FUNCTIONAL SERVICING & PRELIMINARY STORMWATER MANAGEMENT REPORT

12415 COLERAINE DRIVE

TOWN OF CALEDON
REGION OF PEEL

PREPARED FOR:

DI GREGORIO GROUP OF COMPANIES

PREPARED BY:

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

MAY 2018

CFCA FILE NO. 1327-4523

CROZIER
CONSULTING ENGINEERS

Revision Number	Date	Comments
Rev.0	May 16, 2018	Issued for First Submission

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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Di Gregorio Group of Companies to prepare a Functional Servicing and Stormwater Management Report in support of development applications for the site located at 12415 Coleraine Drive in the Town of Caledon.

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

2.0 Site Description

The site is part of an industrial area in the Town of Caledon. The 2.78 ha site spans from Coleraine Drive to Simpson Road. The site has an existing single-storey residential dwelling and an access from Coleraine Drive. The directions referred to throughout this report reference true north and assume Coleraine Drive to run northwest-southeast. The proposal is to demolish the existing building and replace it with an asphalt plant on the northeast side of the property complete with a seasonal field office, and an office building on the southwest side of the property. The majority of the site will be gravel surface excluding two landscape buffers along the northwest and southeast property lines, landscape areas fronting Simpson Road and Coleraine Drive and the asphalt parking lot for the office building.

The subject site is bounded by:

- Residential dwellings and future industrial to the northwest
- Simpson Road to the northeast
- An industrial building to the southeast
- Coleraine Drive to the southwest

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 Region's water network.

3.1 Existing Water Servicing

According to Region of Peel as-constructed drawing No. 6, Project No. TP113126 (March 2015) and drawing No. 29688-D, Project No. 03-1365 (April 2003) the following watermains exist in proximity to the site:

- Existing 300 mm diameter watermain on the northeast side of Simpson Road
- Existing 50 mm diameter domestic water service stub at the northeast property line, extending from the existing watermain on Simpson Road
- Existing 200 mm diameter fire service stub at the northeast property line, extending from the existing watermain on Simpson Road

- Two existing fire hydrants on the northeast side of Simpson Road in general proximity to the site
- Existing 300 mm diameter watermain on the northeast side of Coleraine Drive

3.2 Design Water Demand

The Ontario Building Code (OBC) was used to determine an equivalent population estimate for the proposed industrial development which was used to estimate water demand. The equivalent population for the existing condition was determined based on a unit rate of 4.15 persons/unit according to an email from Region of Peel staff dated September 20, 2016. The proposed office building has an area of warehouse which is calculated separately from the office portion of the building. The results are provided in **Table 1** and detailed calculations are provided in **Appendix A.**

Table 1: Equivalent Population Estimate

Condition	Standard	Development Type	Unit Type	Number of Units	Persons/Unit	Total Persons
Existing	Email from Region of Peel Staff (Sept 20, 2016)	Residential	Single dwelling	1	4.15	5
Proposed	Ontario Building Code Occupancy Table 3.1.17.1	Office Building	9.3 m^2	84	1	84
		Warehouse	28 m^2	10	1	10
		Field Office	9.3 m^2	6	1	6

The Region of Peel Public Works Watermain Design Criteria (June 2010) was used to determine the maximum demand flows generated by the proposed development based on equivalent population estimate for the site. The existing and the proposed average day water demands were compared to show the increase in water demand from the proposed development. The results are provided in **Table 2**, and detailed calculations are provided in **Appendix A.**

Table 2: Estimated Design Water Demand

Standard	Water Service Connection	Average Daily Demand (L/s)			Maximum Daily Demand (L/s)	Peak Hourly Demand (L/s)
		Existing	Proposed	Increase		
Region of Peel Public Works Watermain Design Criteria (June 2010)	Coleraine Drive	0.02	0.33	0.31	0.46	0.98
	Simpson Road	0.02	0.02	0.00	0.03	0.06

For this application, the domestic water service from Coleraine Drive and Simpson Road will be designed for a design water demand peak hour of 0.98 L/s and 0.06 L/s, respectively.

3.3 Fire Flow Demand

The Fire Underwriters Survey (FUS) method was used to estimate the required fire flow demand for the office building for the proposed development. This calculation is used to estimate the size of incoming fire lines but does not provide a recommendation for fire protection for the building.

The office building is proposed to have non-combustible construction and therefore a construction coefficient, C, of 0.8 was applied to the fire flow calculations (Water Supply for Public Fire Protection by Fire Underwriters Survey, 1999). The proposed office building will be equipped with an automatic sprinkler system, which reduces the initial fire flow demand by up to 50%. The automated sprinkler system is to be designed by the mechanical engineer; therefore, the detailed design of the system is not included in this report.

The preliminary fire demand flow is 66.7 L/s (1,857 US GPM) for a duration of 1.5 hours; detailed calculations are provided in **Appendix A.** Note that the Fire Underwriter's Survey value is a conservative estimate for comparison purposes only. The mechanical engineer for this development will complete the required analysis for fire protection. In addition, a hydrant flow test should be completed prior to finalizing the design.

3.4 Proposed Water Servicing

The proposed development will require two water services one from Coleraine Drive and one from Simpson Road. The proposed water servicing is shown on **Drawing C102A** and **Drawing C102B.**

A 200 mm diameter water service from Coleraine Drive is proposed to service the proposed office building on the southwest side of the development. The proposed water service will connect to the existing 300 mm diameter watermain on Coleraine Drive. The water service will split at the property line into a 200 mm diameter fire line and a 50 mm diameter domestic water service.

A 50 mm diameter domestic water service will extend from the existing stub on Simpson Road to service the seasonal field office on the northeast side of the development. Two private fire hydrants are proposed to ensure fire protection throughout the site connected to the Coleraine Drive water service.

A water meter will be installed within the building per the mechanical design and specifications.

4.0 Sanitary Servicing

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

4.1 Existing Sanitary Servicing

According to Region of Peel as-constructed drawing No. 29067-D (September 2000), Town of Caledon As-Constructed Drawing No. 38443-D (August 2003), and Town of Caledon As-Constructed Drawing No. 36842-D respectively, the following sanitary sewers exist in proximity to the site:

- Existing 750 mm diameter sanitary sewer flowing southeast along Coleraine Drive
- Existing 250 mm diameter sanitary sewer flowing southeast along Simpson Road with a 200 mm diameter maintenance hole extending from the main sewer into the site

The existing sanitary flow is 0.63 L/s for the single family home (see detailed calculations in **Appendix B**).

4.2 Design Sanitary Flow

Design sanitary flow for the subject site was calculated using the Region of Peel Public Works Sanitary Sewer Design Criteria (March 2017) and the equivalent population estimate described in **Section 3.2**. Estimated design sanitary demand calculations are provided in **Table 3**, and detailed calculations are provided in **Appendix B**.

Table 3: Estimated Design Sanitary Demand

Standard	Condition	Average Sanitary Flow (L/s)	Peaking Factor	Infiltration Flow (L/s)	Total Design Sanitary Flow (L/s)
Region of Peel	Existing	0.02	4.44	0.55	0.63
	Proposed – Coleraine Drive	0.33	4.50	0.55	2.04
	Proposed – Simpson Road	0.02	4.50	0.55	0.65
				Total Sanitary Flow Increase:	2.06

The proposed sanitary service from Coleraine Drive must convey a total design sanitary flow of 2.04 L/s. The proposed sanitary service from Simpson Road must convey a total design sanitary flow of 0.65 L/s.

4.3 Proposed Sanitary Servicing

The proposed development will require two sanitary services one from Coleraine Drive and one from Simpson Road. The proposed sanitary servicing is shown on **Drawing C102A** and **Drawing C102B.**

A 150 mm diameter sanitary lateral at 2% grade is proposed to service the proposed office building on the southwest side of the development. The proposed lateral will extend from the existing 750 mm diameter sanitary sewer on Coleraine Drive. The proposed lateral has a capacity of approximately 10.50 L/s when flowing at 80% full, which is greater than the design flow of 2.04 L/s and therefore the lateral is sufficient to convey the design sanitary flow from the proposed office building.

The proposed seasonal field office will be serviced by a proposed 150 mm diameter sanitary sewer at a 2% slope extending from the existing sanitary maintenance hole adjacent to Simpson Road. The proposed sanitary connection has a capacity of approximately 10.50 L/s when flowing at 80% full, which is greater than the design flow of 0.65 L/s and therefore the lateral is sufficient to convey the design sanitary flow from the proposed field office.

5.0 Drainage Conditions

5.1 Existing Drainage Conditions

According to Region of Peel as-constructed drawing No. 6, Project No. TP113126, dated March, 2015, there is an existing 1200 mm diameter storm sewer flowing southeast along Simpson Road.

Additionally, according to McCormick Rankin Corporation drawing No. 14, Contract No. 07-30, dated July 28, 2008, there is an existing 375 mm diameter storm sewer flowing south on Coleraine Drive. **Drawing C102A** and **Drawing C102B** illustrates the existing storm sewer and maintenance hole locations.

The 2.78 ha site consists primarily of a vegetated field with a single detached dwelling near Coleraine Drive. The topographic survey indicates that the site has a ridge that extends from the northwest of the property line through to the southeast of the property line, dividing the site in to northeast and southwest drainage catchments as shown on **Figure 1**.

The southwestern portion makes up 0.77 ha of the property and drains to the existing Region of Peel storm sewer system on Coleraine Drive. The northeastern portion makes up 2.0 ha of the property and drains to the existing Town of Caledon storm sewer system on Simpson Drive. Some surface ponding of water occurs at a low point at the east corner of the property before it spills east to Simpson Road.

Drainage from lands northwest of the site currently flows uncontrolled over land onto the site. The overland flow from the site currently flows south through neighbouring properties, and ultimately to West Rainbow Creek. Drainage from the southwest side of the site is denoted Area 101, and the northeast drainage area is denoted Area 102.

The drainage from the site, from both the Town and Region storm sewer systems, is directed downstream, south of Parr Boulevard, to a stormwater management pond. The total peak flow released from the site towards the pond must be limited to 180 L/s/ha (Bolton South Industrial Lands Environmental Servicing Plan, December 2000).

5.2 Proposed Drainage Conditions

The proposed development is an asphalt plant on the northeast side of the property and a two-storey office building and warehouse on the southwest side of the property. The proposed design will maintain the existing drainage pattern. Each drainage catchment will control the peak flow leaving the site to a maximum allowable release rate of 180 L/s/ha. Infiltration was deemed inappropriate on the site due to "heavy" fine grained soils in the area (Bolton South Industrial Lands Master Environmental Servicing Plan, dated December 2000).

The southwest drainage catchment will be collected, controlled, and released to the Region of Peel storm sewers along Coleraine Drive. The northeast drainage catchment will be collected, controlled, and released to the Town of Caledon storm sewers on Simpson Road. A portion of the northeast catchment will pick up the external drainage from the neighbouring property to the northwest. Drainage from this catchment will bypass the internal controls and discharge to the existing storm system on Simpson Road.

<u>Southwest Drainage Catchment – Area 201& UC3</u>

The proposed southwest drainage catchment is a total of 0.77 ha and will contain the office building, landscaped area, and associated parking. This drainage catchment is broken into Area 201 and UC3 as shown on **Figure 2**. Area 201 is controlled drainage area that is mostly impervious. UC3 is uncontrolled impervious area from the end of the driveway. The catchment has a maximum allowable release rate of 138.6 L/s based on the maximum allowable site release rate of 180 L/s/ha (Bolton South Industrial Lands Environmental Servicing Plan, December 2000). The flows from the uncontrolled areas will be deducted from the determined release rate. In the event of an emergency, overland flow will pond on-site to an elevation of 237.17 m and spill to the Coleraine Drive right-of-way through the south corner.

Northeast Drainage Catchment – Area 202, UC1 & UC2

The proposed northeast drainage catchment is a total of 2.0 ha and will contain the asphalt plant production and screening area, seasonal field office, and landscaped areas. It is made up of 1.86 ha of controlled stormwater runoff and 0.14 ha of uncontrolled stormwater runoff. The uncontrolled catchments will collect external drainage as well as some internal drainage and convey it around the site controls. These drainage catchments are denoted as Area 202, UC1, and UC2 on **Figure 2**. Area 202 has a maximum allowable release rate of approximately 340 L/s based on the maximum allowable site release rate of 180 L/s/ha (Bolton South Industrial Lands Environmental Servicing Plan, December 2000) as the uncontrolled flows are deducted from the release rate. In the event of an emergency, overland flow will pond on-site to an elevation of 238.52 m and spill to the Simpson Road right-of-way through the east corner.

External Drainage – Area EXT1.0, EXT2.1 EXT2.2, EXT2.3 & EXT2.4

External drainage enters the site from the northwest. George Bolton Parkway acts as the upper bound of the external drainage catchment. Table 4 demonstrates the details of the external drainage catchments. EXT1.0 will be collected by a swale in Area 201 on the southwest side of the site. EXT2.1, EXT2.2, EXT2.3, and EXT2.4 are conveyed to four proposed catchbasins in the northeast drainage catchment UC1.

Table 4 summarizes the runoff coefficients for the existing and proposed drainage on the subject property.

Table 4: Land Area Comparison

Condition	**Area** (ha)	**Runoff Coefficient**
Southwest – Coleraine Drive		
Pre-Development (101)	0.77	0.28
Total Southwest	***0.77***	**---**
Post-Development (201)	0.77	0.75
Total Southwest	***0.77***	**---**
Northeast – Simpson Road		
Pre-Development (102)	2.00	0.25
Total Northeast:	***2.00***	**---**
Post Development (202)	1.90	0.84
Post-Development Uncontrolled (UC 1)	0.10	0.25
Post-Development Uncontrolled (UC 2)	0.02	0.25
Total Northeast:	***2.00***	**---**
External		
EXT1.0	0.78	0.33
EXT2.1	0.54	0.25
EXT2.2	0.68	0.25
EXT2.3	0.67	0.25
EXT2.4	0.82	0.25
Total Northwest External	***3.49***	**---**

6.0 Stormwater Management

As the site located within the Town of Caledon, the proposed stormwater management design must comply with the following documents:

- Erosion & Sediment Control Guidelines for Urban Construction (GTA Conservation Authorities, 2006)
- Public Works Design, Specifications & Procedures Manual – Storm Sewer Design Criteria (Region of Peel, July 2009)
- Development Standards, Policies and Guidelines (Town of Caledon Version 4- January 2009)
- Bolton South Industrial Lands Environmental Servicing Plan (Burnside Development Services, December 2000)

Table 5 summarizes the stormwater management criteria for the subject site.

Table 5: Summary of Stormwater Management Controls

Control Parameter	Area 201 and 202
Quantity Control	Match post-development peak flow to pre-development peak flows up to a maximum of 180 L/s/ha
Quality Control	Achieve Ontario Ministry of the Environment and Climate Change (MOECC) Enhanced Level of protection (80% total suspended solids (TSS) removal)
Erosion and Sediment Controls	Provided during construction and until the site is stabilized

6.1 Stormwater Quantity Control

Southwest Drainage Catchment – Area 201

Post-development stormwater drainage from the southwest catchment, Area 201, is discharged controlled into the Region of Peel storm system in Coleraine Drive. Using the Town of Caledon intensity-duration-frequency (IDF) data, the Modified Rational Method was used to determine the pre-development and post-development peak flow rates for site stormwater runoff.

The maximum allowable release rate is 138.60 L/s for the 0.77 ha catchment according to the Bolton South Industrial Lands Environmental Servicing Plan. The 5 year pre-development storm event with uncontrolled flows deducted is approximately 63.0 L/s which is lower than the maximum allowable release and therefore will be the target control rate. A 170 mm orifice plate and on-site storage was sized to control the 100-year post-development storm to approximately 62.4 L/s to match the 5-year pre-development flows. The release rate from the orifice is less than the 5-year pre-development peak flow of 63.0 L/s and is lower than the maximum allowable release rate of 138.60 L/s.

The amount of required on-site storage was determined by comparing the 100-year post-development peak flow rate deducting the uncontrolled drainage from UC3 to the release rate from the orifice. A summary of the peak flow rates and required storage volume for the southwest catchment, Area 201, is presented in **Table 6.**

Table 6: Post-Development Flow Rates and Required Storage Volumes for Southwest Catchment

Peak Flow Rate (L/s)				**Required storage for 100-year storm** (m^3)	**Available Storage Underground Cistern** (m^3)
Pre-Development Area 102 (5-year)	**5-year Pre-Development with uncontrolled flows deducted**	**Maximum Allowable Release Rate** (180 L/s/ha)	**Controlled Release from Orifice Plate**		
65.7	63.0	138.6	62.4	279.2	300.0

As shown in **Table 6**, approximately 280 m^3 of on-site storage is required during the 100-year post-development storm event controlled with the proposed orifice control. Approximately 300 m^3 of storage is available in an underground stormwater chamber located under the parking area, thereby exceeding the storage requirements. The available volume is based on a 480 m^2 plan area, and depth constraints due to the existing storm sewer invert. Refer to **Appendix C** for detailed calculations.

Northeast Drainage Catchment – Area 202, UC1, & UC2

Post-development stormwater drainage from the northeast catchment, Area 202, UC1, and UC2, discharges to the Simpson Road municipal storm system. Using the Town of Caledon intensity-duration-frequency (IDF) data, the Modified Rational Method was used to determine the pre-development and post-development peak flow rates for site stormwater runoff.

The maximum allowable release rate is 340 L/s for the 2.0 ha catchment as the uncontrolled flows are deducted from the calculated release rate. The maximum allowable release rate is based on a unit flow rate of 180 L/s/ha from the Bolton South Industrial Lands Environmental Servicing Plan. The 5 year pre-development storm event with uncontrolled flows deducted is approximately 141.5 L/s which is lower than the maximum allowable release rate and therefore will be the target control rate. A 200 mm orifice plate and on-site storage will be used to control the 100-year post-development storm to a maximum of approximately 137.9 L/s to match the 5-year pre-development flows for Area 202.

Area UC1 will collect drainage from external catchments EXT2.1, EXT2.2, EXT2.3, and EXT2.4 to the northwest in the interim until the site to the northwest is developed. The external drainage as well as some internal drainage will be conveyed in a separate storm sewer network to the Simpson Road storm sewer system. Drainage from the external lands as well as drainage from Areas UC1 and UC2 will bypass the quantity control measures.

The amount of on-site storage required was determined by comparing the 100-year post-development peak flow rate to the release rate of the orifice. A summary of the peak flow rates and required storage volume for the controlled northeast catchment, Area 202, is presented in **Table 7.**

Table 7: Pre- and Post-Development Flow Rates and Required Storage Volumes for Northeast Catchment

Peak Flow Rate (L/s)				**Required storage for 100-year storm** (m^3)	**Dry Pond & Pipe Available Storage**(m^3)
Pre-Development Area 101 (5- year)	**5-year Pre-Development with uncontrolled flows deducted**	**Maximum Allowable Release Rate**	**Orifice Controlled Release**		
152.45	141.5	360.0	137.9	829.7	850.0

As shown in **Table 7**, approximately 830 m^3 of on-site storage is required during the 100-year post-development storm event with the proposed orifice control. Approximately 750 m^3 of storage is available in a vegetated dry pond located between the two accesses off of Simpson Road. The remaining 100 m^3 of storage is available in pipe storage throughout the storm sewers on the site. The provided storage volume exceeds the storage requirements. The available volume is based on a 750 m^2 plan area, and depth constraints due to the existing storm sewer invert. Refer to **Appendix C** for detailed calculations.

6.2 Stormwater Quality Control

Stormwater quality controls for the site must incorporate measures to provide an Enhanced Level of Protection (Level 2) according to the MOECC (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. Water quality control will be provided through an oil-grit-separator (OGS) which will be specified during the detailed design stage.

The OGS will be installed downstream of quantity control measures in Area 201 and Area 202, to provide quality control for stormwater drainage before leaving the site. Drainage from Area UC1 and Area UC2 in the northeast catchment, will bypass the quality control device and outlet directly to the Simpson Road storm sewer system. Drainage from Area UC3 in the southwest catchment will bypass the quality control device and outlet directly to the Coleraine Drive storm sewer system.

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.

Silt Fence

Silt fence will be installed on the perimeter of the site to intercept stormwater sheet flow. Based on field decisions, the Site Engineer and the Owner may add additional sediment control fencing prior to, during, and following construction.

Mud Mat

A mud mat will be installed at the entrance to the construction zone in order 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.

Filter Cloth in Catchbasins

Filter cloth will be installed in the existing nearby storm sewer catch basins. The filter cloth will provide sediment control to prevent silt and sediment from entering the stormwater system. Filter fabric for silt control should be Terra Fix 270R or an approved equivalent.

8.0 Conclusions & Recommendations

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

1. Water demand for the proposed office building will be provided with a 200 mm diameter water service, splitting to a 200 mm diameter fire line and a 150 mm diameter domestic line at the property line. The water service will connect to the existing 300 mm diameter watermain in Coleraine Drive.

2. Water demand for the proposed seasonal field office will be provided with a 50 mm diameter water service extending from the existing water stub adjacent to Simpson Road.

3. Two private fire hydrants are proposed to provide internal fire protection connected to the Coleraine Drive watermain.

4. Sanitary servicing for the proposed office building will be provided using a 150 mm diameter sanitary sewer, which connects to the existing 750 mm diameter sanitary sewer in Coleraine Drive. Sanitary servicing for the proposed seasonal field office will be provided using a 150 mm diameter sanitary sewer extending from the existing sanitary maintenance hole adjacent to Simpson Road.

5. Stormwater runoff from the southwest and northeast catchments will outlet to the Coleraine Drive municipal storm system and the Simpson Road municipal storm system respectively. External drainage from the adjacent property to the northwest will be conveyed through the site.

6. Quantity control for the southwest catchment, Area 201, will be provided using a 170 mm diameter orifice plate downstream of an underground stormwater chamber. The orifice plate will restrict the discharged stormwater flow to approximately 62.4 L/s to control to the 5-year pre-development peak stormwater flow, which is less than the maximum allowable release rate of 180 L/s/ha. The storage volume requirement of approximately 300 m^3 is provided in an underground stormwater chamber.

7. Quantity control for the northeast catchment, Area 202, will be provided using a 200 mm diameter orifice plate downstream of a vegetated dry pond. The orifice plate will restrict the discharged stormwater flow to approximately 137.9 L/s to control to the 5-year pre-development peak stormwater flow, which is less than the maximum allowable release rate of 180 L/s/ha. The storage volume requirement of approximately 850 m^3 is provided in a vegetated dry pond and pipe storage.

8. Area UC1 in the northeast catchment collects external drainage. Stormwater runoff from Area UC1 will bypass the quality and quantity controls in the northeast catchment through a separate storm sewer network. Area UC2 will bypass the quantity controls in the northeast catchment. Area UC3 will bypass the quantity and quality controls in the southwest catchment.

9. An OGS will provide an enhanced level of protection (80% TSS removal) for stormwater quality control in each catchment.

10. 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.

Madeline Carter, E.I.T.

C.F. CROZIER & ASSOCIATES INC.

K.J. Firth, P.Eng.
Associate

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Appendix A

Water Demand Calculations

Project: Simpson Rd Asphalt Plant
Project No.: 1327-4523
Created By: NRS
Checked By MAC
Date: 2018.05.07

Domestic Water Demand - Office Building

Existing Water Demand				**Notes & References**
Residential Units	1	unit		
Population Density:	4.15	Persons/unit		Email from Region of Peel dated 2016.09.20
Population:	5	persons		
Design Parameters				
Average Demand =		280	L/ca/day	Region of Peel Public Works Watermain Design Criteria, Section 2.3 Water Demands, Table 1
Average Daily Demand =		1400	L/day	
		0.02	**L/s**	
Peaking Factors				Region of Peel Public Works Watermain Design Criteria, Section 2.3 Water Demands, Table 1
Max Day =	2.0			
Peak Hour =	3.0			
Max Day =		**0.03**	L/s	Max Day = Avg Day * Max Day
Peak Hour =		**0.05**	L/s	Peak Hour = Avg Day * Peak Hour
Proposed Water Demand				
Office Area:	782	m^2		Proposed GFA from J. Gorka Architect Site Plan received 2018.04.10.
Population Density:	9.3	m^2/person (office)		OBC Table 3.1.17.1. Occupant Load
Warehouse Area:	260	m^2		Proposed GFA from J. Gorka Architect Site Plan received 2018.04.10.
Population Density:	28	m^2/person (warehouse)		OBC Table 3.1.17.1. Occupant Load
Population:	94	persons		
Design Parameters				
Average Demand=		300	L/ca/day	Region of Peel Public Works Watermain Design Criteria, Section 2.3 Water Demands, Table 1
Average Daily Demand =		28,200	L/day	
		0.33	**L/s**	
Peaking Factors				Region of Peel Public Works Watermain Design Criteria, Section 2.3 Water Demands, Table 1
Max Day =	1.4			
Peak Hour =	3.0			
Max Day =		**0.46**	L/s	Max Day = Avg Day * Max Day
Peak Hour =		**0.98**	L/s	Peak Hour = Avg Day * Peak Hour

Project: Simpson Rd Asphalt Plant
Project No.: 1327-4523
Created By: NRS
Checked By MAC
Date: 2018.05.07

Domestic Water Demand - Field Office

Existing Water Demand				**Notes & References**
Residential Units	1	unit		
Population Density:	4.15	Persons/unit		Email from Region of Peel dated 2016.09.20
Population:	5	persons		
Design Parameters				
Average Demand =		280	L/ca/day	Region of Peel Public Works Watermain Design Criteria, Section 2.3 Water Demands, Table 1
Average Daily Demand =		1400	L/day	
		0.02	**L/s**	
Peaking Factors				Region of Peel Public Works Watermain Design Criteria, Section 2.3 Water Demands, Table 1
Max Day =	2.0			
Peak Hour =	3.0			
Max Day =		**0.03**	L/s	Max Day = Avg Day * Max Day
Peak Hour =		**0.05**	L/s	Peak Hour = Avg Day * Peak Hour
Proposed Water Demand				
Field Office Area:	56	m^2		Proposed GFA from J. Gorka Architect Site Plan received 2018.04.10.
Population Density:	9.3	m^2/person (office)		OBC Table 3.1.17.1. Occupant Load
Population:	6	persons		
Design Parameters				
Average Demand=		300	L/ca/day	Region of Peel Public Works Watermain Design Criteria, Section 2.3 Water Demands, Table 1
Average Daily Demand =		1,806	L/day	
		0.02	**L/s**	
Peaking Factors				Region of Peel Public Works Watermain Design Criteria, Section 2.3 Water Demands, Table 1
Max Day =	1.4			
Peak Hour =	3.0			
Max Day =		**0.03**	L/s	Max Day = Avg Day * Max Day
Peak Hour =		**0.06**	L/s	Peak Hour = Avg Day * Peak Hour

CROZIER CONSULTING ENGINEERS

Simpson Road Asphalt Plant
Fire Protection Volume Calculation

Project No.: 1327-4523
Date: 2018.03.13
Designed By: RB
Checked By: NS
Updated: 2018.05.16

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 GFA

where

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

GFA = 1042 sq.m.
C = 0.8 non-combustive construction based on email from architecth Jacek Gorka on May 16, 2018

Therefore F = 5,681 L/min

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

2. 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 Burning	15%
Limited Combustible	-15%	Rapid Burning	25%
Combustible	0% (No Change)		

Combustible	0%

0 L/min reduction
5,681 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.

Building will have automatic sprinklers

1,704 L/min reduction

Water Supply for Public Fire Protection
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

4. Exposure - To the value obtained in No. 2, a percentage should be added for structures exposed within 45 metres by the fire area under consideration. The percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s) and the effect of hillside locations on the possible spread of fire.

Separation	Charge	Separation	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%		

Exposed buildings

Name		**Distance**		
North	Adjacent Dwelling	> 45 m	0%	0.00
South	Adjacent Dwelling	> 45 m	0%	0.00
East	Adjacent Dwelling	> 45 m	0%	0.00
West	Adjacent Dwelling	> 45 m	0%	0.00

0 L/min Surcharge

Determine Required Fire Flow

No.1	5,681	
No. 2	0 reduction	
No. 3	-1,704 reduction	
No. 4	0 surcharge	
Required Flow:	**3,977 L/min**	
Rounded to nearest 1000 L/min:	**4,000 L/min** or	66.7 L/s
		1,057 USGPM

Required Volume

4,000 L/min
x **120 min**
480,000 L

Required Duration of Fire Flow		
Flow Required L/min		Duration (hours)
2,000 or less		1.0
	3,000	1.25
	4,000	1.5
	5,000	1.75
	6,000	2.0
	8,000	2.0
	10,000	2.0
	12,000	2.5
	14,000	3.0
	16,000	3.5
	18,000	4.0
	20,000	4.5
	22,000	5.0
	24,000	5.5
	26,000	6.0
	28,000	6.5
	30,000	7.0
	32,000	7.5
	34,000	8.0
	36,000	8.5
	38,000	9.0
40,000 and over		9.5

APPENDIX B

Sanitary Flow Calculations

Project: Simpson Road Asphalt Plant
Project No.: 1327-4523
Created By: NRS
Checked By: MAC
Date: 2018.05.07

Domestic Sanitary Design Flow - Office Building

					Notes & References
Existing Sewage Demand					
Site Area		2.77	ha		
Residential Units		1	unit		
Population Density:		4.15	Persons/unit		Email from Region of Peel dated 2016.09.20
Population:		5	persons		
Design Parameters					
	Average Flow =	302.8	L/ca/day		Region of Peel Public Works Design Criteria Manual - Sanitary Sewer, Std. Dwg 2.5.2
	Average Daily Flow =	1514.0	L/day		
		0.02	**L/s**		
Harmon Peak Factor:	M =	4.44			M = 1 + 14 / (4 + (p/1000)^.5)
	Peak Flow =	0.08	L/s		Peak Flow = Avg Daily Flow * M
Infiltration Flow:	Infiltration =	0.20	L/ha/s		Region of Peel Public Works Design Criteria Manual - Sanitary Sewer, Section 2.3.
	Total Infiltration =	0.55	L/s		
	Total Peak Flow =	**0.63**	L/s		Total Peak Flow = Peak Flow + Total Infiltration
Proposed Sewage Demand					
Commercial Area:		782	m^2 (GFA)		Proposed GFA from J. Gorka Architect Site Plan received 2018.04.10.
Population Density:		9.3	m^2/person (office)		OBC Table 3.1.17.1. Occupant Load
Warehouse Area:		260	m^2		Proposed GFA from J. Gorka Architect Site Plan received 2018.04.10.
Population Density:		28	m^2/person (warehouse)		OBC Table 3.1.17.1. Occupant Load
Population:		94	persons		
Design Parameters					
	Average Daily Flow =	302.8	L/capita/d		Region of Peel Public Works Design Criteria Manual - Sanitary Sewer, Std. Dwg 2.5.2
	Average Daily Flow =	28463.2	L/day		
		0.33	L/s		
Harmon Peak Factor:	M =	4.50			M = 1 + 14 / (4 + (p/1000)^.5)
	Peak Flow =	1.48	L/s		Peak Flow = Average Daily Flow * M
Infiltration Flow:	Infiltration =	0.20	L/ha/s		Region of Peel Public Works Design Criteria Manual - Sanitary Sewer, Sectrion 2.3.
	Total Infiltration =	0.55	L/s		
	Total Peak Flow =	**2.04**	L/s		Total Peak Flow = Peak Flow + Total Infiltration

Project: Simpson Road Asphalt Plant
Project No.: 1327-4523
Created By: NRS
Checked By: MAC
Date: 2018.05.07

Domestic Sanitary Design Flow - Field Office

Existing Sewage Demand					**Notes & References**
Site Area	2.77	ha			
Residential Units	1	unit			
Population Density:	4.15	Persons/unit			Email from Region of Peel dated 2016.09.20
Population:	5	persons			
Design Parameters					
Average Flow =		302.8	L/ca/day		Region of Peel Public Works Design Criteria Manual - Sanitary Sewer, Std. Dwg 2.5.2
Average Daily Flow =		1514.0	L/day		
		0.02	**L/s**		
Harmon Peak Factor:	M =	4.44			M = 1 + 14 / (4 + (p/1000)^.5)
Peak Flow =		0.08	L/s		Peak Flow = Avg Daily Flow * M
Infiltration Flow: Infiltration =		0.20	L/ha/s		Region of Peel Public Works Design Criteria Manual - Sanitary Sewer, Section 2.3.
Total Infiltration =		0.55	L/s		
Total Peak Flow =		**0.63**	L/s		Total Peak Flow = Peak Flow + Total Infiltration
Proposed Sewage Demand					
Field Office:	56	m^2 (GFA)			Proposed GFA from J. Gorka Architect Site Plan received 2018.04.10.
Population Density:	9.3	m^2/person (office)			OBC Table 3.1.17.1. Occupant Load
Population:	6	persons			
Design Parameters					
Average Daily Flow =		302.8	L/capita/d		Region of Peel Public Works Design Criteria Manual - Sanitary Sewer, Std. Dwg 2.5.2
Average Daily Flow =		1823.3	L/day		
		0.02	L/s		
Harmon Peak Factor:	M =	4.50			M = 1 + 14 / (4 + (p/1000)^.5)
Peak Flow =		0.09	L/s		Peak Flow = Average Daily Flow * M
Infiltration Flow: Infiltration =		0.20	L/ha/s		Region of Peel Public Works Design Criteria Manual - Sanitary Sewer, Sectrion 2.3.
Total Infiltration =		0.55	L/s		
Total Peak Flow =		**0.65**	L/s		Total Peak Flow = Peak Flow + Total Infiltration

APPENDIX C

Stormwater Design Calculations

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Stormwater Management Calculations - Site Summary

	Southwest Catchment - Coleraine			Northeast Catchment - Simpson		
Storm Event	**Pre-Development Flow** (L/s)	**Maximum Allowable Release Rate** (L/s)	**Total 100-year Post-Development Flow Rate** (L/s)	**Pre-Development Flow** (L/s)	**Maximum Allowable Release Rate** (L/s)	**Total 100-year Post-Development Flow Rate** (L/s)
2-year	51.4	138.6	67.3	119.1	360.0	157.6
5-year	65.7			152.5		
10-year	80.4			186.5		
25-year	93.8			217.5		
50-year	105.6			244.9		
100-year	117.8			273.2		

Maximum Allowable flow rate is based on 180 L/s/ha from MESP and the area for each catchment
i.e. Southwest catchment (Coleraine Drive) = 180 L/s/ha * 0.77ha = 138.6 L/s allowable release rate
Northeast Catchment (Simpson Road) = 180 L/s/ha *2ha = 360 L/s allowable release rate

Post-Development flow rate is based on Orifice Control + 100-year uncontrolled flow

Condition	Area (ha)	Runoff Coefficient
Southwest - Coleraine Drive		
Pre-Development (101)	0.77	0.28
Total West:	*0.77*	--
Post Development (201)	0.76	0.75
Post-Development Uncontrolled (UC 3)	0.01	0.90
Total West:	*0.77*	--
Northeast - Simpson Road		
Pre-Development (102)	2	0.25
Total East:	*2.00*	--
Post Development (202)	1.86	0.84
Post-Development Uncontrolled (UC 1)	0.12	0.25
Post-Development Uncontrolled (UC 2)	0.02	0.25
Total East:	*2.00*	--

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Stormwater Management Calculations - Site Summary

External Uncontrolled Flows

Catchment	Area (ha)	Weighted Average C	2 yr (L/s)	5 yr (L/s)	10 yr (L/s)	25 yr (L/s)	50 yr (L/s)	100 yr (L/s)
EXT1.0 - external drainage from Northwest	0.78	0.33	60.41	77.29	94.55	110.27	11.28	138.51
EXT2.1 - external drainage from Northwest	0.54	0.25	32.17	41.16	50.35	58.72	66.12	73.76
EXT2.2 - external drainage from Northwest	0.68	0.25	40.51	51.83	63.40	73.95	83.27	92.88
EXT2.3 - external drainage from Northwest	0.67	0.25	39.91	51.07	62.47	72.86	82.04	91.52
EXT2.4 - external drainage from Northwest	0.82	0.25	48.85	62.51	76.46	89.17	100.41	112.01
Total External Flows:			161.45	206.57	252.69	294.71	331.85	370.17

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

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Storm Data: Town of Caledon IDF Parameters

Time of Concentration: **10 min**

Return Period	A	B	C	I (mm/hr)
2 yr	1070	0.8759	7.85	85.718361
5 yr	1593.0	0.8789	11.00	109.67742
10 yr	2221	0.91	12.00	134.16177
25 yr	3158	0.93	15.00	156.47146
50 yr	3886	0.95	16.00	176.19176
100 yr	4688	0.96	17.00	196.53645

References

IDF data from Development Standards, Policies and Guidelines - Town of Caledon (Version 4- January 2009)

Post- Development

Land Use	Area (ha)	Area (m^2)	C	Weighted Average C
Catchment 201 - to Coleraine Drive municipal system				
PR. Landscape	0.17	1728.02	0.25	0.06
PR. Building	0.07	673	0.9	0.08
PR. Gravel	0.52	5200	0.9	0.62
Total Catchment	*0.76*	*7601.02*	--	*0.75*
UC3 - uncontrolled drainage from driveway				
PR. Landscape	0.00	0	0.25	0.00
PR. Building	0.00	0	0.9	0.00
PR. Gravel	0.01	100	0.9	0.90
Total Catchment	*0.01*	*100*	--	*0.90*
Catchment 202- to Simpson Road municipal system				
PR. Landscape	0.18	1763.78	0.25	0.02
PR. Impervious	1.68	16839.22	0.9	0.81
Total Catchment	*1.86*	*18603*	--	*0.84*
UC1 - external drainage from Northwest				
PR. Landscape	0.12	1222	0.25	0.25
PR. Impervious	0.00	0	0.9	0.00
Total Catchment	*0.12*	*1222*	--	*0.25*
UC2 - internal drainage to CB#03				
PR. Landscape	0.02	220	0.25	0.25
PR. Impervious	0.00	0	0.9	0.00
Total Catchment	*0.02*	*220*	--	*0.25*
Total Site	**2.77**	**27746.02**		

Post-Development pervious and impervious areas from J. Gorka Architect Site Plan dated April 10, 2018

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

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External Drainage				
Land Use	**Area** (ha)	**Area** (m^2)	**C**	**Weighted Average C**
EXT1.0 - external drainage from Northwest				
PR. Landscape	0.69	6900	0.25	0.22
PR. Impervious	0.09	900	0.9	0.10
Total Catchment	*0.78*	*7800*	--	*0.33*
EXT2.1 - external drainage from Northwest				
PR. Landscape	0.54	5400	0.25	0.25
PR. Impervious	0.00	0	0.9	0.00
Total Catchment	*0.54*	*5400*	--	*0.25*
EXT2.2 - external drainage from Northwest				
PR. Landscape	0.68	6800	0.25	0.25
PR. Impervious	0.00	0	0.9	0.00
Total Catchment	*0.68*	*6800*	--	*0.25*
EXT2.3 - external drainage from Northwest				
PR. Landscape	0.67	6700	0.25	0.25
PR. Impervious	0.00	0	0.9	0.00
Total Catchment	*0.67*	*6700*	--	*0.25*
EXT2.4 - external drainage from Northwest				
PR. Landscape	0.82	8200	0.25	0.25
PR. Impervious	0.00	0	0.9	0.00
Total Catchment	*0.82*	*8200*	--	*0.25*
Total External	**3.49**	**34900**	--	0.27

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Stormwater Management Calculations - Southwest Catchment (Coleraine Drive) Summary

Storm	Pre-Development Flow Rate (L/s)	Post-Development Uncontrolled Flow Rate (L/s)	Post Development Target (Pre-Development minus Post-Development Uncontrolled) (L/s)	Controlled Release Rate[1] (L/s)	Storage Volume Required (m^3)	Storage Volume Provided (m^3)
2-year	51.4	2.1	49.2	62.4	56.0	300.0
5-year	65.7	2.7	63.0		99.5	
10-year	80.4	3.4	77.1		140.7	
25-year	93.8	3.9	89.9		193.4	
50-year	105.6	4.4	101.2		234.6	
100-year	117.8	4.9	112.9		279.2	

1. Post-development controlled flow rate is controlled by a 170 mm orifice plate to 62.4 L/s. Less than the maximum allowable release rate of 138.6 L/s (MESP 180L/s/ha).

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Southwest Catchment (Coleraine Drive) 2 year pre-to-post

MUNICIPALITY: Town of Caledon

2-yr Pre-Development Peak Flow catchment 101

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)
Catchment UC3	0.28	85.72	0.77	0.051	51.38
	0.90	85.72	0.01	0.002	2.14
			Target Control Rate	0.049	49.23
		Control Rate (Orifice)		0.062	**62.40**

If less than 180 L/s/ha (138.6L/s) then OKAY

2-yr Post-Development Peak Flow catchment 201

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.75	85.72	0.77	0.14	138.03

Storage Determination				
T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	85.72	600	0.138	45.38
15	69.05	900	0.111	53.26
20	58.06	1200	0.093	56.02
25	50.24	1500	0.081	55.83
30	44.38	1800	0.071	53.74
35	39.81	2100	0.064	50.37
40	36.14	2400	0.058	46.06
50	30.60	3000	0.049	35.52
60	26.62	3600	0.043	23.24
70	23.60	4200	0.038	9.82
80	21.23	4800	0.034	-4.43
90	19.31	5400	0.031	-19.27
100	17.74	6000	0.029	-34.57
110	16.41	6600	0.026	-50.24
REQUIRED STORAGE :				**56.0**

Equations:

Intensity
$I = a/(T+B)^C$

Peak Flow
$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$

Storage
$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Southwest Catchment (Coleraine Drive) 5 year pre-to-post

MUNICIPALITY: Town of Caledon

5-yr Pre-Development Peak Flow catchment 101

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)
Catchment UC3	0.28	109.68	0.77	0.066	65.74
	0.90	109.68	0.01	0.003	2.74
			Target Control Rate	0.063	62.99
		Control Rate (Orifice)		0.062	**62.40**

If less than 180 L/s/ha (138.6L/s) then OKAY

5-yr Post-Development Peak Flow catchment 201

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.75	109.68	0.76	0.17	174.31

Storage Determination				
T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	109.68	600	0.174	67.15
15	90.91	900	0.144	83.23
20	77.89	1200	0.124	92.38
25	68.29	1500	0.109	97.29
30	60.92	1800	0.097	99.39
35	55.06	2100	0.088	99.52
40	50.28	2400	0.080	98.20
50	42.96	3000	0.068	92.52
60	37.60	3600	0.060	84.07
70	33.48	4200	0.053	73.75
80	30.23	4800	0.048	62.12
90	27.58	5400	0.044	49.51
100	25.39	6000	0.040	36.15
110	23.53	6600	0.037	22.20
REQUIRED STORAGE :				**99.5**

Equations:

Intensity
$I = a/(T+B)^C$

Peak Flow
$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$

Storage
$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Southwest Catchment (Coleraine Drive) 10 year pre-to-post

MUNICIPALITY: Town of Caledon

10-yr Pre-Development Peak Flow catchment 101

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)
Catchment UC3	0.28	134.16	0.77	0.080	80.41
	0.90	134.16	0.01	0.003	3.36
			Target Control Rate	0.077	77.06
		Control Rate (Orifice)		0.062	**62.40**

If less than 180 L/s/ha (138.6L/s) then OKAY

10-yr Post-Development Peak Flow catchment 201

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.75	134.16	0.76	0.21	213.22

Storage Determination				
T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	134.16	600	0.213	90.49
15	111.40	900	0.177	112.54
20	95.47	1200	0.152	125.92
25	83.68	1500	0.133	133.97
30	74.58	1800	0.119	138.48
35	67.34	2100	0.107	140.52
40	61.44	2400	0.098	140.73
50	52.37	3000	0.083	137.36
60	45.72	3600	0.073	130.54
70	40.63	4200	0.065	121.42
80	36.60	4800	0.058	110.70
90	33.32	5400	0.053	98.78
100	30.61	6000	0.049	85.97
110	28.32	6600	0.045	72.45
REQUIRED STORAGE :				**140.7**

Equations:

Intensity
$I = a/(T+B)^C$

Peak Flow
$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$

Storage
$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Southwest Catchment (Coleraine Drive) 25 year pre-to-post

MUNICIPALITY: Town of Caledon

25-yr Pre-Development Peak Flow catchment 101

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)
Catchment UC3	0.28	156.47	0.77	0.094	93.78
	0.90	156.47	0.01	0.004	3.91
			Target Control Rate	0.090	89.87
		Control Rate (Orifice)		0.062	**62.40**

If less than 180 L/s/ha (138.6L/s) then OKAY

25-yr Post-Development Peak Flow catchment 201

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.75	156.47	0.76	0.25	248.68

Storage Determination				
T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	156.47	600	0.249	111.77
15	131.98	900	0.210	141.99
20	114.29	1200	0.182	161.82
25	100.90	1500	0.160	175.02
30	90.39	1800	0.144	183.71
35	81.93	2100	0.130	189.19
40	74.95	2400	0.119	192.29
50	64.13	3000	0.102	193.44
60	56.11	3600	0.089	190.00
70	49.92	4200	0.079	183.48
80	45.00	4800	0.072	174.81
90	40.99	5400	0.065	164.55
100	37.65	6000	0.060	153.09
110	34.83	6600	0.055	140.70
REQUIRED STORAGE :				**193.4**

Equations:

Intensity
$I = a/(T+B)^C$

Peak Flow
$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$

Storage
$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Southwest Catchment (Coleraine Drive) 50 year pre-to-post

MUNICIPALITY: Town of Caledon

50-yr Pre-Development Peak Flow catchment 101

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)
Catchment UC3	0.28	176.19	0.77	0.106	105.60
	0.90	176.19	0.01	0.004	4.41
			Target Control Rate	0.101	101.20
		Control Rate (Orifice)		0.062	**62.40**

If less than 180 L/s/ha (138.6L/s) then OKAY

50-yr Post-Development Peak Flow catchment 201

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.75	176.19	0.76	0.28	280.02

Storage Determination				
T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	176.19	600	0.280	130.57
15	149.09	900	0.237	166.46
20	129.36	1200	0.206	190.55
25	114.33	1500	0.182	207.04
30	102.50	1800	0.163	218.34
35	92.93	2100	0.148	225.92
40	85.04	2400	0.135	230.75
50	72.75	3000	0.116	234.56
60	63.63	3600	0.101	233.03
70	56.58	4200	0.090	227.95
80	50.97	4800	0.081	220.37
90	46.40	5400	0.074	210.98
100	42.59	6000	0.068	200.20
110	39.37	6600	0.063	188.36
REQUIRED STORAGE :				**234.6**

Equations:

Intensity
$I = a/(T+B)^C$

Peak Flow
$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$

Storage
$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Southwest Catchment (Coleraine Drive) 100 year pre-to-post

MUNICIPALITY: Town of Caledon

100-yr Pre-Development Peak Flow catchment 101

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)
Catchment UC3	0.28	196.54	0.77	0.118	117.80
	0.90	196.54	0.01	0.005	4.92
			Target Control Rate	0.113	112.88
		Control Rate (Orifice)		0.062	**62.40**

If less than 180 L/s/ha (138.6L/s) then OKAY

100-yr Post-Development Peak Flow catchment 201

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.75	196.54	0.76	0.31	312.40

Storage Determination				
T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	196.54	600	0.312	150.00
15	166.89	900	0.265	191.95
20	145.13	1200	0.231	220.66
25	128.46	1500	0.204	240.77
30	115.28	1800	0.183	254.96
35	104.59	2100	0.166	264.89
40	95.75	2400	0.152	271.67
50	81.95	3000	0.130	278.49
60	71.69	3600	0.114	279.16
70	63.74	4200	0.101	275.75
80	57.40	4800	0.091	269.47
90	52.23	5400	0.083	261.10
100	47.93	6000	0.076	251.15
110	44.29	6600	0.070	239.98
REQUIRED STORAGE :				**279.2**

Equations:

Intensity

$I = a/(T+B)^C$

Peak Flow

$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$

Storage

$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/ NRS
Revised By: MAC
Date: 3/5/2018

Stormwater Management Calculations - Northeast Catchment (Simpson Road) Summary

Storm	Pre-Development Uncontrolled Flow Rate (L/s)	Post-Development Uncontrolled Flow Rate (L/s)	Post Development Target (Pre-Development minus Post-Development Uncontrolled) (L/s)	Controlled Release Rate[1] (L/s)	Storage Volume Required (m^3)	Storage Volume Provided (m^3)
2-year	119.1	8.6	110.6	137.9	181.9	850.0
5-year	152.5	11.0	141.5		316.4	
10-year	186.5	13.4	173.0		432.9	
25-year	217.5	15.7	201.8		586.2	
50-year	244.9	17.7	227.2		703.6	
100-year	273.2	19.7	253.5		829.7	

1. Post-development controlled flow rate is controlled by a 200 mm orifice plate to 137.9 L/s. Less than the maximum allowable release rate as determined in the MESP as 180 L/s/ha.

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Northeast Catchment (Simpson Road) 2 year pre-to-post

MUNICIPALITY: Town of Caledon

2-year Target (pre-uncontrolled)

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 102	0.25	85.72	2.00	0.119	119.15	
Catchment UC1	0.25	85.72	0.12	0.007	7.28	External Drainage from Northwest
Catchment UC2	0.25	85.72	0.02	0.001	1.31	
		Target Control Rate		0.111	110.56	
		Control Rate (Orifice)		0.138	**137.90**	

2-yr Post-Development Peak Flow catchment 202

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.84	85.72	1.86	0.37	371.65

Storage Determination				
T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	85.72	600	0.372	140.25
15	69.05	900	0.299	166.00
20	58.06	1200	0.252	177.96
25	50.24	1500	0.218	181.95
30	44.38	1800	0.192	180.85
35	39.81	2100	0.173	176.28
40	36.14	2400	0.157	169.20
50	30.60	3000	0.133	149.86
60	26.62	3600	0.115	125.84
70	23.60	4200	0.102	98.72
80	21.23	4800	0.092	69.41
90	19.31	5400	0.084	38.48
100	17.74	6000	0.077	6.30
110	16.41	6600	0.071	-26.85
REQUIRED STORAGE :				**181.9**

Equations:

Intensity

$I = a/(T+B)^C$

Peak Flow

$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$

Storage

$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Northeast Catchment (Simpson Road) 5 year pre-to-post

MUNICIPALITY: Town of Caledon

5-year Target (pre-uncontrolled)

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 102	0.25	109.68	2.00	0.152	152.45	
Catchment UC1	0.25	109.68	0.12	0.009	9.31	External Drainage from Northwest
Catchment UC2	0.25	109.68	0.02	0.002	1.68	
		Target Control Rate		0.141	141.46	
		Control Rate (Orifice)		0.138	**137.90**	

5-yr Post-Development Peak Flow catchment 202

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.84	109.68	1.86	0.48	475.53

Storage Determination				
T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	109.68	600	0.476	202.58
15	90.91	900	0.394	251.31
20	77.89	1200	0.338	281.12
25	68.29	1500	0.296	299.36
30	60.92	1800	0.264	309.94
35	55.06	2100	0.239	315.14
40	50.28	2400	0.218	316.40
50	42.96	3000	0.186	310.60
60	37.60	3600	0.163	297.24
70	33.48	4200	0.145	278.80
80	30.23	4800	0.131	256.77
90	27.58	5400	0.120	232.07
100	25.39	6000	0.110	205.32
110	23.53	6600	0.102	176.95
REQUIRED STORAGE :				**316.4**

Equations:

Intensity

$I = a/(T+B)^C$

Peak Flow

$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$

Storage

$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Northeast Catchment (Simpson Road) 10 year pre-to-post

MUNICIPALITY: Town of Caledon

10-year Target (pre-uncontrolled)

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 102	0.25	134.16	2.00	0.186	186.48	
Catchment UC1	0.25	134.16	0.12	0.011	11.39	External Drainage from Northwest
Catchment UC2	0.25	134.16	0.02	0.002	2.05	
			Target Control Rate	0.173	173.04	
		Control Rate (Orifice)		0.138	**137.90**	

10-yr Post-Development Peak Flow catchment 202

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.84	134.16	1.86	0.58	581.69

Storage Determination				
T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	134.16	600	0.582	266.28
15	111.40	900	0.483	331.26
20	95.47	1200	0.414	372.62
25	83.68	1500	0.363	399.43
30	74.58	1800	0.323	416.59
35	67.34	2100	0.292	426.99
40	61.44	2400	0.266	432.43
50	52.37	3000	0.227	432.93
60	45.72	3600	0.198	424.02
70	40.63	4200	0.176	408.85
80	36.60	4800	0.159	389.28
90	33.32	5400	0.144	366.49
100	30.61	6000	0.133	341.23
110	28.32	6600	0.123	314.04
REQUIRED STORAGE :				**432.9**

Equations:

Intensity

$I = a/(T+B)^C$

Peak Flow

$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$

Storage

$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Northeast Catchment (Simpson Road) 25 year pre-to-post

MUNICIPALITY: Town of Caledon

25-year Target (pre-uncontrolled)

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 102	0.25	156.47	2.00	0.217	217.50	
Catchment UC1	0.25	156.47	0.12	0.013	13.29	External Drainage from Northwest
Catchment UC2	0.25	156.47	0.02	0.002	2.39	
			Target Control Rate	0.202	201.81	
		Control Rate (Orifice)		0.138	**137.90**	

25-yr Post-Development Peak Flow catchment 202

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.84	156.47	1.86	0.68	678.42

Storage Determination				
T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	156.47	600	0.678	324.31
15	131.98	900	0.572	411.60
20	114.29	1200	0.496	470.55
25	100.90	1500	0.437	511.42
30	90.39	1800	0.392	539.99
35	81.93	2100	0.355	559.78
40	74.95	2400	0.325	573.09
50	64.13	3000	0.278	585.93
60	56.11	3600	0.243	586.22
70	49.92	4200	0.216	578.14
80	45.00	4800	0.195	564.18
90	40.99	5400	0.178	545.90
100	37.65	6000	0.163	524.34
110	34.83	6600	0.151	500.24
REQUIRED STORAGE :				**586.2**

Equations:

Intensity
$I = a/(T+B)^C$

Peak Flow
$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$

Storage
$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Northeast Catchment (Simpson Road) 50 year pre-to-post

MUNICIPALITY: Town of Caledon

50-year Target (pre-uncontrolled)

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 102	0.25	176.19	2.00	0.245	244.91	
Catchment UC1	0.25	176.19	0.12	0.015	14.96	External Drainage from Northwest
Catchment UC2	0.25	176.19	0.02	0.003	2.69	
		Target Control Rate		0.227	227.25	
		Control Rate (Orifice)		0.138	**137.90**	

50-yr Post-Development Peak Flow catchment 202

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.84	176.19	1.86	0.76	763.92

Storage Determination				
T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	176.19	600	0.764	375.61
15	149.09	900	0.646	478.36
20	129.36	1200	0.561	548.93
25	114.33	1500	0.496	598.77
30	102.50	1800	0.444	634.45
35	92.93	2100	0.403	659.99
40	85.04	2400	0.369	678.01
50	72.75	3000	0.315	698.09
60	63.63	3600	0.276	703.61
70	56.58	4200	0.245	699.45
80	50.97	4800	0.221	688.49
90	46.40	5400	0.201	672.56
100	42.59	6000	0.185	652.87
110	39.37	6600	0.171	630.26
REQUIRED STORAGE :				**703.6**

Equations:

Intensity

$I = a/(T+B)^C$

Peak Flow

$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$

Storage

$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$

CROZIER CONSULTING ENGINEERS

Project: Bolton Asphalt Plant
Project No.: 1327-4523

Designed By: WST/NRS
Revised By: MAC
Date: 3/5/2018

Northeast Catchment (Simpson Road) 100 year pre-to-post

MUNICIPALITY: Town of Caledon

100-year Target (pre-uncontrolled)

	C	i (mm/hr)	A (ha)	Q (m3/s)	Q (L/s)	
Catchment 102	0.25	196.54	2.00	0.273	273.19	
Catchment UC1	0.25	196.54	0.12	0.017	16.69	External Drainage from Northwest
Catchment UC2	0.25	196.54	0.02	0.003	3.01	
		Target Control Rate		0.253	253.49	
		Control Rate (Orifice)		0.138	**137.90**	Maximum of 180 L/s/ha*2.00 = 360 L/s - uncontrolled = 340 L/s

100-yr Post-Development Peak Flow catchment 202

C	i (mm/hr)	A (ha)	Q (m3/s)	Qpost(L/s)
0.84	196.54	1.86	0.85	852.13

Storage Determination

T_d min	i mm/hr	T_d sec	Q_{Uncont} m^3/s	S_d m^3
10	196.54	600	0.852	428.54
15	166.89	900	0.724	547.81
20	145.13	1200	0.629	630.98
25	128.46	1500	0.557	690.67
30	115.28	1800	0.500	734.22
35	104.59	2100	0.453	766.17
40	95.75	2400	0.415	789.49
50	81.95	3000	0.355	817.79
60	71.69	3600	0.311	829.32
70	63.74	4200	0.276	829.71
80	57.40	4800	0.249	822.28
90	52.23	5400	0.226	809.13
100	47.93	6000	0.208	791.69
110	44.29	6600	0.192	770.91
REQUIRED STORAGE :				**829.7**

Equations:

Intensity

$$I = a/(T+B)^C$$

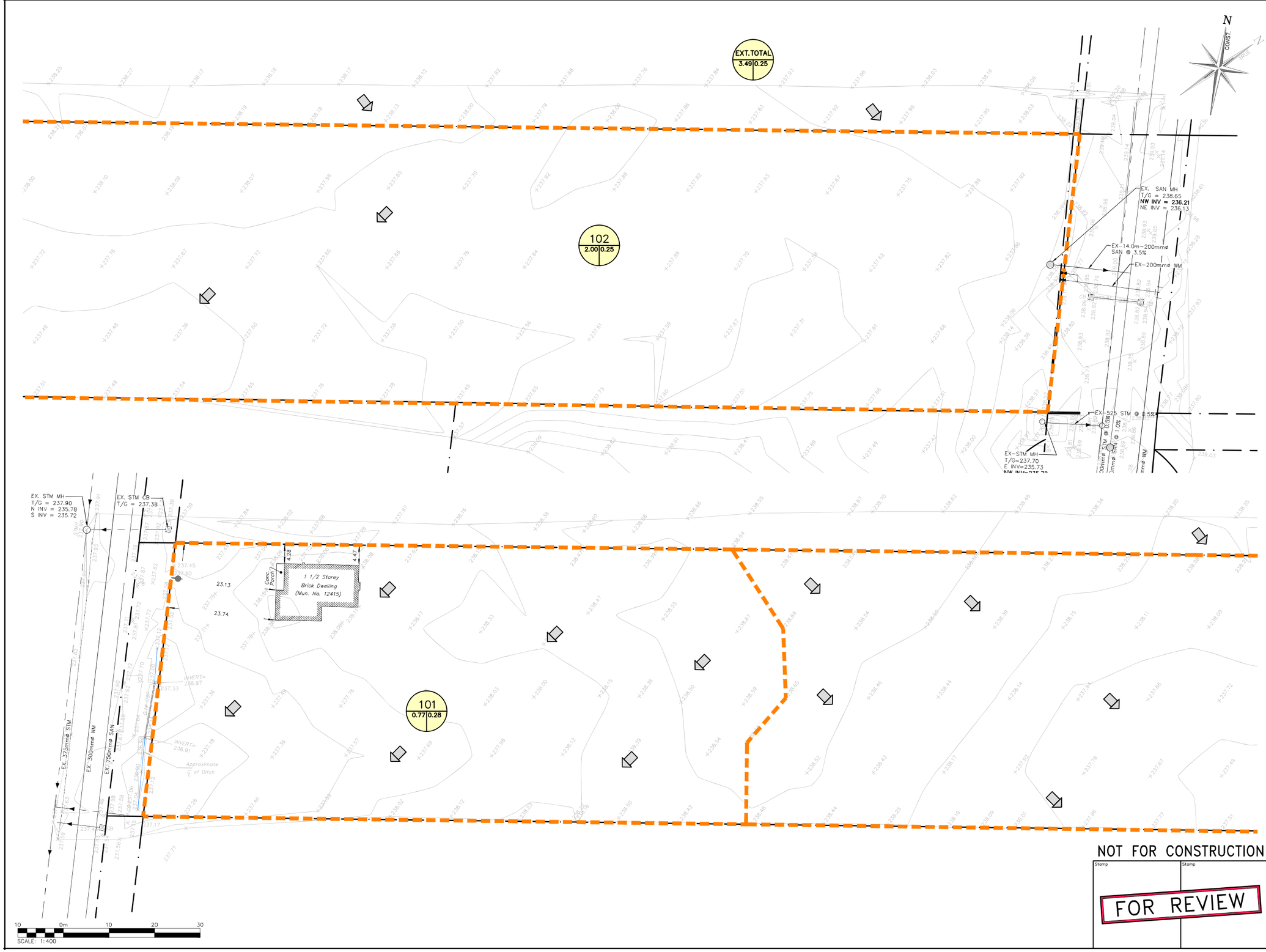
Peak Flow

$$Q_{pre} = 0.00278 \bullet C_{pre} \bullet i_{(Td)} \bullet A$$

Storage

$$S_d = Q_{post} \bullet T_d - Q_{pre} (T_d + T_c) / 2$$

FIGURES



NOT FOR CONSTRUCTION

Stamp: FOR REVIEW

Stamp:

No.	ISSUE / REVISION	YYYY/MMM/DD
0	ISSUED FOR FIRST SUBMISSION	2018/MAY/09

ELEVATION NOTE:

ELEVATIONS ARE GEODATIC IN ORIGIN DERIVED FROM GPS OBSERVATIONS USING THE "TOPNET" GPS NETWORK AND ARE REFERED TO THE CGVD-1928:1978 DATUM.

SURVEY NOTES:

SURVEY COMPLETED BY YOUNG & YOUNG SURVEYING INC. (2016/FEB/16)
REFERENCE No.: 16-B6861

BEARINGS ARE UTM GRID, DERIVED FROM RTN OBSERVATIONS
UTM ZONE 17, NAD83 (CSRS) (2010.0)

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.9996781

BENCHMARK IS TOP NUT OF FIRE HYDRANT ELEVATION=239.93m

SITE PLAN NOTES:

DESIGN ELEMENTS ARE BASED ON SITE PLAN BY J GORKA ARCHITECT.
DATE: APRIL 10, 2018
PROJECT No.: A102

DRAWING NOTES:

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

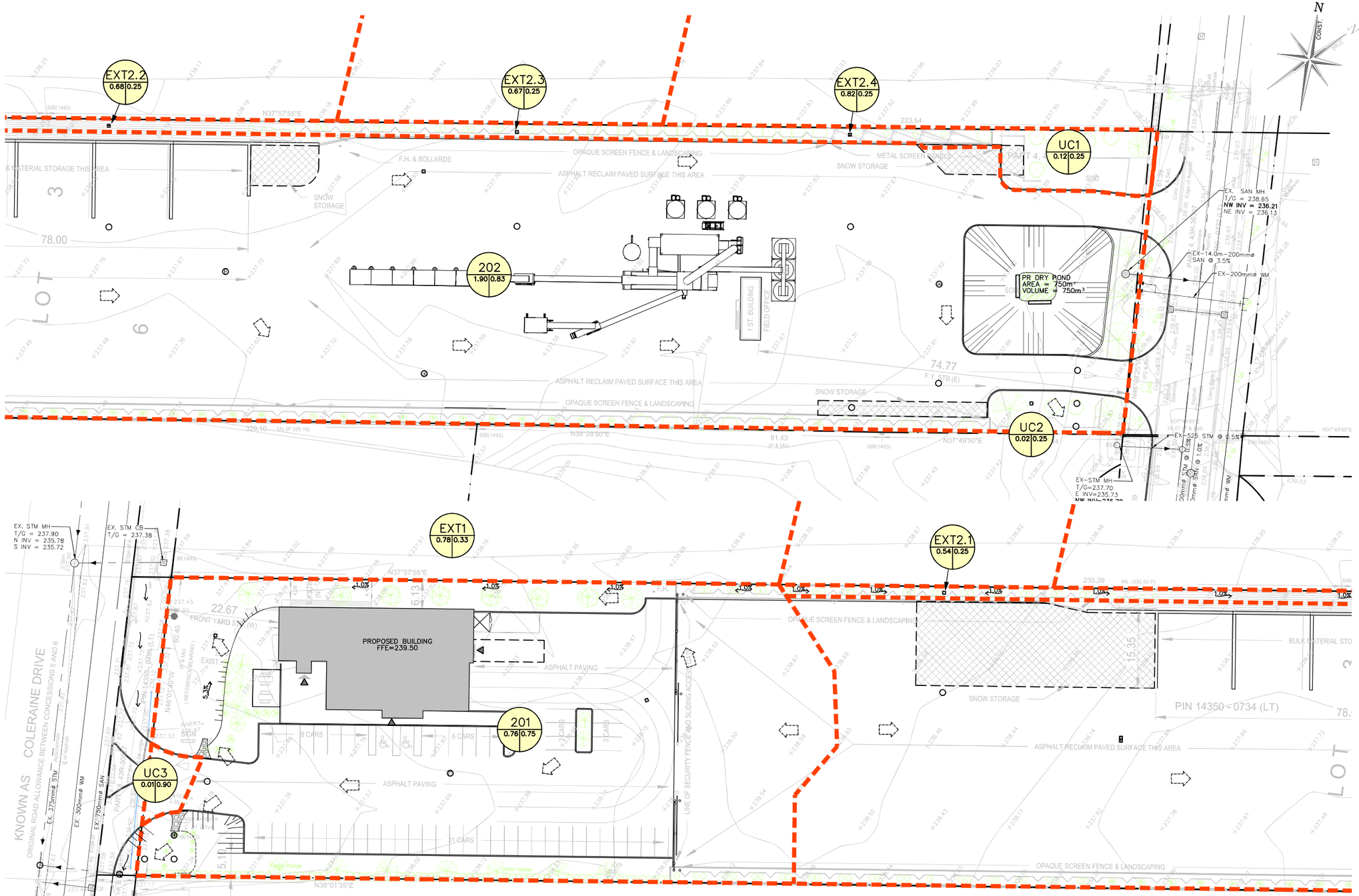
12415 COLERAINE DRIVE
TOWN OF CALEDON

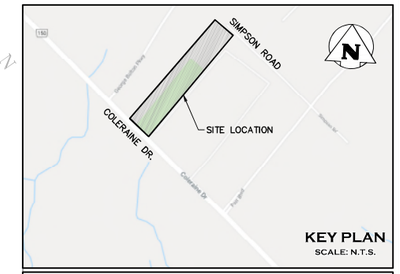
Drawing

PRE-DEVELOPMENT DRAINAGE PLAN

CROZIER & ASSOCIATES Consulting Engineers
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905 875-0026 T
905 875-4915 F
WWW.CFCROZIER.CA

Drawn	Design	Project No.	
Z.A.	N.S.	1327-4523	
Check	Check	Scale	Dwg.
S.C.S	xxx	1:400	FIG.1





LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (0.5m)
- EXISTING CONTOUR (1.0m)
- EXISTING DITCH
- EXISTING GRADE
- PROPOSED OVERLAND FLOW DIRECTION
- STORM DRAINAGE CATCHMENT
- ID / A | RC — CATCHMENT I.D. / AREA (ha) | RUNOFF COEFFICIENT
- BUILDING ENTRANCE (PERSONNEL DOOR)

No.	ISSUE / REVISION	YYYY/MMM/DD
0	ISSUED FOR FIRST SUBMISSION	2018/MAY/09

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Project

12415 COLERAINE DRIVE
TOWN OF CALEDON

Drawing

POST-DEVELOPMENT DRAINAGE PLAN

NOT FOR CONSTRUCTION

Stamp: FOR REVIEW

CROZIER & ASSOCIATES Consulting Engineers
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905 875-0026 T
905 875-4915 F
WWW.CFCROZIER.CA

Drawn	Design	Project No.	
Z.A.	N.S.	1327-4523	
Check	Check	Scale	Dwg.
S.C.S	xxx	1: 400	FIG.2