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655 Hurontario Street

STORMWATER MANAGEMENT REPORT
RDL Export

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Version	Date	Description



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1 Introduction

Tatham Engineering (Tatham) has prepared this Stormwater Management (SWM) Report in support of a site plan approval application of a multi residential development located in the Town of Collingwood. The site is legally described as 655 Hurontario Street in the Town of Collingwood, County of Simcoe.

1.1 SITE DESCRIPTION

The site consists of 0.42 ha of land located northeast of the intersection of Hurontario Street and Lockhart Road in the Town of Collingwood. The site is currently undeveloped and is covered in short grass. The subject property is bounded by Lockhart Road to the south, Hurontario Street to the west and residential homes to the north and east. Figure 1 provided overleaf illustrates the location of the subject property.

1.2 OBJECTIVES

The primary objective of this report is to demonstrate that the proposed development will not adversely affect local surface water quantity or water quality conditions. This will be accomplished by evaluating the effect of the development on local drainage conditions and, where necessary, providing solutions to mitigate any adverse impacts. This will involve an evaluation of existing and future site conditions.

1.3 GUIDELINES & BACKGROUND REPORTS

This report was prepared recognizing provincial guidelines on water resources and the environment, including the following publications:

- The Ministry of the Environment, Conservation and Parks (MECP) Stormwater Management Practices Planning and Design Manual (2003);
- Town of Collingwood Development Standards (2007);
- Nottawasaga Valley Conservation Authority Stormwater Technical Guide (2013); and
- Soil Engineers Ltd. A Geotechnical Investigation for Proposed 4-Storey Building with 1-Level Underground Parking (2019).



2 Existing Drainage Conditions

2.1 BACKGROUND INFORMATION

Information regarding the existing topography, ground cover and drainage patterns was obtained through collection of detailed topographic survey data, review of relevant background studies, plans and base mapping and was confirmed during site visits.

2.2 EXISTING CONDITIONS

The topographic information obtained indicates the site gently slopes towards a low area in the south half of the site. Stormwater will pond in the low area before outletting northeast into an existing storm sewer via a catchbasin on the neighbouring property. The storm sewer originates on Hurontario Street and crosses the subject property from west to east adjacent to the north property line. The Hurontario Street storm sewer conveys stormwater north along Hurontario Street to a catch basin manhole adjacent to the northwest corner of the site. The sewer turns east at the CBMH via a 750 mm dia. concrete pipe. 1.5 m downstream of the CBMH the sewer transitions into a 900 mm dia. CSP. The 900 mm dia. CSP continues east across the site and connects to the existing catchbasin northeast of the property. At the catchbasin, the sewer turns north again to direct flow between existing residential lots. North of the site, the sewer outlets into a ditch and continues through various ditches and culverts northeast to the Minnesota Street drainage system which ultimately outlets to Georgian Bay. Existing drainage patterns are depicted on the appended Drawing DP-1.

For the purposes of hydrologic modelling, the soils have been classified as Alliston sand loam (Type AB). The soil classification was based on the Soil Map of Simcoe County and was confirmed as sand and silt by the geotechnical report prepared by Soil Engineers Ltd in January 2019. The existing site drainage peak flows have been calculated using the Modified Rational Method. The existing condition results are summarized in Table 1 and supporting calculations are provided in Appendix A.



Table 1: Existing Condition Peak Flow Summary

STORM EVENT	PEAK FLOW RATE (m ³ /s) - CATCHMENT 101
2-year	0.004
5-year	0.005
10-year	0.016
25-year	0.025
50-year	0.036
100-year	0.047



3 Future Drainage Conditions

3.1 DESIGN CRITERIA

The Stormwater Management Report is subject to the review and approval of the Town of Collingwood. Issues to be addressed and criteria to be met regarding the development of the site are summarized below.

3.1.1 Stormwater Quality Control

Water quality controls must be provided to satisfy the MECP SWM Practices Planning and Design Manual. Georgian Bay is the ultimate receiving waterbody for site drainage and Enhanced Level water quality protection is required in the form of 80% total suspended solids (TSS) removal.

3.1.2 Stormwater Quantity Control

Proposed condition peak flow rates must be controlled to existing condition rates for all storms up to and including the 100-year event to ensure no adverse impacts for downstream landowners. Recognition of the receiving storm sewer capacity is also required. Safe conveyance must be provided for the Regulatory Storm event.

3.1.3 Siltation and Erosion Control

Recommendations for a siltation and erosion control strategy that will be implemented during construction must be provided.

3.2 PROPOSED DEVELOPMENT

The development will include a four-storey residential building with a total of 50 units. The existing drainage patterns will generally be maintained, with the site being conveyed to the existing catchbasin east of the property. Flow from the 2-year through to the 100-year storm event will be collected by a storm sewer system and directed to an underground storage unit system for controlled release to the existing storm sewer. Emergency overland flows for storms greater than the 100-year storm event will be conveyed through the proposed swales and catch basins adjacent to the north and east property lines (Catchment 202) following existing drainage conditions. The proposed drainage patterns are shown on Drawing DP-2.



4 Proposed SWM Plan

The proposed stormwater management strategy identified for this development will use dry swales for the grassed/roof areas where possible to maximize water quality treatment and flow volume reduction for drainage being conveyed to the outlet. An underground storage system will be installed under the parking area as the end-of-pipe control with two oil and grit separators (OGS) upstream of the storage system to provide water quality treatment for the parking lot runoff before it enters the underground system.

Drainage from the majority of the site (Catchment 201) will drain to the underground storage system, with only a small portion of the site, consisting of grassed side slopes along the property boundary (Catchment 202), draining directly into the swales. The underground storage facility will receive water from two catch basins, one under each parking area, and will outlet to a control structure. The underground storage system layout is shown on the Site Servicing Plan (SS-1).

4.1 WATER QUALITY

Oil and grit separators designed to provide at least 80% total solids removal and treat 90% of the surface runoff generated from its contributing drainage area will be installed upstream of both sections of the underground storage system. Two Stormceptor STC 300i treatment units or approved equal are proposed for the site. The Stormceptor STC 300i treatment units have been sized using the sizing tool available from the manufacturer. These treatment units will provide 82% total suspended solids removal for the site. The Stormceptors provide the treatment required to satisfy Provincial standards for enhanced quality control. The Stormceptor STC 300i sizing calculations are attached in Appendix C for reference. The locations of the oil and grit separators are illustrated on the Site Servicing Plan (SS-1).

Low sloped dry swales are proposed to provide water quality treatment for Catchment 202. We note that specific water quality controls are not required for Catchment 202 as this area consists exclusively of grassed areas.

4.2 WATER QUANTITY

A Rational Method calculation was completed to determine peak flow rates from the subject site under existing and proposed conditions for the 2-year through 100-year storm events. The calculation was then used to determine the required water quantity storage volume to attenuate the proposed condition peak flow rates to existing condition levels. A summary of proposed condition peak flow rates is provided in Table 2. The proposed condition supporting calculations are provided in Appendix B, and proposed condition drainage patterns are depicted on the appended Drawing DP-2.



Table 2: Summary of Peak Flow Rates and SWM Facility Operation

STORM EVENT	PEAK FLOW (m ³ /s) CATCHMENT 201 (CONTROLLED)	PEAK FLOW (m ³ /s) CATCHMENT 202	TOTAL PEAK FLOW (m ³ /s)
2-year	0.003	0.001	0.004 (0.004)
5-year	0.004	0.001	0.005 (0.005)
10-year	0.006	0.004	0.010 (0.016)
25-year	0.010	0.006	0.016 (0.025)
50-year	0.014	0.008	0.022 (0.036)
100-year	0.019	0.010	0.029 (0.047)

Note: Values in brackets represent existing condition flows

The results shown in Table 2 confirm that the proposed condition peak flow rates at the site outlet are maintained below existing condition levels for all design storms. The water quantity storage volume required to control the 100-year storm is 127 m³ and the system provides 157 m³.

The design of the outlet configuration for the underground storage facility consists of:

- a 300 mm dia. HDPE pipe outletting from the underground storage system to STM MH2; and
- orifice plates at the outlet of STM MH2 with a 53 mm opening and a 150 mm opening, set at elevations of 187.95 and 188.35 m respectively;

The stage-storage-discharge table for the underground storage facility is included in Appendix C. Further design details are provided on Site Servicing Plan (SS-1).

Emergency overflows that may occur for storms greater than the 100-year storm event will flow across the parking areas to the grassed swales consistent with existing conditions and ultimately spill to the north. No downstream concerns have been identified.

4.3 WATER BALANCE

It was determined that due to the high groundwater table, a traditional end-of-pipe system would be required as the site is not conducive to infiltration. The groundwater table was determined to be approximately 1.2 - 1.4 m below existing grade in four of the seven boreholes. No groundwater was detected in the remaining three boreholes. The proposed underground storage system is a shallow system and the site is proposed to be raised sufficiently to ensure the underground storage units are not impacted by groundwater. The proposed underground



storage units will also be lined with an impermeable liner to insure no groundwater can enter the storage system.



5 Siltation & Erosion Plan

Siltation and erosion controls will be implemented for all construction activities, including topsoil stripping, material stockpiling, road construction and grading operations. Detailed erosion and sediment control measures to be implemented during and after construction are summarized as follows:

- heavy duty silt fence will be erected before the commencement of any grading operations to control sediment movement;
- a construction vehicle entrance will be constructed and maintained consisting of a stone mud mat to reduce off-site tracking of material;
- regular inspection of control measures will be instituted, and repairs will be made as necessary;
- temporary swales will be constructed to control runoff during construction; and
- long term siltation and erosion control will be enhanced with a revegetation strategy for disturbed areas.



6 Conclusion & Recommendations

The proposed development will consist of 50 units in a four-story residential building in the Town of Collingwood. Existing drainage patterns will generally be maintained, with stormwater runoff directed via storm sewers and the road network to a proposed underground storage facility to provide quantity control for the site. Water quality control will be provided by two proposed OGS systems upstream of the underground storage facilities and low sloped dry swales.

Siltation and erosion control will be provided with the proper construction mitigation efforts. Long-term erosion control will be enhanced with an effective revegetation strategy.



**Appendix A:
Existing Condition Hydrology
Calculations**

	Project:	655 Hurontario Street
	File No.:	118197
	Date:	March 2019
	Designed By:	AS
	Checked By:	DAM
	Subject:	CN Calculation

CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

Catchment 101 Area 0.42 ha

WEIGHTED CN VALUE																										
Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics			Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
Ans	ALLISTON	AB	Sand Loam	1	0.42	1	0.11	0.262	46	0.31	0.738	59	0	0	51	0	0	68	0	0	100	0	0	50	55.594	
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0		
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0		
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0		
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0		
	Totals				0.42	1	0.11004	0.262		0.30996	0.738		0	0	0	0	0	0	0	0	0	0	0	55.6		

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	189.2 m
Minimum Catchment Elevation	188.68 m
Catchment length	100 m
Catchment Slope	1%
Catchment Area	0.42 ha

Time of Concentration (Minutes)	7.09
Time of Concentration (Hours)	0.12
Time to Peak (2/3 x Time of Concentration)	0.08

Time to Peak	0.45 hrs
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For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	189.2 m
Minimum Catchment Elevation	188.68 m
Catchment length	100 m
Catchment Slope	1%
Catchment Area	0.42 ha

Time of Concentration (Minutes)	40.66
Time of Concentration (Hours)	0.68
Time to Peak (2/3 x Time of Concentration)	0.45

Initial Abstraction	6.31 mm
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Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	0.09
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Landuse Type	Soil Series				
	Ans	0	0	0	0
Forest/Woodland	0.08	#N/A	#N/A	#N/A	#N/A
Cultivated	0.22	#N/A	#N/A	#N/A	#N/A
Pasture/Lawn	0.1	#N/A	#N/A	#N/A	#N/A
Impervious	0.95	#N/A	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	#N/A	#N/A	#N/A	#N/A
Meadows	0.09	#N/A	#N/A	#N/A	#N/A
Soil Series Total	0.0948	#N/A	#N/A	#N/A	#N/A

**Appendix B:
Proposed Condition Hydrology
Calculations**

	Project:	655 Hurontario Street
	File No.:	118197
	Date:	March 2019
	Designed By:	AS
	Checked By:	DAM
	Subject:	CN Calculation

CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

Catchment 201 Area 0.3600 ha

WEIGHTED CN VALUE																										
Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics			Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
Ans	ALLISTON	AB	Sand Loam	1	0.36	1	0	0	46	0.0972	0.27	59	0	0	51	0	0	68	0.2628	0.73	100	0	0	50	88.93	
	#N/A	#N/A	#N/A	#N/A	0	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	
	#N/A	#N/A	#N/A	#N/A	0	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	
	#N/A	#N/A	#N/A	#N/A	0	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	
	#N/A	#N/A	#N/A	#N/A	0	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	
	Totals				0.36	1	0	0		0.0972	0.27		0	0		0	0		0.2628	0.73		0	0		88.9	

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	189.2 m
Minimum Catchment Elevation	188.74 m
Catchment length	80 m
Catchment Slope	1%
Catchment Area	0.36 ha

Time of Concentration (Minutes)	5.64
Time of Concentration (Hours)	0.09
Time to Peak (2/3 x Time of Concentration)	0.06

Time to Peak	0.06 hrs
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For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	189.2 m
Minimum Catchment Elevation	188.74 m
Catchment length	80 m
Catchment Slope	1%
Catchment Area	0.36 ha

Time of Concentration (Minutes)	13.28
Time of Concentration (Hours)	0.22
Time to Peak (2/3 x Time of Concentration)	0.15

Initial Abstraction	2.81 mm
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Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	0.72
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Landuse Type	Soil Series				
	Ans	0	0	0	0
Forest/Woodland	0.08	#N/A	#N/A	#N/A	#N/A
Cultivated	0.22	#N/A	#N/A	#N/A	#N/A
Pasture/Lawn	0.1	#N/A	#N/A	#N/A	#N/A
Impervious	0.95	#N/A	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	#N/A	#N/A	#N/A	#N/A
Meadows	0.09	#N/A	#N/A	#N/A	#N/A
Soil Series Total	0.7205	#N/A	#N/A	#N/A	#N/A

	Project:	655 Hurontario Street
	File No.:	118197
	Date:	March 2019
	Designed By:	AS
	Checked By:	DAM
	Subject:	CN Calculation

CURVE NUMBER, INITIAL ABSTRACTION & TIME TO PEAK CALCULATIONS

Catchment 202 Area 0.06 ha

WEIGHTED CN VALUE																										
Soil Series	Soil Series	Hydrologic Soil Group	Soil Texture	Runoff Coefficient Type	Catchment Soil Characteristics			Forest/Woodland			Pasture/Lawns			Meadows			Cultivated			Impervious			Wetland/Lakes/SWMF			Average CN for Soil Type
					Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	Area	Percent	CN	
Ans	ALLISTON	AB	Sand Loam	1	0.06	1	0	0	46	0.06	1	59	0	0	51	0	0	68	0	0	100	0	0	50	59	
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0		
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0		
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0		
	#N/A	#N/A	#N/A	#N/A	0	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0	0	#N/A	0		
	Totals				0.06	1	0	0		0.06	1		0	0		0	0		0	0		0	0	59.0		

Time of Concentration Calculations

For Runoff Coefficients greater than 0.4

Bransby-Williams Formula

Maximum Catchment Elevation	189.6 m
Minimum Catchment Elevation	188.65 m
Catchment length	60 m
Catchment Slope	1.6%
Catchment Area	0.06 ha

Time of Concentration (Minutes)	4.13
Time of Concentration (Hours)	0.07
Time to Peak (2/3 x Time of Concentration)	0.05

Time to Peak	0.24 hrs
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For Runoff Coefficients less than 0.4

Airport Method

Maximum Catchment Elevation	189.6 m
Minimum Catchment Elevation	188.65 m
Catchment length	60 m
Catchment Slope	2%
Catchment Area	0.06 ha

Time of Concentration (Minutes)	21.70
Time of Concentration (Hours)	0.36
Time to Peak (2/3 x Time of Concentration)	0.24

Initial Abstraction	5 mm
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Woods	10
Meadows	8
Cultivated	7
Lawns	5
Impervious	2

Runoff Coefficient	0.10
---------------------------	-------------

Landuse Type	Soil Series				
	Ans	0	0	0	0
Forest/Woodland	0.08	#N/A	#N/A	#N/A	#N/A
Cultivated	0.22	#N/A	#N/A	#N/A	#N/A
Pasture/Lawn	0.1	#N/A	#N/A	#N/A	#N/A
Impervious	0.95	#N/A	#N/A	#N/A	#N/A
Wetland/Lake/SWMF	0.05	#N/A	#N/A	#N/A	#N/A
Meadows	0.09	#N/A	#N/A	#N/A	#N/A
Soil Series Total	0.1	#N/A	#N/A	#N/A	#N/A

Appendix C: SWM Facility Design Calculations



Project: 655 Hurontario Street

Date: March 2019

File No.: 118197

Designed By: AS

Subject: Rational Method Calculation

Checked By: DAM

PRE DEVELOPMENT ANALYSIS

CATCHMENT 101

Runoff Coefficient (Municipal Standard)

2 Year	0.09	
5 Year	0.09	
10 Year	0.27	=(0.8*C _s)+0.2
25 Year	0.36	=(0.7*C _s)+0.3
50 Year	0.45	=(0.6*C _s)+0.4
100 Year	0.55	=(0.5*C _s)+0.5

Peak Rainfall Intensity (Municipal Standard - Collingwood)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	807.4	1135.4	1387.0	1676.2	1973.1	2193.1
B	6.75	7.50	7.97	8.30	9.00	9.04
C	0.828	0.841	0.852	0.858	0.868	0.871

2 Year	33.05 mm/hr	T _c = 41
5 Year	43.62 mm/hr	T _c = 41
10 Year	50.64 mm/hr	T _c = 41
25 Year	59.45 mm/hr	T _c = 41
50 Year	66.48 mm/hr	T _c = 41
100 Year	72.98 mm/hr	T _c = 41

Drainage Area 0.42 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.004 m ³ /s
5 Year	0.005 m ³ /s
10 Year	0.016 m ³ /s
25 Year	0.025 m ³ /s
50 Year	0.036 m ³ /s
100 Year	0.047 m ³ /s

POST DEVELOPMENT ANALYSIS

CATCHMENT 201

Runoff Coefficient (Municipal Standard)

2 Year	0.72	
5 Year	0.72	
10 Year	0.78	=(0.8*C _s)+0.2
25 Year	0.80	=(0.7*C _s)+0.3
50 Year	0.83	=(0.6*C _s)+0.4
100 Year	0.86	=(0.5*C _s)+0.5

Peak Rainfall Intensity (Municipal Standard - Collingwood)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	807.4	1135.4	1387.0	1676.2	1973.1	2193.1
B	6.75	7.50	7.97	8.30	9.00	9.04
C	0.828	0.841	0.852	0.858	0.868	0.871

2 Year	78.28 mm/hr	T _c = 10
5 Year	102.27 mm/hr	T _c = 10
10 Year	118.36 mm/hr	T _c = 10
25 Year	138.40 mm/hr	T _c = 10
50 Year	153.18 mm/hr	T _c = 10
100 Year	168.45 mm/hr	T _c = 10

Drainage Area 0.36 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

		Q_{DIST}	
2 Year	0.056	0.003	0.052 m ³ /s
5 Year	0.073	0.004	0.069 m ³ /s
10 Year	0.091	0.006	0.085 m ³ /s
25 Year	0.110	0.010	0.100 m ³ /s
50 Year	0.126	0.014	0.111 m ³ /s
100 Year	0.143	0.019	0.124 m ³ /s

Required Storage Volumes

Dur.	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
30	48.4	63.9	79.6	93.4	103.9	114.4
40	52.2	69.1	85.9	100.3	110.9	121.4
50	54.9	72.7	90.3	104.7	115.1	125.2
60	57.0	75.4	93.4	107.7	117.5	126.9
70	58.5	77.4	95.7	109.6	118.7	127.3
80	59.7	79.0	97.5	110.8	119.0	126.8
90	60.6	80.2	98.8	111.6	118.7	125.6
100	61.4	81.1	99.8	111.9	118.0	123.8
110	62.0	81.9	100.5	111.8	116.9	121.5
120	62.4	82.4	101.0	111.5	115.4	119.0
130	62.8	82.8	101.3	111.0	113.8	116.1
140	63.0	83.1	101.5	110.3	111.9	113.1
150	63.2	83.3	101.5	109.5	109.8	109.8
160	63.3	83.4	101.4	108.5	107.6	106.3
170	63.3	83.4	101.3	107.4	105.2	102.7
180	63.3	83.3	101.0	106.2	102.7	98.9
190	63.2	83.2	100.7	104.9	100.1	95.1
200	63.1	83.1	100.3	103.6	97.4	91.1
210	62.9	82.8	99.8	102.1	94.7	87.0
220	62.7	82.6	99.3	100.6	91.8	82.9



Project: 655 Hurontario Street

Date: March 2019

File No.: 118197

Designed By: AS

Subject: Rational Method Calculation

Checked By: DAM

POST DEVELOPMENT ANALYSIS

CATCHMENT 202

Runoff Coefficient (Municipal Standard)

2 Year	0.10	
5 Year	0.10	
10 Year	0.28	=(0.8*C ₅)+0.2
25 Year	0.37	=(0.7*C ₅)+0.3
50 Year	0.46	=(0.6*C ₅)+0.4
100 Year	0.55	=(0.5*C ₅)+0.5

Peak Rainfall Intensity (Municipal Standard - Collingwood)

	2 YR	5 YR	10 YR	25 YR	50 YR	100 YR
A	807.4	1135.4	1387.0	1676.2	1973.1	2193.1
B	6.75	7.50	7.97	8.30	9.00	9.04
C	0.828	0.841	0.852	0.858	0.868	0.871

2 Year	50.04 mm/hr	T _c = 22
5 Year	65.92 mm/hr	T _c = 22
10 Year	76.55 mm/hr	T _c = 22
25 Year	89.79 mm/hr	T _c = 22
50 Year	100.15 mm/hr	T _c = 22
100 Year	110.05 mm/hr	T _c = 22

Drainage Area 0.060 ha

Peak Runoff Rate - Rational Method (Q=CiA/360)

2 Year	0.001 m ³ /s
5 Year	0.001 m ³ /s
10 Year	0.004 m ³ /s
25 Year	0.006 m ³ /s
50 Year	0.008 m ³ /s
100 Year	0.010 m ³ /s

Project: _____



Chamber Model -	SC-310	
Units -	Metric	Click Here for Imperial
Number of chambers -	192	
Voids in the stone (porosity) -	40	%
Base of Stone Elevation -	187.95	m
Amount of Stone Above Chambers -	152	mm
Amount of Stone Below Chambers -	152	mm
Area of system -	486.75	sq.meters

Min. Area - 423.306 sq.meters

 Include Perimeter Stone in Calculations

Height of System (mm)	Incremental Single Chamber (cubic meters)	Incremental Total Chamber (cubic meters)	Incremental Stone (cubic meters)	Incremental Ch & St (cubic meters)	Cumulative Chamber (cubic meters)	Elevation (meters)
711	0.00	0.00	4.95	4.95	186.692	188.66
686	0.00	0.00	4.95	4.95	181.745	188.64
660	0.00	0.00	4.95	4.95	176.799	188.61
635	0.00	0.00	4.95	4.95	171.852	188.59
610	0.00	0.00	4.95	4.95	166.905	188.56
584	0.00	0.00	4.95	4.95	161.959	188.53
559	0.00	0.32	4.82	5.14	157.012	188.51
533	0.00	0.84	4.61	5.45	151.874	188.48
508	0.01	1.45	4.37	5.81	146.422	188.46
483	0.02	2.96	3.76	6.73	140.607	188.43
457	0.02	3.83	3.41	7.25	133.882	188.41
432	0.02	4.49	3.15	7.64	126.637	188.38
406	0.03	5.03	2.93	7.96	118.999	188.36
381	0.03	5.52	2.74	8.26	111.034	188.33
356	0.03	5.96	2.56	8.52	102.773	188.31
330	0.03	6.28	2.43	8.71	94.254	188.28
305	0.03	6.61	2.30	8.91	85.539	188.25
279	0.04	6.94	2.17	9.11	76.626	188.23
254	0.04	7.21	2.06	9.27	67.517	188.20
229	0.04	7.43	1.98	9.40	58.246	188.18
203	0.04	7.64	1.89	9.53	48.843	188.15
178	0.04	7.81	1.82	9.63	39.310	188.13
152	0.00	0.00	4.95	4.95	29.680	188.10
127	0.00	0.00	4.95	4.95	24.733	188.08
102	0.00	0.00	4.95	4.95	19.787	188.05
76	0.00	0.00	4.95	4.95	14.840	188.03
51	0.00	0.00	4.95	4.95	9.893	188.00
25	0.00	0.00	4.95	4.95	4.947	187.98



Project :	655 Hurontario Street
File No.	118197
Date:	March 2019
Designed By:	AS
Checked By:	DAM
Subject:	Underground Storage SSD Relationship

STAGE-STORAGE TABLE			
Elevation	Storage Depth	Volume	
		Incremental Storage	Accumulated Storage
(m)	(m)	(cu.m)	(cu.m)
187.95	0.00	0.00	0.00
187.98	0.025	0.00	0.00
188.00	0.051	0.00	0.00
188.03	0.076	0.00	0.00
188.05	0.102	0.00	0.00
188.08	0.127	0.00	0.00
188.10	0.152	0.00	0.00
188.13	0.178	9.63	9.63
188.15	0.203	9.53	19.16
188.18	0.229	9.40	28.57
188.20	0.254	9.27	37.84
188.23	0.279	9.11	46.95
188.26	0.305	8.91	55.86
188.28	0.330	8.71	64.57
188.31	0.356	8.52	73.09
188.33	0.381	8.26	81.35
188.36	0.406	7.96	89.32
188.38	0.432	7.64	96.96
188.41	0.457	7.25	104.20
188.43	0.483	6.73	110.93
188.46	0.508	5.81	116.74
188.48	0.533	5.45	122.19
188.51	0.559	5.14	127.33
188.53	0.584	4.95	132.28
188.56	0.610	4.95	137.23
188.59	0.635	4.95	142.17
188.61	0.660	4.95	147.12
188.64	0.686	4.95	152.07
188.66	0.711	4.95	157.01

	Project :	655 Hurontario Street
	File No.	118197
	Date:	March 2019
	Designed By:	AS
	Checked By:	DAM
	Subject:	SWMF SSD Relationship

STAGE-DISCHARGE TABLE

Outlets

Type	Orifice #1	Orifice #2
Diameter (mm)	53	150
Area (sq.m)	0.0022	0.0177
Coefficient	0.63	0.63
Invert (m)	187.95	188.35

STAGE-DISCHARGE TABLE					
Water Level	Outlets				Total Discharge
	Orifice #1		Orifice #2		
	Head	Discharge	Head	Discharge	
(m)	(m)	(cms)	(m)	(cms)	(cms)
187.95	0.00	0.0000	0.00	0.0000	0.0000
187.98	0.03	0.0003	0.00	0.0000	0.0003
188.00	0.02	0.0010	0.00	0.0000	0.0010
188.03	0.05	0.0014	0.00	0.0000	0.0014
188.05	0.08	0.0017	0.00	0.0000	0.0017
188.08	0.10	0.0020	0.00	0.0000	0.0020
188.10	0.13	0.0022	0.00	0.0000	0.0022
188.13	0.15	0.0024	0.00	0.0000	0.0024
188.15	0.18	0.0026	0.00	0.0000	0.0026
188.18	0.20	0.0028	0.00	0.0000	0.0028
188.20	0.23	0.0029	0.00	0.0000	0.0029
188.23	0.25	0.0031	0.00	0.0000	0.0031
188.26	0.28	0.0032	0.00	0.0000	0.0032
188.28	0.30	0.0034	0.00	0.0000	0.0034
188.31	0.33	0.0035	0.00	0.0000	0.0035
188.33	0.35	0.0037	0.00	0.0000	0.0037
188.36	0.38	0.0038	0.01	0.0000	0.0038
188.38	0.41	0.0039	0.03	0.0008	0.0047
188.41	0.43	0.0040	0.06	0.0024	0.0065
188.43	0.46	0.0042	0.01	0.0044	0.0086
188.46	0.48	0.0043	0.03	0.0090	0.0132
188.48	0.51	0.0044	0.06	0.0119	0.0163
188.51	0.53	0.0045	0.08	0.0143	0.0188
188.53	0.56	0.0046	0.11	0.0163	0.0209
188.56	0.58	0.0047	0.14	0.0181	0.0228
188.59	0.61	0.0048	0.16	0.0197	0.0245
188.61	0.63	0.0049	0.18	0.0212	0.0261
188.64	0.66	0.0050	0.21	0.0226	0.0276
188.66	0.68	0.0051	0.24	0.0239	0.0290

	Project:	655 Hurontario Street
	File No:	118197
	Date:	March 2019
	Designed By:	AS
	Checked By:	DAM
	Subject:	SWMF SSD Relationship

STAGE-STORAGE-DISCHARGE TABLE

Outlets

Type	Orifice #1	Orifice #2
Diameter (mm)	53.00	150.00
Invert(m)	187.95	188.35

STAGE-STORAGE-DISCHARGE TABLE					
Water Level	Outlets		Total Discharge	Storage Volume	
	Orifice #1 Discharge	Orifice #2 Discharge		Active Storage	Total Storage
(m)	(cms)	(cms)	(cms)	(cu.m)	(cu.m)
187.95	0.0000	0.0000	0.000	0.00	0.00
187.98	0.0003	0.0000	0.000	0.00	0.00
188.00	0.0010	0.0000	0.001	0.00	0.00
188.03	0.0014	0.0000	0.001	0.00	0.00
188.05	0.0017	0.0000	0.002	0.00	0.00
188.08	0.0020	0.0000	0.002	0.00	0.00
188.10	0.0022	0.0000	0.002	0.00	0.00
188.13	0.0024	0.0000	0.002	9.63	9.63
188.15	0.0026	0.0000	0.003	9.53	19.16
188.18	0.0028	0.0000	0.003	9.40	28.57
188.20	0.0029	0.0000	0.003	9.27	37.84
188.23	0.0031	0.0000	0.003	9.11	46.95
188.26	0.0032	0.0000	0.003	8.91	55.86
188.28	0.0034	0.0000	0.003	8.71	64.57
188.31	0.0035	0.0000	0.004	8.52	73.09
188.33	0.0037	0.0000	0.004	8.26	81.35
188.36	0.0038	0.0000	0.004	7.96	89.32
188.38	0.0039	0.0008	0.005	7.64	96.96
188.41	0.0040	0.0024	0.006	7.25	104.20
188.43	0.0042	0.0044	0.009	6.73	110.93
188.46	0.0043	0.0090	0.013	5.81	116.74
188.48	0.0044	0.0119	0.016	5.45	122.19
188.51	0.0045	0.0143	0.019	5.14	127.33
188.53	0.0046	0.0163	0.021	4.95	132.28
188.56	0.0047	0.0181	0.023	4.95	137.23
188.59	0.0048	0.0197	0.025	4.95	142.17
188.61	0.0049	0.0212	0.026	4.95	147.12
188.64	0.0050	0.0226	0.028	4.95	152.07
188.66	0.0051	0.0239	0.029	4.95	157.01

Brief Stormceptor Sizing Report - OGS 1

Project Information & Location			
Project Name	655 Hurontario	Project Number	118197
City		State/ Province	Ontario
Country	Canada	Date	3/6/2019
Designer Information		EOR Information (optional)	
Name	Andrew Schoof	Name	
Company	C.C. Tatham & Associates Ltd.	Company	
Phone #	705-444-2565	Phone #	
Email	aschoof@cctatham.com	Email	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	OGS 1
Target TSS Removal (%)	80
TSS Removal (%) Provided	83
Recommended Stormceptor Model	STC 300

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary		
Stormceptor Model	% TSS Removal Provided	% Runoff Volume Captured Provided
STC 300	83	98
STC 750	90	100
STC 1000	91	100
STC 1500	92	100
STC 2000	93	100
STC 3000	94	100
STC 4000	95	100
STC 5000	96	100
STC 6000	97	100
STC 9000	98	100
STC 10000	98	100
STC 14000	98	100
StormceptorMAX	Custom	Custom

Sizing Details			
Drainage Area		Water Quality Objective	
Total Area (ha)	0.17	TSS Removal (%)	80.0
Imperviousness %	73.0	Runoff Volume Capture (%)	90.00
Rainfall		Oil Spill Capture Volume (L)	
Station Name	OWEN SOUND MOE	Peak Conveyed Flow Rate (L/s)	
State/Province	Ontario	Water Quality Flow Rate (L/s)	
Station ID #	6132	Up Stream Storage	
Years of Records	40	Storage (ha-m)	Discharge (cms)
Latitude	44°35'N	0.000	0.000
Longitude	80°56'W	Up Stream Flow Diversion	
		Max. Flow to Stormceptor (cms)	

Particle Size Distribution (PSD) The selected PSD defines TSS removal		
Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes
<ul style="list-style-type: none"> Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules. Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed. For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
<http://www.imbriumsystems.com/technical-specifications>

Brief Stormceptor Sizing Report - OGS 2

Project Information & Location			
Project Name	655 Hurontario	Project Number	118197
City		State/ Province	Ontario
Country	Canada	Date	3/6/2019
Designer Information		EOR Information (optional)	
Name	Andrew Schoof	Name	
Company	C.C. Tatham & Associates Ltd.	Company	
Phone #	705-444-2565	Phone #	
Email	aschoof@cctatham.com	Email	

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	OGS 2
Target TSS Removal (%)	80
TSS Removal (%) Provided	82
Recommended Stormceptor Model	STC 300

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

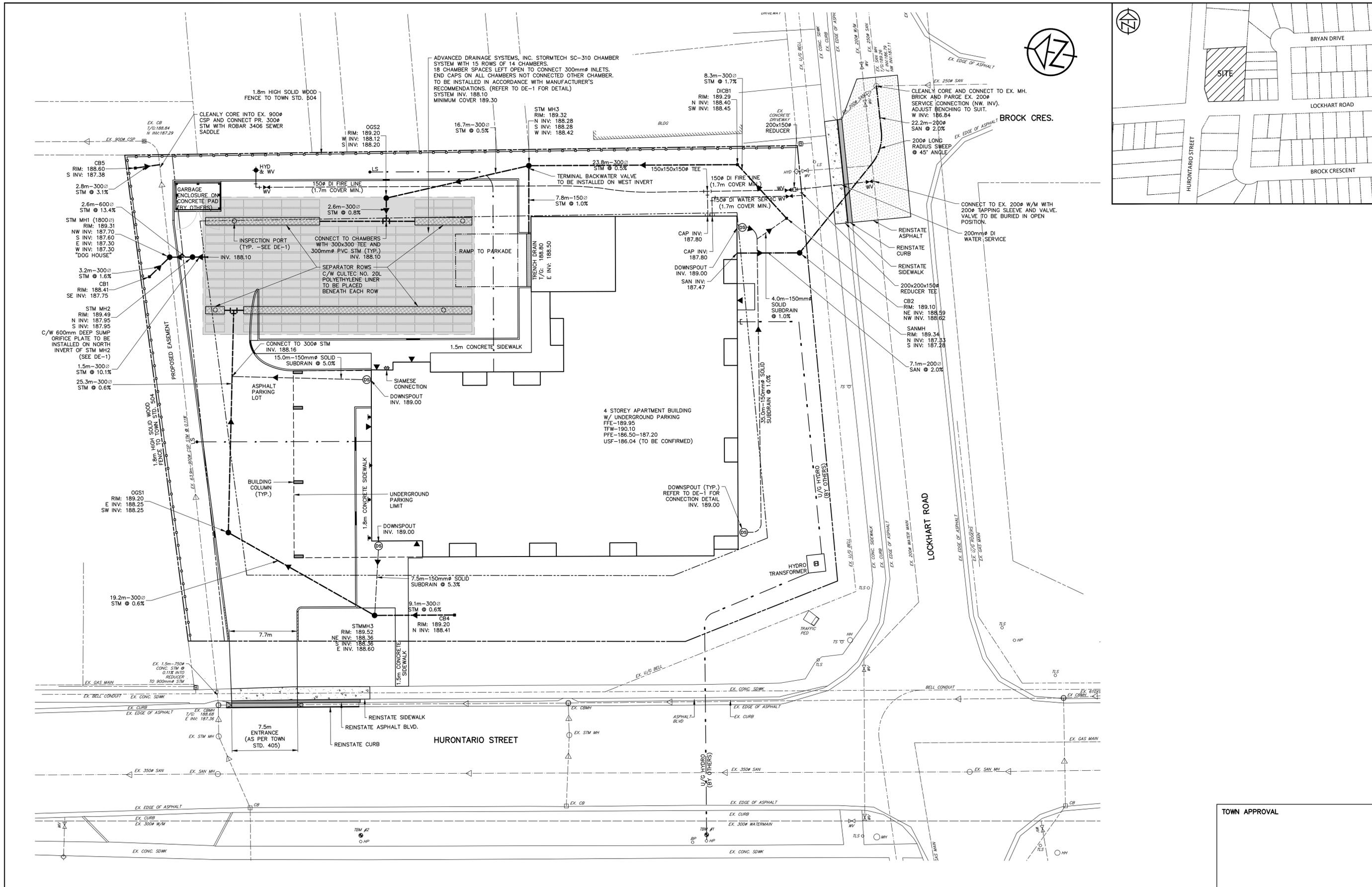
Stormceptor Sizing Summary		
Stormceptor Model	% TSS Removal Provided	% Runoff Volume Captured Provided
STC 300	82	97
STC 750	89	100
STC 1000	90	100
STC 1500	91	100
STC 2000	93	100
STC 3000	94	100
STC 4000	95	100
STC 5000	96	100
STC 6000	96	100
STC 9000	98	100
STC 10000	98	100
STC 14000	98	100
StormceptorMAX	Custom	Custom

Sizing Details			
Drainage Area		Water Quality Objective	
Total Area (ha)	0.19	TSS Removal (%)	80.0
Imperviousness %	73.0	Runoff Volume Capture (%)	90.00
Rainfall		Oil Spill Capture Volume (L)	
Station Name	OWEN SOUND MOE	Peak Conveyed Flow Rate (L/s)	
State/Province	Ontario	Water Quality Flow Rate (L/s)	
Station ID #	6132	Up Stream Storage	
Years of Records	40	Storage (ha-m)	Discharge (cms)
Latitude	44°35'N	0.000	0.000
Longitude	80°56'W	Up Stream Flow Diversion	
		Max. Flow to Stormceptor (cms)	

Particle Size Distribution (PSD) The selected PSD defines TSS removal		
Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes
<ul style="list-style-type: none"> Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules. Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed. For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
<http://www.imbriumsystems.com/technical-specifications>



ADVANCED DRAINAGE SYSTEMS, INC. STORMTECH SC-310 CHAMBER SYSTEM WITH 15 ROWS OF 14 CHAMBERS. 18 CHAMBER SPACES LEFT OPEN TO CONNECT 300mm ϕ INLETS. END CAPS ON ALL CHAMBERS NOT CONNECTED OTHER CHAMBER. TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. (REFER TO DE-1 FOR DETAIL) SYSTEM INV. 188.10 MINIMUM COVER 189.30

TOWN APPROVAL

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BENCHMARKS
 TBM1 - ELEVATION 189.177
 ELEVATIONS HEREON ARE GEODETIC AND REFER TO THE NAIL & WASHER IN SECOND HYDRO POLE NORTH OF THE INTERSECTION OF LOCKHART ROAD AND HURONTARIO STREET ON WEST SIDE OF ROAD.
 TBM2 - ELEVATION 189.682
 ELEVATIONS HEREON ARE GEODETIC AND REFER TO THE NAIL & WASHER IN FIRST HYDRO POLE NORTH OF INTERSECTION OF LOCKHART ROAD AND HURONTARIO STREET ON WEST SIDE OF ROAD.

NOTES
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No.	REVISION DESCRIPTION	DATE	ENGINEER STAMP
1.	1ST SUBMISSION	MAR 16/19	

RD EXPERT
655 HURONTARIO STREET
TOWN OF COLLINGWOOD

SITE SERVICING PLAN



TATHAM ENGINEERING

DESIGN: AS/RD FILE: 118197 DWG: **SS-1**
 DRAWN: RD DATE: DEC 2018
 CHECK: JPA/RS SCALE: 1:200



LEGEND	
DRAINAGE AREA	
AREA IN HECTARES	
RUNOFF COEFFICIENT	
DRAINAGE AREA BOUNDARY	
OVERLAND FLOW ROUTE	

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NOTES
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 TOPOGRAPHIC INFORMATION ON THIS PLAN FROM SURVEY PREPARED BY C.C. TATHAM & ASSOCIATES DATED OCT 13/2016.

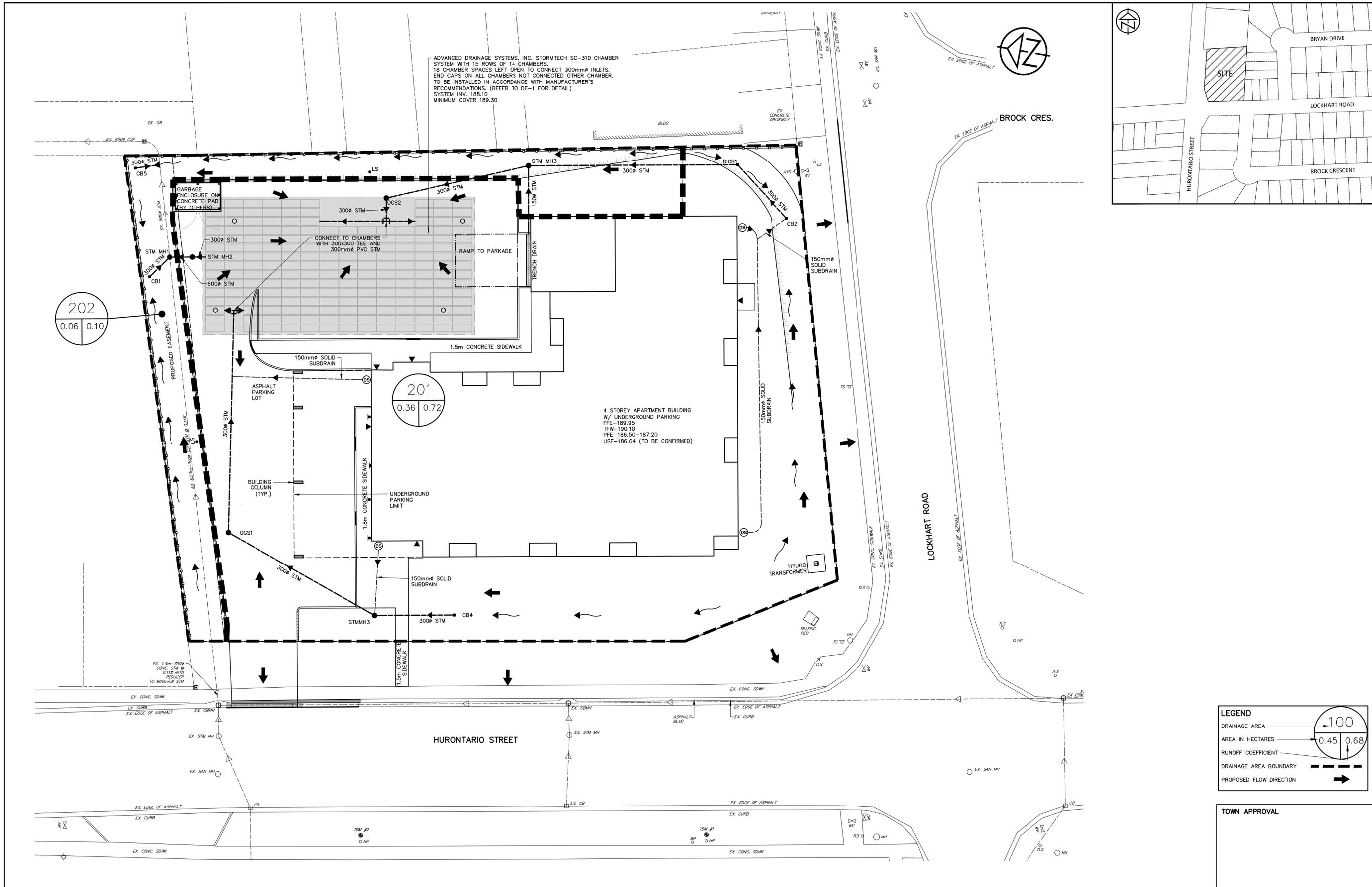
No.	REVISION DESCRIPTION	DATE	ENGINEER STAMP
1.	1ST SUBMISSION	MAR 16/19	

ENGINEER STAMP

RDL EXPORT
655 HURONTARIO STREET
TOWN OF COLLINGWOOD
PRE-DEVELOPMENT
DRAINAGE PLAN

TATHAM ENGINEERING
 DESIGN: AS/RD FILE: 118197 DWG:
 DRAWN: RD DATE: DEC 2018
 CHECK: JPA/RS SCALE: 1:200 **DP-1**

ADVANCED DRAINAGE SYSTEMS, INC. STORMTECH SC-310 CHAMBER SYSTEM WITH 15 ROWS OF 14 CHAMBERS. 18 CHAMBER SPACES LEFT OPEN TO CONNECT 300mmØ INLETS. END CAPS ON ALL CHAMBERS NOT CONNECTED OTHER CHAMBER. TO BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. (REFER TO DE-1 FOR DETAIL) SYSTEM INV. 186.10 MINIMUM COVER 189.30



LEGEND

DRAINAGE AREA	100
AREA IN HECTARES	0.45 0.68
RUNOFF COEFFICIENT	
DRAINAGE AREA BOUNDARY	---
PROPOSED FLOW DIRECTION	→

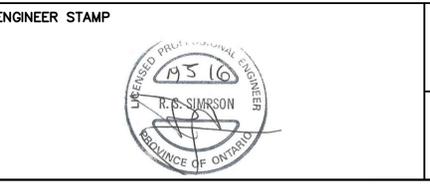
TOWN APPROVAL

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 CONTRACTOR MUST VERIFY ALL DIMENSIONS AND BE RESPONSIBLE FOR SAME. ANY DISCREPANCIES MUST BE REPORTED TO THE ENGINEER BEFORE COMMENCING WORK. DRAWINGS ARE NOT TO BE SCALED.
 TATHAM ENGINEERING LIMITED CLAIMS COPYRIGHT TO THIS DRAWING WHICH MAY NOT BE USED FOR ANY PURPOSE OTHER THAN THAT PROVIDED IN THE CONTRACT BETWEEN THE OWNER/CLIENT AND THE ENGINEER WITHOUT THE EXPRESS CONSENT OF TATHAM ENGINEERING LIMITED.

BENCHMARKS
 TBM1 - ELEVATION 189.177
 ELEVATIONS HEREON ARE GEODETIC AND REFER TO THE NAIL & WASHER IN SECOND HYDRO POLE NORTH OF THE INTERSECTION OF LOCKHART ROAD AND HURONTARIO STREET ON WEST SIDE OF ROAD.
 TBM2 - ELEVATION 189.682
 ELEVATIONS HEREON ARE GEODETIC AND REFER TO THE NAIL & WASHER IN FIRST HYDRO POLE NORTH OF INTERSECTION OF LOCKHART ROAD AND HURONTARIO STREET ON WEST SIDE OF ROAD.

NOTES
 LEGAL SURVEY INFORMATION AND LOT DIMENSIONS SHOWN ON THIS PLAN ARE TAKEN FROM A SURVEY PLAN PREPARED BY ZUBEK, EMO, THOMSEN & PATTEN, DATED 2019, WHICH MAY NOT BE FINAL AND ARE NOT GUARANTEED. THE FINAL REGISTERED PLAN OF SUBDIVISION SHALL BE REFERRED TO FOR CONFIRMATION OF THE DATA.
 TOPOGRAPHIC INFORMATION ON THIS PLAN FROM SURVEY PREPARED BY C.C. TATHAM & ASSOCIATES DATED OCT 13/2016.

No.	REVISION DESCRIPTION	DATE	ENGINEER STAMP
1.	1ST SUBMISSION	MAR 16/19	



RDL EXPORT
655 HURONTARIO STREET
TOWN OF COLLINGWOOD

POST-DEVELOPMENT DRAINAGE PLAN

DESIGN: AS/RD	FILE: 118197	DWG: DP-2
DRAWN: RD	DATE: DEC 2018	
CHECK: JPA/RS	SCALE: 1:200	