FUNCTIONAL SERVICING & PRELIMINARY STORMWATER MANAGEMENT REPORT

LONG POINT ROAD SUBDIVISION

TOWN OF THE BLUE MOUNTAINS
COUNTY OF GREY

PREPARED FOR:

TONY LESIAK & ISABELLA LEHMANN

PREPARED BY:

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JULY 2018

CFCA FILE NO. 1349-4556

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Revision Number	Date	Comments
Rev.1	Sept 24, 2018	Issued for First Submission

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1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by Tony Lesiak and Isabella Lehmann to prepare a Functional Servicing & Preliminary Stormwater Management Report support the development proposal for a proposed Draft Plan consisting of 22 single detached lots and Zoning By-Law Amendment. The proposed development is located on two properties and is legally described as Plan 529 PT Lot 85 RP;16R2186 Parts 4 & 8, and Plan 529 PT Lot 85 RP;16R2186 Parts 5 & 9 in the Town of The Blue Mountains, County of Grey. The location of the proposed development and the proposed Draft Plan are included as Figure 1 and Figure 2 respectively.

The proposed development, consisting of 22 lots, will be serviced with municipal sanitary, storm, and watermain infrastructure located within the municipal right of way (ROW). Preliminary servicing details have been reflected on the Preliminary Sanitary Routing and Water Distribution Plan included in this report as Figure 3. Grading details have been reflected on the Preliminary Site Drainage Plan included in this report as Figure 4.

This report has been prepared to document details associated with the functional servicing and stormwater management design for the proposed development. Contained in this report is a description of the existing site (Section 2.0); the water servicing strategy (Section 3.0); the sanitary servicing strategy (Section 4.0); the drainage & stormwater management strategy (Section 5.0); proposed utilities (Section 6.0); sediment and erosion control plan (Section 7.0) and a concluding discussion (Section 8.0).

2.0 Site Description

The Subject Property is approximately 2.2 ha and is located in a residential area in the Town of The Blue Mountains north of Highway 26 adjacent to Long Point road.

The property is bounded by:

- Residential properties to the north
- A residential property to the south
- A municipal drainage easement to the west
- Long Point Road to the east

Currently the site is undeveloped and fully treed. The site is relatively flat, with the grades generally descending from southeast to northwest. The site drains into a municipal drain west of the property which conveys flows approximately 1 km north of the site where it outlets to Georgian bay.

The site is currently zoned Residential/Recreational Area per the Town of The Blue Mountains official plan which specifies a maximum single detached density of 10 units/ha. Therefore, 22 units on 2.2 hectors is in conformance will this zoning requirement.

3.0 Water Servicing

The following subsections provide an analysis of the water servicing and fire protection strategy to be used for the Long Point Road development.

3.1 Existing Water Servicing

Per Town of Collingwood as-constructed drawing (DWG 112031-WM1, June 2012) an existing 150mm diameter Town of Collingwood Watermain is located in the Long Point Road right-of-way.

Connection to the Long Point Road watermain to service the development is proposed at the intersection of the development right-of-way and Long Point Road.

3.2 Design Water Demand

The Town of The Blue Mountains Design Criteria (The Blue Mountains Engineering Standards, April 2009) were referenced to calculate water demand flows for the proposed development. A per capita water demand of 450 L/C/day was used with an occupancy density of 2.3 persons/unit. The maximum peak day factor of 2.0 and peak hour factor of 4.50 were applied to the average daily demand flow of 0.26 L/sec to obtain max daily demand and peak hour demand flows. A summary of the results is presented in Table 1 and detailed calculations are provided in Appendix A.

Table 1: Estimated Design Water Demand

Standard	**Average Daily Demand** (L/sec)	**Maximum Daily Demand** (L/sec)	**Peak Hourly Demand** (L/sec)
Town of The Blue Mountains	0.26	0.53	1.19

3.3 Fire Flow Demand

The Fire Underwriters Survey (FUS) and Ontario Building Code (OBC) methods were used to estimate the fire flow requirements for the proposed development. All buildings are assumed to fall into building Class C with a gross floor area (GFA) of 480 sq. m. Table 2 summarizes the fire flow and duration requirements under both OBC and FUS approaches.

Table 2: Estimated Fire Demand Flows

Method	**Demand Flow** (L/sec)	**Duration** (h)
OBC	45	1.25
FUS	67	1.5

The FUS method resulted in a more conservative demand flow for the subdivision. The FUS method specifies a required demand fire flow 67 L/sec for a duration of 1.5 hours for the development. Appendix A contains the FUS and OFM calculations.

3.4 Proposed Water Servicing

A connection to the existing Long Point Road watermain will service the development. This watermain is owned and operated by the Town of Collingwood. Consultation with the Town of Collingwood was undertaken to confirm that there is capacity available to provide the required water pressures and flows to meet the calculated water demand. Sizing of this watermain will need to be confirmed by the Town of Collingwood in the detail design stage per their water model.

4.0 Sanitary Servicing

The following subsections provide an analysis of the servicing strategy for the proposed sanitary sewage system for the Long Point Road subdivision development.

4.1 Existing Sanitary Servicing

Per the Town of Collingwood as-constructed drawing (Nº81042/43-SW5, July 1984) a sanitary manhole labeled #69 (MH#69) is located approximately 140m west of the Highway 26 and Osler Bluff Road intersection. This manhole connects to a gravity sanitary sewer that flows to the Craigleith sewage pumping station, which pumps to the wastewater treatment plant north of the proposed development on Long Point Road.

Two parallel sanitary high pressure forcemains along Long Point Road pump sewage to the Sewage Treatment Plant, located north of the site.

4.2 Sanitary Design Flow

Sanitary design flow calculations were undertaken in accordance with the Town of The Blue Mountains Design Criteria. A per capita sewage flow of 450 L/C/day was used with an occupancy density of 2.3 persons/unit. Infiltration flow of 0.23 L/sec/ha and a peaking factor 4.3 were applied to the sewage flow rate to obtain the total estimated design sewage flow for the site. A summary of the design flows is presented in Table 3 and detailed calculations are provided in Appendix A.

Table 3: Estimated Sanitary Design Flows (22 Units)

Standard	**Average Flow** (L/sec)	**Peaking Factor**	**Peak Flow** (L/sec)	**Infiltration Flow** (L/sec)	**Total Estimated Design Flow** (L/sec)
Town of The Blue Mountains	0.26	4.3	1.12	0.51	1.64

The proposed sanitary sewers will be sized to convey a peak sanitary flow of 1.64 L/sec for the development.

4.3 Proposed Sanitary Servicing

A connection to the high-pressure force mains on Long Point Road for such a small development was ruled out due to the cost of a sewage pumping station required to make this connection. As a result, a servicing connection to the gravity sewer in Highway 26 was evaluated as a preferred route.

The Town indicated that there is available residual capacity in the Highway 26 sewer to service the site. Internal to the site, a low-pressure sewer system can be implemented to collect wastewater from the site and drain to the Highway 26 gravity system.

It has been assumed that partial roadway restoration will be required to install the sewage forcemain along Long Point Road. Consultation with the Town during detailed design would be required to determine a corridor for the forcemain within the right-of-way; the location of the forcemain will determine the necessary roadway restorations. An alternative alignment within the municipal drain easement could also be reviewed at detailed design; this alignment would remove the required stream crossing of Watercourse 1 and reduce community transportation disruptions associated with the road restorations but would require agreements with adjacent landowners to allow the forcemain to pass through with the change of use of the easement.

5.0 Drainage & Stormwater Management

Management of stormwater and site drainage for the proposed development will proceed in conformance with the standards provided by the Town of The Blue Mountains, Grey Suable Conservation Authority (GSCA) and Ministry of the Environment and Climate Change (MOECC).

A stormwater management strategy and accompanying recommendations regarding the proposed development have been included below.

- Safe Stormwater Conveyance
  - Safe conveyance of post development peak flows for all storms up to and including the 100-year to Georgian Bay.
- Water Quality Control
  - "Enhanced Protection" per MOECC
- Development Standard
  - Urban cross section within 20-meter right-of-way
  - Lot grading at 2% optimum
  - Minor/major drainage system to convey frequent rainfall/runoff events

5.1 Existing Drainage

The soil type identified on the site is Granby well sorted sandy washout (Soil Map of Simcoe County, North Sheet, Soil Survey Report No. 29), which is classified as Hydrologic Soil Group B (Design Chart H2-6A, MTO Drainage Manual, 1985). This soil type has been generally confirmed in the Geotechnical Report by Wilson Associates, which identified onsite soils as predominantly glaciolacustrine sand overlying sandy silt till. Drainage from the subject site is predominately sheet flow from the southeast to the northwest and discharges into a municipal drain located at the west limits of the site.

The municipal drain conveys flows north to a culvert that crosses Brophy's Lane. North of Brophy's Lane, stormwater traverses the Town of The Blue Mountains waste water treatment facility lands where it discharges into a small pond northwest of the Treatment Facility's main entrance. Town staff have advised that this pond is an aesthetic feature with no stormwater quality or quantity features. The pond, discharges to a drainage channel flowing north down the Long Point Road west ditch to Georgian Bay.

Based on discussions with The Town of Blue Mountain staff, this municipal drain is currently under review for upgrades to increase the size and capacity of the drain. Increased flows from the proposed development could be accommodated during the drains redesign, if necessary.

5.2 Proposed Drainage

The proposed development consists of an urban cross section roadway complete with curb and gutter with an internal storm sewer system. Front yards will be graded to direct runoff towards the ROW where they will be collected by catchbasins and transported through the storm sewer network. During major storm events, excess flows will be safely conveyed via an overland flow route located between lots 11 and 12. Rear yards will slope to the back of the lots where swales will transport flows west to the municipal drain. Drainage Figure 4 displays the proposed drainage configuration for the site.

Due to the site's proximity to Georgian Bay quantity control is not recommended for this site. Uncontrolled release of storm flows allows runoff from the site to travel safely to the bay prior to peak flow periods in the municipal drain. This will reduce flow requirements in the new drain and provide safe conveyance of flows to Georgian Bay.

5.3 Stormwater Quantity Conveyance

Given the small area of the proposed development property, the analysis of onsite quantity control requirements was performed using the Rational Method, per industry standard. A composite runoff coefficient for the existing and proposed site condition was calculated using values found in the Town of The Blue Mountains (The Blue Mountains Engineering Standards, April 2009) and MTO Standards (MTO Drainage Management Manual, 1997). Table 4 illustrates the determination of pre and post development runoff coefficients.

Table 4: Pre and Post Development Conditions Composite Runoff Coefficient

	Pre Development			Post Development		
Land Use	**Area (ha)**	**Runoff Coefficient***	**A x C**	**Area (ha)**	**Runoff Coefficient***	**A x C**
Catchment	PRE-1 (Front Yards and ROW)			POST-1 (Front Yards and ROW)		
Asphalt	0.00	0.90	0.0	0.25	0.90	0.23
Roof	0.00	0.90	0.0	0.18	0.90	0.16
Lawn	0.15	0.30	0.05	0.45	0.30	0.14
Woodland	0.73	0.25	0.18	0	0.25	0.0
Composite	0.88	0.26	**0.23**	0.88	0.59	**0.53**
Catchment	PRE-2 (Rear Yards)			POST-2 (Rear Yards)		
Asphalt	0.0	0.90	0.0	0.10	0.90	0.09
Roof	0.0	0.90	0.0	0.34	0.90	0.31
Lawn	0.0	0.30	0.0	0.88	0.30	0.26
Woodland	1.32	0.25	0.33	0	0.25	0
Composite	1.32	0.25	**0.33**	1.32	0.54	**0.66**

The calculated composite runoff coefficients were applied in the Rational Method. Rainfall events were modelled using Town of The Blue Mountains IDF data, and a 15-minute time of concentration. Refer to Appendix B for the peak flow results. Note that runoff coefficients for the 25 year and 100-year storms were adjusted per the MTO Standard methodology. The results of the analysis are shown in Table 5. Detailed calculations have been included in Appendix B of this report.

Table 5: Rational Method Storage Volume Results

Storm	**Existing (m^3/sec)**			**Proposed (m^3/sec)**			**Difference (m^3/sec)**
	Front (Pre-1)	**Back (Pre -2)**	**Total**	**Front (Post-1)**	**Back (Post -2)**	**Total**	
5-year	0.04	0.07	0.11	0.12	0.16	0.28	0.17
25-year	0.07	0.11	0.18	0.18	0.24	0.42	0.24
100-year	0.09	0.22	0.31	0.25	0.33	0.58	0.27

As the site is within a short proximately to Georgian Bay, peak flows are to be released uncontrolled into the municipal drain. To summarize the data provide the calculated increase in flows generated from the site for the 5, 25 and 100-year storms were between 170 L/sec to 270 L/sec. Future upgrades to the municipal drain should account for these flows.

5.4 Stormwater Quality Control

A preliminary screening of the most practical stormwater water quality measures to implement on-site was undertaken. Due to the small size of the site an oil/grit separator is the most practical quality control measure. The oil/grit separator will be located on-line with the site storm system, downstream of the last catchbasin as depicted in Figure 4.

To achieve an "enhanced" treatment level required by the MOECC a Stormceptor 2000 selected. Refer to Table 2 included below for a detailed breakdown of proposed oil/grit separator and required performance. Refer to Appendix B for the detailed sizing calculations of the proposed Stormceptor water quality treatment unit.

Table 6: Stormceptor Oil/Grit Sizing Criteria

Catchment	Contributing Drainage Area (ha)	Stormceptor Oil/Grit Separator Unit	Total Suspended Solids Removal (%)	Total Annual Runoff Volume Treated (%)
Internal Sewer	0.88	STC-2000	83	97

Once the oil/grit separator is installed, and operating accordingly to manufacturer's specifications, and assumed by the Town, the TOBM staff will be required to inspect and service the unit on a regular basis per the operations and maintenance manual included in Appendix C, to ensure long term efficiency.

6.0 UTILITIES

The Subject Site is proposed to be serviced with natural gas, telephone, cable TV and hydro. We understand these utilities are available in the Long Point Road right-of-way adjacent the subject site. Coordination with the aforementioned utilities will be undertaken during the detailed design phases to confirm utility design capacity and connection locations.

7.0 SEDIMENT AND EROSION CONTROLS DURING CONSTRUCTION

Sediment and erosion controls will be installed prior to the commencement of any construction activities and will be maintained until the site is stabilized or as directed by the Site Engineer and/or the Town of the Blue Mountains. A Grading & Sediment Erosion Control Plan will be prepared as part of the detailed design package to identify the location of the recommended control features. Controls will be inspected after each significant rainfall event and maintained in proper working condition. A summary of proposed controls to be implemented is included below.

- Silt Fencing

Silt fence will be installed where required to intercept sheet flow. Heavy duty silt fence will be located around the downstream side of the work zone limits. It should be noted that additional silt fencing may be added based on field decisions by the Site Engineer and Contractor 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.

- Dust Suppression

During construction activities, the Contractor will ensure that measures for dust suppression are provided as required.

8.0 Conclusions and Recommendations

Based on the foregoing we conclude that the proposed Subject Property Residential Development can be adequately serviced.

1. Access to the site will be provided by way of roadway connections to Long Point Road.
2. A Preliminary site drainage plan has been completed to demonstrate that overland flow routes can be achieved to the municipal drain.
3. The development will be serviced via an internal low-pressure forcemain sanitary sewer system that will outlet to the Highway 26 gravity sanitary sewer.
4. Domestic water supply for the development will be provided via a connection to the Town of Collingwood Municipal watermain within the Long Point Road right-of-way. System pressures, flows and external improvements will be confirmed with the Town of Collingwood as development approvals proceed.
5. Utilities are available to service the site.

Therefore, we recommend approval of the Planning Applications for the subject lands from the perspective of engineering servicing requirements.

Respectfully submitted,

C.F. CROZIER & ASSOCIATES INC.

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Brendan Hummelen, P.Eng.
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APPENDIX A

Domestic Water and Sanitary Flow Calculations

Water Supply for Public Fire Protection - 1999
Fire Underwriters Survey

Part II - Guide for Determination of Required Fire Flow

1. An estimate of fire flow required for a given area may be determined by the formula:

F = 220 * C * sqrt A

where

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 — Wood Frame Construction

2	number of floors		1.5 C
240	sq.m. floor area	480	sq.m. total floor area
100%	Floor 1		
100%	Floor 2		
0%	Floor 3		
0%	Floor 4		
480	sq.m. total floor area		

Therefore F= 7,000 L/min (rounded to nearest 1000 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 Buring	25%
Combustible	No Charge		

Low fire Hazard occupancy for dwellings — 0% reduction

0 L/min reduction

Therefore UPDATED F= 7,000 L/min (rounded to nearest 1000 L/min)

Note: Flow determined shall not be less than 2,000 L/min

3. Sprinklers - The value obtained in No. 2 above maybe reduce by up to 50% for complete automatic sprinkler protection.

Sprinkler System Assume 0% reduction

0 L/min reduction

Water Supply for Public Fire Protection - 1999
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) esposed, 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**		
Front	35	5%	350
Back	16.7	15%	1050
Left	3.7	20%	1400
Right	3.7	20%	1400
			4,200 L/min Surcharge

Determine Required Fire Flow

No.1	7,000	
No. 2	0	reduction
No. 3	0	reduction
No. 4	4,200	surcharge

Required Flow: **4,000 L/min**
Rounded to nearest 1000l/min: **4,000 L/min** or 66.7 L/s
1,057 USGPM

Determine Required Fire Storage Volume

Flow from above 4,000 L/min

Required duration 2.00 hours

Therefore: 480,000 Litres or
480 cu.m. is the required fire storage volume.

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

Fire Protection Water Supply Guideline
Part 3 of the Ontario Building Code (2006)

$$Q = KVS_{TOT}$$

Q = minimum supply of water in litres (L)
K = water supply coefficient
V = total building volume in cubic metres
S_{TOT} = total of spatial coefficient values from property line exposures on all sides

K =	23.0	Group C/D building with combustible construction (Table 1)
V =	1440	480sqm total floor area by 3m height
S_{TOT} =	2	S_{TOT} Need Not Exceed 2.0

Q = 66240 L

Based on ranges listed in Table 2, the required minimum water supply flow rate is **2700 L/min**

45 L/s

CROZIER CONSULTING ENGINEERS	
	File: 1349-4556 Date: 16-May-18 Updated: 13-Jul-18 By: jl'a Check By:

Long Point Road - Water Design Criteria

Developed Site Area	2.20	ha
Number of Residential Units	22	units
Person Per Residential Unit (per Town of the Blue Mountains Development Standards)	2.3	persons/unit
Residential Population	51	persons
Domestic Water Design Flows		
Residential (per Town of the Blue Mountains Development Standards)	450	L/C-day
Total Domestic Water Design Flows		
Average Residential Daily Flow (per Town of the Blue Mountains Development Standards)	0.26	L/sec
Max Day Peak Factor (per Town of the Blue Mountains Development Standards)	2.00	
Max Day Demand Flow	0.53	L/sec
Peak Hour Factor (per Town of the Blue Mountains Development Standards)	4.50	
Peak Hour Flow	1.19	L/sec
Fire Flow Demand (per FUS and OBC)	67	L/sec
Design Flow (per FUS and OBC)	67.53	L/sec

CROZIER CONSULTING ENGINEERS		File: 1349-4556 Date: 16-May-18 By: jl'a Check By:

<u>Longpoint - Sanitary Flows</u>

Developed Site Area		2.20	ha
Number of Residential Units		22	units
Person Per Residential Unit	(Town of The Blue Mountains Development Standards)	2.30	persons/unit
Residential Population		51	persons
<u>Sanitary Design Flows</u>			
Residential	(Town of The Blue Mountains Development Standards)	450	L/C-day
Infiltration (typical)		0.23	L/s/ha
<u>Total Sanitary Design Flows</u>			
Average Daily Residential Flow		0.26	L/sec
Max Day Peak Factor	(Harmon Formula)	4.3	
Infiltration		0.51	L/sec
Design Flow	(Town of The Blue Mountain Development Standards)	***1.64***	**L/sec**

APPENDIX B

Quality Control Measures & Stormwater Flow Calculations

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PROJECT: Long Point Road Development
PROJECT No.: 1349-4556
FILE: Rational Method - Peak Flow
DATE: 7/11/2018 0:00
DESIGN: JL'A

Rational Method for Long Point Road

Rational Method Q=0.0028*C*i*A (cms)
Intensity i=A/ (Tc+b)^c (mm/hr)

Frequency -	TOWN OF THE BLUE MOUNTAINS SPECIFIED IDF	
Storm Return	Coef. A	Coef. B
2	22.3	-0.714
5	29.1	-0.724
10	33.6	-0.729
25	39.3	-0.734
50	43.5	-0.736
100	47.7	-0.738

Pre Development Peak Flows

Storm Return	Area (ha)	Runoff Coef. - C	Time of Concentration - Tc	Intensity - i	Peak Flow - Q
2	0.88	0.23	15.0	60.00	0.03
5	0.88	0.23	15.0	79.39	0.04
10	0.88	0.23	15.0	92.31	0.05
25	0.88	0.25	15.0	108.72	0.07
50	0.88	0.28	15.0	120.67	0.08
100	0.88	0.29	15.0	132.69	0.09

Post-Development Peak Flows

Storm Return	Area (ha)	Runoff Coef. - C	Time of Concentration - Tc	Intensity - i	Peak Flow - Q
2	0.88	0.60	15.0	60.00	0.09
5	0.88	0.60	15.0	79.39	0.12
10	0.88	0.60	15.0	92.31	0.14
25	0.88	0.66	15.0	108.72	0.18
50	0.88	0.72	15.0	120.67	0.21
100	0.88	0.75	15.0	132.69	0.25

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PROJECT: Long Point Road Development
PROJECT No.: 1349-4556
FILE: Rational Method - Peak Flow
DATE: 7/11/2018 0:00
DESIGN: JL'A

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10	33.6	-0.729
25	39.3	-0.734
50	43.5	-0.736
100	47.7	-0.738

Pre Development Peak Flows

Storm Return	Area (ha)	Runoff Coef. - C	Time of Concentration - Tc	Intensity - i	Peak Flow - Q
2	1.32	0.25	15.0	60.00	0.06
5	1.32	0.25	15.0	79.39	0.07
10	1.32	0.25	15.0	92.31	0.09
25	1.32	0.28	15.0	108.72	0.11
50	1.32	0.30	15.0	120.67	0.13
100	1.32	0.31	15.0	132.69	0.15

Post-Development Peak Flows

Storm Return	Area (ha)	Runoff Coef. - C	Time of Concentration - Tc	Intensity - i	Peak Flow - Q
2	1.32	0.54	15.0	60.00	0.12
5	1.32	0.54	15.0	79.39	0.16
10	1.32	0.54	15.0	92.31	0.18
25	1.32	0.59	15.0	108.72	0.24
50	1.32	0.65	15.0	120.67	0.29
100	1.32	0.68	15.0	132.69	0.33

Stormceptor®

FORTERRA™

Detailed Stormceptor Sizing Report – Long Point Road

Project Information & Location			
Project Name	Long Point Road	Project Number	1349-4556
City	Town of The Blue Mountains	State/ Province	Ontario
Country	Canada	Date	7/11/2018
Designer Information		**EOR Information (optional)**	
Name	Rebecca Alexander	Name	
Company	C.F. Crozier & Associates	Company	
Phone #	905-875-0026	Phone #	
Email	ralexander@cfcrozier.ca	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	Long Point Road
Recommended Stormceptor Model	STC 2000
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	83
PSD	Fine Distribution
Rainfall Station	OWEN SOUND MOE

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	68	83
STC 750	78	92
STC 1000	79	92
STC 1500	80	92
STC 2000	83	97
STC 3000	85	97
STC 4000	88	99
STC 5000	88	99
STC 6000	90	100
STC 9000	93	100
STC 10000	93	100
STC 14000	95	100
StormceptorMAX	Custom	Custom

Stormceptor

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology

Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:

- Site parameters
- Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
- Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
- TSS load
- Detention time of the system

Hydrology Analysis
PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour). Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station			
State/Province	Ontario	**Total Number of Rainfall Events**	4492
Rainfall Station Name	OWEN SOUND MOE	**Total Rainfall (mm)**	18531.0
Station ID #	6132	**Average Annual Rainfall (mm)**	463.3
Coordinates	44°35'N, 80°56'W	**Total Evaporation (mm)**	1082.8
Elevation (ft)	580	**Total Infiltration (mm)**	7375.5
Years of Rainfall Data	40	**Total Rainfall that is Runoff (mm)**	10072.7

Notes
• 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.

Stormceptor® FORTERRA™

Drainage Area	
Total Area (ha)	0.88
Imperviousness %	60.0

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	95.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

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

Stormceptor®

FORTERRA™

Site Name	Long Point Road

Site Details

Drainage Area	
Total Area (ha)	0.88
Imperviousness %	60.0

Surface Characteristics	
Width (m)	188.00
Slope %	2
Impervious Depression Storage (mm)	0.508
Pervious Depression Storage (mm)	5.08
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency	
Maintenance Frequency (months) >	12

Infiltration Parameters	
Horton's equation is used to estimate infiltration	
Max. Infiltration Rate (mm/hr)	61.98
Min. Infiltration Rate (mm/hr)	10.16
Decay Rate (1/sec)	0.00055
Regeneration Rate (1/sec)	0.01

Evaporation	
Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow	
Dry Weather Flow (lps)	0

Winter Months	
Winter Infiltration	0

TSS Loading Parameters	
TSS Loading Function	

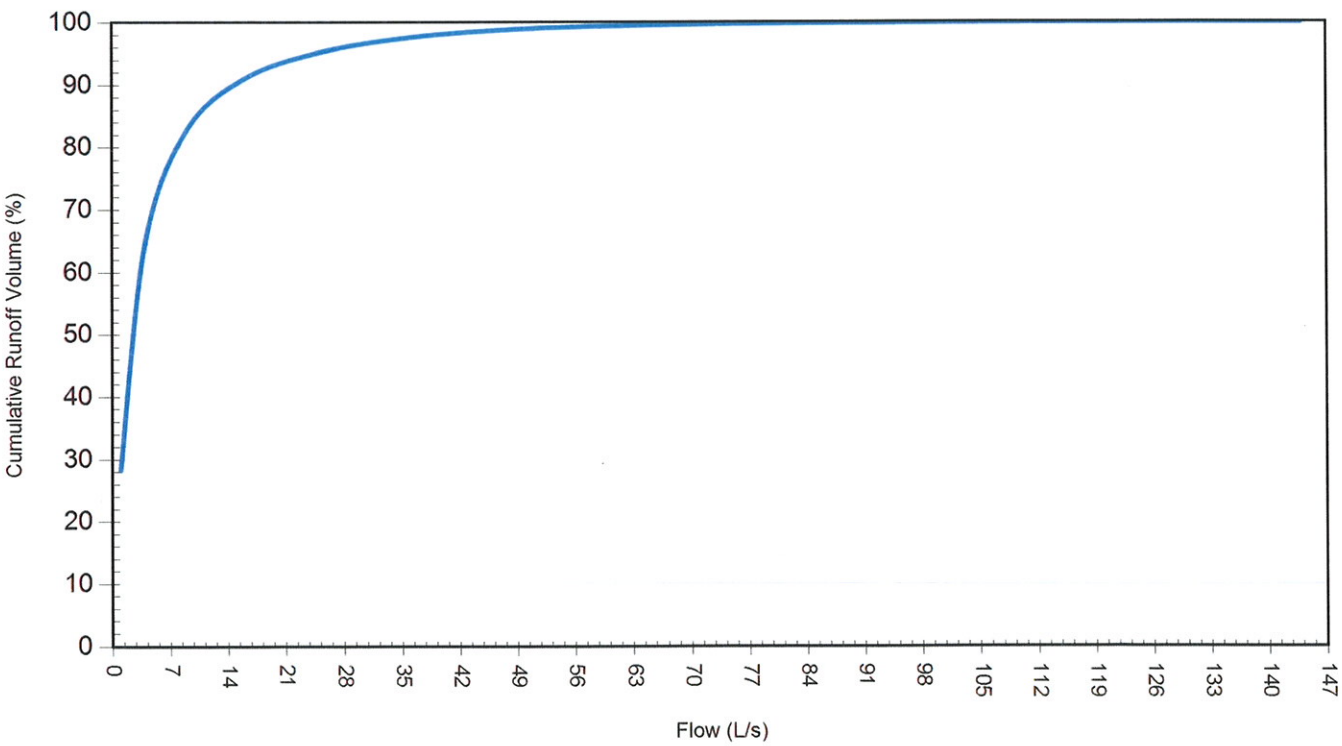
Buildup/Wash-off Parameters	
Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

TSS Availability Parameters	
Availability Constant A	
Availability Factor B	
Availability Exponent C	
Min. Particle Size Affected by Availability (micron)	

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	Runoff Volume (m³)	Volume Over (m³)	Cumulative Runoff Volume (%)
1	25213	63977	28.3
4	57880	31308	64.9
9	73790	15396	82.7
16	81113	8069	91.0
25	84921	4261	95.2
36	87065	2115	97.6
49	88184	996	98.9
64	88704	475	99.5
81	88997	183	99.8
100	89108	72	99.9
121	89149	30	100.0
144	89175	4	100.0

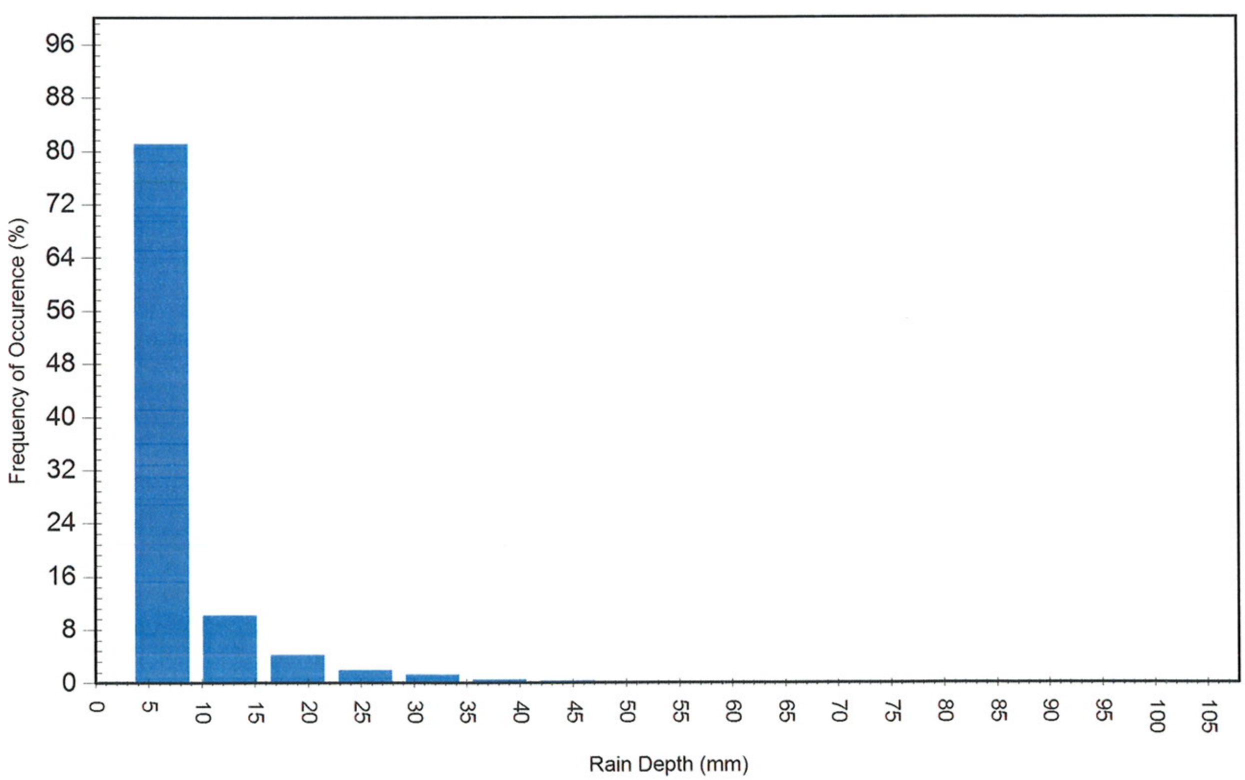
Cumulative Runoff Volume by Runoff Rate

For area: 0.88(ha), imperviousness: 60.0%, rainfall station: OWEN SOUND MOE



Rainfall Event Analysis				
Rainfall Depth (mm)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (mm)**	**Percentage of Annual Volume (%)**
6.35	3645	81.1	5719	30.9
12.70	458	10.2	4102	22.1
19.05	191	4.3	2957	16.0
25.40	89	2.0	1936	10.5
31.75	57	1.3	1599	8.6
38.10	23	0.5	800	4.3
44.45	12	0.3	501	2.7
50.80	10	0.2	472	2.5
57.15	4	0.1	219	1.2
63.50	1	0.0	63	0.3
69.85	0	0.0	0	0.0
76.20	0	0.0	0	0.0
82.55	1	0.0	79	0.4
88.90	1	0.0	84	0.5
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0

Frequency of Occurence by Rainfall Depths

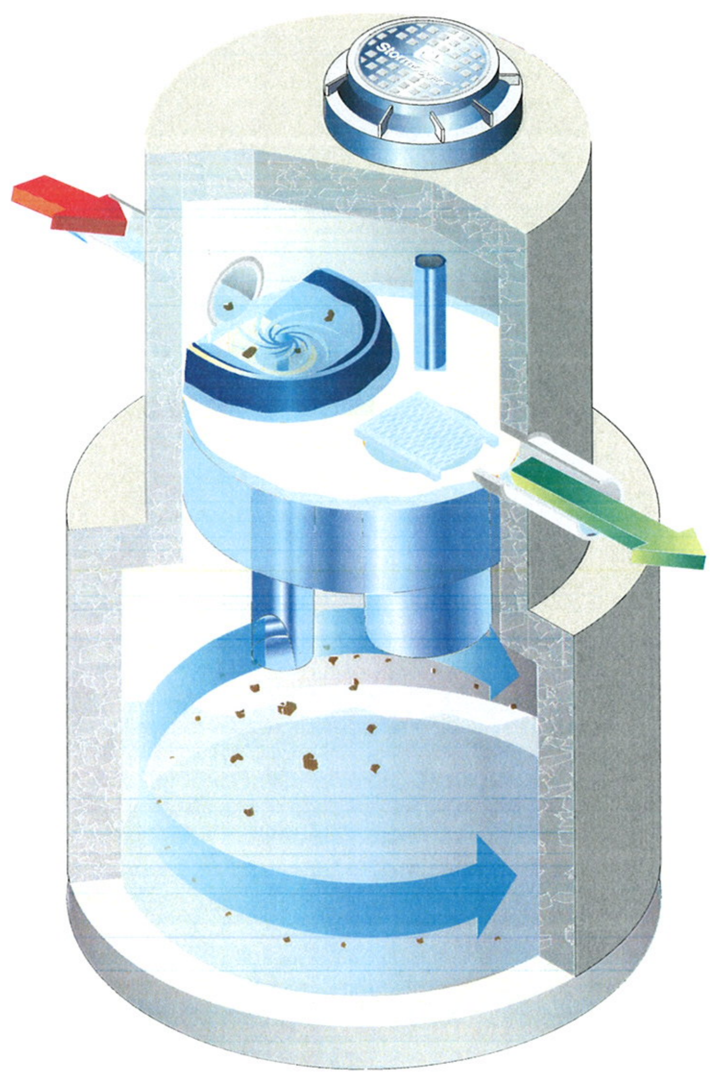


For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

APPENDIX C

Operations & Maintenance Manuals

Stormceptor®
Owner's Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,175,277
Canadian Patent No. 2,180,305
Canadian Patent No. 2,180,338
Canadian Patent No. 2,206,338
Canadian Patent No. 2,327,768
U.S. Patent No. 5,753,115
U.S. Patent No. 5,849,181
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 707,133
Australia Patent No. 729,096
Australia Patent No. 779,401
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Indonesia Patent No. 0007058
Japan Patent No. 3581233
Japan Patent No. 9-11476
Korean Patent No. 0519212
Malaysia Patent No. 118987
New Zealand Patent No. 314,646
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Other Patents Pending

Table of Contents

Congratulations!

Your selection of a Stormceptor® means that you have chosen the most recognized and efficient stormwater oil/sediment separator available for protecting the environment. Stormceptor is a pollution control device often referred to as a "Hydrodynamic Separator (HDS)" or an "Oil Grit Separator (OGS)", engineered to remove and retain pollutants from stormwater runoff to protect our lakes, rivers and streams from the harmful effects of non-point source pollution.

1 – Stormceptor Overview

Stormceptor is a patented stormwater quality structure most often utilized as a treatment component of the underground storm drain network for stormwater pollution prevention. Stormceptor is designed to remove sediment, total suspended solids (TSS), other pollutants attached to sediment, hydrocarbons and free oil from stormwater runoff. Collectively the Stormceptor provides spill protection and prevents non-point source pollution from entering downstream waterways.

Key benefits of Stormceptor include:

- Removes sediment, suspended solids, debris, nutrients, heavy metals, and hydrocarbons (oil and grease) from runoff and snowmelt.
- Will not scour or re-suspend trapped pollutants.
- Provides sediment and oil storage.
- Provides spill control for accidents, commercial and industrial developments.
- Easy to inspect and maintain (vacuum truck).
- "STORMCEPTOR" is *clearly* marked on the access cover (excluding inlet designs).
- Relatively small footprint.
- 3rd Party tested and independently verified.
- Dedicated team of experts available to provide support.

Model Types:

- STC (Standard)
- STF (Fiberglass)
- EOS (Extended Oil Storage)
- OSR (Oil and Sand Removal)
- MAX (Custom designed unit, specific to site)

Configuration Types:

- Inlet unit (accommodates inlet flow entry, and multi-pipe entry)
- In-Line (accommodates multi-pipe entry)
- Submerged Unit (accommodates the site's tailwater conditions)
- Series Unit (combines treatment in two systems)

Please Maintain Your Stormceptor

To ensure long-term environmental protection through continued performance as originally designed for your site, **Stormceptor must be maintained**, as any stormwater treatment practice does. The need for maintenance is determined through inspection of the Stormceptor. Procedures for inspection are provided within this document. Maintenance of the Stormceptor is performed from the surface via vacuum truck.

If you require information about Stormceptor, or assistance in finding resources to facilitate inspections or maintenance of your Stormceptor please call your local Stormceptor Licensee or Imbrium® Systems.

2 – Stormceptor Operation & Components

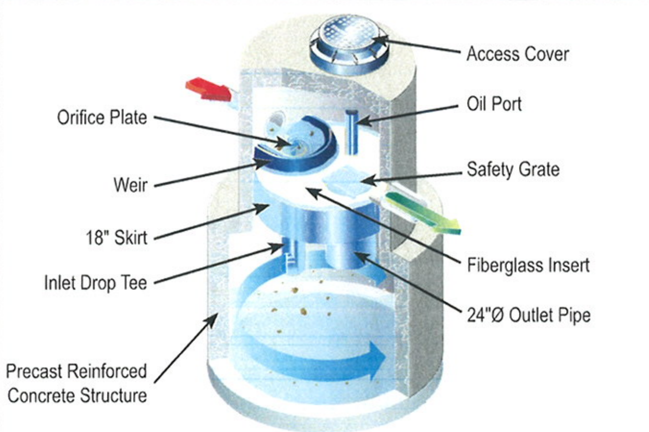
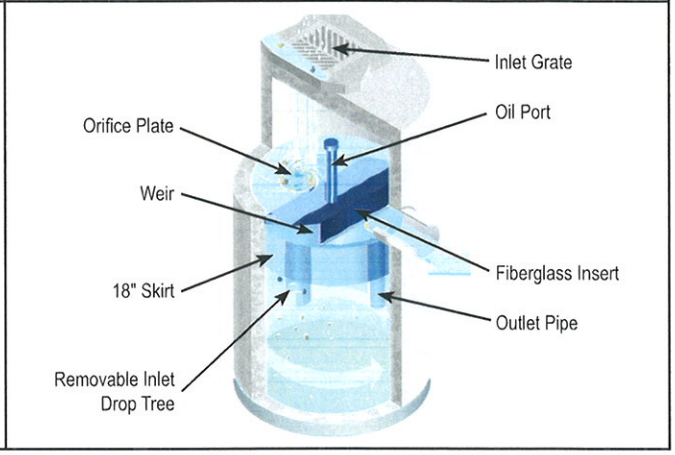
Stormceptor is a flexibly designed underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention using patented flow separation technology.

Stormceptor creates a non-turbulent treatment environment below the insert platform within the system. The insert diverts water into the lower chamber, allowing free oils and debris to rise, and sediment to settle under relatively low velocity conditions. These pollutants are trapped and stored below the insert and protected from large runoff events for later removal during the maintenance procedure.

With thousands of units operating worldwide, Stormceptor delivers reliable protection every day, in every storm. The patented Stormceptor design prohibits the scour and release of captured pollutants, ensuring superior water quality treatment and protection during even the most extreme storm events. Stormceptor's proven performance is backed by the longest record of lab and field verification in the industry.

Stormceptor Schematic and Component Functions

Below are schematics of two common Stormceptor configurations with key components identified and their functions briefly described.

Figure 1. Inline Stormceptor	**Figure 2.** Inlet Stormceptor
	

- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower chamber
- **Orifice plate** – prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower chamber
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vacuum line access port for sediment removal
- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

3 – Stormceptor Identification

Stormceptor is available in both precast concrete and fiberglass vessels, with precast concrete often being the dominant material of construction.

In the Stormceptor, a patented, engineered fiberglass insert separates the structure into an upper chamber and lower chamber. The lower chamber will remain full of water, as this is where the pollutants are sequestered for later removal. Multiple Stormceptor model (STC, OSR, EOS, MAX and STF) configurations exist, each to be inspected and maintained in a similar fashion.

Each unit is easily identifiable as a Stormceptor by the trade name "Stormceptor" embossed on each access cover at the surface. To determine the location of "inlet" Stormceptor units with horizontal catch basin inlet, look down into the grate as the Stormceptor insert will be visible. The name "Stormceptor" is not embossed on inlet models due to the variability of inlet grates used/ approved across North America.

Once the location of the Stormceptor is determined, the model number may be identified by comparing the measured depth from the fiberglass insert level at the outlet pipe's invert (water level) to the bottom of the tank using **Table 1**.

In addition, starting in 1996 a metal serial number tag containing the model number has been affixed to the inside of the unit, on the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the unit using depth measurements, please contact your local Stormceptor Representative for assistance.

Sizes/Models

Typical general dimensions and capacities of the standard precast STC, EOS & OSR Stormceptor models in both USA and Canada/International (excluding South East Asia and Australia) are provided in **Tables 1 and 2**. Typical rim to invert measurements are provided later in this document. The total depth for cleaning will be the sum of the depth from outlet pipe invert (generally the water level) to rim (grade) and the depth from outlet pipe invert to the precast bottom of the unit. Note that depths and capacities may vary slightly between regions.

Table 1A. (US) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (in.)	EOS Model	Insert to Base (in.)	OSR Model	Insert to Base (in.)	Typical STF m (in.)
450	60	4-175	60	65	60	1.5 (60)
900	55	9-365	55	140	55	1.5 (61)
1200	71	12-590	71			1.8 (73)
1800	105	18-1000	105			2.9 (115)
2400	94	24-1400	94	250	94	2.3 (89)
3600	134	36-1700	134			3.2 (127)
4800	128	48-2000	128	390	128	2.9 (113)
6000	150	60-2500	150			3.5 (138)
7200	134	72-3400	134	560	134	3.3 (128)
11000*	128	110-5000*	128	780*	128	
13000*	150	130-6000*	150			
16000*	134	160-7800*	134	1125*	134	

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 1B. (CA & Int'l) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
1500	2.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
11000*	4.0
14000*	3.7

EOS Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
10000*	4.0
14000*	3.7

OSR Model	Insert to Base (m)
300	1.7
750	1.6
2000	2.6
4000	3.6
6000	3.7
9000*	3.6
14000*	3.7

Typical STF m (in.)
1.5 (60)
1.5 (61)
1.8 (73)
2.9 (115)
2.3 (89)
3.2 (127)
2.9 (113)
3.5 (138)
3.3 (128)

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 2A. (US) Storage Capacities

STC Model	Hydrocarbon Storage Capacity gal	Sediment Capacity ft³	EOS Model	Hydrocarbon Storage Capacity gal	OSR Model	Hydrocarbon Storage Capacity gal	Sediment Capacity ft³
450	86	46	**4-175**	175	**065**	115	46
900	251	89	**9-365**	365	**140**	233	58
1200	251	127	**12-590**	591			
1800	251	207	**18-1000**	1198			
2400	840	205	**24-1400**	1457	**250**	792	156
3600	840	373	**36-1700**	1773			
4800	909	543	**48-2000**	2005	**390**	1233	465
6000	909	687	**60-2500**	2514			
7200	1059	839	**72-3400**	3418	**560**	1384	690
11000*	2797	1089	**110-5000***	5023	**780***	2430	930
13000*	2797	1374	**130-6000***	6041			
16000*	3055	1677	**160-7800***	7850	**1125***	2689	1378

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 2B. (CA & Int'l) Storage Capacities

STC Model	Hydrocarbon Storage Capacity L	Sediment Capacity L	EOS Model	Hydrocarbon Storage Capacity L	OSR Model	Hydrocarbon Storage Capacity L	Sediment Capacity L
300	300	1450	**300**	662	**300**	300	1500
750	915	3000	**750**	1380	**750**	900	3000
1000	915	3800	**1000**	2235			
1500	915	6205					
2000	2890	7700	**2000**	5515	**2000**	2790	7700
3000	2890	11965	**3000**	6710			
4000	3360	16490	**4000**	7585	**4000**	4700	22200
5000	3360	20940	**5000**	9515			
6000	3930	26945	**6000**	12940	**6000**	5200	26900
9000*	10555	32980	**9000***	19010	**9000***	9300	33000
11000*	10555	37415	**10000***	22865			
14000*	11700	53890	**14000***	29715	**14000***	10500	53900

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

   **Consist of two chamber structures in series.*

4 – Stormceptor Inspection & Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and is required to insure proper functioning of the Stormceptor. Both inspection and maintenance of the Stormceptor is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity (see **Table 2**). The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.

- Sediment removal is easier when removed on a regular basis at or prior to the recommended maintenance sediment depths, as sediment build-up can compact making removal more difficult.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise Stormceptor performance?

- If construction sediment and debris is not removed prior to activating the Stormceptor unit, maintenance frequency may be reduced.
- If the system is not maintained regularly and fills with sediment and debris beyond the capacity as indicated in **Table 2**, pollutant removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur for the Stormceptor and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor is to be inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins. For typical inspection and maintenance activities, no specific supplemental training is required for the Stormceptor. Information provided within this Manual (provided to the site owner) contains sufficient guidance to maintain the system properly.

In unusual circumstances, such as if a damaged component needs replacement or some other condition requires manned entry into the vessel, confined space entry procedures must be followed. Only professional maintenance service providers trained in these procedures should enter the vessel. Service provider companies typically have personnel who are trained and certified in confined space entry procedures according to local, state, and federal standards.

What equipment is typically required for inspection?

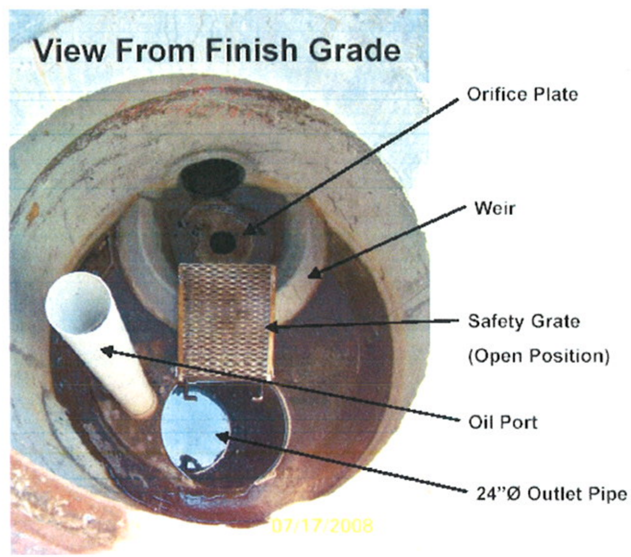
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

Recommended Stormceptor Inspection Procedure:

- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch (100 mm) or 6-inch (150 mm) diameter port.
- Sediment depth can be measured through the oil inspection port or the 24-inch (610 mm) diameter outlet riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

Figure 3.

Figure 4.



What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required

Recommended Stormceptor Maintenance Procedure

Maintenance of Stormceptor is performed using a vacuum truck.

No entry into the unit is required for maintenance. ***DO NOT ENTER THE STORMCEPTOR CHAMBER*** unless you have the proper personal safety equipment, have been trained and are qualified to enter a confined space, as identified by local Occupational Safety and Health Regulations (e.g. 29 CFR 1910.146 or Canada Occupational Safety and Health Regulations – SOR/86-304). Without the proper equipment, training and permit, entry into confined spaces can result in serious bodily harm and potentially death. Consult local, provincial, and/or state regulations to determine the requirements for confined space entry. Be aware, and take precaution that the Stormceptor fiberglass insert may be slippery. In addition, be aware that some units do not have a safety grate to cover the outlet riser pipe that leads to the submerged, lower chamber.

- Ideally maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is to be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
    - For 6-ft (1800 mm) diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch (610 mm) outlet riser pipe.
    - For 4-ft (1200 mm) diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch (305 mm) drop tee hole.

Figure 5.

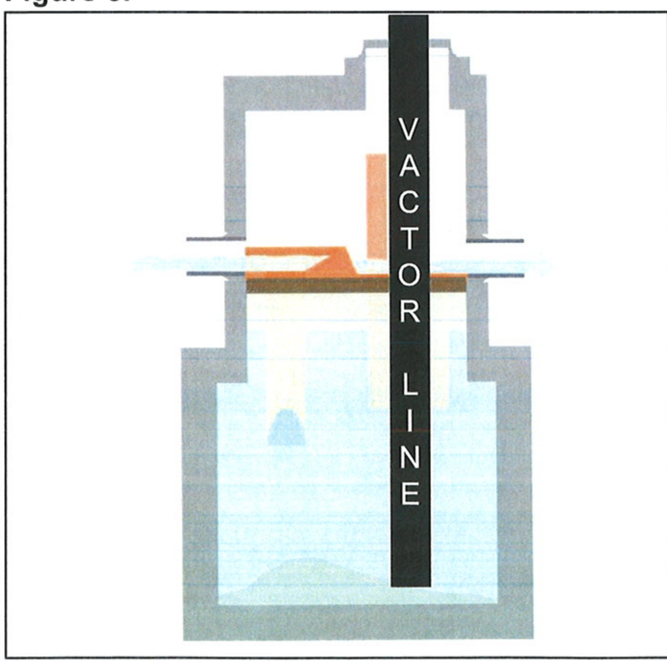
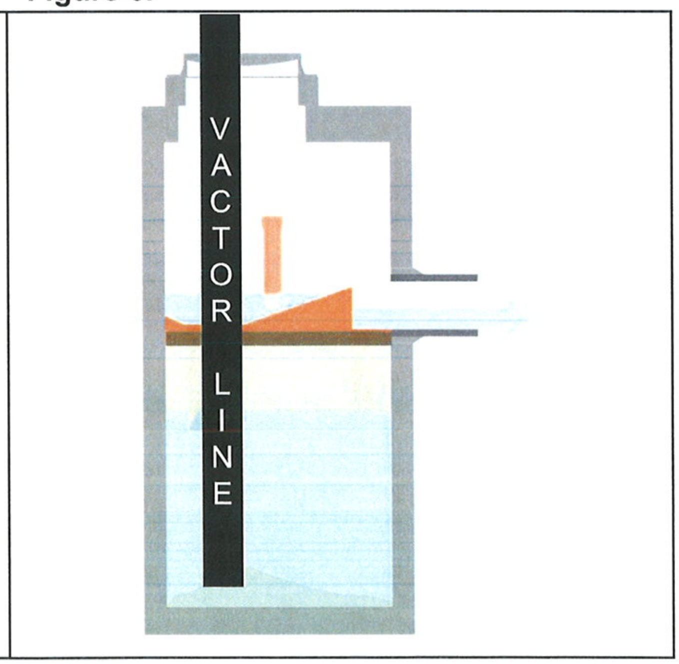


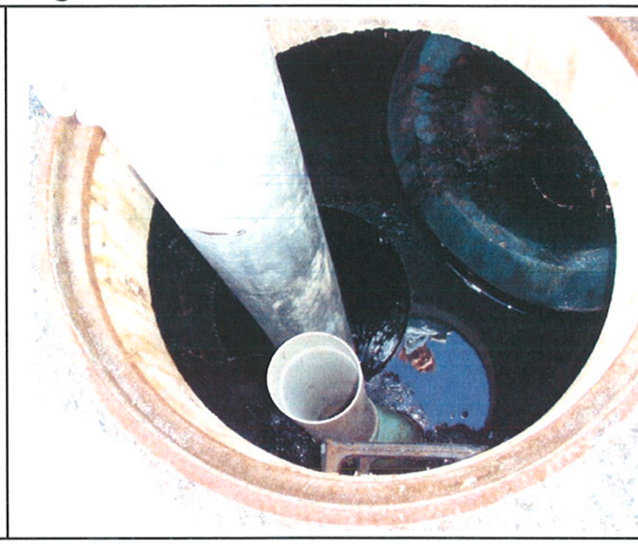
Figure 6.



- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank or to the sanitary sewer, if permitted by the local regulating authority.
- Remove the sediment sludge from the bottom of the unit using the vacuum hose. For large Stormceptor units, a flexible hose is often connected to the primary vacuum line for ease of movement in the lower chamber.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using safe and proper confined space entry procedures.

Figure 7.

Figure 8.



A maintenance worker stationed at the above ground surface uses a vacuum hose to evacuate water, sediment, and debris from the system.

What is required for proper disposal?

The requirements for the disposal of material removed from Stormceptor units are similar to that of any other stormwater treatment Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. This could be site and pollutant dependent. In some cases, approval from the disposal facility operator/agency may be required.

What about oil spills?

Stormceptor is often implemented in areas where there is high potential for oil, fuel or other hydrocarbon or chemical spills. Stormceptor units should be cleaned immediately after a spill occurs by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required in the event of a spill.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a hydrocarbon rainbow or sheen can be seen at very small oil concentrations (< 10 ppm). Stormceptor is effective at removing 95% of free oil, and the appearance of a sheen at the outlet with high influent oil concentrations does not mean that the unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

What factors affect the costs involved with inspection/maintenance?

The Vacuum Service Industry for stormwater drainage and sewer systems is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean Stormceptor units will vary. Inspection and maintenance costs are most often based on unit size, the number of units on a site, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

What factors predict maintenance frequency?

Maintenance frequency will vary with the amount of pollution on your site (number of hydrocarbon spills, amount of sediment, site activity and use, etc.). It is recommended that the frequency of maintenance be increased or reduced based on local conditions. If the sediment load is high from an unstable site or sediment loads transported from upstream catchments, maintenance may be required semi-annually. Conversely once a site has stabilized, maintenance may be required less frequently (for example: two to seven year, site and situation dependent). Maintenance should be performed immediately after an oil spill or once the sediment depth in Stormceptor reaches the value specified in **Table 3** based on the unit size.

Table 3A. (US) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (in)	EOS Model	Maintenance Sediment depth (in)	Oil Storage Depth (in)	OSR Model	Maintenance Sediment depth (in)
450	8	**4-175**	9	24	**065**	8
900	8	**9-365**	9	24	**140**	8
1200	10	**12-590**	11	39		
1800	15					
2400	12	**24-1400**	14	68	**250**	12
3600	17	**36-1700**	19	79		
4800	15	**48-2000**	16	68	**390**	17
6000	18	**60-2500**	20	79		
7200	15	**72-3400**	17	79	**560**	17
11000*	17	**110-5000***	16	68	**780***	17
13000*	20	**130-6000***	20	79		
16000*	17	**160-7800***	17	79	**1125***	17

Note:

1. *The values above are for typical standard units.*

**Per structure.*

Table 3B. (CA & Int'l) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (mm)	EOS Model	Maintenance Sediment depth (mm)	Oil Storage Depth (mm)	OSR Model	Maintenance Sediment depth (mm)
300	225	**300**	225	610	**300**	200
750	230	**750**	230	610	**750**	200
1000	275	**1000**	275	990		
1500	400					
2000	350	**2000**	350	1727	**2000**	300
3000	475	**3000**	475	2006		
4000	400	**4000**	400	1727	**4000**	375
5000	500	**5000**	500	2006		
6000	425	**6000**	425	2006	**6000**	375
9000*	400	**9000***	400	1727	**9000***	425
11000*	500	**10000***	500	2006		
14000*	425	**14000***	425	2006	**14000***	425

Note:

1. *The values above are for typical standard units.*

   **Per structure.*

Replacement parts

Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. Therefore, inspection and maintenance activities are generally focused on pollutant removal. However, if replacements parts are necessary, they may be purchased by contacting your local Stormceptor Representative, or Imbrium Systems.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: ______________________

Allowable Sediment Depth: ______________________

Serial Number: ______________________

Installation Date: ______________________

Location Description of Unit: ______________________

Other Comments: ______________________

Contact Information

Questions regarding the Stormceptor can be addressed by contacting your area Stormceptor Licensee, Imbrium Systems, or visit our website at www.stormceptor.com.

Stormceptor Licensees:

CANADA

Lafarge Canada Inc.
www.lafargepipe.com

403-292-9502 / 1-888-422-4022	Calgary, AB
780-468-5910	Edmonton, AB
204-958-6348	Winnipeg, MB, NW. ON, SK

Langley Concrete Group
www.langleyconcretegroup.com

604-502-5236	BC

Hanson Pipe & Precast Inc.
www.hansonpipeandprecast.com

519-622-7574 / 1-888-888-3222	ON

Lécuyer et Fils Ltée.
www.lecuyerbeton.com

450-454-3928 / 1-800-561-0970	QC

Strescon Limited
www.strescon.com

902-494-7400	NS, NF
506-633-8877	NB, PE

UNITED STATES

Rinker Materials
www.rinkerstormceptor.com
1-800-909-7763

AUSTRALIA & SOUTHEAST ASIA, including New Zealand & Japan

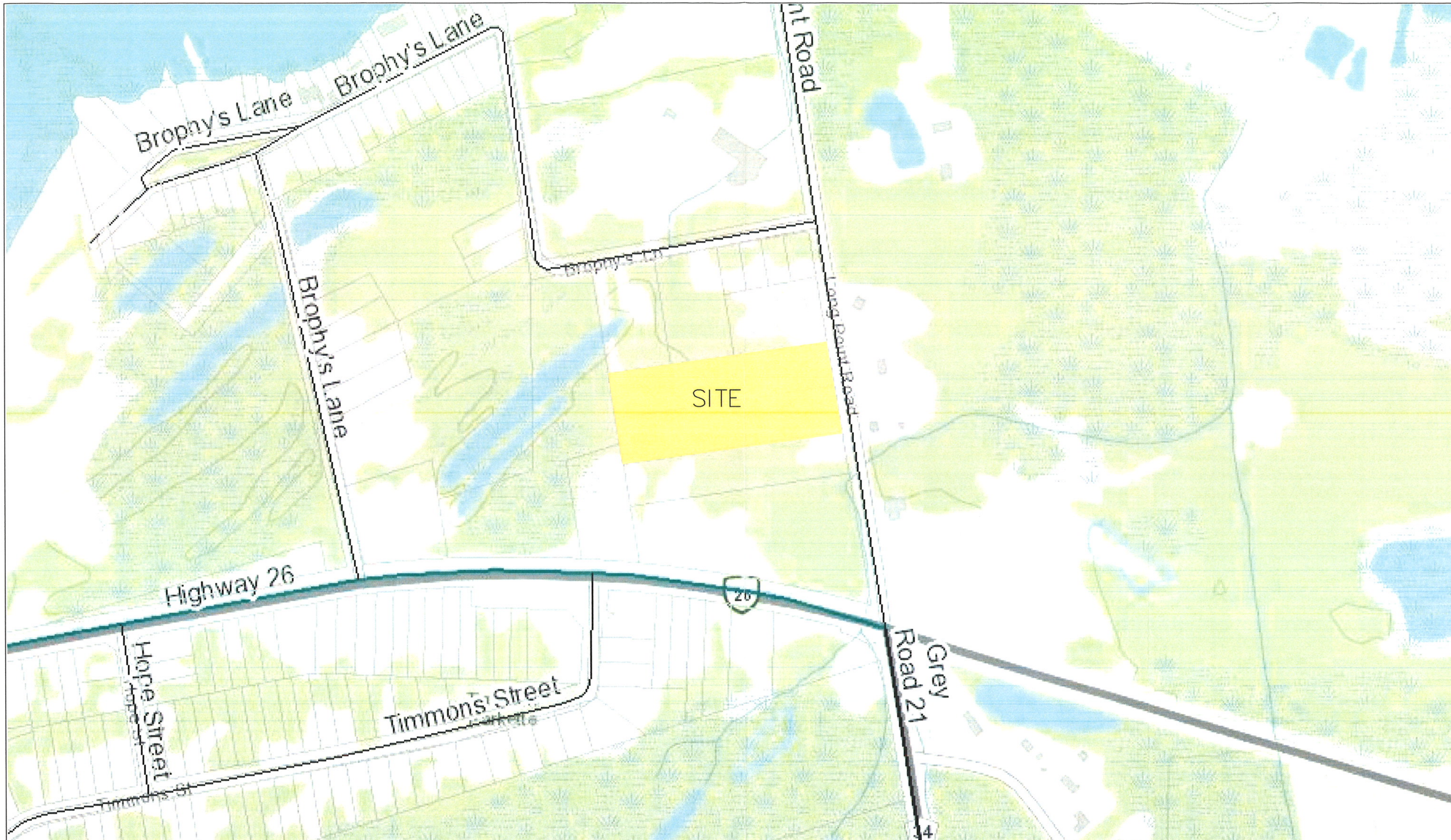
Humes Water Solutions
www.humes.com.au
+61 7 3364 2894

Imbrium Systems Inc. & Imbrium Systems LLC

Canada	1-416-960-9900 / 1-800-565-4801
United States	1-301-279-8827 / 1-888-279-8826
International	+1-416-960-9900 / +1-301-279-8827
Email	info@imbriumsystems.com

www.imbriumsystems.com
www.stormceptor.com

FIGURES



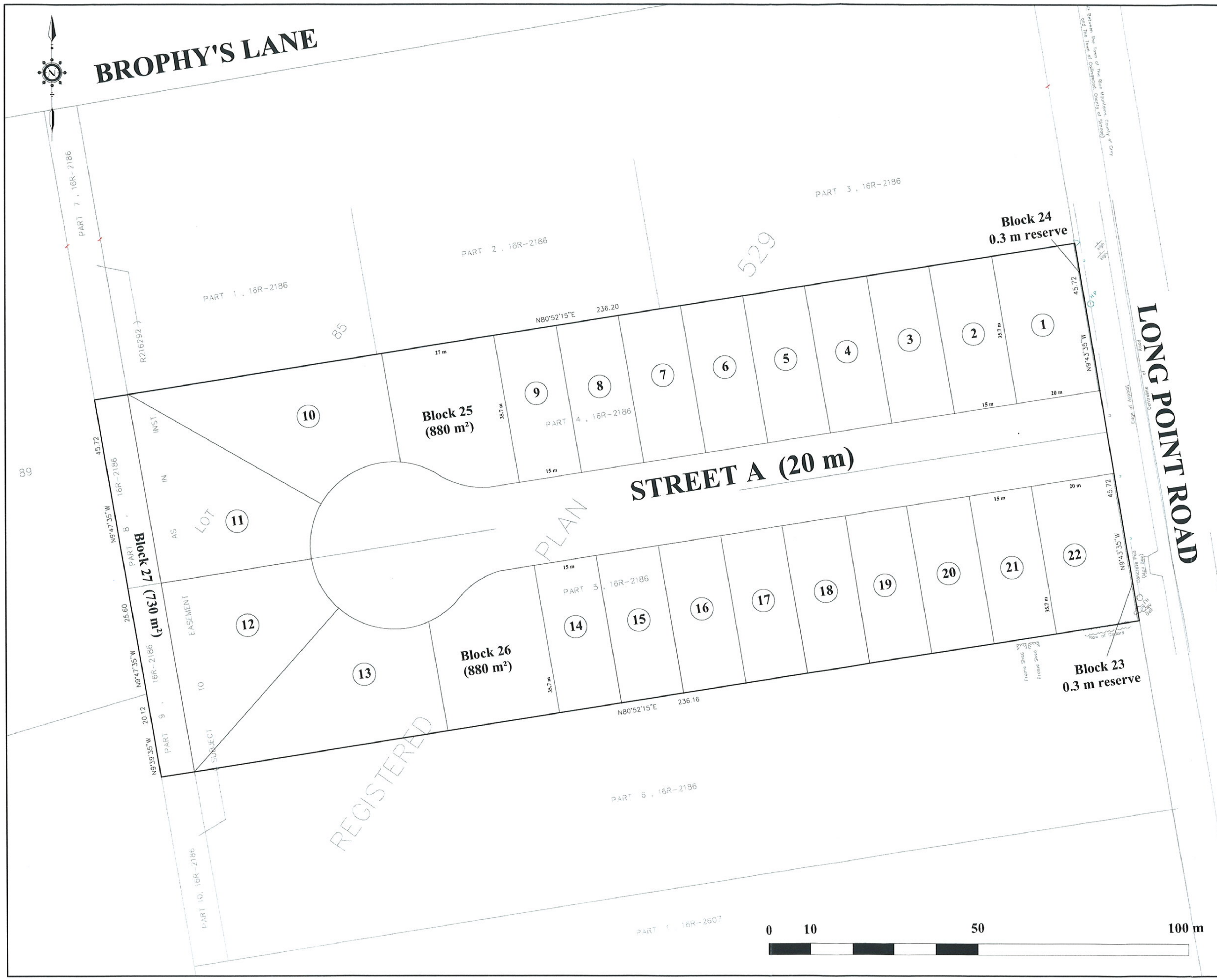
Project: LONGPOINT ROAD

Drawing: SITE LOCATION

CROZIER & ASSOCIATES Consulting Engineers
The HarbourEdge Building, 40 Huron Street, Suite 301, Collingwood, ON L9Y 4R3
705-446-3510 T
705-446-3520 F
www.cfcrozier.ca
info@cfcrozier.ca

Drawn By	Design By	Project 1349-4556

Scale N.T.S.	Date	Check By	Drawing FIG. 1



Draft Plan of Subdivision Long Point Road

Lot 85, Plan 529
RP16R2186

TOWN OF THE BLUE MOUNTAINS
(Formerly Township of Collingwood)
COUNTY OF GREY

SURVEYOR'S CERTIFICATE

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

JUNE, 2018 ______________________
PAUL R. THOMSEN O.L.S.
ZUBEK, EMO, PATTEN & THOMSEN LTD

OWNER'S CERTIFICATE

PASCUZZO PLANNING INC. WAS AUTHORIZED BY TONY LESIAK AND ISABELLA LEHMANN TO SUBMIT THE PROPOSED PLAN OF SUBDIVISION TO THE COUNTY OF GREY FOR APPROVAL.

JUNE, 2018 ______________________
ANDREW PASCUZZO MCIP RPP
PASCUZZO PLANNING INC.

ADDITIONAL INFORMATION REQUIRED UNDER SECTION 51 (17) OF THE PLANNING ACT

(a) AS SHOWN ON DRAFT PLAN,
(b) AS SHOWN ON DRAFT PLAN,
(c) AS SHOWN ON DRAFT AND KEY PLAN,
(d) THE LAND IS TO BE USED ACCORDING TO THE SCHEDULE OF LAND USE,
(e) AS SHOWN ON DRAFT PLAN,
(f) AS SHOWN ON DRAFT PLAN,
(g) AS SHOWN ON DRAFT PLAN,
(h) MUNICIPAL WATER SUPPLY,
(i) SAND,
(j) AS SHOWN ON DRAFT PLAN,
(k) MUNICIPAL SANITARY SEWER,
(l) EASEMENT - MUNICIPAL DRAIN

SCHEDULE OF LAND USE

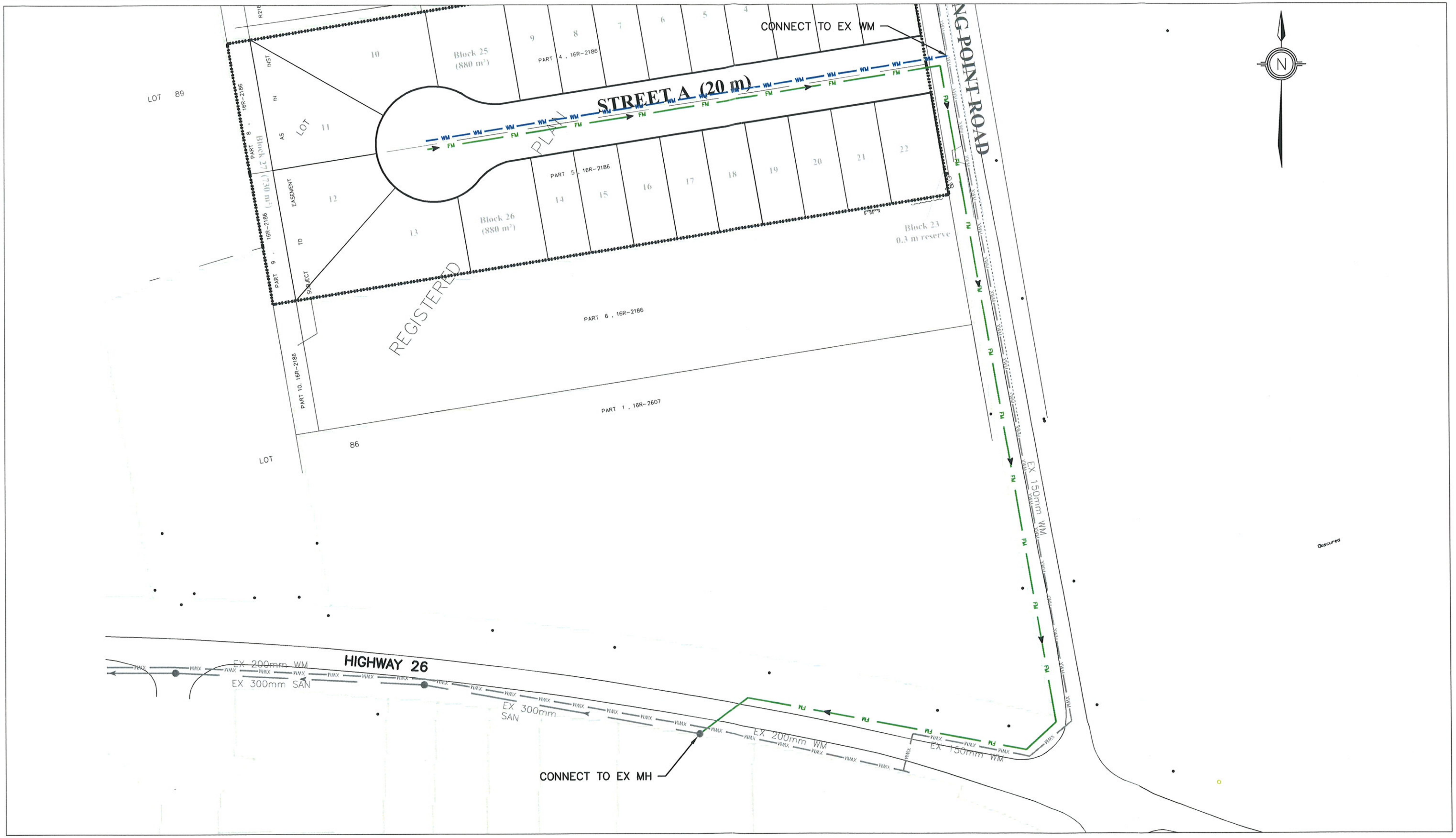
	UNITS	AREA
SINGLE-FAMILY RESIDENTIAL (LOTS 1-22)	22	1.48 ha.
1 FOOT RESERVES (BLOCK 23 and 24)		0.002 ha.
OPEN SPACE (BLOCK 25-27)		0.25 ha.
ROAD (STREET A)		0.43 ha.
TOTAL	22	2.16 ha.

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

PROJECT: 892-17	DRAWN: AP	DATE: JUNE 2018

DWG: 892-17-DP1

PASCUZZO PLANNING INC.



— WM — PROPOSED WATERMAIN
— FM — PROPOSED SANITARY FORCEMAIN

Project: LONG POINT ROAD SUBDIVISION

Drawing: WATERMAIN AND FORCEMAIN

CROZIER CONSULTING ENGINEERS
8 Market Street
Suite 600
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416-477-3392 T
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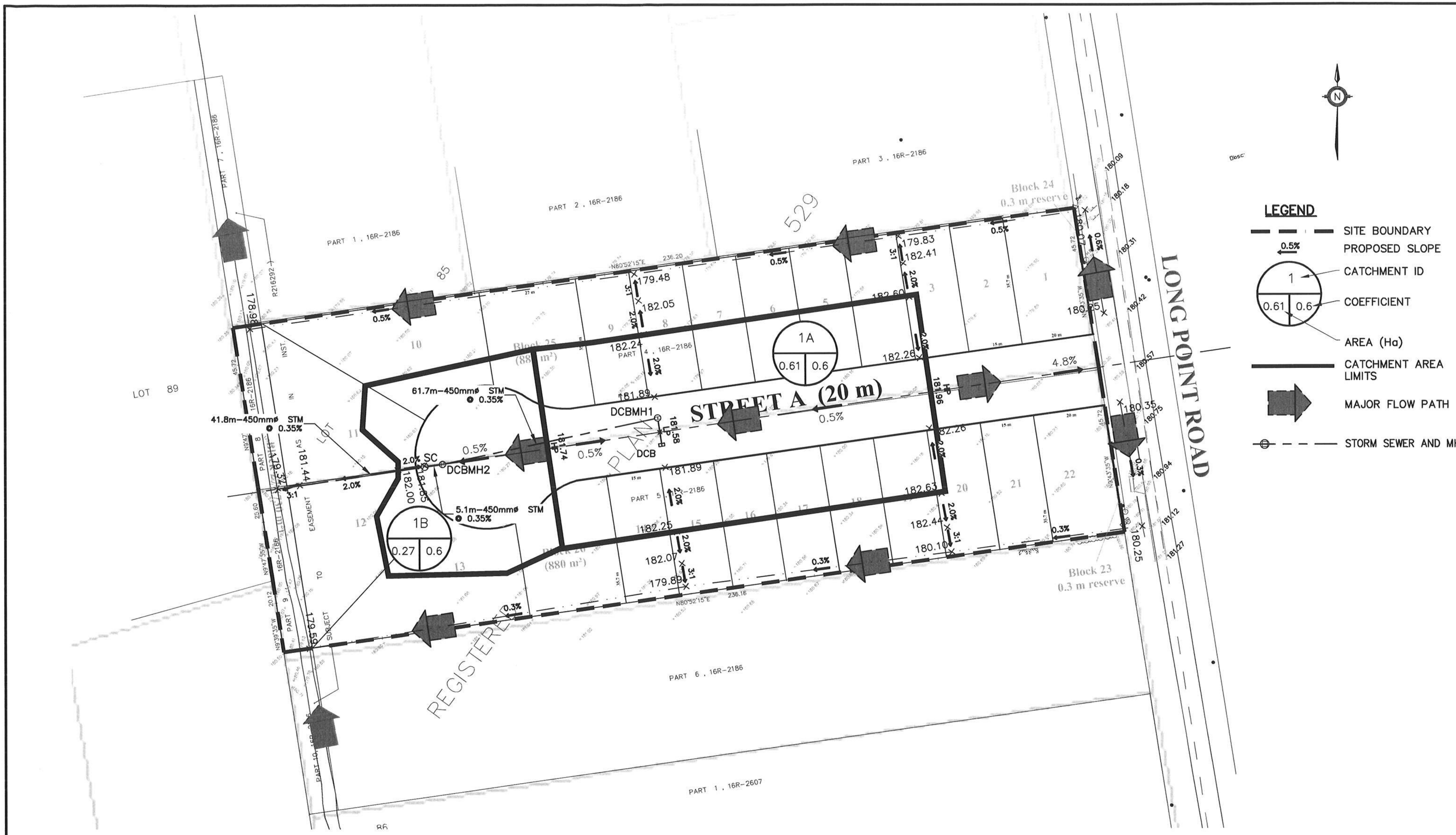
Drawn By	M.V.R.	Design By	M.V.R.	Project	1349–4556
Scale	1:1250	Date	07/17/2018	Check By	J.L.	Drawing	FIG 3

J:\1300\1349-Tony Lesiak\4556-Longpoint Rd\CAD\CIVIL\1SHEET\WORKING\1349-4556 -Fig 3.dwg, Fig 3, 2018-07-23 12:14:59 PM, mrichardson



Project	LONG POINT ROAD SUBDIVISION
Drawing	GRADING AND STORM SEWER

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Drawn By	M.V.R.	Design By	M.V.R.	Project	1349-4556
Scale	1:1000	Date	07/17/2018	Check By	E.E.E./F.F.F.	Drawing	FIG 4