flow	28,560.00 L/day 0.33 L/s	TODIE 1, SECTION 2.3 (REVISED JUNE 2010)
Peak Hour Flow	42,840.00 L/day 0.50 L/s	



13290 Nunnville Road, Town of Caledon Fire Flow Calculation, North Block (6 Units)

Date: 2022.03.07 Designed By: OS Checked By: JB/PS Updated: 2022.04.13

						d: 2022.04.13
ater Supply for	Public Fire P	rotection				
ire Underwriters						
		Part II - Gui	ide for Determinatior	of Required Fire Flow		
1. An estimate o	of fire flow requi	ired for a given ar	rea may be determir	ed by the formula:		
		F = 220 * C *	* sqrt A			
where	F = the req	quired fire flow in lit	tres per minute			
	C = coeffic	ient related to the	e type of construction	ו:		
		= 1.5 = 1.0		struction (structure essentially all combusti		
		= 1.0 = 0.8		ction (brick or other masonry walls, combus construction (unprotected metal structure		
		= 0.6		truction (fully protected frame, floors, roof)		
			uare metres (includin e) in the building cons	g all storeys, but excluding basements o idered.	at least	
Proposed Build	dings					
A =	567 sg.m.			Area of North Block (6 Units):	567.3 sq.m	Based on Concep Plan provided by
C =	1.0	ordinary co	nstruction			WSP Global Inc.
						dated March 23,
						2022.
Therefo Fire	flow determine 3	80,000 L/min for or	ood frame constructi dinary construction			2022.
Fire	flow determine 3 3 2 2	ed above shall no 10,000 L/min for wa 10,000 L/min for or 15,000 L/min for no 15,000 L/min for fire	ood frame construction dinary construction on-combustible const e-resistive constructio	ruction n		
Fire 2. Values obtain	flow determine 3 2 2 2 ned in No. 1 ma	ed above shall no 30,000 L/min for wc 30,000 L/min for or 25,000 L/min for no 25,000 L/min for fire ay be reduced by	ood frame construction dinary construction on-combustible const e-resistive constructio	ruction n poccupancies having low contents fire ha	azard or may	
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Fire 2. Values obtain be increased Non-Comb Limited Comb Comb Rapid Burning	flow determine 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	ed above shall no 80,000 L/min for wo 80,000 L/min for or 25,000 L/min for fire ay be reduced by surcharge for occu -25% -15% 0% (No Change 1,310 L/min reduc	ood frame construction dinary construction on-combustible const e-resistive construction ras much as 25% for a upancies having a hi Free Rapid e) 25%	ruction n occupancies having low contents fire ha gh fire hazard. Burning 15%	azard or may	
Fire : 2. Values obtain- be increased Non-Comb Limited Comb Comb Rapid Burning Note: Flow de	flow determine 3 2 2 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ed above shall no 80,000 L/min for wo 80,000 L/min for or 25,000 L/min for fire ay be reduced by surcharge for occu -25% -15% 0% (No Change 1,310 L/min reduc 6,550 L/min	bod frame construction dinary construction on-combustible const e-resistive construction as much as 25% for a upancies having a hi Free Rapid e) 25% ction	ruction n boccupancies having low contents fire ha gh fire hazard. Burning 15% Burning 25%		
Fire 2. Values obtain be increased Non-Comb Limited Comb Comb Rapid Burning Note: Flow de 3. Sprinklers - Tr The credit for	flow determine 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	ed above shall no 80,000 L/min for voc 85,000 L/min for or 25,000 L/min for fire ay be reduced by surcharge for occu -25% -15% 0% (No Change 1,310 L/min reduc 6,550 L/min not be less than 2 ined in No. 2 abov be a maximum o	bod frame construction dinary construction on-combustible const e-resistive construction ras much as 25% for a upancies having a hi Free Rapid e) 25% ction 2,000 L/min ve maybe reduced b f 30% for an adequa	ruction n occupancies having low contents fire ha gh fire hazard. Burning 15% Burning 25% y up to 50% for complete automatic sp tely designed system conforming to NFF	rinkler protection. PA 13 and other	
Fire 2. Values obtain be increased Non-Comb Limited Comb Comb Rapid Burning Note: Flow de 3. Sprinklers - Th The credit for 1 NFPA sprinkler	flow determine 3 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	ed above shall no 80,000 L/min for wc 80,000 L/min for or 25,000 L/min for or 25,000 L/min for fire ay be reduced by surcharge for occu -25% -15% 0% (No Change 1,310 L/min reduc 6,550 L/min not be less than 2 ined in No. 2 abov be a maximum o' % may be granted	bod frame construction dinary construction on-combustible const e-resistive construction as much as 25% for a upancies having a hi Free Rapid e) 25% ction 2,000 L/min // 6 30% for an adequa d if the water supply	ruction n poccupancies having low contents fire ha gh fire hazard. Burning 15% Burning 25% y up to 50% for complete automatic sp tely designed system conforming to NFF s standard for both the system and fire o	rinkler protection. PA 13 and other	
Fire : 2. Values obtain- be increased Non-Comb Limited Comb Comb Rapid Burning Note: Flow de 3. Sprinklers - Th The credit for i NFPA sprinkler hose lines requ	flow determine 3 3 2 2 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ed above shall no 80,000 L/min for wo 80,000 L/min for or 25,000 L/min for or 25,000 L/min for fire ay be reduced by surcharge for occu -25% -15% 0% (No Change 1,310 L/min reduc 6,550 L/min I not be less than 2 ined in No. 2 abov be a maximum of % may be granted nal credit of up to	bod frame construction dinary construction on-combustible const e-resistive construction as much as 25% for a upancies having a hi Free Rapid e) 25% 25% 25% 25% 25% 25% 25% 25% 25% 25%	ruction n boccupancies having low contents fire ha gh fire hazard. Burning 15% Burning 25% y up to 50% for complete automatic sp fely designed system conforming to NFF s standard for both the system and fire of r a fully supervised system.	rinkler protection. PA 13 and other	
Fire : 2. Values obtain- be increased Non-Comb Limited Comb Comb Rapid Burning Note: Flow de 3. Sprinklers - Th The credit for i NFPA sprinkler hose lines requ	flow determine 3 3 2 2 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ed above shall no 80,000 L/min for wo 80,000 L/min for or 25,000 L/min for or 25,000 L/min for fire ay be reduced by surcharge for occu -25% -15% 0% (No Change 1,310 L/min reduc 6,550 L/min I not be less than 2 ined in No. 2 abov be a maximum of % may be granted nal credit of up to	bood frame construction dinary construction on-combustible const e-resistive construction ras much as 25% for of upancies having a hit Free Rapid e) 25% ction 2,000 L/min ve maybe reduced b f 30% for an adequa d if the water supply 10% may be given for inklers per NFPA 13 (final construction	ruction n poccupancies having low contents fire ha gh fire hazard. Burning 15% Burning 25% y up to 50% for complete automatic sp tely designed system conforming to NFF s standard for both the system and fire o	rinkler protection. PA 13 and other	

13290 Nunnville Road, Town of Caledon Fire Flow Calculation, North Block (6 Units)

Page 2

				forminal	on of Poquirod E	re Flow		
				erminali	on of Required Fi	IE NUW		
	ure - To the value obtaine							
	e fire area under consider							
	ng(s) being exposed, the							
	ovision of automatic sprir ed building(s) and the efi						cy of the	
expose	ed building(s) and the eff	ect of hillside ic	cations c	on ine po	ssible spread of	lire.		
	Separation	Charge	Separa	ition	Charge			
	0 to 3 m	25%	20.1 to	30 m	10%			
	3.1 to 10 m	20%	30.1 to	45 m	5%			
	10.1 to 20 m	15%	> 45 m		0%			
	Expos	ed buildings						
	Name Descriptio							
	North Forest	> 45 m	0%	0.00				
	East East Block		15%	589.50				
	South South Bloc		15%	589.50				
	West Forest	> 45 m	0%	0.00				
				1,179	P L/min Surcharg	le		
							Required Du	ration of Fire Flow
Detern	nine Required Fire Flow						Flow Required	Duration
							L/min	(hours)
	No						2,000 or less	
	No) reduction				3,00	
	No No) reduction				4,00 5,00	
	INO	.4 1,17	9 surchar	ge			6,00	
	Required Flow	v. 7.79	7 L/min				8,00	
Roun	ided to nearest 1000 L/mi) L/min (r	133.3 L/s		10,0	
Koon			,		2,113 USGPI	M	12.0	
					_,		14,0	
							16,C	
	Required Flow (L/	s): 134	1				18,C	000
	Duration (h	r): 2.00					20,0	000
			_				22,0	000
							24,0	
							26,0	
							28,0	
							30,0	
							32,0	
							34,0	
							36,0	000
							38.0	000

Water Supply for Public Fire Protection Fire Underwriters Survey Part II - Guide for Determination of Required Fire Flow 1. An estimate of fire flow required for a given area may be determined by the formula: F = 220 * C * sqrt A where									
Part II - Guide for Determination of Required Fire Flow 1. An estimate of fire flow required for a given area may be determined by the formula: F = 220 * C * sqrt A									
1. An estimate of fire flow required for a given area may be determined by the formula: $F=220\ ^{*}C\ ^{*}sqrt\ A$									
F = 220 * C * sqrt A									
where									
F = the required fire flow in litres per minute									
F = the required tire tlow in litres per minute C = coefficient related to the type of construction: = 1.5 for wood frame construction (structure essentially all combustible) = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior) = 0.8 for non-combustible construction (unprotected metal structural components) = 0.6 for fire-resistive construction (fully protected frame, floors, roof) A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building considered.									
Proposed Buildings Area of East Block (3 Units): 283.65 sq.m Based on Con A = 284 sq.m. Plan provided WSP Global In C = 1.0 ordinary construction dated March 2022.	ру								
Fire flow determined above shall not exceed: 30,000 L/min for wood frame construction 30,000 L/min for ordinary construction 25,000 L/min for non-combustible construction 25,000 L/min for fire-resistive construction									
 Values obtained in No. 1 may be reduced by as much as 25% for occupancies having low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard. 									
Non-Combustible-25%Free Burning15%Limited Combustible-15%Rapid Burning25%Combustible0% (No Change)									
Rapid Burning 25%									
926 L/min reduction 4,632 L/min									
Note: Flow determined shall not be less than 2,000 L/min									
3. Sprinklers - The value obtained in No. 2 above maybe reduced by up to 50% for complete automatic sprinkler protection. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. 10% may be granted if the water supply is standard for both the system and fire departement hose lines required. Additional credit of up to 10% may be given for a fully supervised system.									
Building will not have automatic sprinklers per NFPA 13 (typical 30% reduction)									
0 L/min reduction									

13290 Nunnville Road, Town of Caledon Fire Flow Calculation, East Block (3 Units)

Page 2

ter Supply for Public e Underwriters Surve		.								
		Part II - Gui	de for D	eterminati	on of Require	d Fire Flov	w			
 Exposure - To the values by the fire area under building(s) being exposed the provision of auton exposed building(s) a 	consideration. The osed, the separation natic sprinklers and/o	percentage , openings in pr outside spr	shall de the exp inklers in	pend upo osed build the build	n the height, ling(s), the ler ng(s) expose	area, and ngth and	d construction o height of expos	f the		
Separation		Charge	Separ	ation	Charge					
0 to 3 m		25%		o 30 m	10%					
3.1 to 10 m		20%		o 45 m	5%					
10.1 to 20 m	1	15%	> 45 m		0%					
	Exposed buil	dinas								
Name I	Description	Distance								
	Junnville Road	> 45 m	0%	0.00						
	esidential Building	8 m	20%	555.78						
	outh Block Jorth Block	26 m 15 m	10% 15%	277.89 416.84						
**E21 1	NOTITI DIUCK	13111	13/0		I L/min Surch	arae				
					•					
								Pequi	red Duration	n of Fire Flow
Determine Required F	re Flow							Flow Required	ca Doranoi	Duration
								L/min		(hours)
	No.1	3,70						2,000 or less		1
	No. 2		6 reduct						3,000	1
	No. 3) reduct						4,000	1
	No. 4	1,25	1 surcha	rge					5,000	1
	Required Flow:	5 99	2 L/min						6,000 8,000	2
Rounded to	nearest 1000 L/min:) L/min	or	100.0 L/s				10,000	2
Roomaca io		0,000	,	01	1,585 US				12,000	2
					1,000 000	01111			14,000	3
									16,000	
	Required Flow (L/s):	100	7						18,000	4
	Duration (hr):	2.00							20,000	4
									22,000	1
									24,000	ţ
									26,000	e
									28,000	ć
									30,000	7
									32,000	7
									34,000	8
									36,000	8
								1	38,000	9
								40,000 and ov		ç

	13290 Nunnville Road, Town of Ca Fire Flow Calculation, South Block		Designed By Checked By							
Water Supply for Public Fire Protec Fire Underwriters Survey	ion Part II - Guide for Determination of Required	Fire Flow								
	·	The How								
1. An estimate of fire flow required for	a given area may be determined by the formula:									
	F = 220 * C * sqrt A									
where F = the required f	re flow in litres per minute									
A = The total floor	F = the required fire flow in litres per minute C = coefficient related to the type of construction: = 1.5 for wood frame construction (structure essentially all combustible) = 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior) = 0.8 for non-combustible construction (unprotected metal structural components) = 0.6 for fire-resistive construction (fully protected frame, floors, roof) A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building considered.									
Proposed Buildings A = 567 sq.m. C = 1.0	Area ordinary construction	of South Block (6 Units):	567.3 sq.m	Based on Concept Plan provided by WSP Global Inc. dated March 23, 2022.						
	Fire flow determined above shall not exceed: 30,000 L/min for wood frame construction 30,000 L/min for ordinary construction 25,000 L/min for non-combustible construction 25,000 L/min for fire-resistive construction									
	educed by as much as 25% for occupancies having ge for occupancies having a high fire hazard.	low contents fire hazard or may								
Non-Combustible Limited Combustible Combustible	-25% Free Burning -15% Rapid Burning 0% (No Change)	15% 25%								
Rapid Burning	25%									
	1,310 L/min reduction 6,550 L/min									
Note: Flow determined shall not be	less than 2,000 L/min									
The credit for the system will be a n NFPA sprinkler standards. 10% may	No. 2 above maybe reduced by up to 50% for comp naximum of 30% for an adequately designed system be granted if the water supply is standard for both th lit of up to 10% may be given for a fully supervised sy	conforming to NFPA 13 and other ne system and fire departement								
Building will not have aut	omatic sprinklers per NFPA 13 (typical 30% reduction	n)								
	0 L/min reduction									

Page 2

e Underwriters Surv	c Fire Protection								
	-,	Part II - Gui	de for D	eterminati	on of Required Fire	Flow			
building(s) being exp the provision of auto	ue obtained in No. 2, er consideration. The posed, the separation matic sprinklers and/a and the effect of hillsi	percentage , openings in pr outside spr	shall de the exp inklers ir	pend upo osed build the build	n the height, area, ling(s), the length on ng(s) exposed, the	and construction o and height of expos	f the		
Separatio	า	Charge	Separ	ation	Charge				
0 to 3 m		25%		5 30 m	10%				
3.1 to 10 r		20%		o 45 m	5%				
10.1 to 20	m	15%	> 45 m	1	0%				
	Exposed bui	dinas							
Name	Description	Distance							
North	North Block	19 m	15%	589.50					
East	East Block	26 m	10%	393.00					
South	Residential Building	8 m	20%	786.00					
West	Forest	> 45 m	0%	0.00	8 L/min Surcharge				
				1,70	, init obtendige				
							Requi	red Duration	of Fire Flow
Determine Required	Fire Flow						Flow Required		Duration
							L/min		(hours)
	No.1	5,240					2,000 or less		1.0
	No. 2		0 reduct					3,000	1.:
	No. 3		0 reduct					4,000	1.
	No. 4	1,768	8 surchc	irge				5,000	1.
	Required Flow:	0 21(8 L/min					6,000	2.
.								8 000	21
Rounded to	nearest 1000 I /min [.]	9 00() I /min	or	150.01/s			8,000	
Rounded to	o nearest 1000 L/min:	9,00(0 L/min	or	150.0 L/s 2.378 USGPM			10,000	2.
Rounded to	o nearest 1000 L/min:	9,000	0 L/min	or	150.0 L/s 2,378 USGPM			10,000 12,000	2. 2.
Rounded fo	o nearest 1000 L/min:	9,00(0 L/min	or				10,000	2. 2. 2. 3. 3.
Rounded fo	Required Flow (L/s):	9,000	0 L/min	or				10,000 12,000 14,000	2. 2. 3. 3.
Rounded fo			0 L/min	or				10,000 12,000 14,000 16,000	2. 2. 3. 3. 4. 4.
Rounded to	Required Flow (L/s):	150	0 L/min	or				10,000 12,000 14,000 16,000 18,000 20,000 22,000	2. 2. 3. 3. 4. 4. 5.
Rounded to	Required Flow (L/s):	150	0 L/min	or				10,000 12,000 14,000 16,000 18,000 20,000 22,000 24,000	2. 2. 3. 3. 4. 4. 5. 5.
Rounded to	Required Flow (L/s):	150	0 L/min	or				10,000 12,000 14,000 16,000 20,000 22,000 24,000 26,000	2. 2. 3. 3. 4. 4. 5. 5. 6.
Rounded to	Required Flow (L/s):	150	D L/min	or				10,000 12,000 14,000 16,000 20,000 22,000 24,000 24,000 26,000 28,000	2. 2. 3. 4. 4. 5. 5. 6. 6.
Rounded to	Required Flow (L/s):	150	D L/min	or				10,000 12,000 14,000 16,000 18,000 20,000 22,000 24,000 26,000 28,000 30,000	2. 2. 3. 4. 4. 5. 5. 6. 6. 7.
Rounded to	Required Flow (L/s):	150	D L/min	or				10,000 12,000 14,000 16,000 18,000 20,000 22,000 24,000 24,000 26,000 28,000 30,000 32,000	2. 2. 3. 3. 4. 5. 5. 6. 6. 7. 7.
Rounded to	Required Flow (L/s):	150) L/min	or				10,000 12,000 14,000 16,000 20,000 22,000 24,000 26,000 28,000 30,000 32,000 34,000	2. 2. 3. 3. 4. 4. 5. 5. 6. 6. 6. 7. 7. 7. 8.
Rounded to	Required Flow (L/s):	150) L/min	or				10,000 12,000 14,000 16,000 20,000 22,000 24,000 26,000 28,000 30,000 32,000 34,000 36,000	2. 2. 3. 4. 4. 5. 5. 6. 6. 7. 7. 8. 8.
Rounded to	Required Flow (L/s):	150) L/min	or			40,000 and ov	10,000 12,000 14,000 16,000 20,000 22,000 24,000 26,000 28,000 30,000 30,000 32,000 34,000 36,000 38,000	2. 2. 3.



13290 Nunnville Road, Town of Caledon Fire Flow Calculation, Summary
 Date:
 2022.03.07

 Designed By:
 OS

 Checked By:
 JB/PS

 Updated:
 2022.03.25

Fire Underwriters Survey Summary							
Block Required Fire Flow Duratio							
	(L/s)	(hr)					
North	134	2.00					
East	100	2.00					
South	150	2.00					



5-200 Connie Cres. Concord ON L4K 1M1 Phone 416-883-9777 Fax 905-303-6977

FLOW TEST REPORT

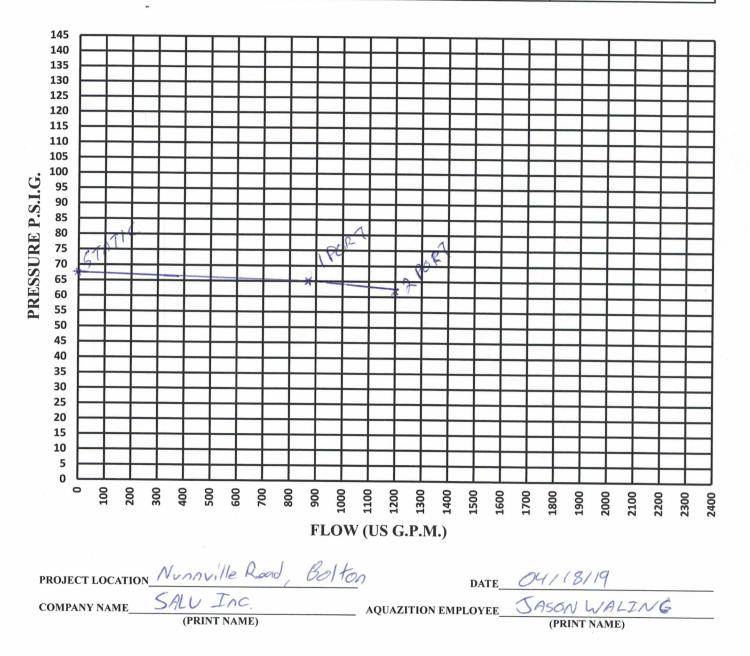
13160 Nunnville Road LOCATION OF RESIDUAL HYDRANT

13259 Numville Road LOCATION OF FLOW HYDRANT_

TIME OF TEST 1200 WATERMAIN SIZE 150mm STATIC PRESSURE

67

NUMBER OF OUTLETS	PITOT PRESSURE	FLOW (US G.P.M.)	RESIDUAL PRESSURE
One 2 ¹ / ₂ " hydrant port	27	870	65
Two 2 ¹ / ₂ " hydrant port	13	1207	62





5-200 Connie Cres. Concord ON L4K 1M1 Phone 416-883-9777 Fax 905-303-6977

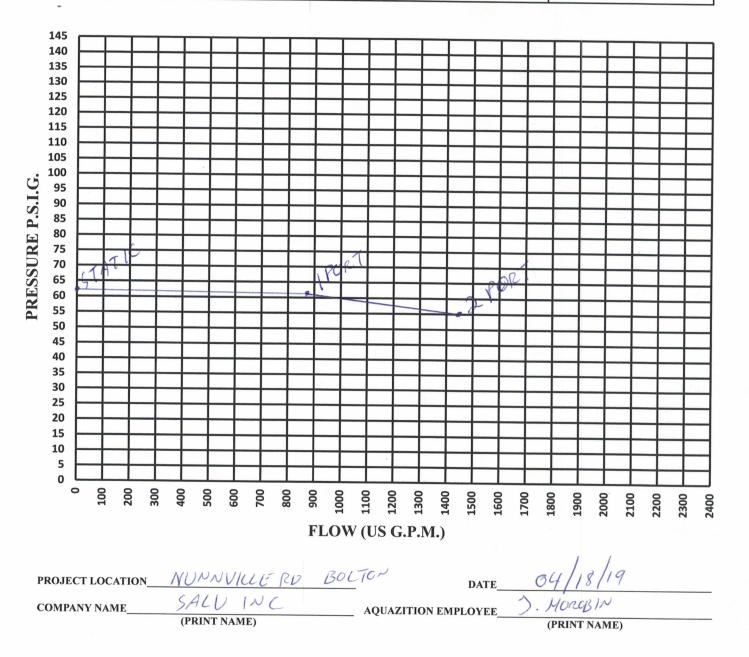
FLOW TEST REPORT

LOCATION OF RESIDUAL HYDRANT 13259 NUNNVILLE PD

LOCATION OF FLOW HYDRANT 13160 NUNNVILLERD

TIME OF TEST 12:15 watermain size 150 nm static pressure 62

NUMBER OF OUTLETS	PITOT PRESSURE	FLOW (US G.P.M.)	RESIDUAL PRESSURE
One 2 ¹ / ₂ " hydrant port	27	870	61
Two 2 ¹ / ₂ " hydrant port	19	1459	55
	r.		





PROJECT: Nunnville Road PROJECT No.: 649-6278 DATE: 2019.04.23 UPDATE: 2022.04.13 DESIGN: JB CHECK: PS

Projected Fire Flow Calculations - 1							
Test	Test Hydrant Location / ID		Residual Pressure during Test	Flow from Hydrant Test	Desired Residual Pressure*	Projected Fire Flow Available at	20 psi
	Ps Pt Qt Pr		Qr				
		(psi)	(psi)	(USGPM)	(psi)	(USGPM)	L/s
1	Numpuille Deed	17	65	870	40	3,547	224
2	Nunnville Road	67	62	1207		3,001	189
Q _r =	$Q_r = Q_t \times ((P_s - P_r)/(P_s - P_t))^{0.54}$ Formula to determine available flow as per AWWA M17 (1989)						
NOTE: Projected fire flows are calculated on the basis of hydrant tests carried out by Aqualization on April 18, 2019 at 12:15 pm.							
	Note Region of peel operation pressures 40-100 psi						



PROJECT: Nunnville Road PROJECT No.: 649-6278 DATE: 2019.04.23 UPDATE: 2022.04.13 DESIGN: JB CHECK: PS

	Projected Fire Flow Calculations - 2						
Test	Test Hydrant Location / ID		Residual Pressure during Test	Flow from Hydrant Test	Desired Residual Pressure*	Projected Fire Flow Available c	at 20 psi
		Ps	Pt	Qt	Pr	Qr	
		(psi)	(psi)	(USGPM)	(psi)	USGPM	L/s
1	Nuppyille Board	62	61	870	40	4,618	291
2	2 Nunnville Road	62 55	55	1459		2,708	171
Q _r = Q _t x ((P _s - P _r)/(P _s - P _t)) ^{0.54} Formula to determine available flow as per AWWA M17 (1989) NOTE: Projected fire flows are calculated on the basis of hydrant tests carried out by Aqualization on April 18, 2019 at 12:15 pm. Note Region of peel operation pressures 40-100 psi							

APPENDIX B

Sanitary Demand Calculations



Project: 13290 Nunnville Road Project No.: 649-6278 Prepared By: OS Checked By: JB Date: 2022.03.30 Updated: 2022.04.22

Update					
90 Nunnville Ro	ad, Town of (
P Global Inc. date	d April 5, 2022.	References			
rea 0.41	ha				
sity 3.4	persons/unit	Population density as per email			
Inits 15		corespondence with Iwona Frandsen from the Region of Peel.			
ion 51	persons				
302.8	L/person/day	Region of Peel 2013 Water and Wastewater Master Plan for the Lake-Based System, Volume IV - Wastewater master Plan, Table 4.1, Section 2.1.1. (March 31, 2014)			
4.00	(Max Harmon Factor of 4.00)	Construction of Data and Advanced Line and			
15,442.80	L/day				
0.18	L/s				
61,771.20	L/day				
0.71	L/s				
0.20	L/s/ha	Region of Peel 2013 Water and Wastewater			
0.08	L/s	Master Plan for the Lake-Based System, Volume IV - Wastewater master Plan, Section			
		2.1.3. (March 31, 2014)			
0.80	L/s				
	PO Nunnville Ro P Global Inc. date rea 0.41 sity 3.4 nits 15 ion 51 302.8 4.00 15,442.80 0.18 61,771.20 0.71 0.20 0.08	sity 3.4 persons/unit nits 15 fon 51 persons 302.8 L/person/day 4.00 (Max Harmon			

${}^{\text{APPENDIX}} C$

Stormwater Design Calculations



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Modified Rational Calculations - Input Parameters 13290 Nunnville Road, Town of Caledon

Storm Data:		Caledon			
Time of Concentration:		T _c =	10	min	(per Town of Caledon standards
Return Period	А	В	с	l (mm/hr)	
2 yr	1070	8	0.8759	85.72	
5 yr	1593	11	0.8789	109.68	
10 yr	2221	12	0.9080	134.16	
25 yr	3158	15	0.9335	156.47	
50 yr	3886	16	0.9495	176.19	
100 yr	4688	17	0.9624	196.54	

Pre - Development Conditions					
Catchment ID	Area (ha)	Area (m²)	Weighted Average C		
101	0.77	7,700	0.30		
102	0.08	800	0.25		
Total Site	0.85	8,500	0.30		

Post- Development Conditions					
Catchment ID	Area (ha)	Area (m²)	Weighted Average C		
UC1	0.51	5,100	0.25		
201	0.32	3,200	0.77		
202	0.02	200	0.53		
Total Site	0.85	8,500	0.45		

Equations:

Peak Flow $Q_{post} = 0.0028 \cdot C_{post} \cdot i(T_d) \cdot A$ Intensity $i(T_d) = A / (T + B)^C$

I:\600\649 - Bolton Gateway Developments Inc\6278- 13290 Nunnville Rd\Design\Civil_Water\2022.04.13_MRM Calculations



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2022.03.29

Target Flow Rates Summary

Flow Rates (L/s)									
Storm Event					Post-Development Flows				
(yr)		Pre-Development Flows		Uncontrolled Flows		Target Control Flow	Control Flow	Total Outlet Flow	
	Q ₁₀₁	Q ₁₀₂	Q _{pre-total}	Q _{UC1}	Q ₂₀₂	Q ₂₀₁ = Q _{pre} - Q _{UC1} - Q ₂₀₂	Q ₂₀₁ - 150 mm orifice	Q _{post-total}	
2	55	5	60	31	3	27	27	60	
5	71	6	77	39	3	35	34	77	
10	87	8	94	48	4	42	41	93	
25	101	9	110	56	5	49	47	107	
50	114	10	124	63	5	56	51	120	
100	127	11	138	70	6	62	56	132	

Catchment 201 (150mm Orifice Tube)					
Storm Event	Target Flow Rate	Flowrate	Required Storage	Provided Storage	
(yr)	Q ₂₀₁ = Q _{pre} - Q _{UC1} - Q ₂₀₂	L/s	m ³	m ³	
2	27	27	24		
5	35	34	35		
10	42	41	44	110	
25	49	47	56] '''	
50	56	51	66		
100	62	56	77		



Project: 13290 Nunnville Road Project No.: 649-6278 Created By: OS Reviewed By: JB/PS Date: 2022.03.09 Updated: 2022.04.13

2022.03.29

Modified Rational Calculations - 2 - Year Storm Event

Control Criteria

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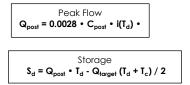
2 yr: Uncontrolled Post-Development Flow:

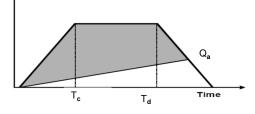
Q _{UC1} =	31	L/s
Q ₂₀₂ =	3	L/s

2 yr: Target Flow Rate:

	L/s	55	Q ₁₀₁ =
		5	Q ₁₀₂ =
	L/s	27	Q _{target 201} =
(150 mm orifice)	L/s	27	Q _{orifice 202} =

Storage Volume Determination						
T _d	i	T _d	Q _{Post}	S _d		
(min)	(mm/hr)	(sec)	(m ³ /s)	(m ³)		
10	85.72	600	0.059	19.4		
20	58.06	1200	0.040	23.9		
30	44.38	1800	0.031	22.9		
40	36.14	2400	0.025	19.6		
50	30.60	3000	0.021	15.0		
60	26.62	3600	0.018	9.7		
70	23.60	4200	0.016	3.9		
80	21.23	4800	0.015	-2.2		
90	19.31	5400	0.013	-8.6		
100	17.74	6000	0.012	-15.2		
110	16.41	6600	0.011	-21.9		
120	15.28	7200	0.011	-28.8		
130	14.30	7800	0.010	-35.8		
140	13.45	8400	0.009	-42.9		
150	12.70	9000	0.009	-50.0		
160	12.04	9600	0.008	-57.2		
Required Sto	rage Volume:			23.9		







Project: 13290 Nunnville Road Project No.: 649-6278 Created By: OS Reviewed By: JB/PS Date: 2022.03.09 Updated: 2022.04.13

2022.03.29

Modified Rational Calculations - 5 -Year Storm Event

Control Criteria

.....

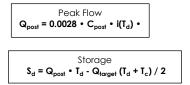
5 yr: Uncontrolled Post-Development Flow:

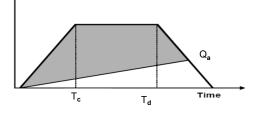
Q _{UC1} =	39	L/s
Q ₂₀₂ =	3	L/s

5 yr: Target Flow Rate:

	L/s	71	Q ₁₀₁ =
	L/s	6	Q ₁₀₂ =
	L/s	35	Q _{target 202} =
(150 mm orifice)	L/s	34	Q _{orifice 202} =

Storage Volume Determination					
T _d	i	T _d	Q _{Post}	S _d	
(min)	(mm/hr)	(sec)	(m³/s)	(m ³)	
10	109.68	600	0.076	24.8	
20	77.89	1200	0.054	33.6	
30	60.92	1800	0.042	34.5	
40	50.28	2400	0.035	31.9	
50	42.96	3000	0.030	27.2	
60	37.60	3600	0.026	21.4	
70	33.48	4200	0.023	14.8	
80	30.23	4800	0.021	7.6	
90	27.58	5400	0.019	0.0	
100	25.39	6000	0.018	-8.0	
110	23.53	6600	0.016	-16.2	
120	21.95	7200	0.015	-24.6	
130	20.57	7800	0.014	-33.2	
140	19.37	8400	0.013	-41.9	
150	18.31	9000	0.013	-50.8	
160	17.36	9600	0.012	-59.8	
Required Stor	34.5				







Project: 13290 Nunnville Road Project No.: 649-6278 Created By: OS Reviewed By: JB/PS Date: 2022.03.08 Updated: 2022.04.13

2022.03.29

Modified Rational Calculations - 10 - Year Storm Event

Control Criteria

.....

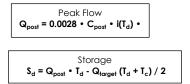
10 yr: Uncontrolled Post-Development Flow:

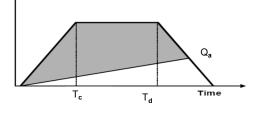
Q _{UC1} =	48	L/s
Q ₂₀₂ =	4	L/s

10 yr: Target Flow Rate:

	L/s	87	Q ₁₀₁ =
	L/s	8	Q ₁₀₂ =
	L/s	42	Q _{target 202} =
(150 mm orifice)	L/s	41	Q _{orifice 202} =

Storage Volume Determination					
T _d	i	T _d	Q _{Post}	Sd	
(min)	(mm/hr)	(sec)	(m ³ /s)	(m ³)	
10	134.16	600	0.093	31.1	
20	95.47	1200	0.066	42.4	
30	74.58	1800	0.051	43.7	
40	61.44	2400	0.042	40.6	
50	52.37	3000	0.036	35.0	
60	45.72	3600	0.032	28.0	
70	40.63	4200	0.028	19.9	
80	36.60	4800	0.025	11.2	
90	33.32	5400	0.023	1.9	
100	30.61	6000	0.021	-7.8	
110	28.32	6600	0.020	-17.8	
120	26.37	7200	0.018	-28.0	
130	24.68	7800	0.017	-38.4	
140	23.20	8400	0.016	-49.0	
150	21.89	9000	0.015	-59.7	
160	20.73	9600	0.014	-70.5	
Required Sto	43.7				







Project: 13290 Nunnville Road Project No.: 649-6278 Created By: OS Reviewed By: JB/PS Date: 2022.03.09 Updated: 2022.04.13

2022.03.29

Modified Rational Calculations - 25 - Year Storm Event

Control Criteria

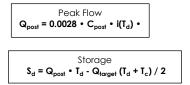
25 yr: Uncontrolled Post-Development Flow:

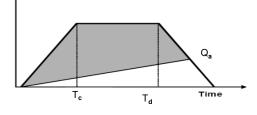
Q _{UC1} =	56	L/s
Q ₂₀₂ =	5	L/s

25 yr: Target Flow Rate:

	L/s	101	Q ₁₀₁ =
	L/s	9	Q ₁₀₂ =
	L/s	49	Q _{target 202} =
(150 mm orifice)	L/s	47	Q _{orifice 202} =

Storage Volume Determination					
T _d	i	T _d	Q _{Post}	S _d	
(min)	(mm/hr)	(sec)	(m ³ /s)	(m ³)	
10	156.47	600	0.108	36.6	
20	114.29	1200	0.079	52.3	
30	90.39	1800	0.062	55.9	
40	74.95	2400	0.052	53.6	
50	64.13	3000	0.044	48.1	
60	56.11	3600	0.039	40.7	
70	49.92	4200	0.034	31.9	
80	45.00	4800	0.031	22.1	
90	40.99	5400	0.028	11.7	
100	37.65	6000	0.026	0.8	
110	34.83	6600	0.024	-10.6	
120	32.41	7200	0.022	-22.3	
130	30.32	7800	0.021	-34.2	
140	28.49	8400	0.020	-46.3	
150	26.88	9000	0.019	-58.7	
160	25.44	9600	0.018	-71.2	
Required Store	55.9				







2022.03.29

Modified Rational Calculations - 50 - Year Storm Event

Control Criteria

.....

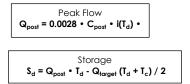
50 yr: Uncontrolled Post-Development Flow:

Q _{UC1} =	63	L/s
Q ₂₀₂ =	5	L/s

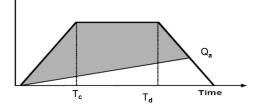
50 yr: Target Flow Rate:

	L/s	114	Q ₁₀₁ =
	L/s	10	Q ₁₀₂ =
	L/s	56	Q _{target 202} =
(150 mm orifice)	L/s	51	Q _{orifice 202} =

Storage Volume Determination				
T _d	i	T _d	Q _{Post}	S _d
(min)	(mm/hr)	(sec)	(m ³ /s)	(m ³)
10	176.19	600	0.122	42.1
20	129.36	1200	0.089	60.8
30	102.50	1800	0.071	65.6
40	85.04	2400	0.059	63.7
50	72.75	3000	0.050	58.0
60	63.63	3600	0.044	50.1
70	56.58	4200	0.039	40.6
80	50.97	4800	0.035	30.0
90	46.40	5400	0.032	18.6
100	42.59	6000	0.029	6.6
110	39.37	6600	0.027	-5.8
120	36.62	7200	0.025	-18.6
130	34.23	7800	0.024	-31.7
140	32.15	8400	0.022	-45.1
150	30.30	9000	0.021	-58.6
160	28.67	9600	0.020	-72.3
Required Storage Volume: 65.6			65.6	



Discharge





2022.03.29

Modified Rational Calculations - 100 - Year Storm Event

Control Criteria

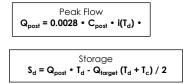
100 yr: Uncontrolled Post-Development Flow:

Q _{UC1} =	70	L/s
Q ₂₀₂ =	6	L/s

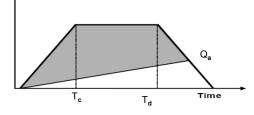
100 yr: Target Flow Rate:

	L/s	127	Q ₁₀₁ =
	L/s	11	Q ₁₀₂ =
	L/s	62	Q _{target 202} =
(150 mm orifice)	L/s	56	Q _{orifice 202} =

Storage Volume Determination				
T _d	i	T _d	Q _{Post}	S _d
(min)	(mm/hr)	(sec)	(m ³ /s)	(m ³)
10	196.54	600	0.136	47.8
20	145.13	1200	0.100	69.9
30	115.28	1800	0.080	76.1
40	95.75	2400	0.066	74.8
50	81.95	3000	0.057	69.1
60	71.69	3600	0.049	60.8
70	63.74	4200	0.044	50.6
80	57.40	4800	0.040	39.3
90	52.23	5400	0.036	27.0
100	47.93	6000	0.033	14.1
110	44.29	6600	0.031	0.6
120	41.17	7200	0.028	-13.3
130	38.47	7800	0.027	-27.5
140	36.11	8400	0.025	-42.0
150	34.03	9000	0.023	-56.8
160	32.18	9600	0.022	-71.7
Required Storage Volume: 76.1				



Discharge





Orifice Design Summa	Orifice Design Summary - 2 Year Storm Event		
Orifice Type = Invert Elevation = Diameter of Orifice = Area of Orifice (A) = Orifice Coefficient (Cd) =	Tube 241.08 m 150 mm 0.0177 sq.m 0.820 sq.m		
Calculation of Head Centroid Elevation = Water Elevation = Upstream Head*, (h) =	241.16 m 241.33 m 0.18 m		
Qa = Actual Controlled Discharge, Qa = Qa = *Head is based upon orifice area @ orif	(Cd)(A)(2gh)^0.5 0.02685 26.85 L/s fice face not Vena Contracta		



Orifice Design Summo	Orifice Design Summary - 5 Year Storm Event		
Orifice Type =	Tube		
Invert Elevation =	241.08 m		
Diameter of Orifice =	150 mm		
Area of Orifice (A) =	0.0177 sq.m		
Orifice Coefficient (Cd) =	0.820		
Calculation of Head			
Centroid Elevation =	241.16 m		
Water Elevation =	241.44 m		
Upstream Head*, (h) =	0.28 m		
Qa =	(Cd)(A)(2gh)^0.5		
Actual Controlled Discharge, Qa =	0.03427 cms		
Qa =	34.27 L/s		
*Hoad is based upon crifico area @ or	ifice face not Vena Contracta		



Orifice Design Summary - 10 Year Storm Event		
Orifice Type =	Tube	
Invert Elevation =	241.08 m	
Diameter of Orifice =	150 mm	
Area of Orifice (A) =	0.0177 sq.m	
Orifice Coefficient (Cd) =	0.820	
Calculation of Head		
Centroid Elevation =	241.16 m	
Water Elevation =	241.56 m	
Upstream Head*, (h) =	0.40 m	
Qa =	(Cd)(A)(2gh)^0.5	
Actual Controlled Discharge, Qa =	0.04076 cms	
Qa =	40.76 L/s	
*Head is based upon orifice area @ orifi	ice face not Vena Contracta	



	y - 25 Year Storm Event
Orifice Type =	Tube
Invert Elevation =	241.08 m
Diameter of Orifice =	150 mm
Area of Orifice $(A) =$	0.0177 sq.m
Orifice Coefficient (Cd) =	0.820
Calculation of Head	
Centroid Elevation =	241.16 m
Water Elevation =	241.69 m
Upstream Head*, (h) =	0.54 m
Qa =	(Cd)(A)(2gh)^0.5
Actual Controlled Discharge, Qa =	0.04699 cms
Qa =	46.99 L/s
*Head is based upon orifice area @ orif	ice face not Vena Contracta



Orifice Design Summary - 50 Year Storm Event		
Orifice Type = Invert Elevation = Diameter of Orifice = Area of Orifice (A) = Orifice Coefficient (Cd) =	Tube 241.08 m 150 mm 0.0177 sq.m 0.820 sq.m	
Calculation of Head Centroid Elevation = Water Elevation = Upstream Head*, (h) =	241.16 m 241.80 m 0.64 m	
Qa = Actual Controlled Discharge, Qa = Qa = *Head is based upon orifice area @ orit	(Cd)(A)(2gh)^0.5 0.05141 cms 51.41 L/s fice face not Vena Contracta	



 Project:
 13290 Nunnville Road

 Project No.:
 649-6278

 Created By:
 OS

 Reviewed By:
 JB/PS

 Date:
 2022.03.09

 2022.03.29
 2022.04.13

Orifice Design Summary	Orifice Design Summary - 100 Year Storm Event		
Orifice Type =	Tube		
Invert Elevation =	241.08 m		
Diameter of Orifice =	150 mm		
Area of Orifice (A) =	0.0177 sq.m		
Orifice Coefficient (Cd) =	0.820		
Calculation of Head			
Centroid Elevation =	241.16 m		
Water Elevation =	241.91 m		
Upstream Head*, (h) =	0.76 m		
Qa =	(Cd)(A)(2gh)^0.5		
Actual Controlled Discharge, Qa =	0.05585 cms		
Qa =	55.85 L/s		
*Head is based upon orifice area @ or	*Head is based upon orifice area @ orifice face not Vena Contracta		



Provided Storage					
Diameter of Pipe	Length of Pipe	Cross Sectional Area of Pipe	Provided Storage		
(mm)	(m)	(m ²)	(m ³)		
1200	97	1.13	109.7		

Super Pipe Summary					
Storm Event (yr)	Storage Required (m3)	Storage Provided (m3)	Percent Full	HWL (m)	
2	23.90	109.70	22%	241.33	
5	34.53	109.70	31%	241.44	
10	43.71	109.70	40%	241.56	
25	55.86	109.70	51%	241.69	
50	65.59	109.70	60%	241.80	
100	76.14	109.70	69%	241.91	



Project: 13290 Nunnville Road Project No.: 0649-6278

Enhanced Topsoil Design

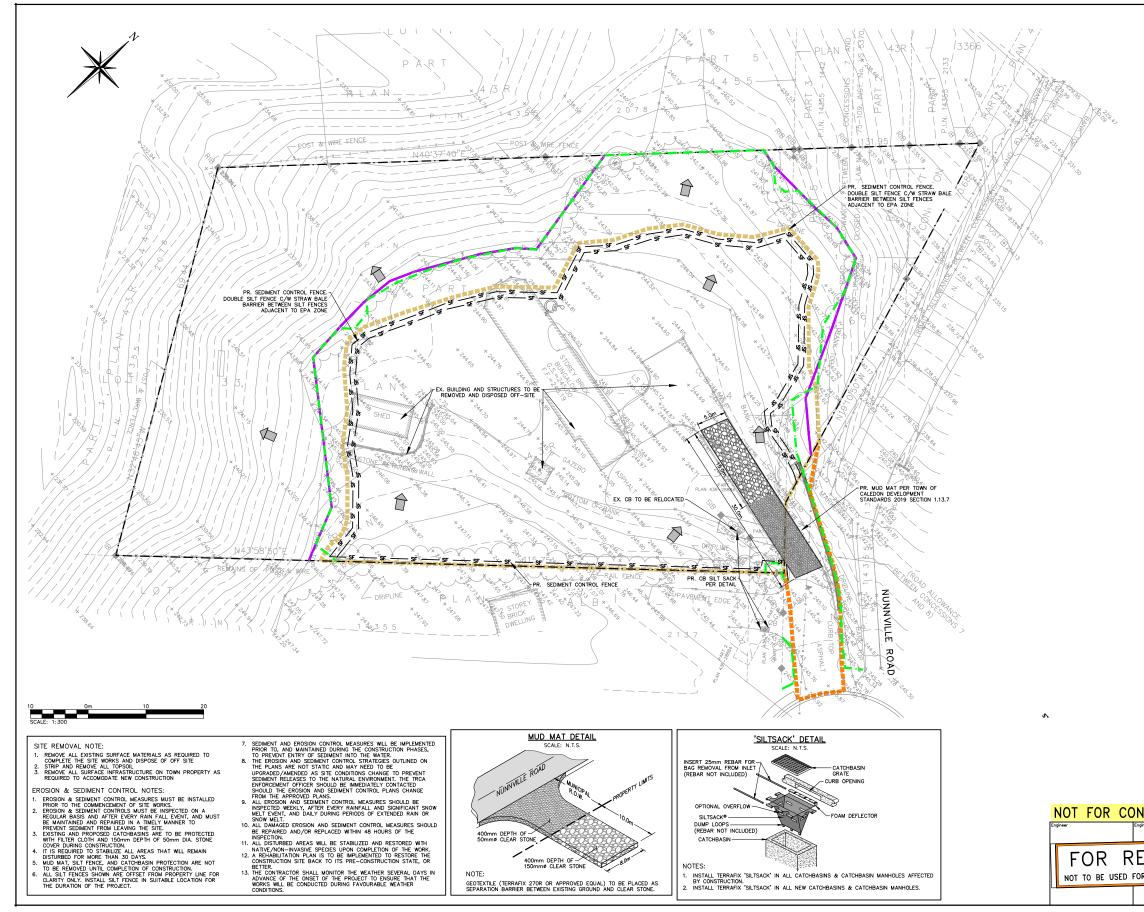
Storage Required	Total Area of Additional Topsoil	Extra Topsoil Depth ¹	Soil Volume	Soil Porosity	Soil Field Capacity	Avalable Storage Volume ²
m3	ha	mm	m3			m3
12.50	0.06	150.00	90.00	0.47	0.32	13.50

1. Topsoil depth in addition to the 150mm minimum covering the site, total topsoil depth = 300mm (150mm + 150mm = 300mm topsoil)

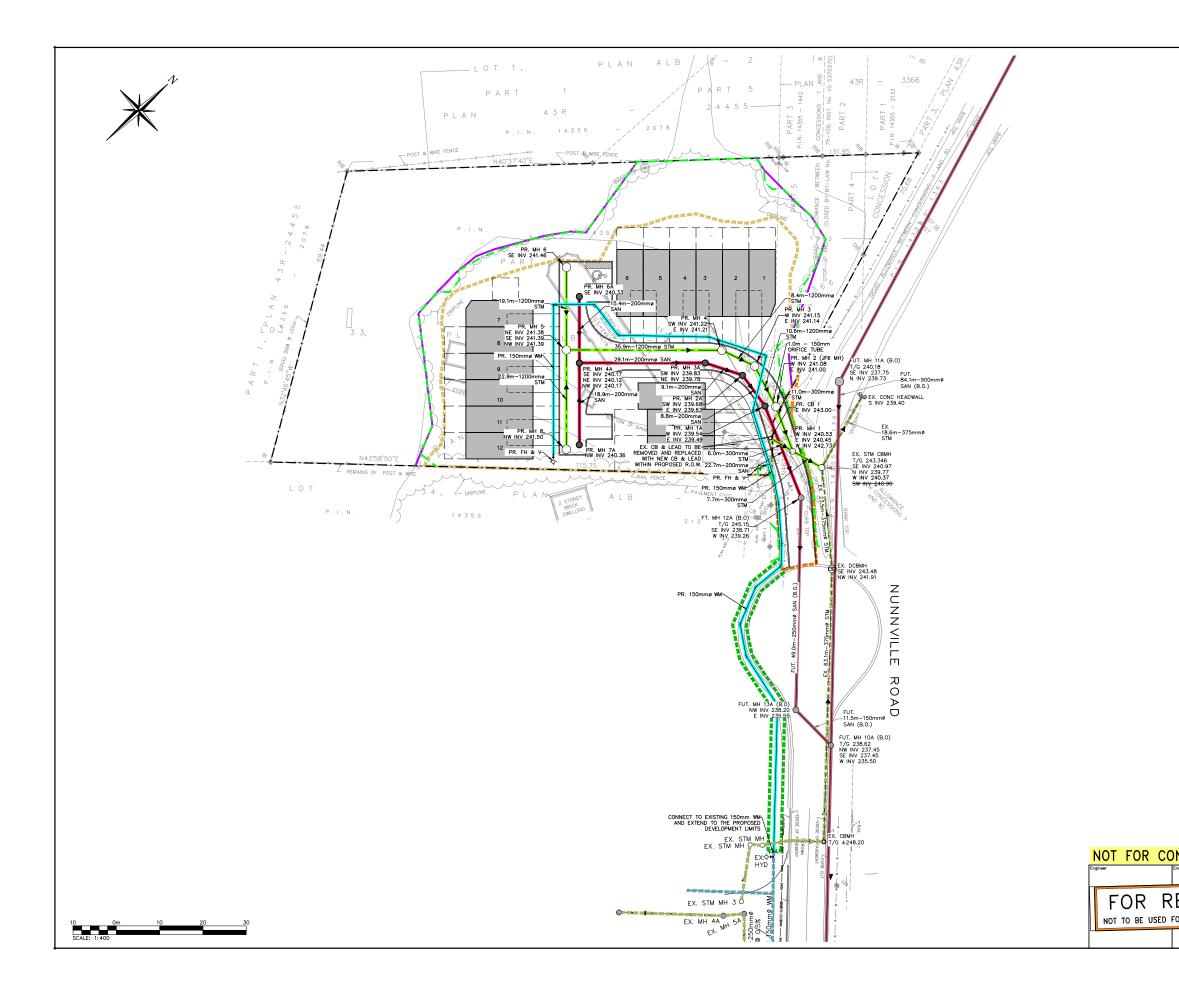
2. Water volume that can be stored for a given soil = (soil volume) x (soil porosity - soil field capacity)

Total Contributing Area	0.25 ha
Allowable Infiltration Rainfall Depth:	5 mm
Available Runoff Volume to be infiltrated:	12.50 m3

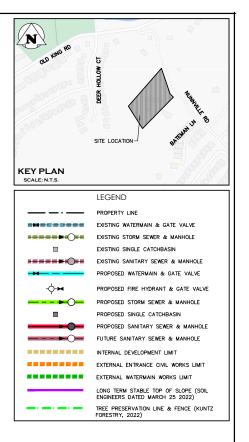
DRAWINGS AND FIGURES



		÷
	DD PMG PD DD PMG PD STE LOCATION STE LOCATION STALEN TS	ALL B
	SCALE: N.T.S. LEGEND PROPERTY LINE x 215.00 EXISTING GRADE MUD-MAT; SEE DETAIL SF SILT FENCE LONG TERM STABLE TOP OF SLOPE (ENGINEERS DATED MARCH 25 2022) TREE PRESERVATION LINE & FENCE (FORESTRY, 2022) INTERNAL DEVELOPMENT LIMIT	
	EXTERNAL ENTRANCE CIVIL WORKS LI]
	0 ISSUED FOR FIRST SUBMISSION 2	2022/APR/13
		YYYY/MMM/DD
	ELEVATION NOTE: ELEVATIONS ARE GEODETIC IN ORIGIN AND ARE REFERED TO FIRST ORD WITES ARE MODES ARE GEODETIC IN ORIGIN AND ARE REFERENCE TO THE UNITES ARE WITES ARE REFERENCED TO THE CANADAM GEODETIC VEN OF 1928, 1978 ADJUSTMENT (CCVD-1928; 1978) SURVEY NOTES: SURVEY NOTES: SURVEY NOTES: SURVEY NOTES: DESIGN ELEVENTS STOWN ARE BASED ON CONCEPT PLAN PREPARED BY PROJECT NO: 211-0998-01 (2022/APR/OS) DESIGN ELEVENTS STOWN ARE BASED ON CONCEPT PLAN PREPARED BY PROJECT NO: 211-0998-01 (2022/APR/OS) DRAWING NOTES: THIS DRAWING IS THE EXCLUSIVE PROPERTY OF CF. CROZER & ASSOCI THE GERMOLITON OF ANY PART OF IT WITHOUT PRIOR WRITEN CONS DESIGN ELEVENTS STOWN ARE DASED ON CONCEPT PLAN PREPARED BY PROJECT NO: 211-0998-01 (2022/APR/OS) DRAWING NOTES: THIS DRAWING IS THE EXCLUSIVE PROPERTY OF CF. CROZER & ASSOCI THE GERMOLITON OF ANY PART OF IT WITHOUT PRIOR WRITEN CONS DESIGN ELEVENTS OF DESIGN OF DIS OFTICE FOR TO CONT THE CONTRACTOR SHALL VERFY ALL DUENSIONS, LEVELS, AND DATUMS ERPORT ANY DESCREMANCES OF OMISSIONS TO THIS OFTICE FOR TO CONT THE CONTRACTOR SHALL VERFY ALL DUENSIONS, LEVELS, AND DATUMS ERPORT ANY DESCREMANCES OF OMISSIONS TO THIS OFTICE FOR TO CONT THE ORDINATION FOR ANY UNDERSTOO IN CONJUNCTION WITH PLANS AND DOCUMENTS AFFURICABLE TO THE PROPARED TO THS CALLS ALL EXISTING UNDERGROUND UTUITIES TO BE VERIFIED IN THE FIELD BY CONTRACTOR PRIOR TO CONSTRUCTION.	25.1929 THE 23RD THE 23RD Y WSP ATES INC. AND ENT OF THIS CONSTRUCTION. ALL OTHER THIS DRAWING.
	13290 NUNNVILLE RD TOWN OF CALEDON	
	REMOVALS, EROSION & SEDIMENT CONTROL PLAN	
EVIEW DR CONSTRUCTION	Oran P.S./J.B. Project No. 649	100 1 L9T 6P4 -0026 T -4915 F
	Check P.S. Check P.S./N.C. Scale 1: 300 Dwg.	C101



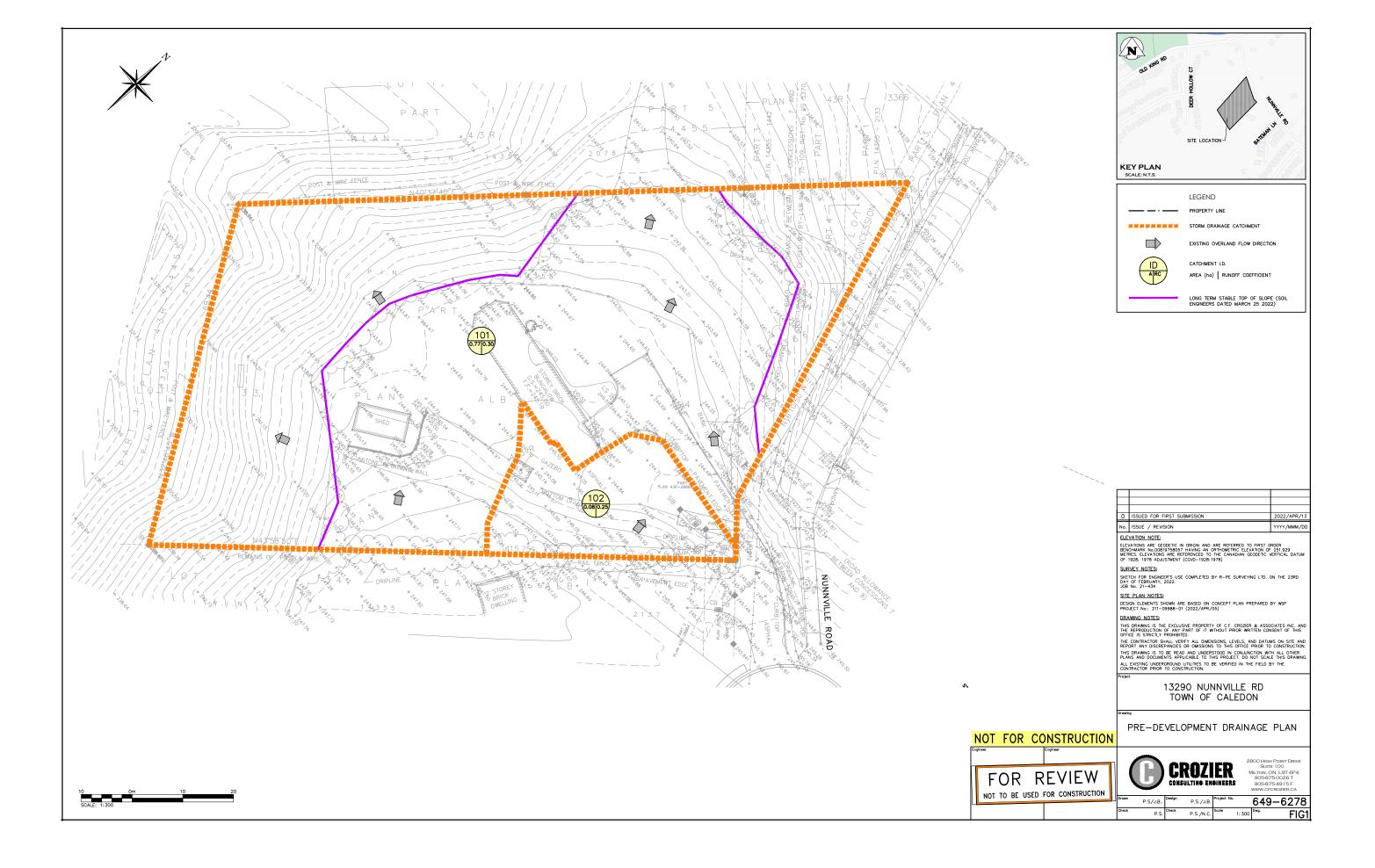
	0	ISSUED FOR FIRST SUBMISSION	2022/APR/13
	No.	ISSUE / REVISION	YYYY/MMM/DD
	ELE	ATION NOTE:	
	BEN0 METF	ATIONS ARE GEODETIC IN ORIGIN AND ARE REFERRED TO FIRST (HMARK No.00819758057 HAVING AN ORTHOMERIC ELEVATION O ESS. ELEVATIONS ARE REFERENCED TO THE CANADIAN GEODETIC 928, 1978 ADJUSTMENT (CGVD-1928:1978)	F 251.929
	SUR	VEY_NOTES:	
	DAY	CH FOR ENGINEER'S USE COMPLETED BY R-PE SURVEYING LTD. OF FEBRUARY, 2022. No. 21-434	ON THE 23RD
		PLAN NOTES:	
		GN ELEMENTS SHOWN ARE BASED ON CONCEPT PLAN PREPARED IECT No.: 211-09988-01 (2022/APR/05)	BY WSP
	DRA	WING NOTES:	
	THE	DRAWING IS THE EXCLUSIVE PROPERTY OF C.F. CROZIER & ASSI REPRODUCTION OF ANY PART OF IT WITHOUT PRIOR WRITTEN CO ZE IS STRICTLY PROHIBITED.	DCIATES INC. AND NSENT OF THIS
	THE	CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATU RT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO	MS ON SITE AND CONSTRUCTION.
	THIS	DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WI IS AND DOCUMENTS APPLICABLE TO THIS PROJECT, DO NOT SCA	TH ALL OTHER LE THIS DRAWING.
		EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD IRACTOR PRIOR TO CONSTRUCTION.	BY THE
	Project		
		13290 NUNNVILLE RD	
		TOWN OF CALEDON	
	Dress		
	Drawin	PRELIMINARY	
		SITE SERVICING PLAN	
NSTRUCTION			
Engineer			
			H POINT DRIVE
		MILTON,	E 100 ON L9T 6P4
EVIEW			75-0026 T 75-4915 F
OR CONSTRUCTION			CROZIER.CA
on construction	Drawn	P.S/J.B Design P.S./J.B. Project No. 649	9-6278
	Check	P.S. Check P.S./N.C. Scole 1: 400 Dwg.	C102





	SCALE: N.T.S.	- A	11.67 6
		LEGEND	
		PROPERTY LINE	
		EXISTING CONTOUR (0.5m)	
		EXISTING CONTOUR (1.0m)	
	xx	EXISTING FENCE	
	0	EXISTING STORM SEWER & MANHO	
		EXISTING SANITARY SEWER & MAN	IHOLE
	× ^{215.00}	EXISTING GRADE	
	×215.00	PROPOSED GRADE	
	×215.00	PROPOSED GRADE (TO MATCH EX	-
	2.0%	PROPOSED MINOR FLOW DIRECTION	1
	2.0%	PROPOSED GRASSED SWALE	
		PROPOSED SLOPE (3:1 MAX.)	
		PROPOSED MAJOR OVERLAND FLO	W DIRECTION
		EXISTING MAJOR OVERLAND FLOW	DIRECTION
	-∲-₩	PROPOSED FIRE HYDRANT & GATE	VALVE
	0	PROPOSED STORM MANHOLE	
	•	PROPOSED SANITARY SEWER & M	ANHOLE
	m / mm	PROPOSED SINGLE / DOUBLE CATC	HBASIN
	********	DEVELOPMENT LIMIT	
		EXTERNAL ENTRANCE CIVIL WORKS	LIMIT
		LONG TERM STABLE TOP OF SLOP ENGINEERS DATED MARCH 25 202	PE (SOIL 22)
		TREE PRESERVATION LINE & FENC FORESTRY, 2022)	
		DHISCION	2022 (400 (
	0 ISSUED FOR FIRST SU	BMISSION	2022/APR/1
	0 ISSUED FOR FIRST SU No. ISSUE / REVISION	BMISSION	
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