blueprint2build

Stormwater Management Study Report

Prepared For:

INVECTA DEVELOPMENT (OTTAWA) CORPORATION

Site:

1622 Roger Stevens Drive

Ottawa, Ontario.

Prepared By:

blueprint2build

May 23, 2018 – Rev 1.

Sergey Kiselyov, P.Eng.
14 Cardico Drive, Unit 1A-W,
Stouffville, ON. L4A 2G5

1 Introduction

1.1 Site Information

This report is for the site located at 1622 Roger Stevens Drive (Regional Road 6), Ottawa (150m west from intersection of Roger Stevens Drive and Dorack Drive). Legal description of property is Part of Lot 21, Concession 1, Part 1, Plan 5R-4485, Geographic Township of North Gower, City of Ottawa, Province of Ontario. The existing site is a developed lot with 1 building currently used as an Art Gallery, second building is a residence and associated parking area.

Image 1 - Site Location – Image form Google Earth

The property owner intends to redevelop the existing property and the proposed development will consist of; a one storey convenience store with food partner, and a gas bar complete with underground fuel storage tanks, dispenser's islands and associated canopy structure.

1.2 Report Background

This storm water study report is being prepared on behalf of INVECTA DEVELOPMENT (OTTAWA) CORPORATION to address the municipal requirements for a Storm Water Management (SWM) report and Ministry of Environment and Climate Change (MOECC).

This SWM report will provide details for storm water quality and quantity control to ensure that the proposed development will not have any adverse effects on the existing site drainage conditions.

1.3 Objective of SWM Study

The objectives of the SWM study are:

- Identify the storm water runoff (quality and quantity) impacts to the existing drainage networks from the developed site.
- Address any concerns from the City of Ottawa and Ministry of Environment and Climate Control (MOECC) regarding quality and quantity control.
- Demonstrate that the proposed new site development complete with new drainage system is safe for operational use and will have no adverse effects to the site and surrounding existing drainage system.

1.4 Information Sources

This report is based on information that was obtained from the following agencies.

- Ministry of Environment – Stormwater Management Planning and Design Manual
- City of Ottawa Infrastructure Standards and Specifications, Servicing Study Guidelines for Development Applications.

2 SWM Design

2.1 Site Design

The stormwater management servicing strategy proposed for the development has been prepared utilizing the City of Ottawa Instruction and Guidelines, abiding by the following guidelines.

- Currently there are no specific SWM design criteria that have been developed for this area but the submission should demonstrate through appropriate analyses that the proposed development will not result in water quality or quantity impacts to the receiving watercourse.
- It was proposed Post-Development flow for all storm events must not exceed Pre-Development Flow for the same storm event.
- On-site storm infrastructure must have a capacity to accommodate a **1 in 5 Year** storm event with a planned and designed **100-Year** over-land flow route.
- Run off from site to be treated to Enhance Level of protection established by MOE 8**0%** of TSS to be removed with 9**0%** of all run off to be treated.

2.2 Pre-Development Conditions

At present, the site is a developed piece of land with an art gallery and residential building complete with associated parking areas. The project site within the property boundary is a 0.413ha site located at 1622 Roger Stevens Drive, 150m west from intersection of Roger Stevens Drive and Dorack Drive Geographic Township of North Gower, City of Ottawa, Ontario. Existing site cover consist of a building, asphalt and landscaped surfaces. Currently the site does not have any storm network. Under pre-development condition the North portion of site surface drains uncontrolled towards the road side ditch of Roger Stevens Drive. West portion of the site is approximately 0.554ha and drains to adjacent land towards Steven's Creek. This land belongs to The Rideau Valley Conservation Authority (RVCA). The site is entirely located outside of the RVCA Flood plan Limit. For additional details see Figure 1.

2.3 Post Development Conditions

The client intends to demolish all existing site structures including the art gallery, residential building and re-develop the whole site to include the following:

- one story convenience store (complete with a food partner),
- gas bar complete with:
  - underground fuel storage tanks
  - fuel dispenser's islands
  - associated canopy structure
- and, all new parking and landscaped areas.

For access and egress to the site it is proposed to maintain two existing site entrances to Roger Stevens Drive. The site will share the East entrance with the adjacent property (Funeral Home). The new development includes new curbs to properly delineate site entrances, access, and parking areas. The site will be re graded to ensure that it is self-contained in terms of stormwater flow management. Due to existing drainage conditions and significant up to 3.0m. drop of elevations the site will continue to direct runoff from 0.0553ha of the landscaped areas to the adjacent land on the west towards Steven's Creek. Under post development condition no increase of runoff for this landscape strip is proposed, no overland flow control compensation of runoff from these areas is deemed necessary and or is feasible for the landscaped strips. For storm water management calculation of the area within a drainage boundary of site will be compared.

For design purposes the run off from the drainage boundary of site, will be compared with same corresponding area for pre-development condition. The resulting overland flow will be directed to the road side ditch of Roger Stevens Drive. It is proposed to introduce a new storm system in the developed area. The new storm system will collect all the onsite water from the site including the roof top of all structures and divert the flows to the Roger Stevens Drive Road Side Ditch through quantity control underground chambers. This storm chamber will provide additional infiltration and sediment removal from site, improving downstream condition in receiving watercourse. For further details see drawing C01, C02 and Figure 2. This runoff from the gas bar (including all roof tops) will be treated in the proposed new Oil / Grit separator Stormceptor (EOS 750) to Enhance levels of protection.

The proposed new storm sewer system for the site is designed to convey peak flow rates for the 5-year storm event under post-development conditions.

2.4 Allowable Flow

As per the stormwater management strategy outlined on the post development condition, the stormwater runoff generated on site will be collected by the storm drainage system and then the treated flows will be directed to the road side ditch of Roger Stevens Drive through a restrictor plate for quantity flow controls. The stormwater will then run through an Oil/Grit Separator (EOS 750) with extra hydro carbon storage) that provides the quality control before discharging to the ditch.

Post-development hydrologic conditions for the controlled portion of the site were established utilizing the current City of Ottawa standards, including the current 2-Year to 100-Year MOE IDF data.

A conservative surface run-off coefficient of 0.90 was used for impervious surfaces (i.e. Roof drainage and parking area), and 0.3 was used for pervious surfaces (i.e. landscape areas). The weighted surface run-off coefficient calculated to be 0.502 for existing and 0.819 for proposed conditions respectfully.

Table 1. Below shows the pre and post development coefficients for the site controlled area.

Surface Composition		Impervious	Pervious	Combined
Existing Condition	(m^2)	1205.900	2370.50	3576.40
	(ha)	0.121	0.237	0.358
Runoff Coefficient		0.900	0.300	0.502

Surface Composition		Impervious	Pervious	Combined
Proposed Condition	(m^2)	3095.10	481.30	3576.40
	(ha)	0.310	0.048	0.358
Runoff Coefficient		0.900	0.300	0.819

Table 1-Pre and Post Development Runoff Coefficients

Rainfall intensity (*I*) is calculated based on MOE IDF Curves (Ottawa Macdonald Cartier Airport).

$I_{100}= A*T^{B}$

Where I_{100}: Rainfall Intensity

A: Coefficient

B: Exponent

T: Time of concentration in hours

$I_{100}=50*0.1666^{-0.686} = 170.96mm/h$

The 100-Year pre-development peak flow is:

$$Q = 0.00278\ C\ I\ A \quad \leftarrow Equation(1)$$

$$\begin{aligned} Where\ Q &:= Maximum\ Runoff\ Rate(m^3/sec) \\ C &:= Runoff\ Coefficient \\ I &:= Rainfall\ Intensity(mm/hr) \\ A &:= Drainage\ Area\,(ha) \end{aligned}$$

$Q = 0.00278\ x\ 0.502\ x\ \frac{170.96mm}{hr} x\ 0.3576ha =\ 0.0853\frac{m^3}{sec}$, the results of peak flow rates Q (m^3/sec) for the time of concentration 10 min generated by the “Rational Method” for existing and proposed conditions are shown on Table 2.

Storm Event	Rainfall Intensity (mm/hr)				<Equation 1> Flow Rate (m^3/sec)		
	a	b	c	I	Existing	Proposed	Excess Flow
2-Year	21.8	0.0	-0.704	76.98	0.0384	0.0627	0.0242
5-Year	29.3	0.0	-0.696	102.00	0.0509	0.0830	0.0321
10-Year	34.3	0.0	-0.693	118.76	0.0593	0.0967	0.0374
25-Year	40.6	0.0	-0.689	139.57	0.0696	0.1136	0.0439
50-Year	45.3	0.0	-0.688	155.45	0.0776	0.1265	0.0489
100-Year	50.0	0.0	-0.686	170.96	0.0853	0.1391	0.0538

Table 2-Controlled Area Peak Flows 2 to 100 Years Storm Events)

2.5 Quantity Control

To satisfy the proposed requirements, the runoff generated by storms for predevelopment condition up to and including the 100-year event must be controlled to the same storm event.
Maximum allowable release rate is generated by 100 years storm:

$$Q_{\text{allowable}} = 0.0853 \text{ m}^3/\text{sec}$$

To mitigate the impacts of the proposed development, onsite storage and flow control is provided using an orifice pipe restrictor located at outlet of proposed manhole CB MH 1 to limit the release rate to the 100-Year pre-development condition.

Sizing of the orifice is given by the formula:

$$Q = CA\sqrt[2]{2gh}$$

Were Q= Flow rate through orifice (m^3/sec) = $Q_{\text{allowable}}$
C= Contraction coefficient =0.8 (for orifice pipe)
A= Area of orifice pipe cross section (m^2)
g= Acceleration due to gravity (m/sec^2) = 9.81(m/sec^2)
h= Pressure head to be dissipated (m)

The maximum possible water level of on-site ponding during a major storm event is 362.25 m. By trial and error calculations a 150mm diameter orifice pipe is required to control the flow rate to 100 Year Storm Event pre-development levels (0.0858 m^3/s).

$$Q(_{\text{orifice}}) = (0.8)\pi\left(\frac{0.15}{2}\right)^2 \sqrt{2(9.81)(90.38 - (88.62 + 0.150/2))}$$

=0.0815 m^3/sec ≤ 0.0853 m^3/sec (Predevelopment 100-Year Storm Allowable Rate)

Based on the chosen 150mm diameter orifice pipe the actual required retention volume is calculated using the "Modified Rational Method" as shown on Table 3.

Stm Event	Td	Id	Qpost	Qorifice	Excess Flow	Volume(cum)
	5	275	0.2240	0.0815	0.142447982	42.73439452
	7	218	0.1778	0.0815	0.096282976	40.43884998
	10	171	0.1392	0.0815	0.057690548	34.6143286
	15	129	0.1054	0.0815	0.023886507	21.49785638
	20	106	0.0865	0.0815	0.00500746	6.008951534
100 Year	25	91	0.0743	0.0815	-0.007274761	-10.91214174
	30	80	0.0655	0.0815	-0.016004281	-28.80770637
	Max Volume Required				cum	**42.73**

Table 3-Required Storage Volume (100 Year Storm Event)

As per Table3 above 42.73 m^3 of on-site storage is required during the 100 Year Storm Event.

The required storage will be achieved by utilizing underground chamber, drainage structures and pipe(s) storage. No asphalt surface storage is proposed for this project.

Table 4 below shows how the required storage is provided.

Structure	**Diameter (mm)**	**Area (m^2)**	**Maximum. Water level**	**Invert**	**Volume (m^3)**
CB#1	600x600	0.36	90.38	88.93	0.52
Sum					**0.52**

U/G Conduit	**Diameter (m)**	**Area (m^2)**	**Length (m)**	**Volume (m^3)**
1	150.00	0.02	19.70	0.35
2	200.00	0.03	55.50	1.74
Sum				**2.09**

Total Provided Storage Volume (m^3)	
Catch Basins & Manholes	0.52
Underground Conduits	2.09
Undeground Storage	43.00
Total Provided	**45.61**

Table 4-Provided On-Site Storage

As per Table 5 above the maximum storage provided on site is 45.61 m^3 which exceeds the required storage volume of 42.73 m^3.

When the Storm Event exceeds the 100 Year Storm the water level reaches 90.38 m and all the storage capacity of the system is exceeded, the system will discharge via overland flow at elevation 90.52 towards the west access driveway onto Road side ditch on Roger Stevens Drive Right of Way.

2.6 Quality Control

For quality control purposes, installation of a Stormceptor EOS 750 unit at system discharge is proposed for the "ENHANCE LEVEL" of total suspended solids (TSS) removal. Sizing of the Stormceptor is based on guidelines provided by the manufacturer. The "*Stormceptor EOS 750*" sizing report is attached for reference.

Based on the Stormceptor sizing calculations, it is determined that use of the EOS-750 as a standalone device for 84% removal of total suspended solids (TSS) and 98% of runoff capture for the SWM area under consideration is sufficient (Appendix – PCSWMM detail report).

As defined by the MOE in the Certificate of Approval the operation and maintenance of the Stormceptor is the responsibility of the owner which states:

> "*The Owner shall design, construct and operate the oil/grit separator with the objective that no visible oil sheens occur in the effluent discharged from the oil/grit separator.*
>
> *The Owner shall carry out and maintain an annual inspection and maintenance program on the operation of the oil/grit separator in accordance with the manufacturer's recommendation.*
>
> *After a two (2) year period, the District Manager of the MOE District Office may alter the frequency of inspection of the oil/grit separator if he/she is requested to do so by the Owner and considers it acceptable upon review of information submitted in support of the request."*

2.7 Erosion and Sediment Control during Construction

The erosion potential of the study area was assessed using methods described in the "*MTO Drainage Management Manual*" of temporary erosion and sediment control measures suitable for construction sites close to highways.

During Site construction, various temporary measures will be implemented to prevent the discharge of sediment laden Stormwater from the Site. These measures include silt fencing, catch basin buffers and mud-mats as shown on C01 - Grading Plan.

In addition to the above, the following "good housekeeping" measures are recommended:

- All exposed soil shall be stabilized as soon as possible with a seed and mulch application as directed by the Engineer.
- No construction activity or machinery shall intrude beyond the silt/snow fence or limit of construction area. All construction vehicles shall leave the site at designated locations as shown on the plans.
- Stockpiles of soil shall be set back from any watercourse and stabilized against erosion as soon as possible. A set back of at least 15m from any top-of-bank, watercourse or pond is required.
- Cleaning and repairs of mud-mats and any other temporary sediment control measures shall be completed as deemed necessary through regular inspection.
- Sediment/silt shall be removed from the sediment control devices after storm events and deposited in areas as approved by the engineer.
- All re-graded areas within the development which are not occupied by buildings, roadways, sidewalks, or driveways shall be top-soiled and sodded/seeded immediately after completion of final grading operations as directed by the engineer.

3 Summary and Conclusions

In summary, all required conditions of the City of Ottawa have been satisfied as follows:

- There is no increase in Stormwater flow from the Site.
- The SWM facilities provide Enhanced Level of treatment.
- The Sediment and Erosion Control Plan demonstrates how erosion and sedimentation will be minimized during construction

This SWM Report satisfies all requirements for stormwater quantity, quality, and sedimentation and erosion control.

If you have any questions, please do not hesitate to contact the undersigned.

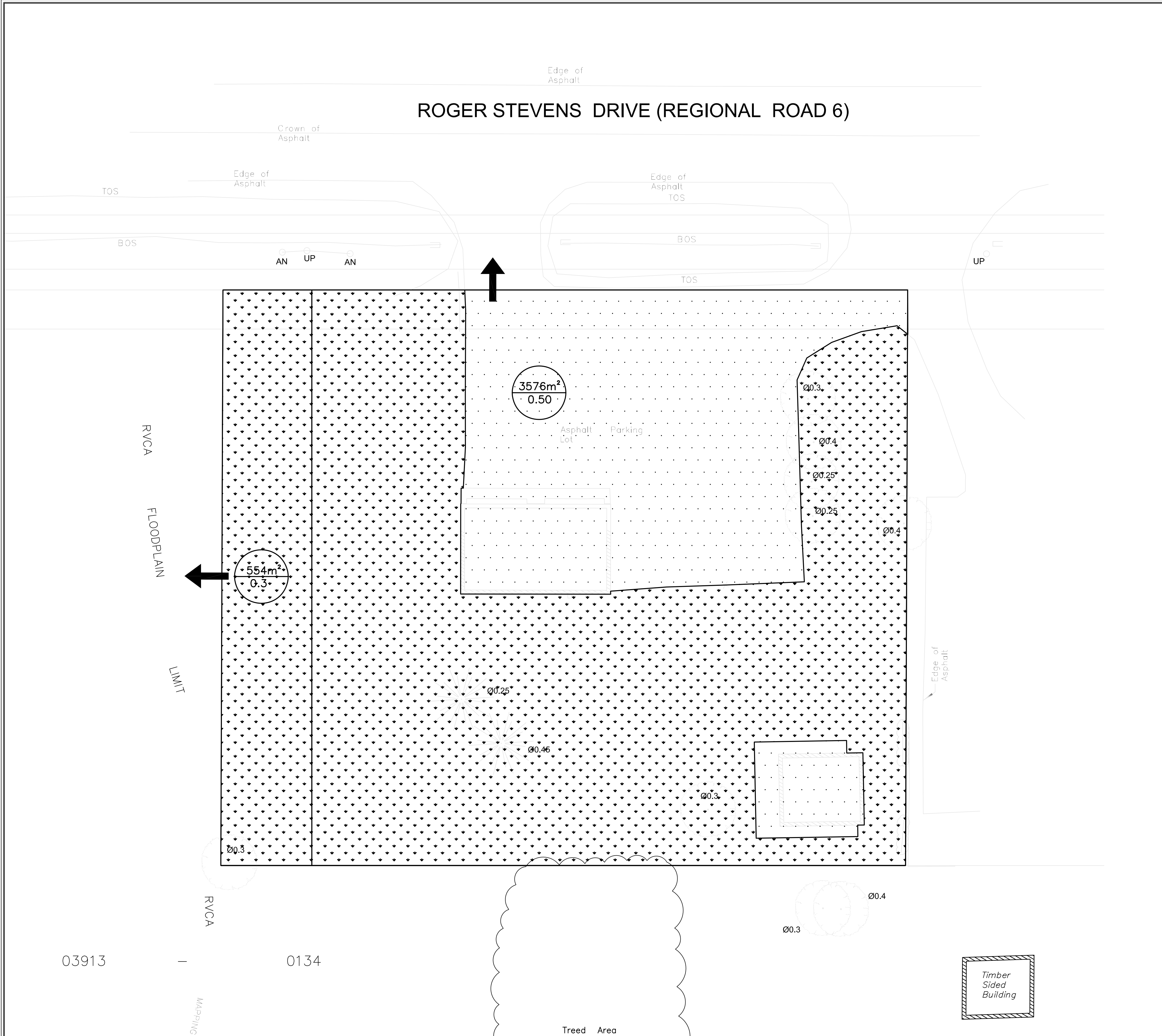
Respectfully submitted,

Blueprint2build

June 19, 2018

Sergey Kiselyov, P.Eng.

Appendix A – Figure 1. Pre Development Condition



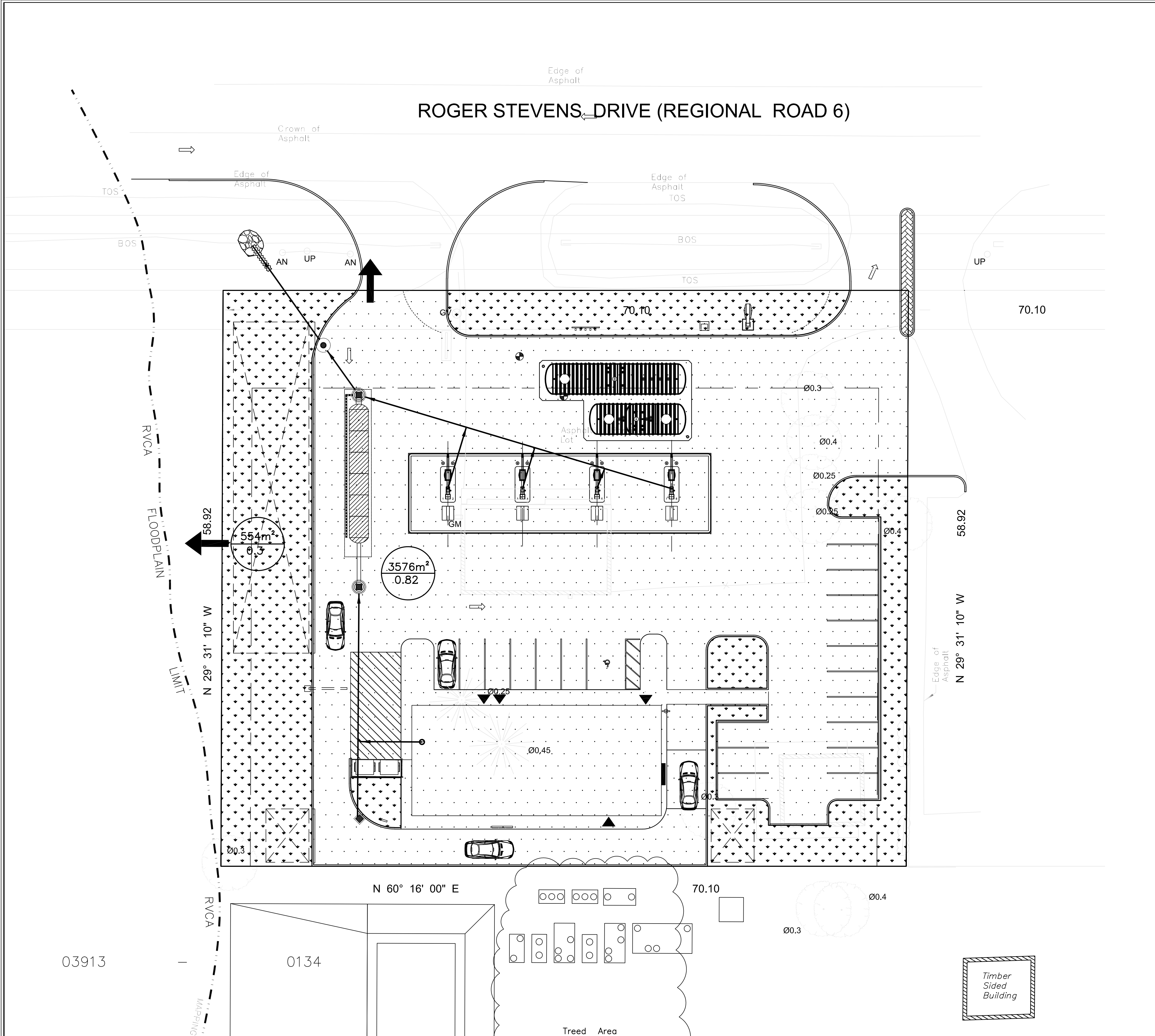
LEGEND:

1385m² / 0.803	CATCHMENT AREA / RUNOFF COEFFICIENT
- - - -	DRAINAGE BOUNDARY UNDER CONSIDERATION
←	OVERLAND FLOW
	GRASS COVER
	HARDSCAPE COVER ASPHALT, CONCRETE, ROOF, ETC.

EXISTING STORM DRAINAGE

DRAWN BY:	S.K.	SCALE:	N.T.S.
CHECKED BY:	S.J.	FIGURE NO. :	1
DATED:	MAY 2018		

Appendix B – Figure 2. Post Development Condition.



LEGEND:

- 1385m² / 0.803 — CATCHMENT AREA / RUNOFF COEFFICIENT
- DRAINAGE BOUNDARY UNDER CONSIDERATION
- PROPOSED STORM SEWER
- OVERLAND FLOW
- GRASS COVER
- HARDSCAPE COVER ASPHALT, CONCRETE, ROOF, ETC.

PROPOSED STORM DRAINAGE

DRAWN BY:	S.K.	SCALE:	N.T.S.
CHECKED BY:	S.J.	FIGURE NO. :	2
DATED:	MAY 2018		

Appendix C – Stormceptor Sizing Report

Stormceptor® FORTERRA

Detailed Stormceptor Sizing Report – 1622 Roger Stevens Derive, Kars

Project Information & Location			
Project Name	Roger Steven Drive, Kars, Parkland	**Project Number**	1804-176-00
City	Ottawa	**State/ Province**	Ontario
Country	Canada	**Date**	5/1/2018
Designer Information		**EOR Information (optional)**	
Name	Sergey Kiselyov	**Name**	
Company	Blueprint2build Inc.	**Company**	
Phone #	905-888-0800	**Phone #**	
Email	skiselyov@blueprint2build.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	1622 Roger Stevens Derive, Kars
Recommended Stormceptor Model	STC 750
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	84
PSD	Fine Distribution
Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A

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	75	93
STC 750	84	98
STC 1000	85	98
STC 1500	85	98
STC 2000	88	99
STC 3000	89	99
STC 4000	91	100
STC 5000	92	100
STC 6000	93	100
STC 9000	95	100
STC 10000	95	100
STC 14000	97	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**	4819
Rainfall Station Name	OTTAWA MACDONALD-CARTIER INT'L A	**Total Rainfall (mm)**	20978.1
Station ID #	6000	**Average Annual Rainfall (mm)**	567.0
Coordinates	45°19'N, 75°40'W	**Total Evaporation (mm)**	1632.2
Elevation (ft)	370	**Total Infiltration (mm)**	2927.5
Years of Rainfall Data	37	**Total Rainfall that is Runoff (mm)**	16418.4

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.

Drainage Area	
Total Area (ha)	0.358
Imperviousness %	86.0

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

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
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)	88.53
Stormceptor Outlet Invert Elev (m)	88.50
Stormceptor Rim Elev (m)	90.65
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	300
Pipe Material	PVC - plastic
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

Site Name	1622 Roger Stevens Derive, Kars

Site Details

Drainage Area	
Total Area (ha)	0.358
Imperviousness %	86.0

Surface Characteristics	
Width (m)	120.00
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

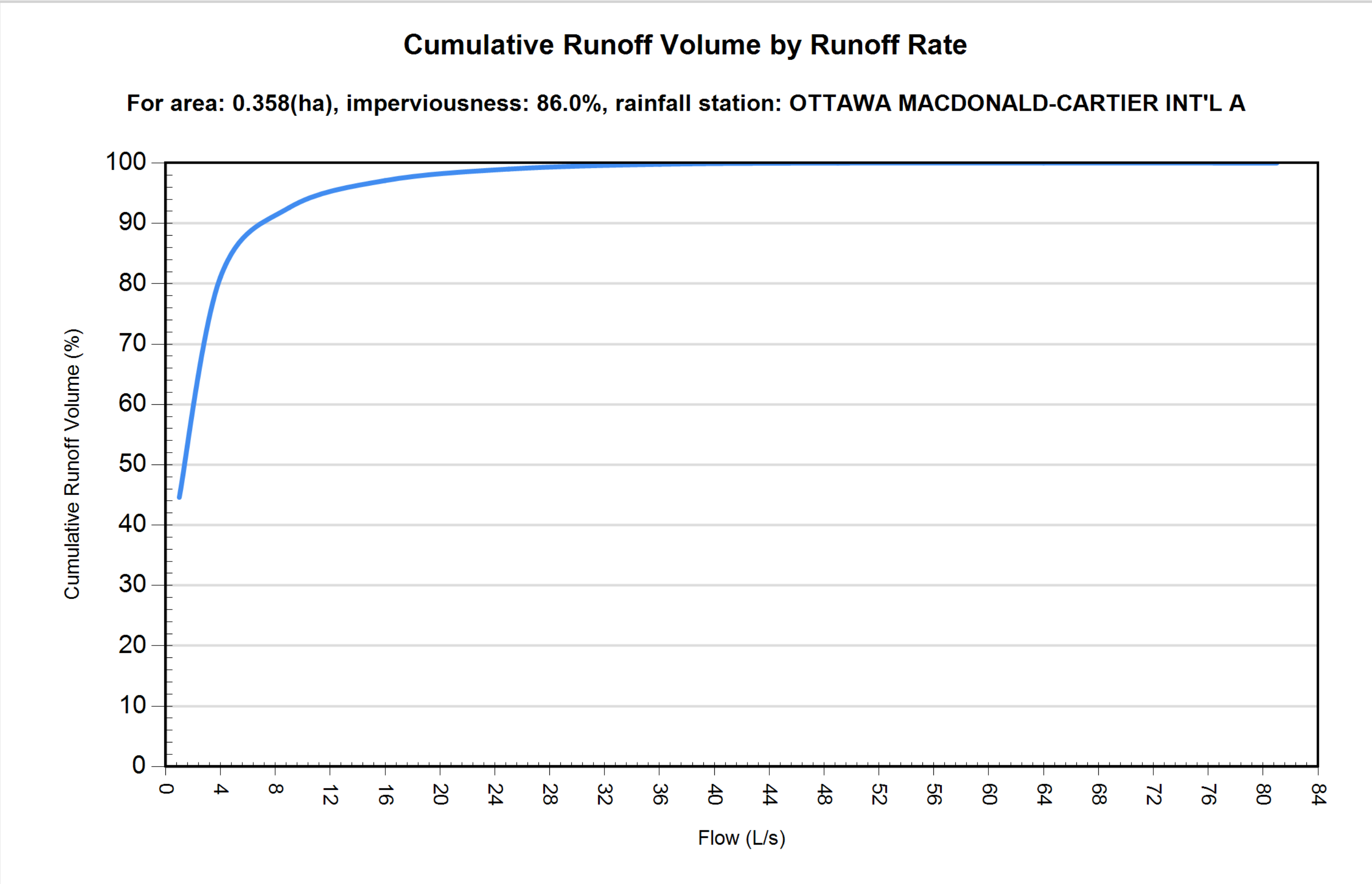
Winter Months	
Winter Infiltration	0

TSS Loading Parameters	
TSS Loading Function	

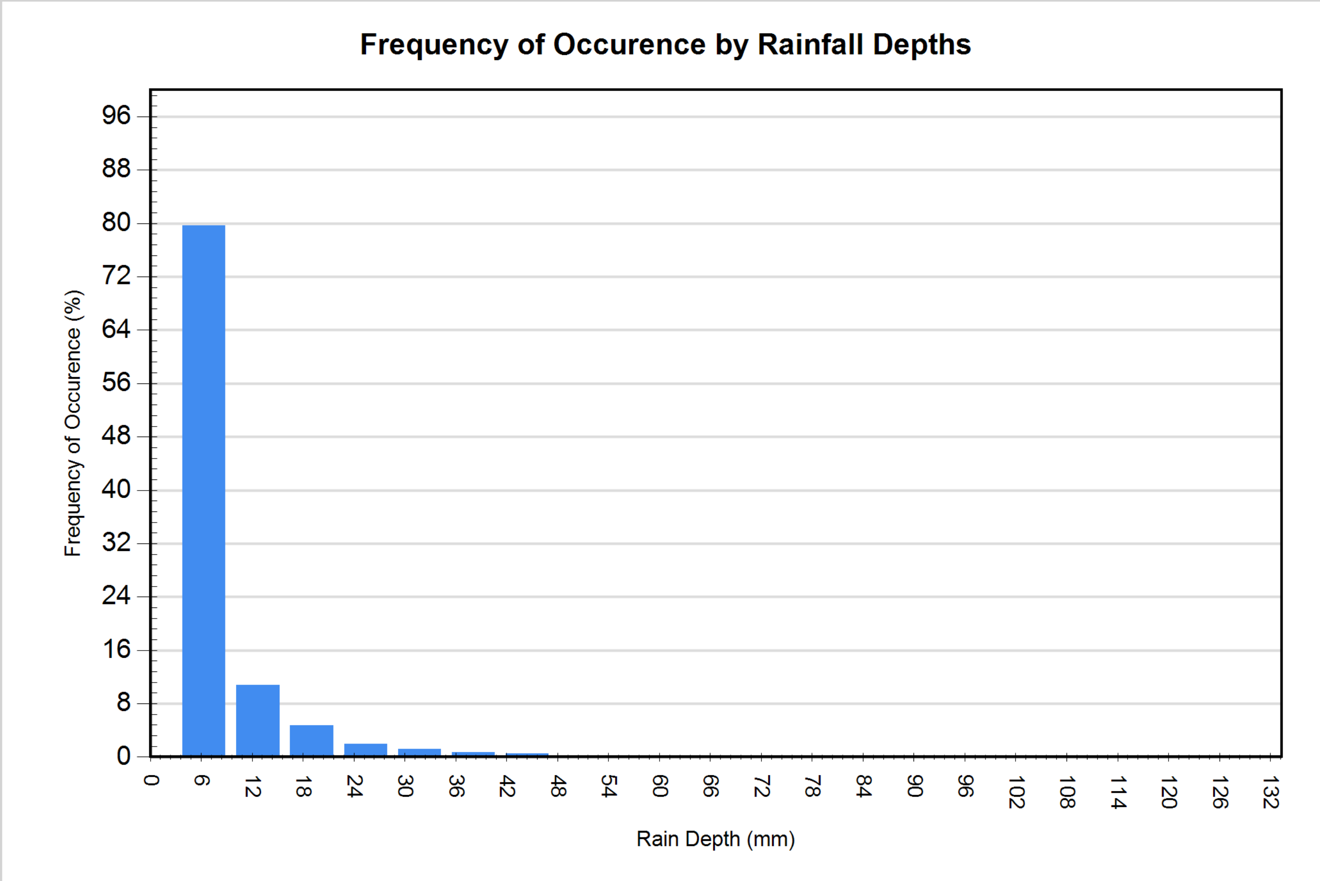
Buildup/Wash-off Parameters	
Target Event Mean Conc. (EMC) mg/L	
Exponential Buildup Power	
Exponential Washoff Exponent	

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	26415	32759	44.6
4	48000	11172	81.1
9	54800	4371	92.6
16	57447	1724	97.1
25	58551	620	99.0
36	59029	141	99.8
49	59142	28	100.0
64	59170	1	100.0
81	59171	0	100.0



Rainfall Event Analysis				
Rainfall Depth (mm)	No. of Events	Percentage of Total Events (%)	Total Volume (mm)	Percentage of Annual Volume (%)
6.35	3843	79.7	5885	28.1
12.70	520	10.8	4643	22.1
19.05	225	4.7	3470	16.5
25.40	98	2.0	2144	10.2
31.75	58	1.2	1639	7.8
38.10	32	0.7	1118	5.3
44.45	24	0.5	996	4.7
50.80	9	0.2	416	2.0
57.15	5	0.1	272	1.3
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0
114.30	1	0.0	109	0.5
120.65	0	0.0	0	0.0
127.00	0	0.0	0	0.0



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